ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

CONTENTS (Cont'd.)

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

When you perform trouble diagnoses, read GI section, "HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES" and "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".

Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help 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), seat belt pre-tensioners, a diagnosis sensor 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:

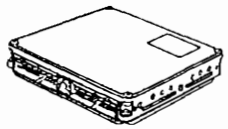
- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **All SRS air bag electrical wiring harnesses and connectors are covered with yellow outer insulation. Do not use electrical test equipment on any circuit related to the SRS.**

Engine Fuel & Emission Control System

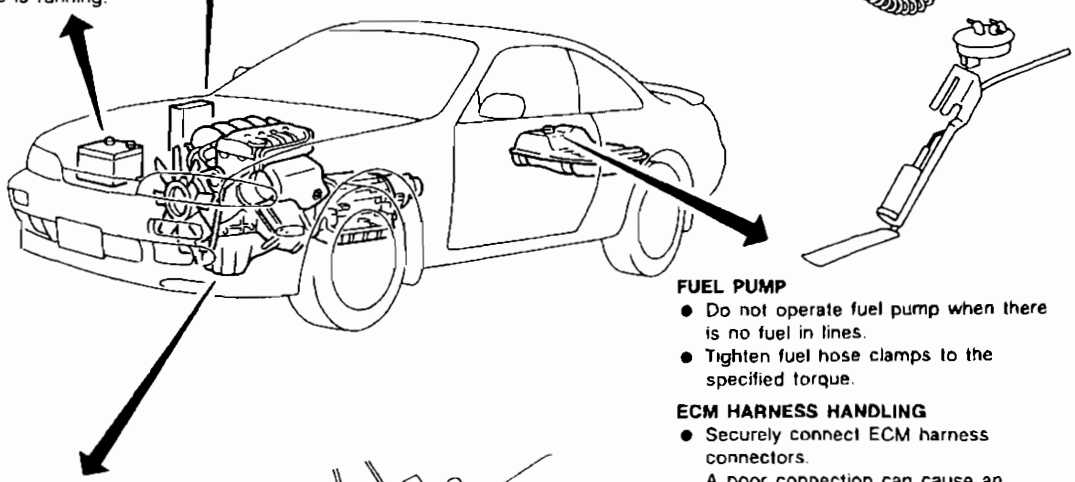
ECM
- Do not disassemble ECM (ECCS control module).
- Do not turn diagnosis mode selector forcibly
- If a battery terminal is disconnected, the memory will return to the ECM value. The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected.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

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

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



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



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

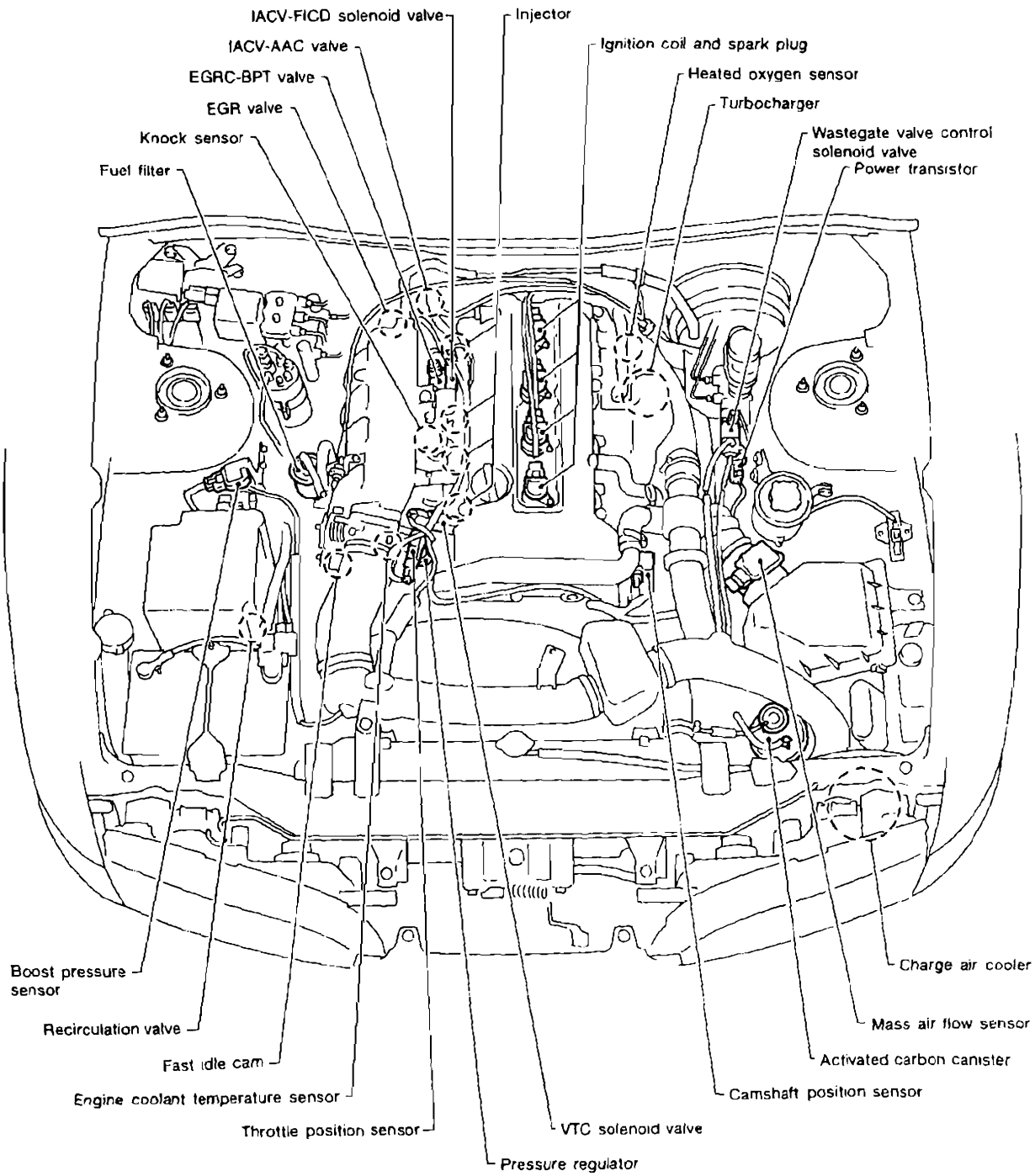
ECM HARNESS HANDLING
- Securely connect ECM harness connectors.
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- Keep ECM harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECM system malfunction due to receiving external noise, degraded operation of ICs, etc.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

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

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.

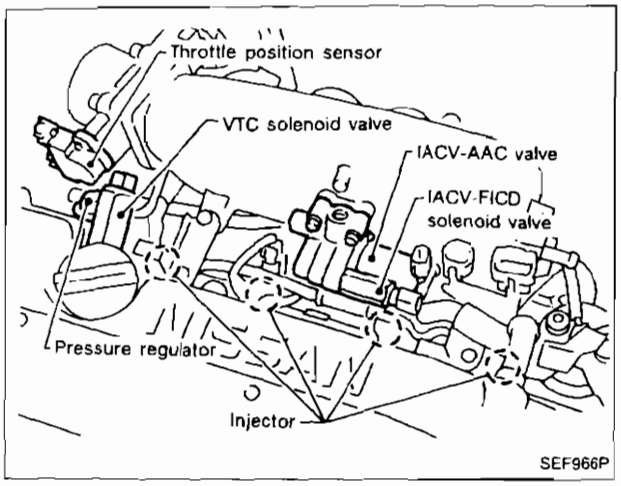
SEF181P

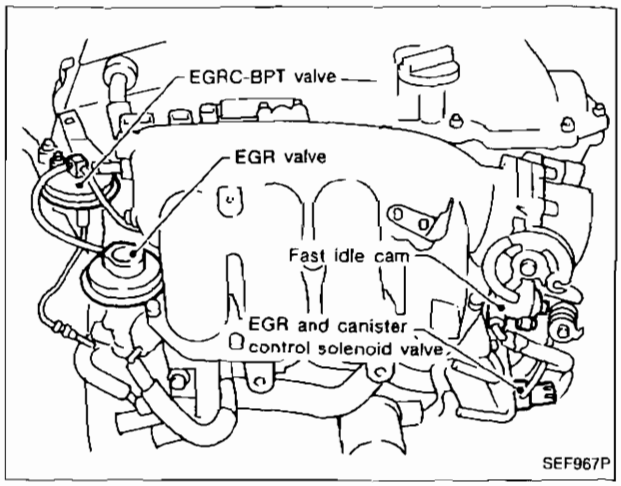
ECCS Component Parts Location

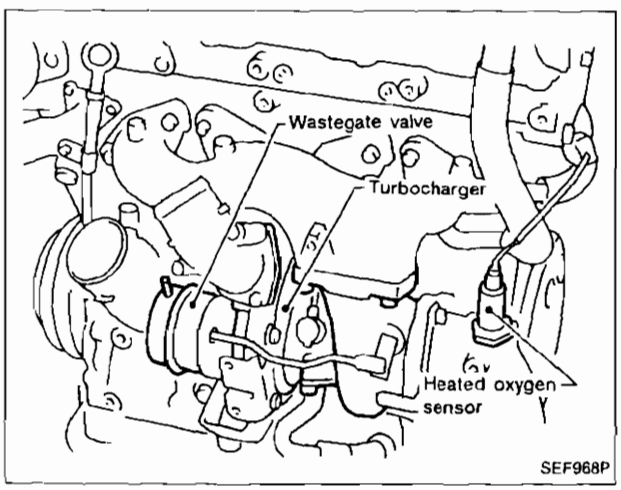


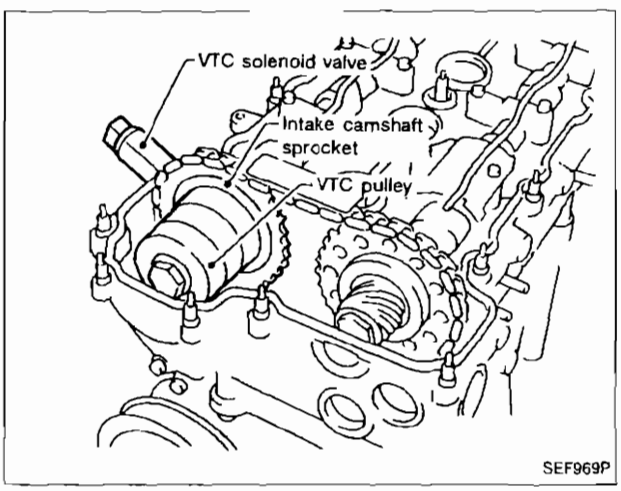
SFF965P

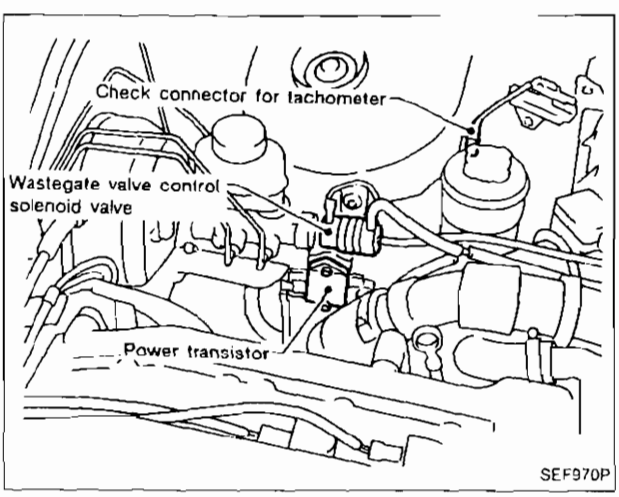
ECCS Component Parts Location (Cont'd)

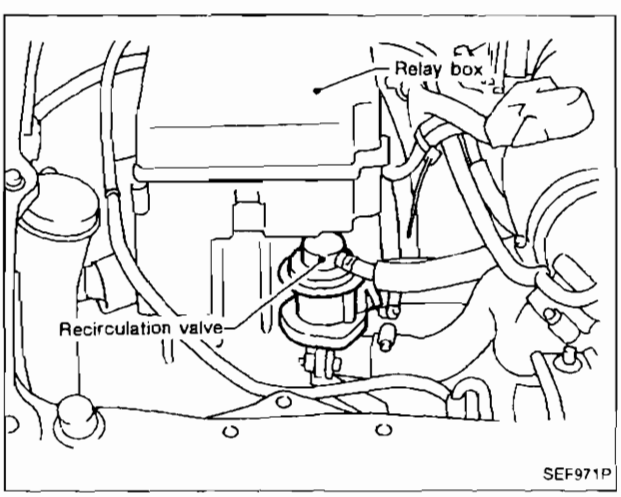






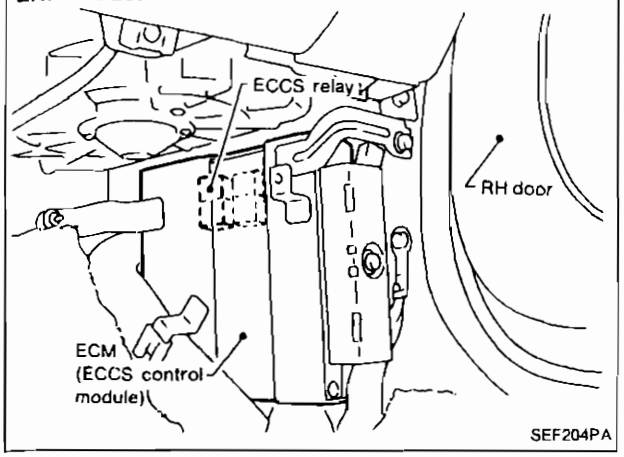






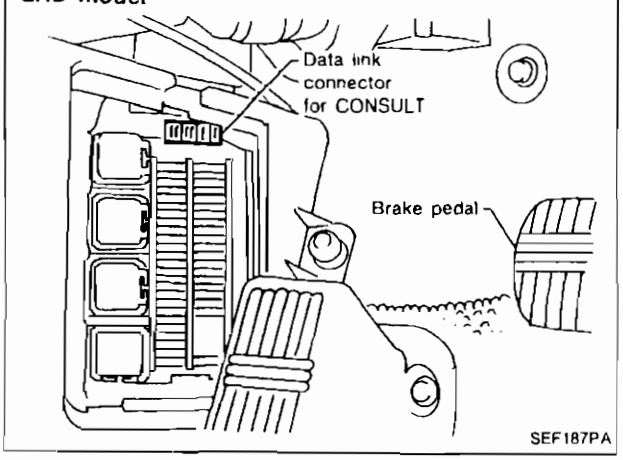
ECCS Component Parts Location (Cont'd)

LHD model



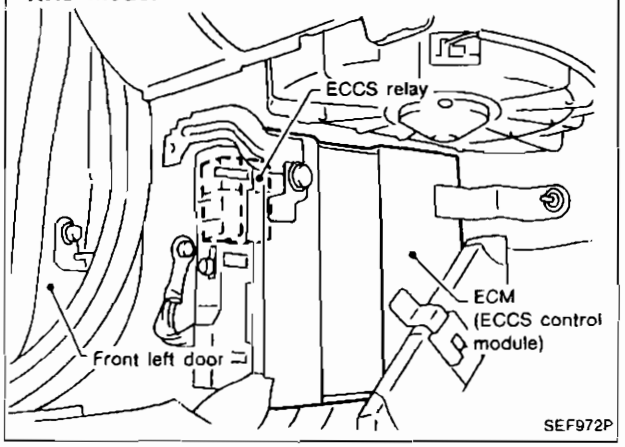
SEF204PA

LHD model



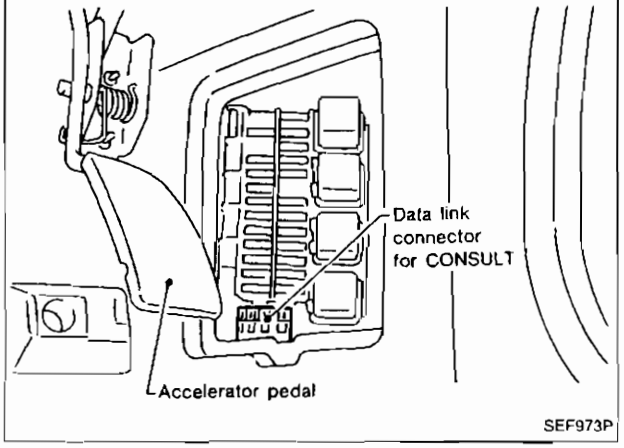
SEF187PA

RHD model



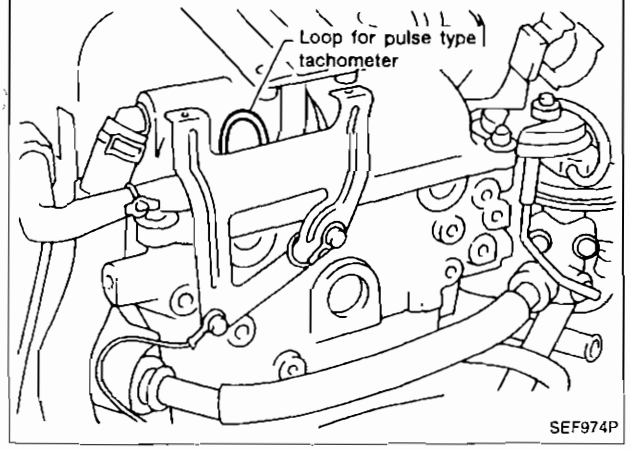
SEF972P

RHD model



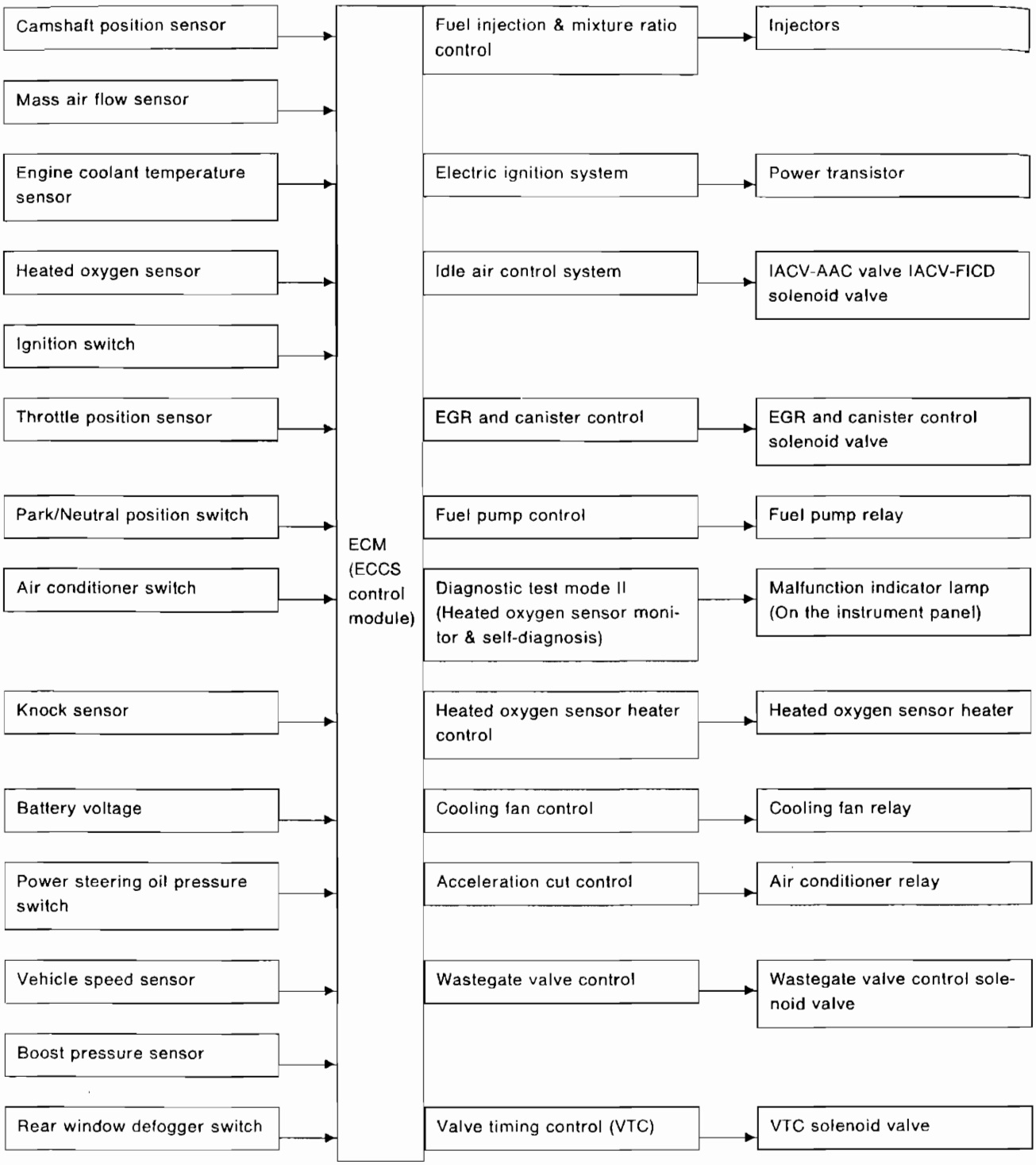
SEF973P

Engine rear

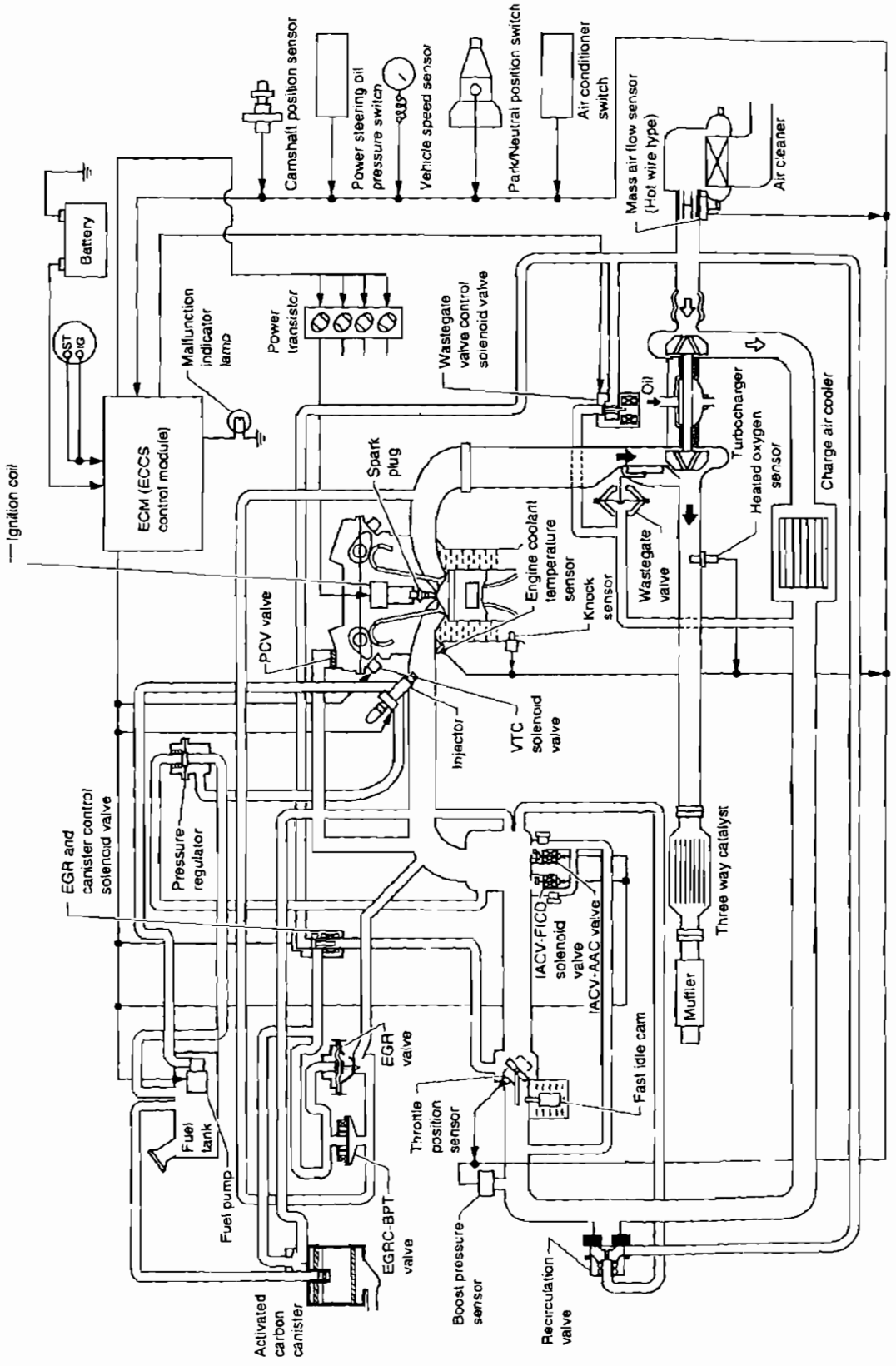


SEF974P

System Chart

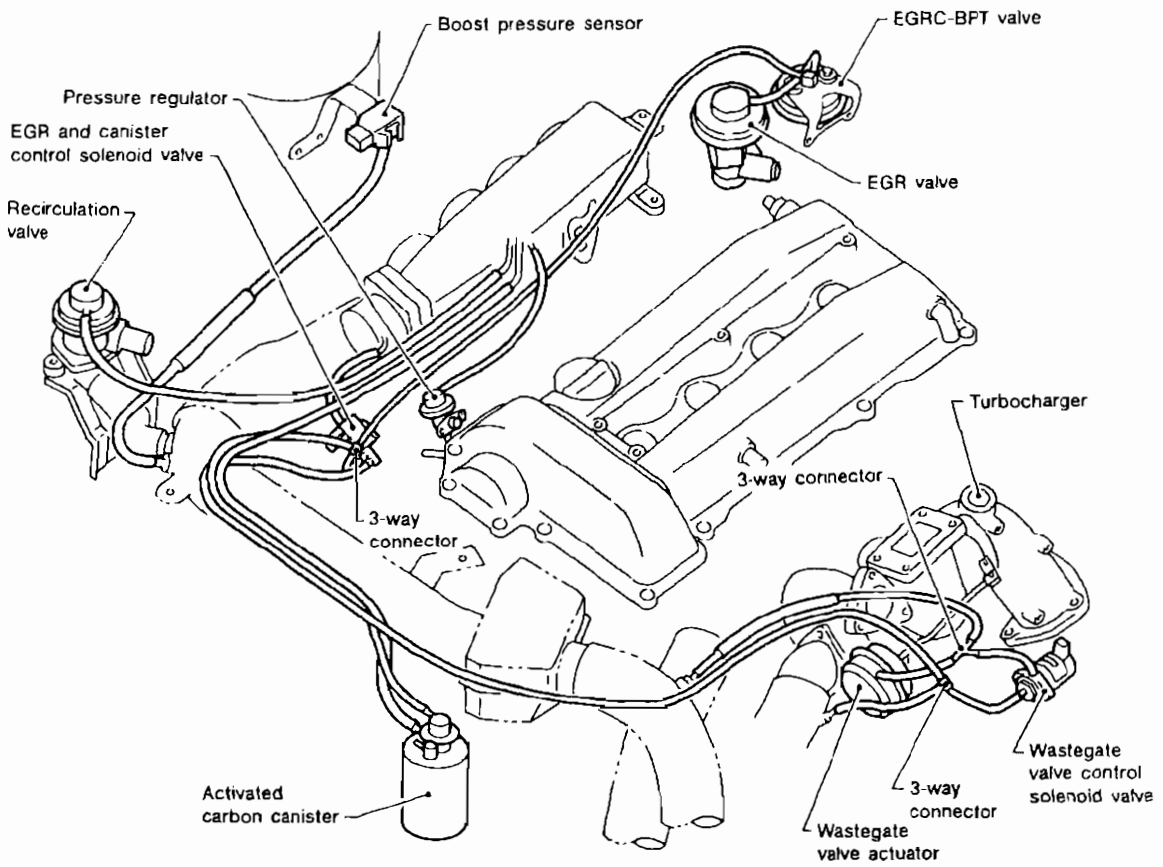


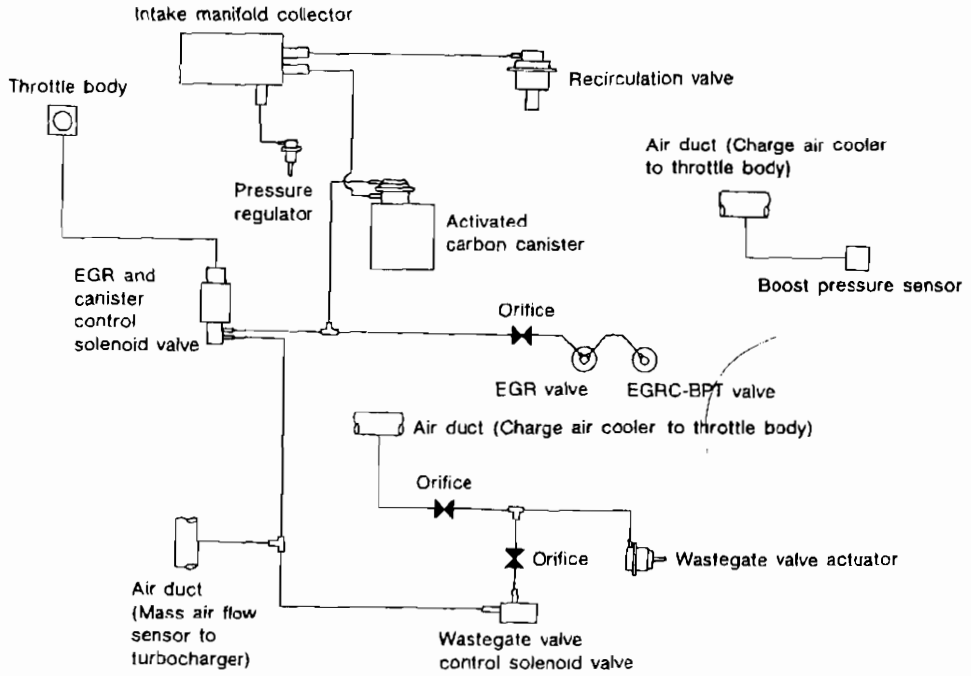
System Diagram



SEC975P

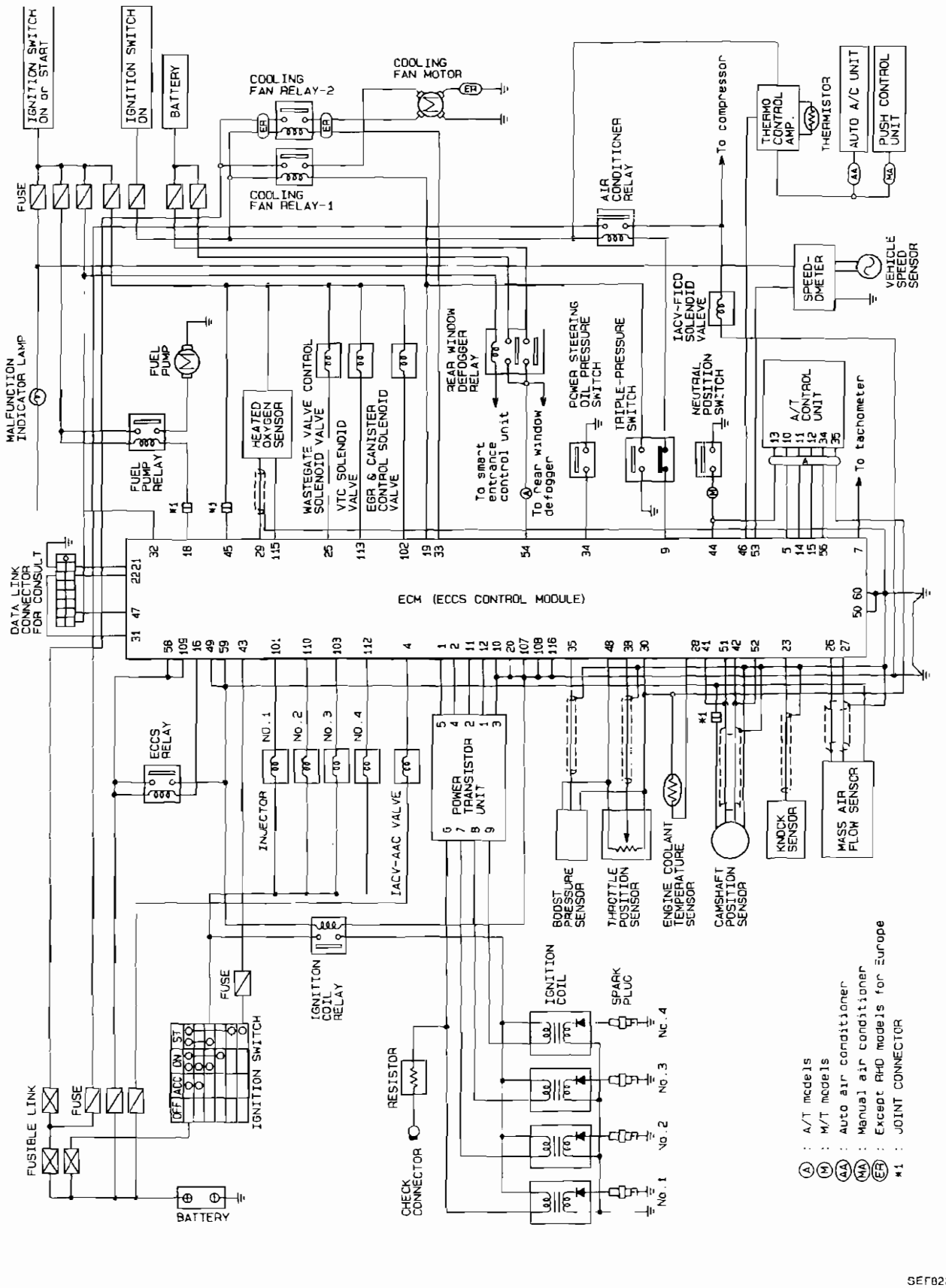
Vacuum Hose Drawing

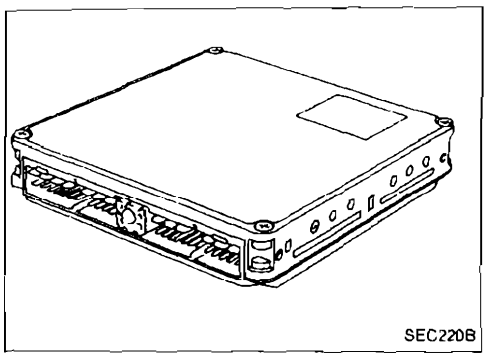




SEF976P

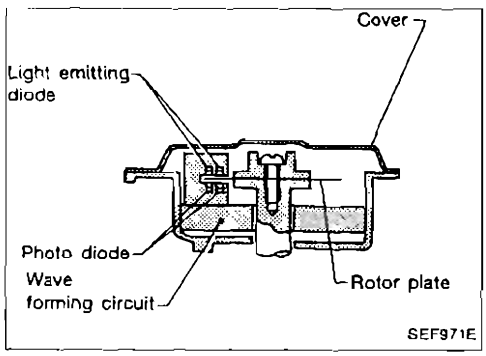
Circuit Diagram




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 unit controls the engine.



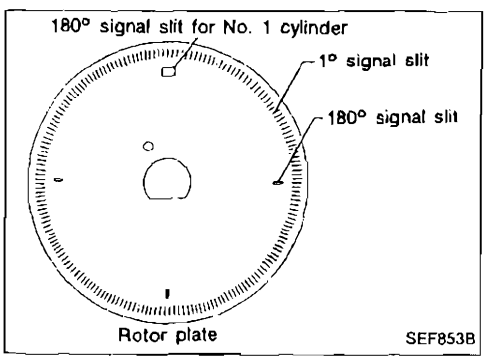
SEF971E

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 4 slits for 180° signal. Light Emitting Diodes (LED) and photo diodes are built in the wave-forming circuit.

When the rotor plate passes between the LED and the photo diode, the slits in the rotor plate continually cut the light being transmitted to the photo diode from the LED This generates rough-shaped pulses which are converted into on-off pulses by the wave-forming circuit, which are sent to the ECM. For diagnosis, refer to EC-109, 201.



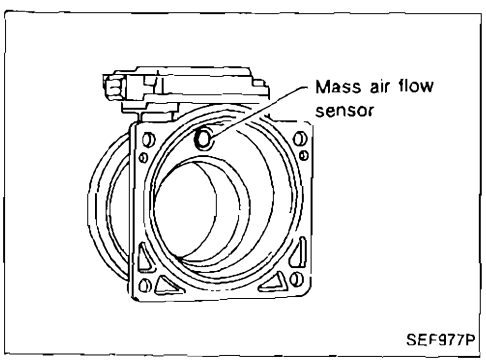
SEF853B

Mass Air Flow Sensor (MAFS)

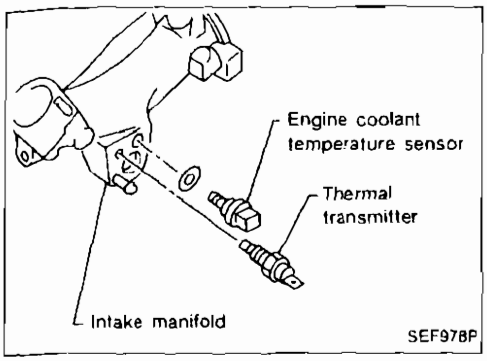
The mass air flow sensor measures the intake air flow rate by measuring a part of the entire flow. Measurements are made in such a way that the ECM receives electrical output signals varied by the amount of heat emitting from the hot film placed in the stream of the intake air.

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

Therefore, it is necessary to supply the hot film with more electric current in order to maintain the temperature of the hot film. The ECM detects the air flow by means of this current change. For diagnosis, refer to EC-113, 201.



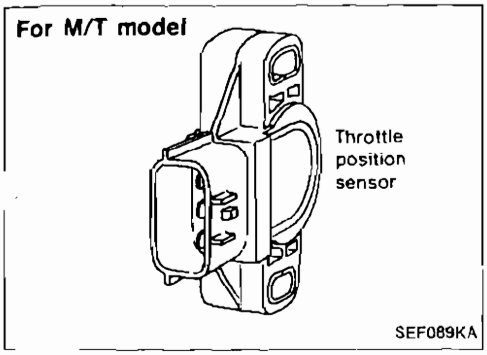
SEF977P



Engine Coolant Temperature Sensor (ECTS)

The engine coolant temperature sensor, located on the top of thermostat 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.
For diagnosis, refer to EC-116, 201.

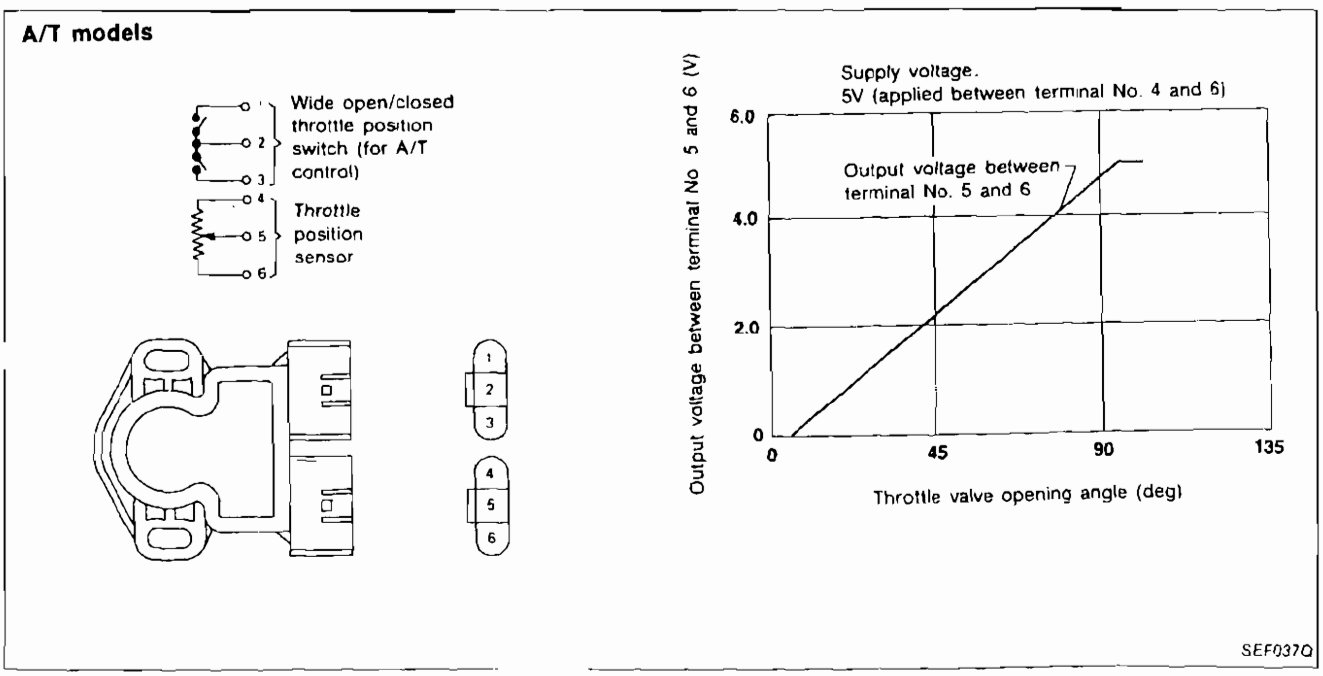
For M/T model

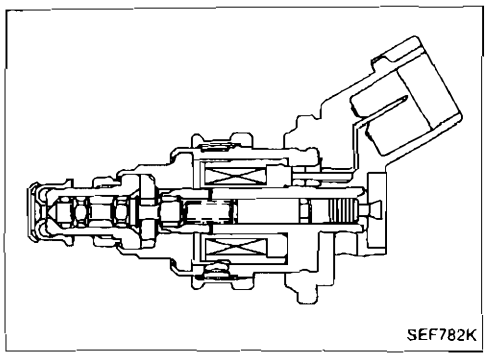


Throttle Position Sensor (TPS) & Soft Closed Throttle Position (CTP) Switch

The throttle position sensor responds to acccelerator 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.
Closed throttle 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. For diagnosis, refer to EC-135, 204.

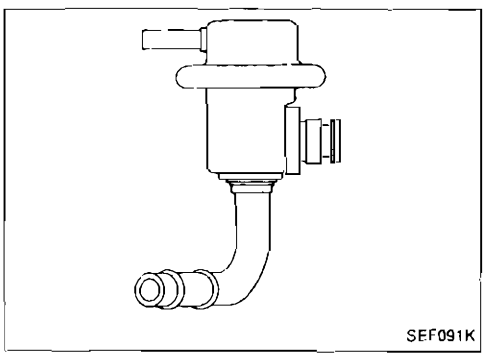
A/T models




SEF782K

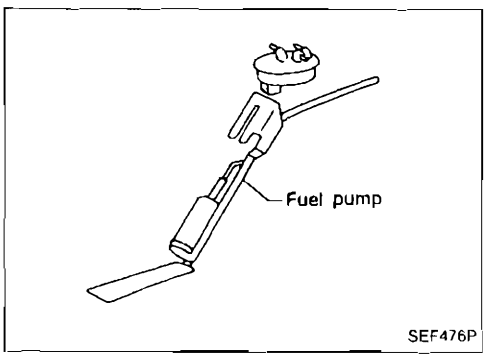
Fuel Injector

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. For diagnosis, refer to EC-156, 205.


SEF091K

Fuel Pressure Regulator

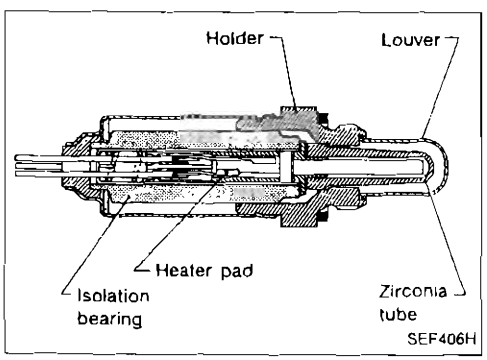
The pressure regulator maintains the fuel pressure at 299.1 kPa (2.991 bar, 3.05 kg/cm^2, 43.4 psi). Since the injected fuel amount depends on injection pulse duration, it is necessary to maintain the pressure at the above value. For diagnosis, refer to EC-208.



SEF476P

Fuel Pump

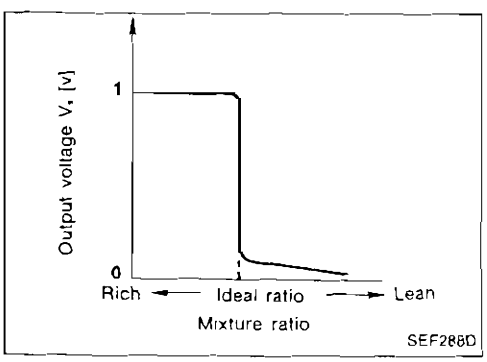
The fuel pump is a turbine type located in the fuel tank. For diagnosis, refer to EC-159, 202.



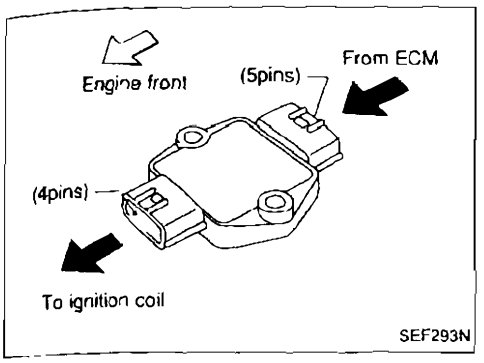
SEF406H

Heated Oxygen Sensor (HO2S)

The heated oxygen sensor, which is placed into the exhaust outlet, monitors the amount of oxygen in the exhaust gas.
The sensor has a closed-end tube made of ceramic zirconia. The outer surface of the tube is exposed to exhaust gas, and the inner surface to atmosphere. The zirconia of the tube compares the oxygen density of exhaust gas with that of atmosphere, and generates electricity. In order to improve generating power of the zirconia, its tube is coated with platinum. The voltage is approximately 1V in a richer condition of the mixture ratio than the ideal air-fuel ratio, while approximately 0V in leaner conditions. The radical change from 1V to 0V occurs at around the ideal mixture ratio. In this way, the heated oxygen sensor detects the amount of oxygen in the exhaust gas and sends the signal of approximately 1V or 0V to the ECM. A heater is used to activate the sensor. For diagnosis, refer to EC-152, 203.

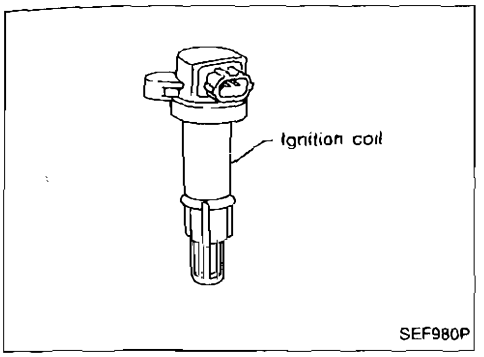


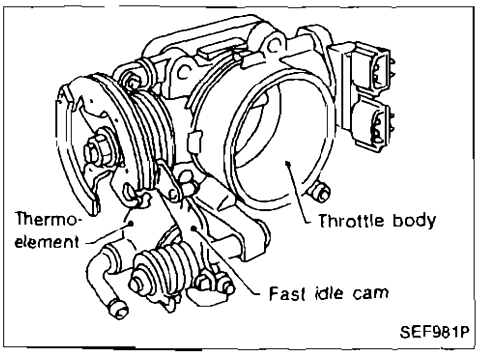
SEF288D



Power Transistor Unit & Ignition Coil

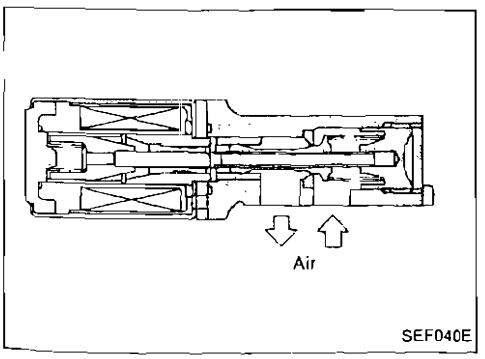
The ignition signal from the ECM is amplified by the power transistor, which turns the ignition coil primary circuit on and off, inducing the proper high voltage in the secondary circuit. The ignition coil is a small, molded type located on the spark plug.
For diagnosis, refer to EC-120, 202.





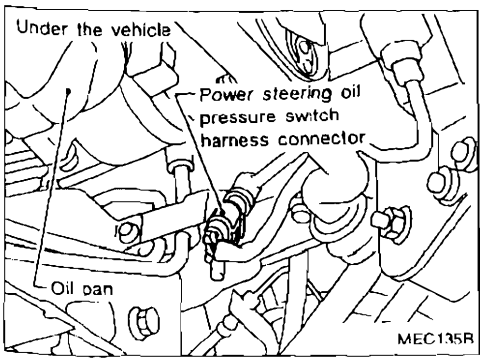
Fast Idle Cam (FIC)

The FIC is installed on the throttle body to maintain adequate engine speed while the engine is cold. It is operated by a volumetric change in wax located inside the thermo-element. The thermo-element is controlled by engine coolant temperature. For diagnosis, refer to EC-207.



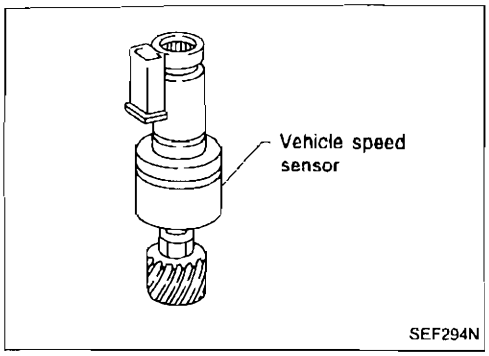
Idle Air Control Valve (IACV)-Auxiliary Air Control (AAC) Valve

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. For diagnosis, refer to EC-169, 204.



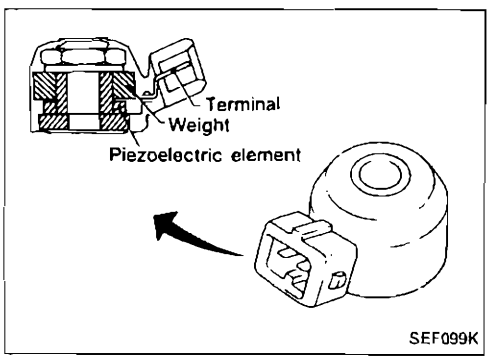
Power Steering Oil Pressure Switch

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. For diagnosis, refer to EC-184, 206.



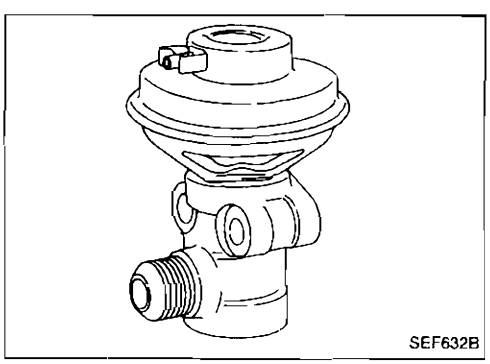
Vehicle Speed Sensor (VSS)

The vehicle speed sensor provides a vehicle speed signal to the speedometer and the speedometer sends a signal to the ECM.
The speed sensor consists of a pulse generator which is installed in the transmission. For diagnosis, refer to EC-145, 202.



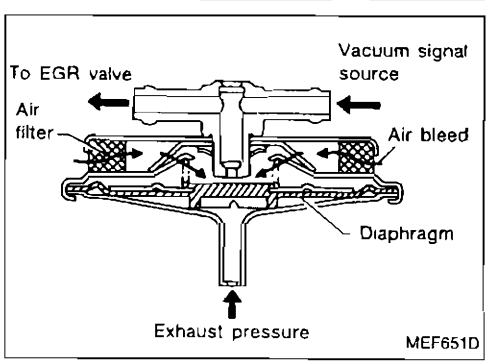
Knock Sensor (KS)

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.
For diagnosis, refer to EC-132, 205.



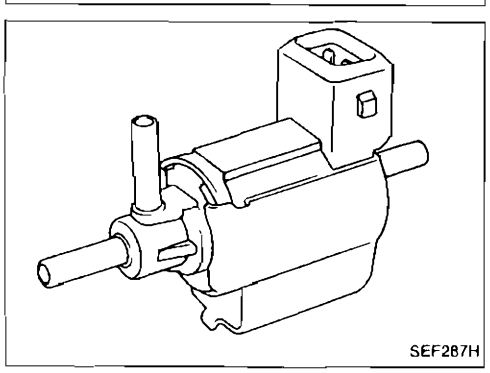
Exhaust Gas Recirculation (EGR) Valve

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. For diagnosis, refer to EC-148, 203.



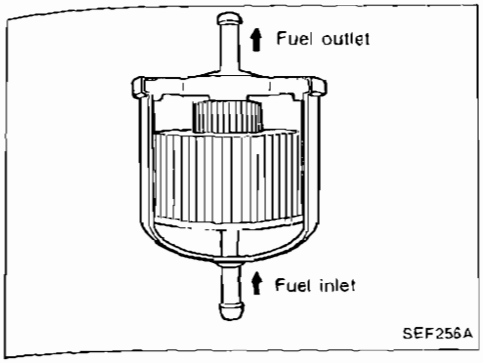
EGR Control (EGRC)-BPT Valve

The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation. For diagnosis, refer to EC-148, 203.



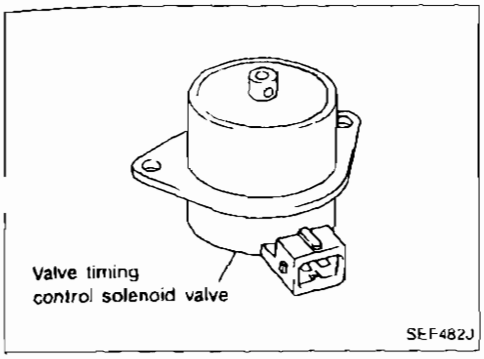
EGR and Canister Control Solenoid Valve

The EGR and canister control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve and canister purge valve).
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and carbon canister. For diagnosis, refer to EC-148, 203.



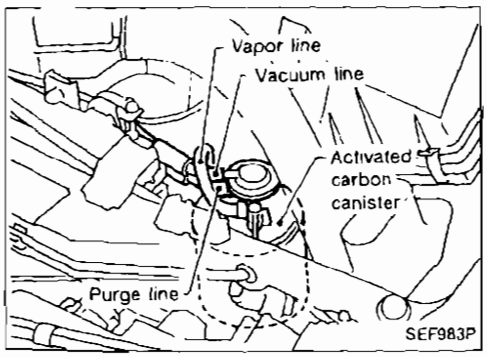
Fuel Filter

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



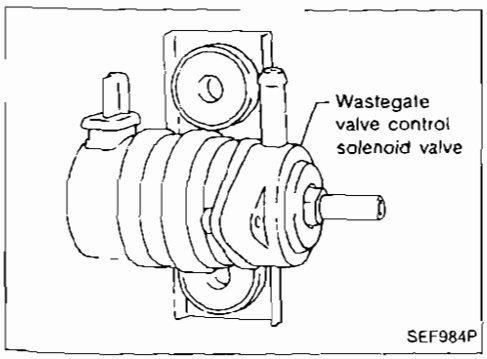
Valve Timing Control (VTC) Solenoid Valve

The valve timing control solenoid is installed at the front right of the cylinder head, and controls oil pressure which regulates the position of the intake camshafts. For diagnosis, refer to EC-166, 205.



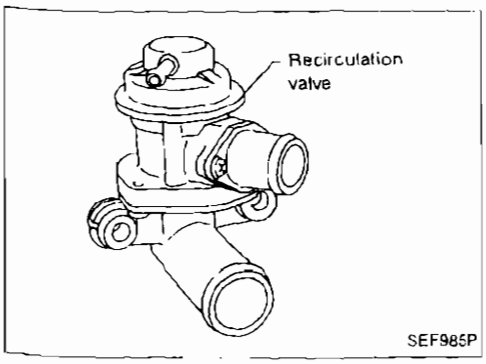
Carbon Canister

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. For diagnosis, refer to EC-148, 210.



Wastegate Valve Control Solenoid Valve

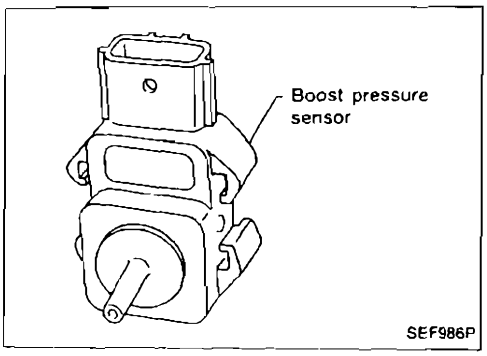
The solenoid valve is actuated by the ON/OFF pulse from the ECM. The longer that ON duty is left on the larger the amount of vacuum signals from the suction pipe or compressor outlet are fed into the wastegate valve actuator. The actuator is hard to open at this time. When the ECM sends an OFF signal, the coil pulls the plunger and cuts the route to the suction pipe. For diagnosis, refer to EC-163, 205.



Recirculation Valve

The recirculation valve reduces the noise occurring in the compressor of the turbocharger during deceleration. This valve recirculates air compressed downstream of the inter-cooler to upstream of the compressor using the intake manifold vacuum that occurs when the throttle chamber is suddenly closed.

The recirculation valve also must not be disassembled or adjusted. For diagnosis, refer to EC-206.

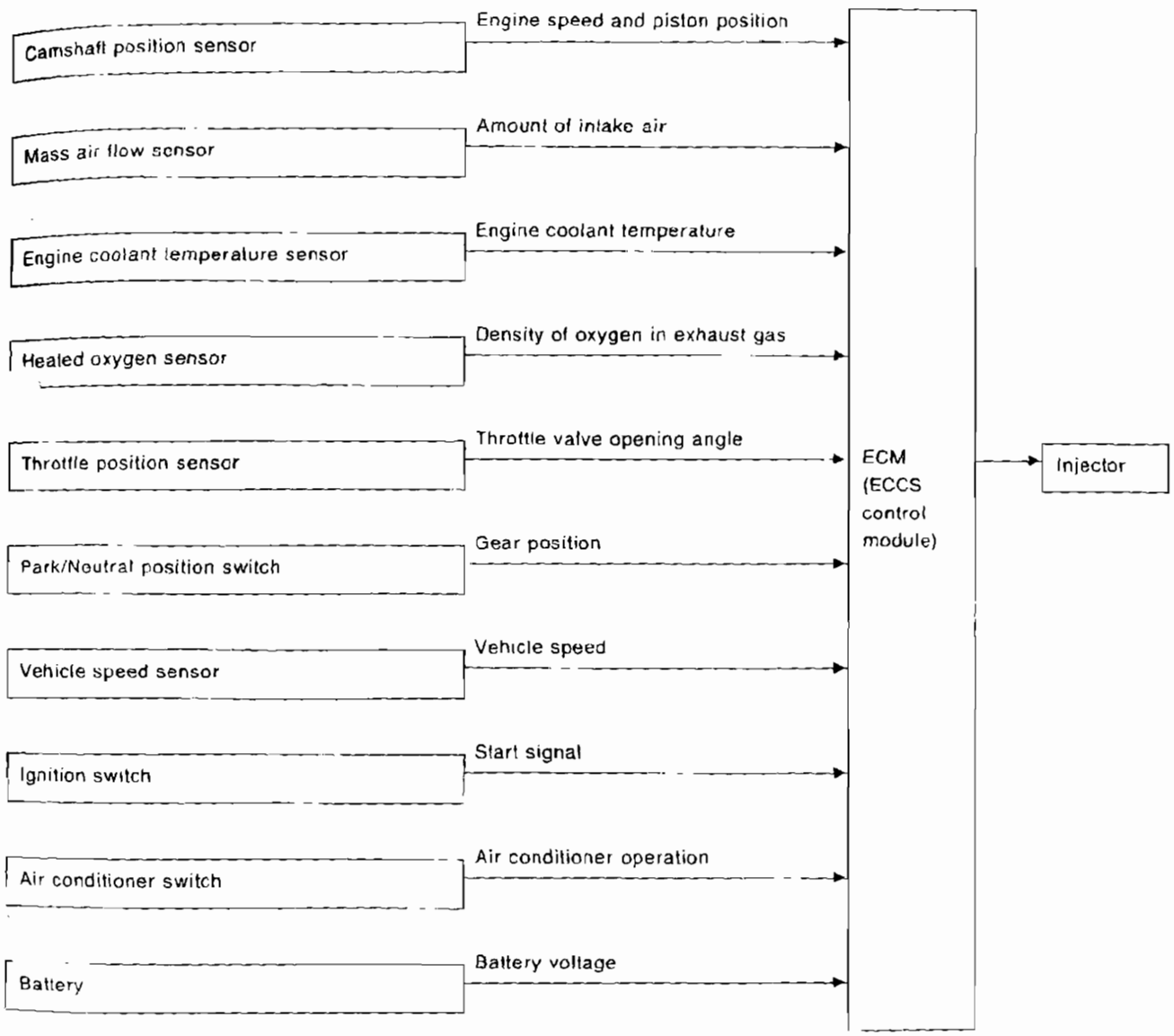


Boost Pressure Sensor

The boost pressure sensor detects boost pressure at the upstream of the throttle body. The pressure signal is transmitted to the ECM to control the boost pressure precisely. For diagnosis, refer to EC-128, 206.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



BASIC MULTIPORT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

The amount of fuel injection is compensated for to improve engine performance. This will be made under various operating conditions as listed below.

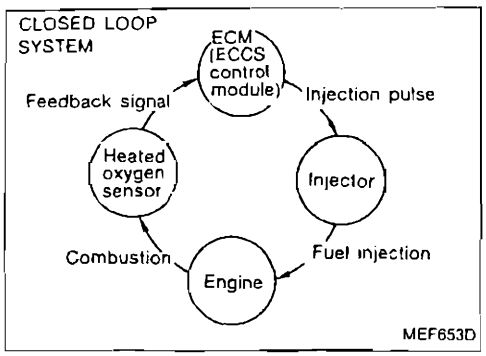
< Fuel increase >

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

< Fuel decrease >

1) During deceleration

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 a 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.

OPEN LOOP CONTROL

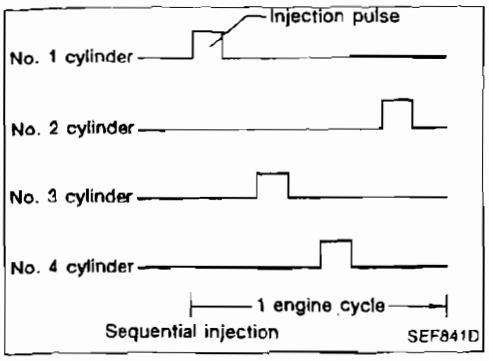
The open loop control condition refers to that under which the ECM detects any of the following conditions and feedback control stops in order to maintain stabilized fuel combustion.

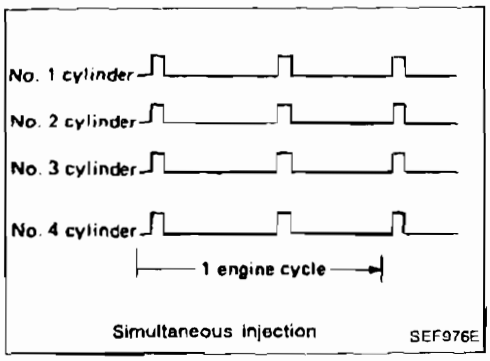
1) Deceleration
2) High-load, high-speed operation
3) Engine idling
4) Malfunction of heated oxygen sensor or its circuit
5) Insufficient activation of heated oxygen sensor at low engine coolant temperature
6) Engine starting

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor. This feedback signal is then sent to the ECM to control the amount of fuel injection to provide a basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both Manufacturing differences (i.e. mass air flow sensor hot wire) and characteristic changes during operation (i.e. injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "fuel injection duration" to automatically compensate for the difference between the two ratios.

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





FUEL INJECTION TIMING

Two types of systems are used — sequential multiport fuel injection system and simultaneous multiport fuel injection system.

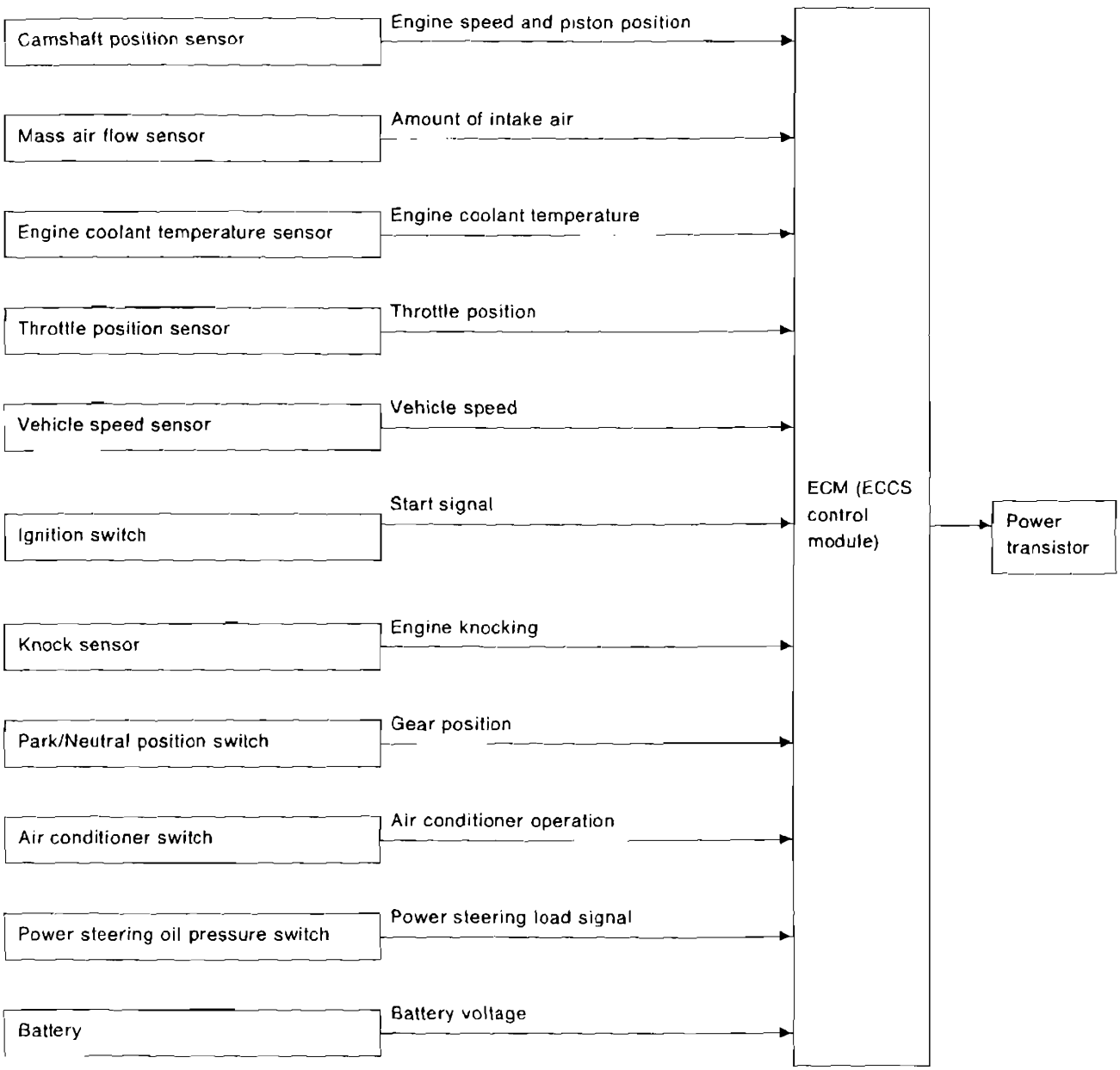
1) Sequential multiport fuel injection system
   Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
2) Simultaneous multiport fuel injection system
   Fuel is injected simultaneously into all four cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM. The four 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.

FUEL SHUT-OFF

Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Electronic Ignition (EI) System

INPUT/OUTPUT SIGNAL LINE



Electronic Ignition (EI) System (Cont'd)

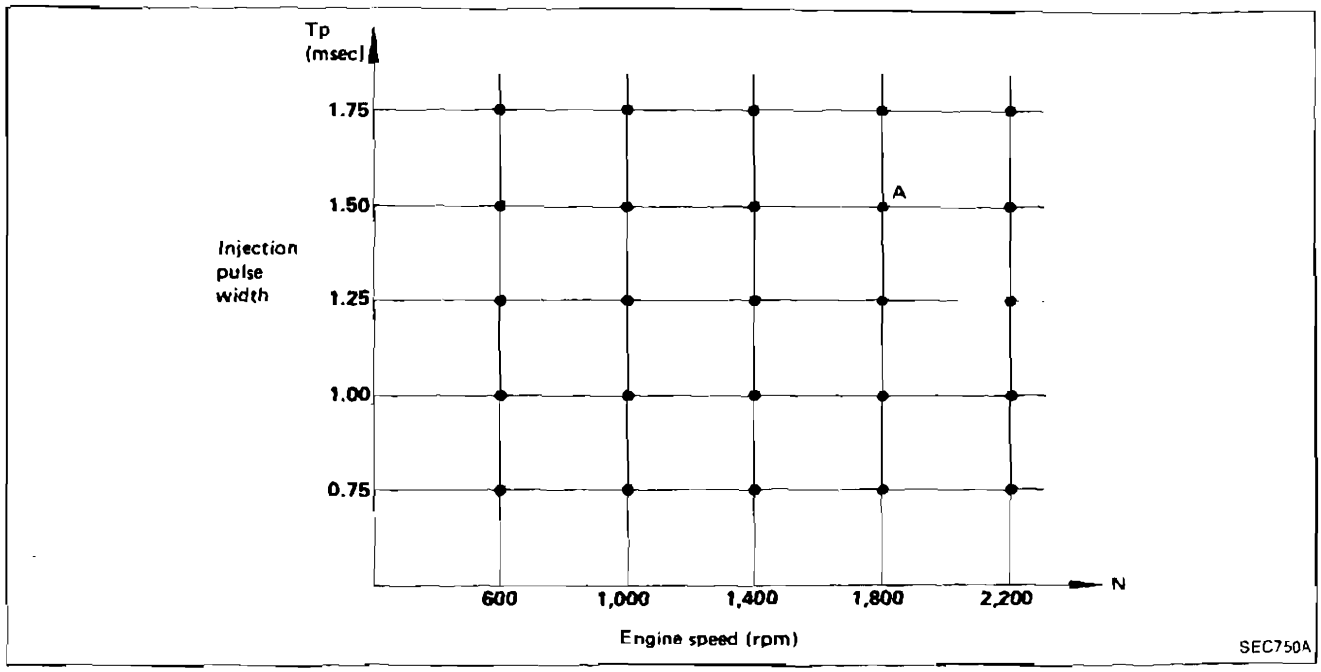
SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM in order to maintain the best air-fuel ratio for 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.

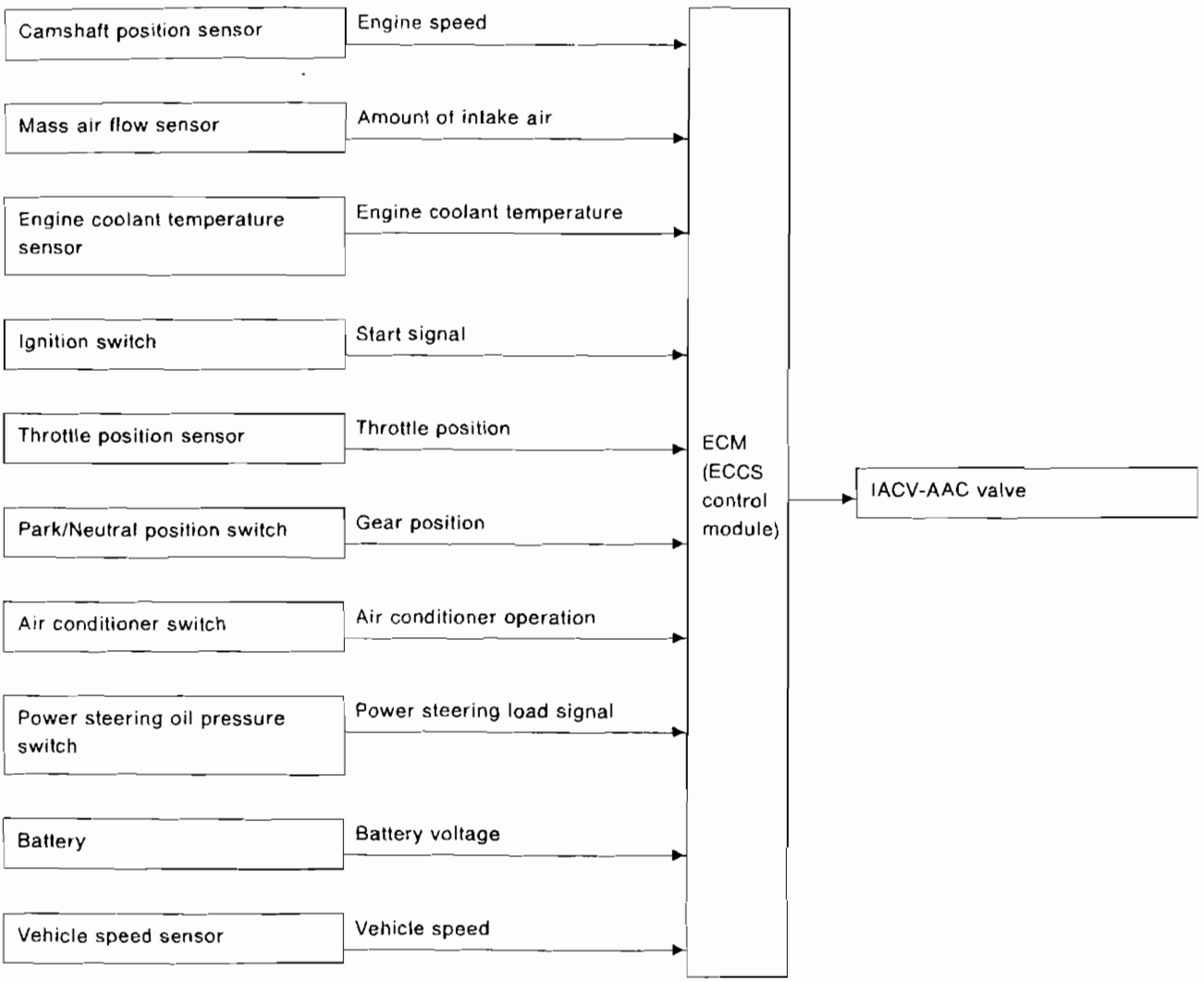


The retard system, actuated by the knock sensor, is designed only for emergencies. The basic ignition timing is pre-programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. Consequently, the retard system does not operate under normal driving conditions.

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



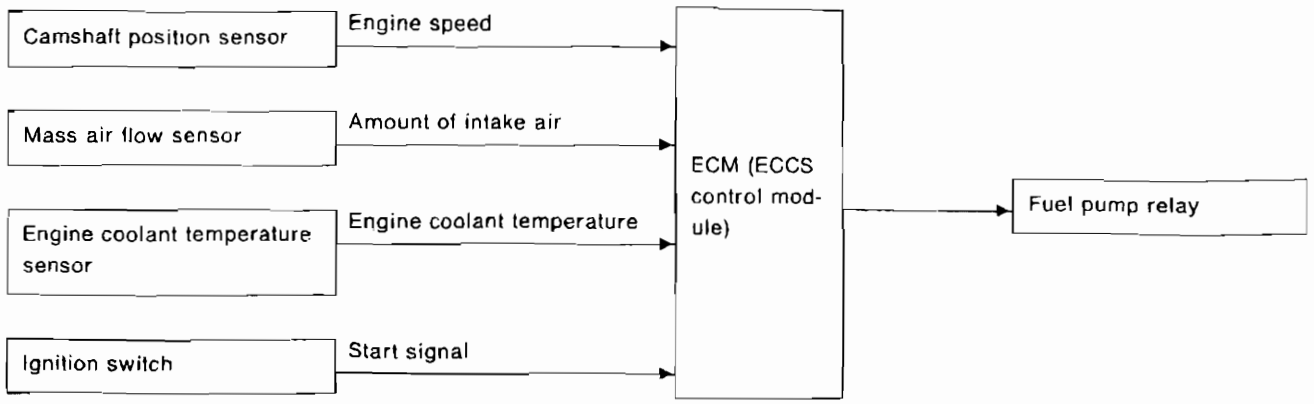
SYSTEM DESCRIPTION

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 the 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 the 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

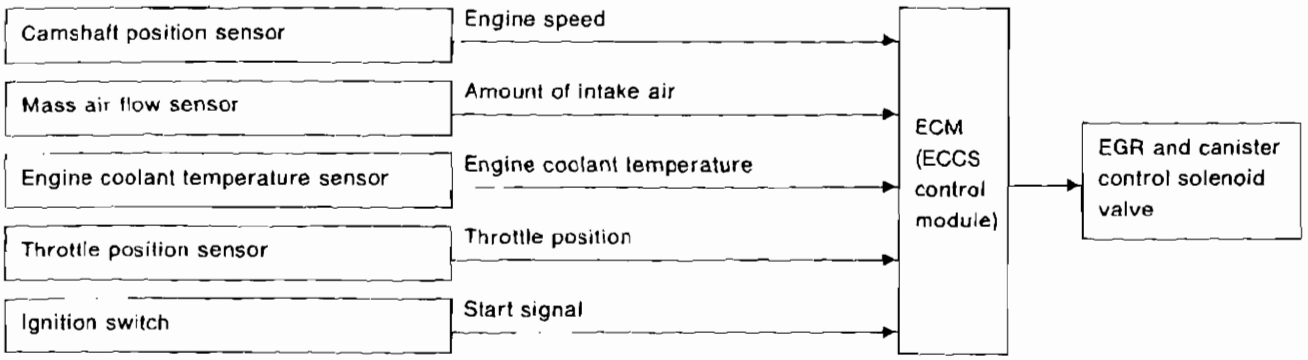
Fuel pump ON-OFF control

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 the battery from 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 second
Except as shown above	Stops

Exhaust Gas Recirculation (EGR) and Canister Control System

INPUT/OUTPUT SIGNAL LINE



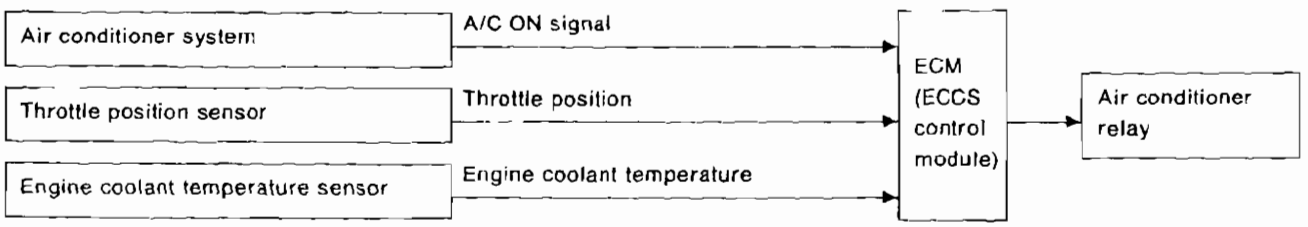
SYSTEM DESCRIPTION

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 and the EGR & canister control solenoid valve. When the ECM detects any of the following conditions, current flows through the solenoid valve. This causes the port vacuum to be discharged into the atmosphere. The EGR valve and canister remain closed.

1) Low engine coolant temperature
2) Engine starting
3) High-speed engine operation
4) Engine idling
5) Excessively high engine coolant temperature
6) Mass air flow sensor malfunction

Air Conditioner Cut Control

INPUT/OUTPUT SIGNAL LINE



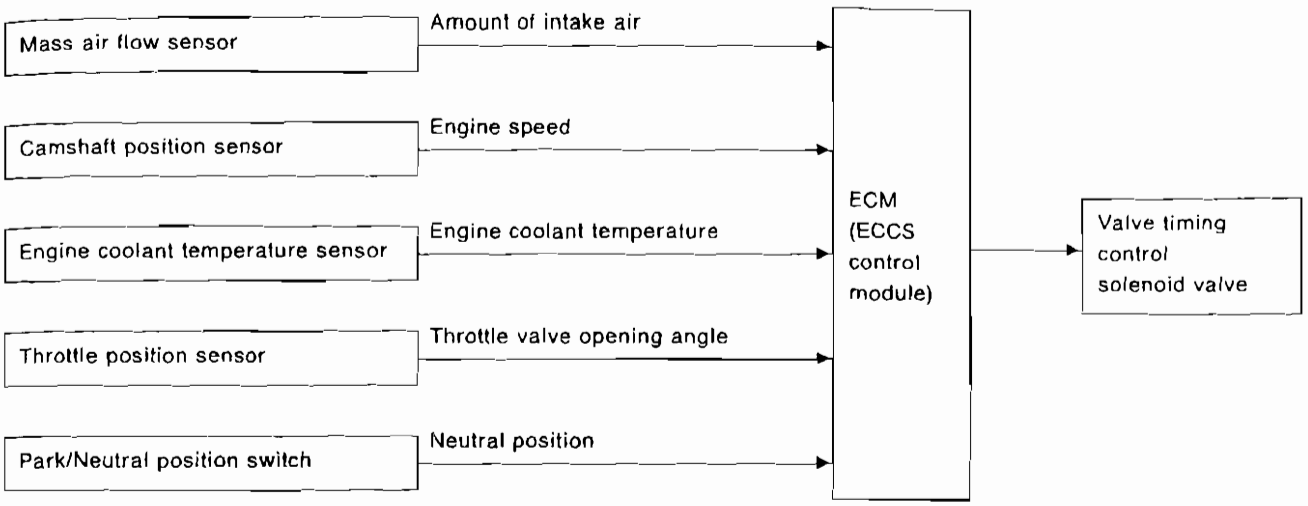
SYSTEM DESCRIPTION

When the accelerator pedal is fully depressed, or engine coolant temperature is extremely high, the air conditioner is turned off for a few seconds.

This system improves acceleration when the air conditioner is used.

Valve Timing Control (VTC)

INPUT/OUTPUT SIGNAL LINE



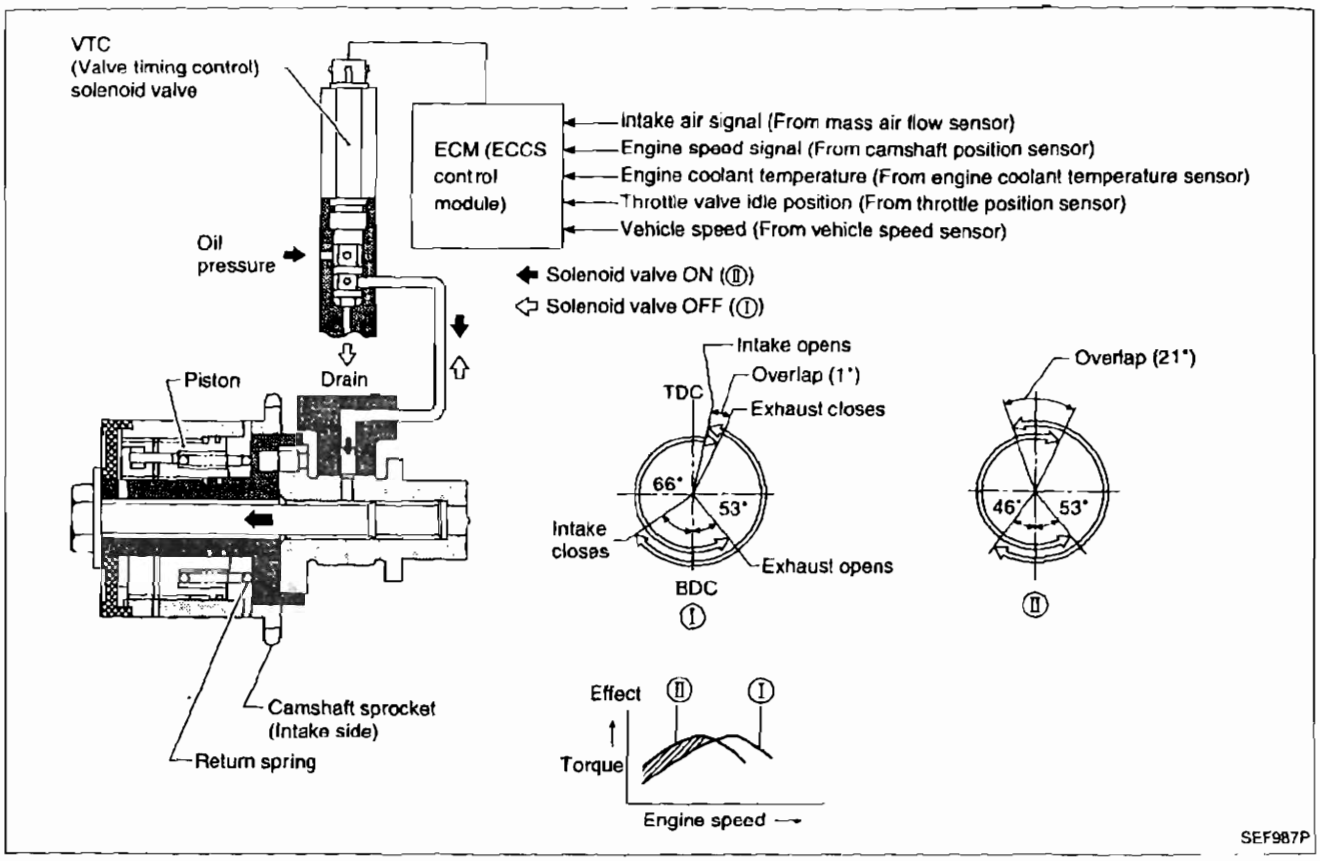
SYSTEM DESCRIPTION

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, vehicle speed 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 (VTC) (Cont'd)

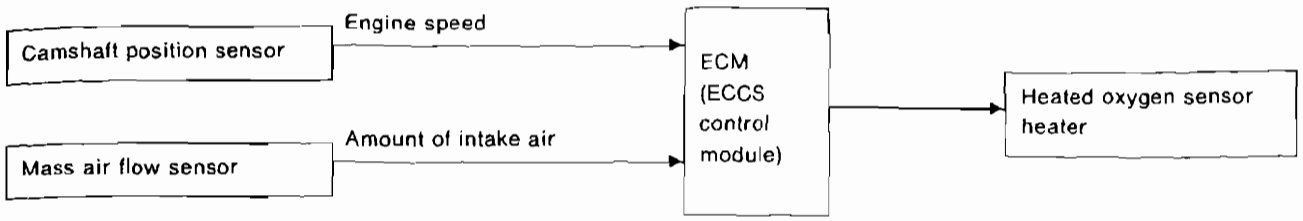


OPERATION

Engine operating condition	Valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine torque curve
• Vehicle is running. • Engine coolant temperature is 50°C (122°F) or more. • Engine speed is between 1,050 rpm and 5,700 rpm.	ON	Advance	Increased	Ⅱ
• Engine load is high. • Engine speed is 1,050 rpm or less				
Those other than above	OFF	Normal	Normal	Ⅰ

Heated Oxygen Sensor (HO2S) Heater Control

INPUT/OUTPUT SIGNAL LINE



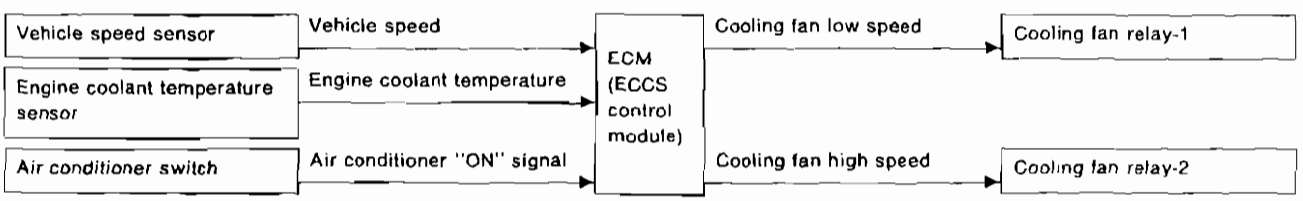
The ECM performs ON/OFF control of the heated oxygen sensor heater corresponding to the engine speed and engine load.

OPERATION

Engine operating condition	Heated oxygen sensor heater
Engine speed is more than 4,000 rpm.	OFF
Heavy load	OFF
Except above	ON

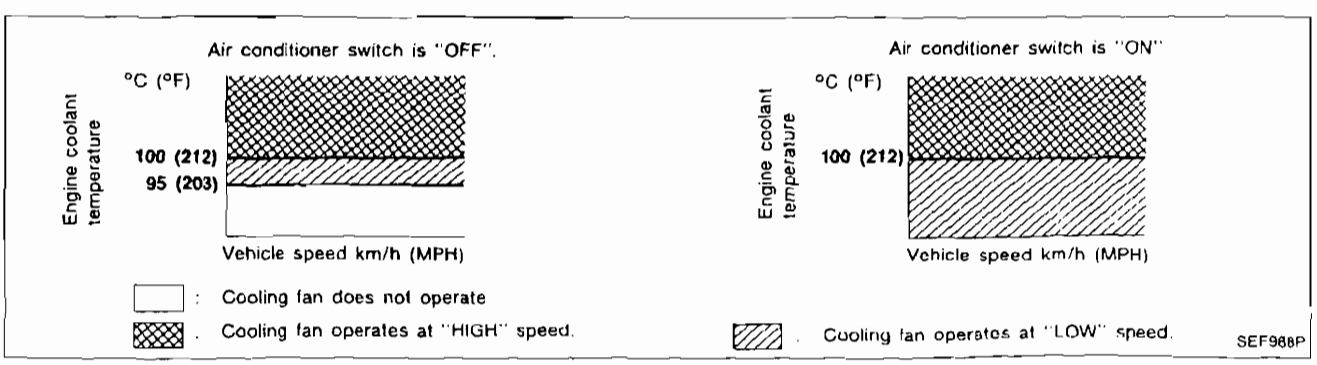
Cooling Fan Control

INPUT/OUTPUT SIGNAL LINE



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

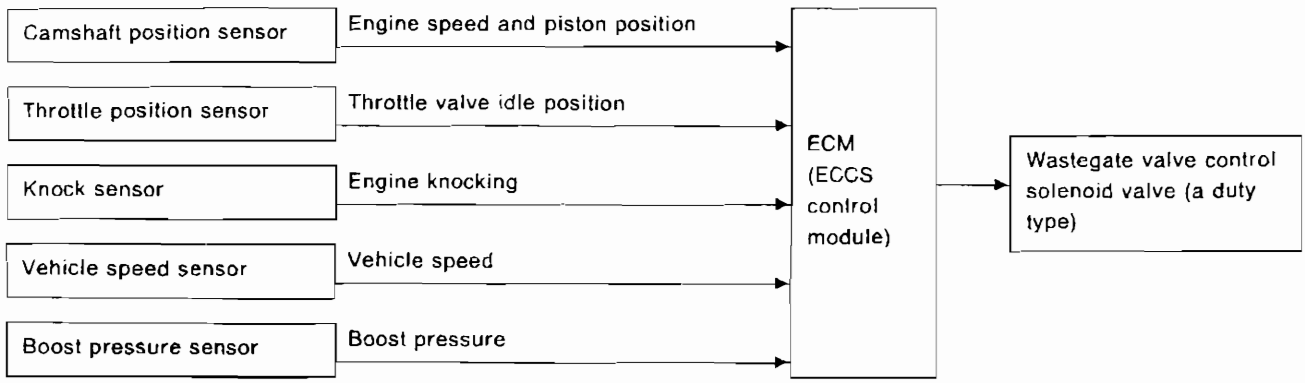
OPERATION



The cooling fan operates at HIGH speed if diagnostic test mode II (self-diagnostic results) for engine coolant temperature sensor is "NG".

Boost Pressure Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

The output signal maps of the ECM are selected according to fuel octane rating, gear position (M/T model) and vehicle speed (A/T model).
The wastegate valve control solenoid valve changes the source vacuum which activates the actuator. This results in a proportional boost pressure to the acceleration.
Knock signs are used to determine fuel octane rating.

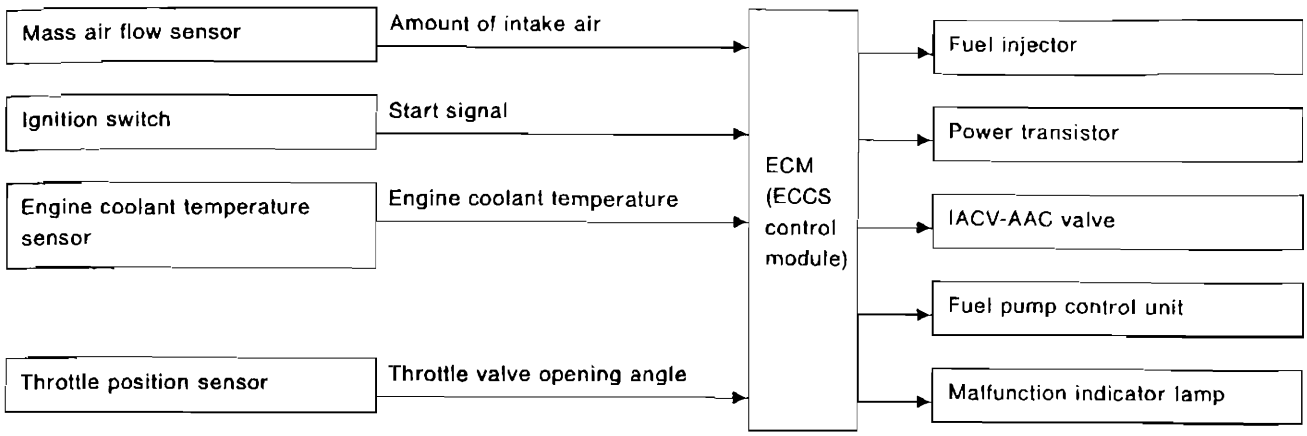
OPERATION

Fuel octane rating	Gear position or vehicle speed	Boost pressure control map
Premium	• 1, 2 and 3 speed gears (M/T model) • Less than 46 km/h (29 MPH) (A/T model)	A slow response type
	• 4 and 5 speed gears (M/T model) • More than 46 km/h (29 MPH) (A/T model)	A quick response type
Lower than the above	Any	Fixed

Fail-safe System

CPU MALFUNCTION

Input/output signal line



Outline

The fail-safe system makes engine starting possible if there is something malfunctioning in the ECM's CPU circuit.
In former models, 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 activating condition when ECM is malfunctioning

The fail-safe mode operates 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, 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 below the specified value, the ECM senses an mass air flow sensor malfunction. In the 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 (Mass air flow sensor malfunction)

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

Fail-safe System (Cont'd)

ENGINE COOLANT TEMPERATURE SENSOR MALFUNCTION

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

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

THROTTLE POSITION SENSOR MALFUNCTION

Description

When the output signal of throttle position sensor is abnormal the ECM judges it as a malfunctioning of throttle position sensor.
The ECM do not use the throttle position sensor signal.

KNOCK SENSOR MALFUNCTION

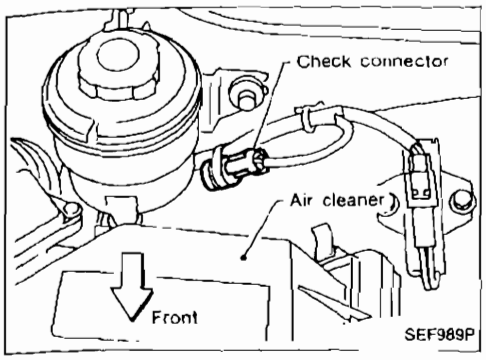
When ECM judged to be malfunctioning, ignition timing is controlled numerical value for regular gasoline.

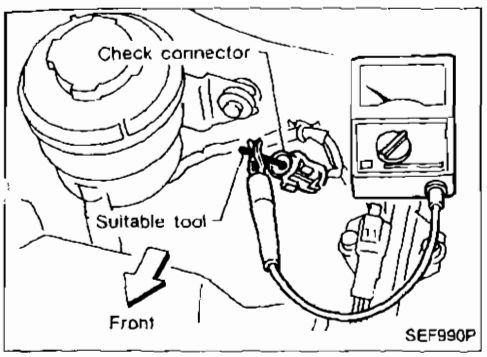
START SIGNAL FOR MALFUNCTION

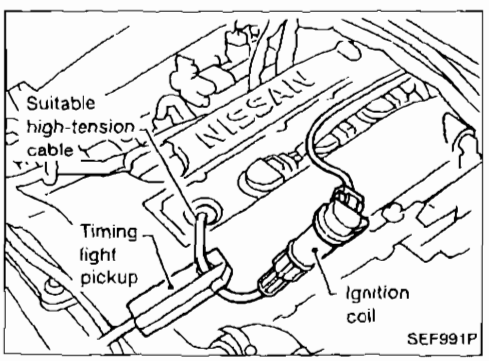
If the ECM always receives a start signal, the ECM will judge the start signal "OFF" when engine speed is above 1,000 rpm to prevent extra enrichment.
After the engine speed is below 200 rpm, start-up enrichment will be allowed until the engine speed reaches 1,000 rpm.

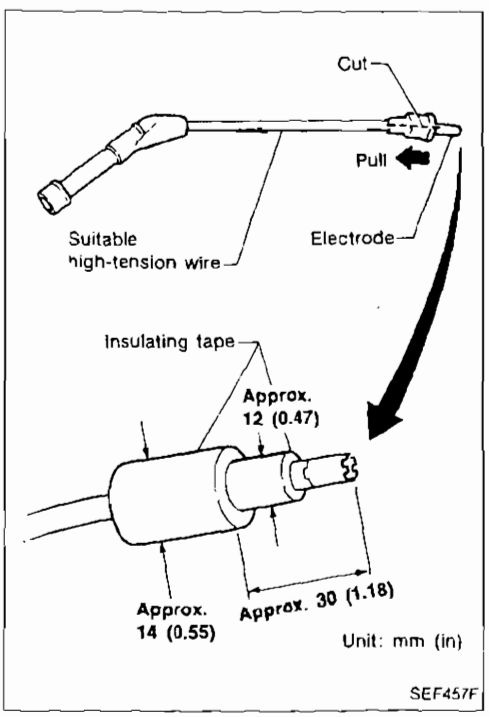
BOOST PRESSURE SENSOR MALFUNCTION

When ECM judged to be malfunctioning, the duty of wastegate valve control solenoid valve is fixed at 20%.









Direct Ignition System

CHECKING IDLE SPEED AND IGNITION TIMING

Idle speed

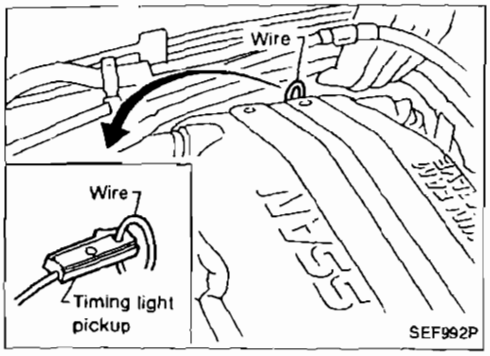
1. Disconnect check connector for voltage type tachometer.
2. Connect tachometer using a suitable tool.

Ignition timing

- **Method A (Without SST)**

1. Remove No. 1 ignition coil.
2. Connect No. 1 ignition coil and No.1 spark plug with a suitable high-tension wire as shown, and attach timing light. For the above procedures, enlarge the end of a suitable high-tension wire with insulating tape as shown.
3. Check ignition timing.

Direct Ignition System (Cont'd)



- **Method B (Without SST)**

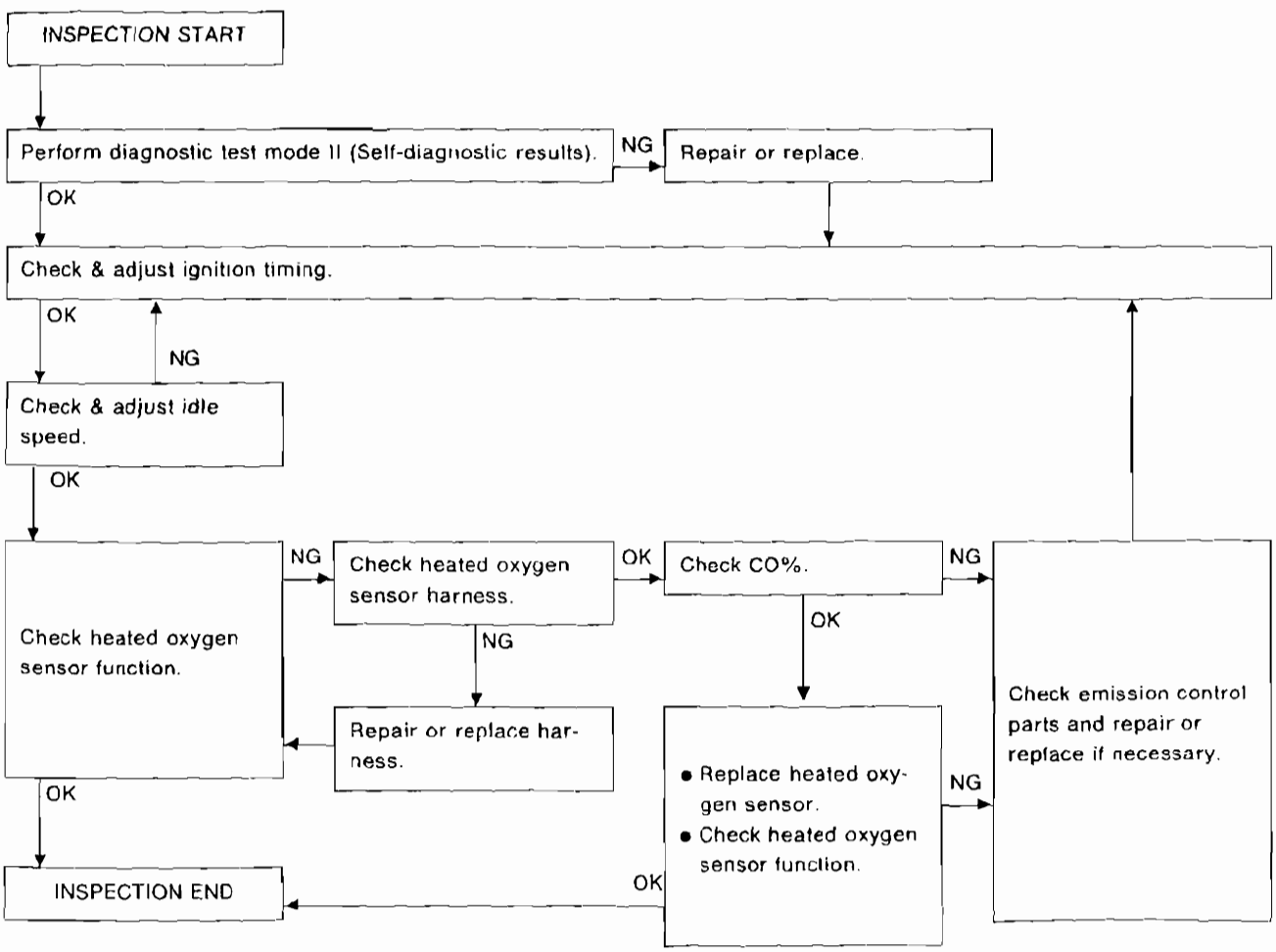
Clamp wire as shown.
This wire is provided at the rear end of the engine.

PREPARATION

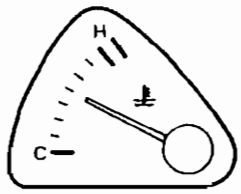
1. Make sure that the following parts are in good order.
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses
- Air intake system (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- EGR valve operation
- Throttle valve

2. On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
3. When checking idle speed, ignition timing and mixture ratio of A/T models, shift lever to "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

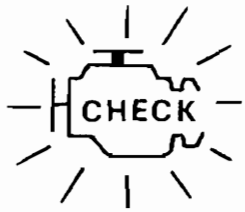


SEF810K

B

SEF247F

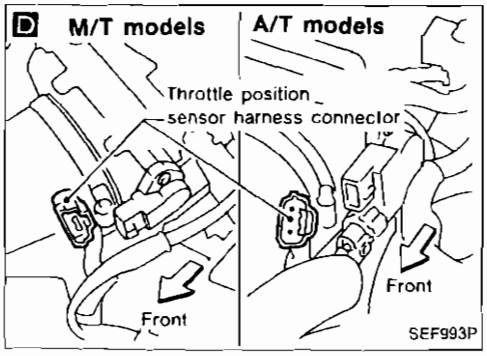
C



Malfunction indicator lamp

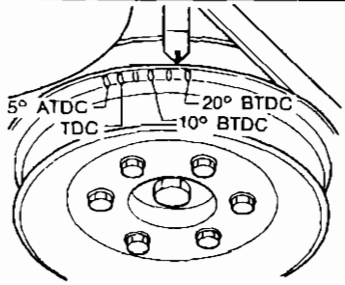
SEF051PA

D



SEF993P

E



SMA189AA

START

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

A

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

B

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

C

Perform diagnostic test mode II (Self-diagnostic results).

OK

NG

Repair or replace components as necessary.

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

D

1) Select "IGNITION TIMING ADJ" in WORK SUPPORT mode.
2) Touch "START".

1) Stop engine and disconnect throttle position sensor harness connector.
2) Start engine.

Race engine two or three times to about 2,000 rpm under no-load. Then run engine at idle speed.

E

Check ignition timing with a timing light.

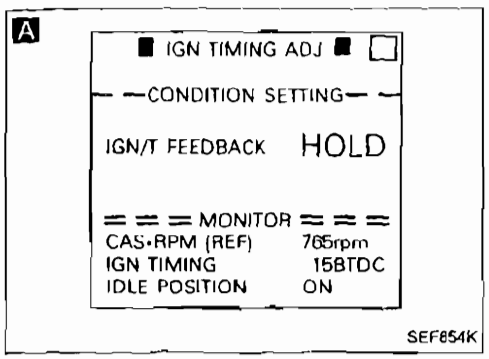
15° ± 2° BTDC

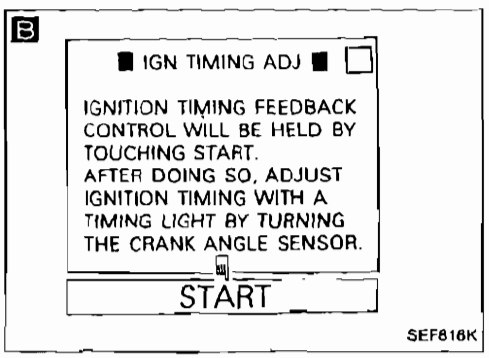
OK

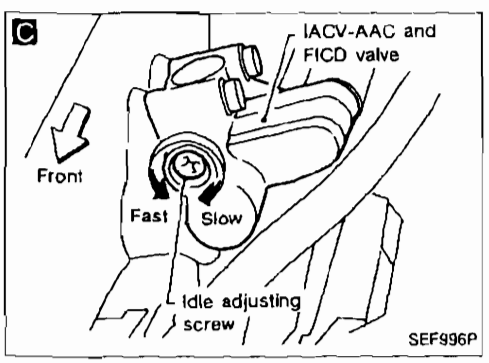
NG

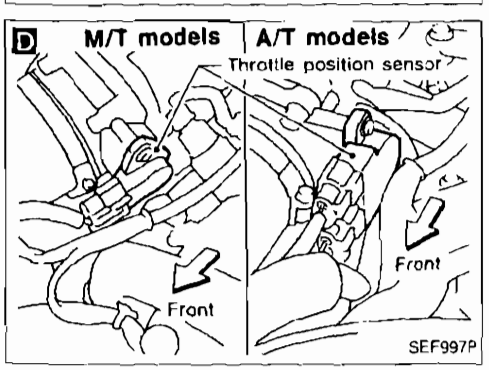
Adjust ignition timing by turning camshaft position sensor after loosening securing bolts.

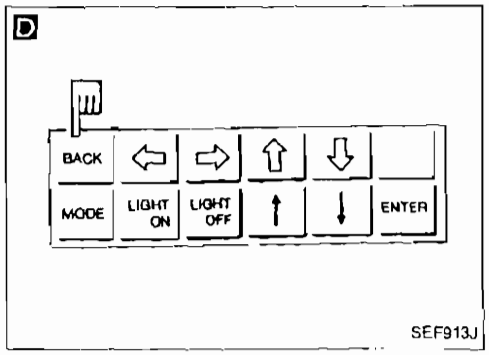
Ⓐ











Ⓐ

A

Check idle speed.

Read idle speed in "IGN TIMING ADJ" in "WORK SUPPORT" mode.

— OR —

Check idle speed.

800 ± 50 rpm (A/T in "N" position)

OK ↓ NG → Ⓔ

B

1) Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2) Touch "START".

— OR —

Turn off engine and disconnect throttle position sensor harness connector. Then start engine.

↓

Race engine two or three times to about 2,000 rpm under no-load. Then run engine at idle speed.

↓

C

Adjust idle speed by turning idle speed adjusting screw.

750 ± 50 rpm (A/T in "N" position)

↓

D

Touch "Back".

1) Stop engine and connect throttle position sensor harness connector.
2) Start engine.

↓

Race engine two or three times to about 2,000 rpm under no-load. Then run engine at idle speed.

↓

Check idle speed.

Read idle speed in "DATA MONITOR" mode with CONSULT

— OR —

Check idle speed.

800 ± 50 rpm (A/T in "N" position)

OK ↓ NG

Check AAC valve and replace if necessary.

↓

Ⓑ

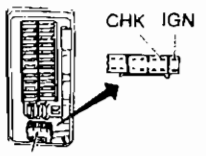
Check AAC valve harness and repair if necessary.

↓

Check ECM function* by substituting another known good ECM.

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

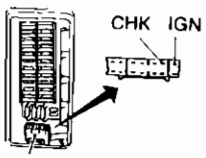
A



Data link connector for CONSULT
(Connect CHK and IGN terminals with a suitable harness.)

SEF265LB

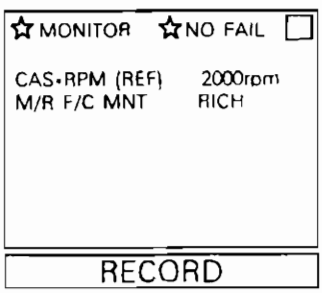
B



Data link connector for CONSULT
(Disconnect the harness.)

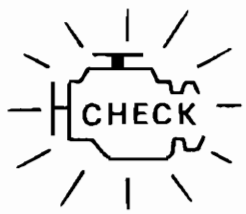
SEF273LB

B



SEF818K

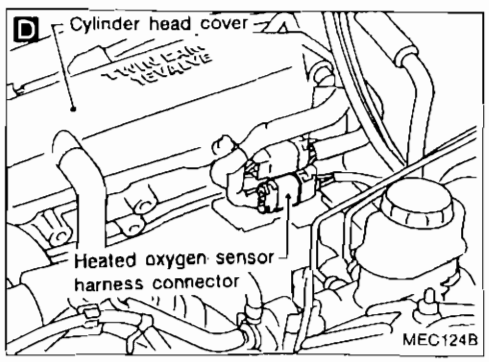
C



Malfunction indicator lamp

SEF051PA

D



MEC124B

Ⓑ

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

A

Set on-board diagnostic system of ECM to Diagnostic Test Mode II (heated oxygen sensor monitor).

B C

Check heated oxygen sensor signal.
1) See "M/R F/C MNT" 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 cycle: RICH → LEAN → RICH
2 cycles: RICH → LEAN → RICH → LEAN → RICH

NG → Ⓒ

OR

Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds at 2,000 rpm.

OK

END

D

Replace heated oxygen sensor. Connect heated oxygen sensor harness connector. → Ⓕ

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

A

Set on-board diagnostic system of ECM to Diagnostic Test Mode II (heated oxygen sensor monitor).

B C

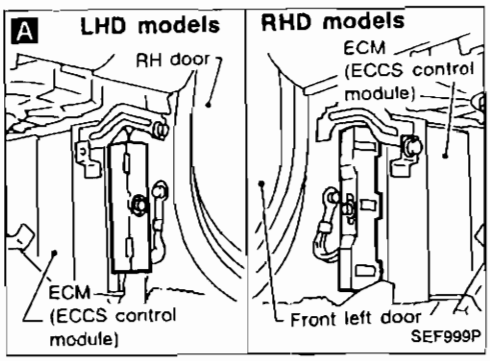
Check heated oxygen sensor signal.
1) See "M/R F/C MNT" in "Data monitor" mode.
2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
1 cycle: RICH → LEAN → RICH
2 cycles: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

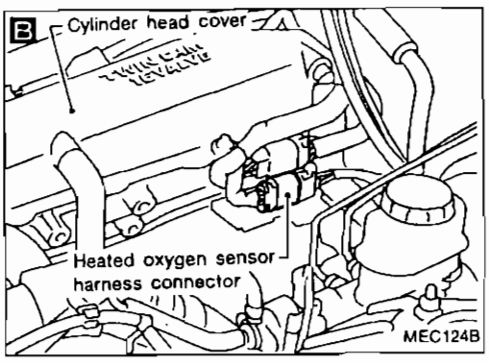
OK → Ⓔ

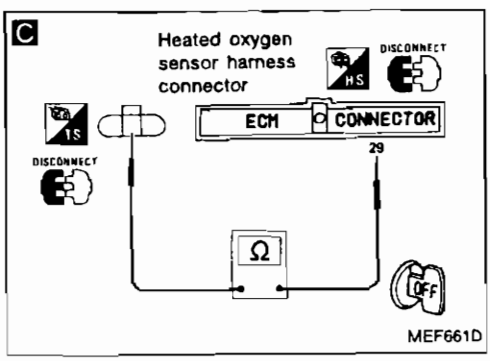
NG → Ⓖ

OR

Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds at 2,000 rpm







Ⓒ

A B C

Check heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable
2) Disconnect ECM connector from ECM.
3) Disconnect heated oxygen sensor harness connector. Then connect harness side terminal for heated oxygen sensor to ground with a jumper wire.
4) Check for continuity between terminal No. 29 of ECM connector and ground metal on vehicle body.

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

OK

NG

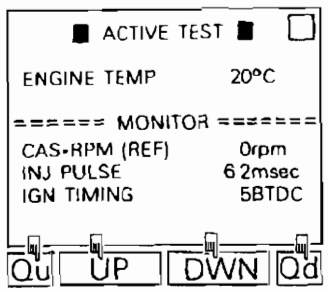
Ⓔ

Repair or replace harness.

Connect ECM connector to ECM.

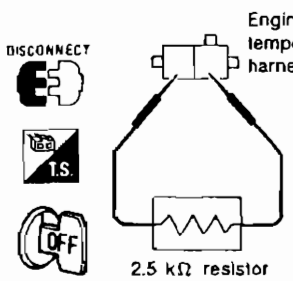
Ⓓ

A



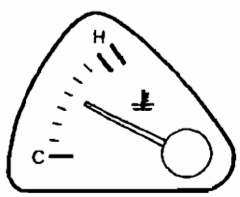
SEF788K

B



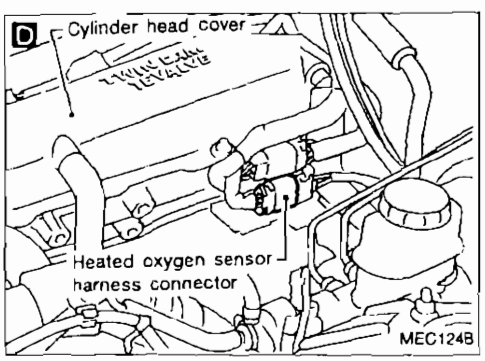
MEF663D

C



SEF810K

D



MEC124B

Ⓓ

A B

1) Select "ENGINE TEMP" or "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
2) Set "ENG COOLANT TEMP" to 20°C (68°F) by touching "DWN" and "Qd".

OR

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

C

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

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

Check "CO" %.

Idle CO: Less than 10% (and engine runs smoothly)

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

D

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.

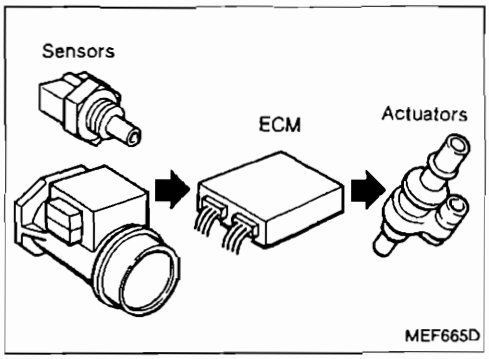
Check engine coolant temperature sensor. → Ⓔ

Check ECM function* by substituting another known good ECM.

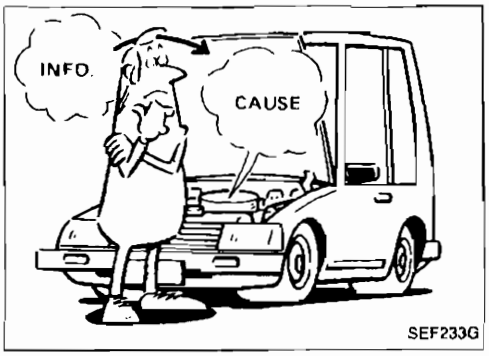
*: ECM may be the cause of a problem, but this is rarely the case.

Contents

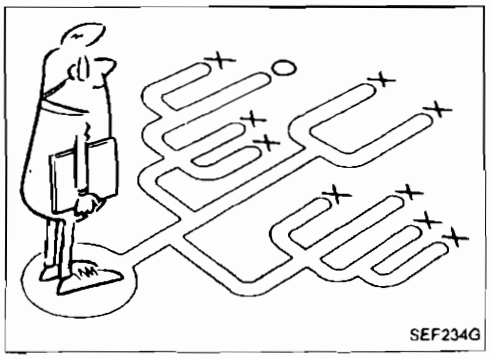
Contents (Cont'd)



MEF665D



SEF233G


SEF234G

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.

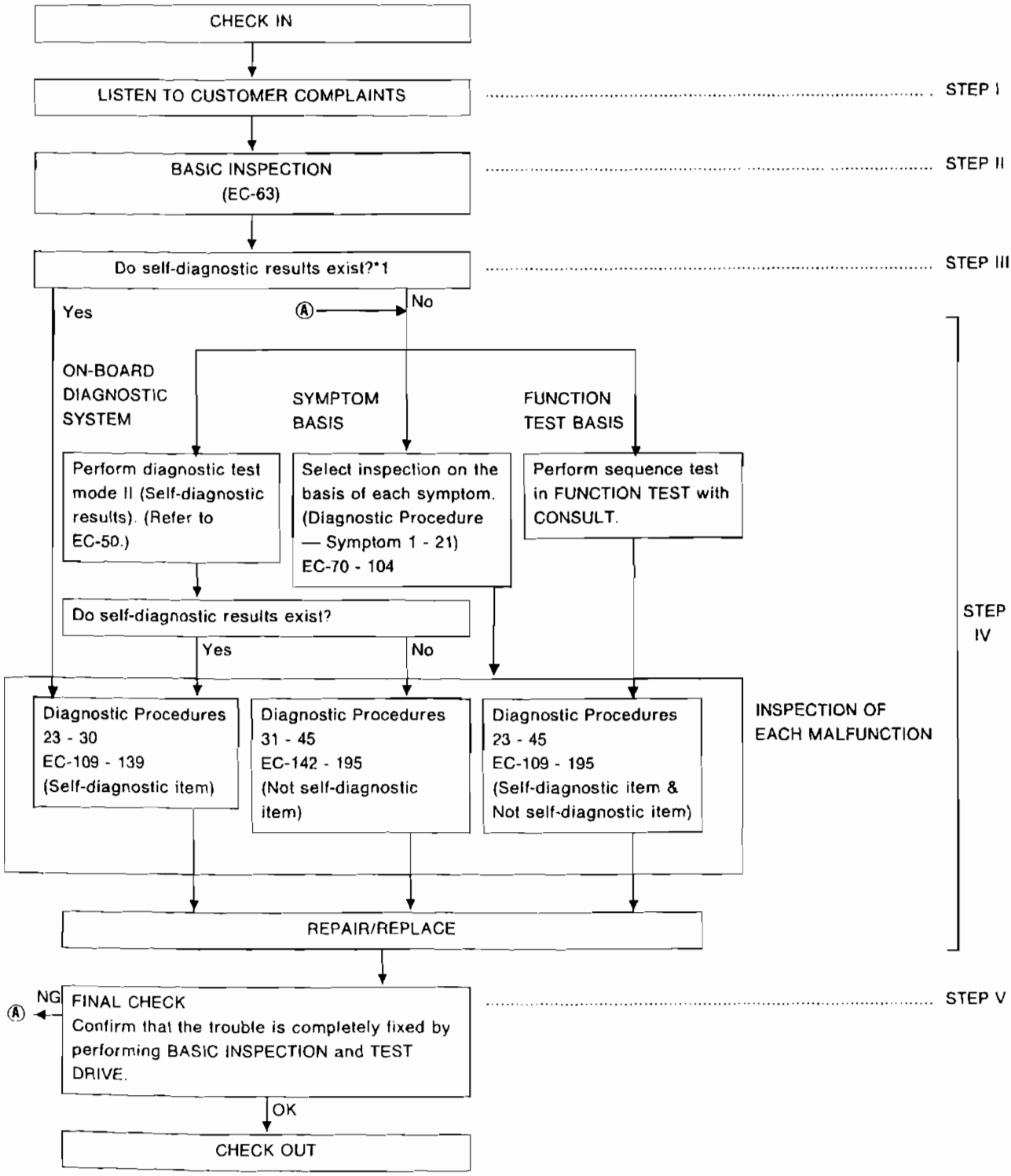
Before checking, talk to customer about drivability complaint. The customer is a very good supplier of information on such problems, especially intermittent ones. Through interaction with the customer, find out what symptoms are present and under what conditions they occur.

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.

1. Verify the complaint.
2. Isolate the cause.
3. Repair
4. Recheck and be sure no new symptoms have been caused.

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 (EC-47).**

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

DESCRIPTION FOR WORK FLOW

STEP	DESCRIPTION
STEP I	Identify the trouble using the "DIAGNOSTIC WORKSHEET" as shown on the next page
STEP II	Be sure to carry out the Basic Inspection, or the results of inspections thereafter may be misinterpreted.
STEP III	Check the self-diagnostic results stored in the ECM of the failed vehicle.
STEP IV	Perform inspection often selecting from the following three tests according to the trouble observed. 1. ON-BOARD DIAGNOSTIC SYSTEM Follow the self-diagnostic procedure for each item described in "How to Execute On-board Diagnostic System in Diagnostic Test Mode II". Non-self-diagnostic procedures described for some items will also provide results which are equal to the self-diagnostic results. 2. SYMPTOM BASIS This inspection is of a simplified method. When performing inspection of a part, the corresponding system must be checked thoroughly by selecting the appropriate check item from Diagnostic Procedures 23 - 45. 3. FUNCTION TEST BASIS (Sequence test) In this inspection, the CONSULT judges "OK" or "NG" on each system in place of a technician. When performing inspection of a part, the corresponding system must be checked thoroughly by selecting the appropriate check item from Diagnostic Procedures 23 - 45. 4. Diagnostic Procedure • This inspection program is prepared using the data obtained when disconnection of harness or connectors has occurred in the respective circuit. • Inspection of the "Not self-diagnostic item" does not actually start with the execution of diagnostic test mode II (self-diagnostic results). However, inspection is started by assuming that the diagnostic test mode II (self-diagnostic results) has already been performed. • When a system having the diagnostic test mode II (self-diagnostic results) function contains any circuit placed outside the range of this diagnostic test mode II (self-diagnostic results) function, it is arranged that the "Not self-diagnostic item" of such a system will be performed when the self-diagnostic result is OK. Example: CAMSHAFT POSITION SENSOR
STEP V	1. FINAL CHECK item is not described in the "Not self-diagnostic item". However, this FINAL CHECK must be performed without fail in order to ensure that the trouble has been repaired, and also that the unit disassembled in the course of the repair work has been reassembled correctly. 2. If the same trouble phenomenon is observed again in the final check: Go back to STEP IV, and perform the inspection using a method which is different from the previous method. 3. If the cause of the trouble is still unknown even after conducting step 2 above, check the circuit of each system for a short by using the voltage available at the "ECM INPUT/OUTPUT SIGNAL INSPECTION" terminal.

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

KEY POINTS

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

SEF907L

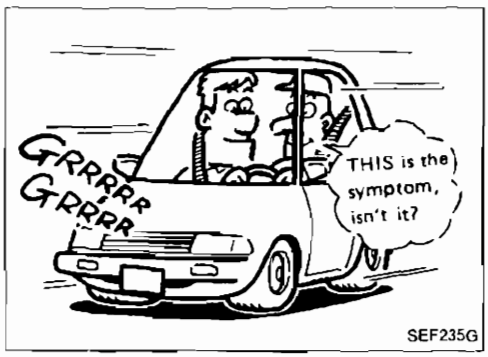
DIAGNOSTIC WORKSHEET

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

Worksheet sample

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

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



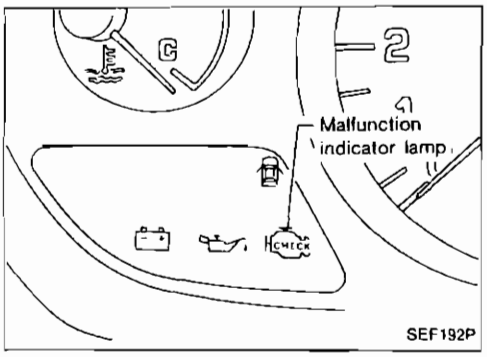
SEF235G

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 counter clockwise.
			Retarded	Rotate distributor clockwise.
3	Mixture ratio feedback control	Heated oxygen sensor	Suspended	Disconnect heated oxygen sensor harness connector.
		ECM	Operation check	Perform diagnostic test mode II (Self-diagnostic results) 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	Throttle position sensor condition	ECM	ON-OFF switching	Rotate throttle position sensor body.
10	Ignition spark	Timing light	Spark power check	Try to flash timing light for each cylinder.

- **Select the "Variable factor" when the symptom occurs.**
  Perform the "Service procedure" to try to simulate the intermittent.



On-board Diagnostic System

MALFUNCTION INDICATOR LAMP (MIL)

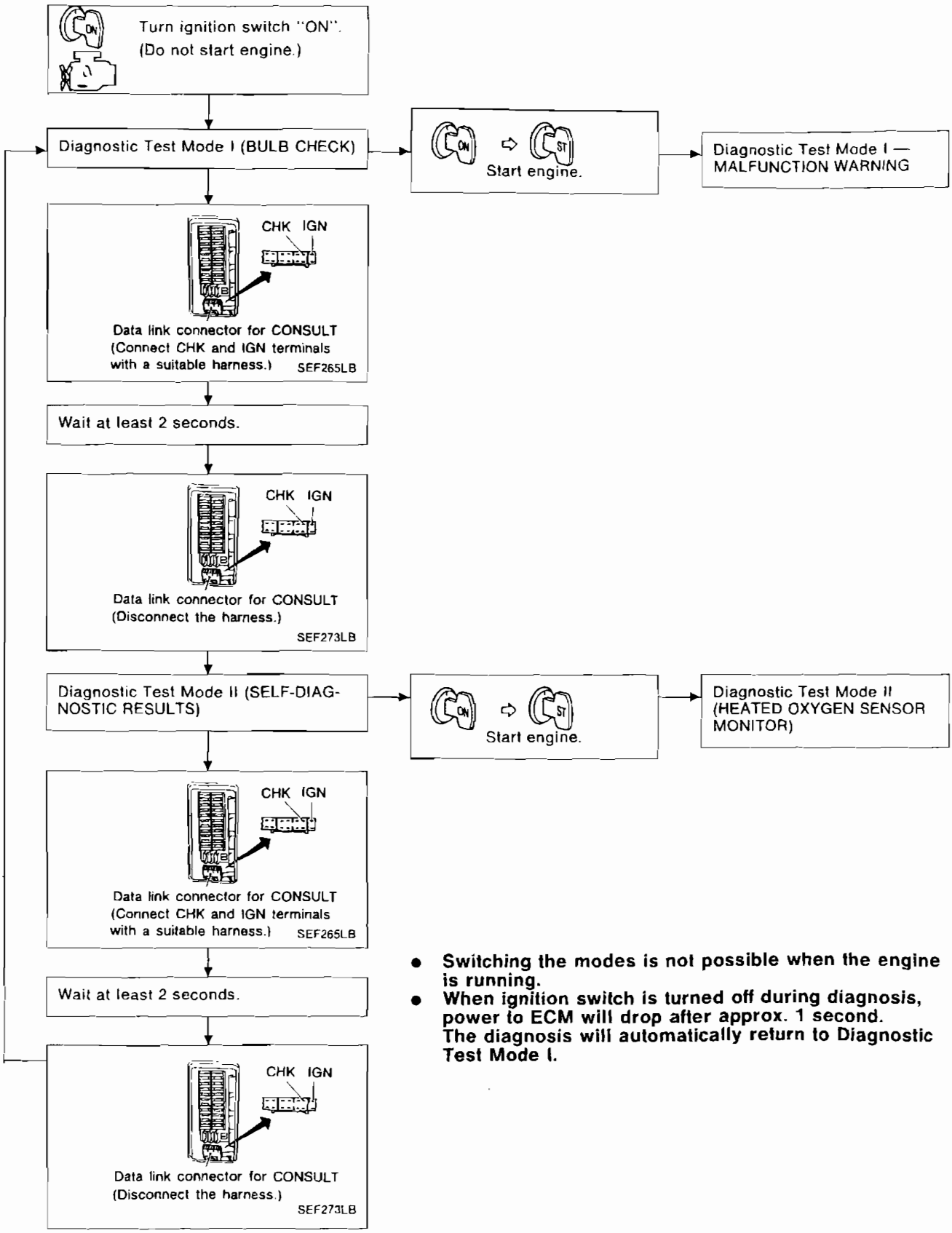
A malfunction indicator lamp has been adopted on all models.

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 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 it remains "OFF", check the bulb in the MALFUNCTION INDICATOR LAMP.

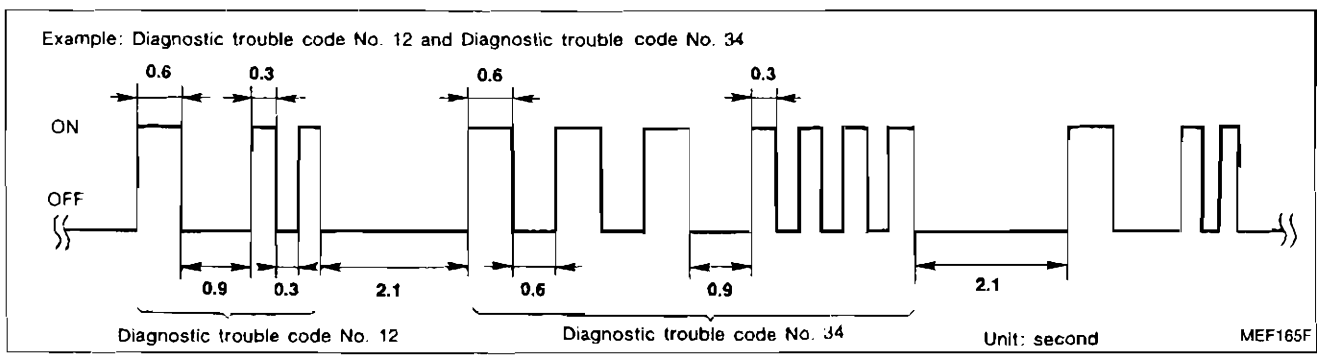
DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

MALFUNCTION INDICATOR LAMP	Condition
ON	When the ECM's CPU or camshaft position sensor is malfunctioning.
OFF	OK

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 (MIL) 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 MIL flashes for 0.6 seconds once and then it flashes for 0.3 seconds twice. 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 the ECM memory.

Display diagnostic trouble code table

Diagnostic trouble code No.	Detected items
11*	Camshaft position sensor circuit
12	Mass air flow sensor circuit
13	Engine coolant temperature sensor circuit
21*	Ignition signal circuit
26	Boost pressure sensor circuit
34	Knock sensor circuit
43	Throttle position sensor circuit
54	Signal circuit from A/T control unit to ECM
55	No malfunction in the above circuits

*: Check items causing a malfunction of camshaft position sensor circuit first, if both "CAMSHAFT POSITION SENSOR (No. 11)" and "IGN SIGNAL-PRIMARY (No. 21)" are displayed one after the other.

Diagnostic trouble code No.	Detected items	Malfunction is detected when ...	Check item (remedy)
11*	Camshaft position sensor circuit	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• 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
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 circuit	• The boost pressure sensor circuit is open or shorted. (An abnormally high or low output voltage is entered.)	• Harness and connector • Boost pressure sensor
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
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
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

*: Check items causing a malfunction of camshaft position sensor circuit first, if both "CAMSHAFT POSITION SENSOR (No. 11)" and "IGN SIGNAL-PRIMARY (No. 21)" are displayed one after the other.

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

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.**
- **Do not erase the stored memory before beginning diagnostic test mode II (Self-diagnostic results).**

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

DESCRIPTION

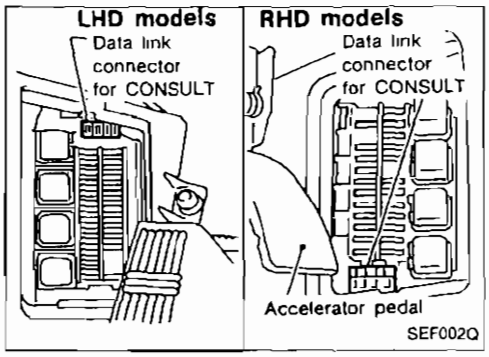
In this mode, the MALFUNCTION INDICATOR LAMP displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor.

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

*: Maintain conditions just before switching to open loop.

HOW TO CHECK HEATED OXYGEN SENSOR

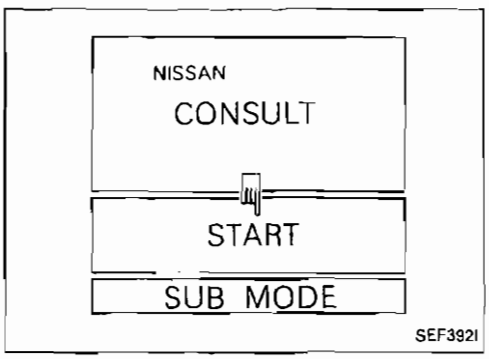
1. Set Diagnostic Test Mode II. (Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES".)
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of the gauge.
3. Run engine at about 2,000 rpm for about 2 minutes under no-load conditions.
4. Make sure MALFUNCTION INDICATOR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



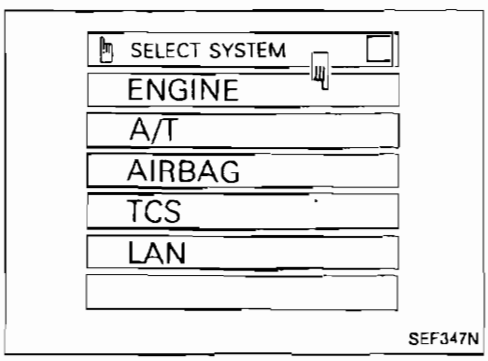
Consult

CONSULT INSPECTION PROCEDURE

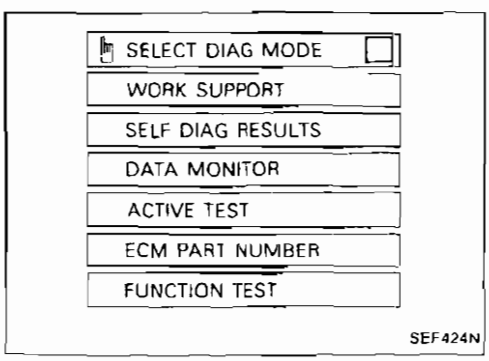
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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, read 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
	Vehicle speed sensors			X		X
	Throttle position sensor	X	X	X		X
	Knock sensor		X			
	Boost pressure sensor		X			
	Ignition switch (start signal)			X		X
	Air conditioner switch			X		
	Park/Neutral position switch			X		X
	Power steering oil pressure switch			X		X
	Battery			X		
	A/T signal		X			
OUTPUT	Injectors			X	X	X
	Power transistor (ignition timing)	X	X (Ignition signal)	X	X	X
	IACV-AAC valve	X		X	X	X
	Valve timing control solenoid valve			X	X	X
	EGRC-solenoid valve			X	X	X
	Air conditioner relay			X		
	Fuel pump relay	X		X	X	X
	Cooling fan relay			X	X	X
	Wastegate valve control solenoid valve			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 (THROTTLE SENSOR ADJUSTMENT)	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 VALVE ADJ (AAC VALVE ADJUSTMENT)	SET ENGINE RPM 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 IDLE. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line

SELF-DIAGNOSTIC RESULTS MODE

DIAGNOSTIC ITEM	DIAGNOSTIC ITEM IS DETECTED WHEN	CHECK ITEM (REMEDY)
CAMSHAFT POSI SEN* (CRANK ANGLE SENSOR*)	• Either 1° or 180° signal is not entered for the first few seconds during engine cranking. • Either 1° or 180° signal is not input often enough while the engine speed is higher than the specified rpm.	• Harness and connector (If harness and connector are normal, replace camshaft position sensor.)
MASS AIR FLOW SEN (AIR FLOW METER)	• 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 (ENGINE TEMP SENSOR)	• 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
IGN SIGNAL — PRIMARY*	• The ignition signal in primary circuit is not entered during engine cranking or running	• Harness and connector • Power transistor unit
KNOCK SENSOR (DETONATION SENSOR)	• The knock sensor circuit is open or shorted (An abnormally high or low voltage is entered.)	• Harness and connector • Knock sensor
THROTTLE POSI SEN (THROTTLE SENSOR)	• The throttle position sensor circuit is open or shorted. (An abnormally high or low voltage is entered.)	• Harness and connector • Throttle position sensor
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 POSI SEN (No. 11)" and "IGN SIGNAL-PRIMARY (No. 21)" are displayed one after the other.

- **Sensor failures which set a self-diagnosis code are listed as due to an open or short circuit.**
- ***A sensor sending a signal which is inaccurate but not open or short will NOT set a self-diagnosis code.***
- **If a driveability symptom is present but no self-diagnosis code is set, perform further inspections using DATA MONITOR.**

DATA MONITOR MODE

Remarks : • Specification data are reference values.
• Specification data are output/input 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.
• If the real-time diagnosis results are NG and the self-diagnostic results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
CMPS·RPM (REF) (CAS·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 (AIR FLOW MTR)	• Engine: After warming up, idle the engine • A/C switch "OFF" • Selector lever "N" position • No-load	Idle	0.8 - 1.5V	• Harness and connector • Mass air flow sensor
		3,000 rpm	1.4 - 2.0V	
COOLANT TEMP/S (ENG TEMP SEN)	• Engine: After warming up		More than 70°C (158°F)	• Harness and connector • Engine coolant temperature sensor
O2 SEN (EXH GAS SEN)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V → 0.6 - 0.9V	• Harness and connector • Heated oxygen sensor • Intake air leaks • Injectors
M/R F/C MNT			LEAN → RICH Changes more than 5 times during 10 seconds.	
VHCL SPEED SE (CAR SPEED SEN)	• 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 (THROTTLE SEN)	• Ignition switch: ON (Engine stopped)	Throttle valve fully closed (Engine: After warming up)	0.35 - 0.65V	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment
		Throttle valve fully open	Approx. 4.0V	
START SIGNAL	• Ignition switch: ON → START		OFF → ON	• Harness and connector • Starter switch
CLOSED TH/POS (IDLE POSITION)	• Ignition switch: ON (Engine stopped)	Throttle valve: Closed throttle position (Engine: After warming up)	ON	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment • Throttle position switch
		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 (NEUTRAL 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	

Consult (Cont'd)

MONITOR ITEM	CONDITION		SPECIFICATION	CHECK ITEM WHEN OUTSIDE SPEC.
INJ PULSE	• Engine: After warming up • A/C switch "OFF" • Selector lever "N" position • No-load	Idle	1.7 - 2.5 msec.	• Harness and connector • Injector • Mass air flow sensor • Intake air system
		2,000 rpm	1.5 - 2.3 msec.	
IGN TIMING	ditto	Idle	15° BTDC	• Harness and connector • Camshaft position sensor
		2,000 rpm	More than 25° BTDC	
IACV-AAC/V (AAC VALVE)	ditto	Idle	20 - 40%	• Harness and connector • IACV-AAC valve
		2,000 rpm	—	
A/F ALPHA	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	75 - 125%	• Harness and connector • Injector • Mass air flow sensor • Heated oxygen sensor • Carbon canister purge line • Intake air system
AIR COND RLY	Engine: After warming up, idle the engine Air conditioner switch OFF → ON		OFF → ON	• Harness and connector • Air conditioner switch • Air conditioner relay
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 1 second) • Engine running and cranking • When engine is stopped (stops in 1 second)		ON	• Harness and connector • Fuel pump relay
	Except as shown above		OFF	
VALVE TIM SOL	• Jack up rear wheel • Engine: After warming up	• Idle	OFF	• Harness and connector • Valve timing solenoid valve
		• Shift selector lever to any position except "N" or "P" position • Quickly depress accelerator pedal, then quickly release it	OFF → ON → OFF	
COOLING FAN (RADIATOR FAN)	• When cooling fan is stopped.		OFF	• Harness and connector • Cooling fan relay • Cooling fan motor
	• When cooling fan operates at low speed		LOW	
	• When cooling fan operates at high speed		HI	
EGRC SOL/V (EGR CONT S/V)	• Engine: After warming up • A/C switch "OFF" • Shift lever "N" • No-load	Idle	ON	• Harness and connector • EGRC-solenoid valve
		2,000 rpm	OFF	
W/G CONT S/V	ditto	Idle	0%	• Harness and connector • Wastegate valve control solenoid valve
		Racing up to 4,000 rpm	20%	

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• 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 sensors
IACV-AAC/V OPENING (AAC/V OPENING)	• 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 (ENGINE TEMPERATURE)	• 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
IGNITION TIMING	• 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	• Engine: After warming up, idle the engine. • A/C switch "OFF" • Selector lever "N" position • 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 (RADIATOR FAN)	• Ignition switch: ON • Turn cooling fan "LOW", "HI" and "OFF" with CONSULT	Cooling fan moves at low and high speed, and stops.	• Harness and connector • Cooling fan relay • Cooling fan motor
FUEL PUMP RELAY	• 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 (EGR CONT SOL VALVE) VALVE TIM SOL	• 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-LEARNING CONT	• 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

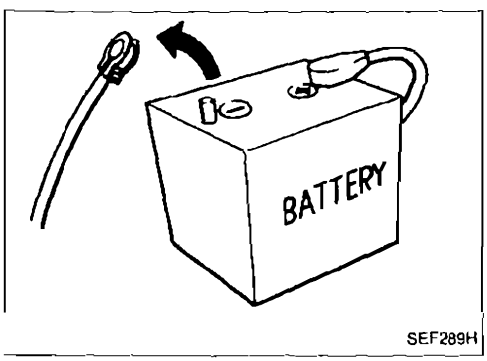
FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	• Ignition switch: ON (Engine stopped) • Displays the self-diagnostic results.	—		Objective system
CLOSED THROTTLE POSI (CLOSED THROTTLE POSITION SWITCH CIRCUIT) (IDLE POSITION (IDLE SWITCH CIRCUIT))	• Ignition switch: ON (Engine 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 (THROTTLE SENSOR 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 (NEUTRAL SW CIRCUIT)	• Ignition switch: ON (Engine stopped) • Neutral position switch circuit is tested when shift lever is manipulated.	OUT OF N/P-POSITION	OFF	• Harness and connector • Neutral position switch/ Inhibitor switch • Linkage + Inhibitor switch adjustment
		IN N-POSITION	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 (EGR CONT S/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
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 (RADIATOR 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 relay • Cooling fan motor

Consult (Cont'd)

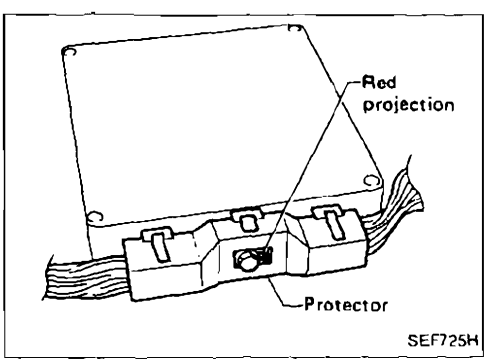
FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	• Ignition switch: ON → START • Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output 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 (CAR SPEED SEN CIRCUIT)	• 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 heated oxygen sensor output at 2,000 rpm under non-loaded state.	• O2 SEN 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) • Heated oxygen sensor circuit • Heated oxygen sensor operation • Fuel pressure high or low • Mass air flow sensor

Consult (Cont'd)

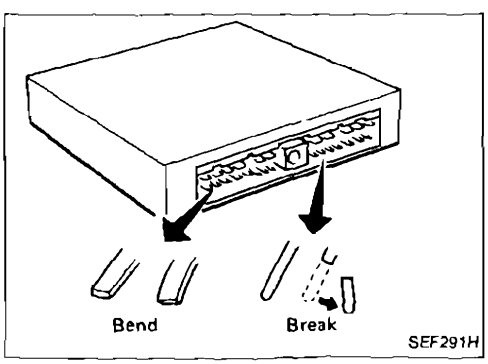
FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
POWER BALANCE	• After warming up, idle the engine. • Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models 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 (AAC VALVE 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



SEF289H



SEF725H



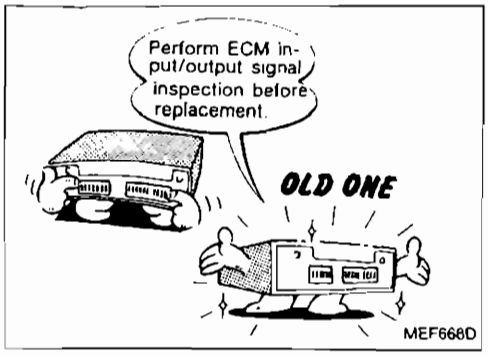
SEF291H

Diagnostic Procedure

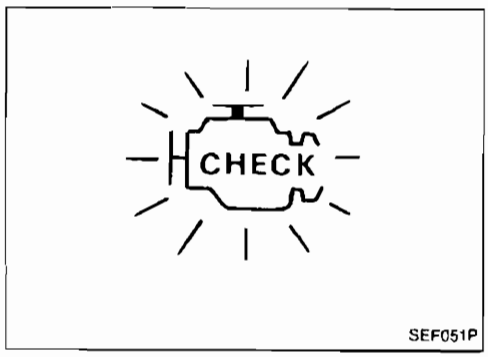
CAUTION:

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

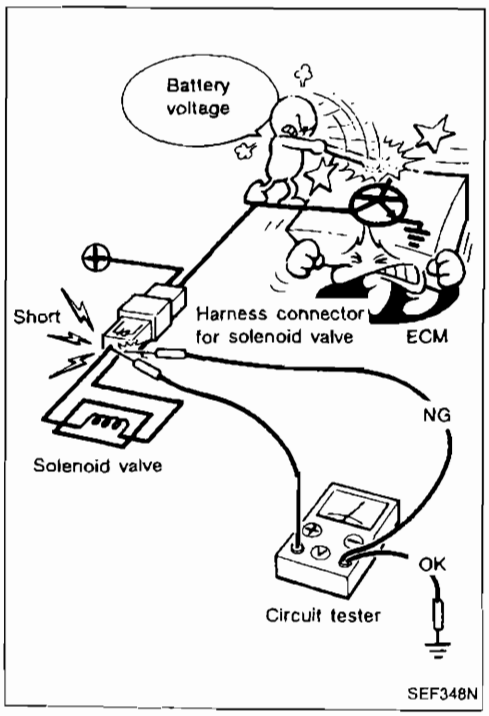
Diagnostic Procedure (Cont'd)



5. Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EC-196.)

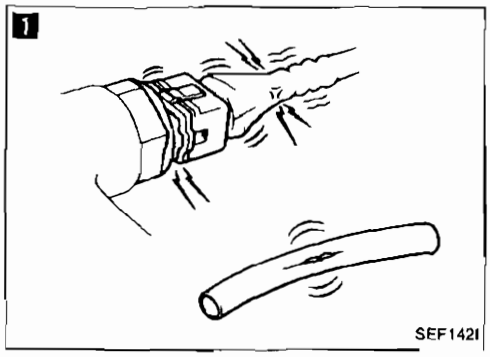


6. After performing this "Diagnostic Procedure", perform diagnostic test mode II (Self-diagnostic results) and driving test.



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

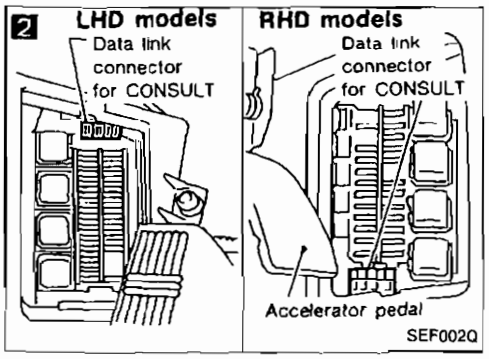
BEFORE STARTING

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 EC-53.)



3

DOES ENGINE START? — No → Go to **6**

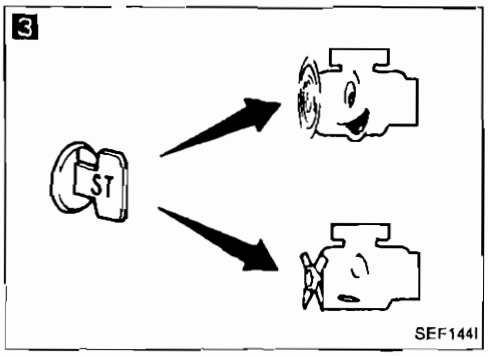
Yes

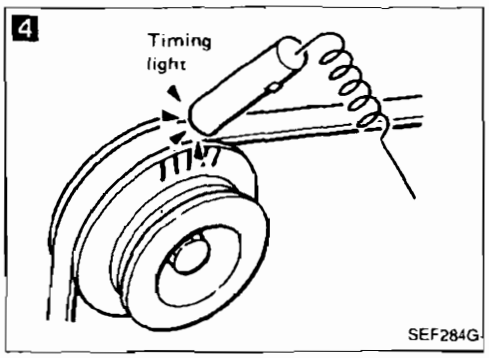
4

CHECK IGNITION TIMING.
Warm up engine sufficiently and check ignition timing at idle using timing light. (Refer to page EC-33.)
Ignition timing: 15° ± 2° BTDC

NG → Adjust ignition timing by turning camshaft position sensor.

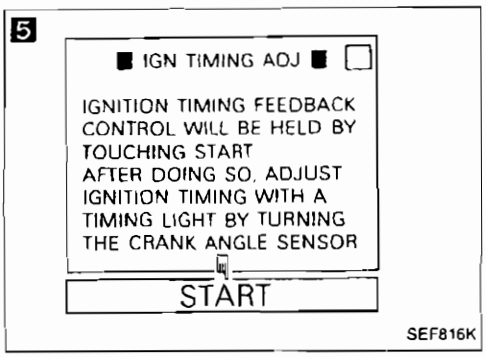
OK

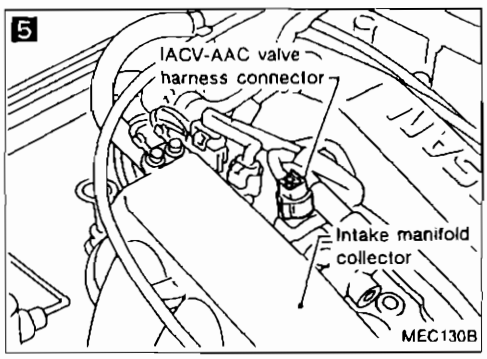


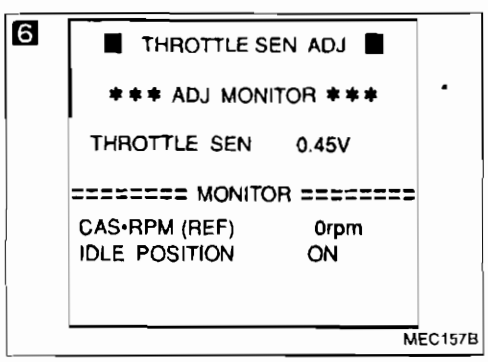


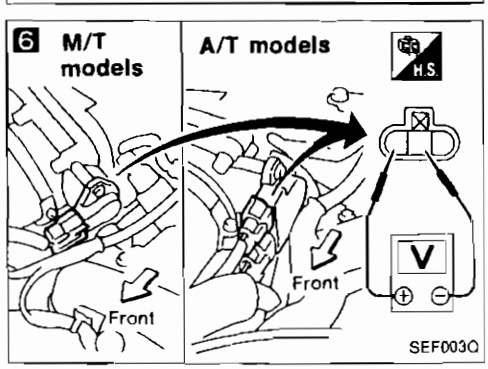
(Go to Ⓐ on next page.)

Basic Inspection (Cont'd)









Ⓐ

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 750 ± 50 rpm (A/T in "N" position)?

NG → Adjust engine speed by turning idle adjusting screw.

OR

When disconnecting throttle position sensor harness connector, does engine speed fall to 750 ± 50 rpm (A/T in "N" position)?

OK

6

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

1. Perform "THROTTLE SEN ADJ" or "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
2. Check that output voltage of throttle position sensor is 0.35 to 0.65V. (Throttle valve fully closes.) and "IDLE POSITION" or "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 "IDLE POSITION" or "CLOSED TH/POS" stays "ON".

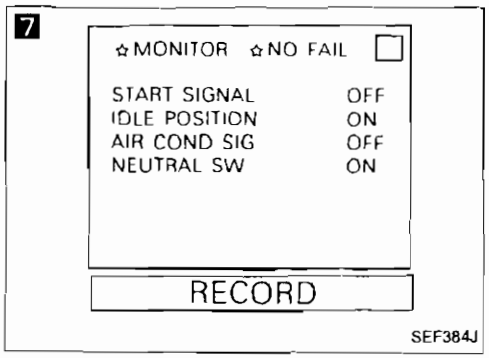
OR

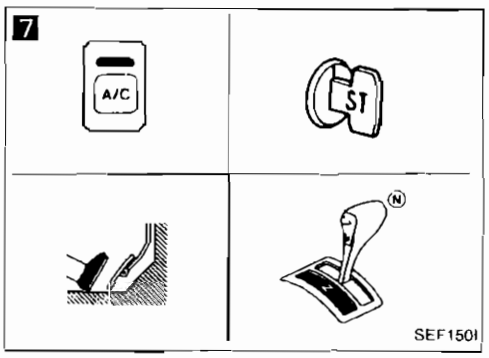
Measure output voltage of throttle position sensor using voltmeter, and check that it is 0.35 to 0.65V. (Throttle valve fully closed.)

OK

(Go to Ⓑ on next page)

Basic Inspection (Cont'd)





Ⓑ

7 **CHECK SWITCH INPUT SIGNAL.**

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

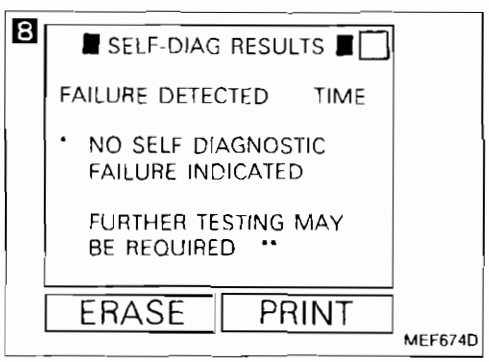
NG → Repair or replace the malfunctioning switch or its circuit.

OR

Remove ECM from front dash side 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
Closed throttle position	Accelerator pedal released → Accelerator pedal fully depressed	0.35 - 0.65 → Approx. 4.0
A/C signal	A/C OFF → A/C ON (Engine running)	Battery voltage → Approx. 0
Neutral (Parking) position switch	Selector lever is "N" or "P" position → Except "N" and "P" position	0 → 4.0 - 5.0

OK



8 **READ SELF-DIAGNOSTIC RESULTS.**

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

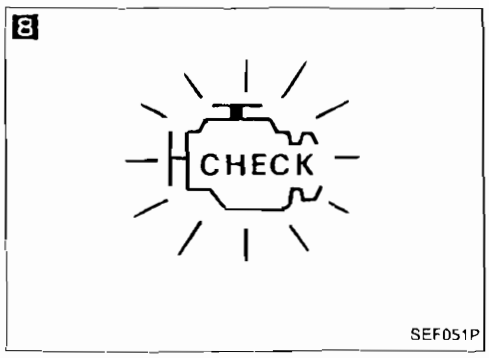
Yes → Go to the relevant inspection procedure.

OR

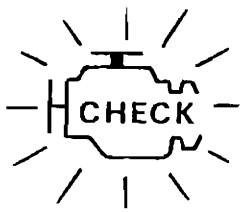
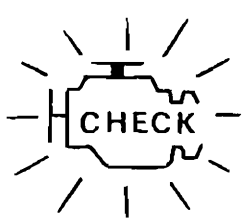
1. Set Diagnostic Test Mode II. (Self-diagnostic results) (Refer to page EC-50.)
2. Count the number of malfunction indicator lamp flashes and read out the diagnostic trouble codes.
3. Are the diagnostic trouble codes being output?

No

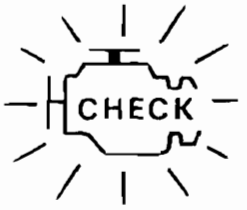
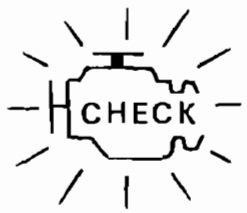
INSPECTION END



How to Execute On-board Diagnostic System in Diagnostic Test Mode II

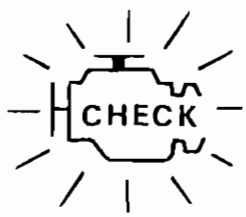
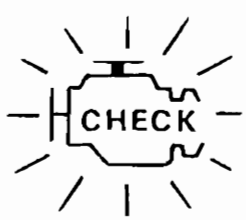
Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Camshaft position sensor circuit	11	☆ MONITOR ☆ NO FAIL ☐ CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q  SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** OR 2) Turn ignition switch "OFF" and then "ON". 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**
Mass air flow sensor circuit	12	☆ MONITOR ☆ NO FAIL ☐ CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q  SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Turn ignition switch "ON" wait for at least 5 seconds and then start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** OR 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**

How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

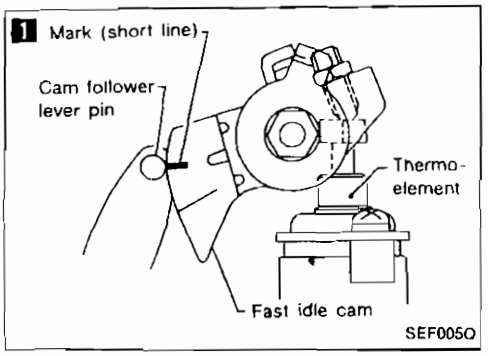
Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement: Illustration	Method
Engine coolant temperature sensor circuit	13	☆ MONITOR ☆ NO FAIL □ CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q  SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Turn ignition switch "ON" or start engine 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** OR 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**
Ignition signal circuit	21	☆ MONITOR ☆ NO FAIL □ CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q  SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** OR 2) Turn ignition switch "OFF" and then "ON" 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**

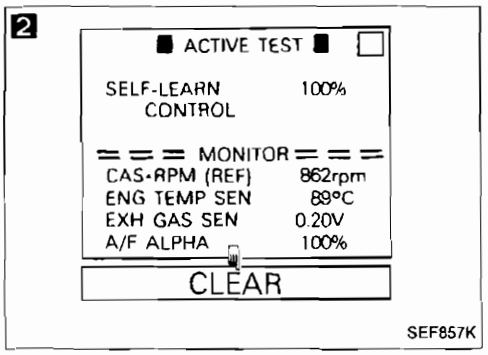
*: D agnostic test mode II (Self-diagnostic results) is not performed but this method provides results which are equal to the self-diagnostic results.

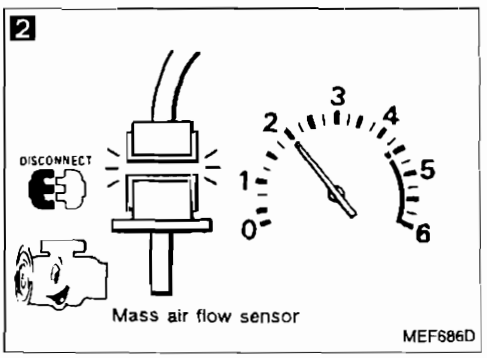
How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Boost pressure sensor circuit	26	☆ MONITOR ☆ NO FAIL CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q  SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** OR 1) Turn ignition switch "OFF" and then "ON". 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**
Knock sensor circuit	34	☆ MONITOR ☆ NO FAIL CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q  SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** OR 2) Turn ignition switch "OFF" and then "ON". 3) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**

*: Diagnostic test mode II (Self-diagnostic results) is not performed but this method provides results which are equal to the self-diagnostic results.







Diagnostic Procedure 1 — Symptom — High Idling after Warm-up

1

CHECK FAST IDLE CAM.
Does mark (short line) on fast idle cam align with the pin center of cam follower lever?

No → Check fast idle cam adjustment. (See page EC-207.)

Yes ↓

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 mass air flow sensor harness connectors.
2. After starting and running engine for at least 30 seconds at 2,000 rpm, does the engine speed drop?

No ↓

CHECK THROTTLE LINKAGE.

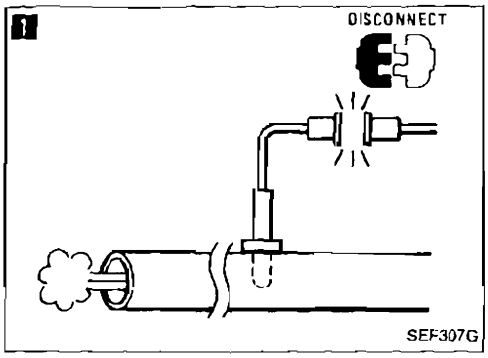
1. Check that throttle linkage moves smoothly.
2. Confirm that throttle valve both fully opens and fully closes.

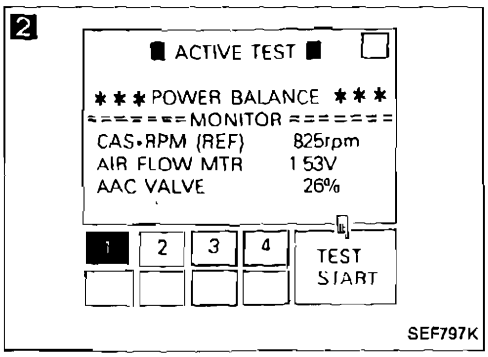
NG → Repair throttle linkage or sticking of throttle valve.

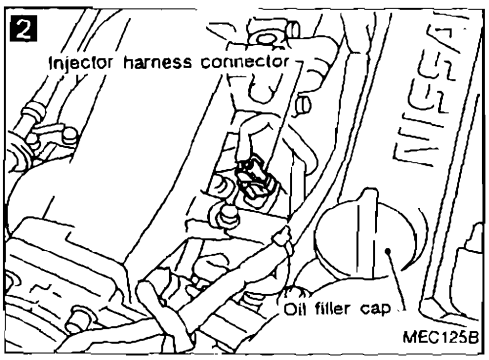
OK ↓

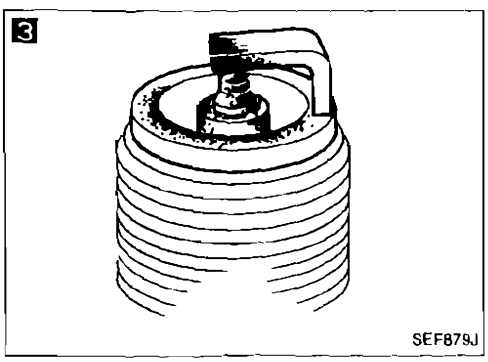
INSPECTION END

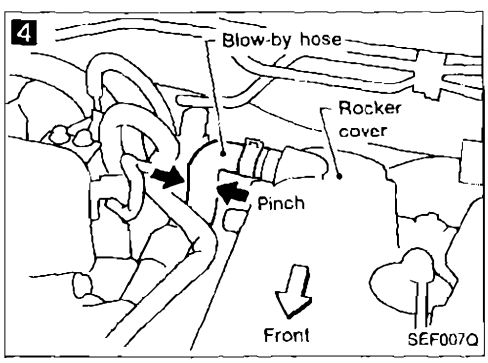
Diagnostic Procedure 2 — Symptom — Hunting











1

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

Yes → Check heated oxygen sensor(s). (See page EC-152.)

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 **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 ↓

3

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

NG → Repair or replace spark plug(s).

OK ↓

4

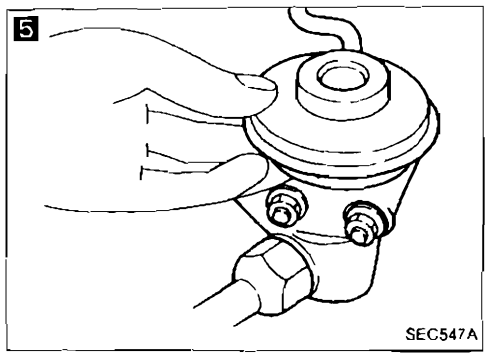
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

No ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 2 — Symptom — Hunting (Cont'd)



Ⓐ

5

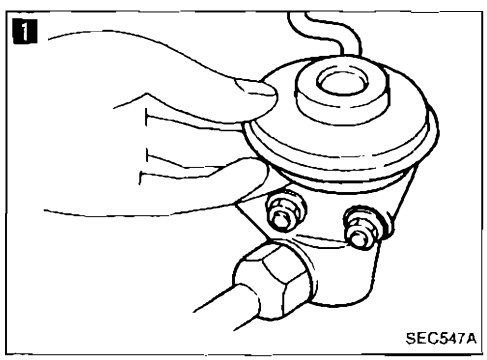
CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace

OK ↓

INSPECTION END

Diagnostic Procedure 3 — Symptom — Unstable Idle

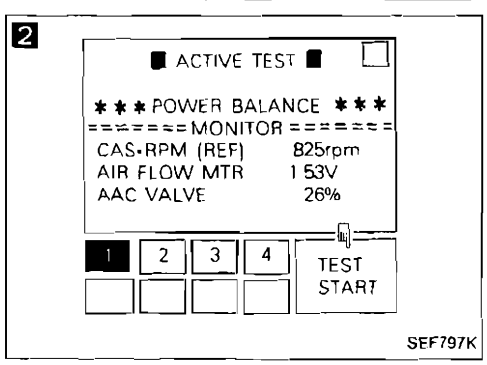


1

CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK ↓



2

PERFORM POWER BALANCE TEST.

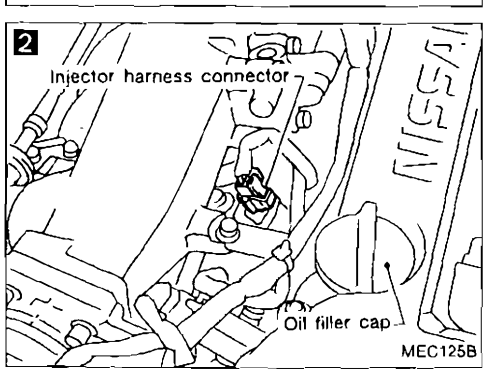
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

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 ↓

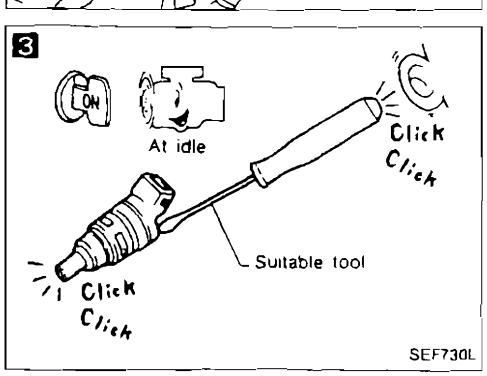


3

CHECK INJECTOR.
Does each injector make an operating sound at idle?

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

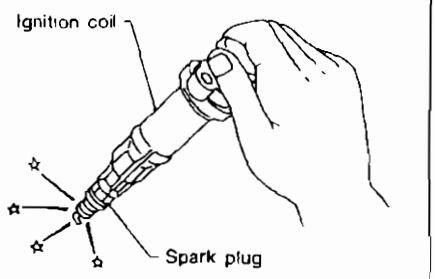
Yes ↓



(Go to Ⓐ on next page.)

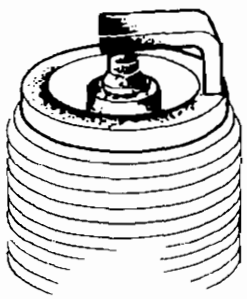
Diagnostic Procedure 3 — Symptom — Unstable Idle (Cont'd)

4



SEF008Q

5



SEF156I

6

■ FUEL PRES RELEASE ■

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

START

MEF688D

Ⓐ

4 **CHECK IGNITION SPARK.**

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

NG → Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202.)

OK ↓

5 **CHECK SPARK PLUGS.**

Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK ↓

6 **CHECK FUEL PRESSURE.**

1. 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. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)

NG → Check fuel pump and circuit.

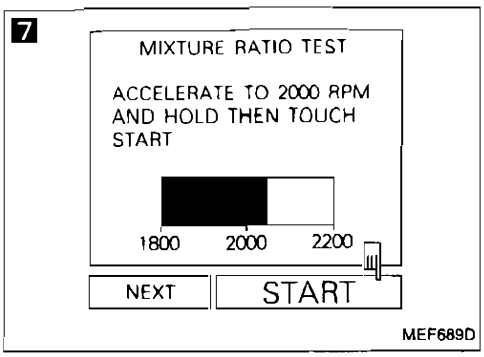
— OR —

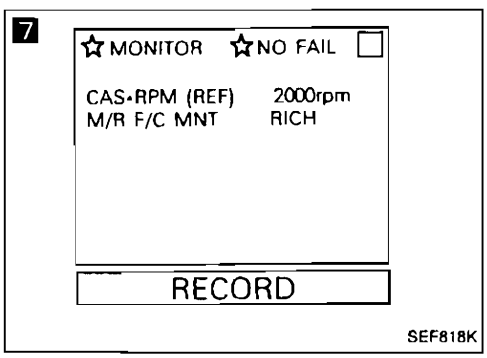
1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

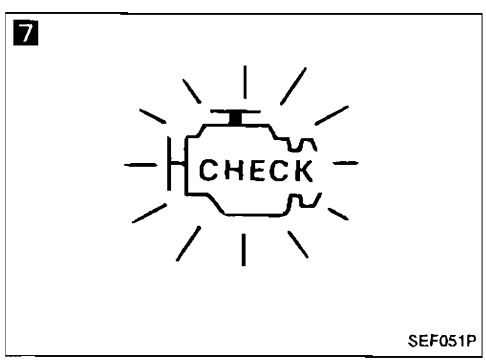
OK ↓

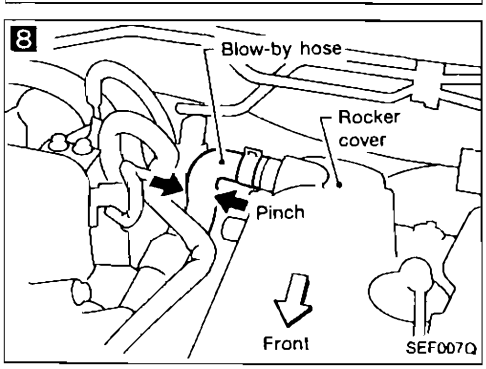
(Go to Ⓑ on next page.)

Diagnostic Procedure 3 — Symptom — Unstable Idle (Cont'd)









Ⓑ

7

CHECK HEATED OXYGEN SENSOR.

1. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.

NG → Replace heated oxygen sensor(s).

OR

2. See "M/R F/C MNT" in "Data monitor" mode.
3. 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 cycle: RICH → LEAN → RICH
2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

2. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II. (See page EC-52.)
3. 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?

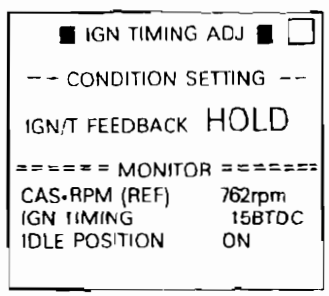
Yes → Discover air leak location and repair.

No ↓

(Go to Ⓒ on next page.)

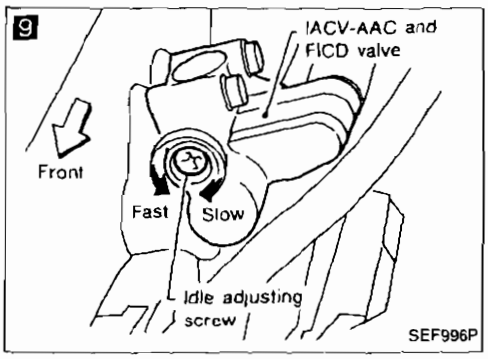
Diagnostic Procedure 3 — Symptom — Unstable Idle (Cont'd)

9



SEF786K

9



SEF996P

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 at 750 ± 50 rpm (A/T in "N" position) by turning idle adjusting screw?

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

OR

1. Disconnect throttle position sensor harness connector.
2. Can you set engine speed at 750 ± 50 rpm (A/T in "N" position) by turning idle adjusting screw?

Yes ↓

10

CHECK COMPRESSION PRESSURE.

- Check compression pressure.

Standard: kPa (bar, kg/cm², psi)/300 rpm
981 (9.81, 10.0, 142)
Minimum: kPa (bar, kg/cm², psi)/300 rpm
883 (8.83, 9.0, 128)
Difference between each cylinder: kPa (bar, kg/cm², psi)/300 rpm
98 (0.98, 1.0, 14)

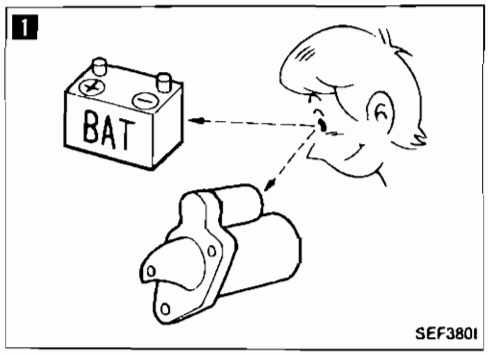
NG → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

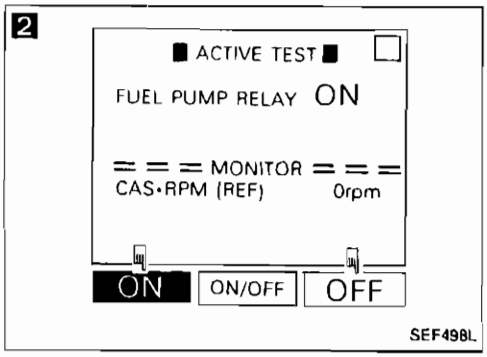
OK ↓

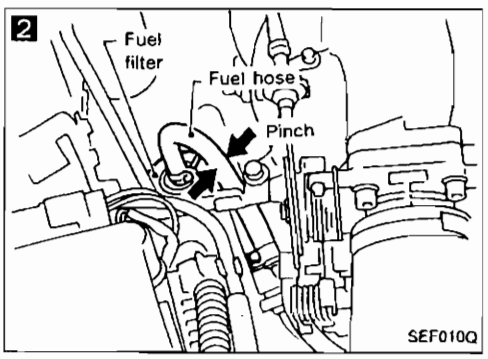
Disconnect and reconnect harness connectors in the circuit. Then retest.

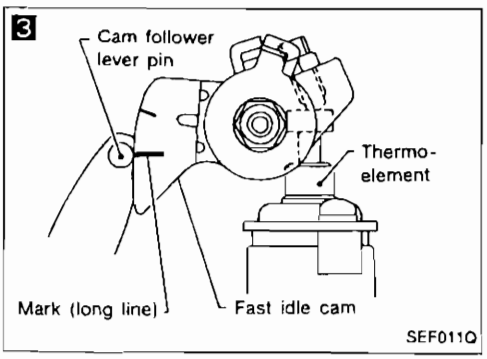
Trouble is not fixed. ↓

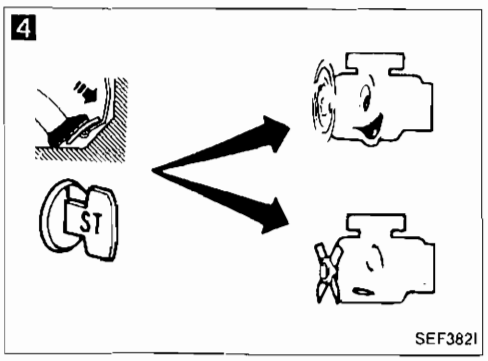
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.











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

1

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

NG → Repair or replace.

OK ↓

2

CHECK FUEL PRESSURE.

1. Turn ignition switch "ON".
2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
3. Pinch fuel feed hose with fingers.

Is fuel pressure pulsation felt on the fuel feed hose?

No → Check fuel pump and circuit. (See page EC-159.)

OR

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

Yes ↓

3

CHECK FAST IDLE CAM.
When the engine is cold, does mark (long line) on fast idle cam align with the pin center of cam follower lever?

No → Check fast idle cam adjustment. (See page EC-207.)

Yes ↓

4

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

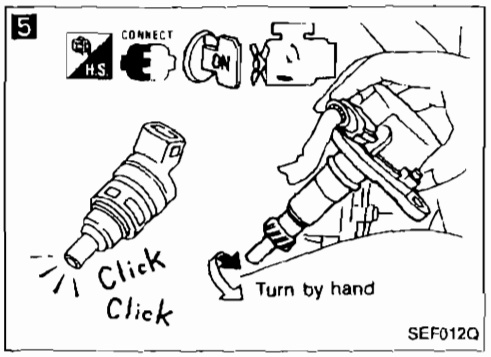
Yes → Check IACV-AAC valve and circuit. (See page EC-169.)

No ↓

(Go to Ⓐ on next page.)

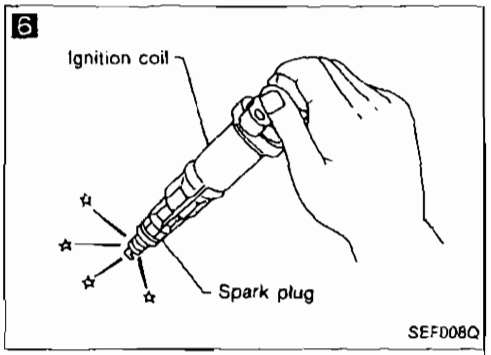
Diagnostic Procedure 4 — Symptom — Hard to Start or Impossible to Start when the Engine is Cold (Cont'd)

5



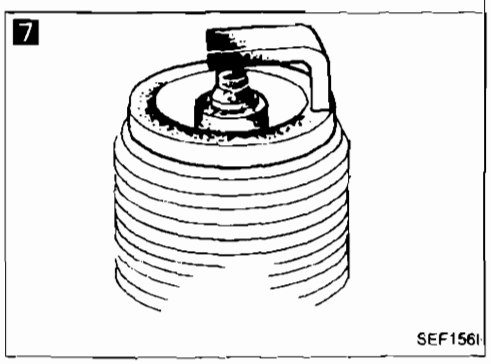
SEF012Q

6



SEF008Q

7



SEF156I

Ⓐ

5

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

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

Yes

6

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

NG → Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202)

OK

7

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

NG → Repair or replace spark plug(s).

OK

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

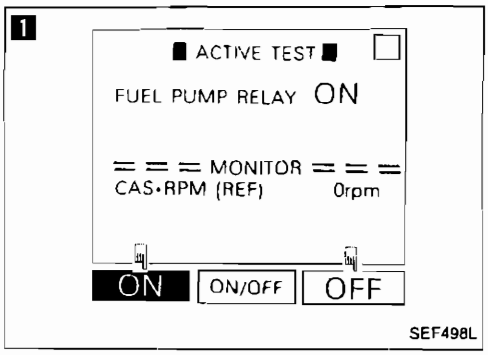
NG → Repair or replace.

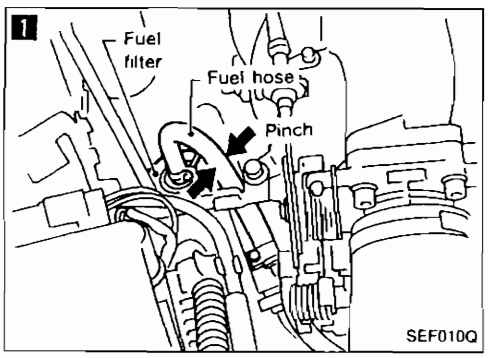
OK

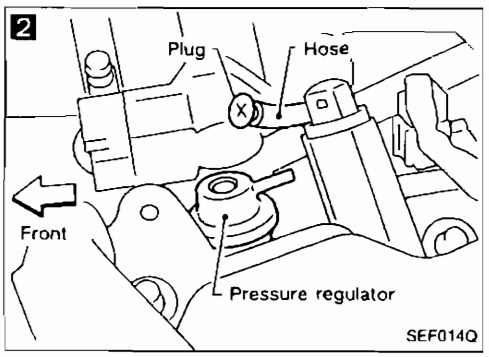
Disconnect and reconnect harness connectors in the circuit. Then retest.

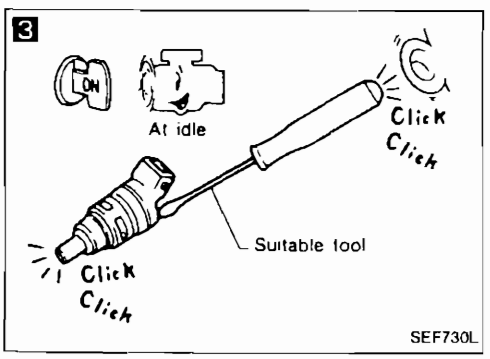
Trouble is not fixed.

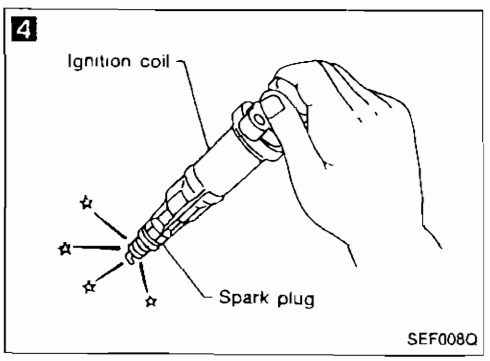
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.











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

1

CHECK FUEL PRESSURE.

1. Turn ignition switch "ON".
2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
3. Pinch fuel feed hose with fingers.

Is fuel pressure pulsation felt on the fuel feed hose?

No → Check fuel pump and circuit. (See page EC-159.)

OR

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

Yes ↓

2

CHECK FUEL VAPOR.

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

Yes → Check fuel properties.

No ↓

3

CHECK INJECTOR.

Does each injector make an operating sound at idle?

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

Yes ↓

4

CHECK IGNITION SPARK.

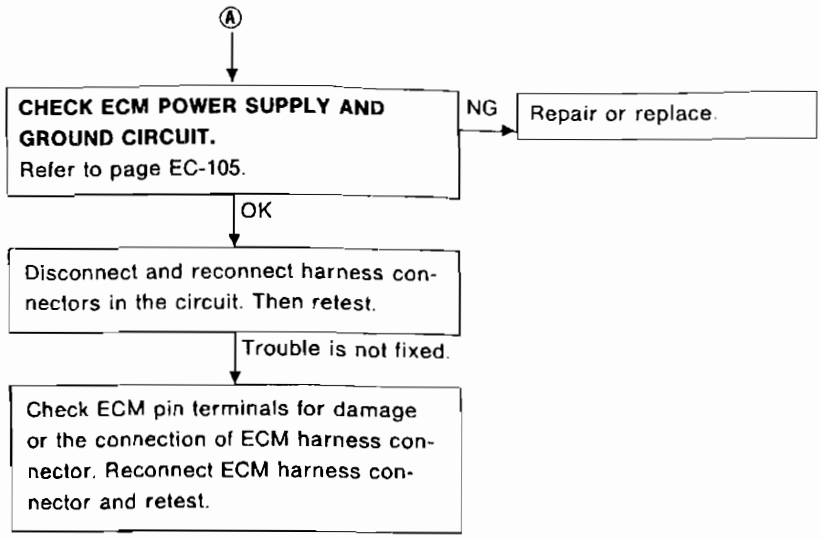
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine
4. Check for spark.

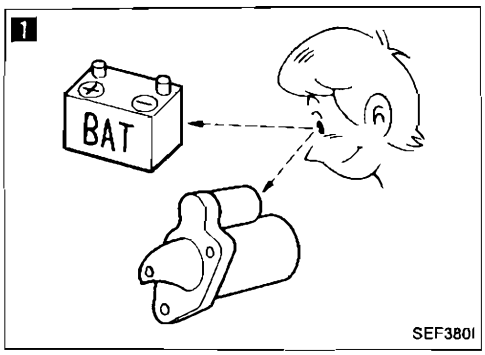
NG → Check ignition coil, power transistor unit and circuits. (See page EC-120, 202.)

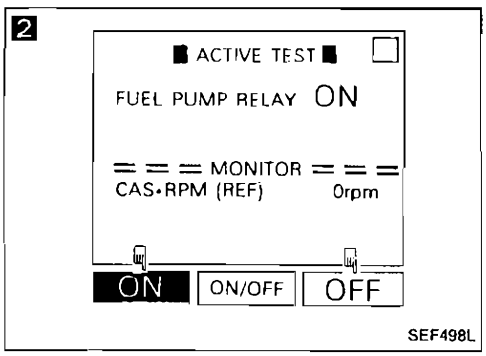
OK ↓

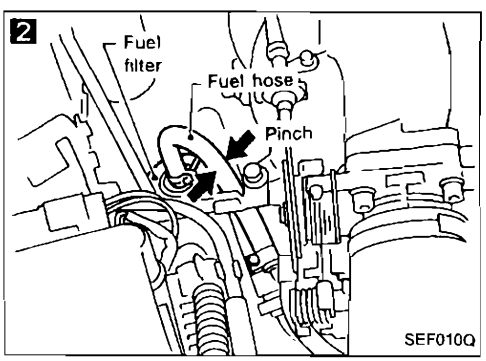
(Go to Ⓐ on next page.)

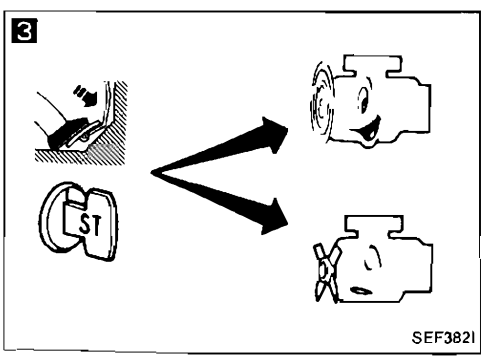
Diagnostic Procedure 5 — Symptom — Hard to Start or Impossible to Start when the Engine is Hot (Cont'd)

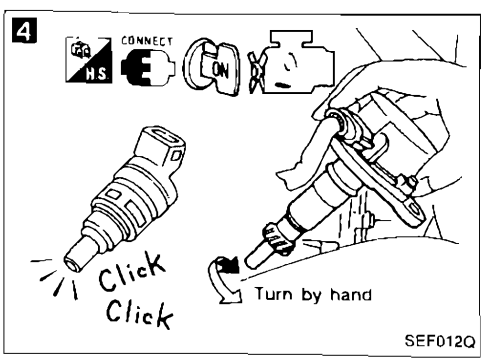












Diagnostic Procedure 6 — Symptom — Hard to Start or Impossible to Start under Normal Conditions

1

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

NG → Repair or replace.

OK ↓

2

CHECK FUEL PRESSURE.

1. Turn ignition switch "ON".
2. Perform "FUEL PUMP RELAY" in "ACTIVE TEST" mode.
3. Pinch fuel feed hose with fingers.

Is fuel pressure pulsation felt on the fuel feed hose?

No → Check fuel pump and circuit (See page EC-159.)

OR

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

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. Disconnect power transistor harness connector
3. Turn ignition switch ON. (Do not start engine.)
4. When rotating camshaft position sensor shaft, does each injector make an operating sound?

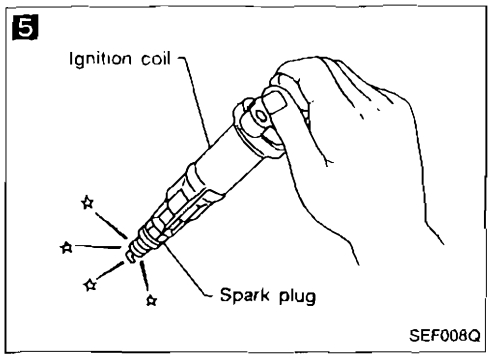
No → Check injectors and circuits.

Yes ↓

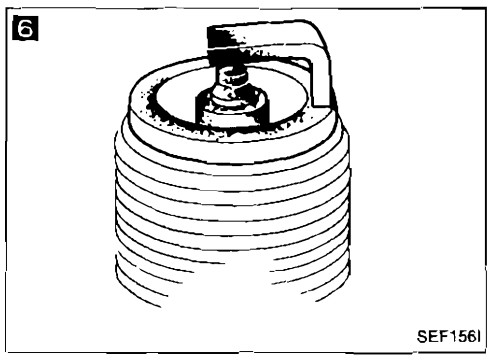
(Go to Ⓐ on next page.)

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

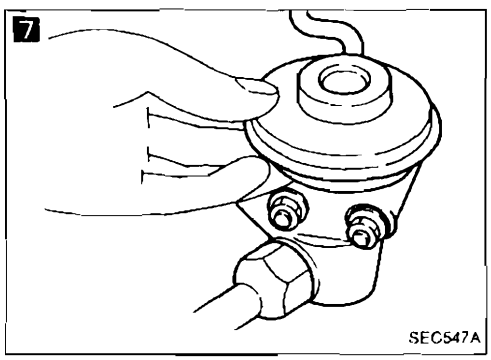
5



6



7



Ⓐ

5

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

NG → Check ignition coil, power transistor unit and circuits. (See page EC-120, 202)

OK ↓

6

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

NG → Repair or replace spark plug(s).

OK ↓

7

CHECK EGR VALVE.
Check EGR valve for sticking.

NG → Repair or replace.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

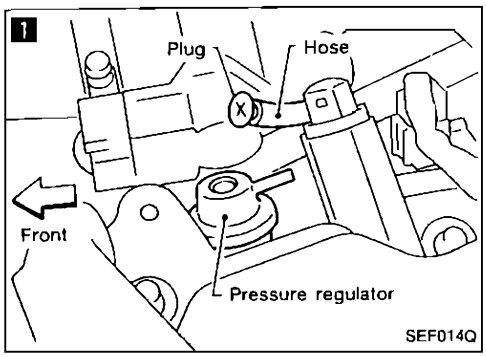
NG → Repair or replace.

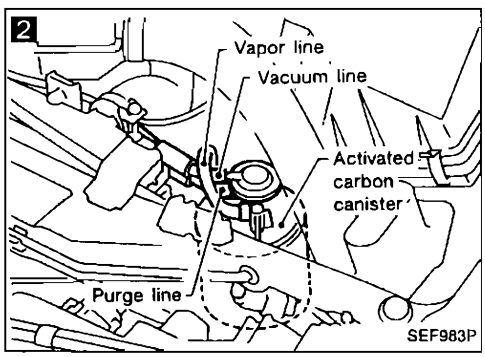
OK ↓

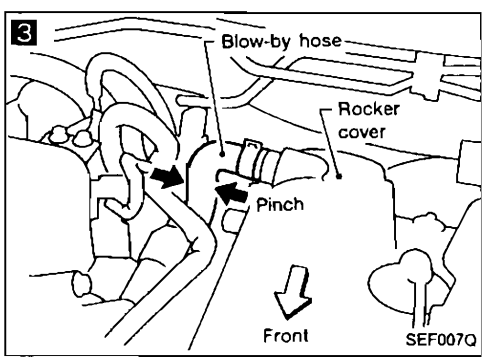
Disconnect and reconnect harness connectors in the circuit. Then retest.

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 7 — Symptom — Hesitation when the Engine is Hot

1

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

Yes → Check fuel properties.

No ↓

2

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

Yes → Check purge and vacuum lines.

No ↓

3

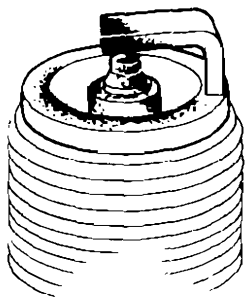
CHECK FOR INTAKE AIR LEAK
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair

No ↓

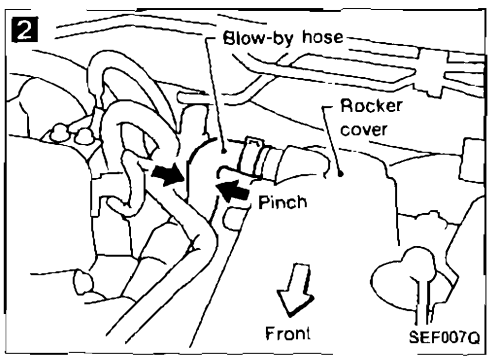
INSPECTION END

1



SEF156I

2



SEF007Q

Diagnostic Procedure 8 — Symptom — Hesitation when the Engine is Cold

1

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

NG → Repair or replace spark plug(s).

OK ↓

2

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

Yes → Discover air leak location and repair.

No ↓

Go to Diagnostic Procedure 24 (EC-113.)
Or try a known good mass air flow sensor.

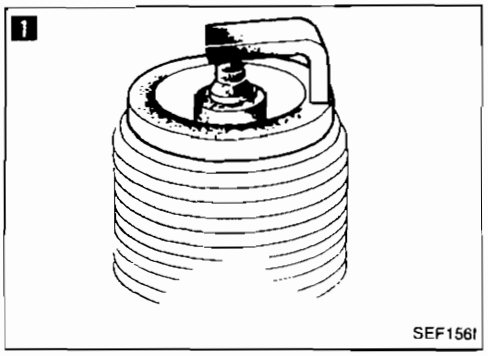
Trouble is not fixed. ↓

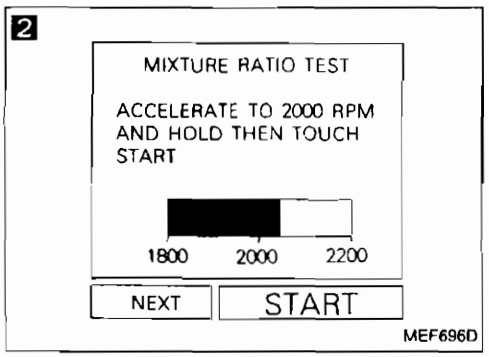
CHECK FOR INTAKE VALVE DEPOSITS.
If there are deposits on intake valves, remove them.

↓

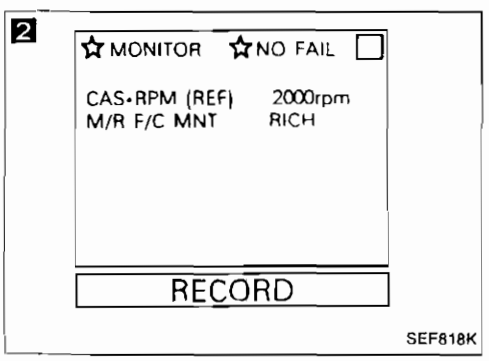
INSPECTION END

Diagnostic Procedure 9 — Symptom — Hesitation under Normal Conditions

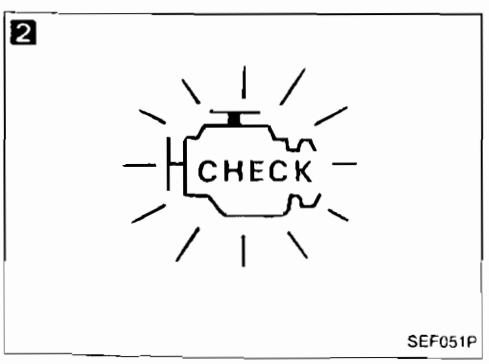

SEF156I



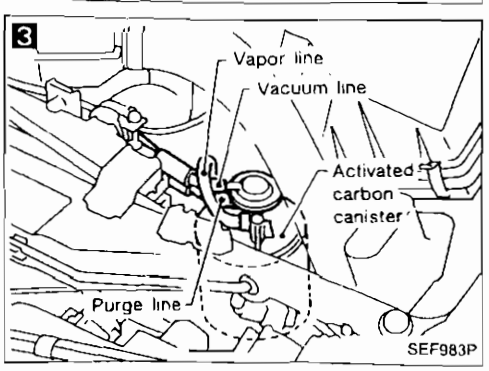
MEF696D



SEF818K



SEF051P



SEF983P

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. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.

Yes → Replace heated oxygen sensor(s).

OR

2. See "M/R F/C MNT" in "DATA MONITOR" mode.
3. 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 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

2. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II (See page EC-52.)
3. 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 ↓

3

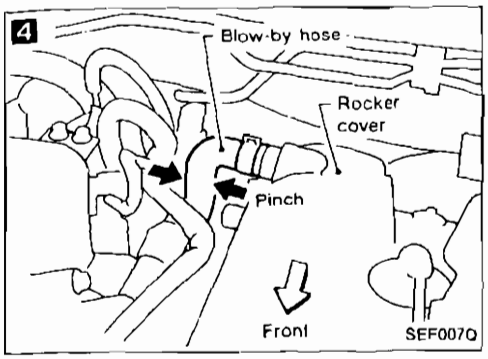
CHECK CANISTER PURGE.
1. Disconnect canister purge line hose and plug hose
2. Perform cruise test.
3. Does the hesitation disappear?

Yes → Check purge and vacuum lines.

No ↓

(Go to Ⓐ on next page.)

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



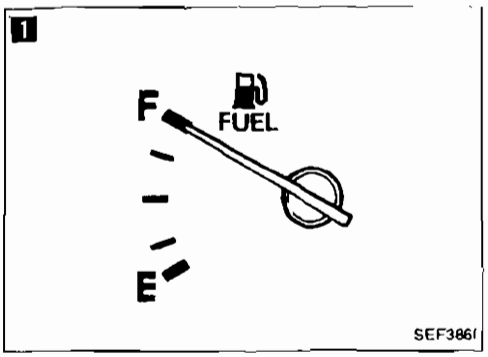
Ⓐ

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 ↓

INSPECTION END

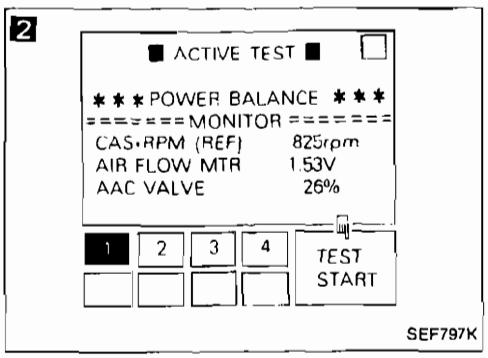


Diagnostic Procedure 10 — Symptom — Engine Stalls when Turning

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.**

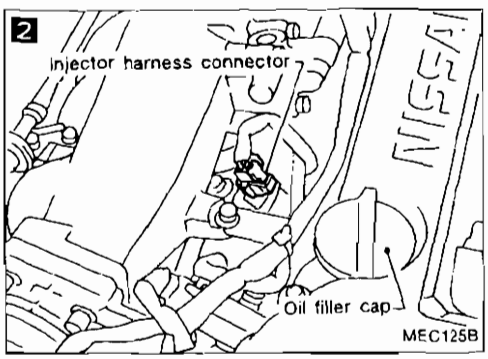
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

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 ↓

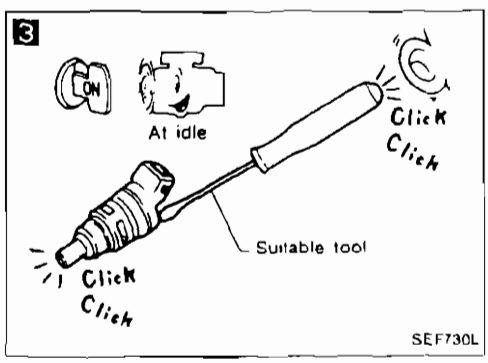


3 **CHECK INJECTOR.**
Does each injector make an operating sound at idle?

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

Yes ↓

(Go to Ⓐ on next page.)

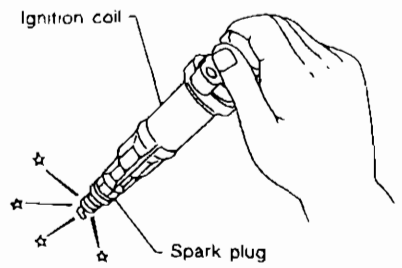


How to Execute On-board Diagnostic System in Diagnostic Test Mode II (Cont'd)

Detected items	Display Diagnostic trouble code No.	How to perform diagnostic test mode II (Self-diagnostic results) judgement	
		Illustration	Method
Throttle position sensor circuit	43	☆ MONITOR ☆ NO FAIL CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q CHECK SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Jack up drive wheels 2) Start engine. 3) Shift to a suitable gear position (Except "P" or "N" position), and run engine at vehicle speed of 5 km/h (3 MPH) or higher for at least 10 seconds. 4) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** — OR — 4) Turn ignition switch "OFF" and then "ON". 5) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**
Signal circuit from A/T control unit to ECM	54	☆ MONITOR ☆ NO FAIL CAS•RPM(REF) 800rpm AIR FLOW MTR 1.55V ENG TEMP SEN 81°C EXH GAS SEN 0.06V M/R F/C MNT LEAN CAR SPEED SEN 0km/h RECORD SEF004Q CHECK SEF051P	**PERFORM DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).** 1) Turn ignition switch "ON" or start engine. 2) Select "DATA MONITOR" mode with CONSULT. ☆ **NO FAIL** — OR — 2) Perform diagnostic test mode II (Self-diagnostic results) with ECM. **Malfunction indicator lamp displays diagnostic trouble code No. 55.**

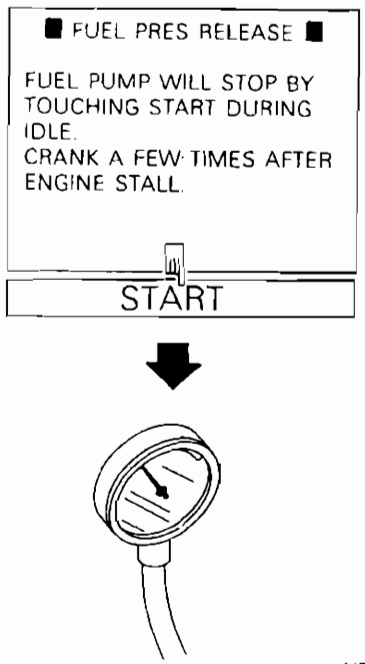
Diagnostic Procedure 10 — Symptom — Engine Stalls when Turning (Cont'd)

4



SEF008Q

5



MEF699D

Ⓐ

4

CHECK IGNITION SPARK.

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

NG → Check ignition coil, power transistor unit and circuits. (See page EC-120, 202)

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. 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
The moment throttle valve is fully open:
approx. 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

NG → Repair or replace.

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 11 — Symptom — Engine Stalls when the Engine is Hot

1

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

Yes → Check fuel properties.

No ↓

2

PERFORM POWER BALANCE TEST.
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.
Does each injector make an operating sound at idle?

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

Yes ↓

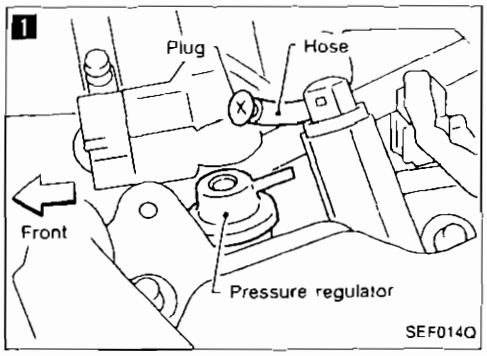
4

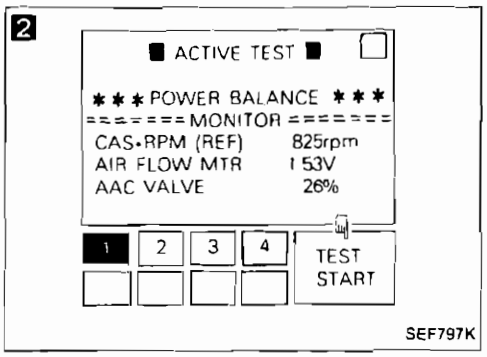
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

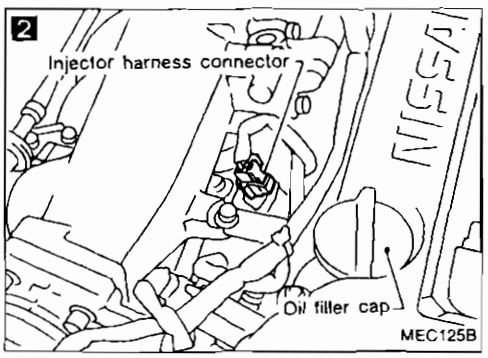
NG → Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202.)

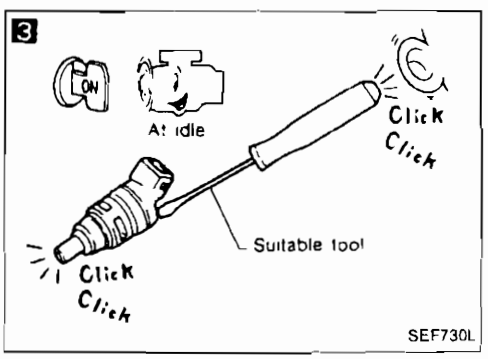
OK ↓

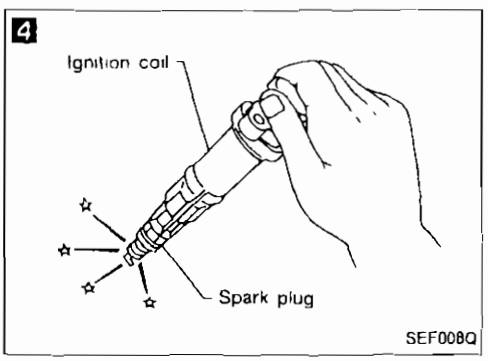
(Go to Ⓐ on next page.)



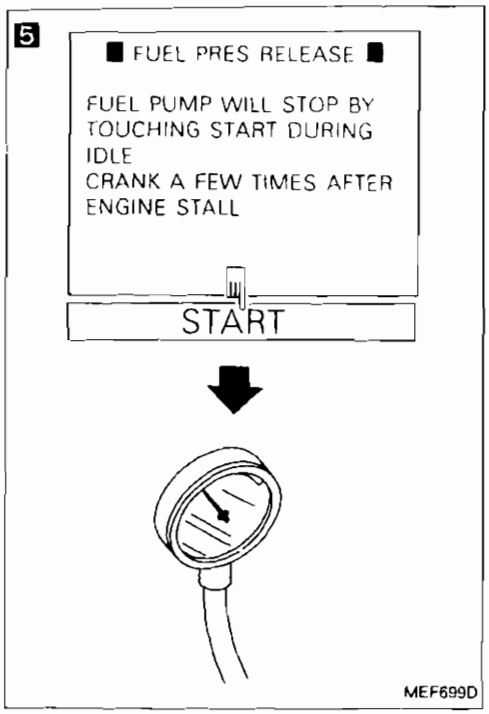








Diagnostic Procedure 11 — Symptom — Engine Stalls when the Engine is Hot (Cont'd)



Ⓐ

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. 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

NG → Repair or replace.

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 12 — Symptom — Engine Stalls when the Engine is Cold

1

CHECK FAST IDLE CAM.
When the engine is cold, does fast idle cam keep cam follower lever in position?

No → Check fast idle cam adjustment. (See page EC-207)

Yes ↓

2

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

Yes → Check IACV-AAC valve and circuits. (See page EC-169.)

No ↓

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?

— OR —

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

NG → Go to **7** .

OK ↓

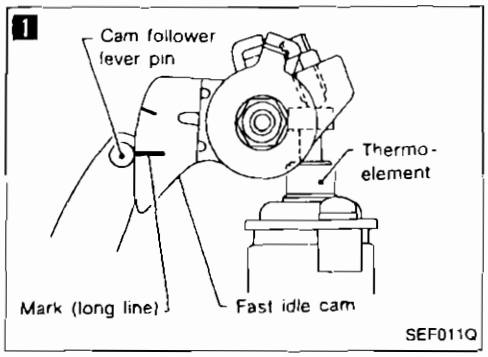
4

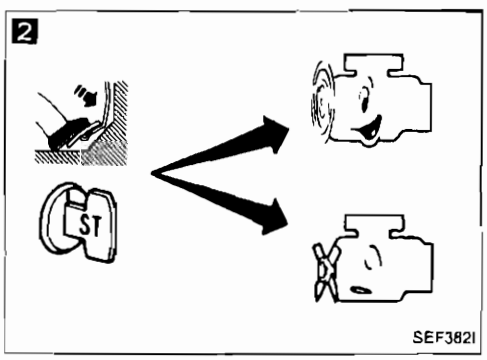
CHECK INJECTOR.
Does each injector make an operating sound at idle?

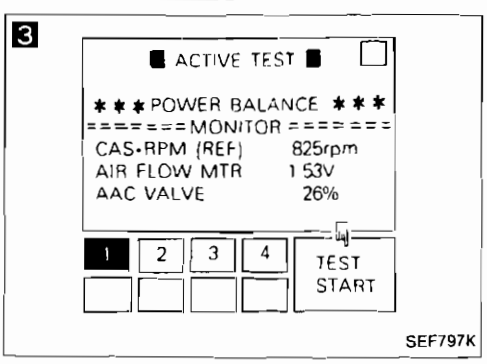
NG → Check injector(s) and circuit(s).

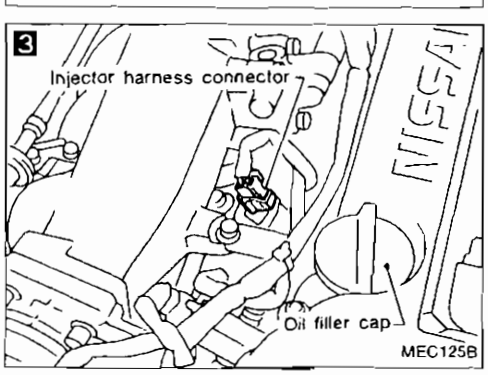
OK ↓

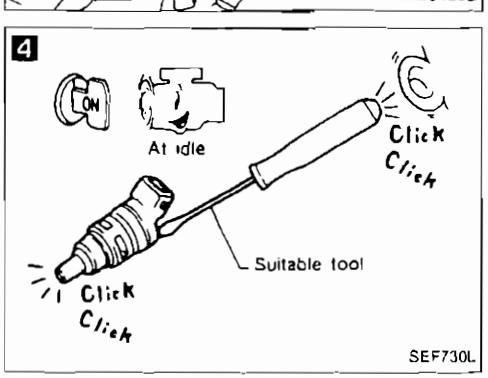
(Go to Ⓐ on next page)





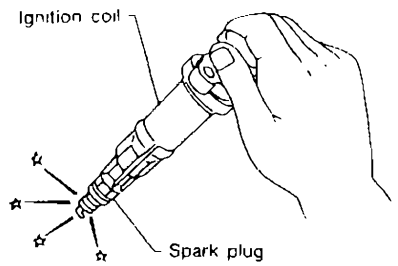






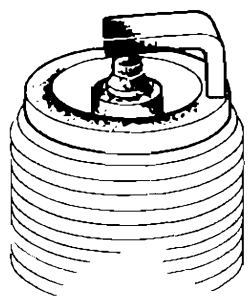
Diagnostic Procedure 12 — Symptom — Engine Stalls when the Engine is Cold (Cont'd)

5



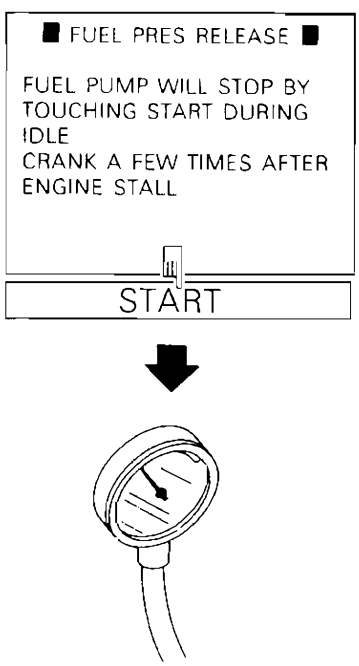
SEF008Q

6



SEF156I

7



MEF701D

Ⓐ

5

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

NG → Check ignition coil, power transistor unit and circuits. (See page EC-120, 202)

OK ↓

6

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

NG → Repair or replace spark plug(s).

OK ↓

7

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. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

NG → Repair or replace.

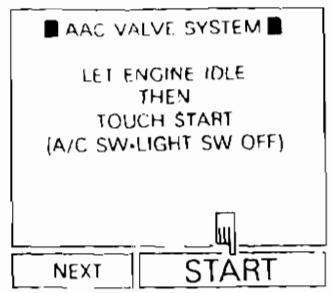
OK ↓

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

Trouble is not fixed. ↓

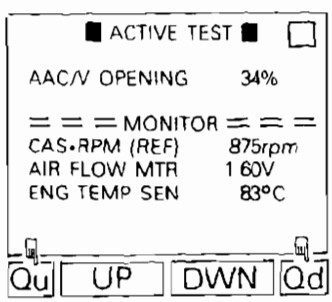
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

1



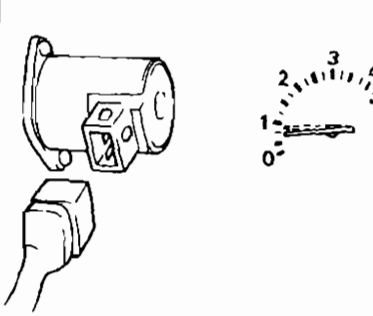
SEF196L

1



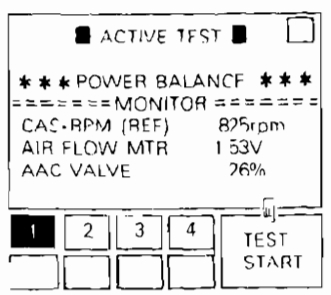
SEF319L

1



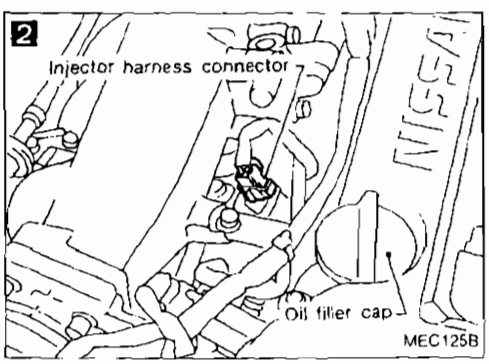
SEF146I

2



SEF797K

2



MEC125B

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

1

CHECK IACV-AAC VALVE.

1. Start engine and warm it up sufficiently.
2. Perform "AAC/V SYSTEM" or "IACV-AAC/V SYSTEM " in "FUNCTION TEST" mode

No → Check IACV-AAC valve and circuit. (See page EC-169.)

— OR —

1. Select "AAC/V OPENING" or "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 ↓

3

CHECK INJECTOR.

Does each injector make an operating sound at idle?

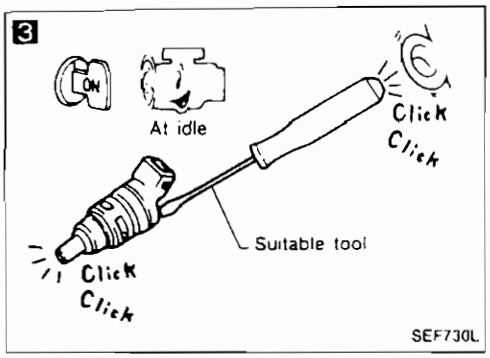
No → Check injector(s) and their circuit(s)

Yes ↓

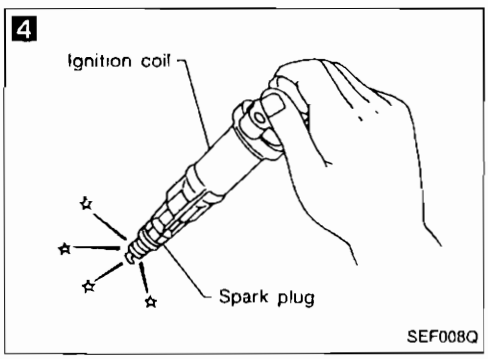
(Go to Ⓐ on next page.)

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

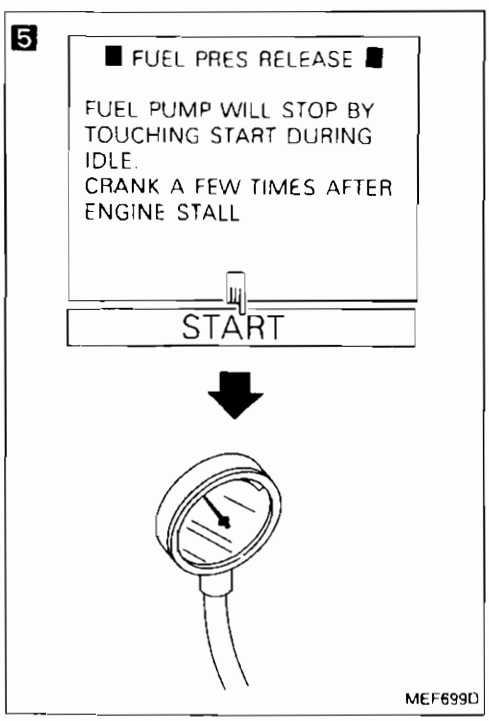
3



4



5



Ⓐ

4

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

NG → Check ignition coil, power transistor unit and their circuits. (See page EC-120, 202.)

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. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

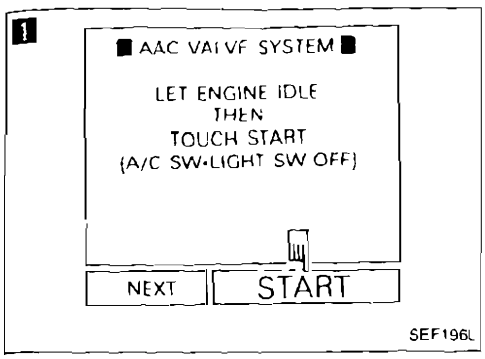
NG → Repair or replace.

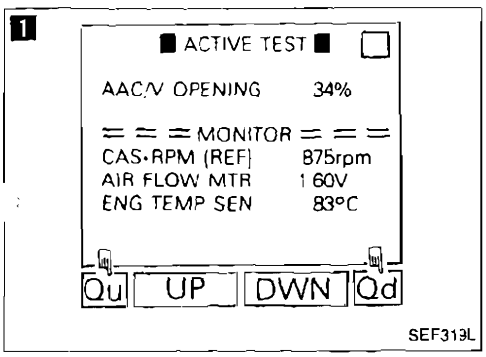
OK ↓

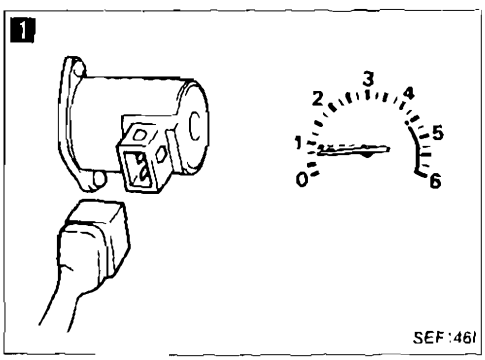
Disconnect and reconnect harness connectors in the circuit. Then retest.

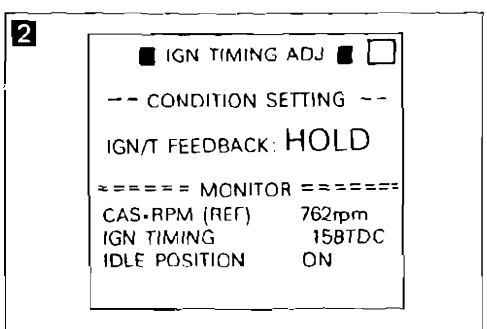
Trouble is not fixed. ↓

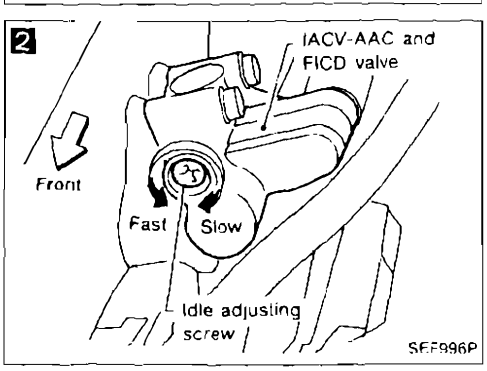
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.











Diagnostic Procedure 14 — Symptom — Engine Stalls after Decelerating

1

CHECK IACV-AAC VALVE.

1. Start engine and warm it up sufficiently.
2. Perform "AAC/V SYSTEM" or "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode.

No → Check IACV-AAC valve and circuit. (See page EC-169.)

OR

1. Select "AAC/V OPENING" or "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

CHECK IDLE ADJ. SCREW CLOGGING.

1. Perform "IGN TIMING ADJ" in "WORK SUPPORT" mode
2. Can you set engine speed at 750 ± 50 rpm (A/T in "N" position) by turning idle adjusting screw?

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

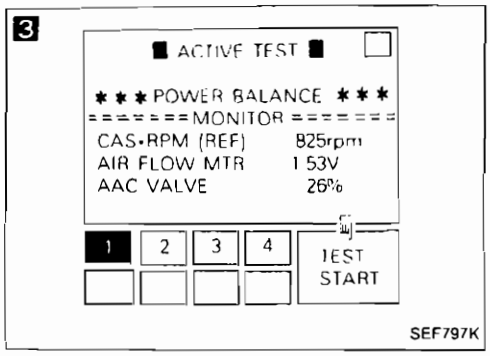
OR

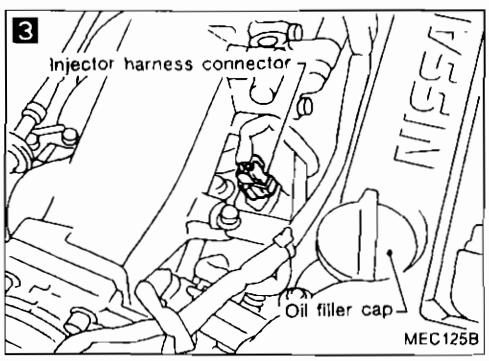
1. Disconnect throttle position sensor harness connector
2. Can you set engine speed at 750 ± 50 rpm (A/T in "N" position) by turning idle adjusting screw?

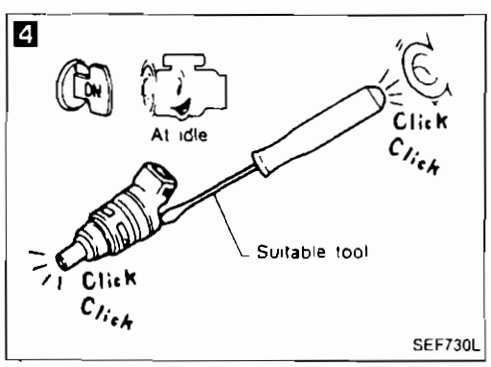
Yes

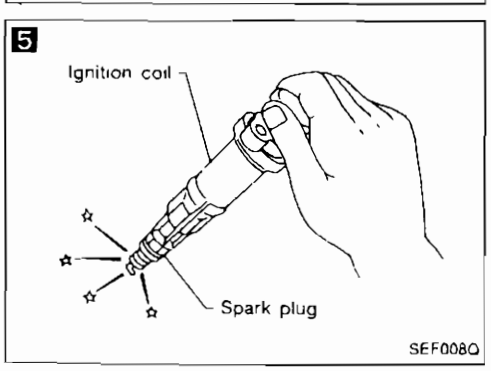
(Go to Ⓐ on next page.)

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









Ⓐ

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. Does each injector make an operating sound at idle?

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

Yes ↓

5

CHECK IGNITION SPARK.

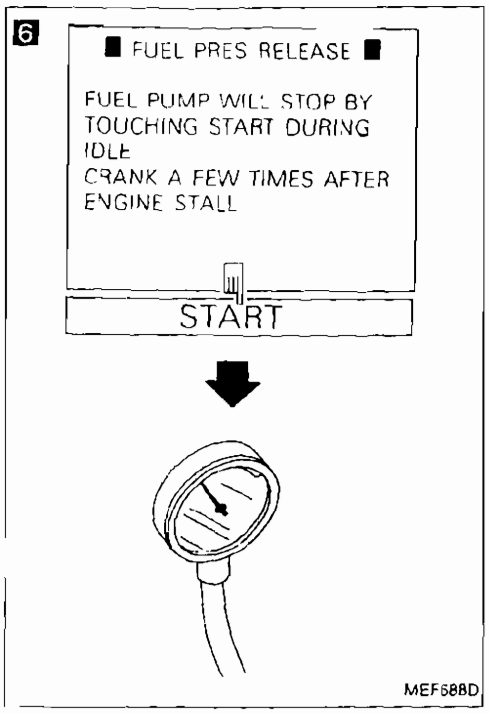
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

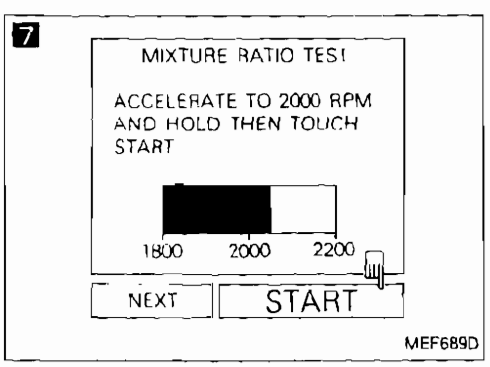
NG → Check ignition coil, power transistor unit and circuits. (See page EC-120, 202.)

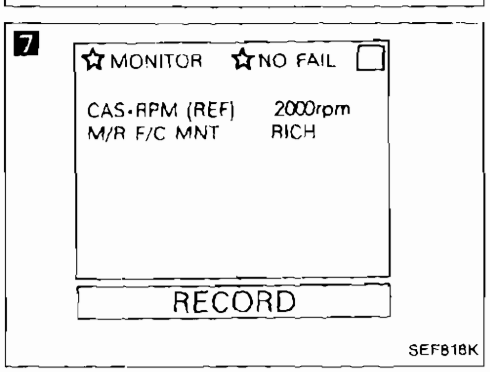
OK ↓

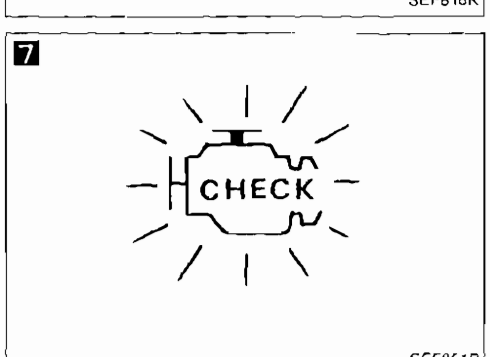
(Go to Ⓑ on next page.)

Diagnostic Procedure 14 — Symptom — 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. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

NG → Check fuel pressure regulator diaphragm.

— OR —

1. Release fuel pressure to zero (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK

7

CHECK HEATED OXYGEN SENSOR.

1. Start engine and warm it up sufficiently.
2. Perform "MIXTURE RATIO TEST" in "FUNCTION TEST" mode.

NG → Replace heated oxygen sensor(s).

— OR —

2. See "M/R F/C MNT" in "DATA MONITOR" mode
3. 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 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

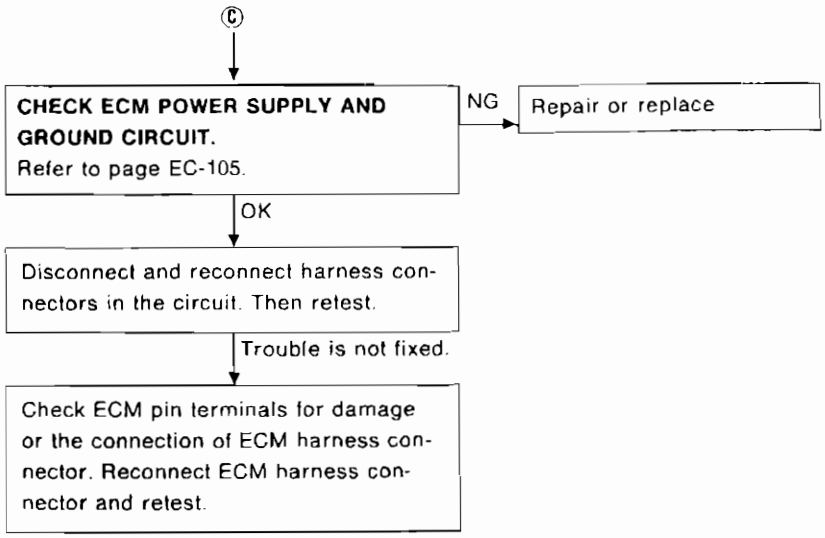
— OR —

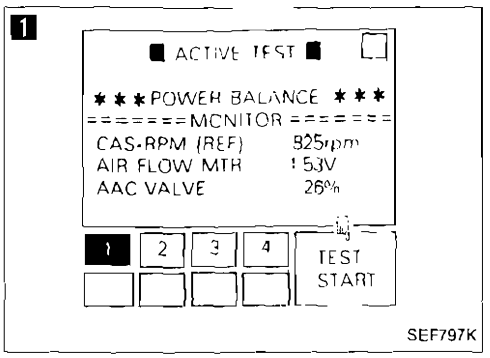
2. Set "Heated oxygen sensor monitor" in Diagnostic Test Mode II (See page EC-52.)
3. Maintaining engine at 2,000 rpm under no-load, check that malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

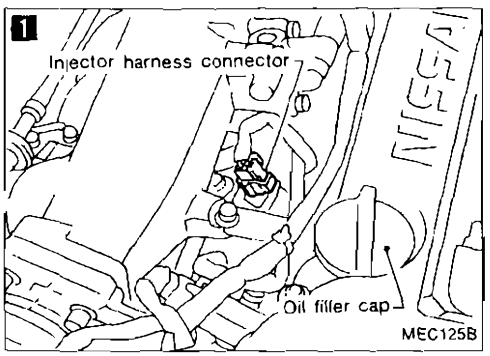
OK

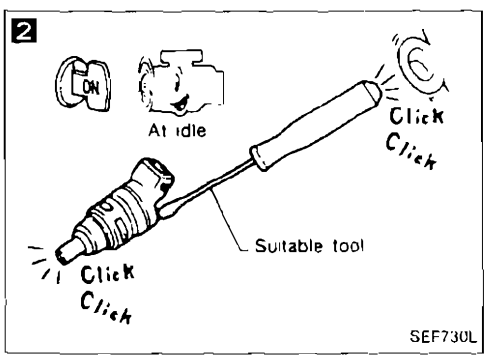
(Go to Ⓒ on next page.)

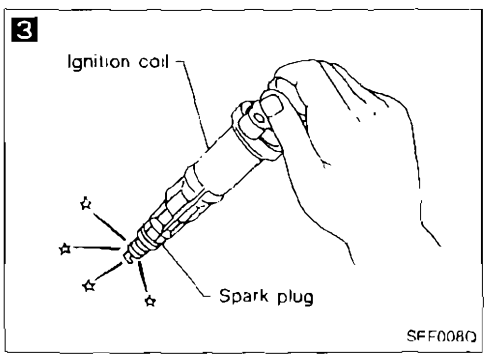
Diagnostic Procedure 14 — Symptom — Engine Stalls after Decelerating (Cont'd)











Diagnostic Procedure 15 — Symptom — Engine Stalls when Accelerating or when Driving at Constant Speed

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.
Does each injector make an operating sound at idle?

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

Yes ↓

3

CHECK IGNITION SPARK.

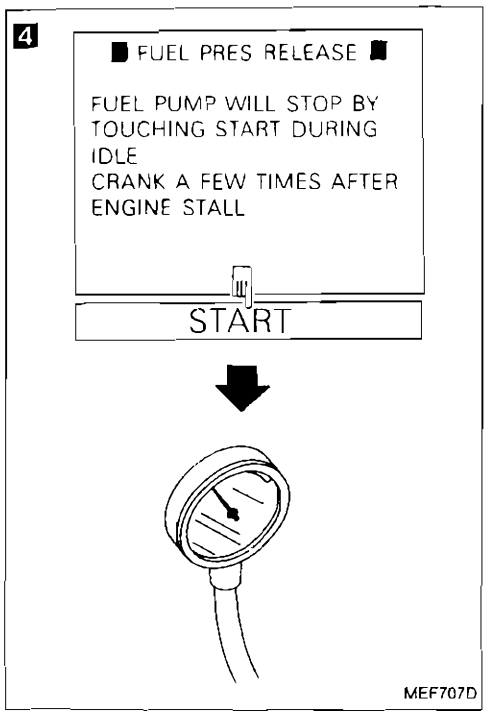
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

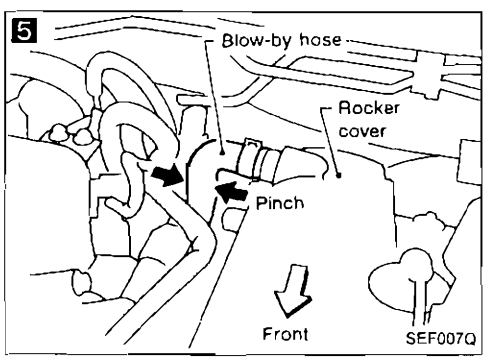
NG → Check ignition coil, power transistor unit and circuits. (See page EC-120, 202)

OK ↓

(Go to Ⓐ on next page.)

Diagnostic Procedure 15 — Symptom — Engine Stalls when Accelerating or when Driving at Constant Speed (Cont'd)





Ⓐ

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. 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

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

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

5

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

Yes → Discover air leak location and repair.

No ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

Yes → Repair or replace.

No ↓

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 16 — Symptom — Engine Stalls when the Electrical Load is Heavy

1

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

NG → Repair or replace.

OK ↓

2

PERFORM POWER BALANCE TEST.

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.
Does each injector make an operating sound at idle?

No → Check injector(s) and circuit(s)

Yes ↓

4

CHECK IGNITION SPARK.

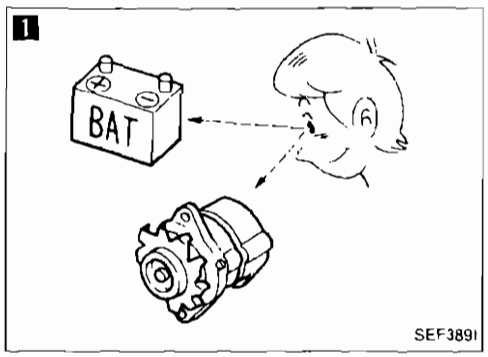
1. Disconnect ignition coil assembly from rocker cover
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil, power transistor unit and circuits (See page EC-120 202.)

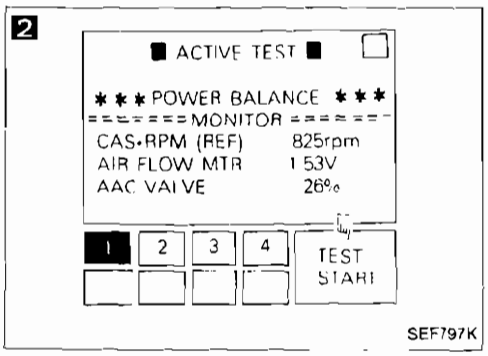
OK ↓

(Go to Ⓐ on next page)

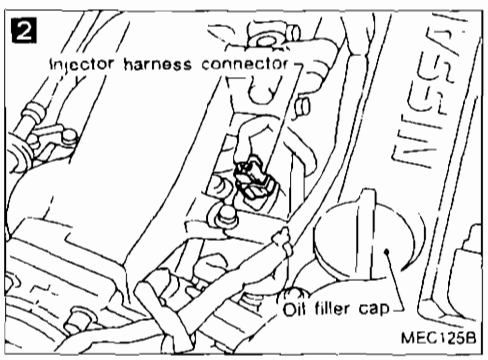
1



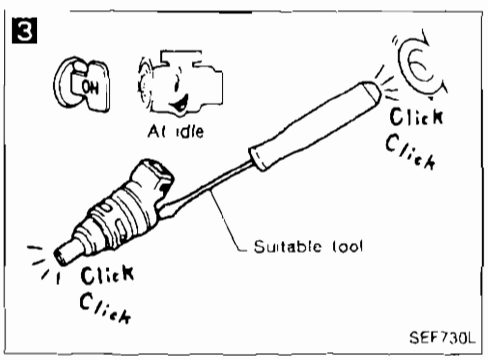
2



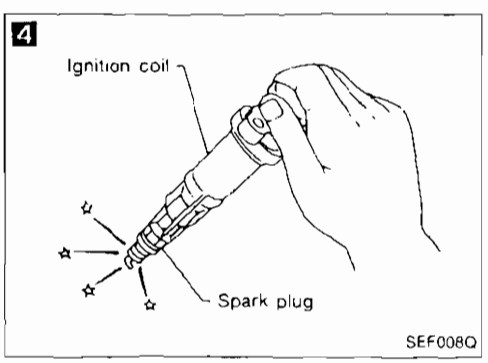
2



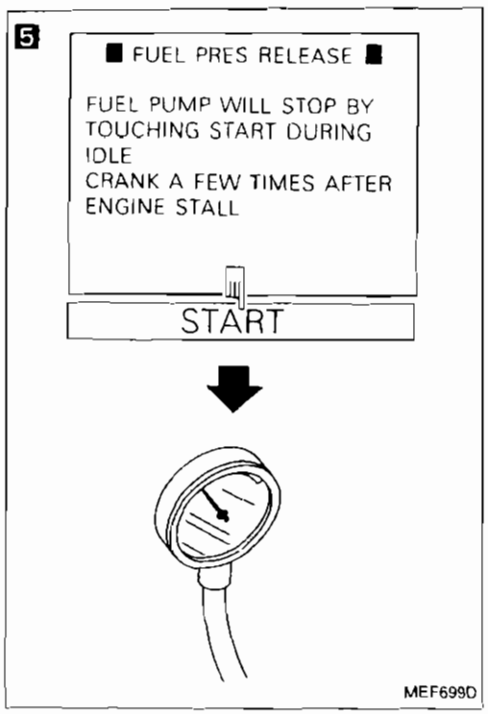
3



4



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



Ⓐ

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. 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

CHECK ECM POWER SUPPLY AND GROUND CIRCUIT.
Refer to page EC-105.

NG → Repair or replace.

OK ↓

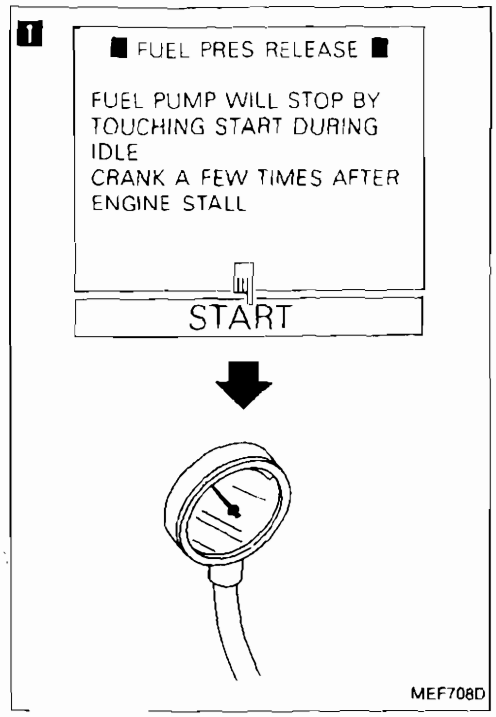
Disconnect and reconnect harness connectors in the circuit. Then retest.

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 17 — Symptom — 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. 245 kPa (2.45 bar, 2.5 kg/cm², 36 psi)
   The moment throttle valve is fully open:
   approx. 294 kPa (2.94 bar, 3.0 kg/cm², 43 psi)

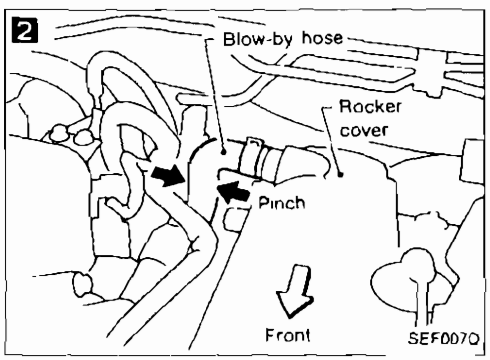
NG → Check fuel pressure regulator diaphragm.

OR

1. Release fuel pressure to zero. (Refer to page EC-208.)
2. Install fuel pressure gauge and check fuel pressure.

OK ↓

2

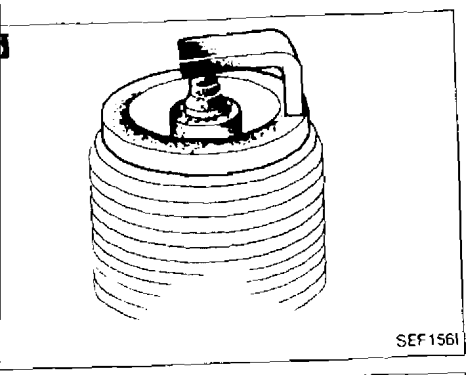


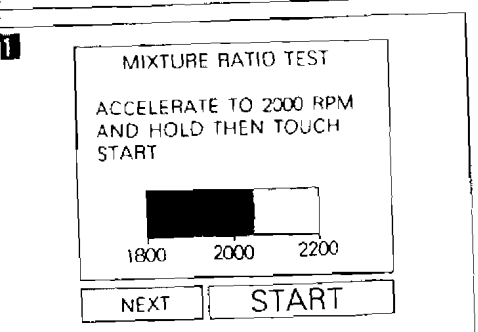
CHECK FOR INTAKE AIR LEAK.
When pinching blow-by hose (lowering the blow-by air supply), does the engine speed rise?

Yes → Discover air leak location and repair.

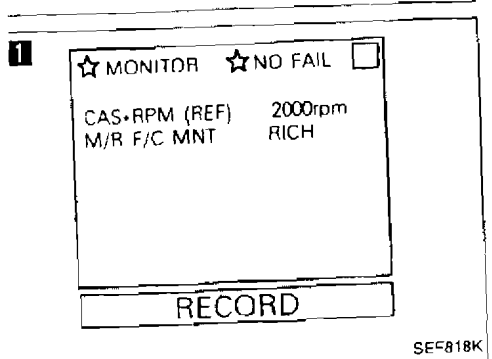
No ↓

INSPECTION END

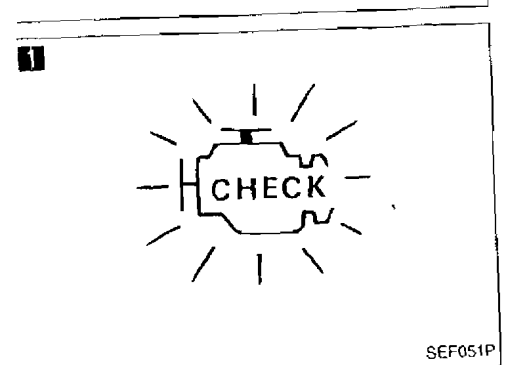

SEF156I



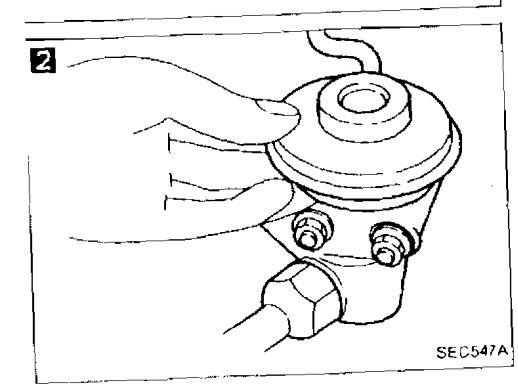
MEF711D

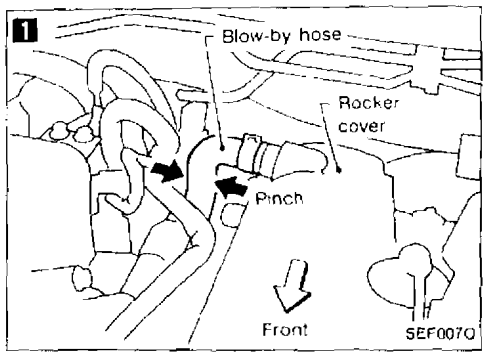


SEF818K

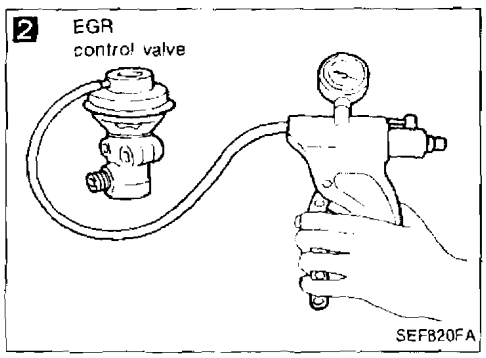


SEF051P

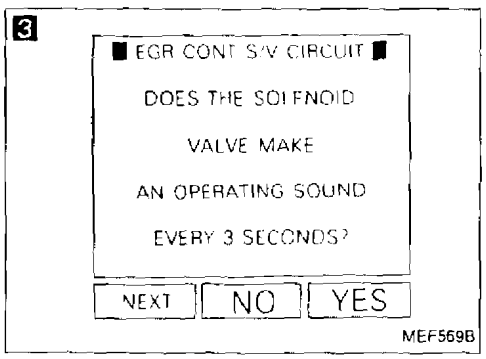

SEC547A



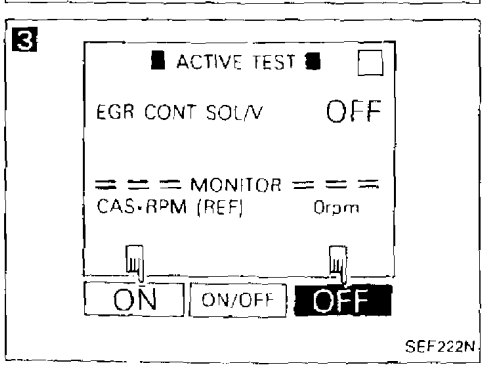
SEF007O



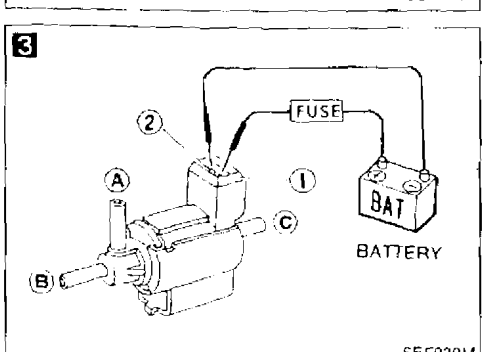
SEF820FA



MEF569B



SEF222N



SEF930M

Diagnostic Procedur

1

CHECK FOR INTAKE AIR LEAK.

When pinching blow-by hose (low the blow-by air supply), does the speed rise?

No ↓

2

CHECK EGR OPERATION.

1. Apply vacuum directly to the EG valve using a handy vacuum pu
2. Check to see that the engine rur rough or dies.

Yes ↓

3

CHECK EGRC-SOLENOID VALVE.

1. Turn ignition switch "ON"
2. Perform "EGR CONT S/V CIRCUIT" or "EGRC S/V CIRCUIT" in "FUNCTION TEST" mode.

— OR —

1. Turn ignition switch "ON".
2. Select "EGR CONT SOL/V "EGRC SOL VALVE" in "ACTIVE TEST" mode.
3. Turn EGRC-solenoid valve and OFF.
4. Check operating sound.

— OR —

1. Disconnect EGRC-solenoid valve harness connector.
2. Supply EGRC-solenoid valv terminals with battery curre and check operating sound

OK ↓

4

CHECK VACUUM HOSES.

Check the following vacuum hoses fo clogging, cracks and poor connectior

a) Vacuum hose between EGR valve and EGRC-solenoid valve.
b) Vacuum hose between EGRC-sole noid valve and throttle body port.
c) Vacuum hose between EGRC-sole noid valve and air duct.

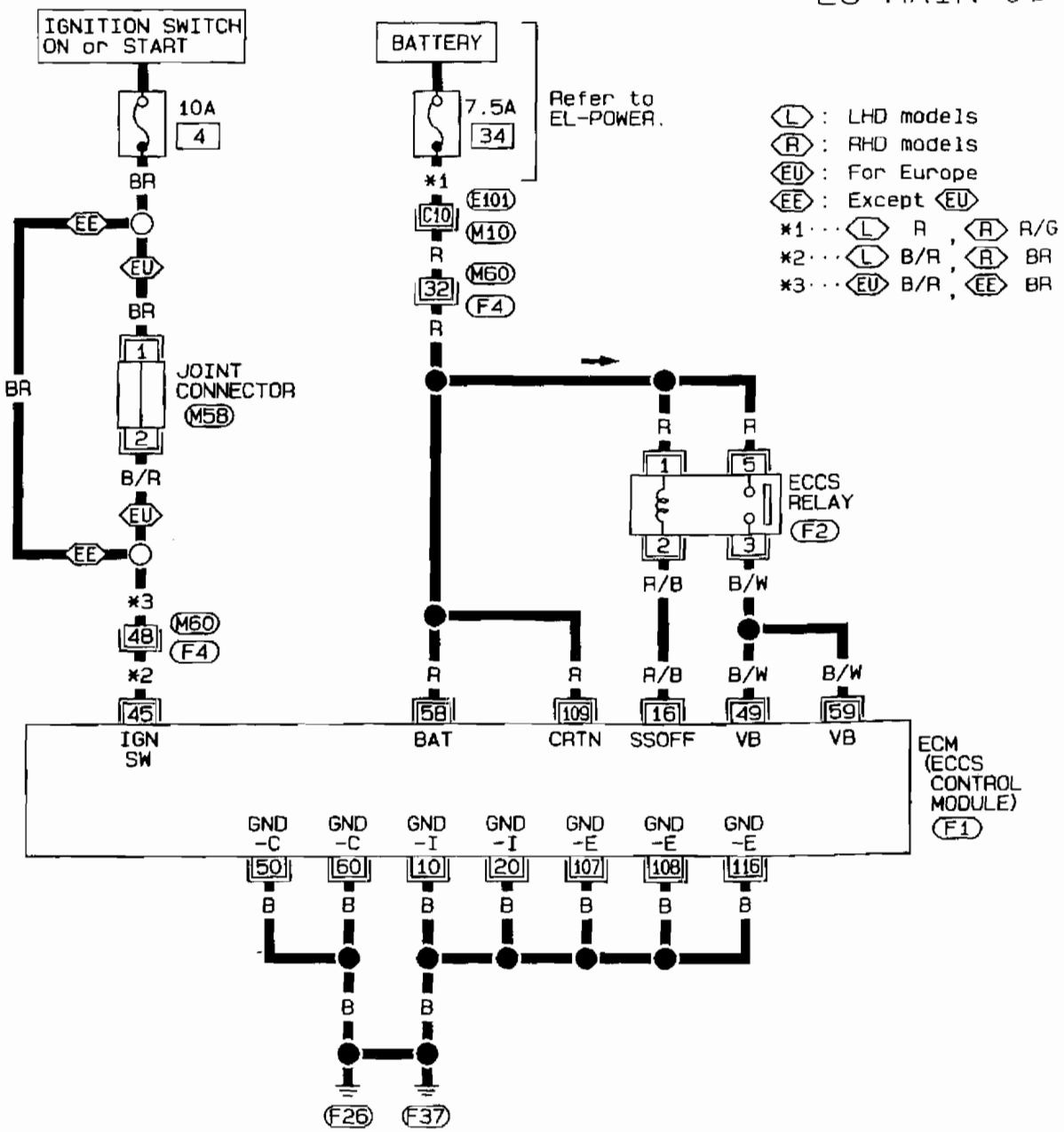
OK ↓

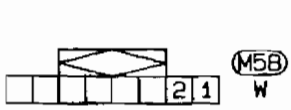
(Go to Ⓐ on next page.)

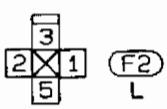
Diagnostic Procedure 22

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

EC-MAIN-01

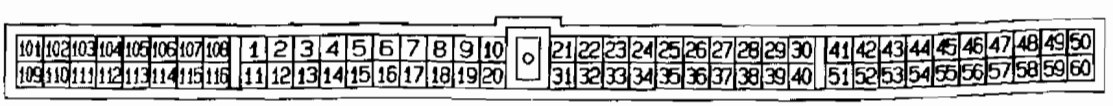






Refer to last page (Foldout page).

M10 , E101
M60 , F4

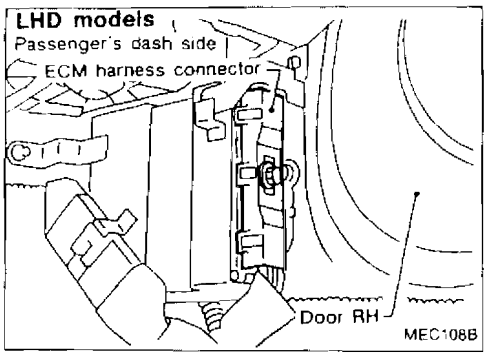


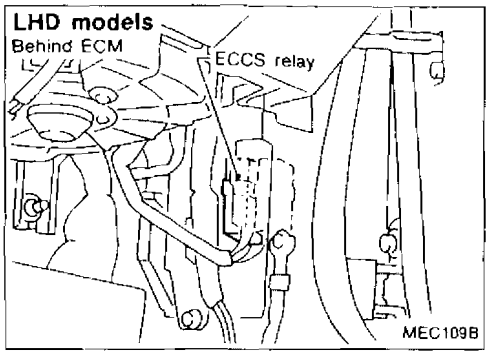
H.S.

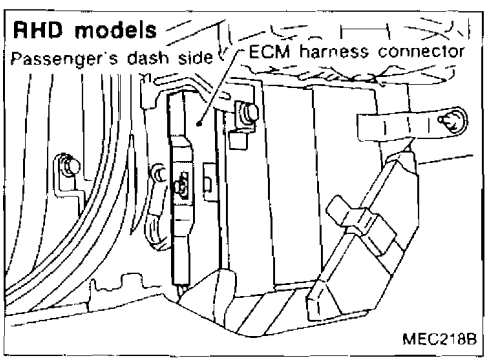
SEF824P

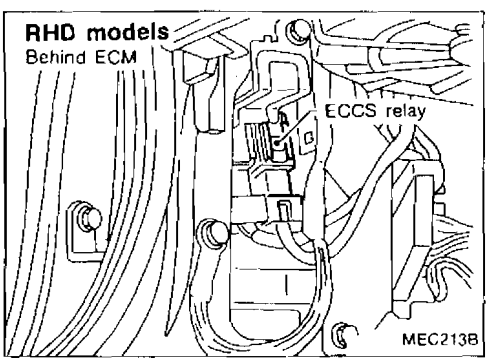
Diagnostic Procedure 22 (Cont'd)

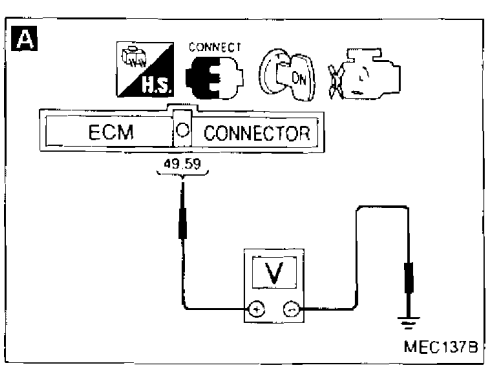
Harness layout

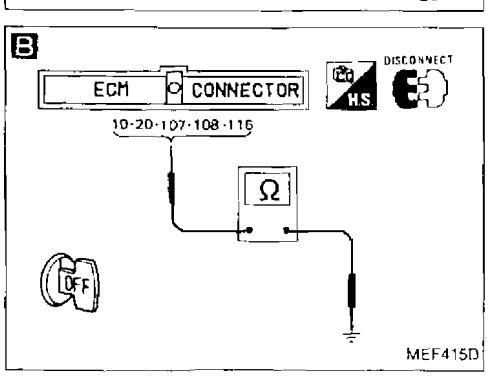


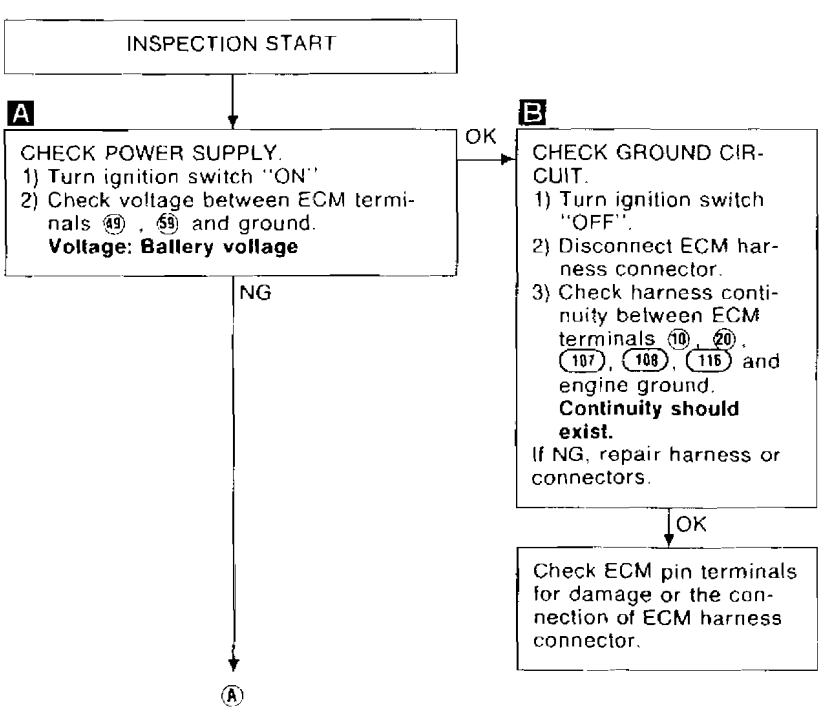




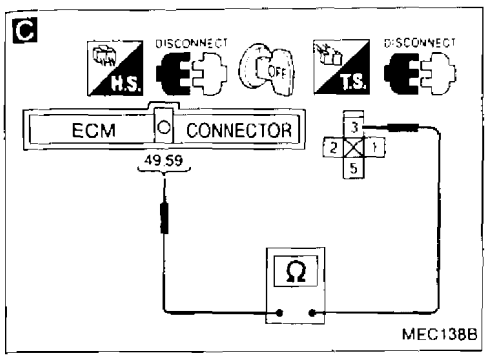


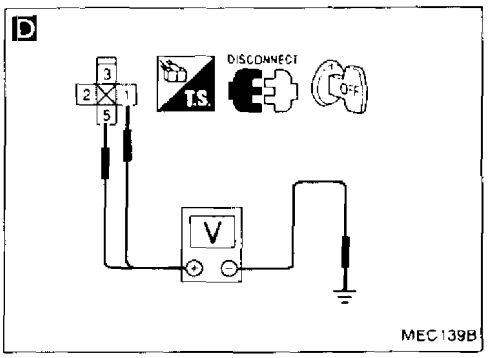


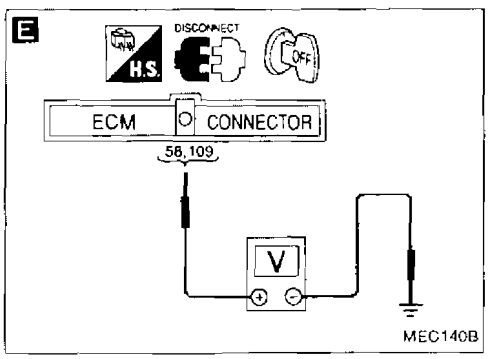


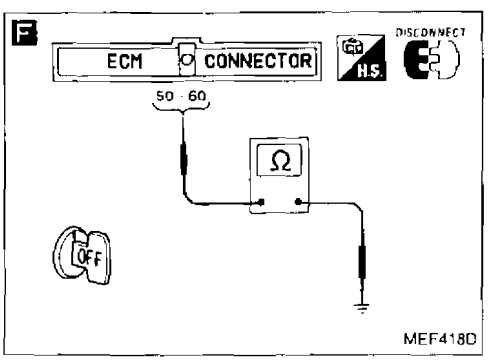


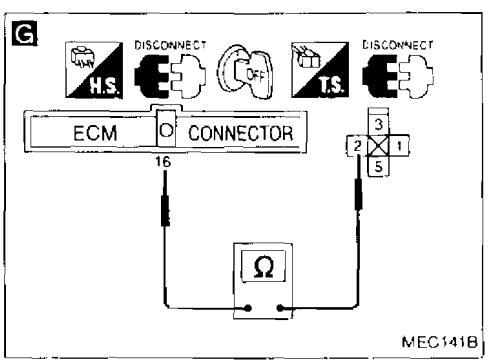
Diagnostic Procedure 22 (Cont'd)











Ⓐ

C

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM

1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector
3) Disconnect ECCS relay.
4) Check harness continuity between ECM terminals ㊾ , ㊾ and terminal ③

Continuity should exist.

NG → Repair harness or connectors.

OK ↓

D

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.

1) Check voltage between terminals ① , ⑤ and ground.

Voltage: Battery voltage

NG → Check the following.
- 7.5A fuse
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4)
- Harness continuity between ECCS relay and battery

If NG, repair harness or connectors.

OK ↓

E

CHECK VOLTAGE BETWEEN ECM AND GROUND

1) Check voltage between ECM terminals ㊽ , (109) and ground.

Voltage: Battery voltage

NG → Check the following.
- Harness continuity between ECM and harness connector (F4)

If NG, repair harness or connectors.

OK ↓

F

CHECK GROUND CIRCUIT.

1) Check harness continuity between ECM terminals ㊿ , ㊿ and engine ground.

Continuity should exist.

NG → Repair harness or connectors.

OK ↓

G

CHECK OUTPUT SIGNAL CIRCUIT.

1) Check harness continuity between ECM terminal ⑯ and terminal ②.

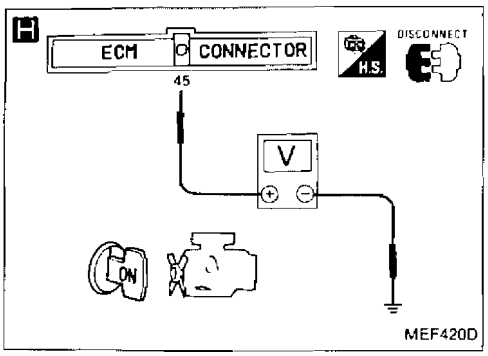
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

Ⓑ

Diagnostic Procedure 22 (Cont'd)



(B)

H

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "ON".
2) Check voltage between ECM terminal (45) and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M60), (F4)
- Joint connector (M58) (Models for Europe)
- Harness continuity between ECM and ignition switch

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (ECCS relay).
Refer to "Electrical Components Inspection". (See page EC-206.)

NG → Replace ECCS relay.

OK ↓

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

Trouble is not fixed. ↓

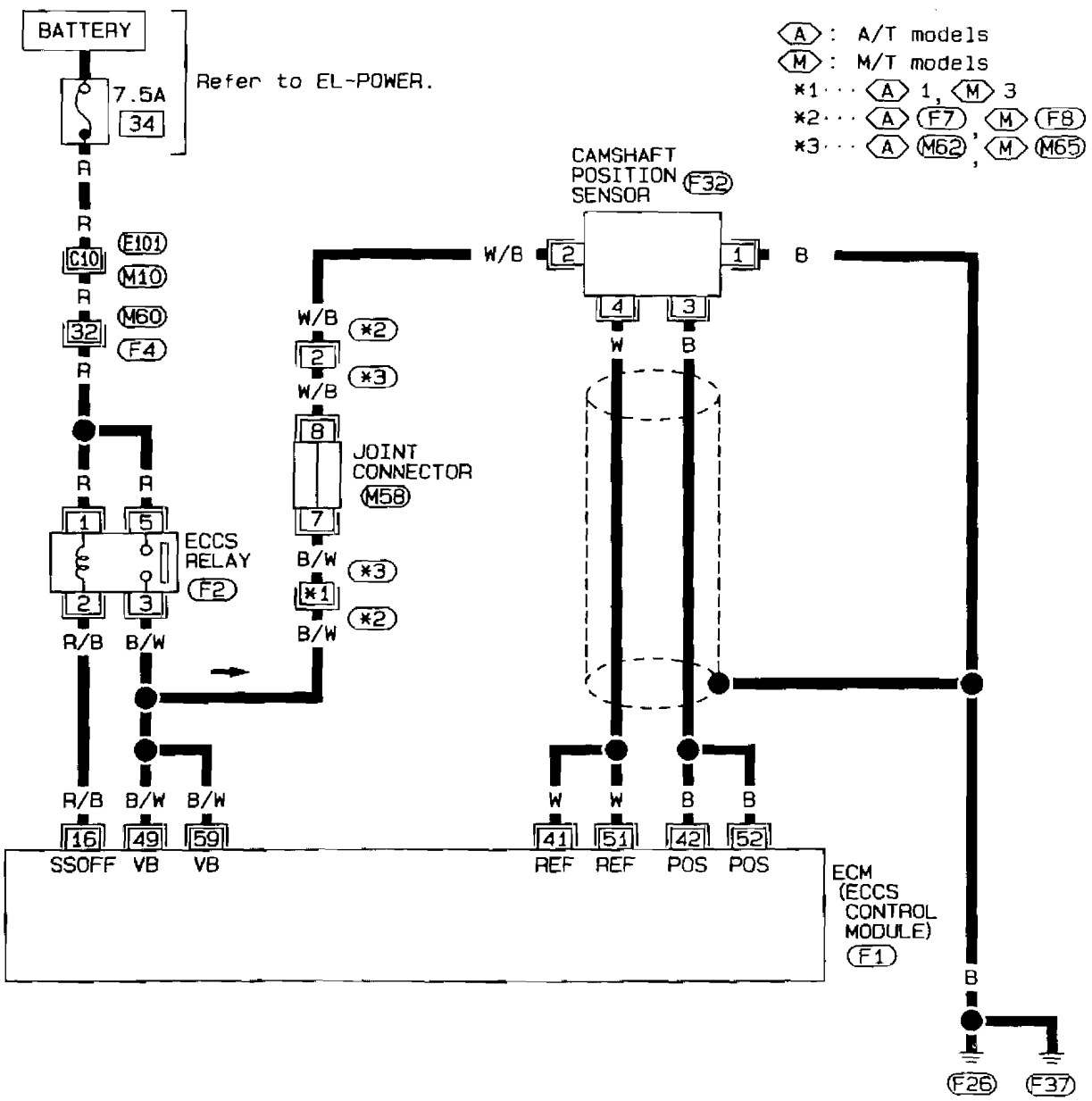
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

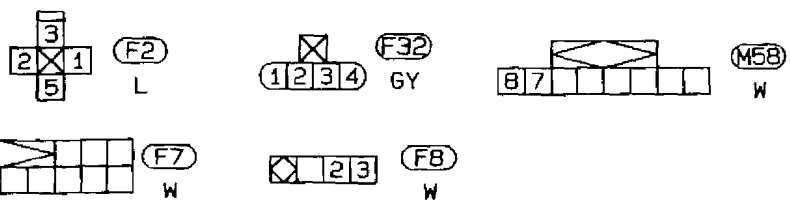
Diagnostic Procedure 23

CAMSHAFT POSITION SENSOR (Diagnostic trouble code No. 11)

LHD MODELS

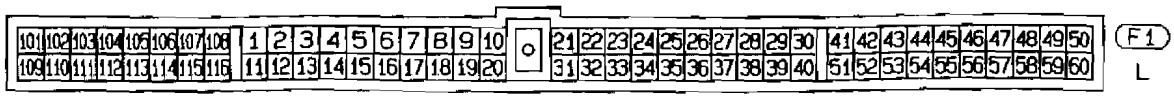
EC-CMPS-01





Refer to last page (Foldout page).

Ⓜ10, Ⓔ101, Ⓜ60, Ⓕ4

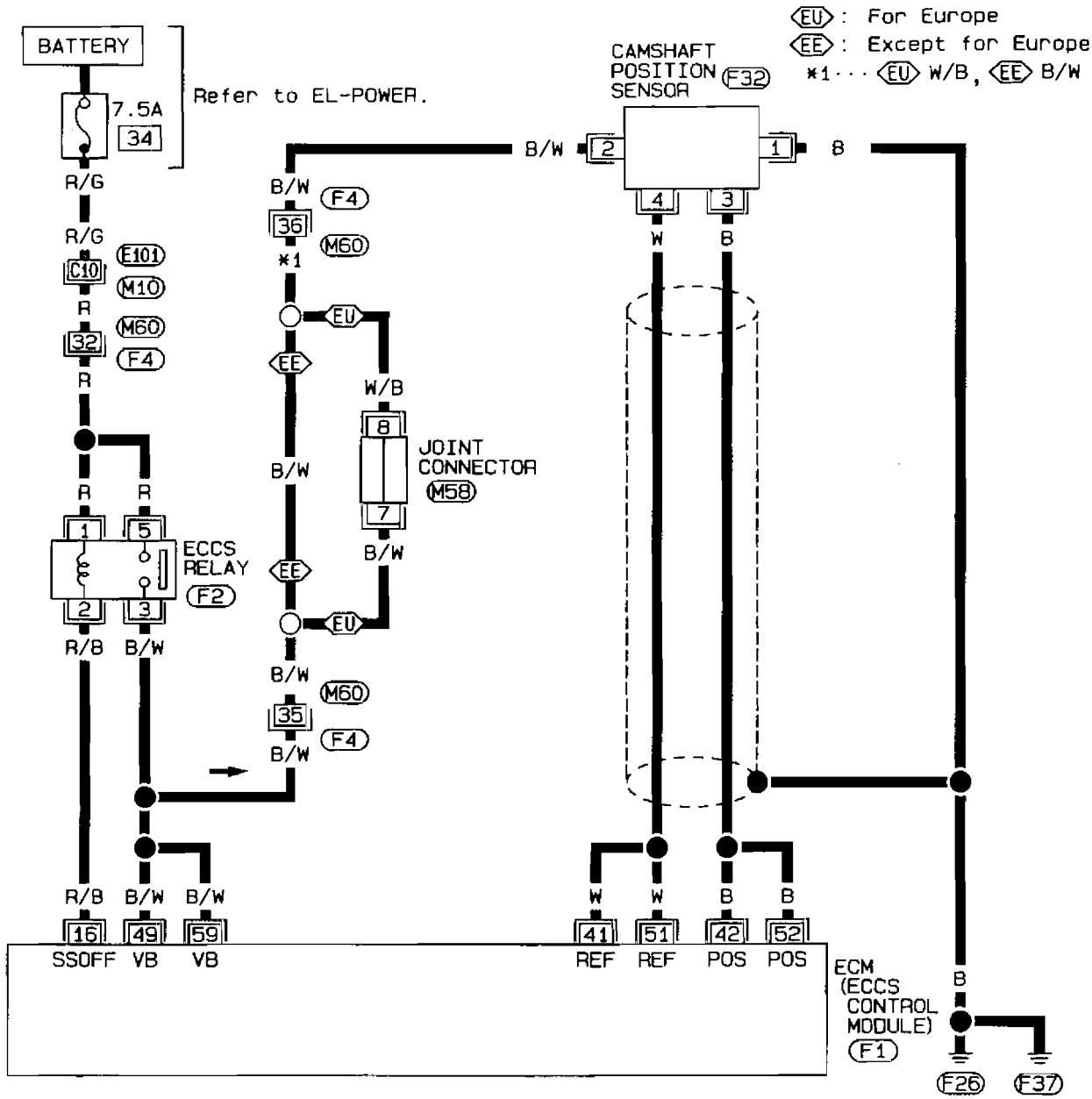


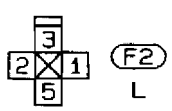
SEF825P

Diagnostic Procedure 23 (Cont'd)

RHD MODELS

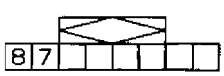
EC-CMPS-02





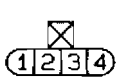
F2

L



M58

W

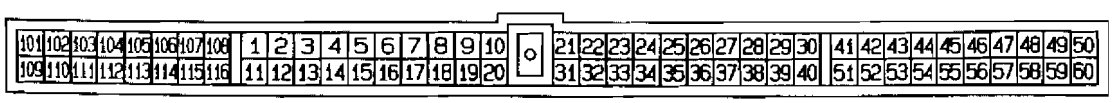


F32

GY

Refer to last page (Foldout page).

M10, E101
M60, F4



F1

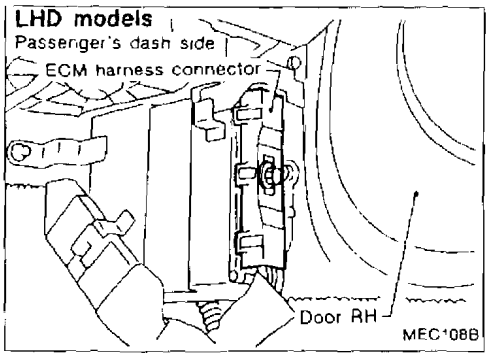
L

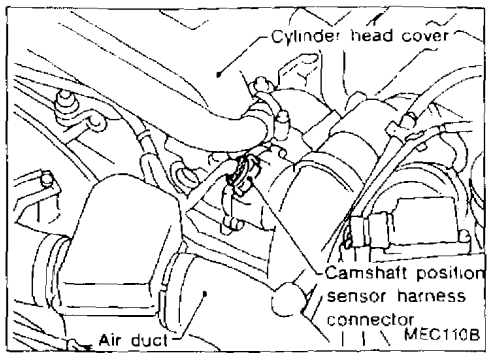
H.S.

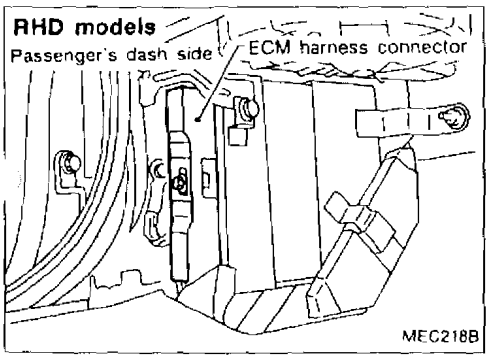
SEF853P

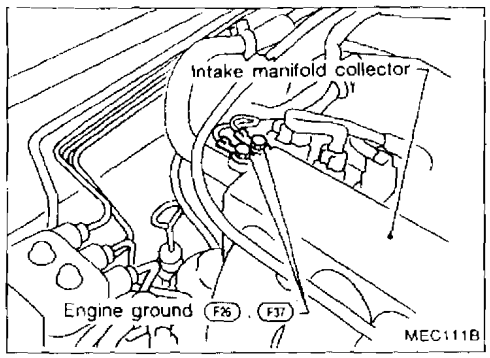
Diagnostic Procedure 23 (Cont'd)

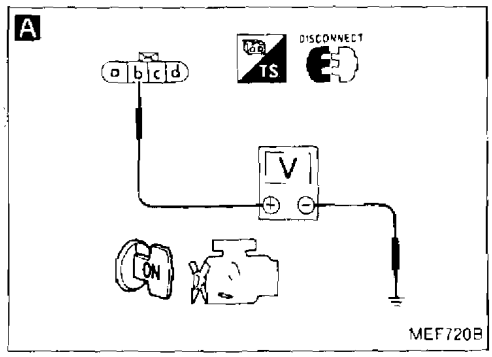
Harness layout

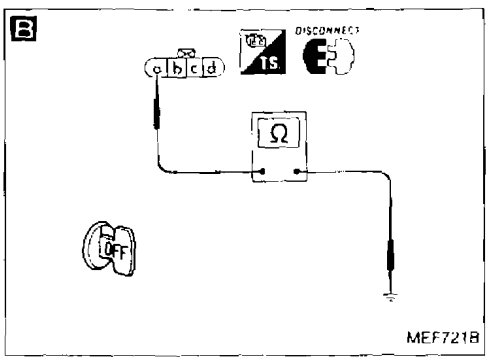












INSPECTION START

A

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

NG → Check the following.
- Harness connectors F7, M62 (LHD A/T models)
- Harness connectors F8, M65 (LHD M/T models)
- Harness connectors M60, F4 (RHD models)
- Joint connector M58 (Models for Europe)
- Harness continuity between camshaft position sensor and ECCS relay

If NG, repair harness or connectors.

OK ↓

B

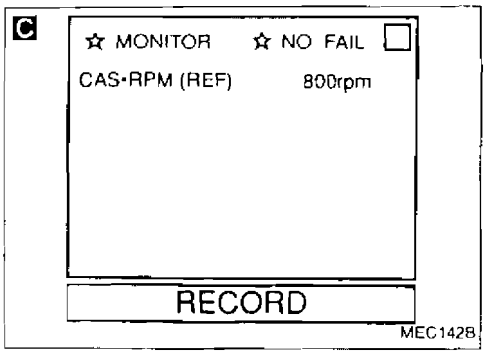
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Loosen and retighten ground screws.
3) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.

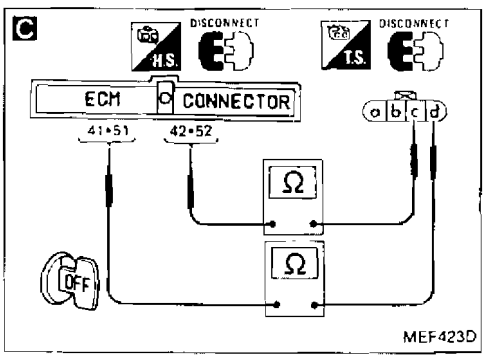
NG → Repair harness or connectors.

OK ↓

Ⓐ

Diagnostic Procedure 23 (Cont'd)





Ⓐ

C

CHECK INPUT SIGNAL CIRCUIT

1) Reconnect camshaft position sensor harness connector.
2) Start engine.
3) Read "CAS·RPM" or "CMPS·RPM" signal in "DATA MONITOR" mode with CONSULT.
800 ± 50 rpm (A/T: in "N" position)

NG → Repair harness or connectors

OR

1) Disconnect ECM harness connector.
2) Check harness continuity between terminal ⓒ and ECM terminals ㊷, ㊷ (1° signal), terminal ⓓ and ECM terminals ㊶, ㊶ (180° signal).
Continuity should exist.

OK ↓

CHECK COMPONENT
(Camshaft position sensor).
Refer to "Electrical Components Inspection". (See page EC-201.)

NG → Replace camshaft position sensor.

OK ↓

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

Trouble is not fixed. ↓

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

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

FINAL CHECK ↓

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

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

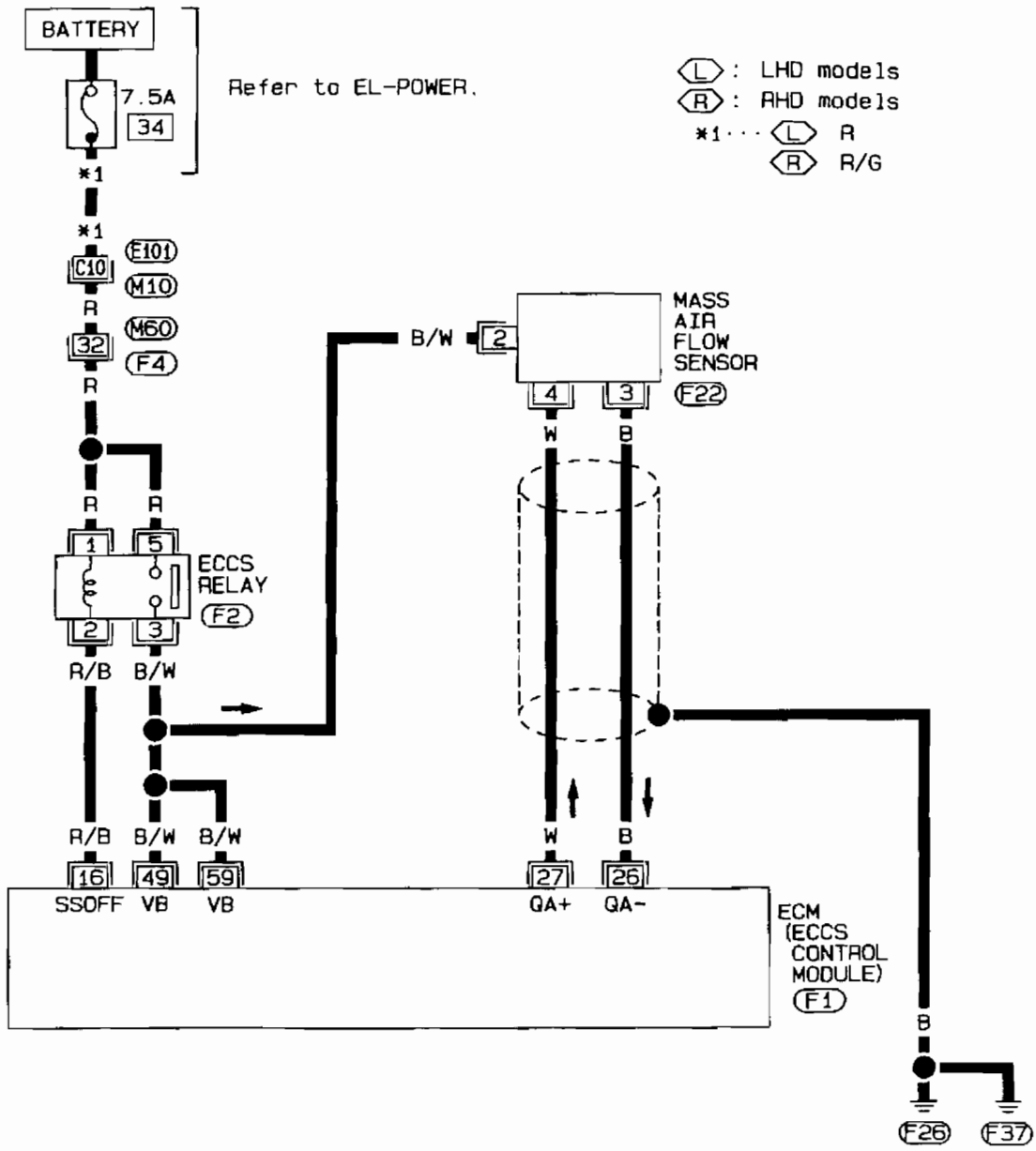
OK ↓

INSPECTION END

Diagnostic Procedure 24

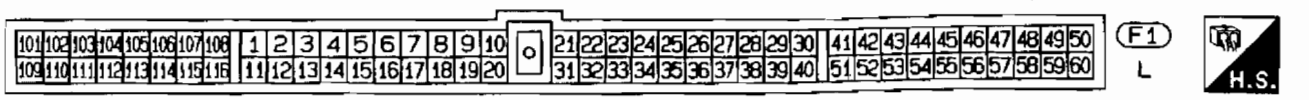
MASS AIR FLOW SENSOR (Diagnostic trouble code No. 12)

EC-MAFS-01



Refer to last page (Foldout page).

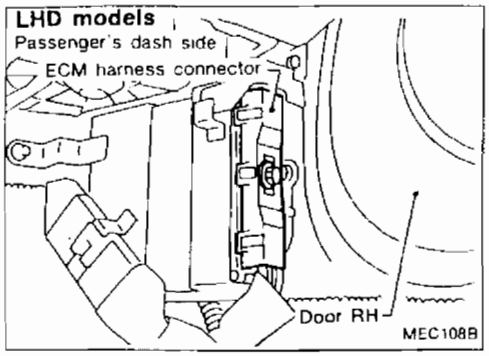
M10, E101
M60, F4

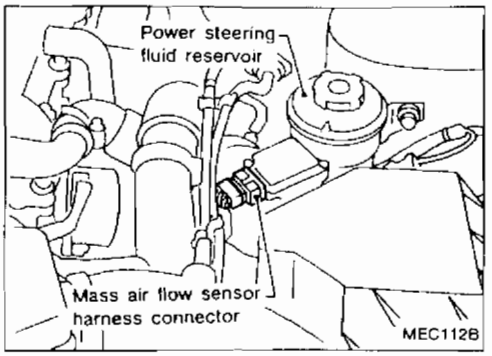


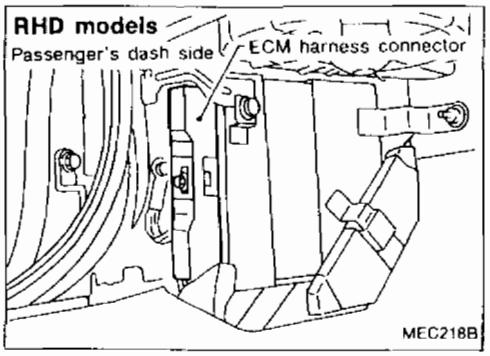
SEF826P

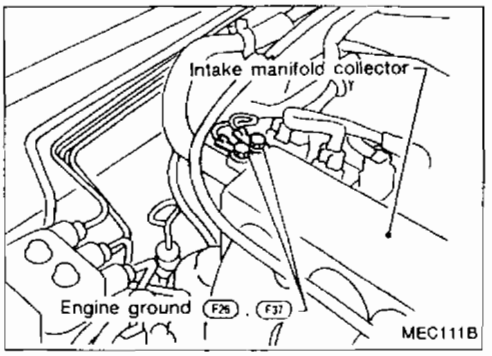
Diagnostic Procedure 24 (Cont'd)

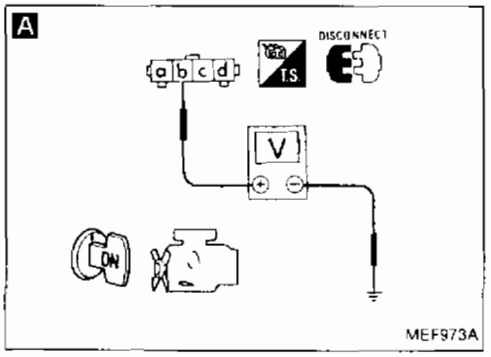
Harness layout

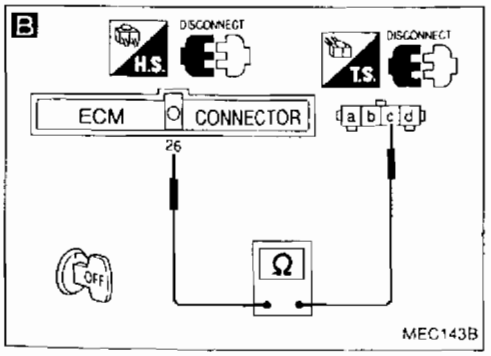












INSPECTION START

A

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

NG → Check the following.
- Harness continuity between mass air flow sensor and ECCS relay

If NG, repair harness or connectors.

OK

B

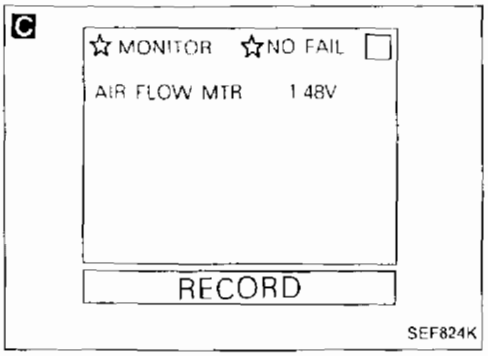
CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Loosen and retighten ground screws.
4) Check harness continuity between terminal ⓒ and ECM terminal ㉖
Continuity should exist.

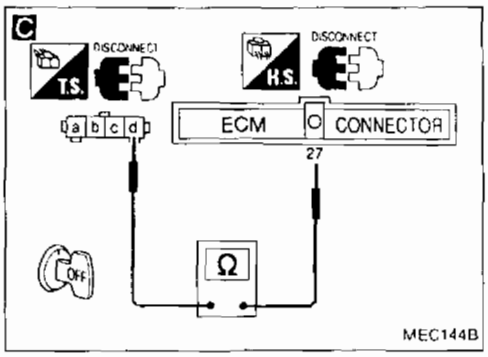
NG → Repair harness or connectors.

OK

Ⓐ

Diagnostic Procedure 24 (Cont'd)





Ⓐ

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect mass air flow sensor harness connector and ECM harness connector.
2) Start engine and warm it up sufficiently.
3) Read "AIR FLOW MTR" or "MAS AIR/FL SE" signal in "DATA MONITOR" mode with CONSULT.
   Voltage: 0.8 - 1.5V
   (At idle)

NG → Repair harness or connectors.

OR

1) Check harness continuity between terminal ⓓ and ECM terminal ㉗.
   Continuity should exist.

OK ↓

CHECK COMPONENT
(Mass air flow sensor).
Refer to "Electrical Components Inspection". (See page EC-201.)

NG → Replace mass air flow sensor.

OK ↓

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

Trouble is not fixed. ↓

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

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

FINAL CHECK ↓

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

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

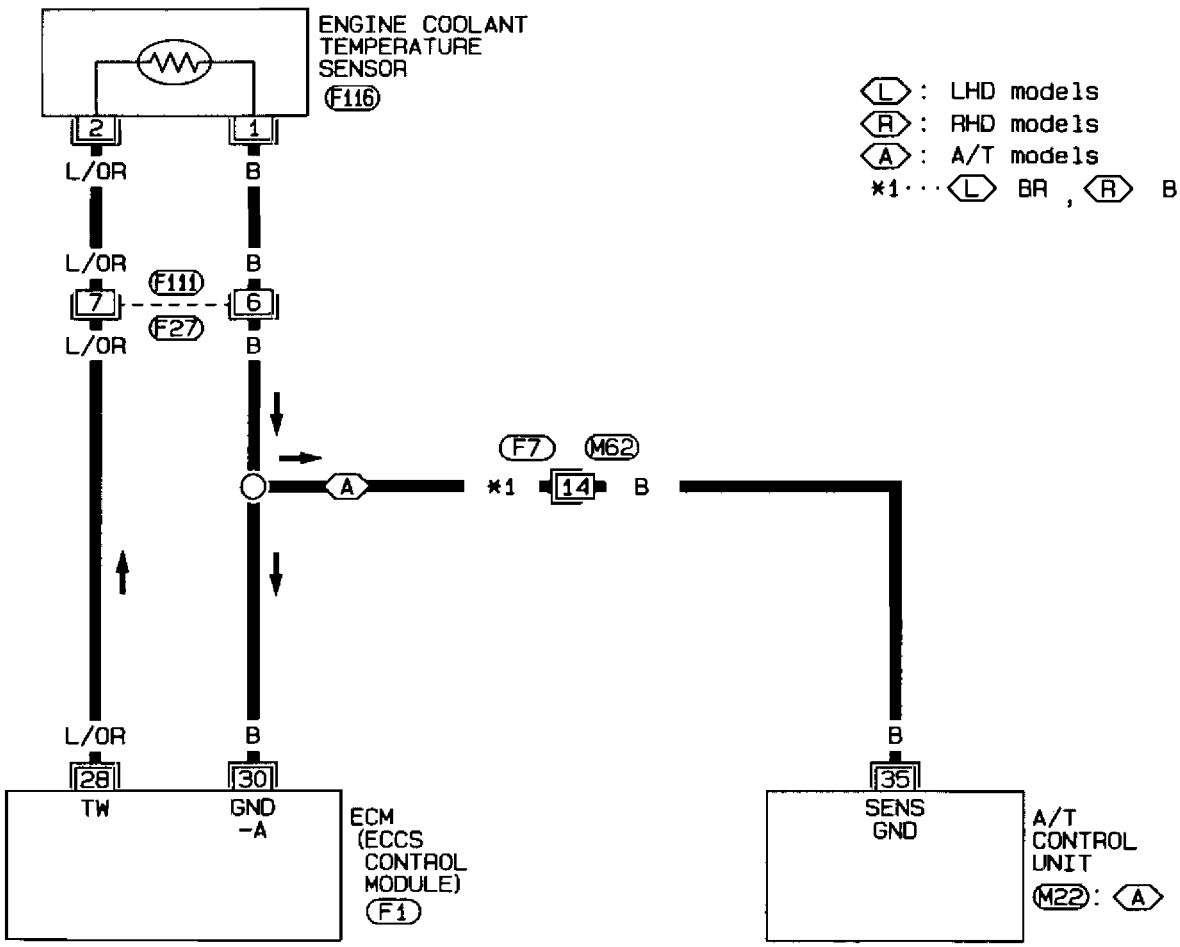
OK ↓

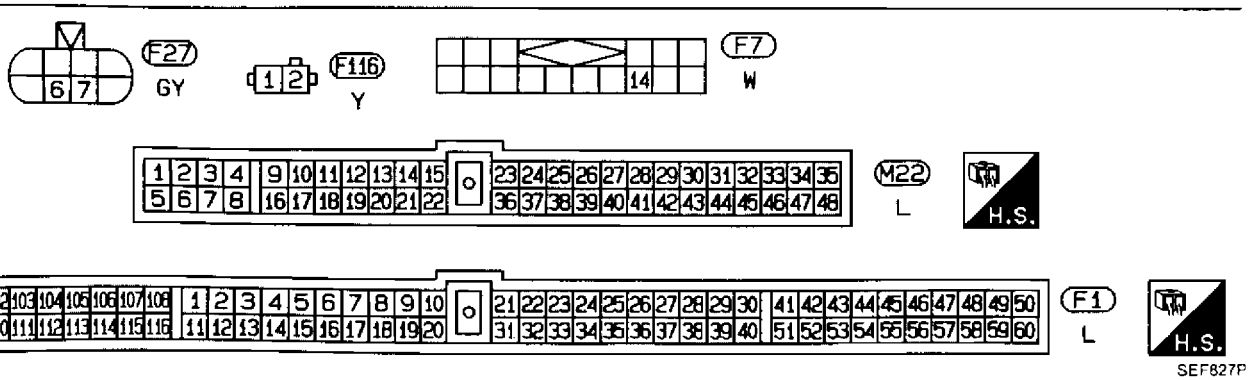
INSPECTION END

Diagnostic Procedure 25

ENGINE COOLANT TEMPERATURE SENSOR (Diagnostic trouble code No. 13)

EC-ECTS-01

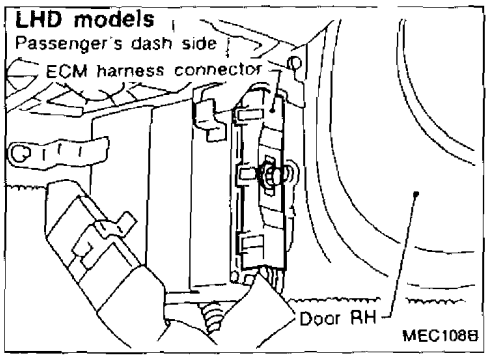


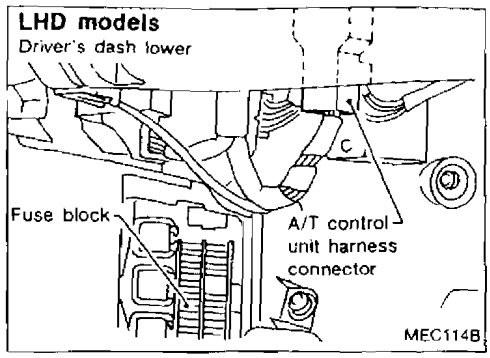


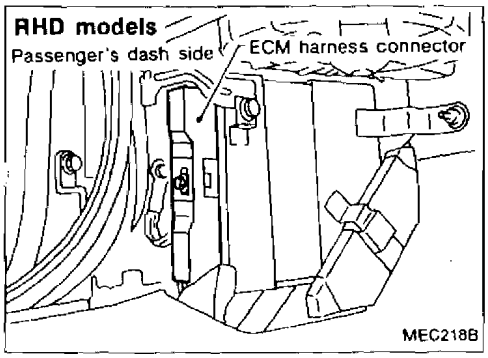
SEF827P

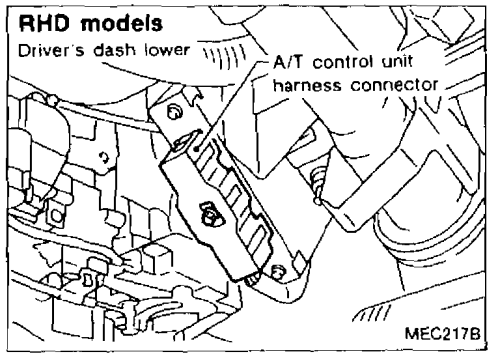
Diagnostic Procedure 25 (Cont'd)

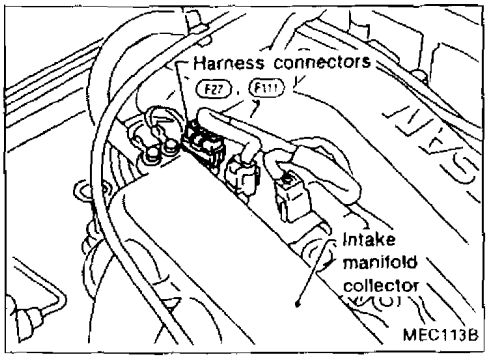
Harness layout



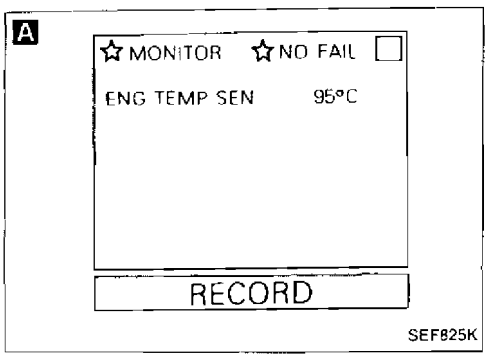


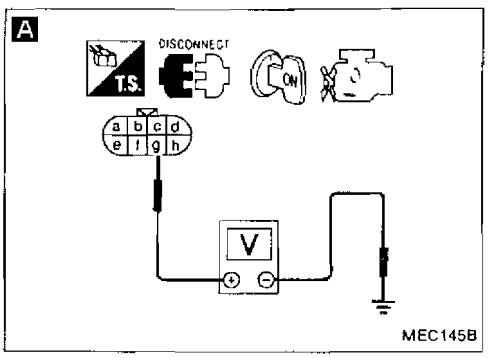


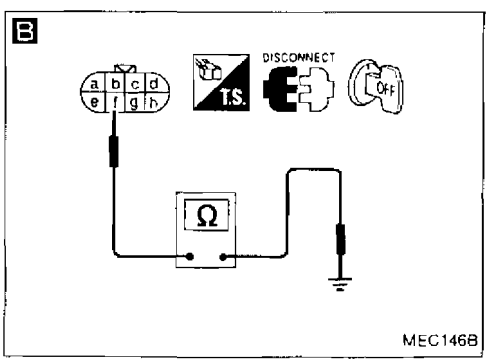




Diagnostic Procedure 25 (Cont'd)







INSPECTION START

A

CHECK POWER SUPPLY.

1) Start engine and warm it up sufficiently.
2) Select "ENG TEMP SEN" or "COOLAN TEMP/S" signal in "DATA MONITOR" mode with CONSULT.
3) Stop engine.
4) When restarting engine make sure that CONSULT indicates "ENG TEMP SEN" or "COOLAN TEMP/S" is 50°C (122°F) or more.

NG → Check the following.
- Harness continuity between ECM and harness control (F27)

If NG, repair harness or connectors.

OR

1) Disconnect harness connectors (F27), (F111).
2) Turn ignition switch "ON".
3) Check voltage between terminal (g) and ground.

Voltage: Approximately 5V

OK

B

CHECK GROUND CIRCUIT.
1) Turn ignition switch "OFF".
2) Check harness continuity between terminal (f) and engine ground.

Continuity should exist.

NG → Check the following.
- Harness connectors (F7), (M62) (A/T models)
- Harness continuity between ECM and harness connector (F27)
- Harness continuity between A/T control unit and harness connector (F27)

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "Electrical Components Inspection". (See page EC-201.)

NG → Replace engine coolant temperature sensor.

OK

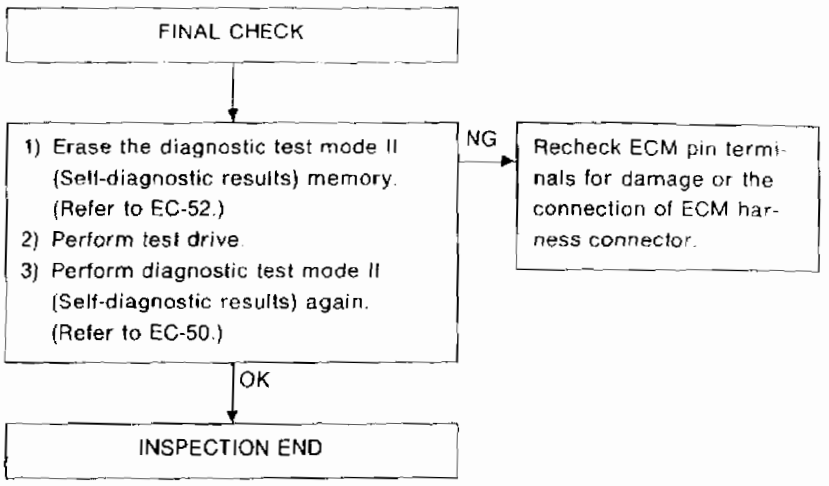
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

Diagnostic Procedure 25 (Cont'd)

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

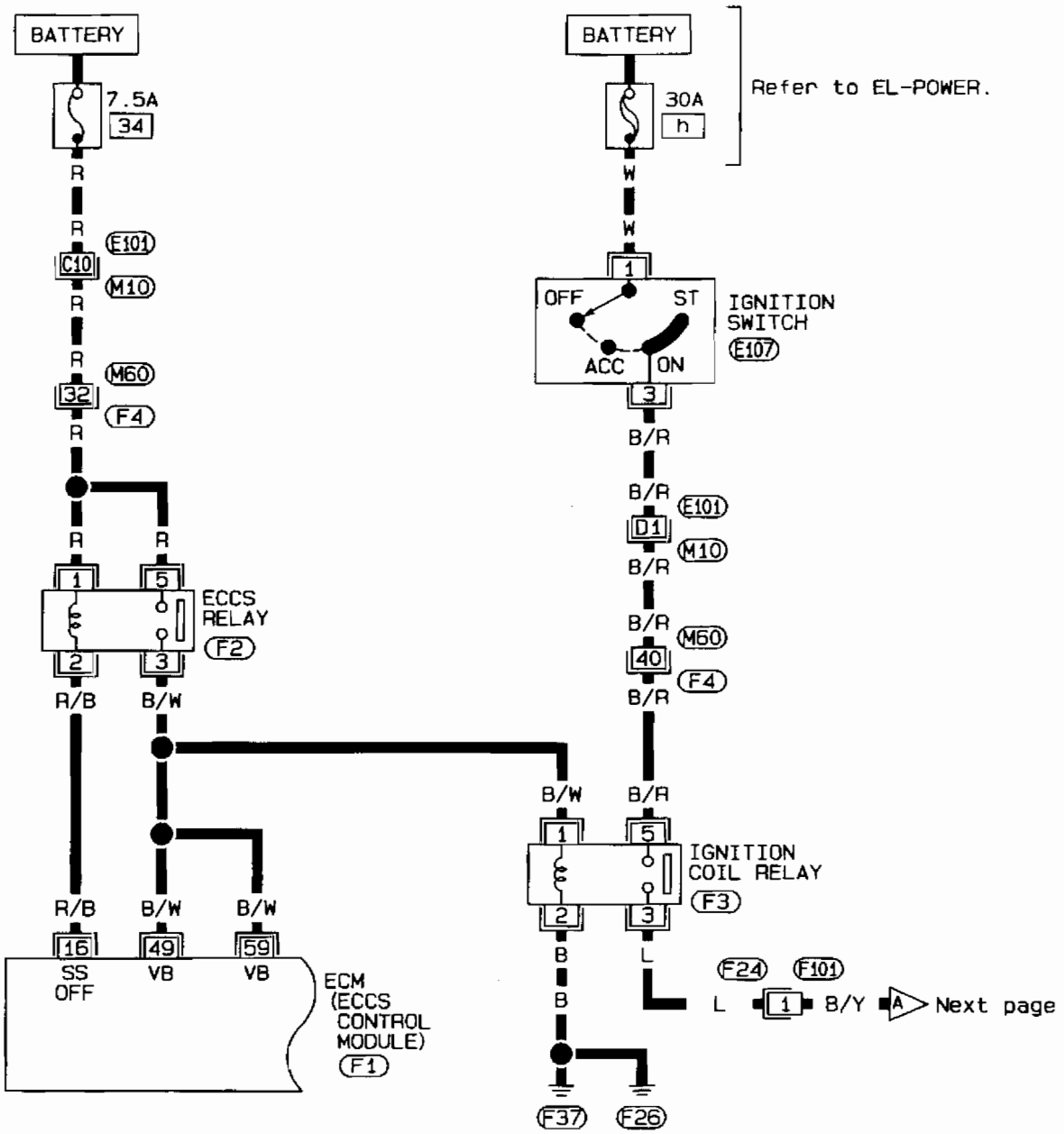


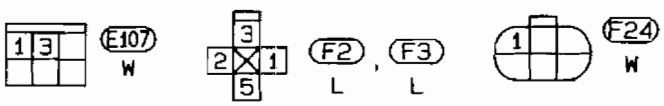
Diagnostic Procedure 26

IGNITION SIGNAL (Diagnostic trouble code No. 21)

LHD MODELS

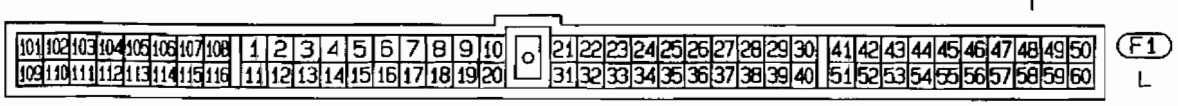
EC-IGN/SG-01





Refer to last page (Foldout page).

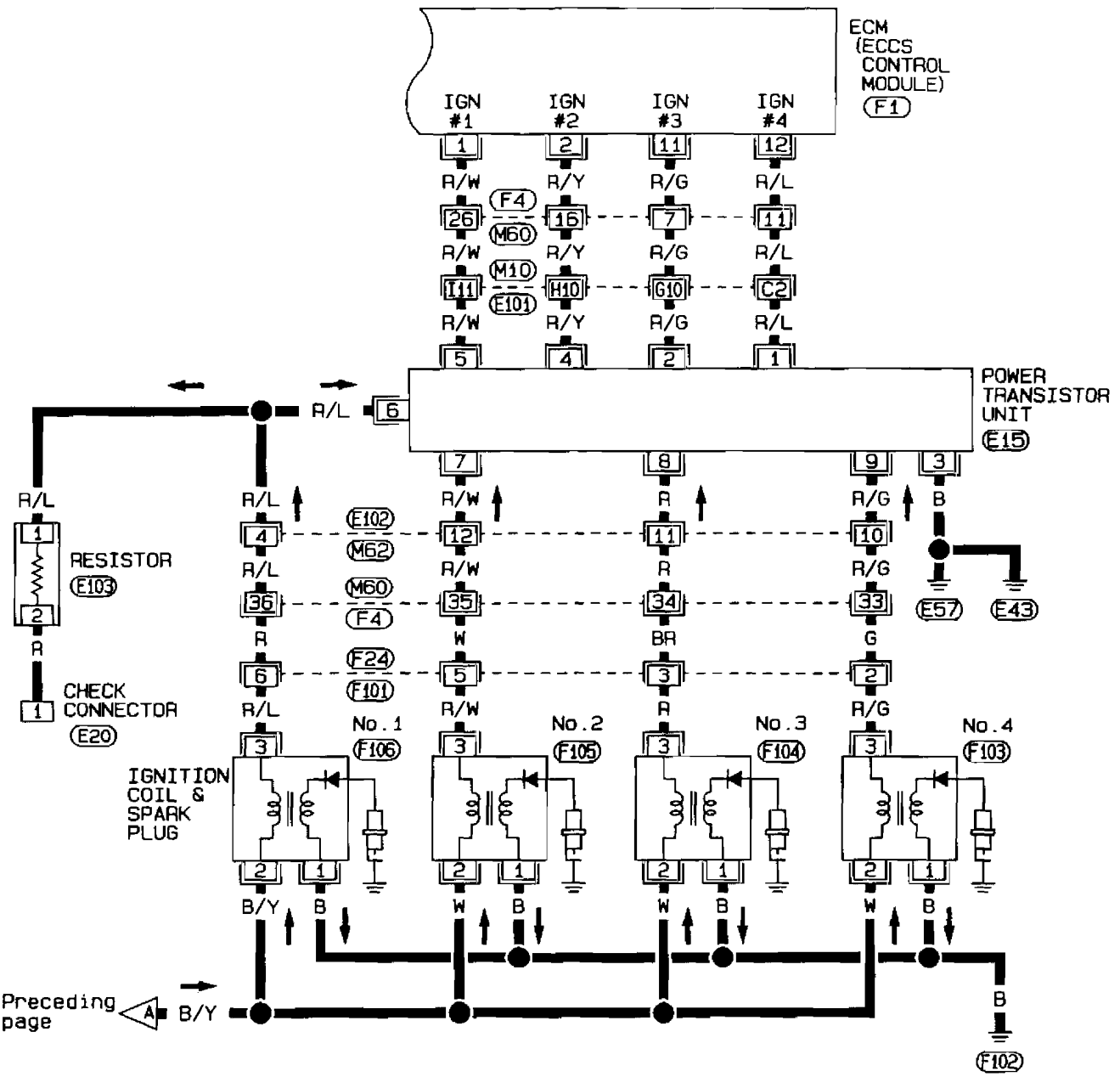
M10, E101, M60, F4

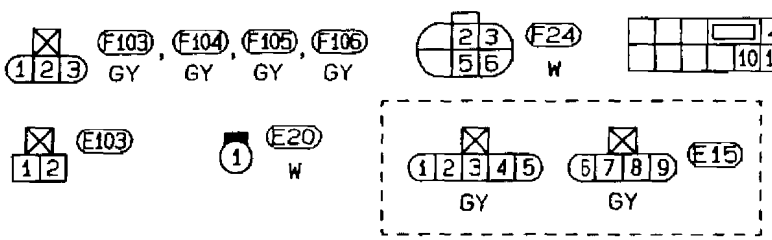


SEF826P

Diagnostic Procedure 26 (Cont'd)

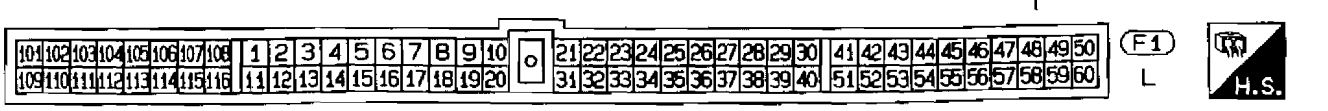
EC-IGN/SG-02





Refer to last page
(Foldout page).

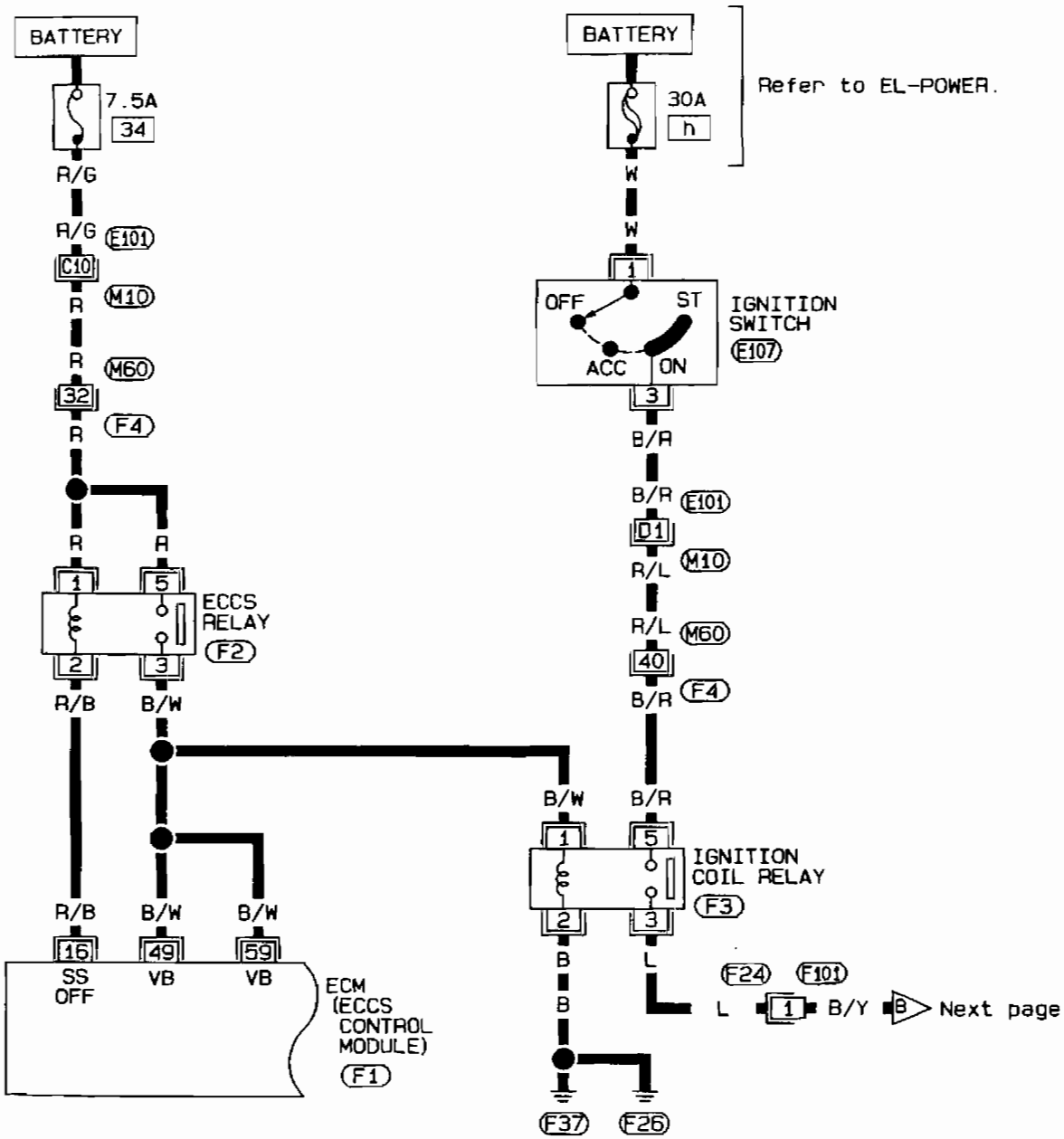
M10, E101
M60, F4

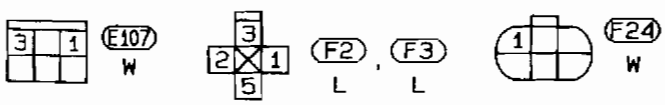


SEF829P

RHD MODELS

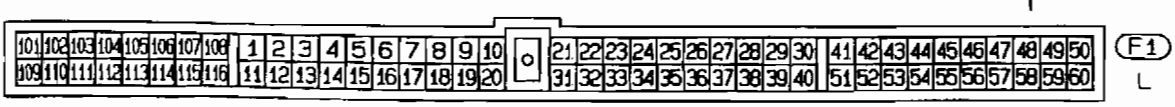
EC-IGN/SG-03





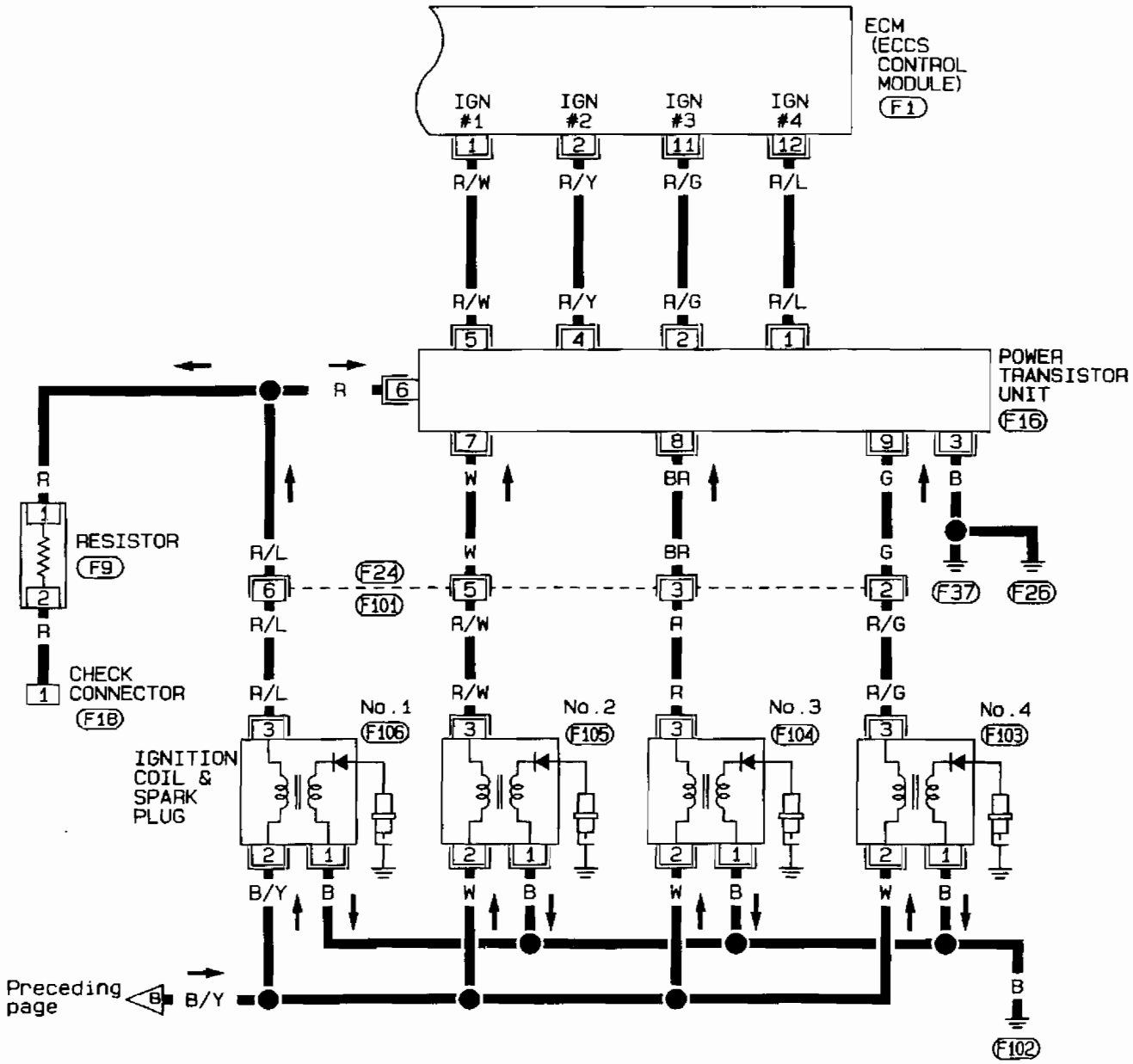
Refer to last page (Foldout page).

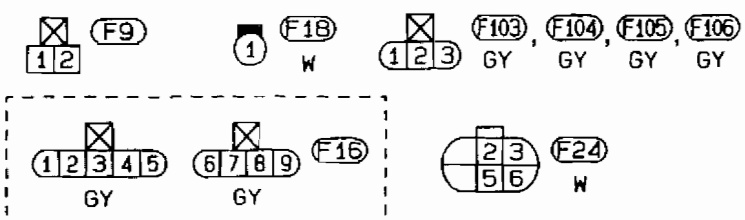
M10, E101
M60, F4

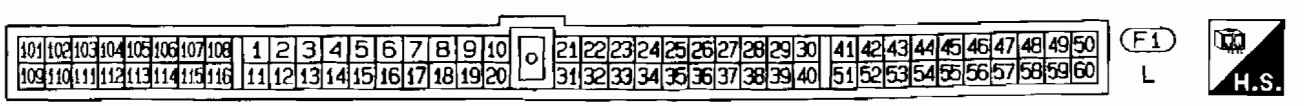


SEP830P

EC-IGN/SG-04



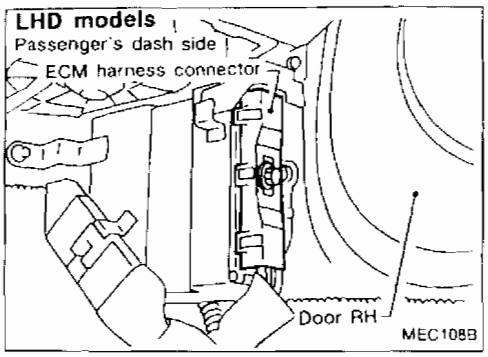


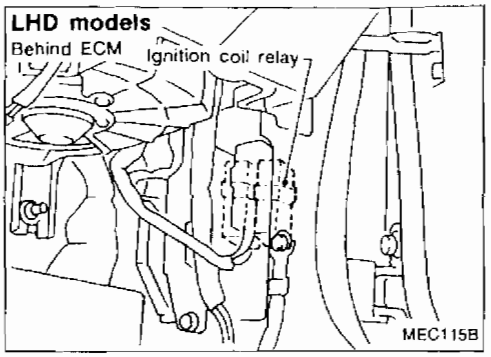


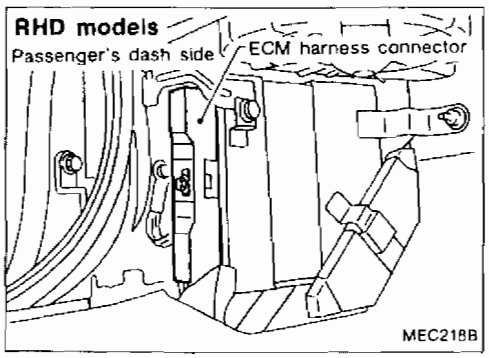
SEF831P

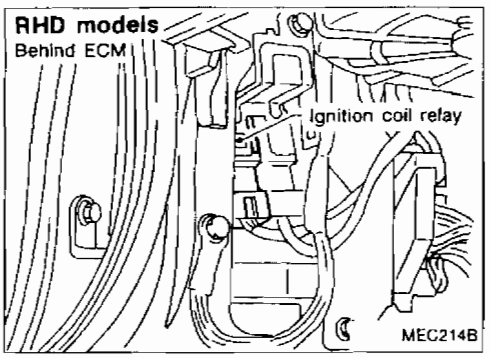
Diagnostic Procedure 26 (Cont'd)

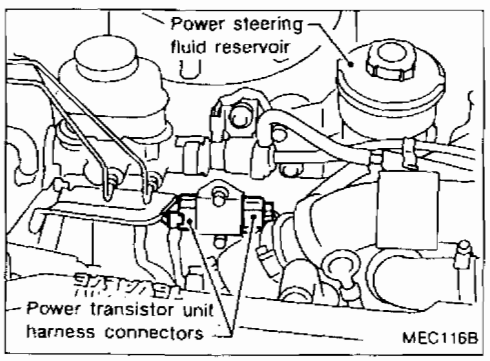
Harness layout

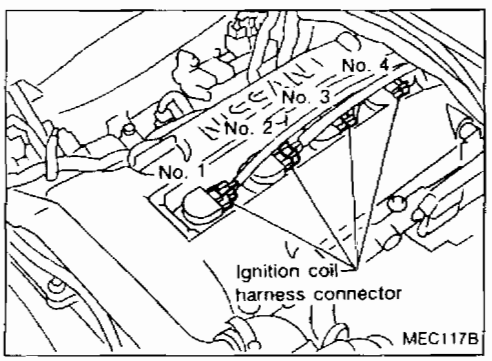




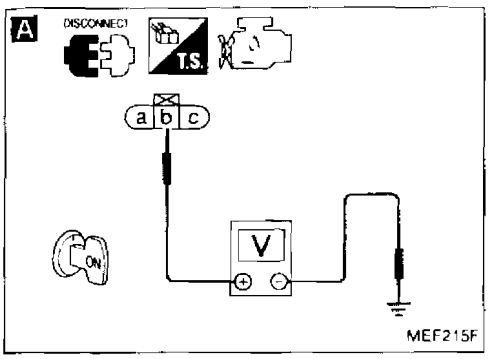


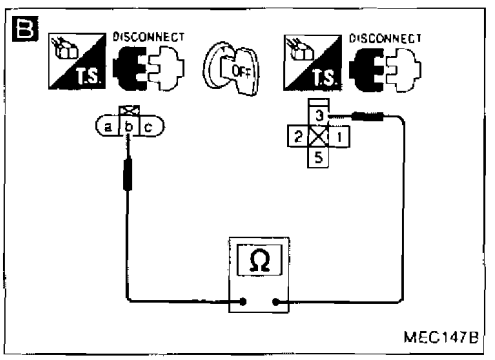


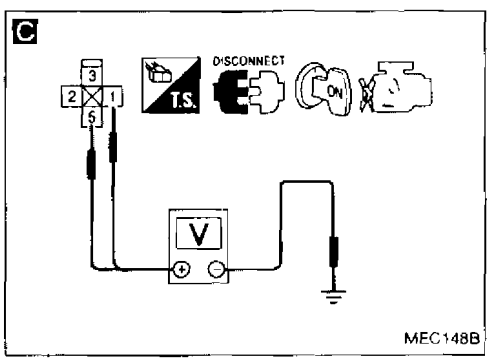


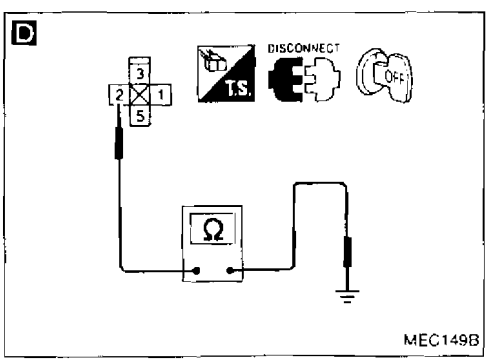


Diagnostic Procedure 26 (Cont'd)









INSPECTION START

A

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

OK → Go to "CHECK GROUND CIRCUIT-II" on next page.

NG

B

CHECK POWER SUPPLY-II.
1) Turn ignition switch "OFF".
2) Disconnect ignition coil relay.
3) Check harness continuity between terminal ⓑ and terminal ③.
Continuity should exist.

NG → Check the following
- Harness connectors (F24), (F101)
- Harness continuity between ignition coil and ignition coil relay

If NG, repair harness or connectors.

OK

C

CHECK POWER SUPPLY-III.
1) Turn ignition switch "ON".
2) Check voltage between terminals ①, ⑤ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4)
- Harness continuity between ignition coil relay and ignition switch
- Harness continuity between ignition coil relay and ECCS relay

If NG, repair harness or connectors.

OK

D

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

NG → Repair harness or connectors.

OK

CHECK COMPONENT (Ignition coil relay).
Refer to "Electrical Components Inspection". (See page EC-206.)

NG → Replace ignition coil relay.

OK

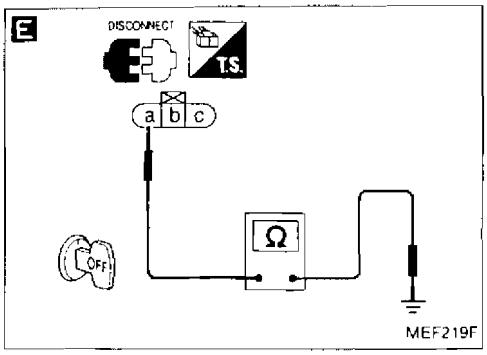
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

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

Diagnostic Procedure 26 (Cont'd)

E



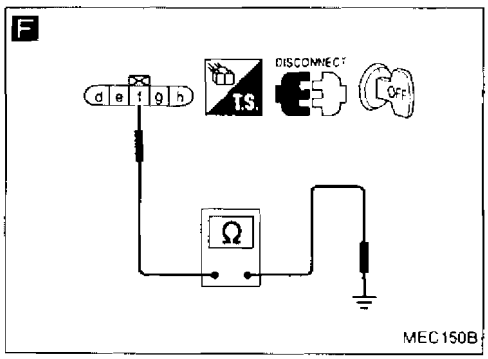
MEF219F

CHECK GROUND CIRCUIT-II.
1) Turn ignition switch "OFF".
E 2) Check harness continuity between terminal ⓐ and engine ground.
Continuity should exist.
3) Disconnect power transistor unit harness connector.
F 4) Check harness continuity between terminal ⓕ and engine ground.
Continuity should exist.

NG → Repair harness or connectors

OK ↓

F



MEC150B

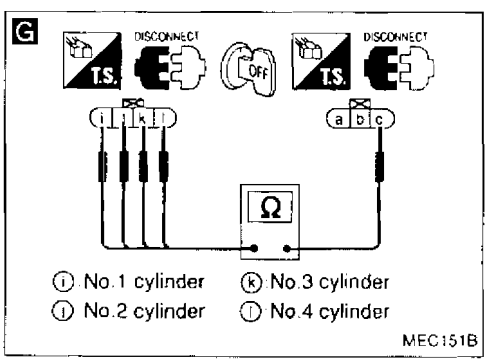
CHECK OUTPUT SIGNAL CIRCUIT.
G 1) Check harness continuity between terminals ⓘ, ⓙ, ⓚ, ⓛ and terminal ⓒ.
Continuity should exist.
2) Disconnect ECM harness connector.
H 3) Check harness continuity between following terminals.
① - ⓗ ⑪ - ⓔ
② - ⓖ ⑫ - ⓓ
Continuity should exist.

NG → Check the following.
- Harness connectors (F24), (F101)
- Harness connectors (M60), (F4) (LHD models)
- Harness connectors (E102), (M62) (LHD models)
- Harness connectors (M10), (E101) (LHD models)
- Harness continuity between ignition coil and power transistor unit
- Harness continuity between ECM and power transistor unit

If NG, repair harness or connectors.

OK ↓

G



ⓘ No.1 cylinder ⓚ No.3 cylinder
ⓙ No.2 cylinder ⓛ No.4 cylinder

MEC151B

CHECK COMPONENTS
(Ignition coil and power transistor unit)
Refer to "Electrical Components Inspection". (See pages EC-202.)

NG → Replace malfunctioning component(s).

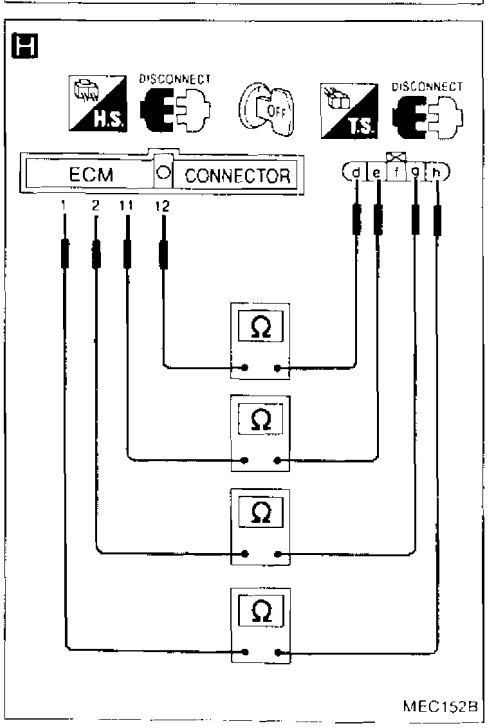
OK ↓

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

Trouble is not fixed. ↓

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

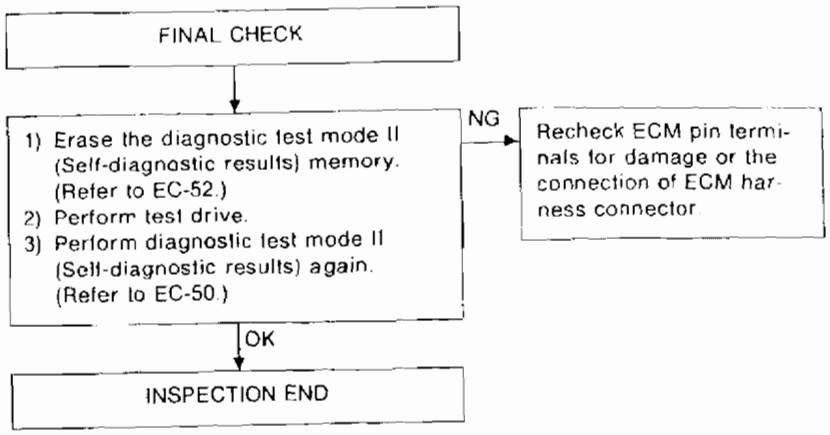
H



MEC152B

Diagnostic Procedure 26 (Cont'd)

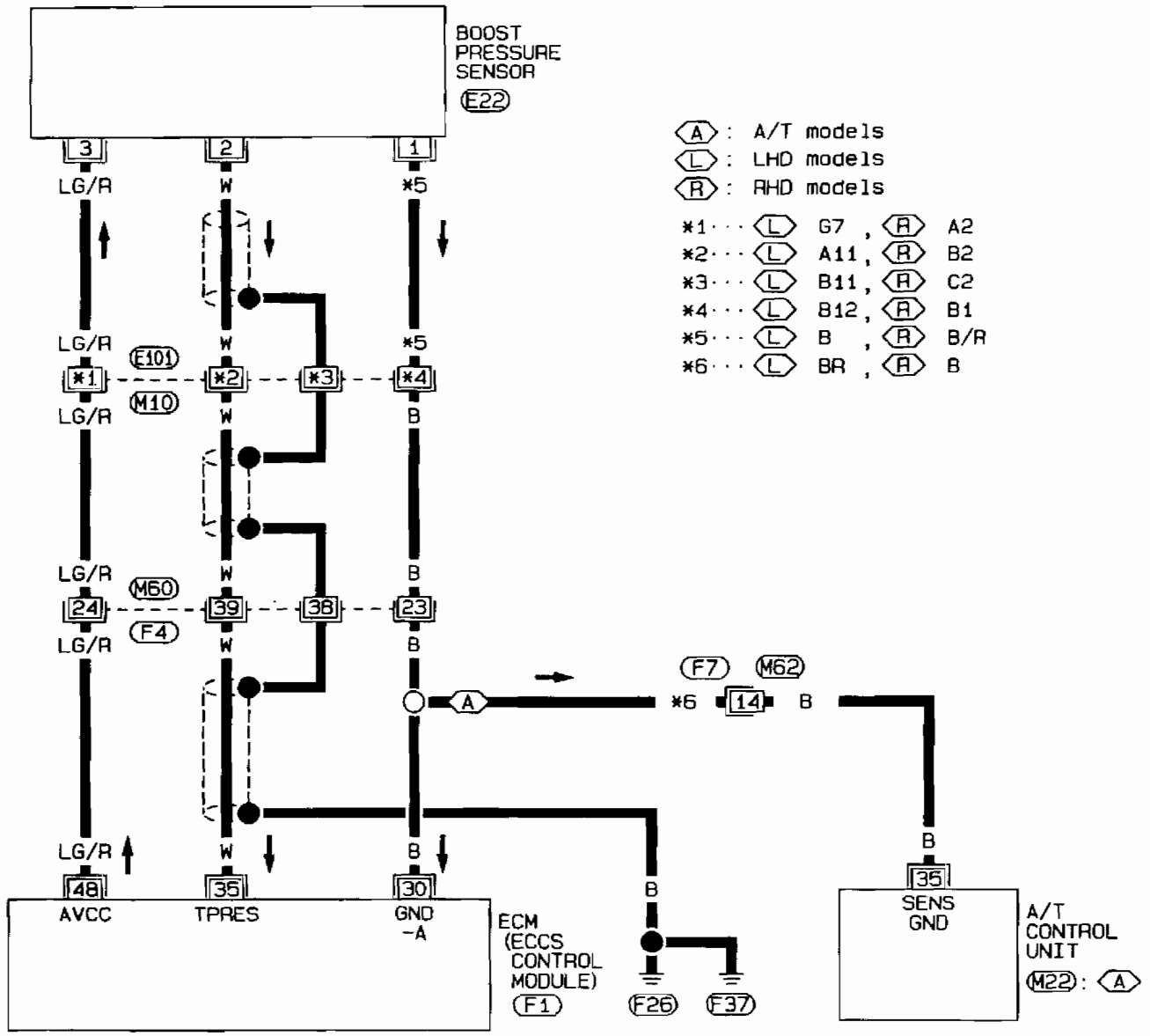
Perform FINAL CHECK by the following procedure after repair is completed.

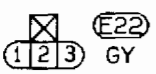


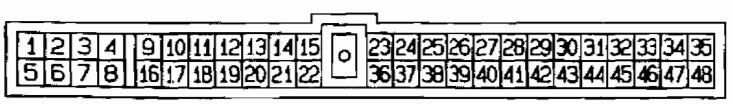
Diagnostic Procedure 27

BOOST PRESSURE SENSOR (Diagnostic trouble code No. 26)

EC-BOOST-01

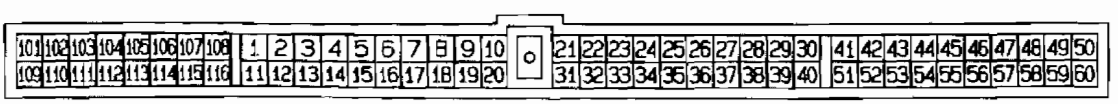






M22
L

Refer to last page (Foldout page).
M10, E101
M60, F4

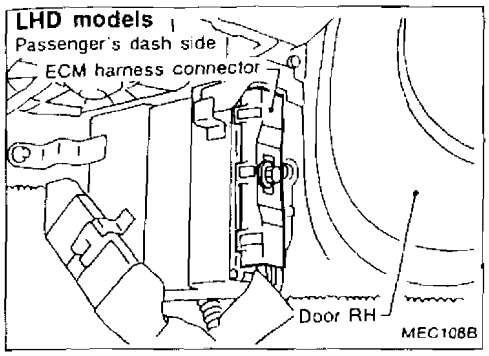


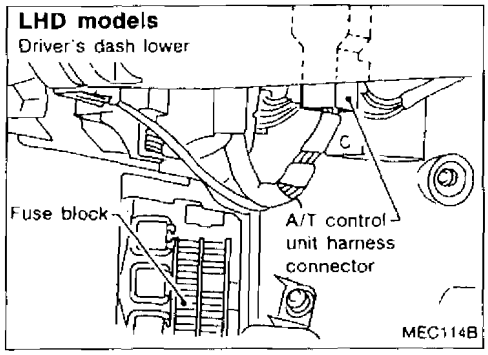
F1
L

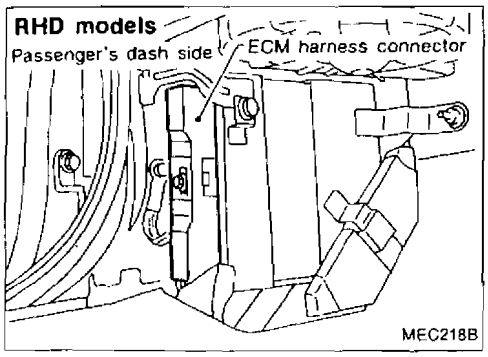
SEF838P

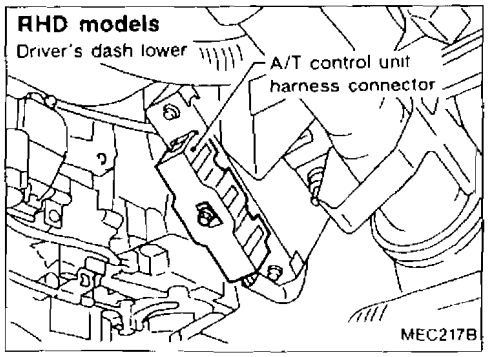
Diagnostic Procedure 27 (Cont'd)

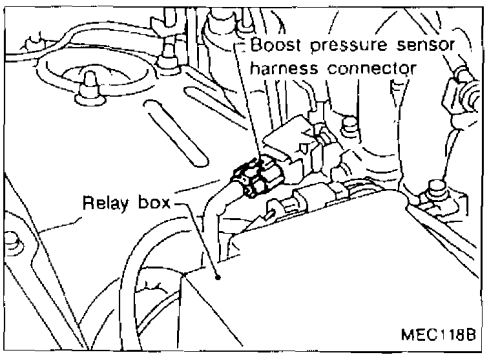
Harness layout

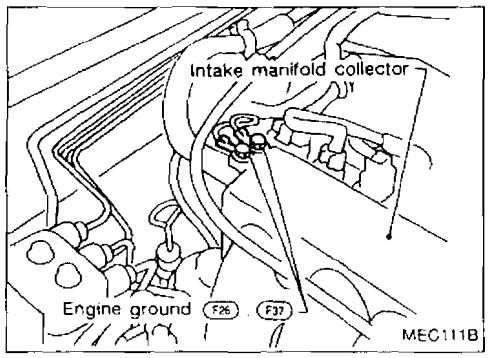




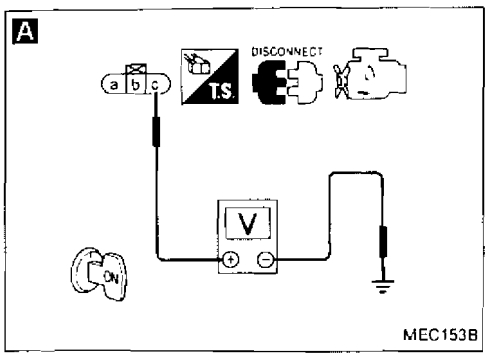


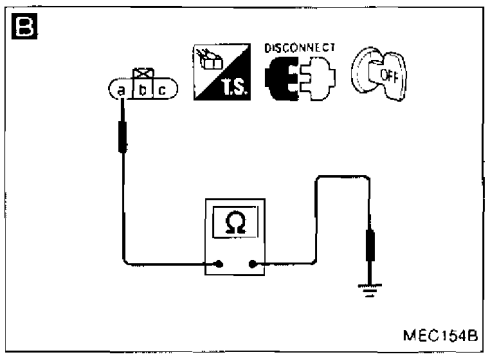


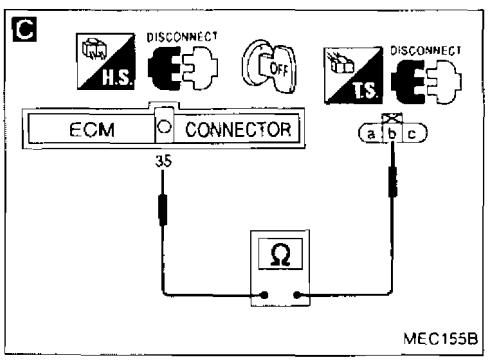




Diagnostic Procedure 27 (Cont'd)







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 → Check the following.
- Harness connectors (F4), (M60)
- Harness connectors (M10), (E101)
- Harness continuity between ECM and boost pressure sensor

If 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 → Check the following.
- Harness connectors (F4), (M60)
- Harness connectors (M10), (E101)
- Harness connectors (F7), (M62) (A/T models)
- Harness continuity between ECM and boost pressure sensor
- Harness continuity between A/T control unit and boost pressure sensor

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ㉟ and terminal ⓑ.
Continuity should exist.

NG → Check the following.
- Harness connectors (F4), (M60)
- Harness connectors (M10), (E101)
- Harness continuity between ECM and boost pressure sensor

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Boost pressure sensor).
Refer to "Electrical Components Inspection" (See page EC-206.)

NG → Replace boost pressure sensor.

OK ↓

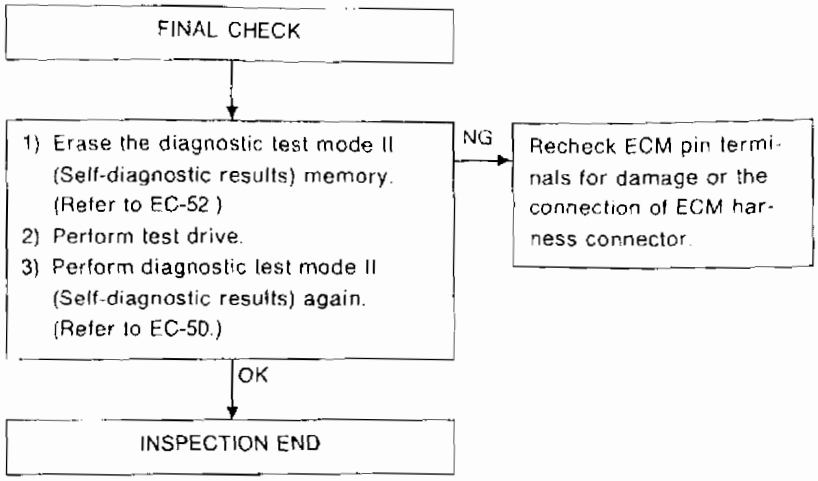
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is fixed. ↓

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

Diagnostic Procedure 27 (Cont'd)

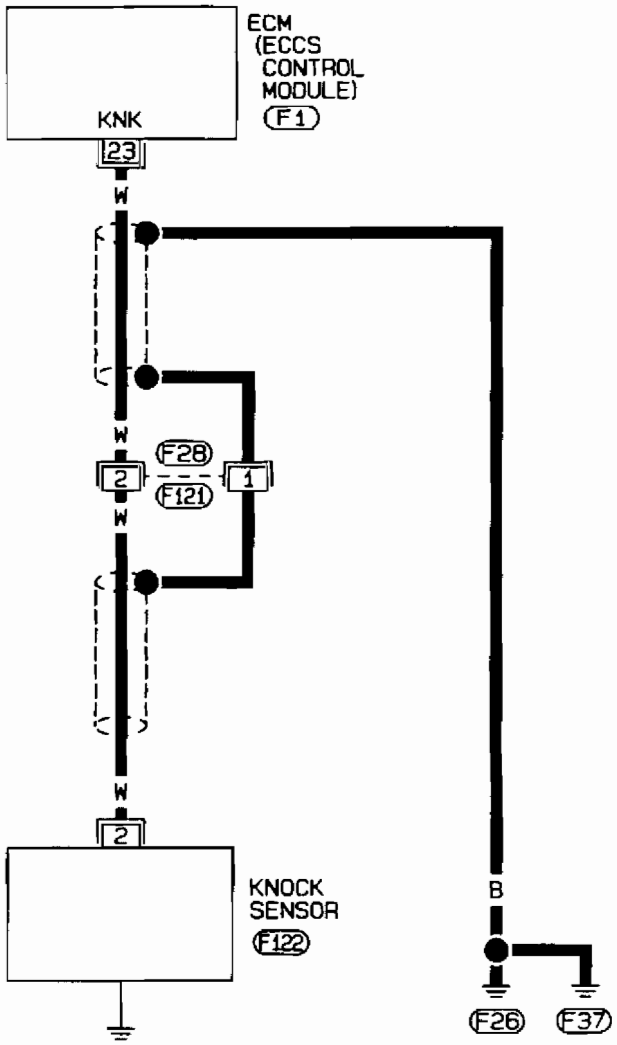
Perform FINAL CHECK by the following procedure after repair is completed.



Diagnostic Procedure 28

KNOCK SENSOR (Diagnostic trouble code No. 34)

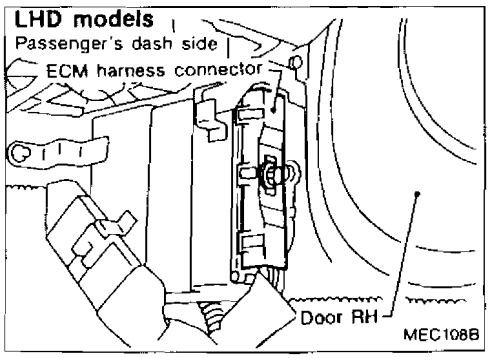
EC-KS-01

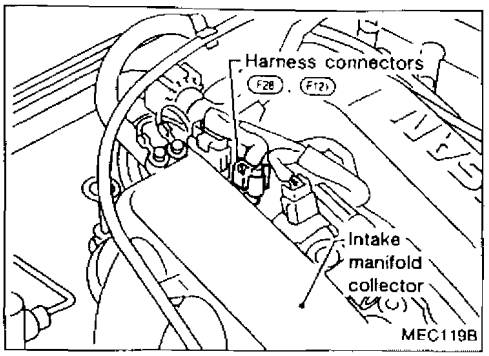


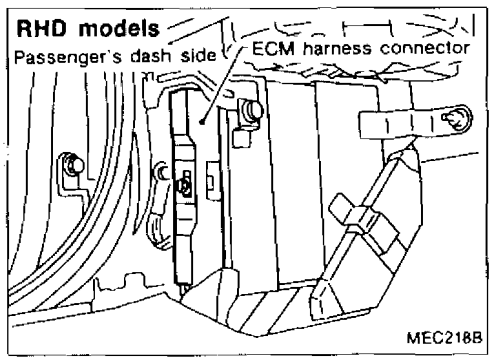
SEF836P

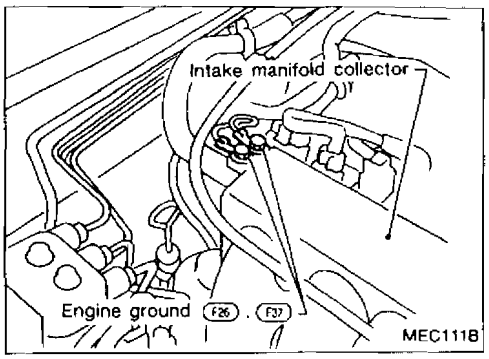
Diagnostic Procedure 28 (Cont'd)

Harness layout

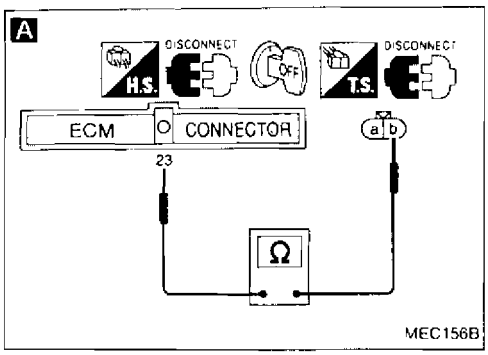








Diagnostic Procedure 28 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector and harness connectors (F28), (F121).
2) Check harness continuity between terminal (b) and ECM terminal (23).
Continuity should exist.

NG → Repair harness or connectors.

OK

Loosen and retighten ground screws.

CHECK COMPONENT
(Knock sensor).
Refer to "Electrical Components Inspection" (See page EC-205.)

NG → Replace knock sensor.

OK

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

Trouble is fixed

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

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

FINAL CHECK

1) Erase the diagnostic test mode II (Self-diagnostic results) memory. (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

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

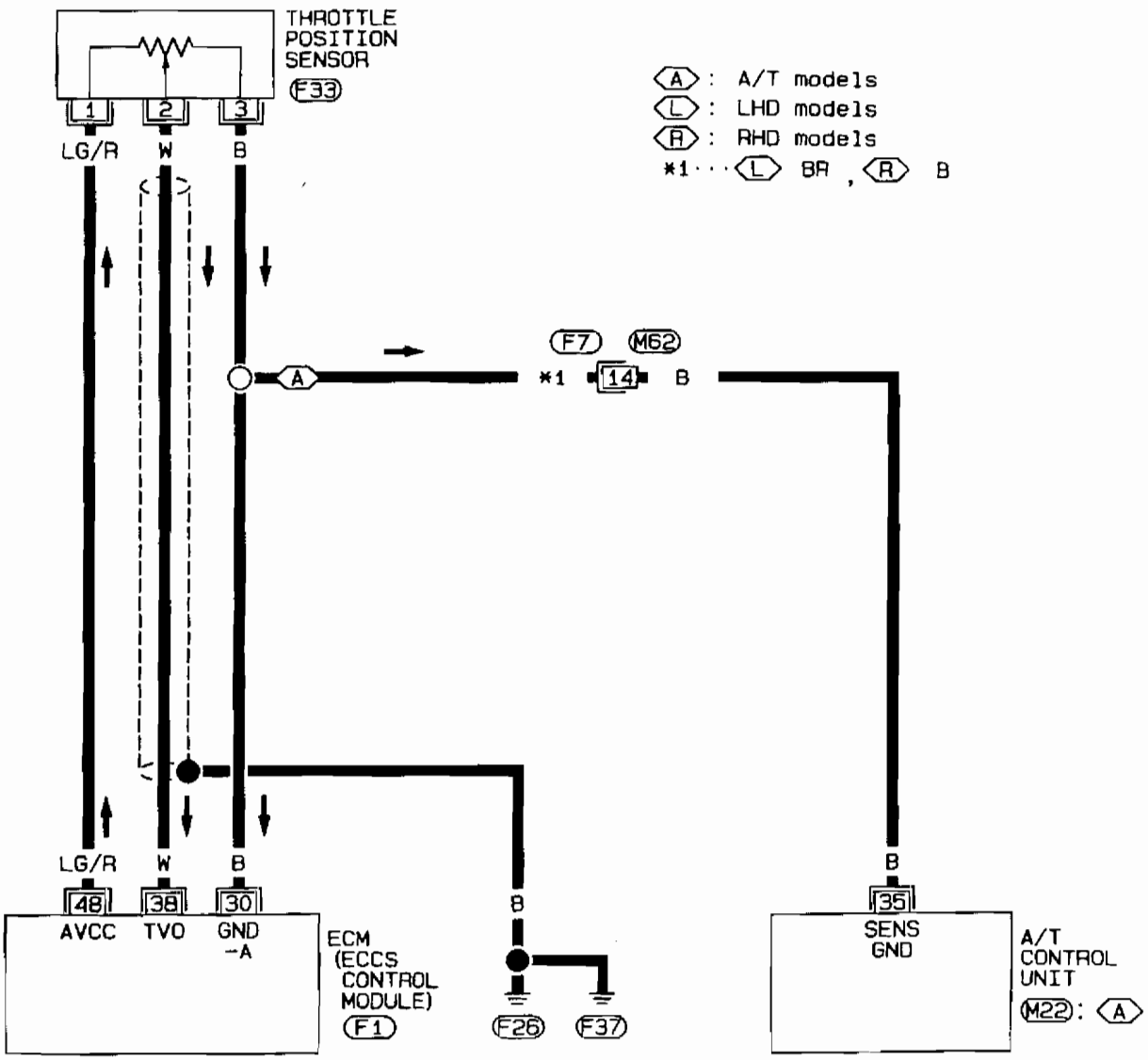
OK

INSPECTION END

Diagnostic Procedure 29

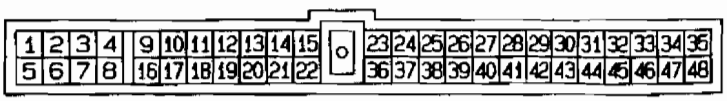
THROTTLE POSITION SENSOR (Diagnostic trouble code No. 43)

EC-TPS-01

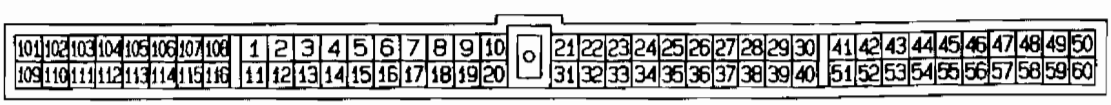


F7
W

F33
BR



M22
L

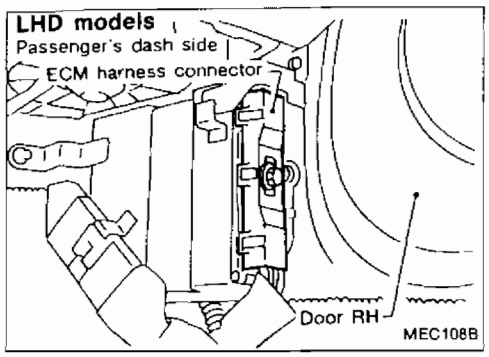


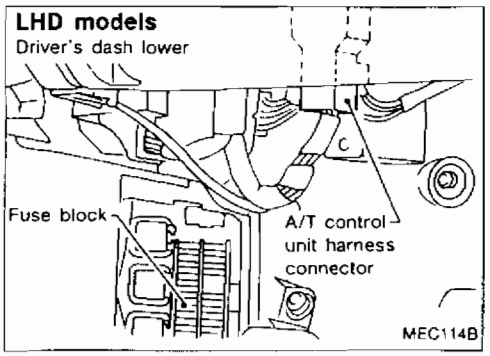
F1
L

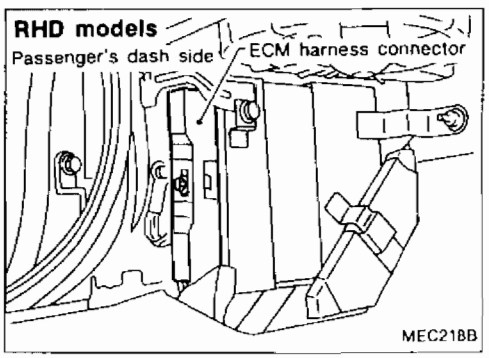
SEF835P

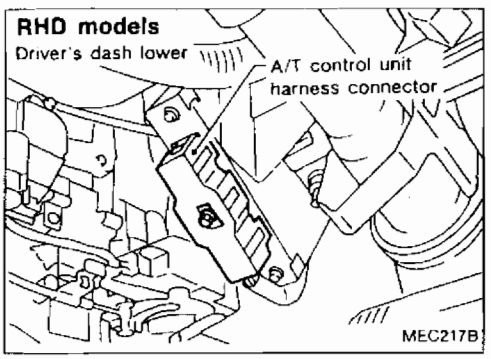
Diagnostic Procedure 29 (Cont'd)

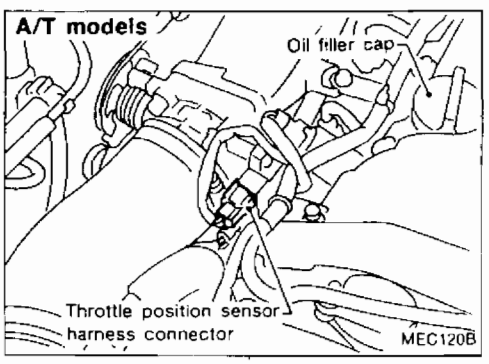
Harness layout

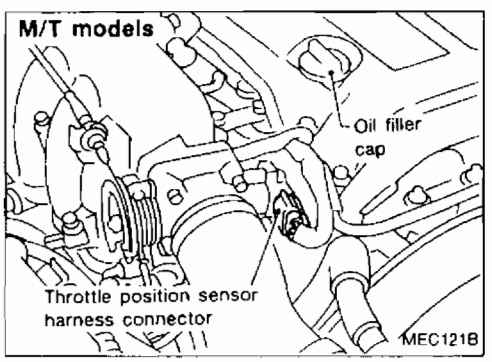


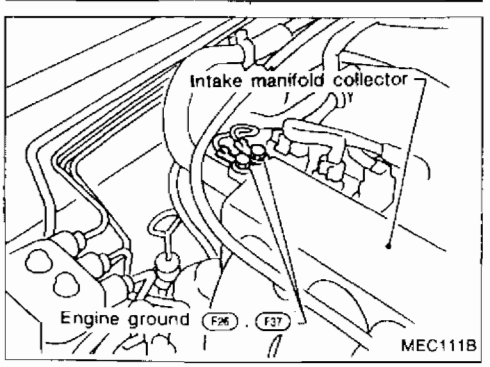




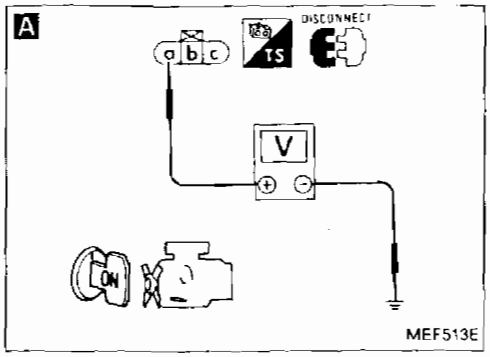


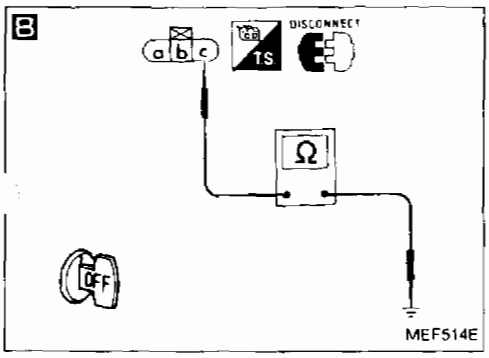


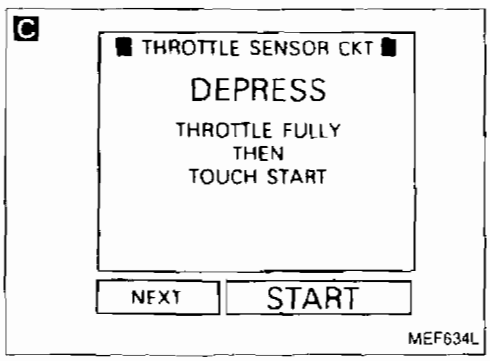


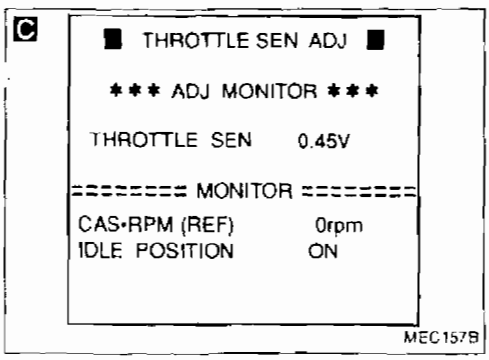


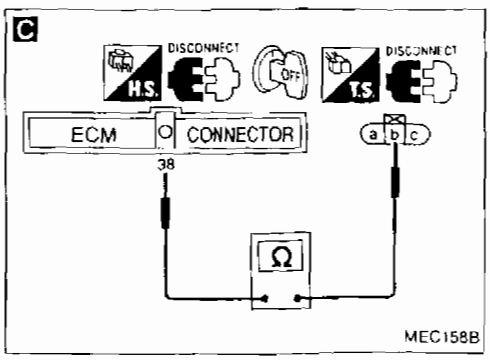
Diagnostic Procedure 29 (Cont'd)











INSPECTION START

A

CHECK POWER SUPPLY.
1) Disconnect throttle position sensor harness connector.
2) Turn ignition switch "ON".
3) Check voltage between terminal (a) 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 (c) and engine ground.
Continuity should exist.

NG → Check the following.
- Harness connectors (F7), (M62) (A/T models)
- Harness continuity between ECM and throttle position sensor
- Harness continuity between A/T control unit and throttle position sensor

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1) Reconnect throttle position sensor harness connector.
2) Turn ignition switch "ON".
3) Perform "THROTTLE SENSOR CKT" or "THROTTLE POSI SEN CKT" in "FUNCTION TEST" mode with CONSULT.

NG → Repair harness or connectors.

— OR —

3) Read "THROTTLE SEN" or "THRTL POS SEN" signal in "WORK SUPPORT" mode with CONSULT.
Throttle valve fully closed:
0.35 - 0.65V
Throttle valve fully open:
Approx. 4.0V

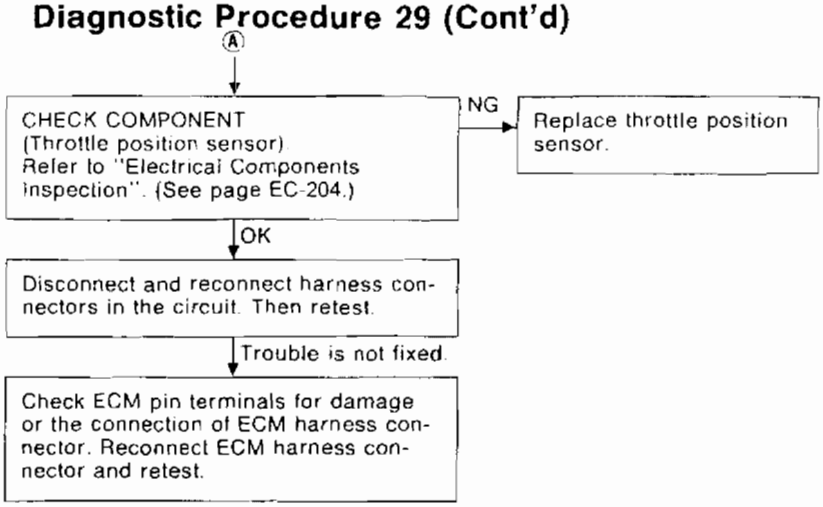
— OR —

1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal (38) and terminal (b).
Continuity should exist.

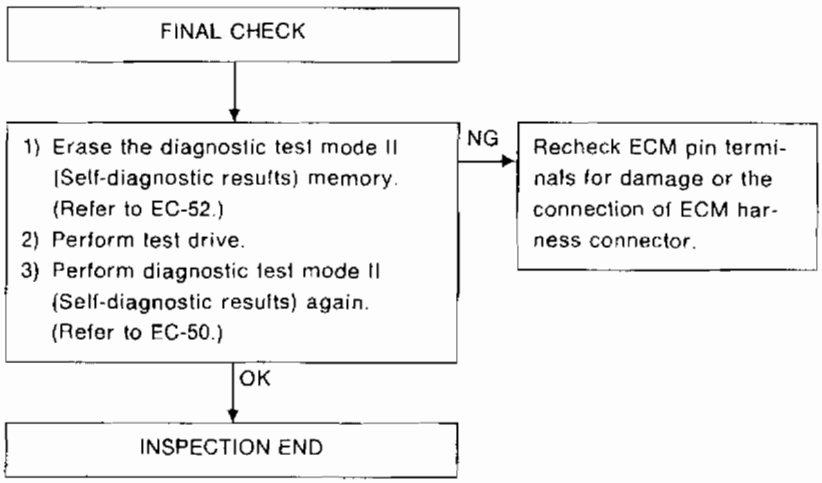
OK ↓

(A)

Diagnostic Procedure 29 (Cont'd)



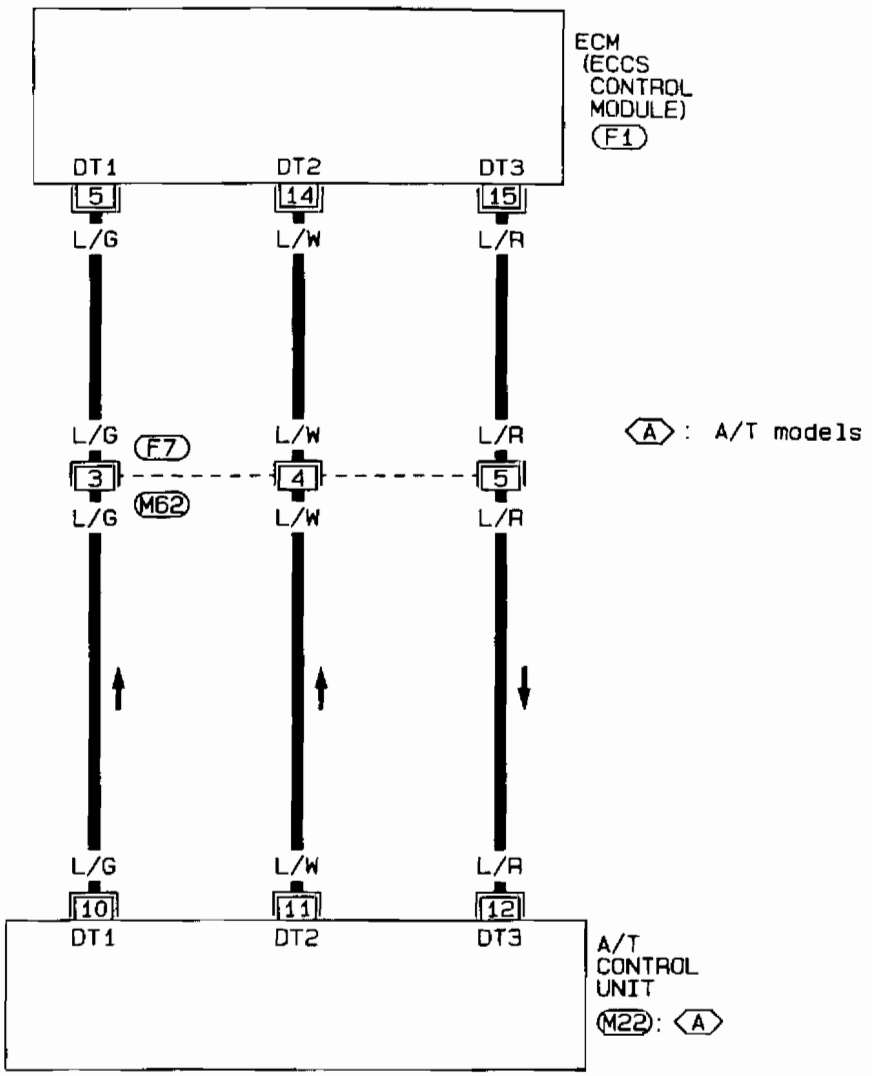
Perform FINAL CHECK by the following procedure after repair is completed.

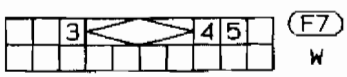


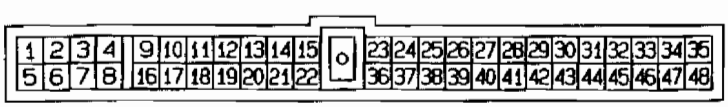
Diagnostic Procedure 30

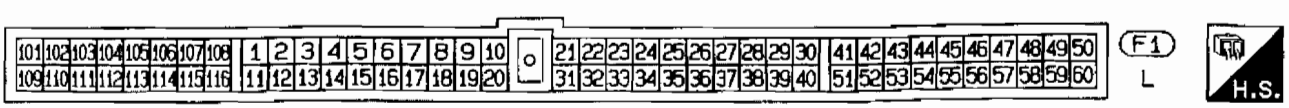
A/T CONTROL (Diagnostic trouble code No. 54)

EC-AT/C-01





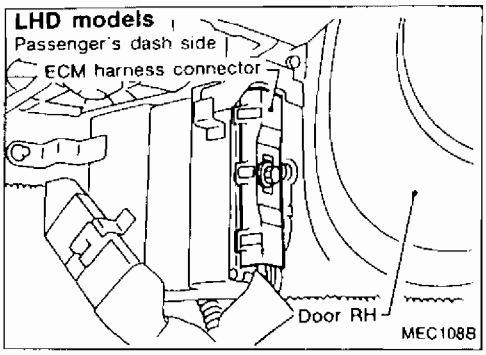


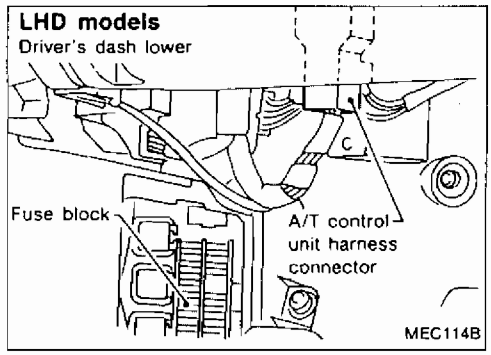


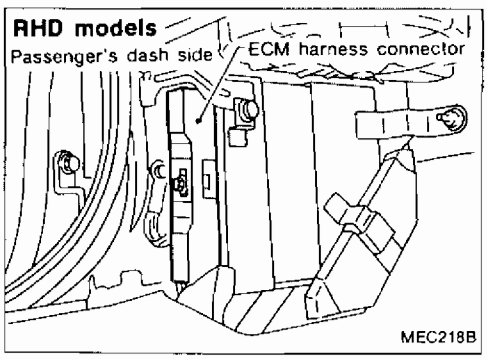
SEF839P

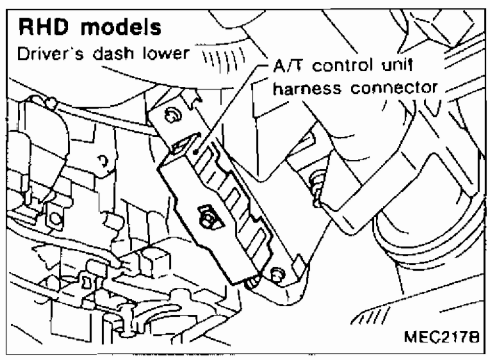
Diagnostic Procedure 30 (Cont'd)

Harness layout

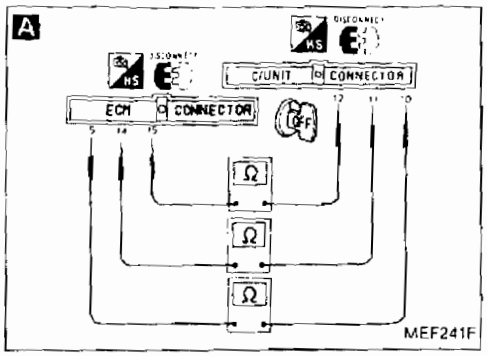








Diagnostic Procedure 30 (Cont'd)



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector and A/T control unit harness connector.
2) Check harness continuity between ECM terminal ⑤ and terminal ⑩, ECM terminal ⑭ and terminal ⑪, ECM terminal ⑮ and terminal ⑫.
Continuity should exist.

NG → Check the following.
- Harness connectors (F7), (M62)
- Harness continuity between ECM and A/T control unit

If NG, repair harness or connectors.

OK ↓

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

Trouble is not fixed. ↓

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

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

FINAL CHECK

1) Erase the diagnostic test mode II (Self-diagnostic results) memory (Refer to EC-52.)
2) Perform test drive.
3) Perform diagnostic test mode II (Self-diagnostic results) again. (Refer to EC-50.)

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

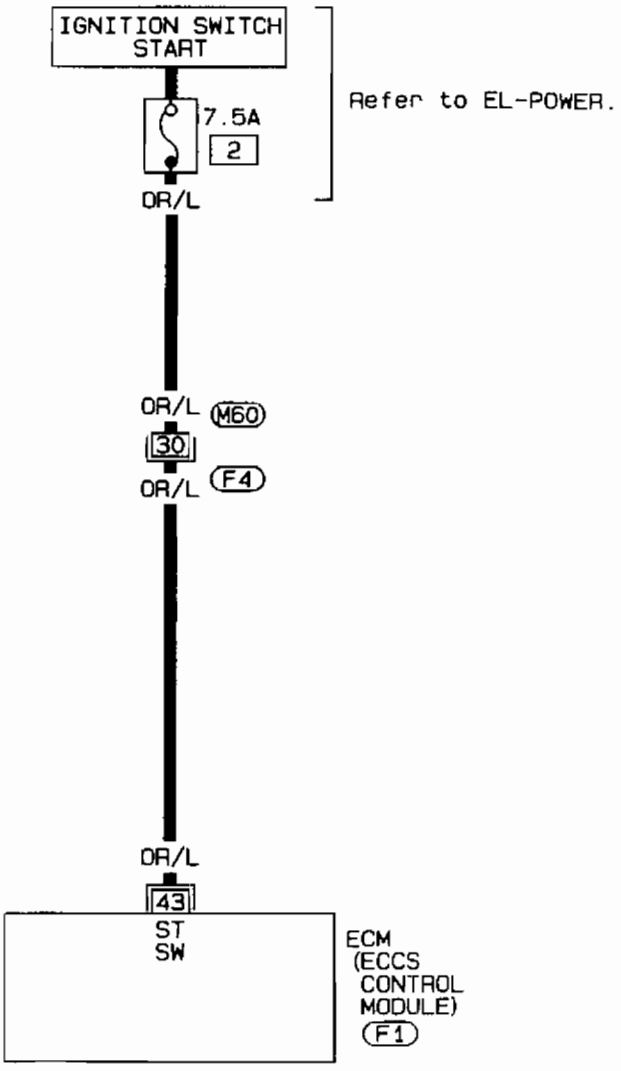
OK ↓

INSPECTION END

Diagnostic Procedure 31

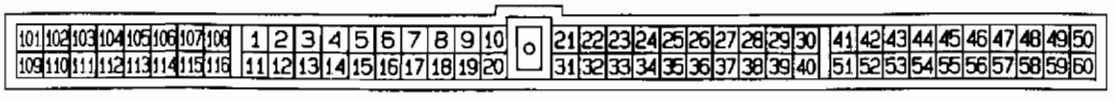
START SIGNAL (Not self-diagnostic item)

EC-S/SIG-01



Refer to last page
(Foldout page).

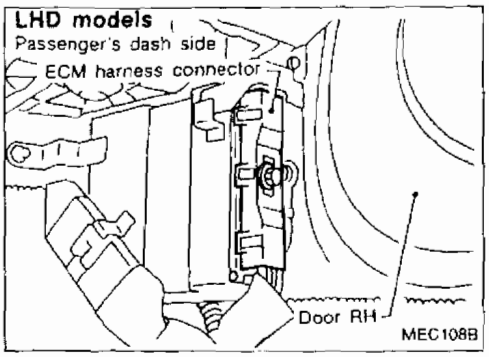
M60, F4

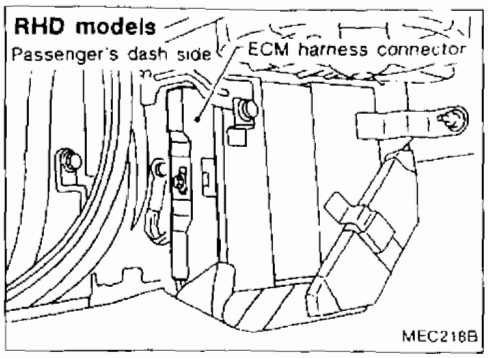


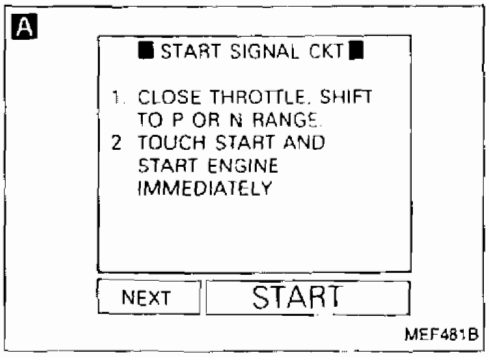
SEF844P

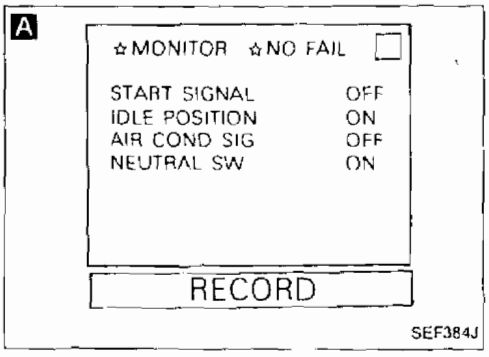
Diagnostic Procedure 31 (Cont'd)

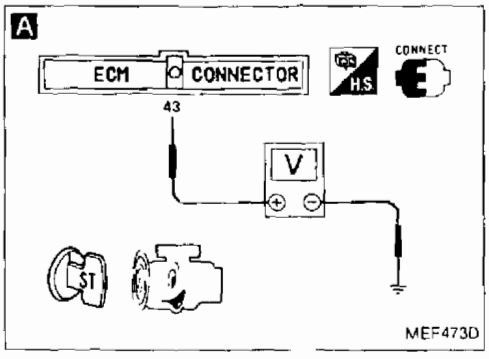
Harness layout

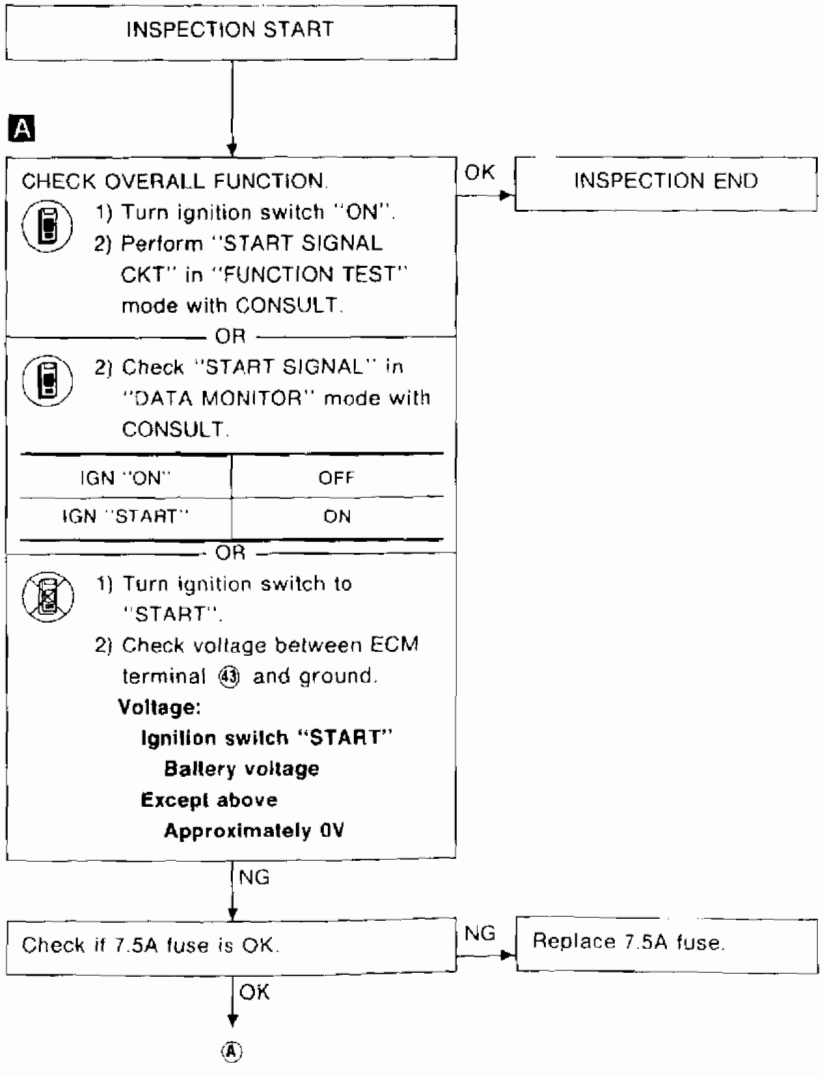




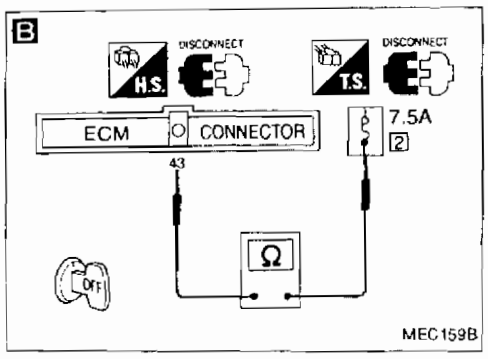








Diagnostic Procedure 31 (Cont'd)



Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and 7.5A fuse
3) Check harness continuity between ECM terminal ㊸ and fuse block.
Continuity should exist.

NG →

Check the following.
- Harness connectors (F4), (M60)
- Harness continuity between ECM and fuse block

If NG, repair harness or connectors.

OK ↓

Disconnect and reconnect harness connectors in the circuit. Then retest

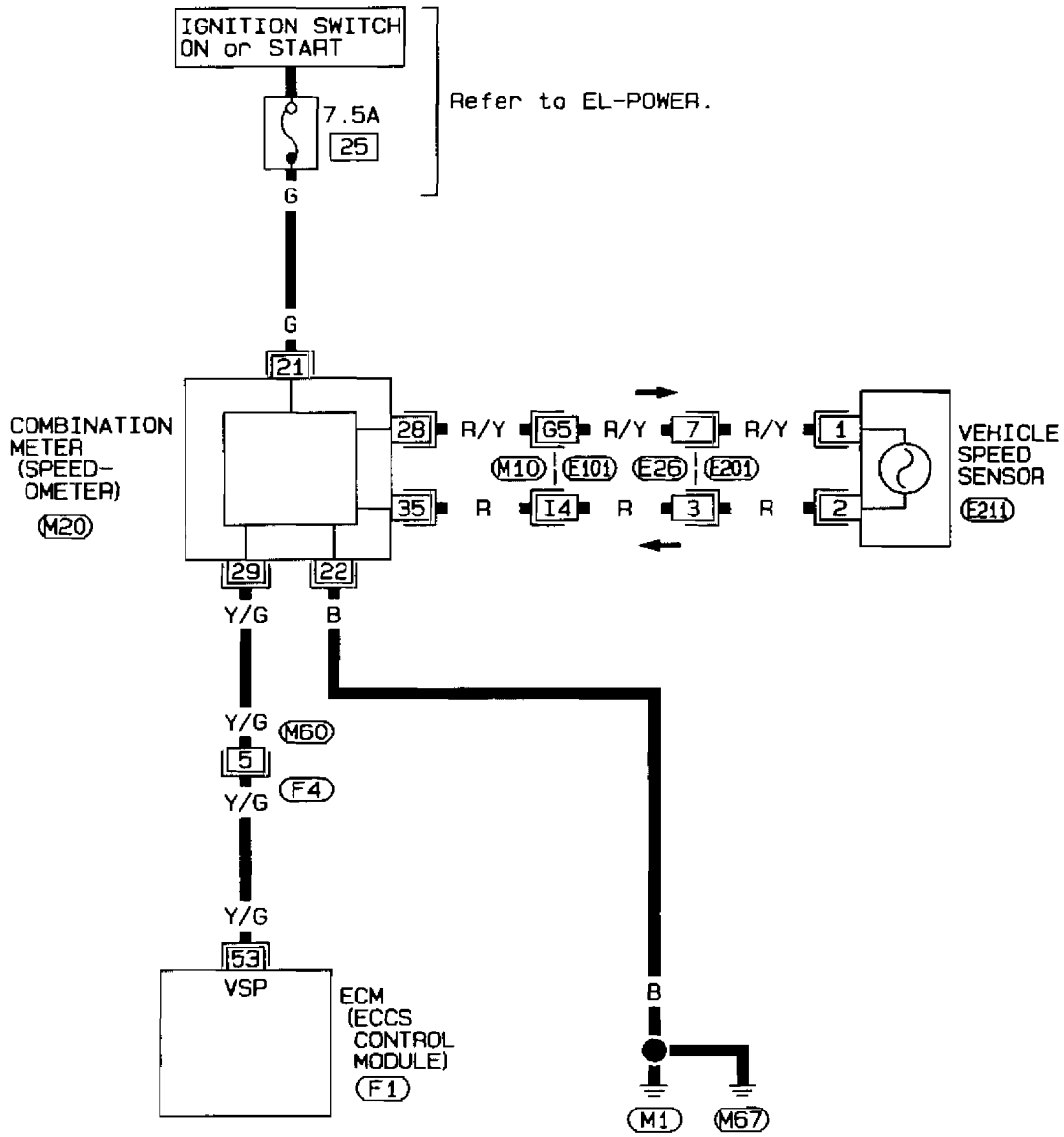
Trouble is not fixed. ↓

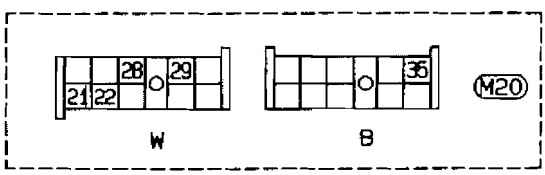
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

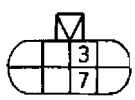
Diagnostic Procedure 32

VEHICLE SPEED SENSOR (Not self-diagnostic item)

EC-VSS-01

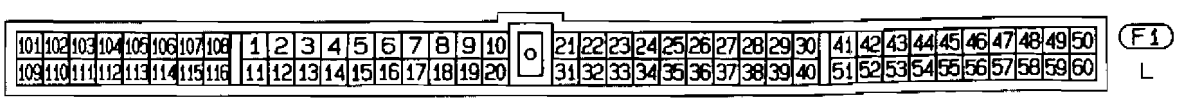






Refer to last page (Foldout page).

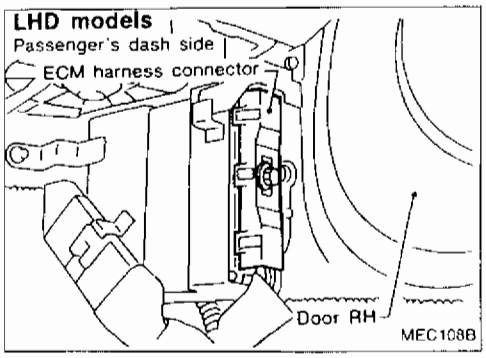
M10 E101
M60 F4

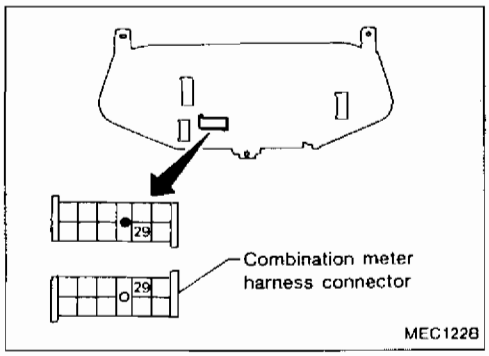


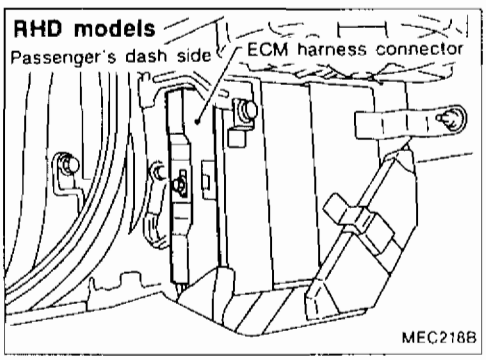
SEF837P

Diagnostic Procedure 32 (Cont'd)

Harness layout

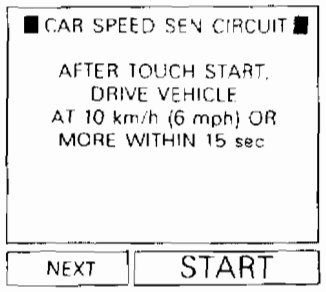






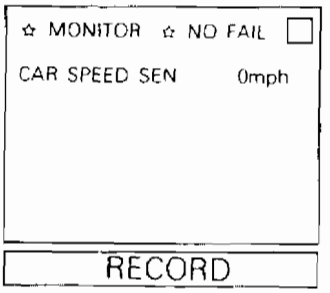
Diagnostic Procedure 32 (Cont'd)

A



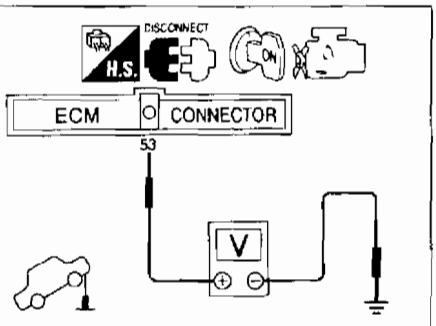
SEF631L

A



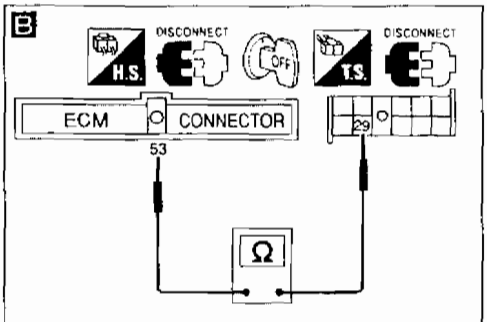
SEF587I

A



MEC160B

B



MEC161B

INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Jack up drive wheels.
2) Perform "CAR SPEED SEN CIRCUIT" or "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Read "CAR SPEED SEN" or "VHCL SPEED SE" signal in "DATA MONITOR" mode with CONSULT.
CONSULT value should be the same as the speedometer indication.

OR

2) Disconnect ECM harness connector.
3) Turn ignition switch "ON".
4) Rotate drive wheel by hand.
5) Check voltage between ECM terminal (53) and body ground.
Voltage should vary between approx. 0 to 5V.

OK → INSPECTION END

NG

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

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

OK

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector and combination meter harness connector.
3) Check harness continuity between ECM terminal (53) and terminal (29).
Continuity should exist.

NG → Check the following.
- Harness connectors (F4), (M60)
- Harness continuity between ECM and combination meter

If NG, repair harness or connectors.

OK

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

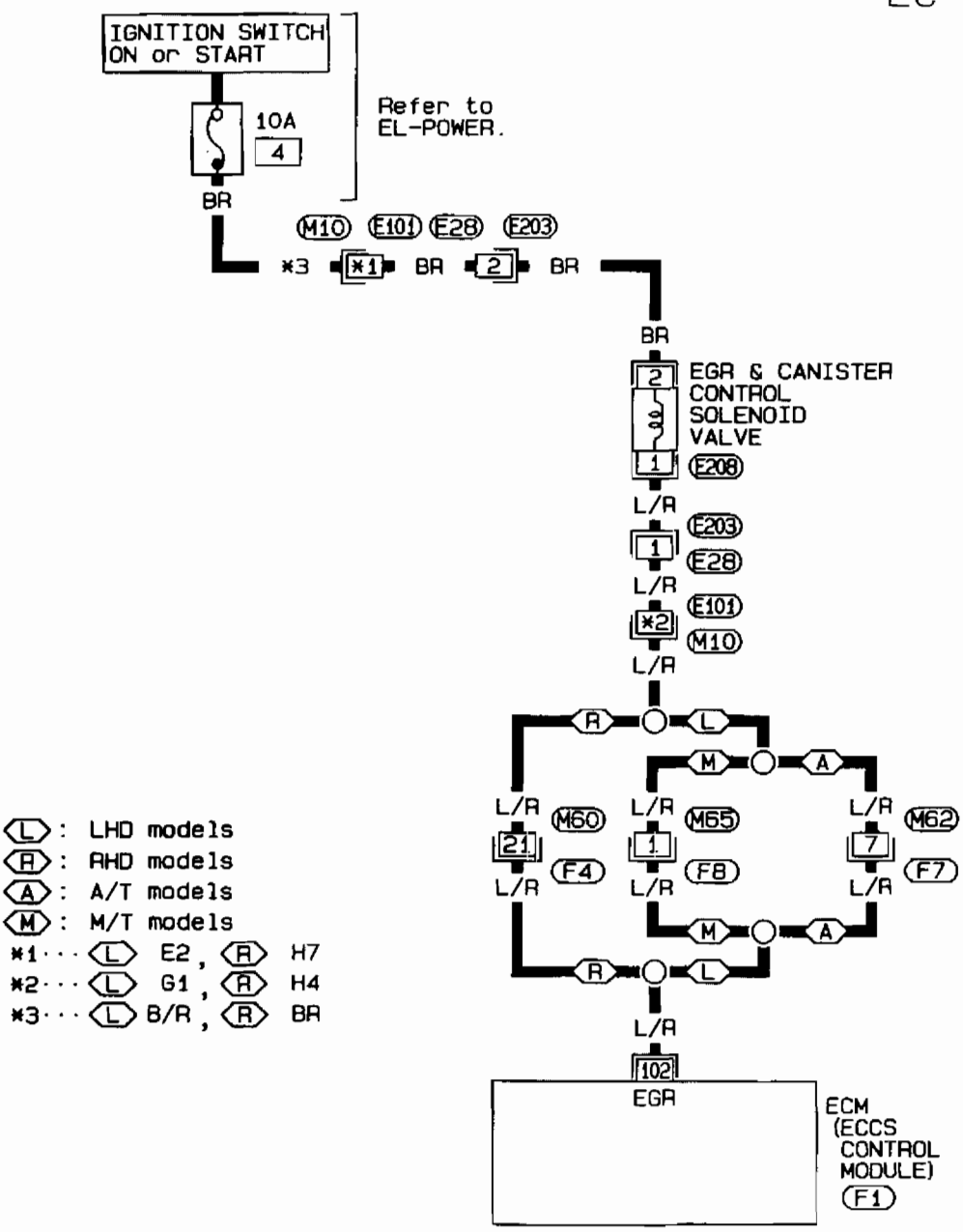
Trouble is not fixed.

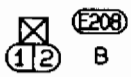
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

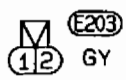
Diagnostic Procedure 33

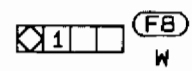
EGR AND CANISTER CONTROL (Not self-diagnostic item)

EC-EGRC/V-01





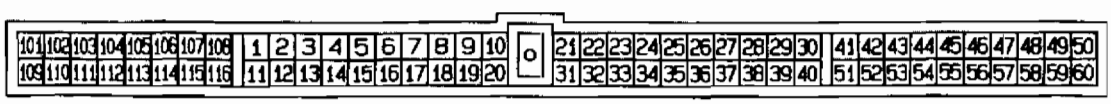




Refer to last page (Foldout page).

M10, E101

M60, F4

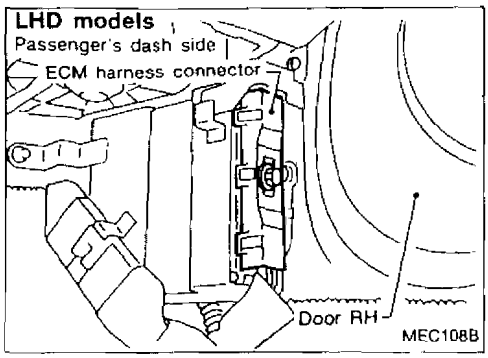


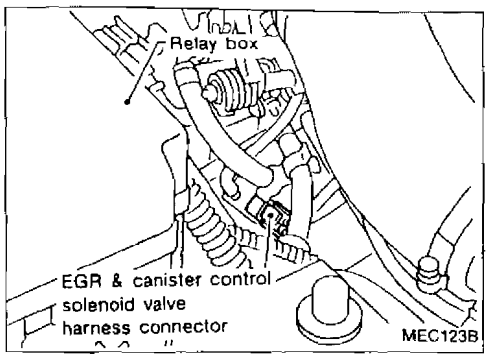
H.S.

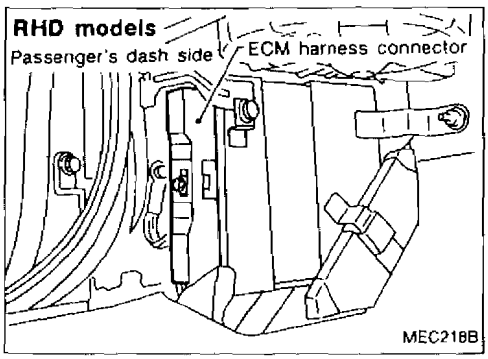
SEF832P

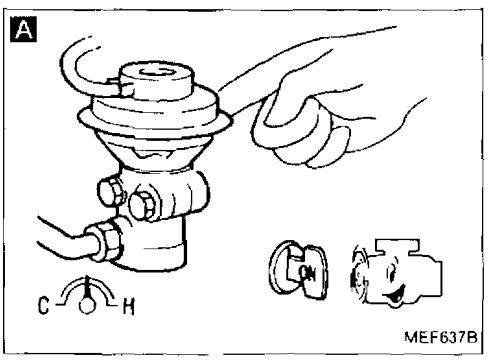
Diagnostic Procedure 33 (Cont'd)

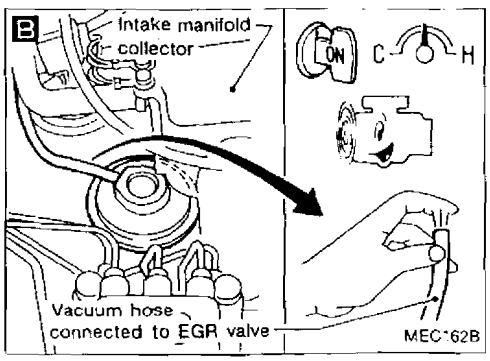
Harness layout











INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform diagnostic test mode II (Self-diagnostic results).
Make sure that diagnostic trouble code No. 12 is not displayed.
3) Make sure that EGR valve spring moves up and down (Use your finger) under the following conditions.
At idle:
Spring does not move.
Racing engine from idle to 3,000 rpm:
Spring moves up and down.

OK → INSPECTION END

NG

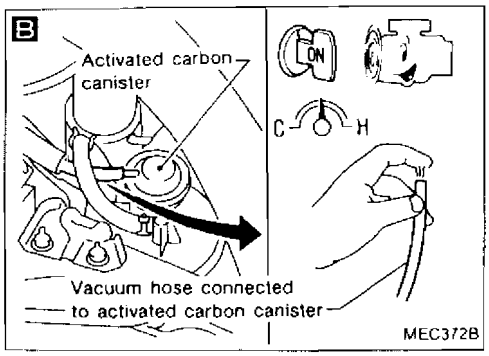
B

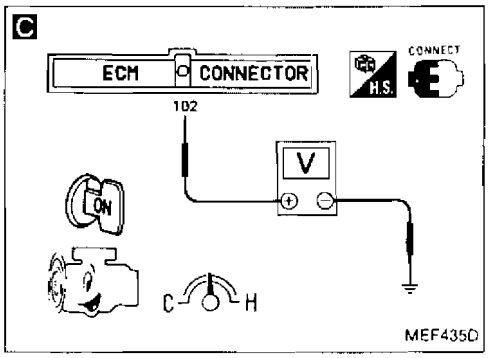
CHECK VACUUM SOURCE TO EGR VALVE.
1) Disconnect vacuum hoses to EGR valve and activated carbon canister.
2) Make sure that vacuum exists under the following conditions.
At idle:
Vacuum should not exist.
Racing engine from idle to 3,000 rpm:
Vacuum should exist.

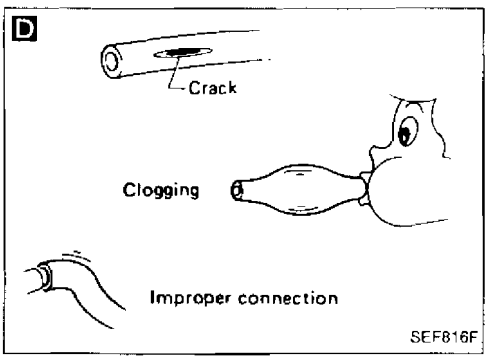
OK → CHECK COMPONENTS (EGR valve, EGRC-BPT valve and activated carbon canister).
Refer to "Electrical Components Inspection".
(See pages EC-203, 210.)
→ Replace malfunctioning component(s).

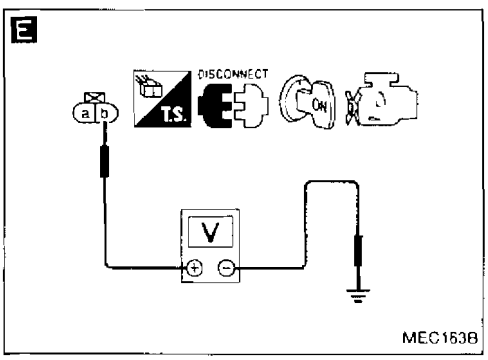
NG → Ⓐ

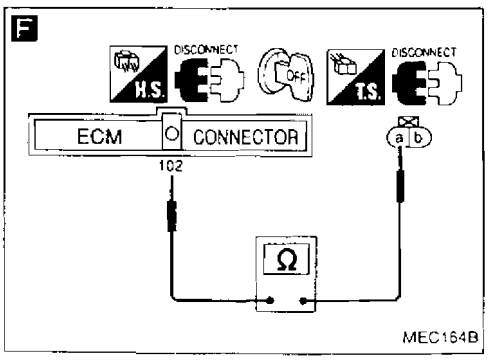
Diagnostic Procedure 33 (Cont'd)











Ⓐ

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

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

NG ↓

E CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect EGR & canister control solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M10), (E101)
- Harness connectors (E28), (E203)
- 10A fuse
- Harness continuity between EGR & canister control solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

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

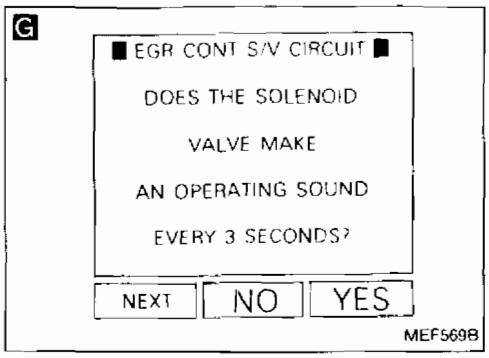
NG → Check the following.
- Harness connectors (E203), (E28)
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4) (RHD models)
- Harness connectors (M62), (F7) (LHD A/T models)
- Harness connectors (M65), (F8) (LHD M/T models)
- Harness continuity between ECM and EGR & canister control solenoid valve

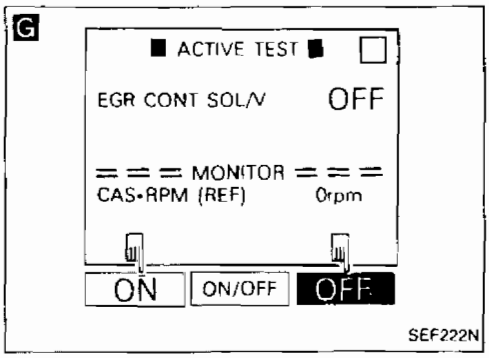
If NG, repair harness or connectors.

OK ↓

Ⓑ

Diagnostic Procedure 33 (Cont'd)





Ⓐ

G

CHECK COMPONENT
(EGR & canister control solenoid valve).

1) Reconnect EGR & canister control solenoid valve harness connector and ECM harness connector.
2) Turn ignition switch "ON".
3) Perform "EGR CONT S/V CIRCUIT" or "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

NG → Replace EGR & canister control solenoid valve.

OR

3) Turn EGR & canister control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "Electrical Components Inspection". (See page EC-203.)

OK ↓

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

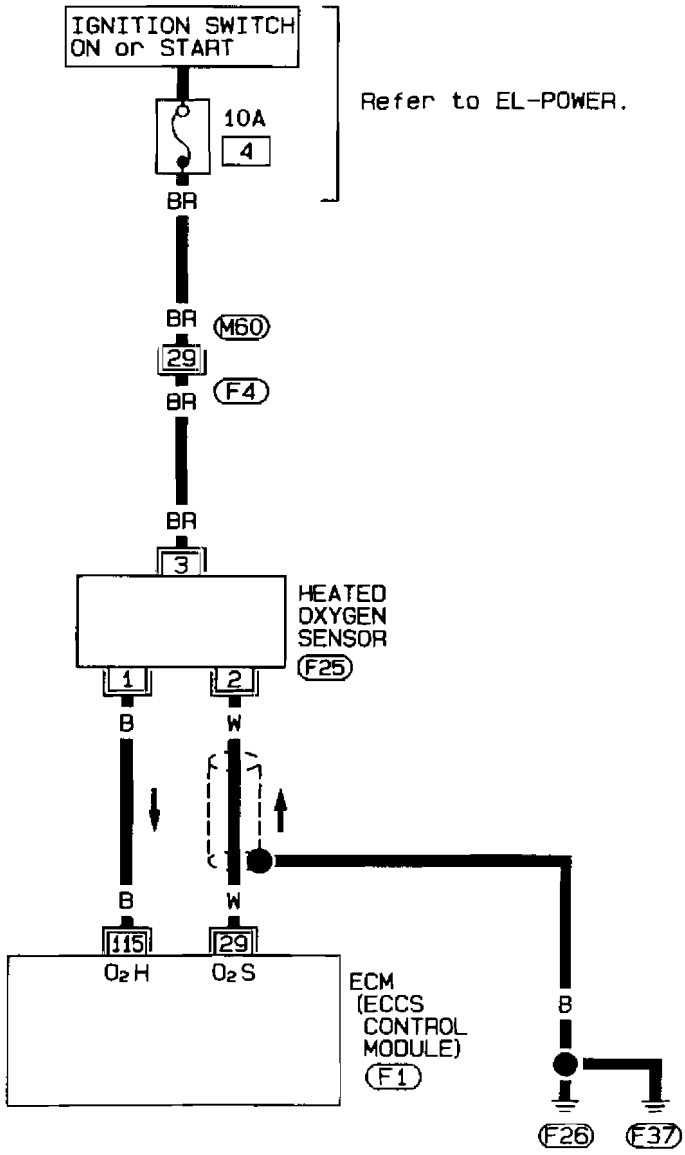
Trouble is not fixed. ↓

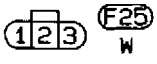
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 34

HEATED OXYGEN SENSOR (Not self-diagnostic item)

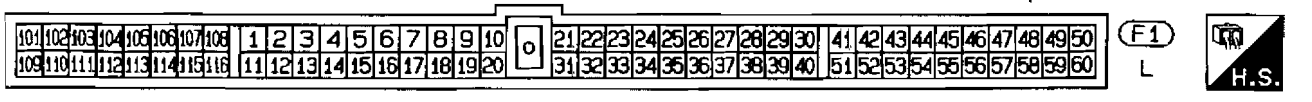
EC-H02S-01





Refer to last page (Foldout page).

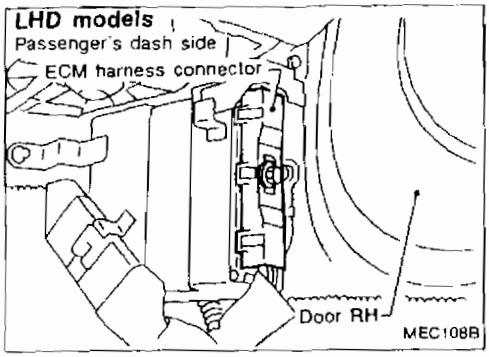
M60, F4

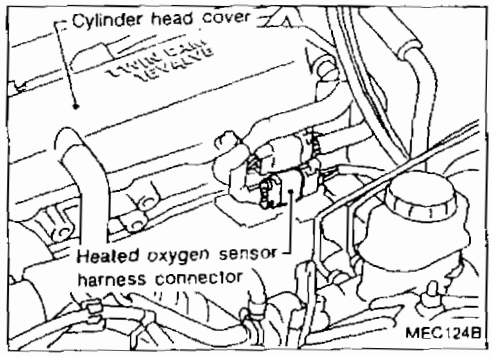


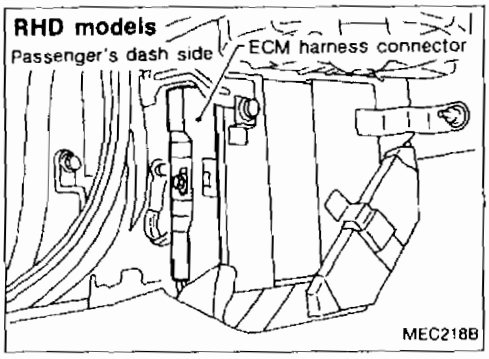
SEF833P

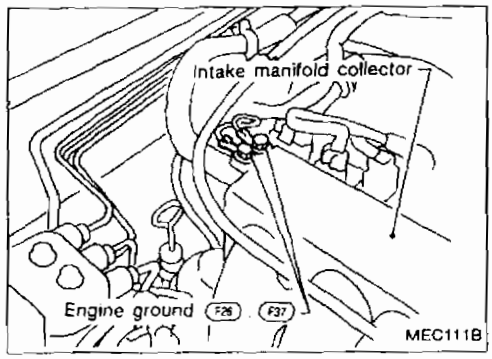
Diagnostic Procedure 34 (Cont'd)

Harness layout

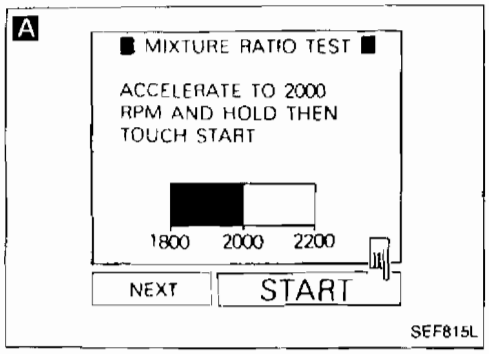


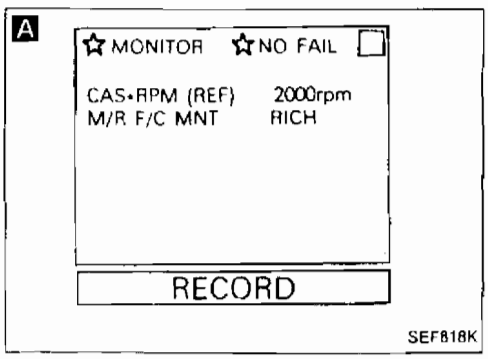


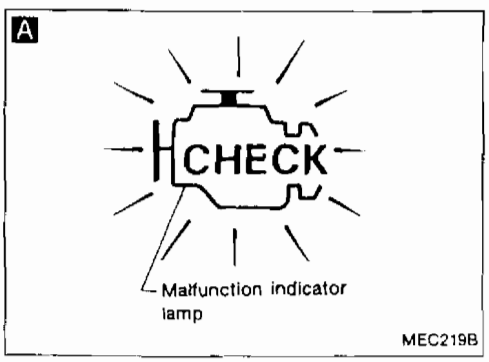


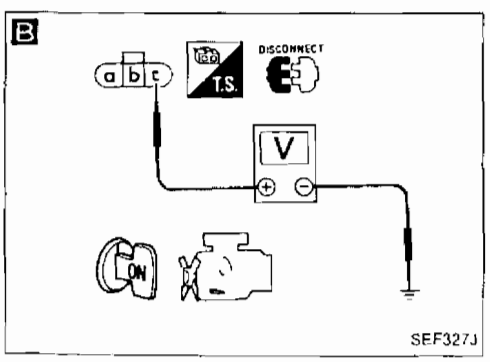


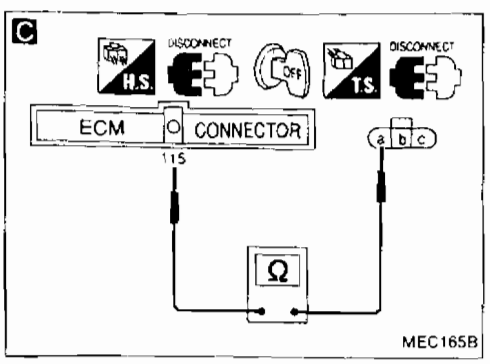
Diagnostic Procedure 34 (Cont'd)











INSPECTION START

A

CHECK HEATED OXYGEN SENSOR CIRCUIT.
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" in "DATA MONITOR" mode indicates "RICH" and "LEAN" periodically more than 5 times during 10 seconds at 2,000 rpm.

OR

2) Run engine at about 2,000 rpm for about 2 minutes under no-load.
3) Set ECM Diagnostic Test Mode II.
4) Keep engine speed at 2,000 rpm and make sure that the malfunction indicator lamp on the instrument panel goes on and off more than 5 times during 10 seconds.

OK → INSPECTION END

NG

B

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

NG → Check the following.
- Harness connectors (F4), (M60)
- 10A fuse
- Harness continuity between heated oxygen sensor and fuse

If NG, repair harness or connectors.

OK

C

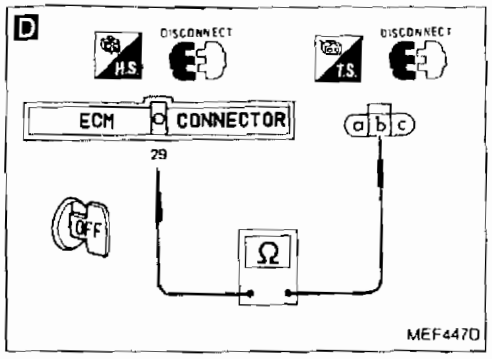
CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between terminal ⓐ and ECM terminal (115).
Continuity should exist.

NG → Repair harness or connectors.

OK

Ⓐ

Diagnostic Procedure 34 (Cont'd)



Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.
1) Loosen and retighten ground screws.
2) Check harness continuity between ECM terminal ㉙ and terminal ⓑ.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

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

Trouble is not fixed. ↓

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

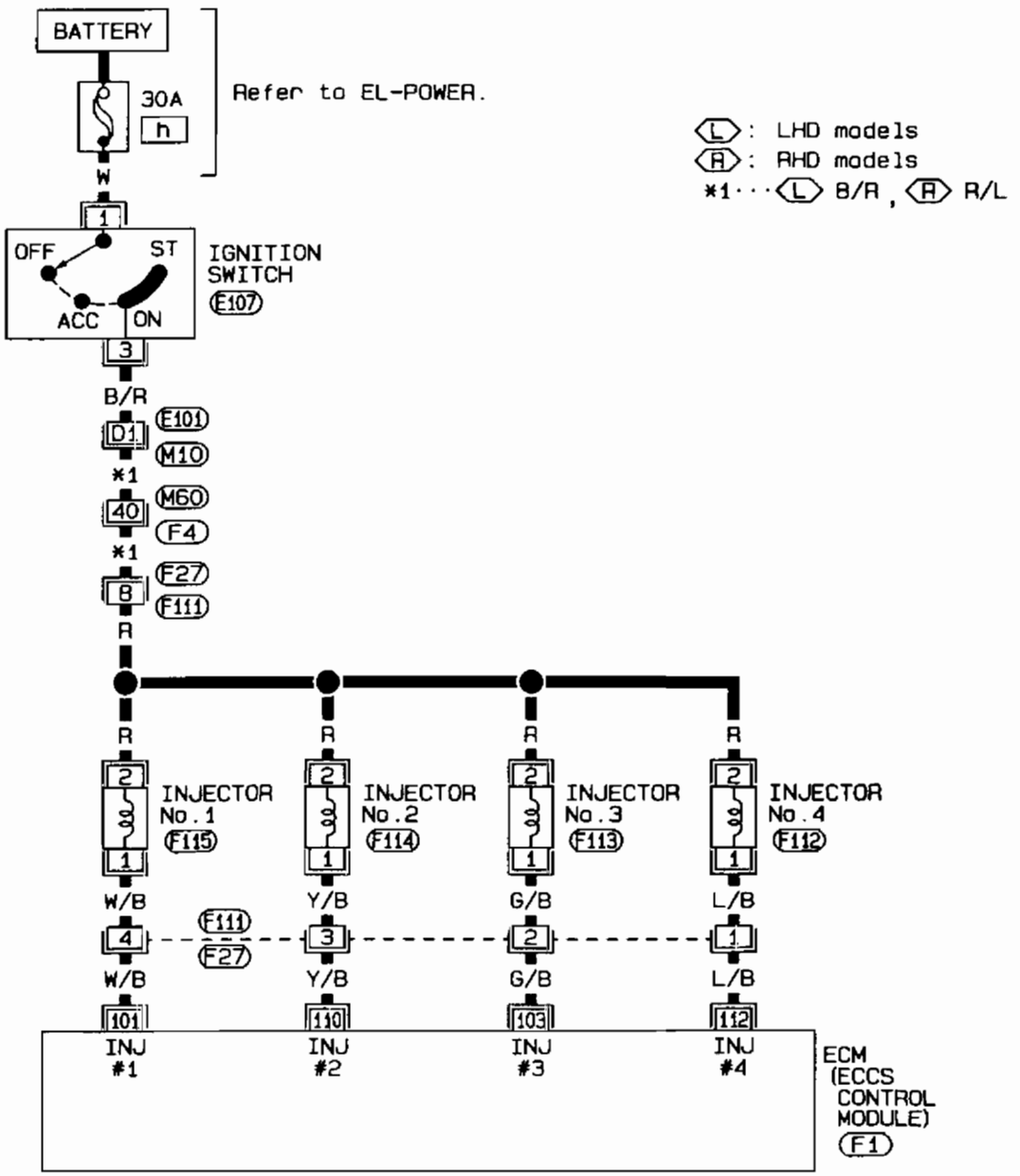
Trouble is not fixed. ↓

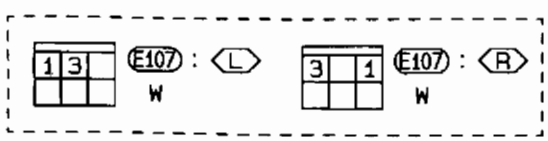
Replace heated oxygen sensor.

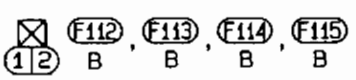
Diagnostic Procedure 35

INJECTOR CIRCUIT (Not self-diagnostic item)

EC-INJECT-01

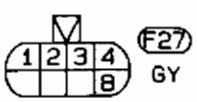


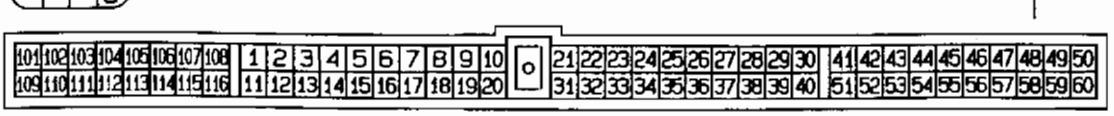




Refer to last page (Foldout page).

M10, E101
M60, F4

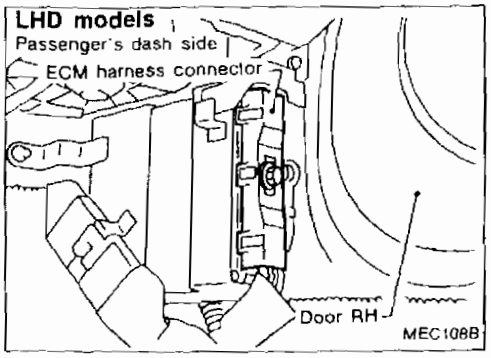


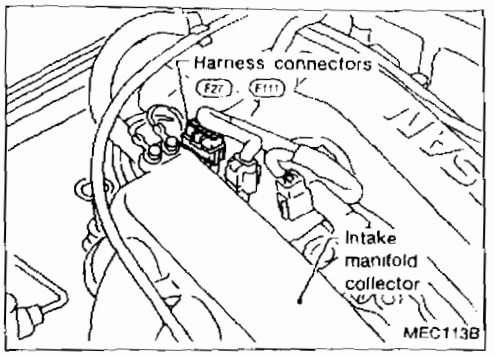


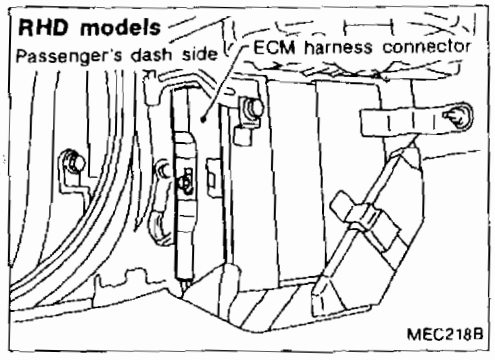
SEF834P

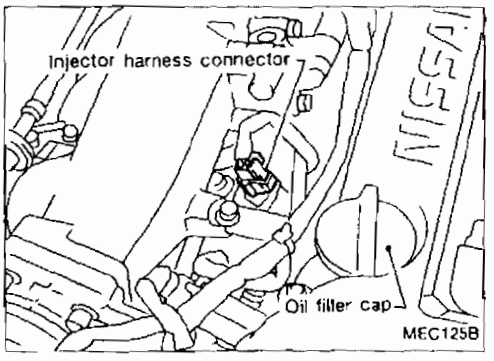
Diagnostic Procedure 35 (Cont'd)

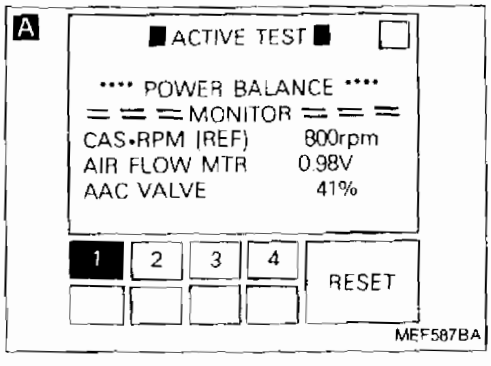
Harness layout

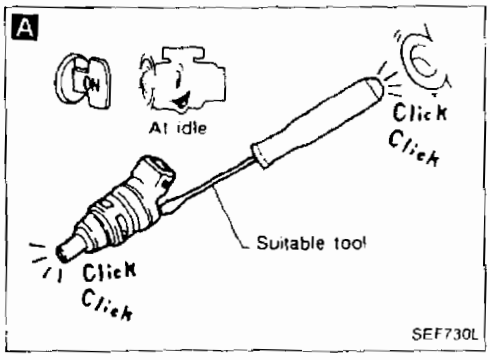


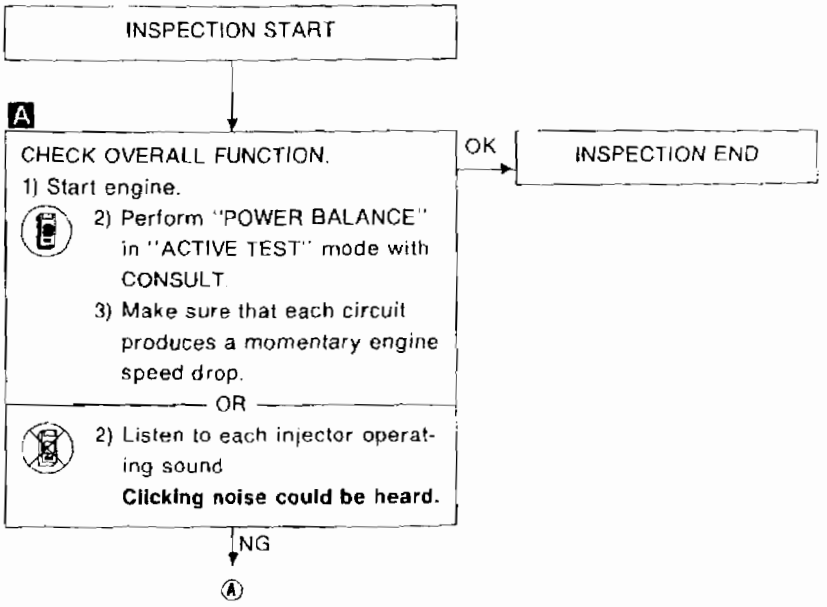




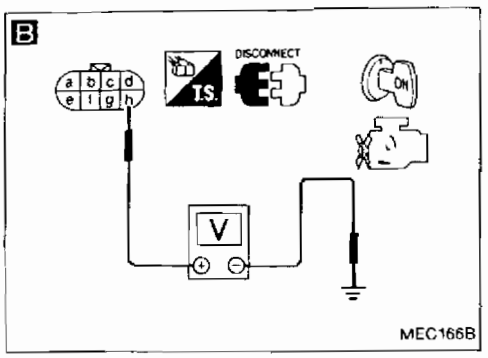


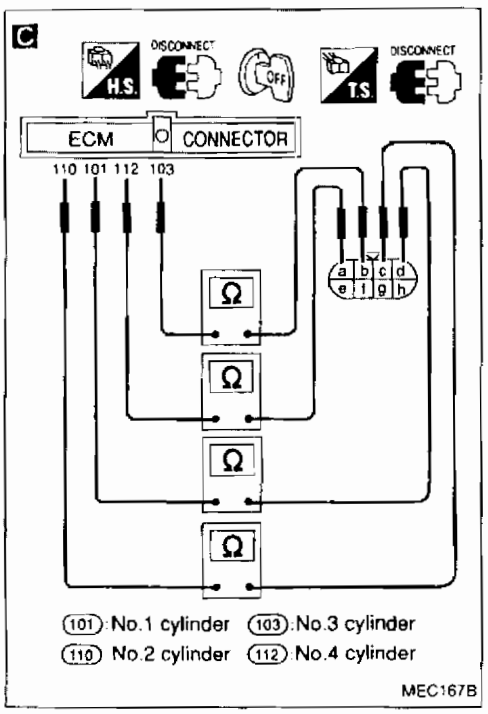






Diagnostic Procedure 35 (Cont'd)





Ⓐ

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect harness connectors (F27), (F111).
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓗ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F27), (F111)
- Harness connectors (F4), (M60)
- Harness connectors (M10), (E101)
- Harness continuity between ignition switch and harness connector (F27)

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between
ECM terminal (101) and terminal ⓓ,
ECM terminal (110) and terminal ⓒ,
ECM terminal (103) and terminal ⓑ,
ECM terminal (112) and terminal ⓐ.
Continuity should exist.

NG → Check the following.
- Harness connectors (F27), (F111)
- Harness continuity between ECM and harness connector (F27)

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Injector).
Refer to "Electrical Components Inspection". [See page EC-205.]

NG → Replace injector.

OK ↓

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

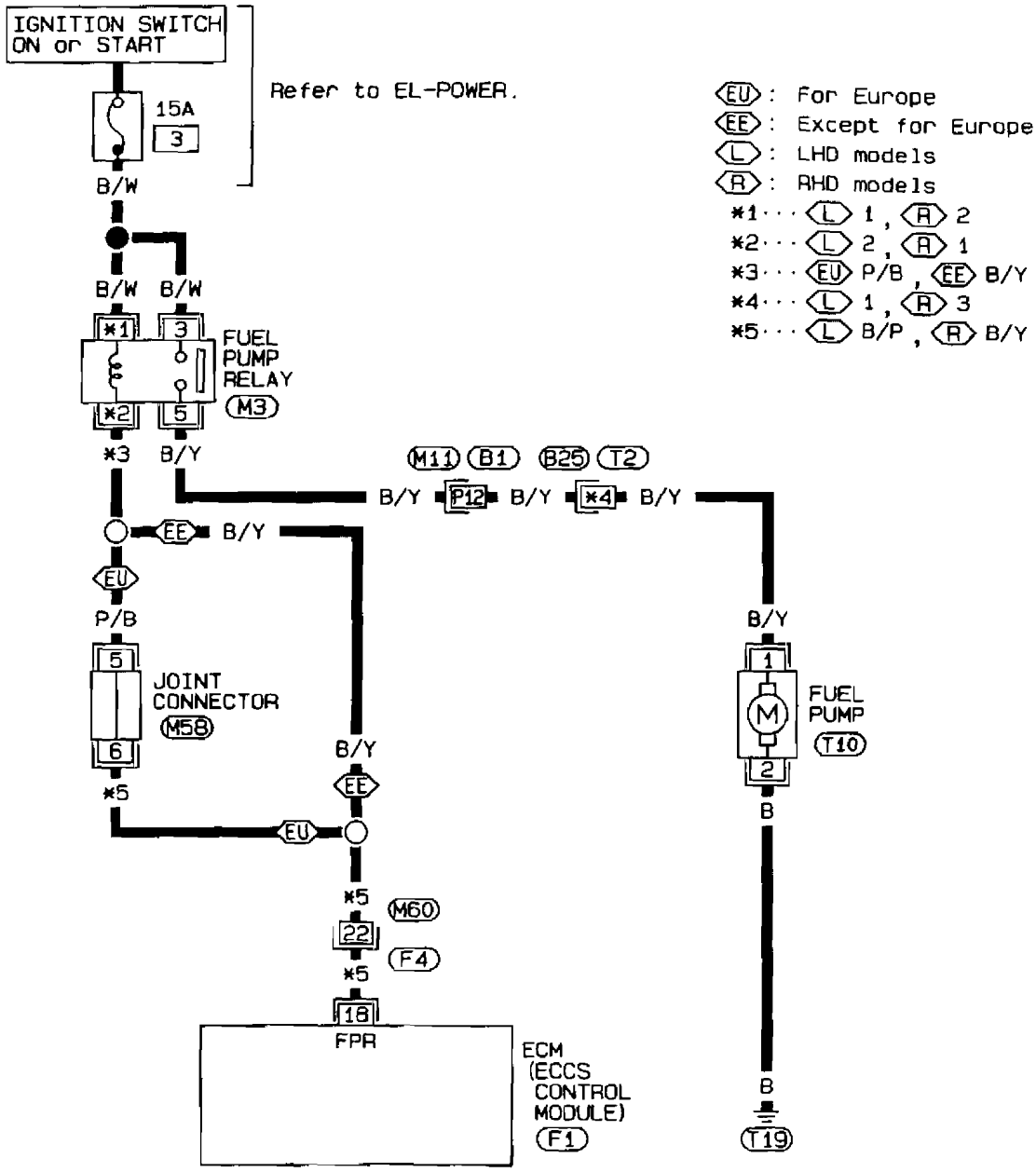
Trouble is not fixed ↓

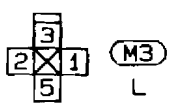
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

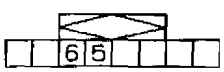
Diagnostic Procedure 36

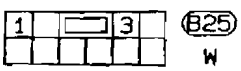
FUEL PUMP (Not self-diagnostic item)

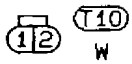
EC-F/PUMP-01







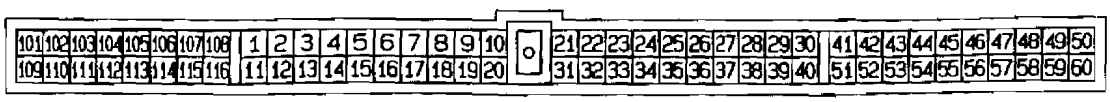




Refer to last page (Foldout page).

M11 , B1

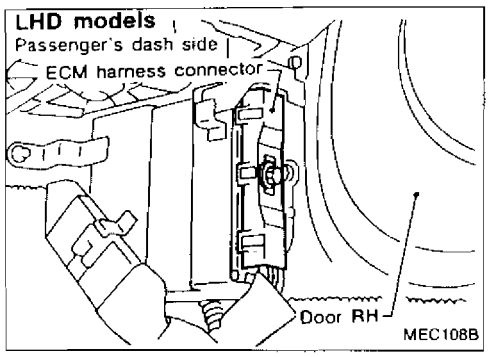
M60 , F4

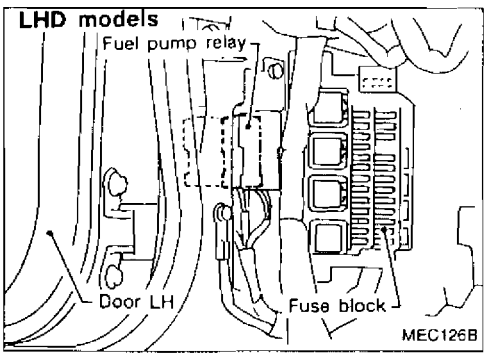


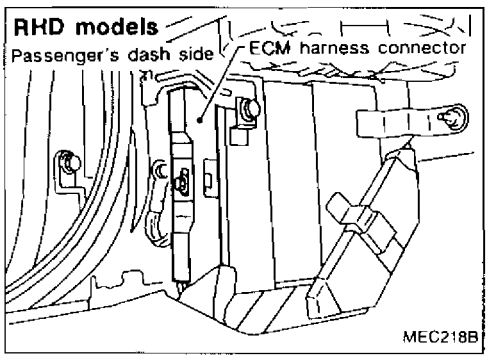
SEF845P

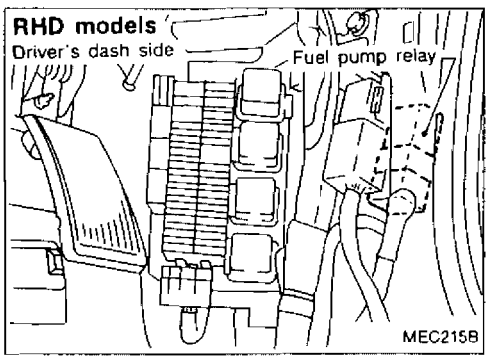
Diagnostic Procedure 36 (Cont'd)

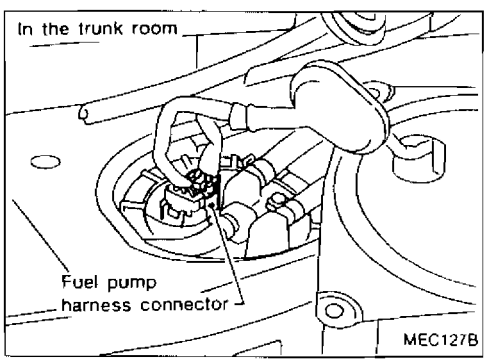
Harness layout



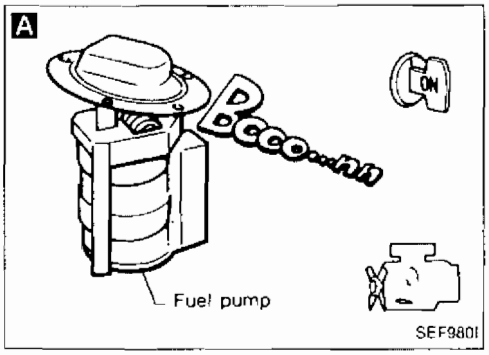


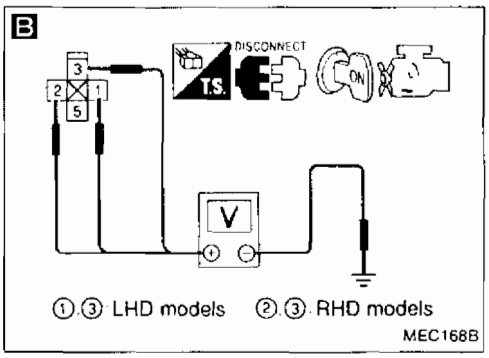


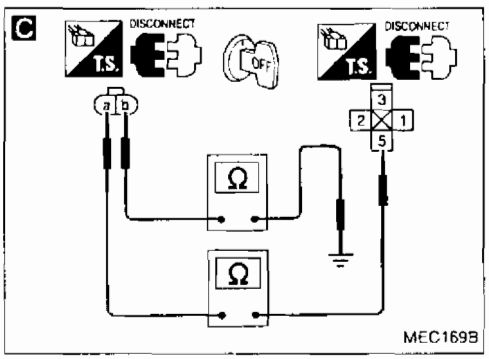


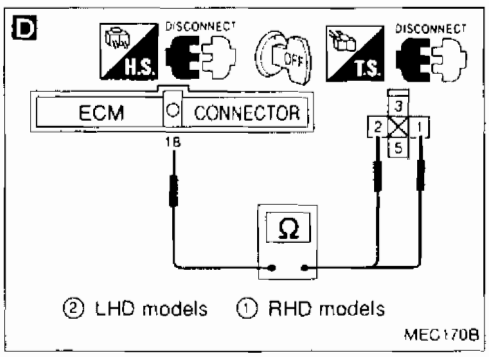


Diagnostic Procedure 36 (Cont'd)









INSPECTION START

A

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

OK → INSPECTION END

NG

B

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

NG → Check the following
- 15A fuse
- Harness continuity between fuel pump relay and fuse

If NG, repair harness or connectors.

OK

C

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

NG → Check the following.
- Harness connectors (M11), (61)
- Harness connectors (B25), (T2)
- Harness continuity between fuel pump and fuel pump relay
- Harness continuity between fuel pump and body ground

If NG, repair harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ⑱ and terminal ② (LHD models), ① (RHD models).
Continuity should exist.

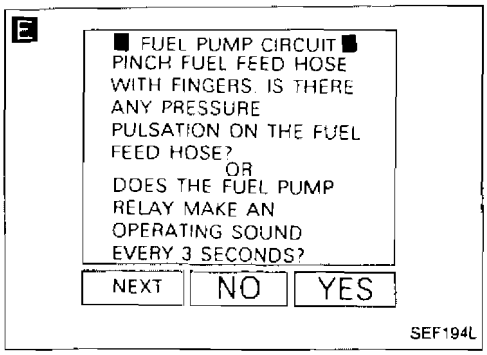
NG → Check the following
- Harness connectors (F4), (M60)
- Joint connector (M58) (Models for Europe)
- Harness continuity between ECM and fuel pump relay

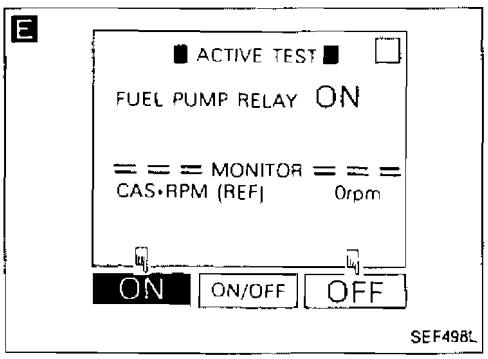
If NG, repair harness or connectors.

OK

Ⓐ

Diagnostic Procedure 36 (Cont'd)





Ⓐ

E

CHECK COMPONENT
(Fuel pump relay).
1) Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2) Turn ignition switch "ON".
3) Perform "FUEL PUMP CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

3) Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "Electrical Components Inspection". (See page EC-206.)

NG → Replace fuel pump relay.

OK ↓

CHECK COMPONENT
(Fuel pump).
Refer to "Electrical Components Inspection". (See page EC-202.)

NG → Replace fuel pump.

OK ↓

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

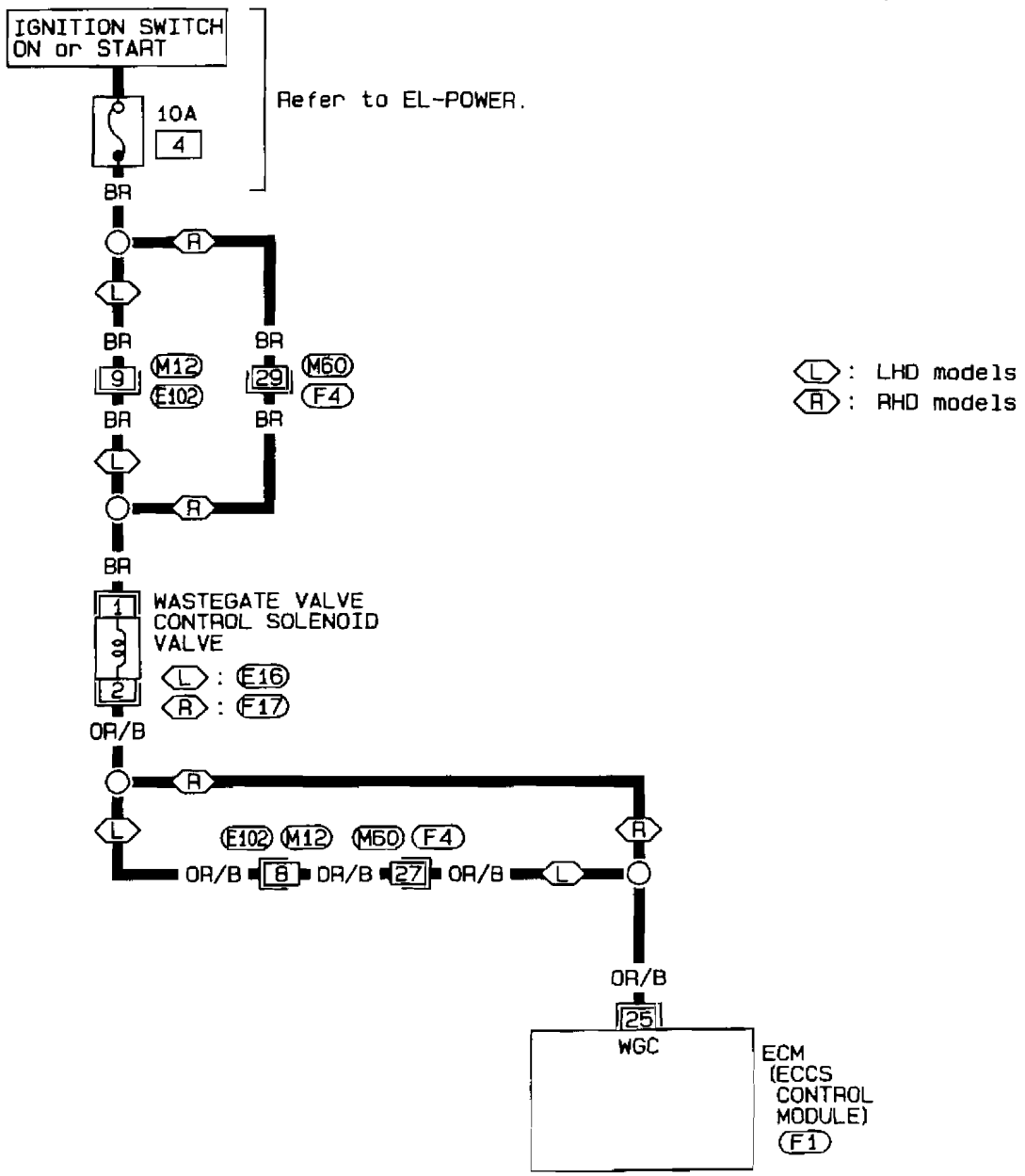
Trouble is not fixed. ↓

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

Diagnostic Procedure 37

WASTEGATE VALVE CONTROL (Not self-diagnostic item)

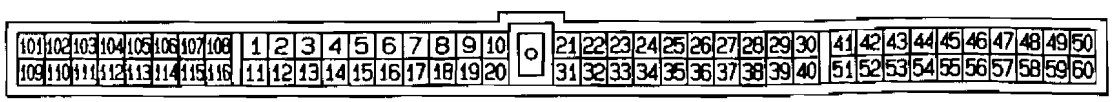
EC-WG/V-01



L : E16 R : F17

Refer to last page (Foldout page).

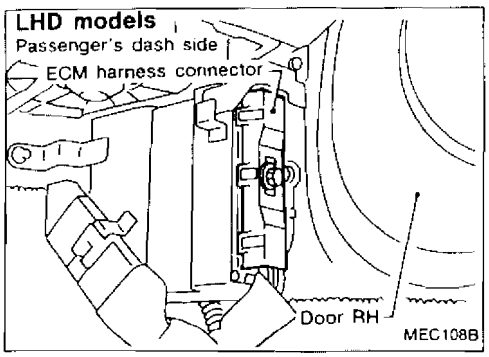
M60, F4

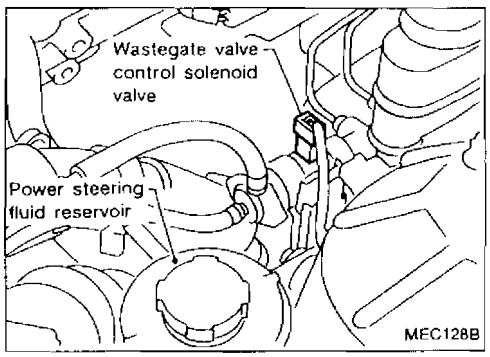


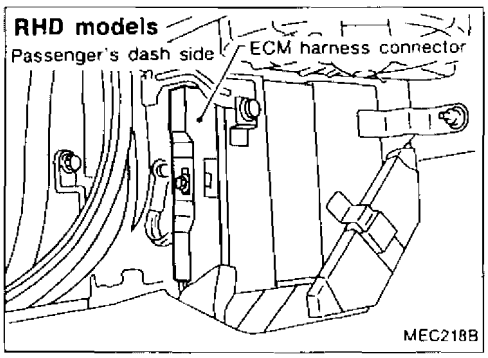
SF841P

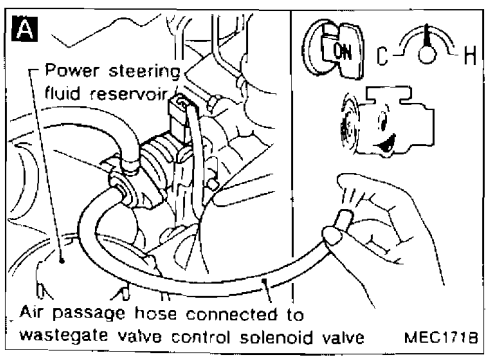
Diagnostic Procedure 37 (Cont'd)

Harness layout









INSPECTION START

A

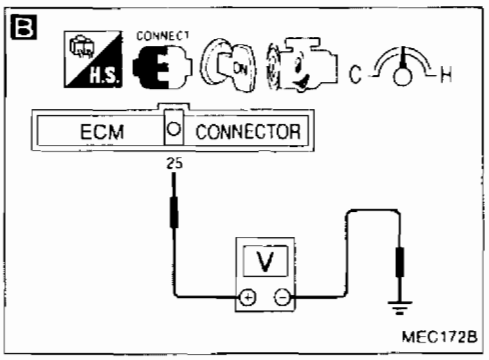
CHECK OVERALL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform diagnostic test mode II (Self-diagnostic results). Make sure that diagnostic trouble code No. 55 is displayed.
3) Stop engine.
4) Disconnect air passage hose to wastegate valve control solenoid valve and restart engine.
5) Make sure that boost pressure exists under the following conditions
At idle:
Boost pressure should not exist.
Engine is racing quickly (Up to about 5,000 rpm).
Boost pressure should exist.

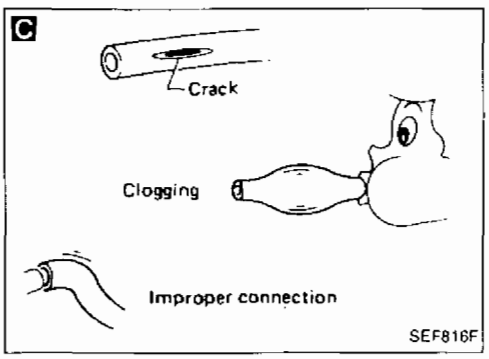
OK → CHECK COMPONENT (Wastegate valve actuator).
Refer to "TURBOCHARGER" in EM section.
If NG, replace wastegate valve actuator.

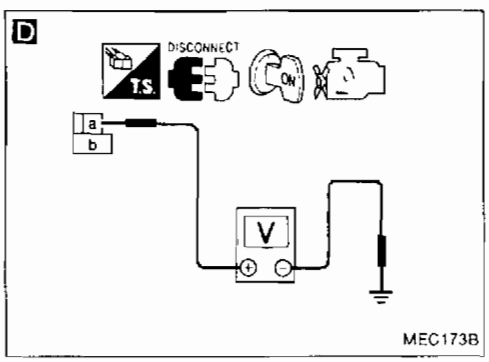
OK → INSPECTION END

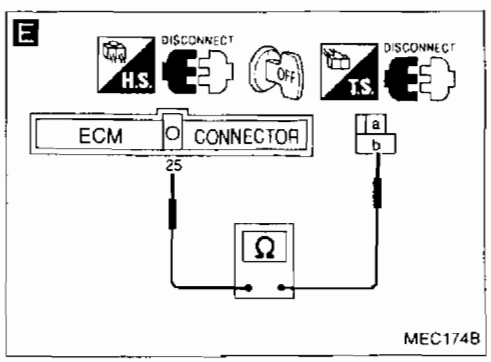
NG → Ⓐ

Diagnostic Procedure 37 (Cont'd)









Ⓐ

B

CHECK CONTROL FUNCTION.
1) Check voltage between ECM terminal ㉕ and ground under the following conditions.
Voltage:
At idle
Battery voltage
Engine is racing quickly (Up to about 5,000 rpm).
Approximately 4 - 5V

OK → **C**

Check air passage hose for clogging, cracks and proper connection.

NG ↓

D

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

NG →

Check the following.
- Harness connectors (M12), (E102) (LHD models)
- Harness connectors (M60), (F4) (RHD models)
- 10A fuse
- Harness continuity between wastegate valve control solenoid valve and fuse.

If NG, repair harness or connectors.

OK ↓

E

CHECK OUTPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal ㉕ and terminal ⓑ.
Continuity should exist.

NG →

Check the following.
- Harness connectors (E102), (M12) (LHD models)
- Harness connectors (M60), (F4) (LHD models)
- Harness continuity between ECM and wastegate valve control solenoid valve

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Wastegate valve control solenoid valve).
Refer to "Electrical Components Inspection". (See page EC-205.)

NG → Replace wastegate valve control solenoid valve.

OK ↓

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

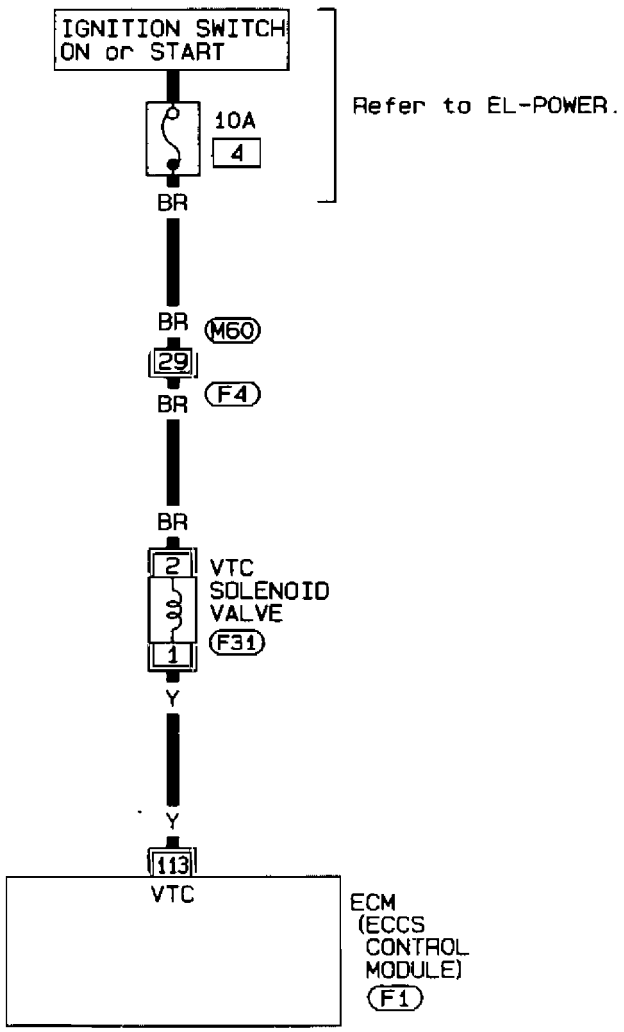
Trouble is not fixed. ↓

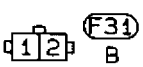
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 38

VALVE TIMING CONTROL (Not self-diagnostic item)

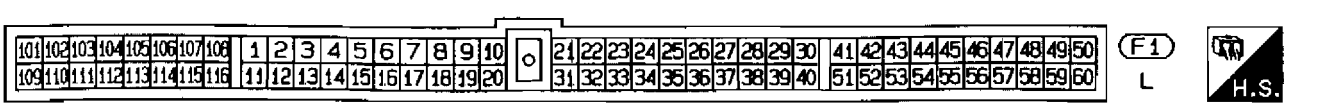
EC-VTC-01





Refer to last page
(Foldout page).

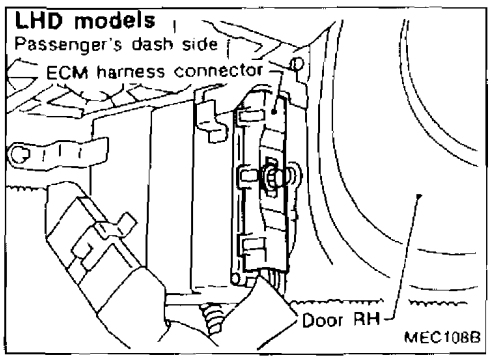
M60, F4

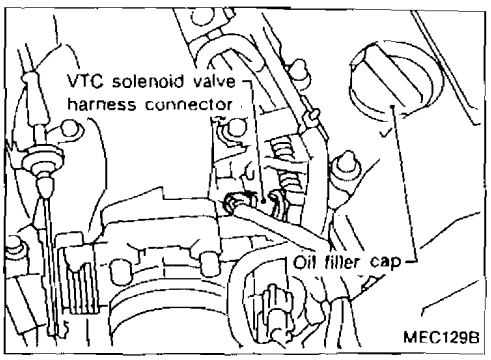


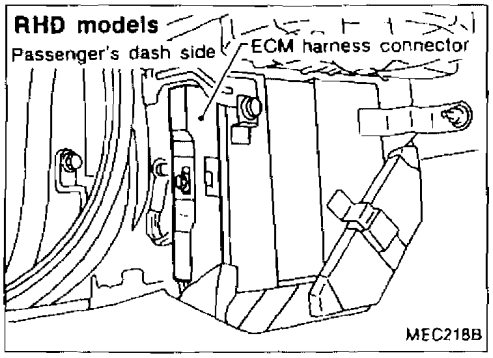
SEF842P

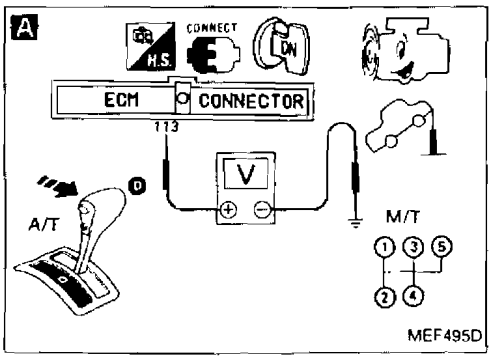
Diagnostic Procedure 38 (Cont'd)

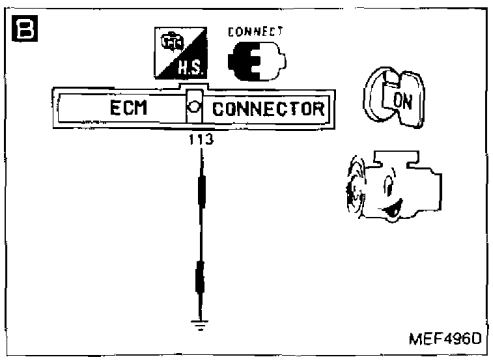
Harness layout











INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Jack up drive wheels.
2) Start engine.
3) Shift gear to any position except the neutral position (M/T model). Shift selector lever to any position except "N" or "P" position (A/T model).
4) Check voltage between ECM terminal (113) and ground under the following conditions.

Voltage:
Quickly depress accelerator pedal, then quickly release it.
Approximately 0V
At idle
Battery voltage

OK → **B**

NG → (A)

B

CHECK VTC SOLENOID VALVE OPERATION.
1) Stop engine.
2) Connect a suitable jumper wire between ECM terminal (113) and body ground
3) Start engine and make sure that improper idle condition occurs.

If it does not occur, go to CHECK COMPONENT (VTC solenoid valve)

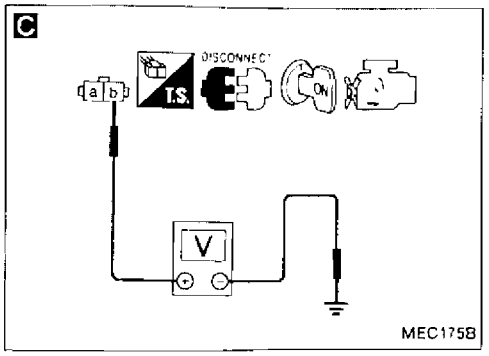
Occurs.

INSPECTION END

Diagnostic Procedure 38 (Cont'd)

Ⓐ

C



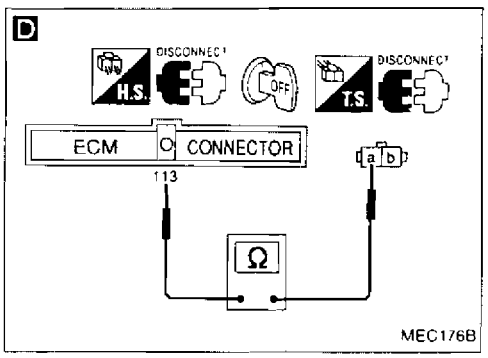
CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect VTC solenoid valve harness connector.
3) Turn ignition switch "ON".
4) Check voltage between terminal ⓑ and ground.
Voltage: Battery voltage.

NG → Check the following.
- Harness connectors (M60), (F4)
- 10A fuse
- Harness continuity between VTC solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

D

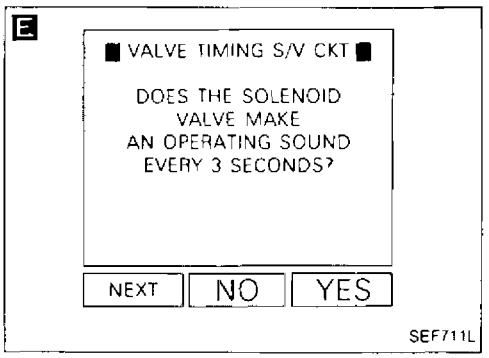


CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Check harness continuity between terminal ⓐ and ECM terminal (f13).
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

E



CHECK COMPONENT (VTC solenoid valve).

1) Reconnect ECM harness connector and VTC solenoid valve harness connector.
2) Turn ignition switch "ON".
3) Perform "VALVE TIMING S/V CKT" in "FUNCTION TEST" mode with CONSULT

NG → Replace VTC solenoid valve.

OR

3) Perform "VALVE TIMING SOL" in "ACTIVE TEST" mode with CONSULT.
4) Turn VTC solenoid valve "ON" and "OFF", and check operating sound.

OR

Refer to "Electrical Components Inspection". (See page EC-205.)

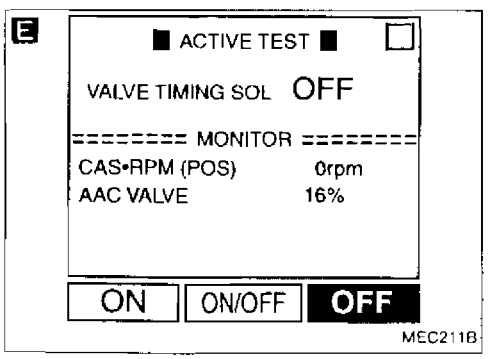
OK ↓

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.

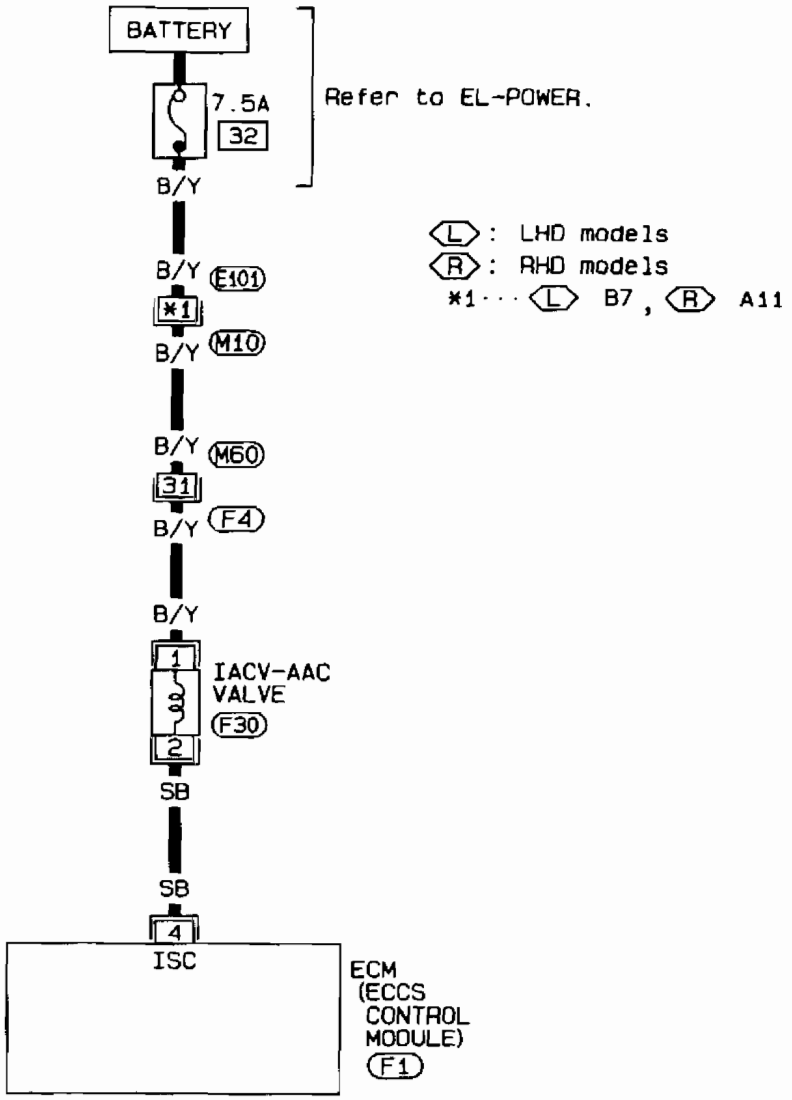
E

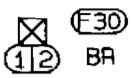


Diagnostic Procedure 39

IACV-AAC VALVE (Not self-diagnostic item)

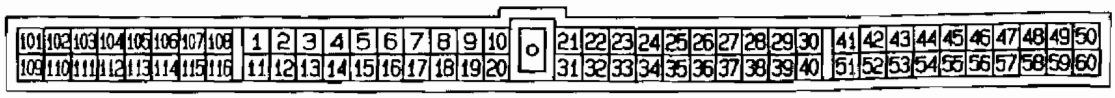
EC-AAC/V-01





Refer to last page (Foldout page).

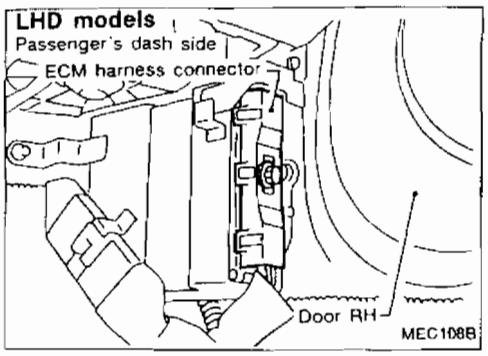
M10 , E101
M60 , F4

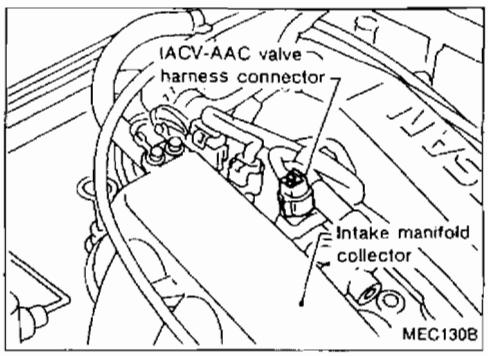


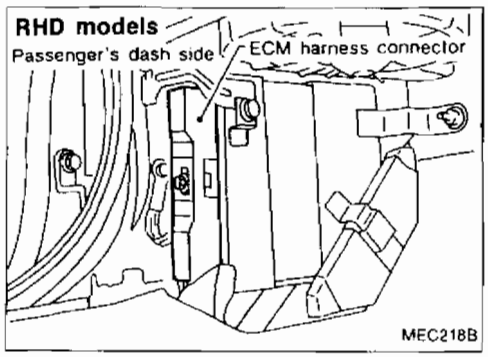
SEF840P

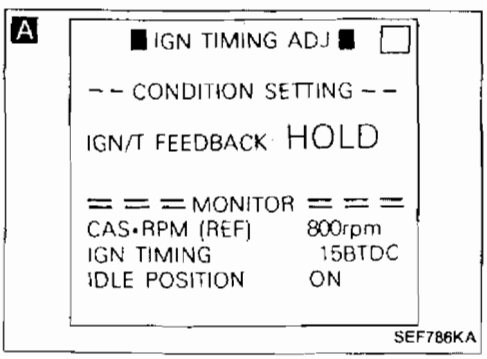
Diagnostic Procedure 39 (Cont'd)

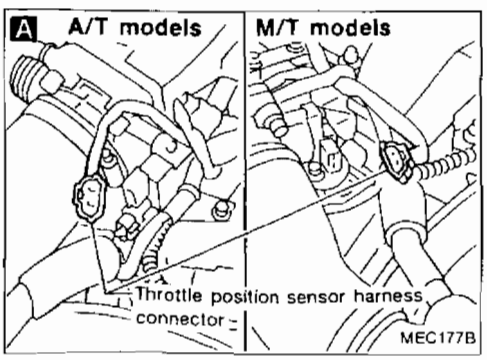
Harness layout

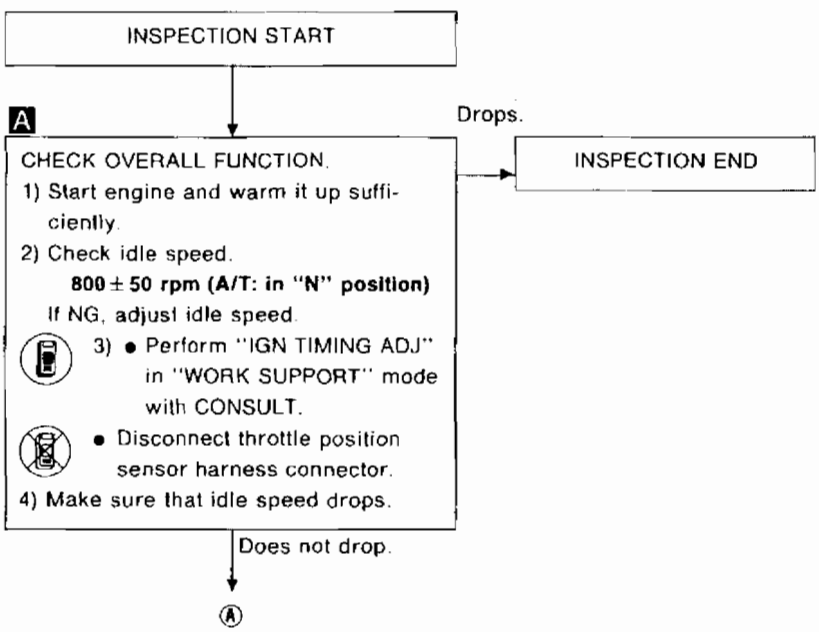




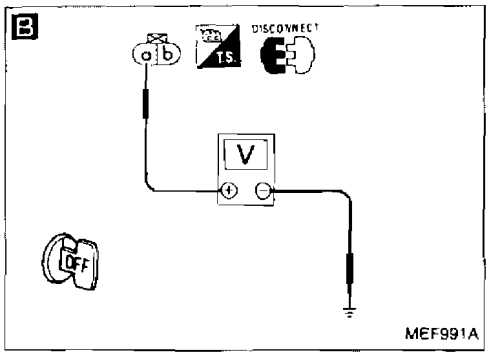


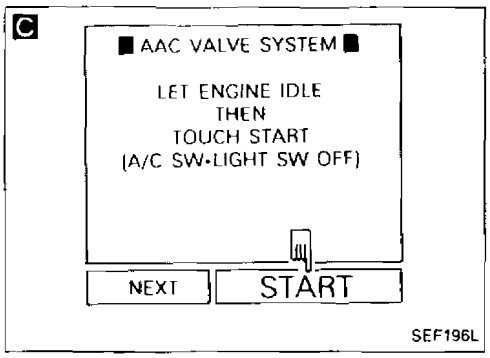


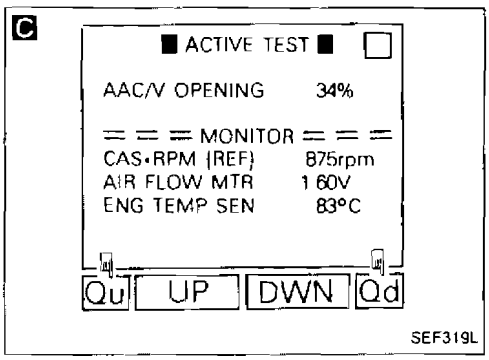


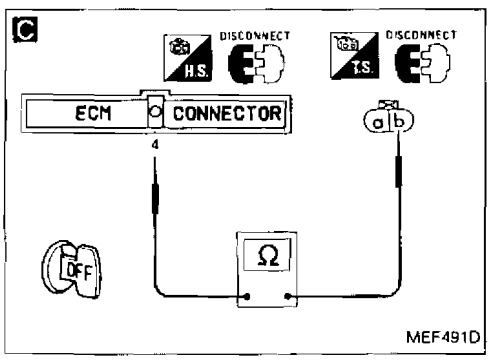


Diagnostic Procedure 39 (Cont'd)









Ⓐ

B

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect IACV-AAC valve harness connector.
3) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4)
- 7.5A fuse
- Harness continuity between IACV-AAC valve and fuse

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1) Reconnect IACV-AAC valve harness connector.
2) Perform "AAC VALVE SYSTEM" or "IACV-AAC/V SYSTEM" in "FUNCTION TEST" mode with CONSULT.

NG → Repair harness or connectors.

OR

2) Perform "AAC VALVE OPENING TEST" or "IACV-AAC/V OPENING" in "ACTIVE TEST" mode with CONSULT.

OR

1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ④ and terminal ⓑ.
Continuity should exist.

OK ↓

CHECK COMPONENT (IACV-AAC valve).
Refer to "Electrical Components Inspection". (See page EC-204.)

NG → Replace IACV-AAC valve.

OK ↓

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

Trouble is not fixed. ↓

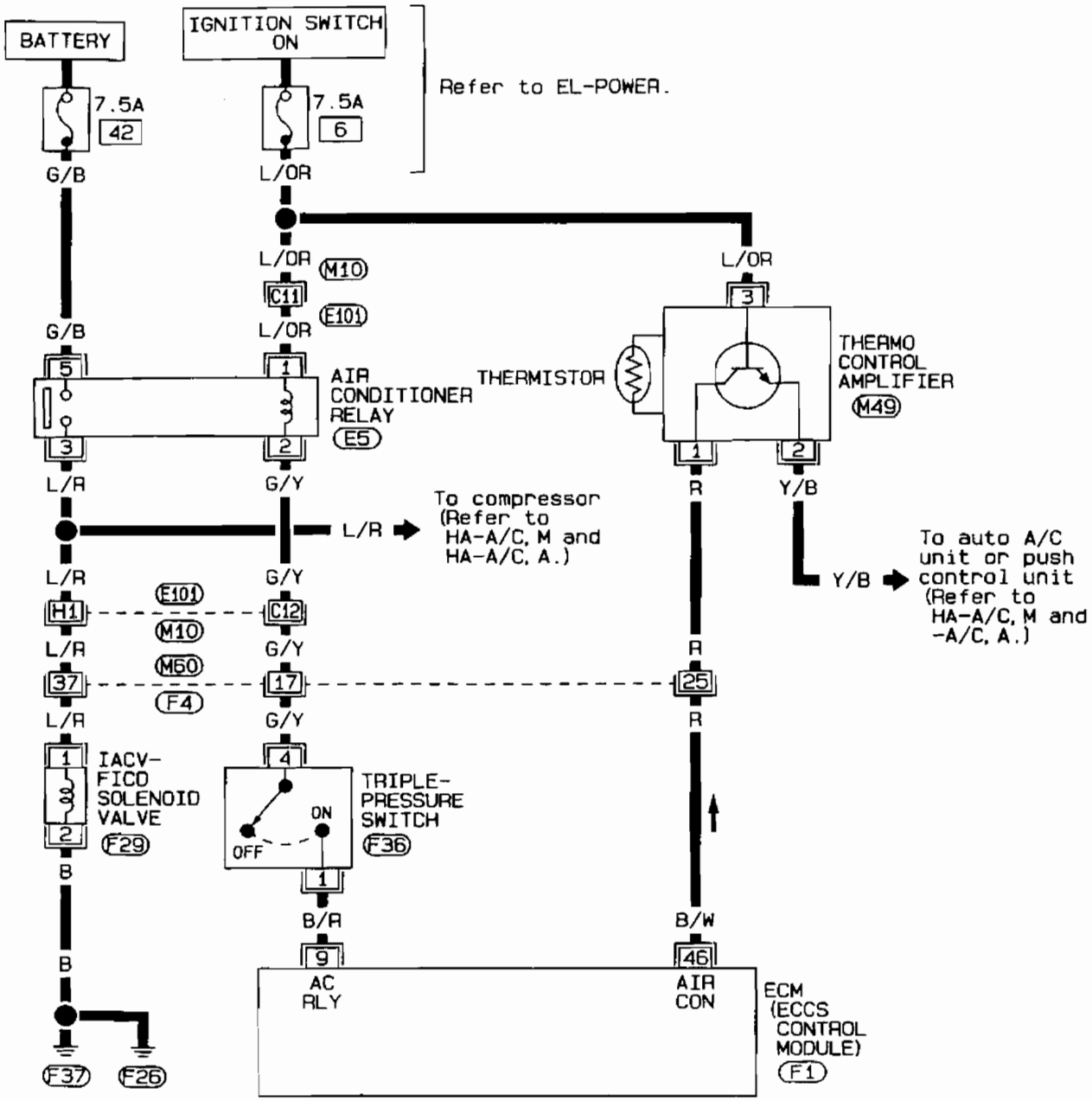
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

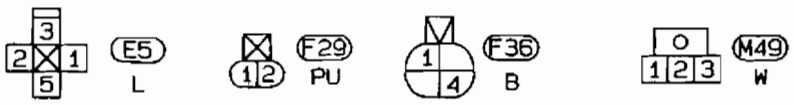
Diagnostic Procedure 40

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

LHD MODELS

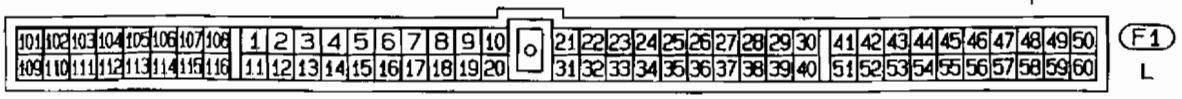
EC-FICD-01





Refer to last page (Foldout page).

M10, E101
M60, F4

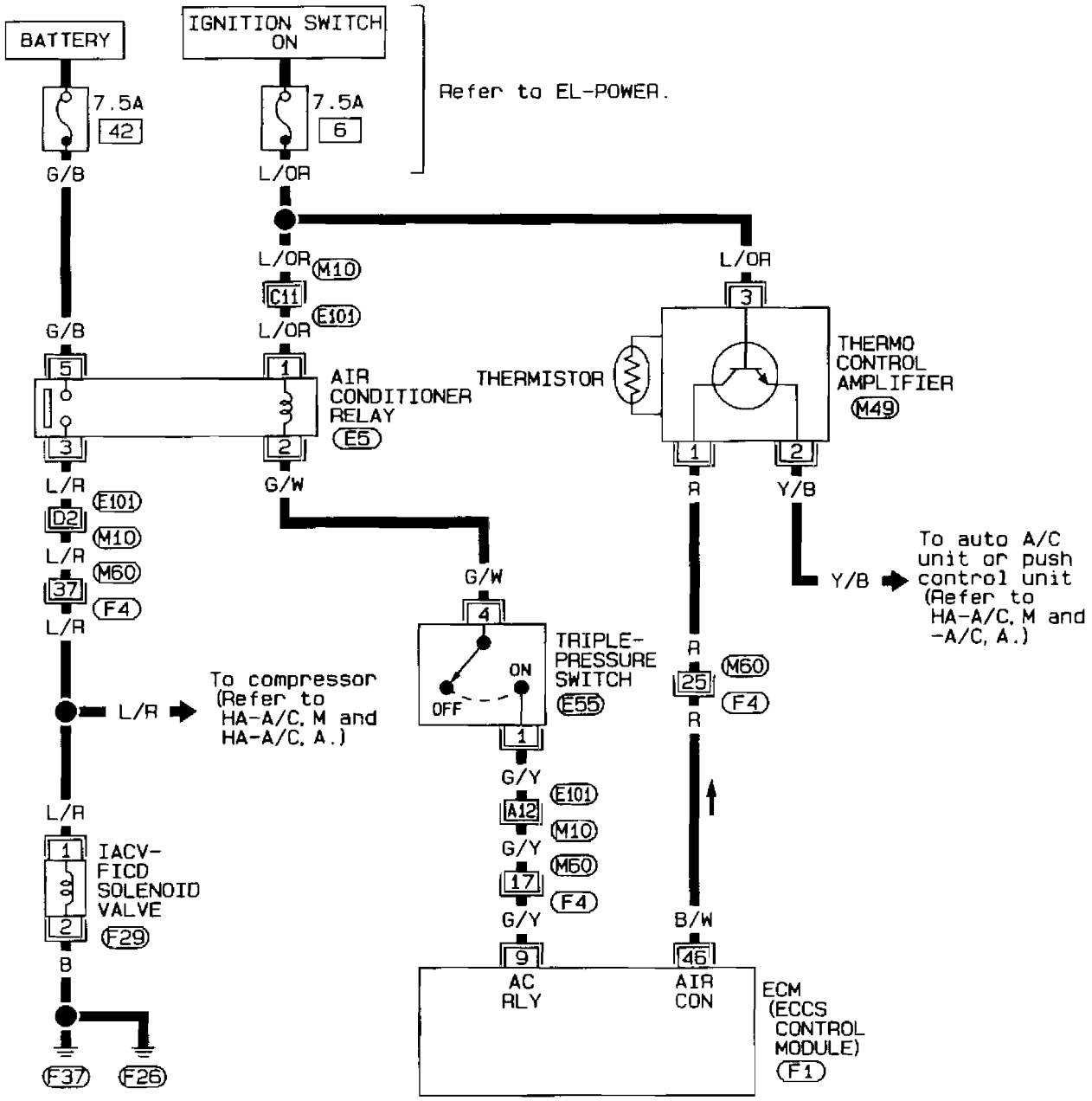


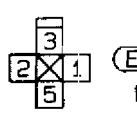
H.S.

SEF846P

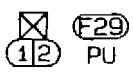
RHD MODELS

EC-FICD-02



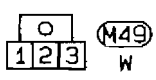


E5
L



F29
PU

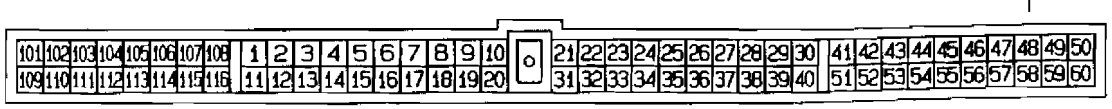
E55
B



M49
W

Refer to last page (Foldout page).

M10, E101
M60, F4



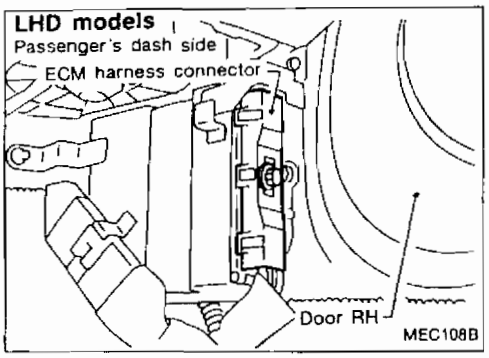
F1
L

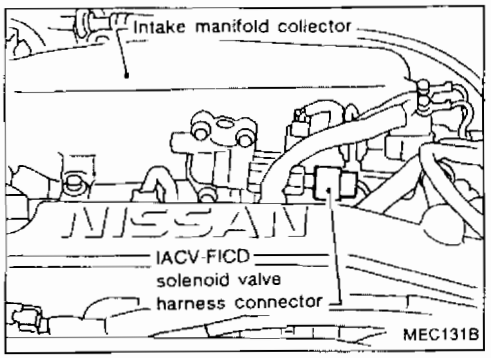
H.S.

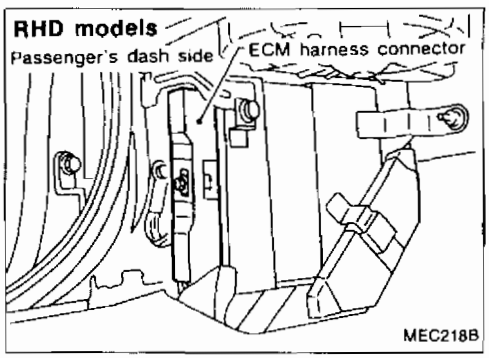
SEF847P

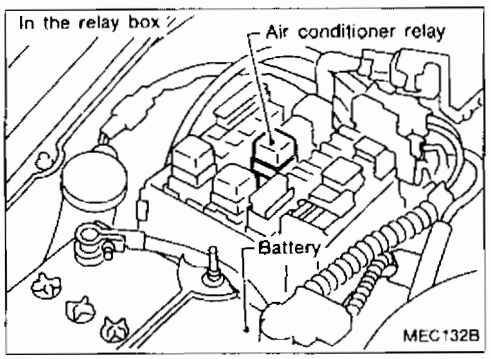
Diagnostic Procedure 40 (Cont'd)

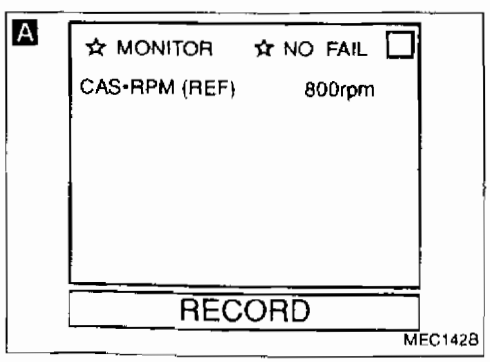
Harness layout

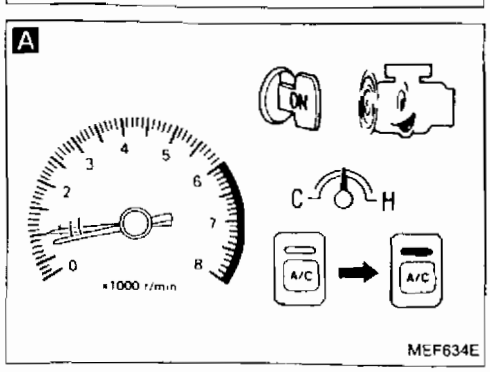


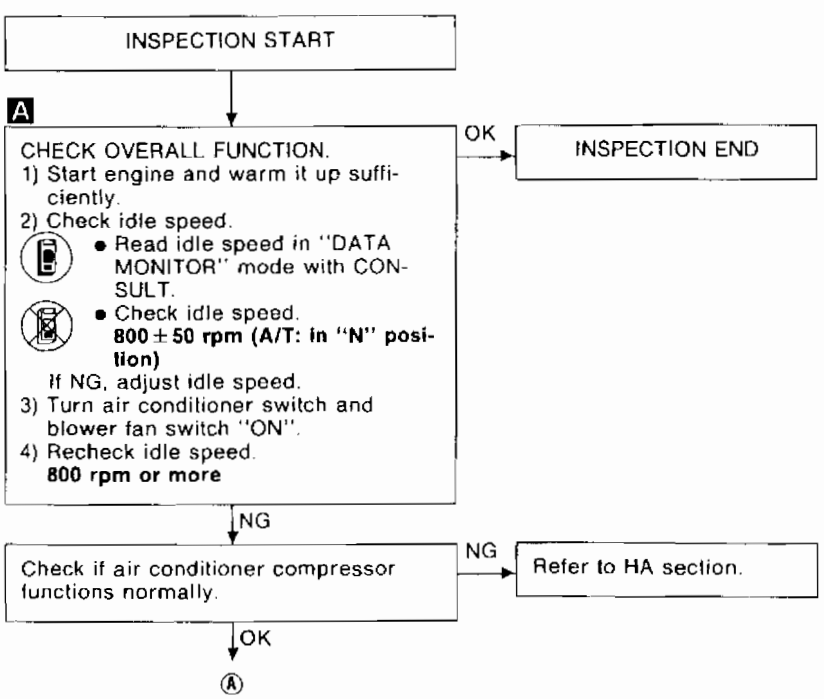




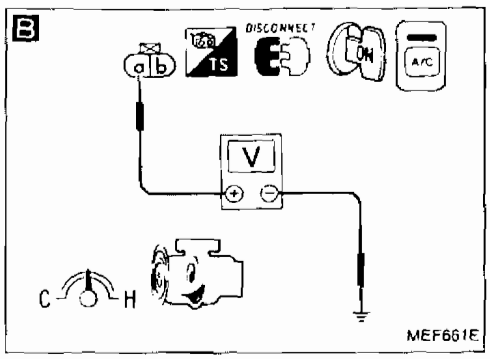


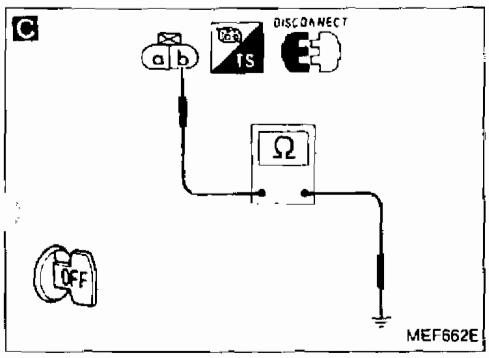






Diagnostic Procedure 40 (Cont'd)





Ⓐ

B

CHECK POWER SUPPLY.
1) Stop engine and turn air conditioner switch and blower fan switch "OFF".
2) Disconnect IACV-FICD solenoid valve harness connector.
3) Restart engine and turn air conditioner switch and blower fan switch "ON".
4) Check voltage between terminal ⓐ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4)
- Harness continuity between A/C relay and IACV-FICD solenoid valve

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT.
1) Stop engine.
2) Check harness continuity between terminal ⓑ and engine ground.
Continuity should exist.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (IACV-FICD solenoid valve).
Refer to "Electrical Components Inspection". (See page EC-205.)

NG → Replace IACV-FICD solenoid valve.

OK ↓

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

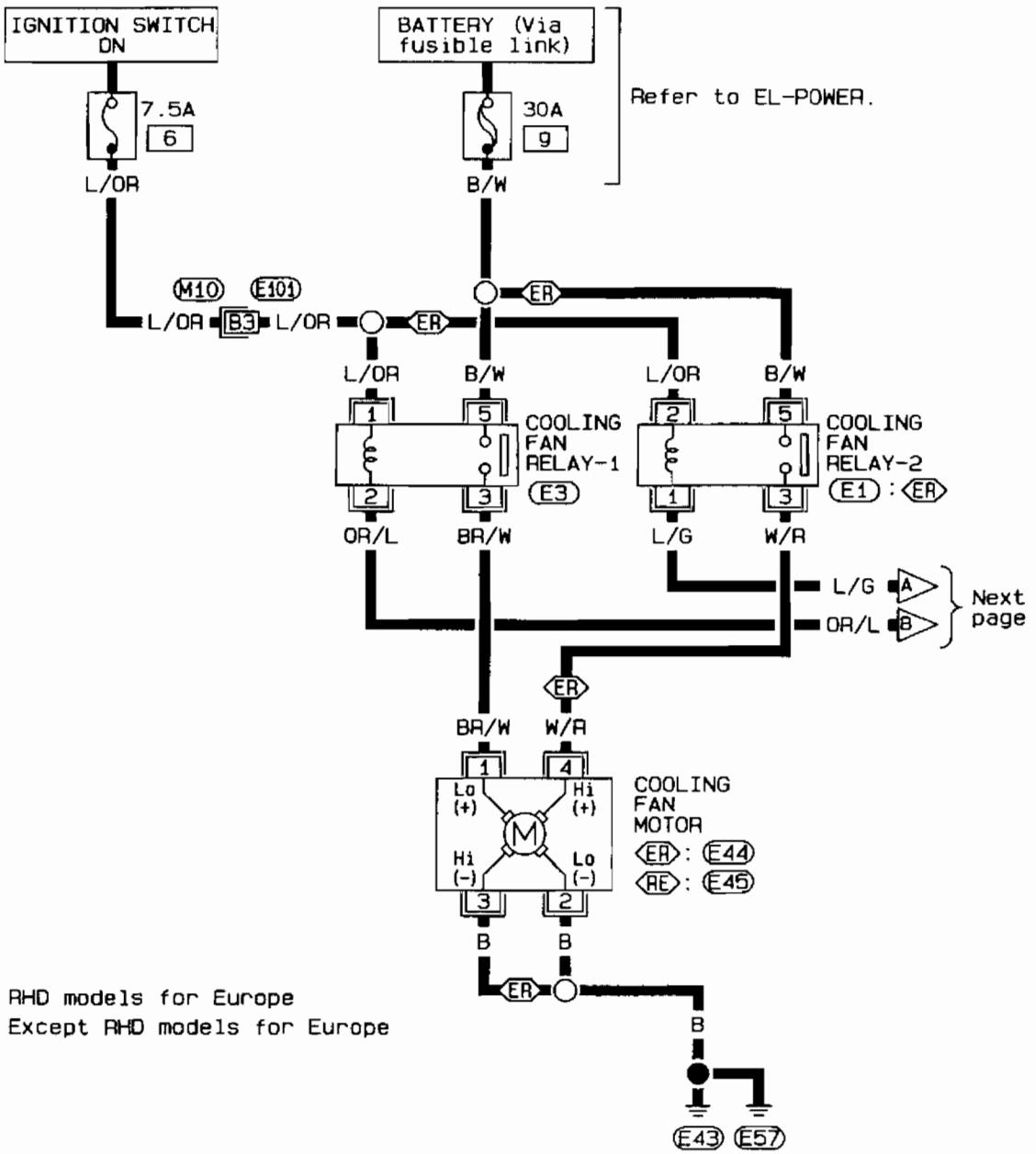
Trouble is not fixed. ↓

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

Diagnostic Procedure 41

COOLING FAN CONTROL (Not self-diagnostic item)

EC-COOL/F-01



E1, E3 (L, L)

E44 (W)

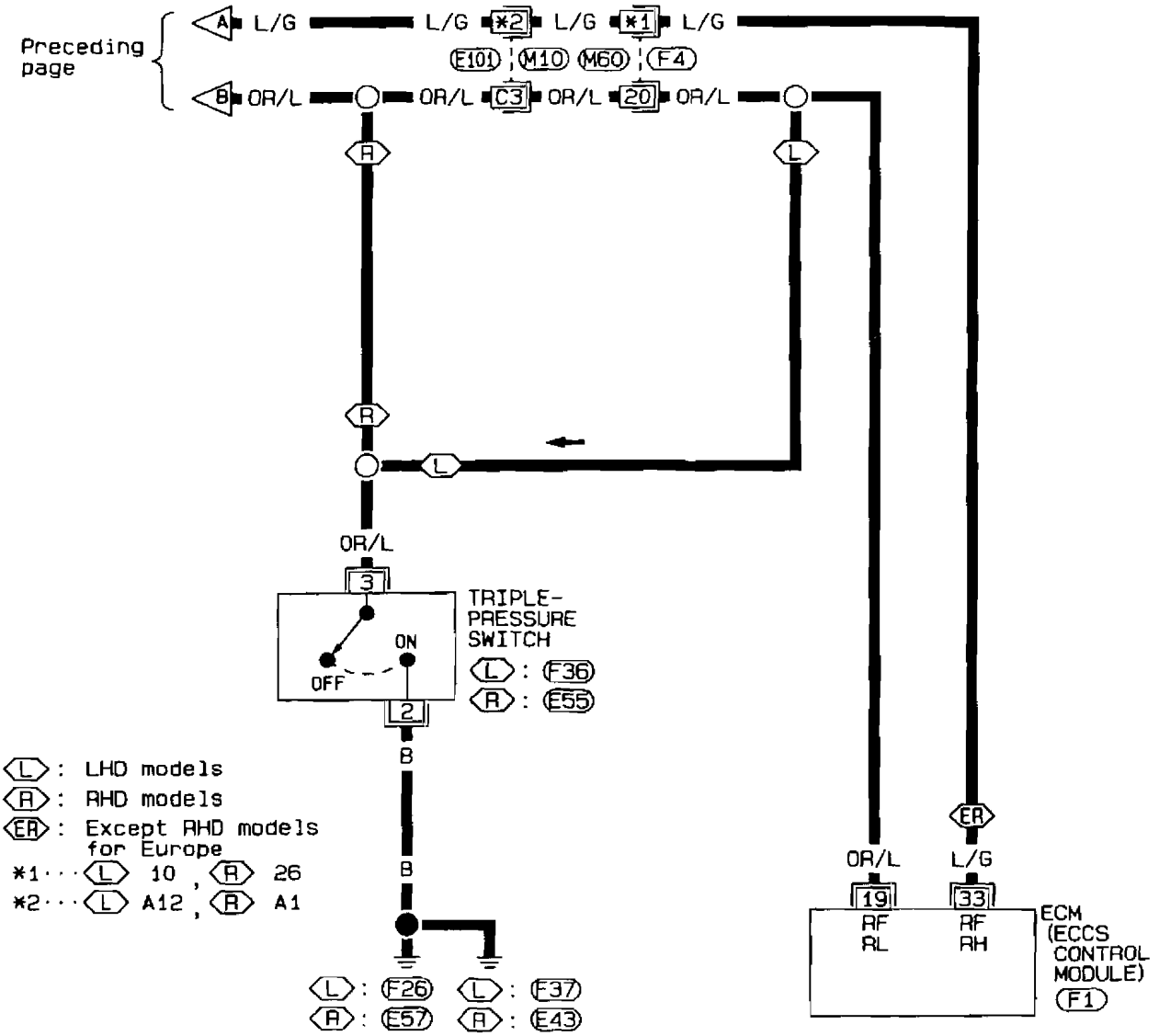
E45 (W)

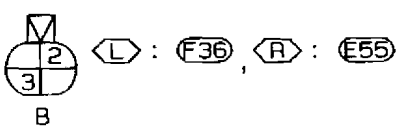
Refer to last page (Foldout page).

M10, E101

SEF850P

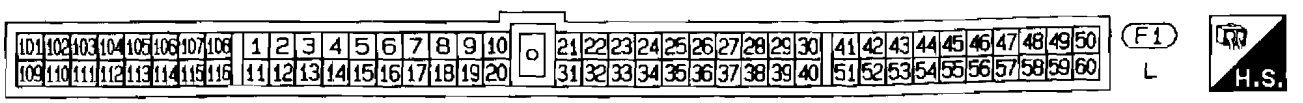
EC-COOL/F-02





Refer to last page (Foldout page).

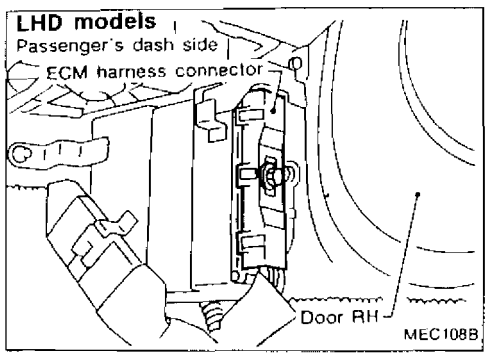
M10 , E101
M60 , F4

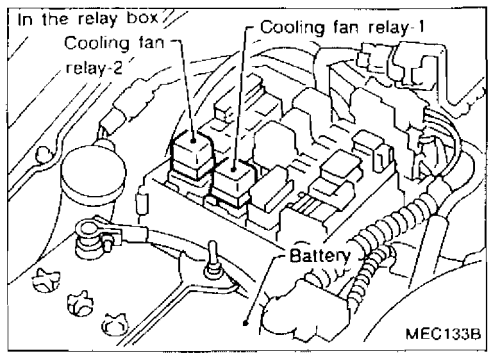


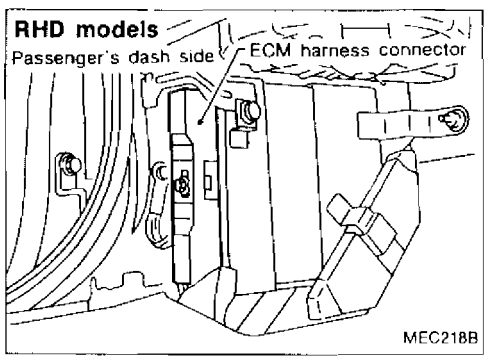
SEF851P

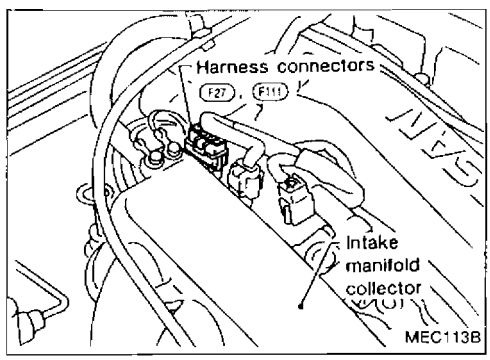
Diagnostic Procedure 41 (Cont'd)

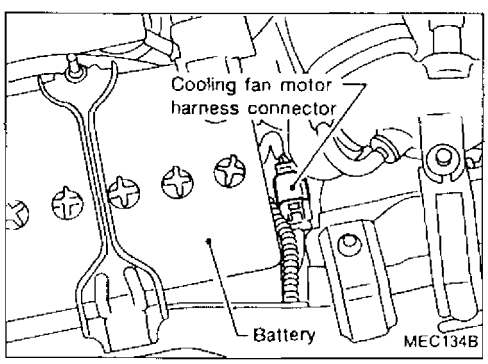
Harness layout

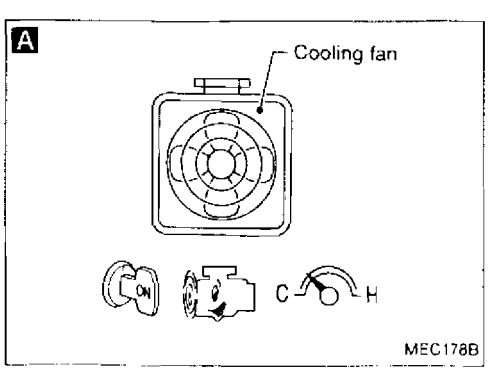


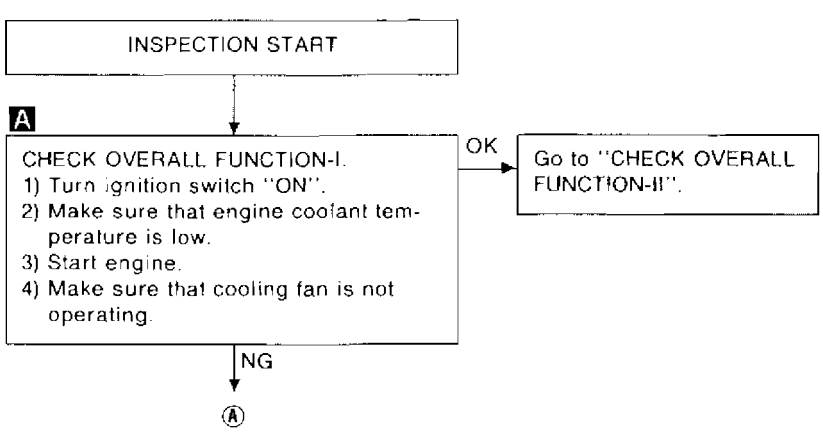




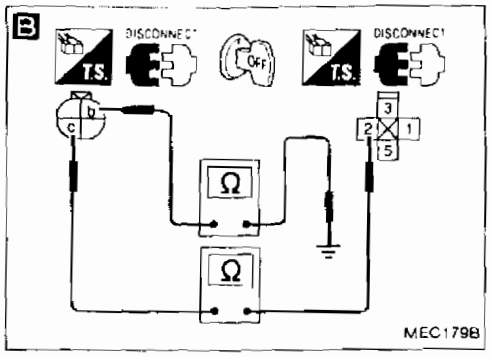








Diagnostic Procedure 41 (Cont'd)



Ⓐ

B

CHECK HARNESS CONTINUITY BETWEEN COOLING FAN RELAY-1 AND GROUND.
1) Stop engine.
2) Disconnect cooling fan relay-1.
3) Disconnect triple-pressure switch harness connector.
4) Check harness continuity between terminal ② and terminal ⓒ, terminal ⓑ and body ground.
Continuity should exist.

NG → Check the following.
- Harness connectors (E101), (M10) (LHD models)
- Harness connectors (M60), (F4) (LHD models)
- Harness continuity between cooling fan relay-1 and triple-pressure switch
- Harness continuity between triple-pressure switch and body ground.

If NG, repair harness or connectors.

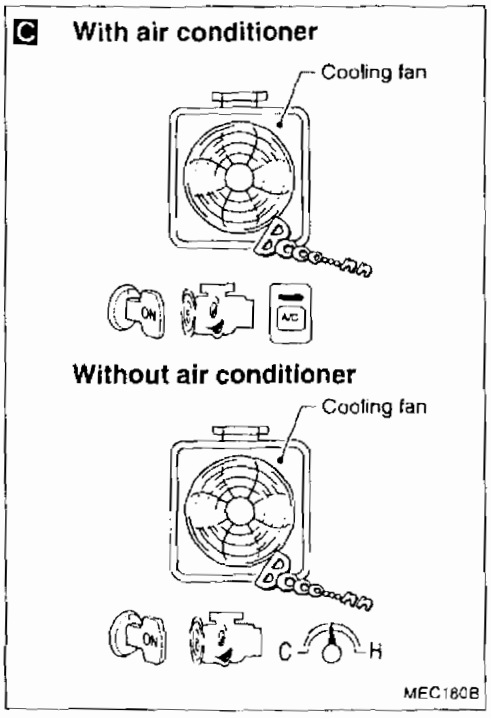
OK ↓

CHECK COMPONENT (Triple-pressure switch).
Refer to "HA section".

NG → Replace triple-pressure switch.

OK ↓

Go to "CHECK OUTPUT SIGNAL CIRCUIT" in **PROCEDURE A**



CHECK OVERALL FUNCTION-II.

C

CHECK COOLING FAN LOW SPEED OPERATION.

With air conditioner
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.

Without air conditioner
1) Start engine.
2) Keep engine speed at about 2,000 rpm until engine is warmed up sufficiently.
3) Make sure that cooling fan begins to operate at low speed during warm-up.

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

(RE): RHD models for Europe
(ER): Except RHD models for Europe

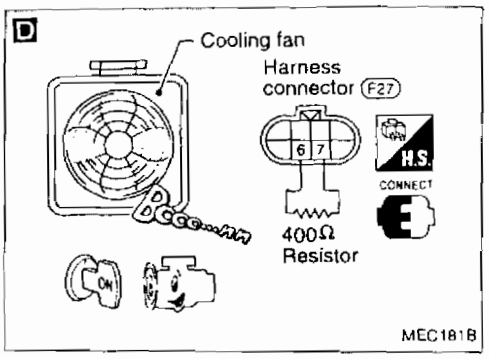
OK ↓

(RE) → INSPECTION END

(ER) ↓

Ⓑ

Diagnostic Procedure 41 (Cont'd)



Ⓑ

D

CHECK COOLING FAN HIGH SPEED OPERATION.

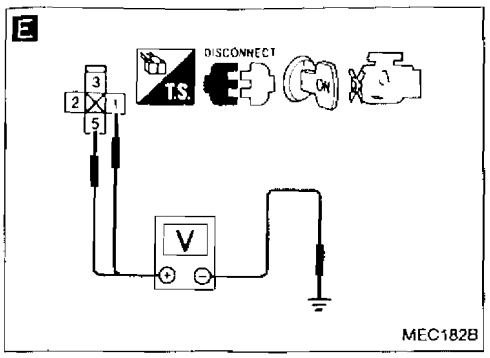
1) Turn both air conditioner switch and blower fan switch "OFF".
2) Stop engine.
3) Connect 400 Ω resistor between terminals ⑥ and ⑦ on harness connector F27. (Refer to "Diagnostic Procedure 25".)
4) Restart engine and make sure that cooling fan operates at high speed.

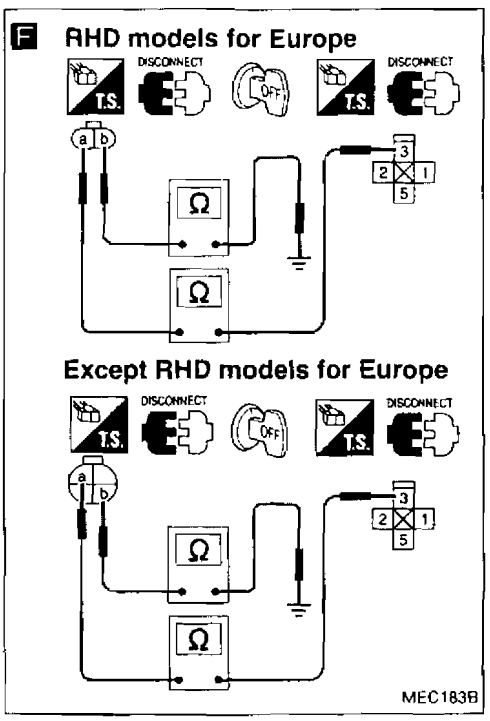
NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B)

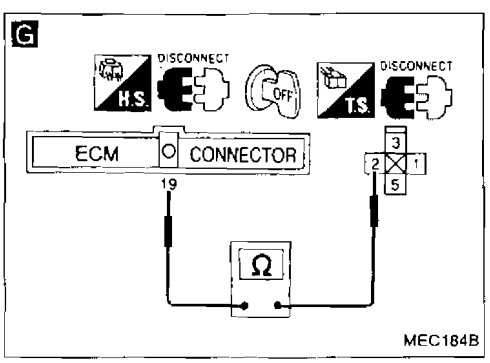
OK ↓

INSPECTION END

Diagnostic Procedure 41 (Cont'd)







PROCEDURE A

INSPECTION START

E

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect cooling fan relay-1.
3) Turn ignition switch "ON".
4) Check voltage between terminals ①, ⑤ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M10), (E101)
- 7.5A fuse
- 30A fusible link
- Harness continuity between cooling fan relay-1 and fuse
- Harness continuity between cooling fan relay-1 and fusible link

If NG, repair harness or connectors.

OK

F

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

NG → Repair harness or connectors.

OK

G

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

NG → Check the following.
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4)
- Harness continuity between ECM and cooling fan relay-1

If NG, repair harness or connectors.

OK

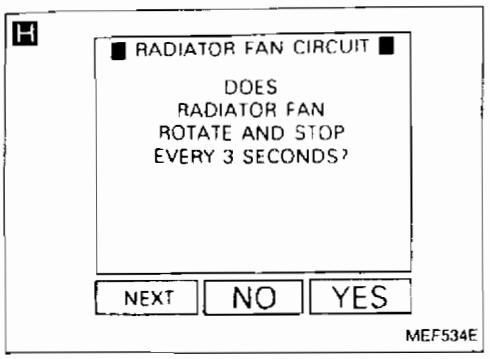
CHECK COMPONENT
(Cooling fan relay-1).
Refer to "Electrical Components Inspection". (See page EC-206.)

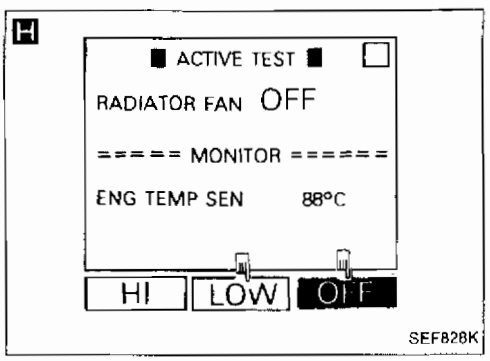
NG → Replace cooling fan relay.

OK

Ⓒ

Diagnostic Procedure 41 (Cont'd)





Ⓒ

H

CHECK COMPONENT
(Cooling fan motor).
1) Reconnect cooling fan relay-1, cooling fan motor harness connector and ECM harness connector.
2) Turn ignition switch "ON".
3) Perform "RADIATOR FAN CIRCUIT" or "COOLING FAN CIRCUIT in "FUNCTION TEST" mode with CONSULT.

OR

3) Perform "RADIATOR FAN TEST" or "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

Refer to "Electrical Components Inspection". (See page EC-206.)

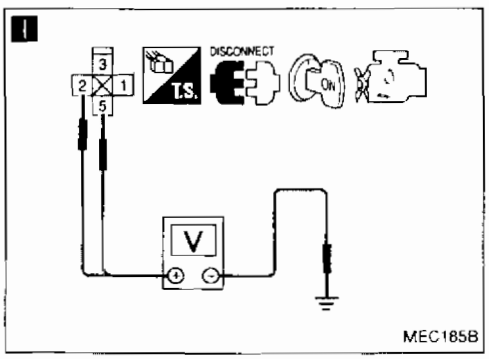
NG → Replace cooling fan motor.

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.



PROCEDURE B

INSPECTION START ↓

I

CHECK POWER SUPPLY.
1) Stop engine.
2) Disconnect cooling fan relay-2.
3) Turn ignition switch "ON".
4) Check voltage between terminals ②, ⑤ and ground.
Voltage: Battery voltage

NG → Check the following.
- Harness continuity between cooling fan relay-2 and harness connector (E101)
- Harness continuity between cooling fan relay-2 and fusible link

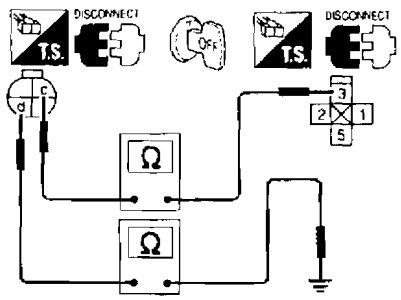
If NG, repair harness or connectors.

OK ↓

Ⓑ

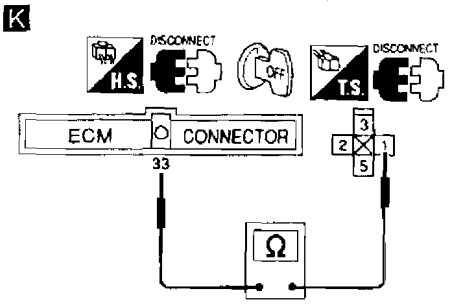
Diagnostic Procedure 41 (Cont'd)

J



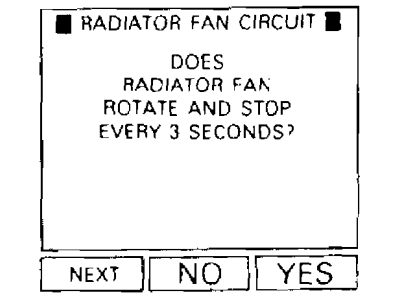
MEC186B

K



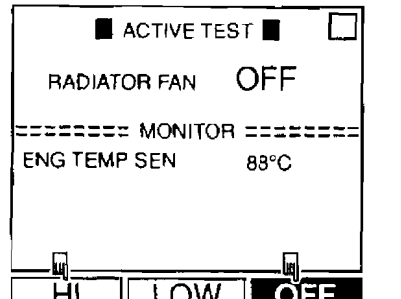
MEC187B

L



MEF534E

L



MEC188B

Ⓑ

J

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

NG → Repair harness or connectors.

OK ↓

K

CHECK OUTPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ㉝ and terminal ①.
Continuity should exist.

NG → Check the following.
- Harness connectors (E101), (M10)
- Harness connectors (M60), (F4)
- Harness continuity between ECM and cooling fan relay-2

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-2).
Refer to "Electrical Components Inspection". (See page EC-206.)

NG → Replace cooling fan relay.

OK ↓

L

CHECK COMPONENT
(Cooling fan motor).

1) Reconnect cooling fan relay-2, cooling fan motor harness connector and ECM harness connector.
2) Disconnect 400 Ω resistor from harness connector (F27).
3) Turn ignition switch "ON".
4) Perform "RADIATOR FAN CIRCUIT" or "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

— OR —

4) Perform "RADIATOR FAN TEST" or "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

— OR —

Refer to "Electrical Components Inspection". (See page EC-206.)

NG → Replace cooling fan motor.

OK ↓

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

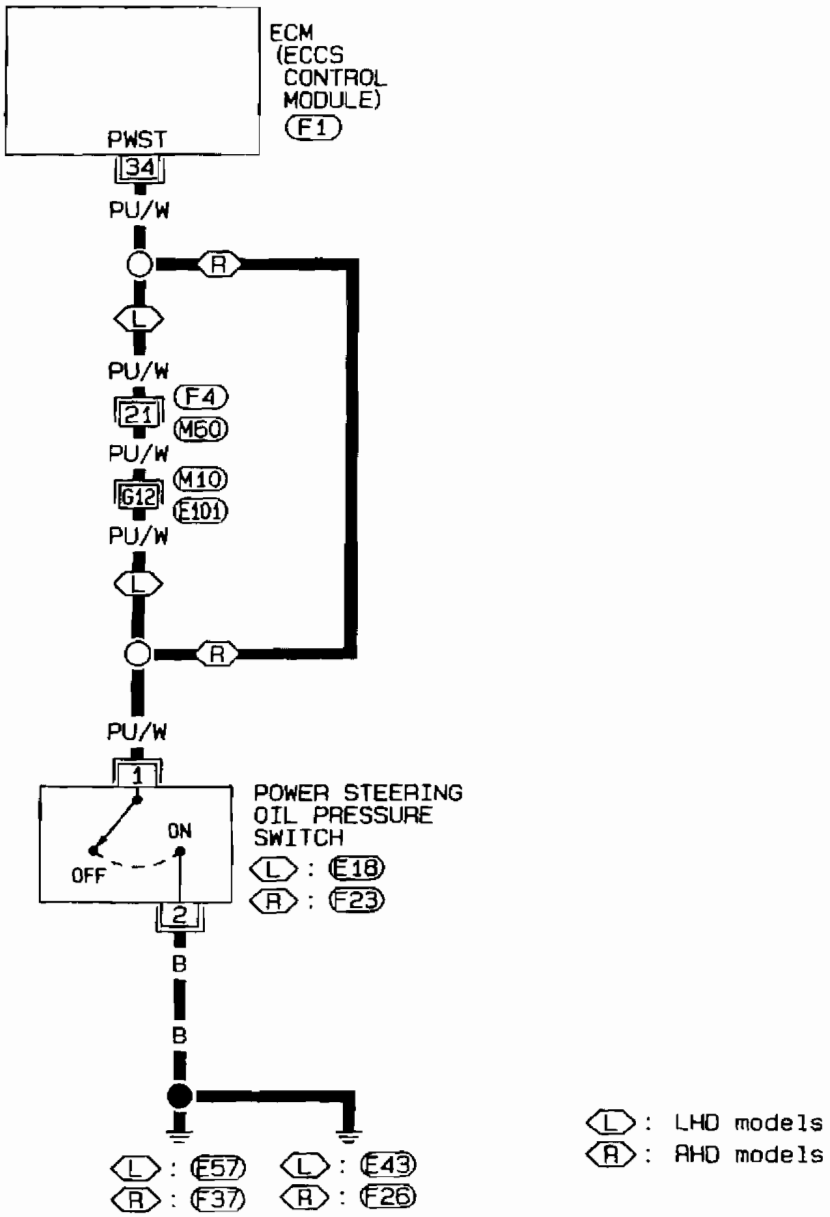
Trouble is not fixed. ↓

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

Diagnostic Procedure 42

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

EC-PST/SW-01



1 2 W L : E18, R : F23

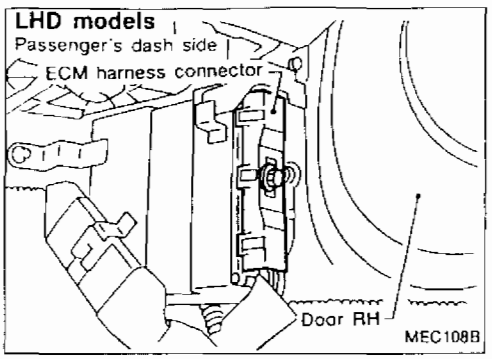
Refer to last page (Foldout page).

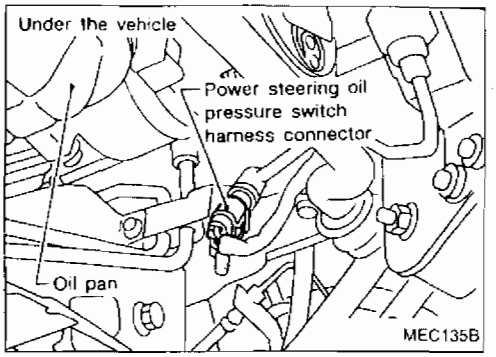
M10, E101
M60, F4

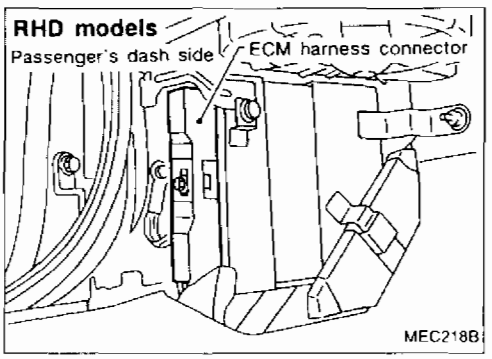
SEF848P

Diagnostic Procedure 42 (Cont'd)

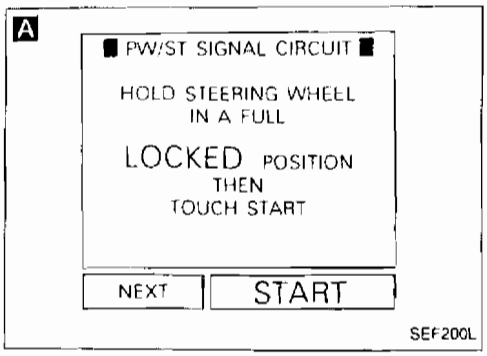
Harness layout

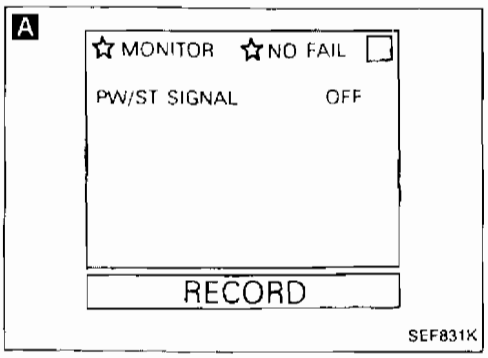


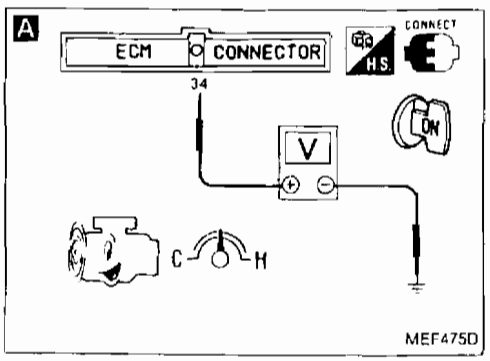


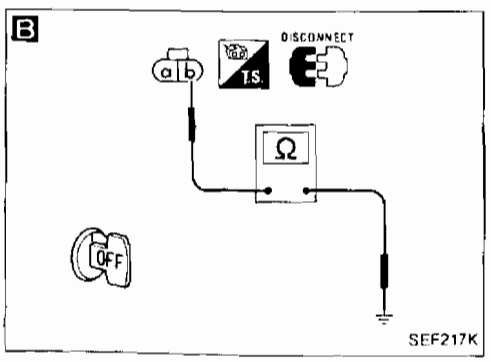


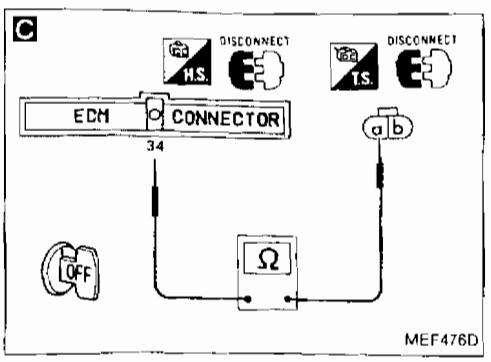
Diagnostic Procedure 42 (Cont'd)











INSPECTION START

A

CHECK CONTROL FUNCTION.
1) Start engine and warm it up sufficiently.
2) Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

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

OR

2) Check voltage between ECM terminal ㉞ and ground.
Voltage:
When steering wheel is turned quickly
Approximately 0V
Except above
4 - 5V

OK → INSPECTION END

NG

B

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

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1) Disconnect ECM harness connector.
2) Check harness continuity between ECM terminal ㉞ and terminal ⓐ.
Continuity should exist.

NG → Check the following.
- Harness connectors (F4), (M60) (LHD models)
- Harness connectors (M18), (E101) (LHD models)
- Harness continuity between ECM and power steering oil pressure switch

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "Electrical Components Inspection". (See page EC-206.)

NG → Replace power steering oil pressure switch.

OK

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

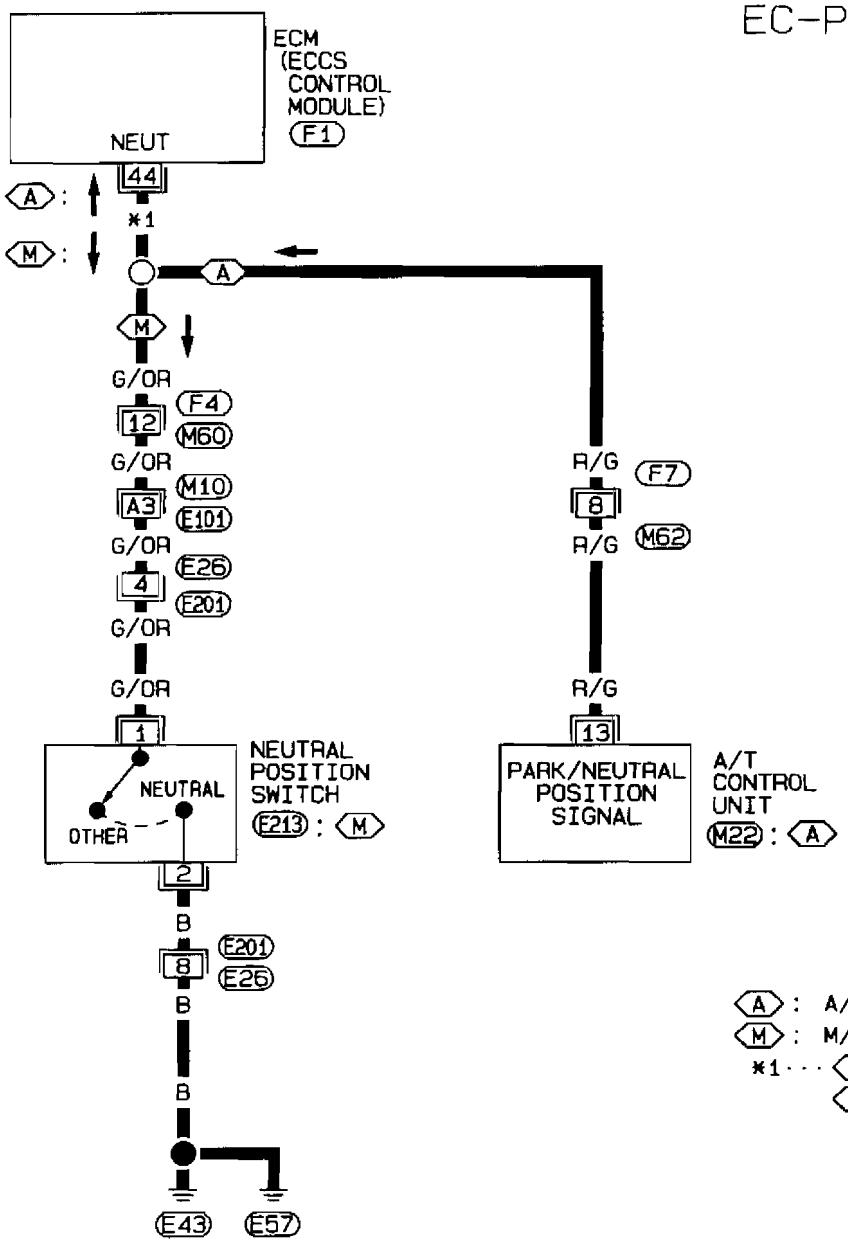
Trouble is not fixed.

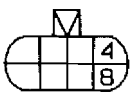
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

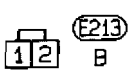
Diagnostic Procedure 43

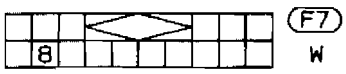
NEUTRAL POSITION SWITCH & A/T CONTROL UNIT (PARK/NEUTRAL POSITION SIGNAL)
(Not self-diagnostic item)

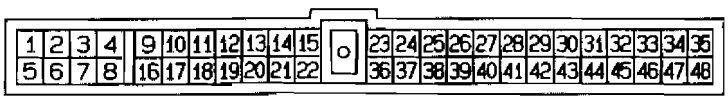
EC-PNP/SW-01





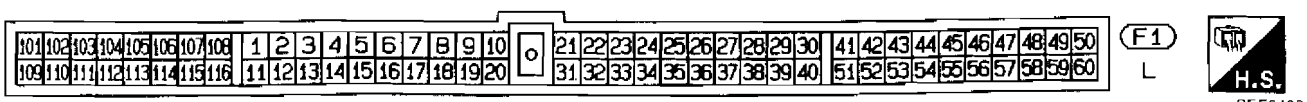






Refer to last page
(Foldout page).

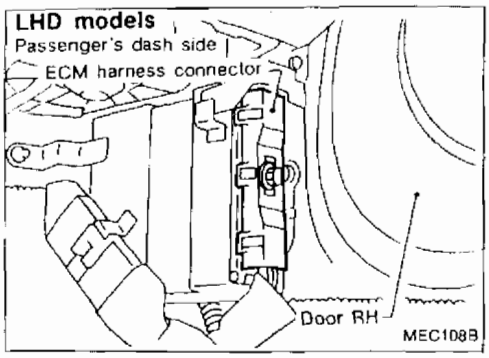
M10, E101
M60, F4

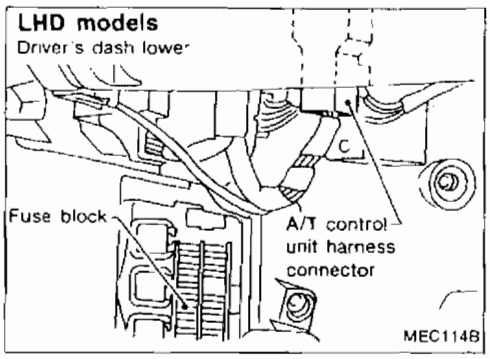


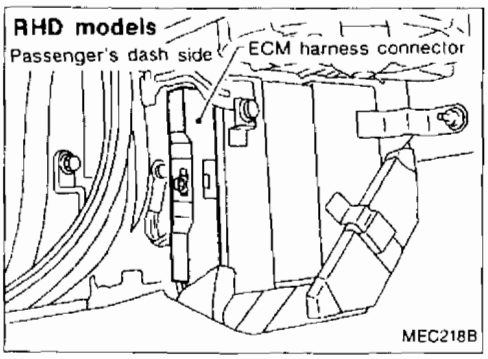
SEF843P

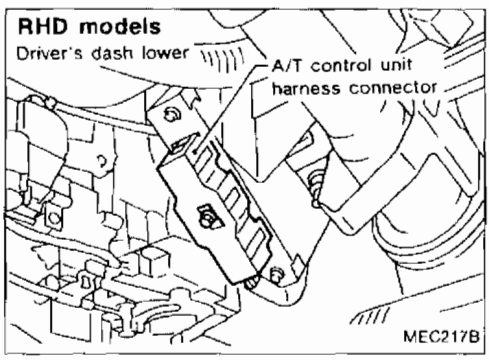
Diagnostic Procedure 43 (Cont'd)

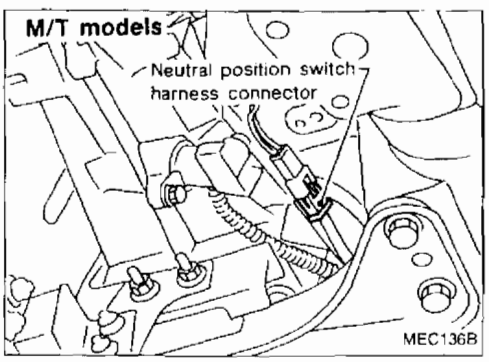
Harness layout





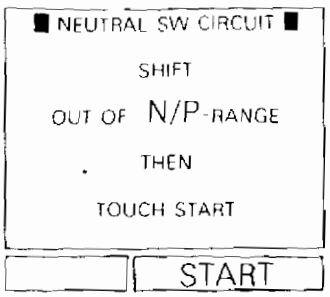






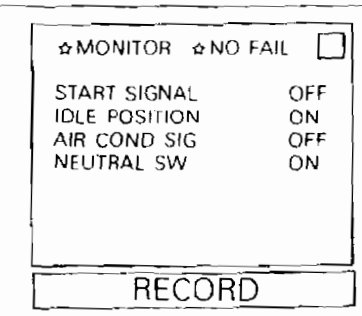
Diagnostic Procedure 43 (Cont'd)

A



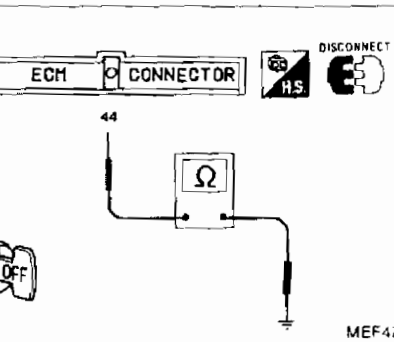
SEF206L

A



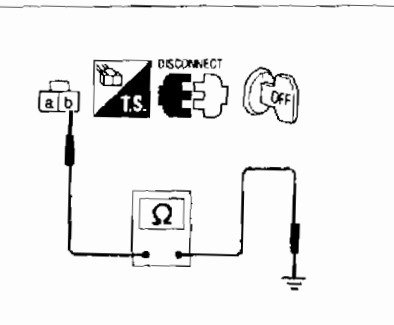
SEF384J

A



MEF479D

B



MEC189B

Neutral position switch

INSPECTION START

A

CHECK OVERALL FUNCTION.

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

OK → INSPECTION END

OR

2) Check "NEUTRAL SW" or "NEUT POSI SW" signal in "DATA MONITOR" mode with CONSULT.
Neutral position: ON
Except above: OFF

OR

1) Set shift lever to the neutral position.
2) Disconnect ECM harness connector.
3) Check harness continuity between ECM terminal (44) and body ground.
Continuity should exist.

NG

Turn ignition switch "OFF".

B

CHECK GROUND CIRCUIT.

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

NG → Check the following.
- Harness connectors (E201), (E26)
- Harness continuity between neutral position switch and body ground

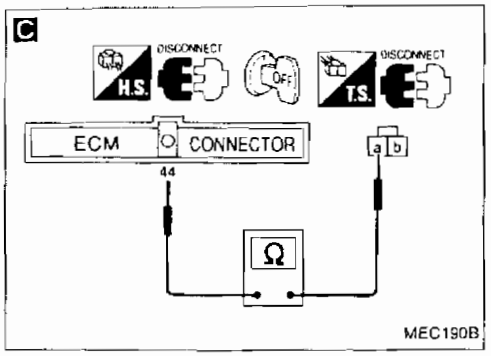
If NG, repair harness or connectors.

OK

Disconnect ECM harness connector

Ⓐ

Diagnostic Procedure 43 (Cont'd)



Ⓐ

C

CHECK INPUT SIGNAL CIRCUIT
1) Check harness continuity between ECM terminal ㊹ and terminal ⓐ.
Continuity should exist.

NG → Check the following.
- Harness connectors (F4), (M60)
- Harness connectors (M10), (E101)
- Harness connectors (E26), (E201)
- Harness continuity between ECM and neutral position switch

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Neutral position switch)
Refer to "ON-VEHICLE SERVICE" in MT section.

NG → Replace neutral position switch.

OK ↓

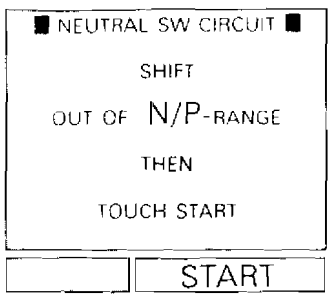
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

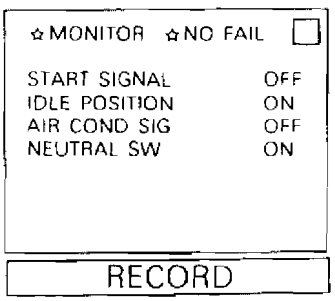
Diagnostic Procedure 43 (Cont'd)

D



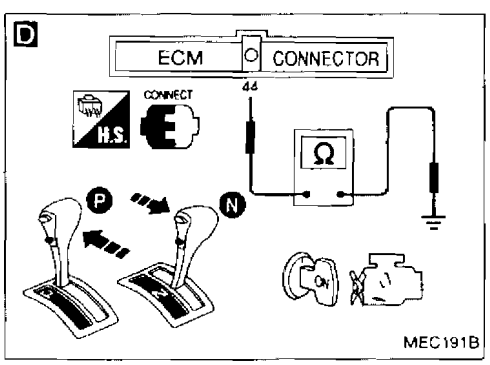
SEF206L

D



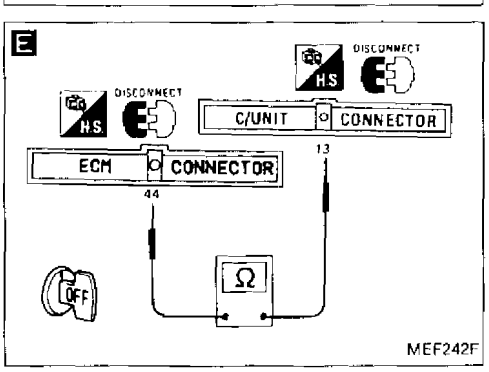
SEF384J

D



MEC191B

E



MEF242F

A/T CONTROL UNIT (PARK/NEUTRAL POSITION SIGNAL) CIRCUIT

INSPECTION START

D

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

OK → INSPECTION END

— OR —

2) Check "NEUTRAL SW" or "NEUT POSI SW" signal in "DATA MONITOR" mode with CONSULT.
"N" or "P": ON
Except above: OFF

— OR —

2) Check voltage between ECM terminal ㊹ and ground under the following conditions.
Voltage:
"N" or "P"
Approximately 0V
Except above
Approximately 5V

NG

E

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect A/T control unit harness connector.
4) Check harness continuity between ECM terminal ㊹ and terminal ⑬.
Continuity should exist.

NG → Check the following.
- Harness connectors (F7), (M62)
- Harness continuity between ECM and A/T control unit

If NG, repair harness or connectors.

OK

CHECK INHIBITOR SWITCH FUNCTION.
Make sure that inhibitor switch functions properly. (Refer to AT section).

NG → Check inhibitor switch and circuit (Refer to AT section.)

OK

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

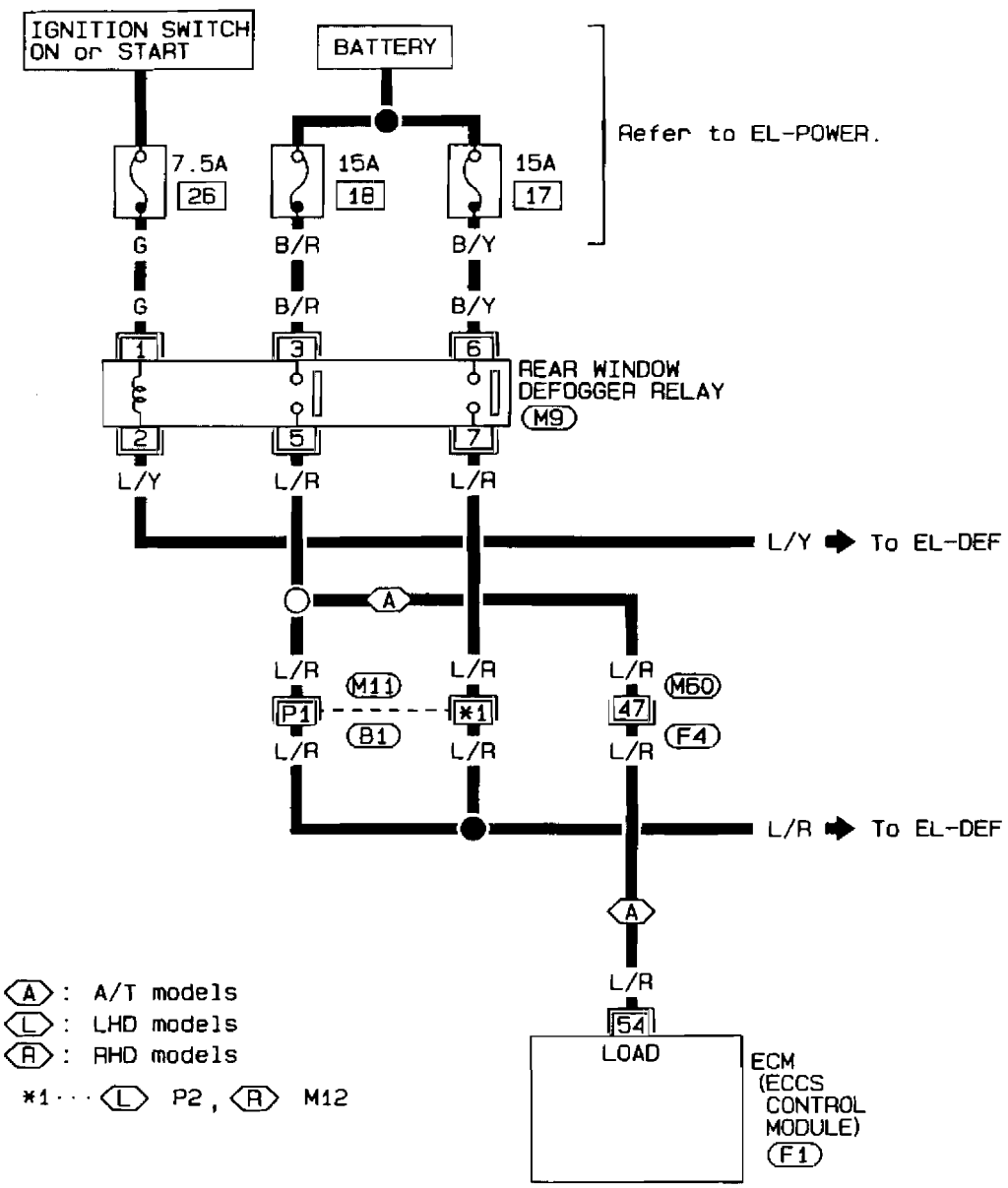
Trouble is not fixed.

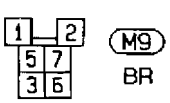
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 44

REAR WINDOW DEFOGGER SWITCH (Not self-diagnostic item)

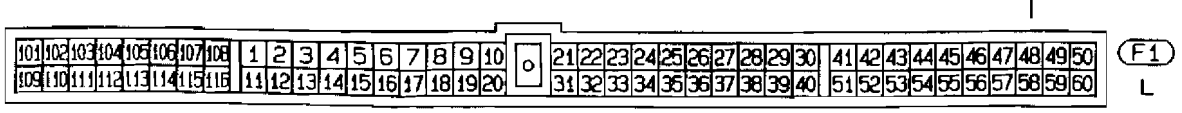
EC-DEF/S-01





Refer to last page (Foldout page).

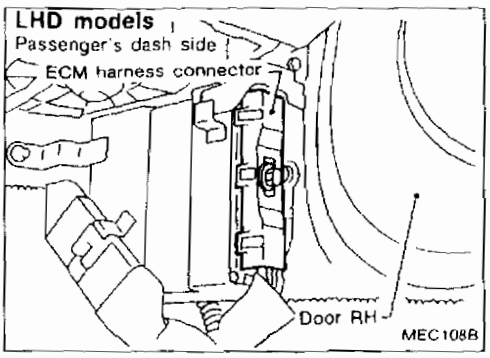
M11, B1
M60, F4

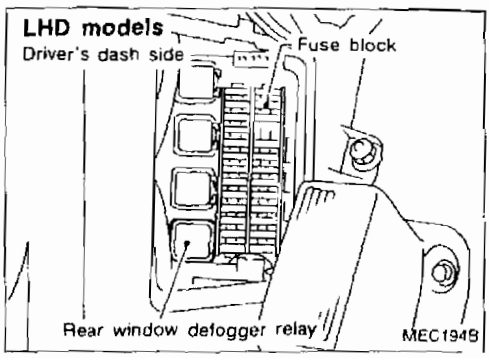


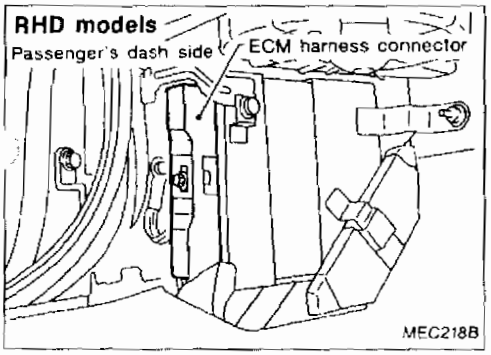
SEF849P

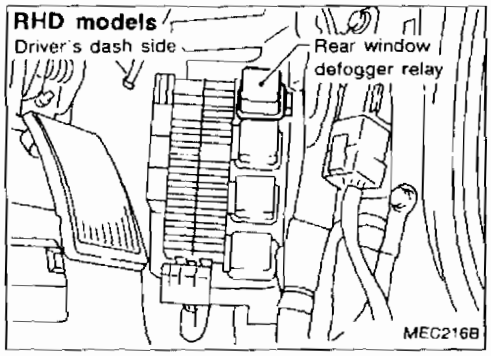
Diagnostic Procedure 44 (Cont'd)

Harness layout

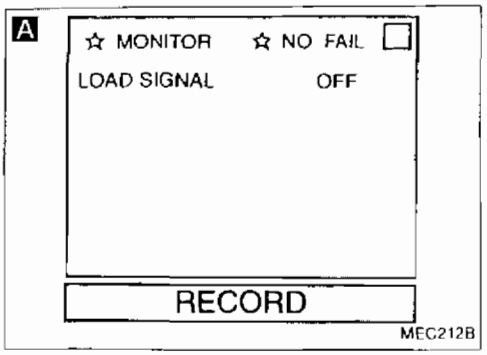


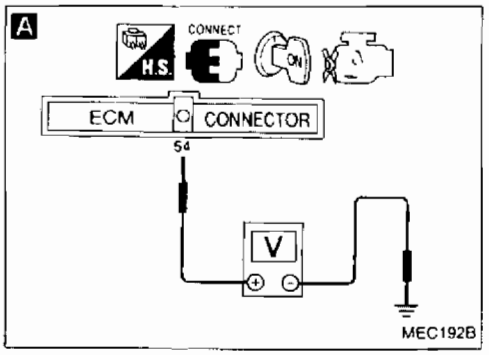


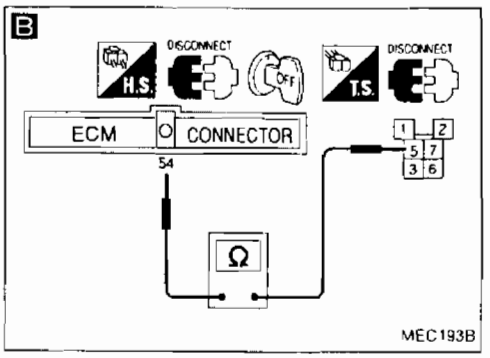




Diagnostic Procedure 44 (Cont'd)







INSPECTION START

A

CHECK OVERALL FUNCTION.
1) Turn ignition switch "ON".
2) Check "LOAD SIGNAL" in "DATA MONITOR" mode with CONSULT.
Rear window defogger switch "ON": ON
Rear window defogger switch "OFF": OFF

OR

2) Check voltage between ECM terminal (54) and ground under the following conditions.
Voltage:
Rear window defogger switch "ON"
Battery voltage
Rear window defogger switch "OFF"
Approximately 0V

OK → INSPECTION END

NG

Check if rear window defogger functions normally.

NG → Check rear window defogger circuit. (Refer to EL section.)

OK

B

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect ECM harness connector.
3) Disconnect rear window defogger relay.
4) Check harness continuity between ECM terminal (54) and terminal (5).
Continuity should exist.

NG → Check the following.
- Harness connectors (M60), (F4)
- Harness continuity between ECM and rear window defogger relay

If NG, repair harness or connectors.

OK

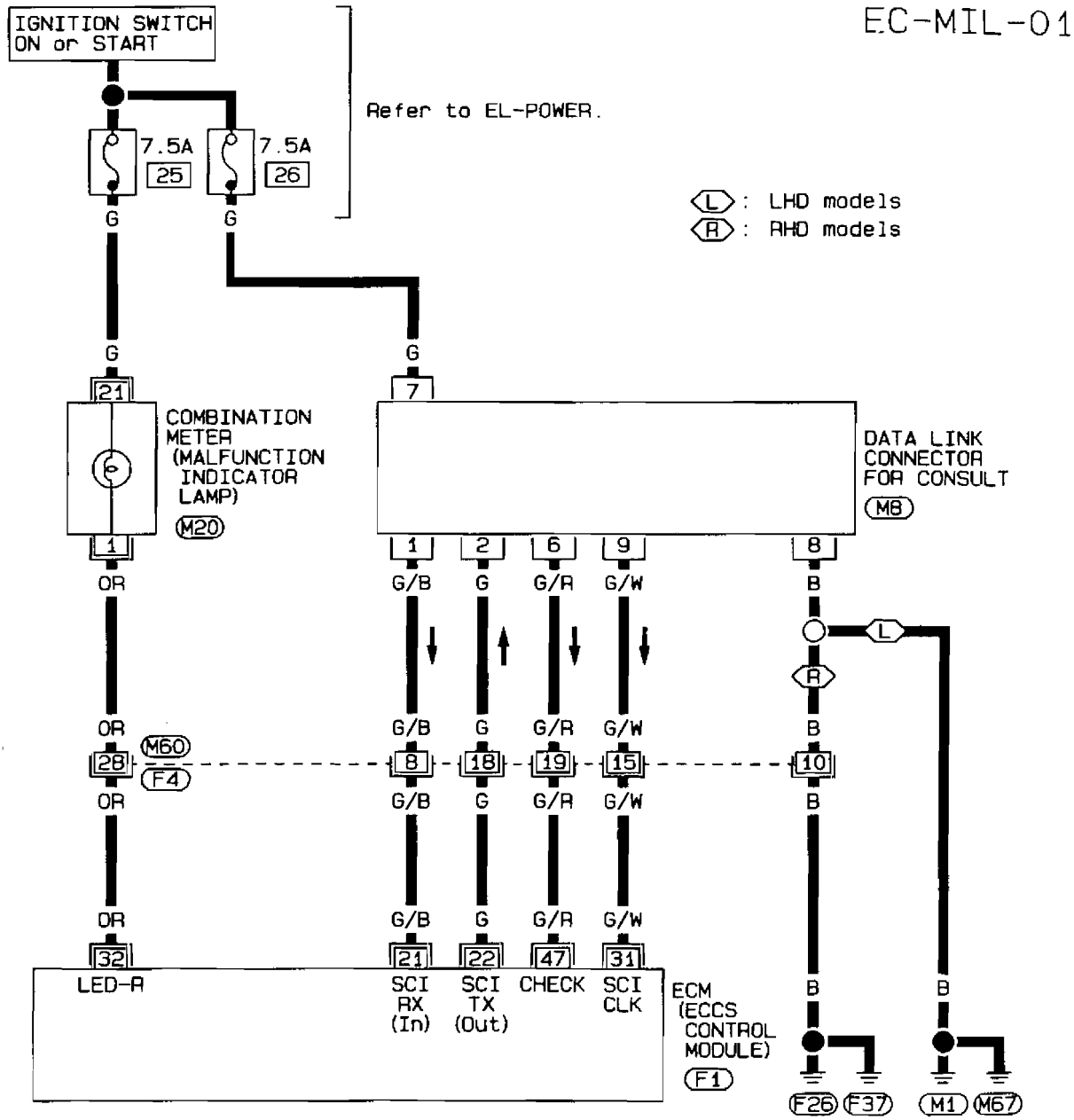
Disconnect and reconnect harness connectors in the circuit. Then retest.

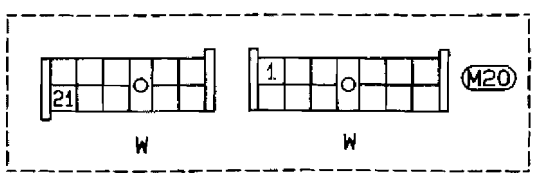
Trouble is not fixed.

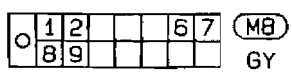
Check ECM pin terminals for damage or the connection of ECM harness connector. Reconnect ECM harness connector and retest.

Diagnostic Procedure 45

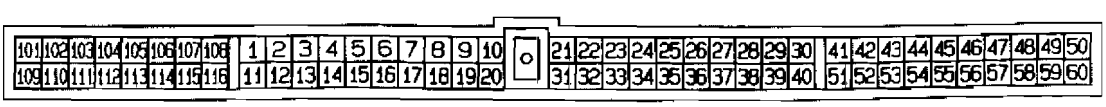
MALFUNCTION INDICATOR LAMP & DATA LINK CONNECTOR FOR CONSULT (Not self-diagnostic item)



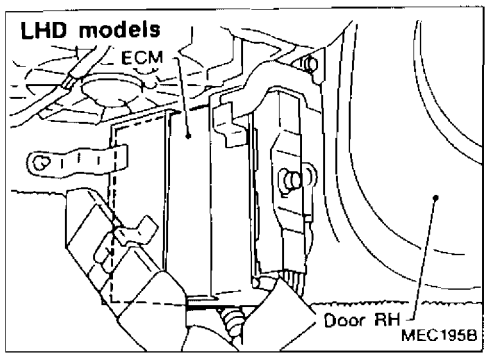




Refer to last page (Foldout page).
M60, F4



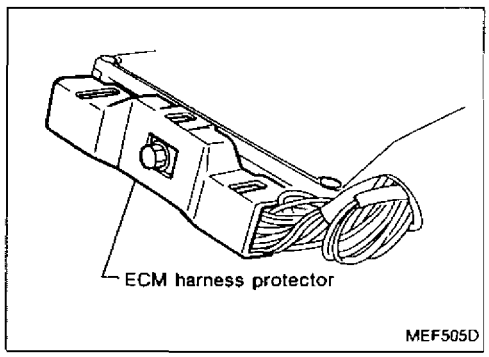
SEF852P



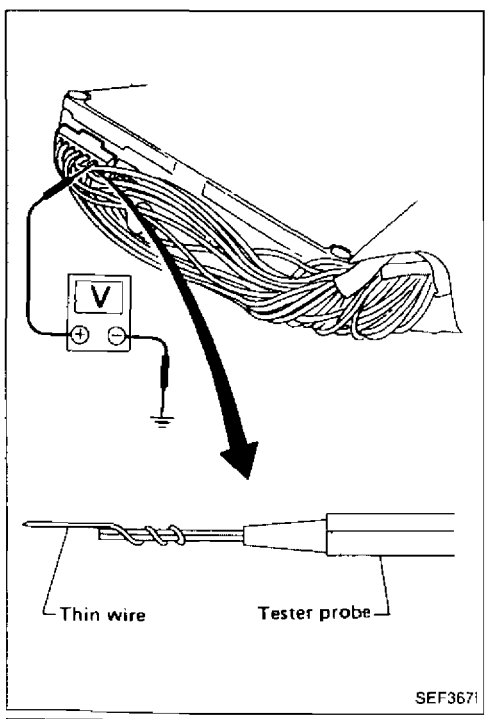
Electrical Components Inspection

ECM INPUT/OUTPUT SIGNAL INSPECTION

1. ECM is located at passenger's dash side. For this inspection, remove the passenger's dash side cover.

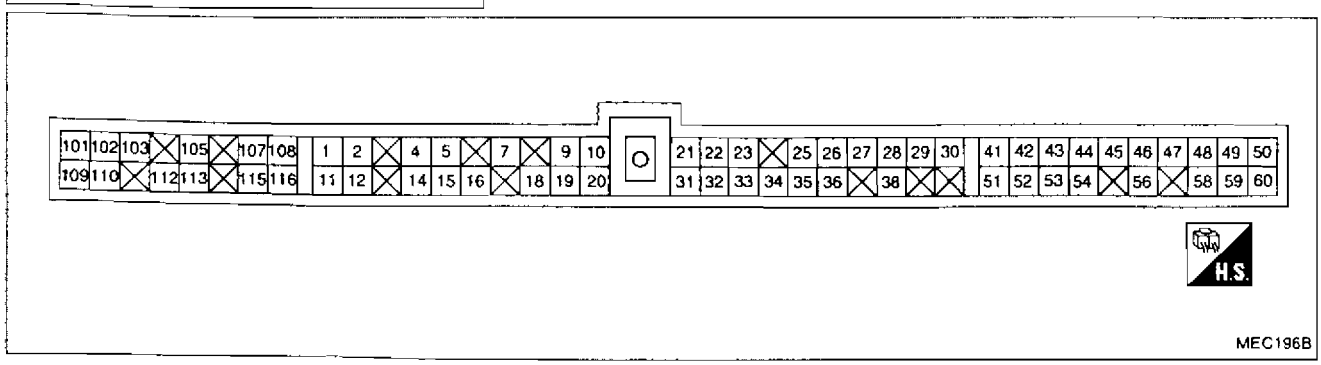


2. Remove ECM harness protector.



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

ECM HARNESS CONNECTOR TERMINAL LAYOUT



Electrical Components Inspection (Cont'd)

*Data are reference values.

TER-MINAL NO.	ITEM	CONDITION	*DATA
19	Cooling fan (Low speed)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Cooling fan is operating.	Approximately 0V
23	Knock sensor	Engine is running.	2.0 - 3.0V
25	Wastegate valve control solenoid valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Engine is racing up to 5,000 rpm.	Approximately 5V
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 3,000 rpm	1.4 - 2.0V
28	Engine coolant temperature sensor	Engine is running.	0 - 5.0V Output voltage varies with engine coolant temperature.
29	Heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - 0.3V ↔ 0.6 - 0.9V
33	Cooling fan (High speed)	Engine is running. └ Cooling fan is not operating. └ Cooling fan is operating at low speed.	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Cooling fan is operating at high speed.	Approximately 0V
34	Power steering oil pressure switch	Engine is running. └ Steering wheel stays straight.	4.0 - 5.0V
		Engine is running. └ Steering wheel is turned.	Approximately 0V
35	Boost pressure sensor	Engine is running. └ Idle speed	Approximately 2V
		Engine is running. └ Engine is racing up to 4,000 rpm	Approximately 2.2V

Electrical Components Inspection (Cont'd)

*Data are reference values.

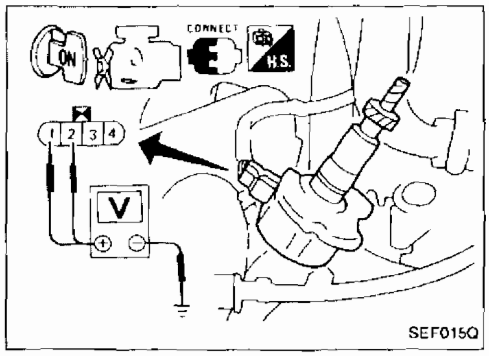
TER-MINAL NO.	ITEM	CONDITION	*DATA
38	Throttle position sensor	Ignition switch "ON"	0.35 - 4.0V Output voltage varies with throttle valve opening angle.
41 51	Camshaft position sensor (Reference signal)	Engine is running. └ **Do not run engine at high speed under no-load.**	0.3 - 0.6V Output voltage slightly varies with engine speed.
42 52	Camshaft position sensor (Position signal)	Engine is running. └ **Do not run engine at high speed under no-load.**	2.0 - 3.0V Output voltage slightly varies with engine speed.
43	Start signal	Ignition switch "ON"	0V
		Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
44	Neutral position switch (M/T models) A/T control unit (A/T models)	Ignition switch "ON" ├ Gear position is "Neutral position" (M/T models). └ Gear position is "N" or "P" (A/T models).	0V
		Ignition switch "ON" └ Except the above conditions	4.0 - 5.0V
45	Ignition switch	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
46	Air conditioner switch	Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
		Engine is running. └ Both air conditioner switch and blower fan switch are "ON".	Approximately 0V
48	Power source for sensors	Ignition switch "ON"	Approximately 5.0V
49 59	Power source for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
54	Load signal	Ignition switch "ON" └ Rear window defogger switch is "ON".	BATTERY VOLTAGE (11 - 14V)
		Ignition switch "ON" └ Rear window defogger switch is "OFF".	Approximately 0V
58	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)

*Data are reference values

TER-MINAL NO.	ITEM	CONDITION	*DATA
101 103 110 112	Injectors	Engine is running.	BATTERY VOLTAGE (11 - 14V)
102	EGR & canister control solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
		Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)
113	VTC solenoid valve	Engine is running. (Jack-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)
		Engine is running. (Jack-up condition) └ Engine is racing up to 2,000 rpm.	Approximately 0V
115	Heated oxygen sensor heater	Engine is running. └ Engine speed is between idle and 4,000 rpm.	Approximately 0V
		Engine is running. └ Engine speed is above 4,000 rpm.	BATTERY VOLTAGE (11 - 14V)

Electrical Components Inspection (Cont'd)



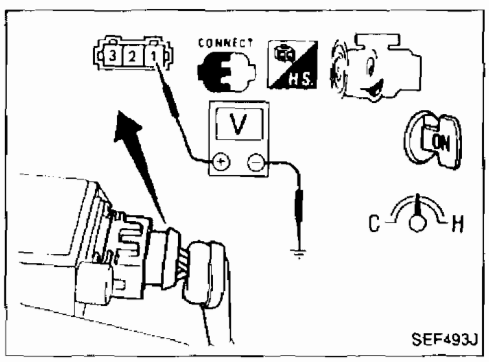
CAMSHAFT POSITION SENSOR

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
① (180° signal)	Voltage fluctuates between 5V and 0.1V
② (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.

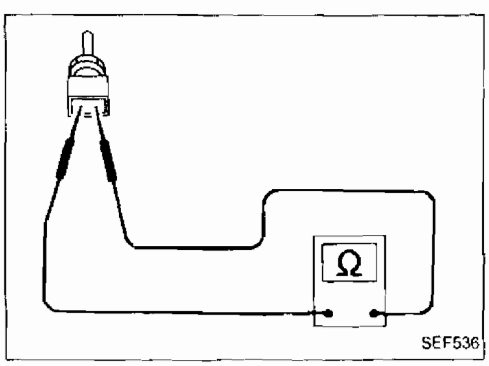


MASS AIR FLOW SENSOR

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 ① and ground.

Conditions	Voltage V
Idle speed	0.8 - 1.5
3,000 rpm	1.4 - 2.0

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



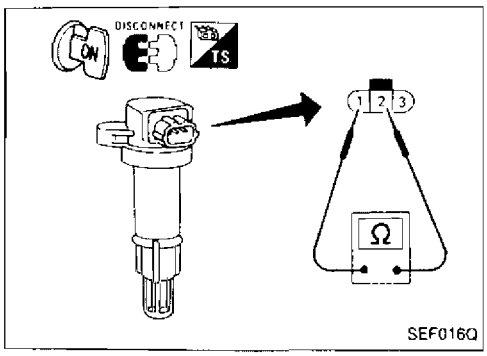
ENGINE COOLANT TEMPERATURE SENSOR

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

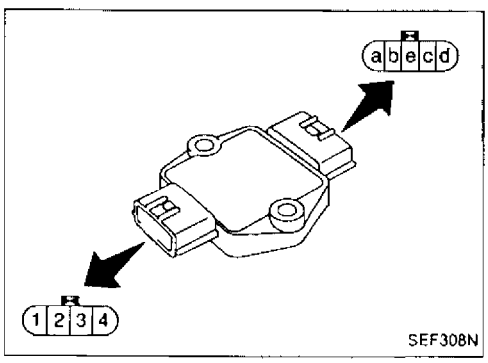
If NG, replace engine coolant temperature sensor.

Electrical Components Inspection (Cont'd)



IGNITION COIL

1. Disconnect ignition coil harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: Approximately 1Ω
   If NG, replace ignition coil.

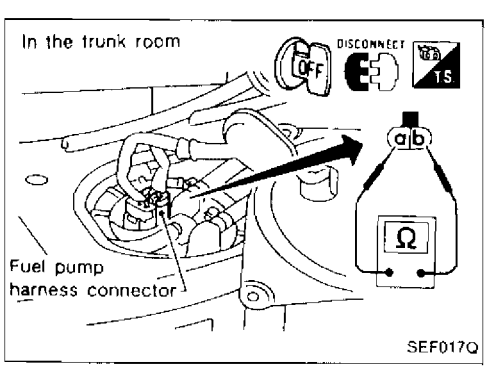


POWER TRANSISTOR

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

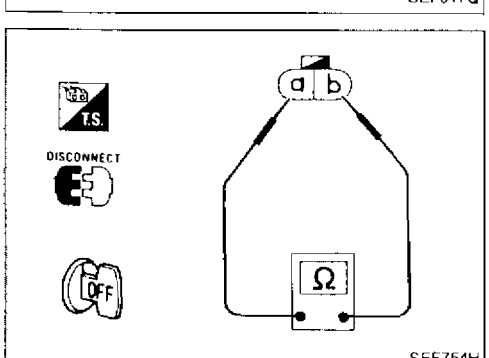
Terminal combination				Tester polarity	Continuity	Tester polarity	Continuity
e 1	e 2	e 3	e 4	⊕ ⊖	No	⊖ ⊕	Yes
e a	e b	e c	e d	⊕ ⊖	Yes	⊖ ⊕	Yes
1 a	2 b	3 c	4 d	⊕ ⊖	Yes	⊖ ⊕	No

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.

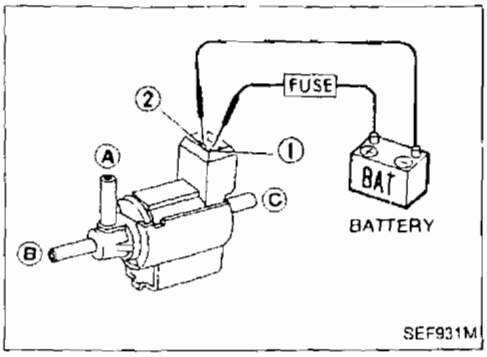
Continuity should come and go.

If NG replace vehicle speed sensor.

Electrical Components Inspection (Cont'd)

EGR AND CANISTER CONTROL SOLENOID VALVE

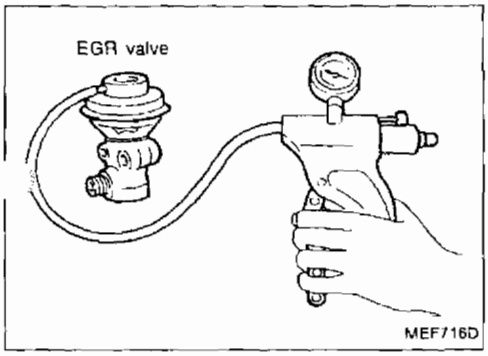
Check air passage continuity.



SEF931M

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

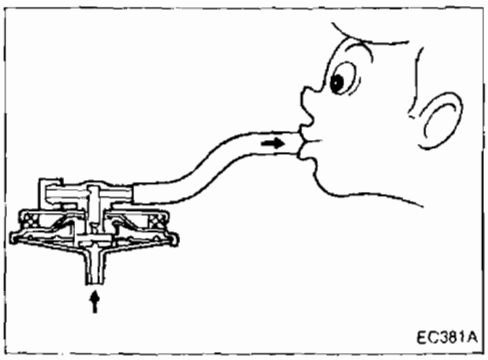
EGR VALVE



MEF716D

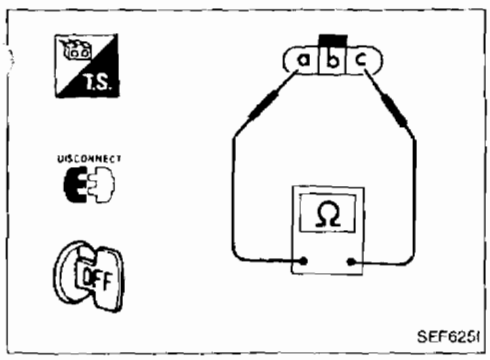
Apply vacuum to EGR vacuum port with a hand vacuum pump.
EGR valve spring should lift.
If NG, replace EGR valve.

EGRC-BPT VALVE


EC381A

Plug one of two ports of EGRC-BPT valve.
Apply a pressure above 0.490 kPa (4.90 mbar, 50 mmH_2O, 1.97 inH_2O) to check for leakage. If a leak is noted, replace valve.

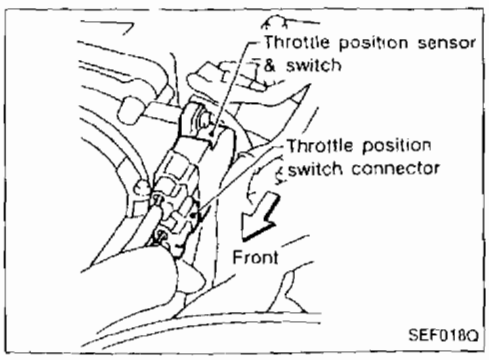
HEATED OXYGEN SENSOR HEATER



SEF625I

Check resistance between terminals ⓐ and ⓒ.
Resistance: 3 - 1,000Ω
If NG, replace heated oxygen sensor.

THROTTLE POSITION SWITCH (A/T model only)

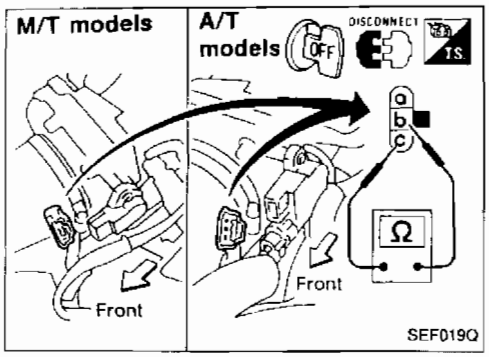


SEF018Q

Refer to "TROUBLE DIAGNOSES" in AT section.

Electrical Components Inspection (Cont'd)

THROTTLE POSITION SENSOR



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

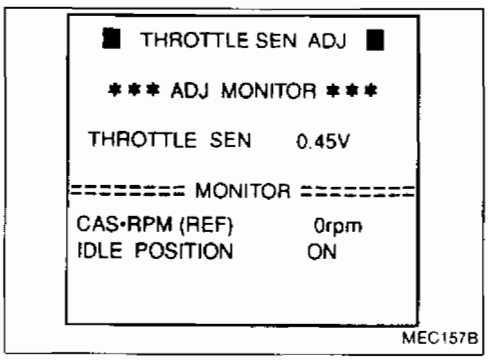
Accelerator pedal condition	Resistance kΩ
Completely released	Approximately 0.7
Partially released	0.7 - 5
Completely depressed	Approximately 5

If NG, replace throttle position sensor.

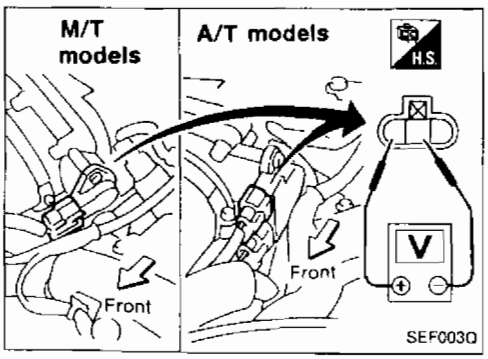
Adjustment of throttle position sensor (idle position)

If throttle position sensor is replaced or removed, it is necessary to install it in the proper position, by following the procedure as shown below:

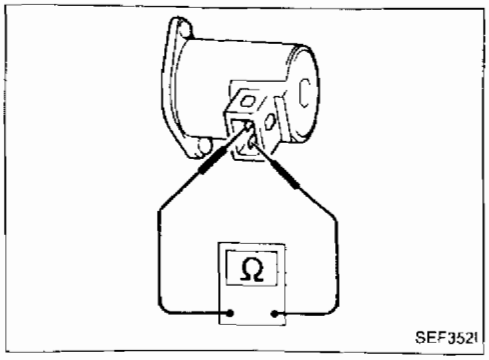
1. Install throttle position sensor body in throttle body. Do not tighten bolts. Leave bolts loose.
2. Connect throttle position sensor harness connector.
3. Start engine and warm it up sufficiently.



4. Perform "THROTTLE SEN ADJ" or "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
   Measure output voltage of throttle position sensor using voltmeter.



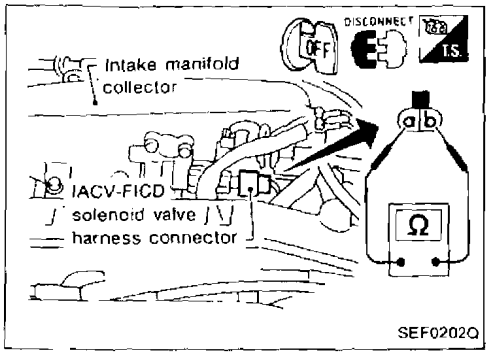
5. Adjust by rotating throttle position sensor body so that output voltage is 0.35 to 0.65V.
6. Tighten mounting bolts.
7. Disconnect throttle position sensor harness connector for a few seconds and then reconnect it.



IACV-AAC VALVE

- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω
- Check plunger for seizing or sticking.
- Check for broken spring.

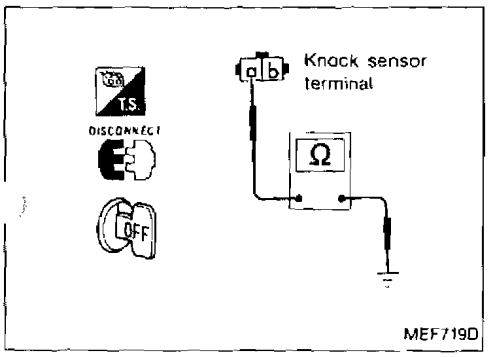
Electrical Components Inspection (Cont'd)



IACV-FICD SOLENOID VALVE

Disconnect IACV-FICD solenoid valve harness connector.

- Check for clicking sound when applying 12V direct current to terminals.
- Check plunger for seizing or sticking.
- Check for broken spring.



KNOCK SENSOR

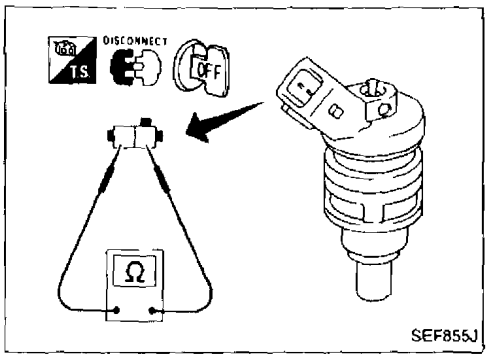
1. Disconnect knock sensor sub-harness connector.
2. Check continuity between terminal ⓐ and ground.

Continuity should exist.

- It is necessary to use an ohmmeter which can measure more than 10 MΩ.

CAUTION:

Discard any knock sensor which has been dropped or has undergone shocks; use a new one.

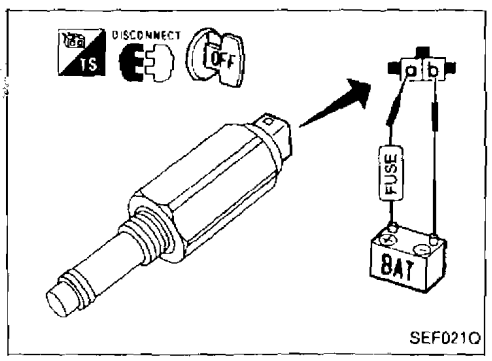


INJECTOR

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.

   Resistance: 10 - 14Ω

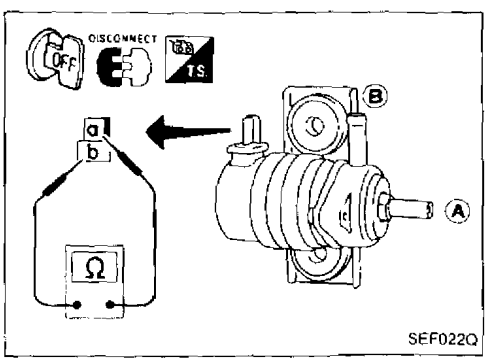
   If NG, replace injector.



VALVE TIMING CONTROL (VTC) 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.



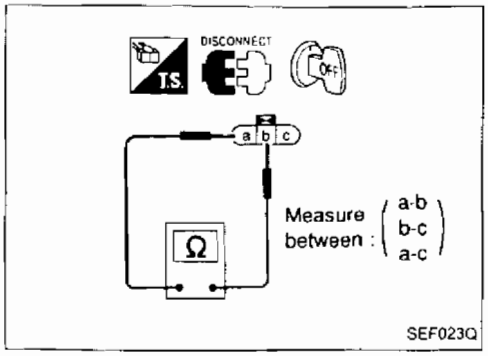
WASTEGATE VALVE CONTROL SOLENOID VALVE

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.

Electrical Components Inspection (Cont'd)

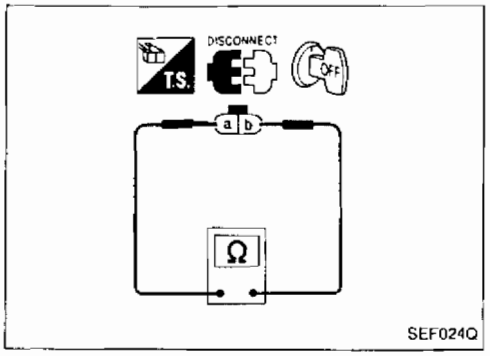


BOOST PRESSURE SENSOR

Check resistance between terminals.

Resistance:

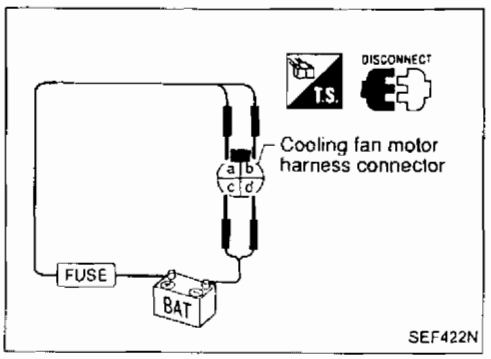
ⓐ and ⓑ Approximately 1.1 kΩ
ⓑ and ⓒ Approximately 0.5 kΩ
ⓐ and ⓒ Approximately 0.3 kΩ



POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector.
2. Check continuity between terminals.

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

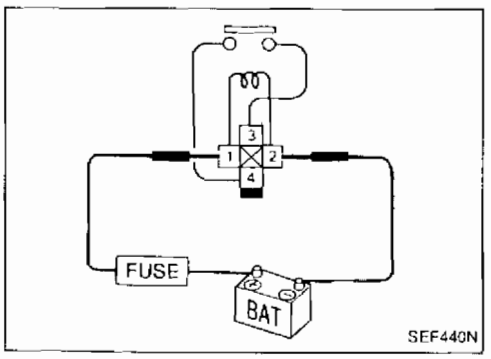


COOLING FAN MOTOR

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

Fan speed	Terminal	
	⊕	⊖
Low	ⓐ	ⓓ
High	ⓐ, ⓑ	ⓒ, ⓓ

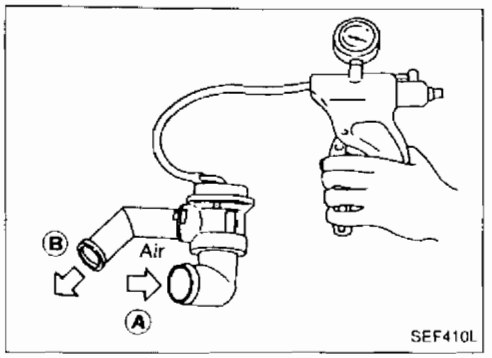
Cooling fan motor should operate.
If NG, replace cooling fan motor.



ECCS RELAY, FUEL PUMP RELAY, IGNITION COIL RELAY AND COOLING FAN RELAY 1·2

Check continuity between terminals ③ and ④.

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

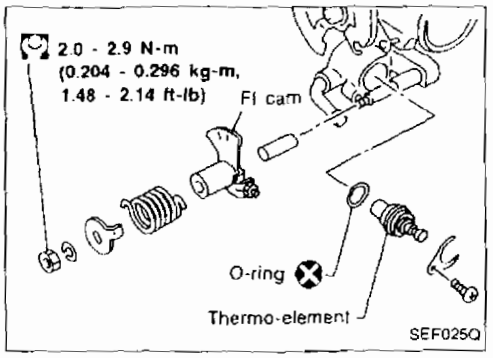


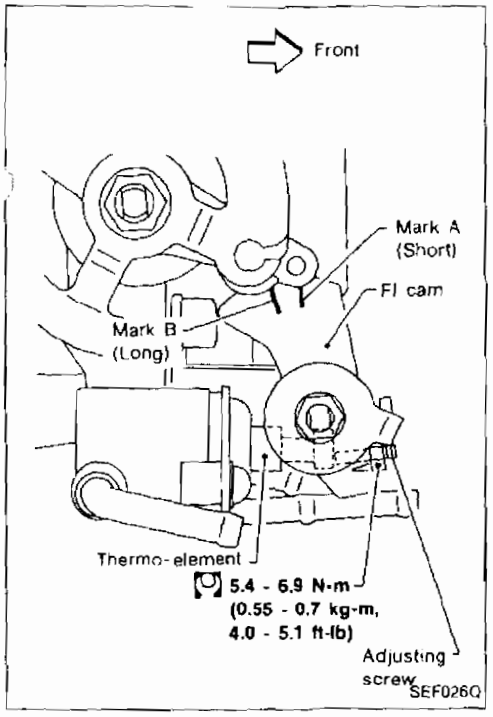
RECIRCULATION VALVE

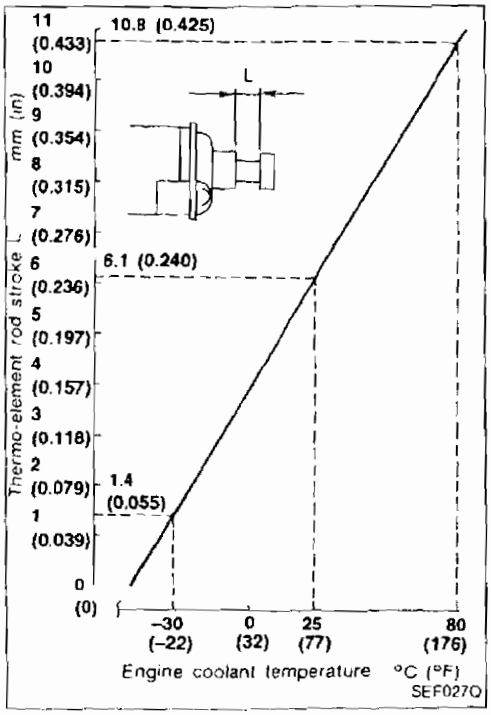
Check air passage continuity between Ⓐ and Ⓑ.

Condition	Continuity
A vacuum of above −27.3 to −34.0 kPa (−273 to −340 mbar, −205 to −255 mmHg, −8.07 to −10.04 inHg) is applied to vacuum port	Yes
No vacuum applied	No

If NG, replace recirculation valve.
Do not disassemble and adjust recirculation valve.







Fast Idle Cam (FIC) Inspection and Adjustment

REMOVAL AND INSTALLATION

- **Do not extract thermo-element by pulling center rod.**
- **Always replace O-ring with a new one.**
- **Lubricate O-ring with a smear of engine oil.**
- **After installation, check for water leakage.**

INSPECTION

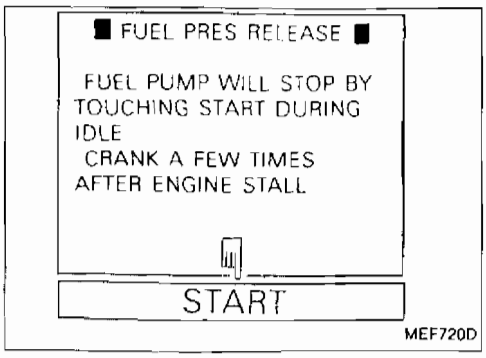
1. Start engine. Warm the engine coolant up to 80°C (176°F) and keep it there for 10 minutes.
2. Check that mark A (short line) on FI cam aligns with roller center.

a. If NG, measure thermo-element stroke (L) and engine coolant temperature.
   If stroke L is in the specification shown in the figure, adjust FI cam with adjusting screw.

b. If stroke (L) is out of the specification, replace thermo-element with a new one.

ADJUSTMENT

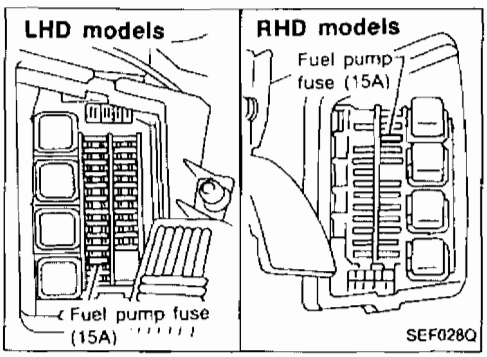
1. Start engine. Warm the engine coolant up to 80°C (176°F) and keep it there for 10 minutes.
2. Loosen adjusting screw and align mark A (short line) on FI cam with roller center.
   Tighten lock nut to the specification.
3. Cool down the engine coolant to 25°C (77°F) and keep it there for 5 minutes.
4. Check that mark B (long line) on FI cam aligns with roller center.



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.

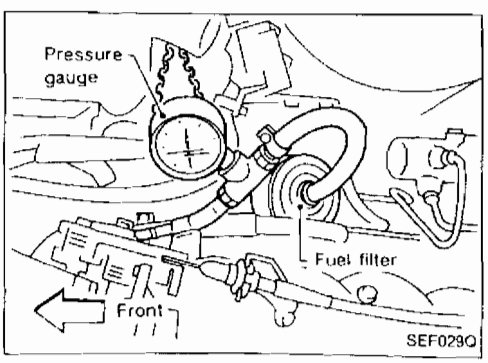


1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuse for fuel pump.

Fuel Pressure Check

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

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
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.

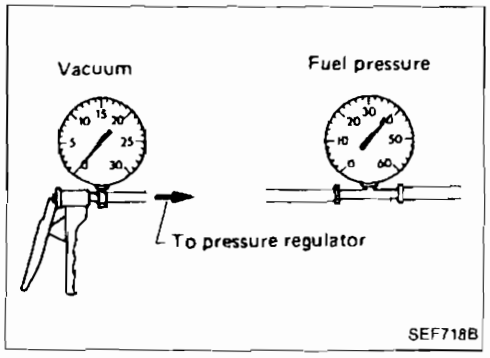
Approximately 245 kPa (2.45 bar, 2.5 kg/cm^2, 36 psi)

When fuel pressure regulator valve vacuum hose is disconnected.

Approximately 294.1 kPa (2.94 bar, 3.0 kg/cm^2, 43 psi)

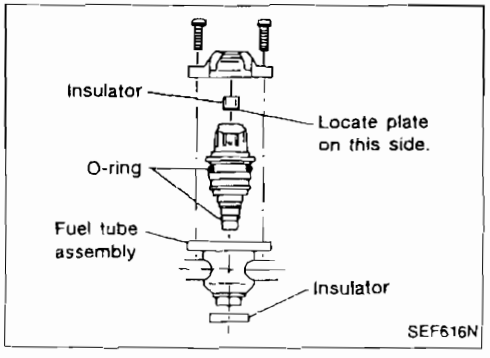
Fuel Pressure Check (Cont'd)

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. Remove injectors with fuel tube assembly.
   Refer to "INTAKE MANIFOLD" in EM section.
2. Push out any malfunctioning injector from fuel tube assembly.

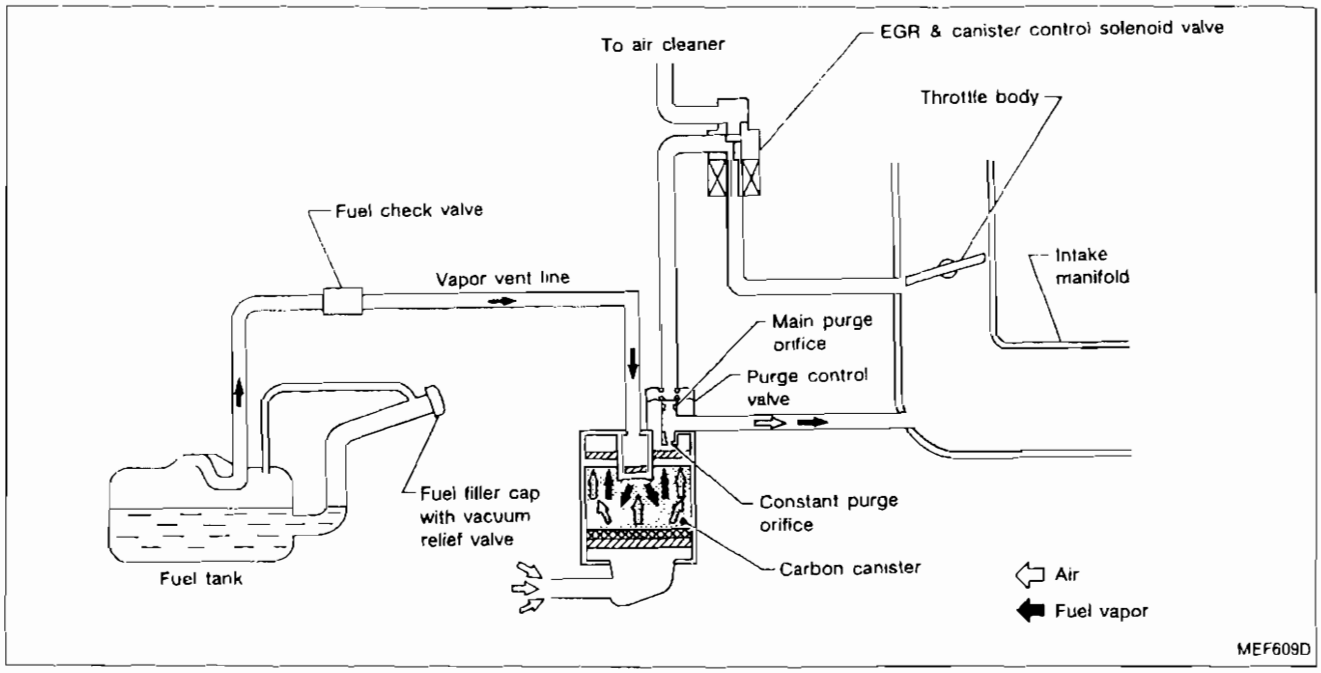
- **Do not extract injector by pinching connector.**
- **Always replace O-rings and insulators with new ones.**
- **Lubricate O-ring with a smear of silicone oil.**

3. Installation is in the reverse order of removal.

CAUTION:

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

Description



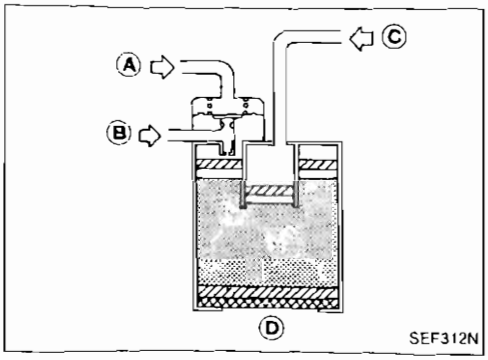
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the carbon canister.

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.



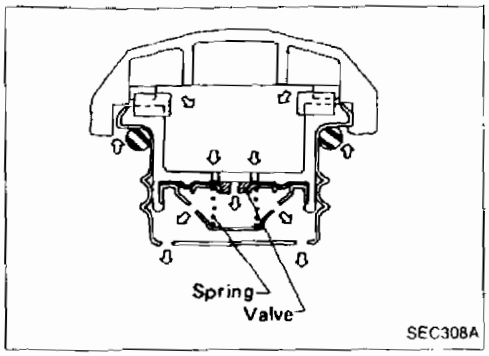
Inspection

ACTIVATED CARBON CANISTER

Check carbon canister as follows:

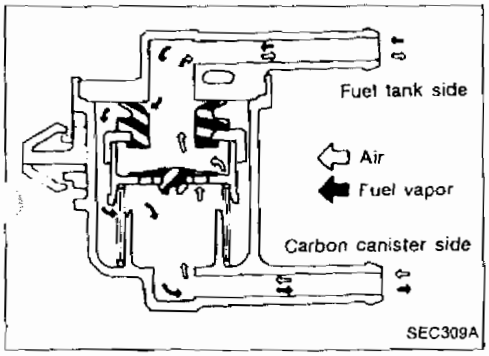
1. Blow air in port Ⓐ and ensure that there is no leakage.
2.
- Apply vacuum to port Ⓐ.
- Cover port Ⓓ with hand.
- Blow air in port Ⓒ and ensure free flow out of port Ⓑ.

Inspection (Cont'd)



FUEL 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 is in good mechanical condition. Note also that, by further sucking air, the resistance should disappear with valve clicks.
3. If valve is clogged or if no resistance is felt, replace cap as an assembly.



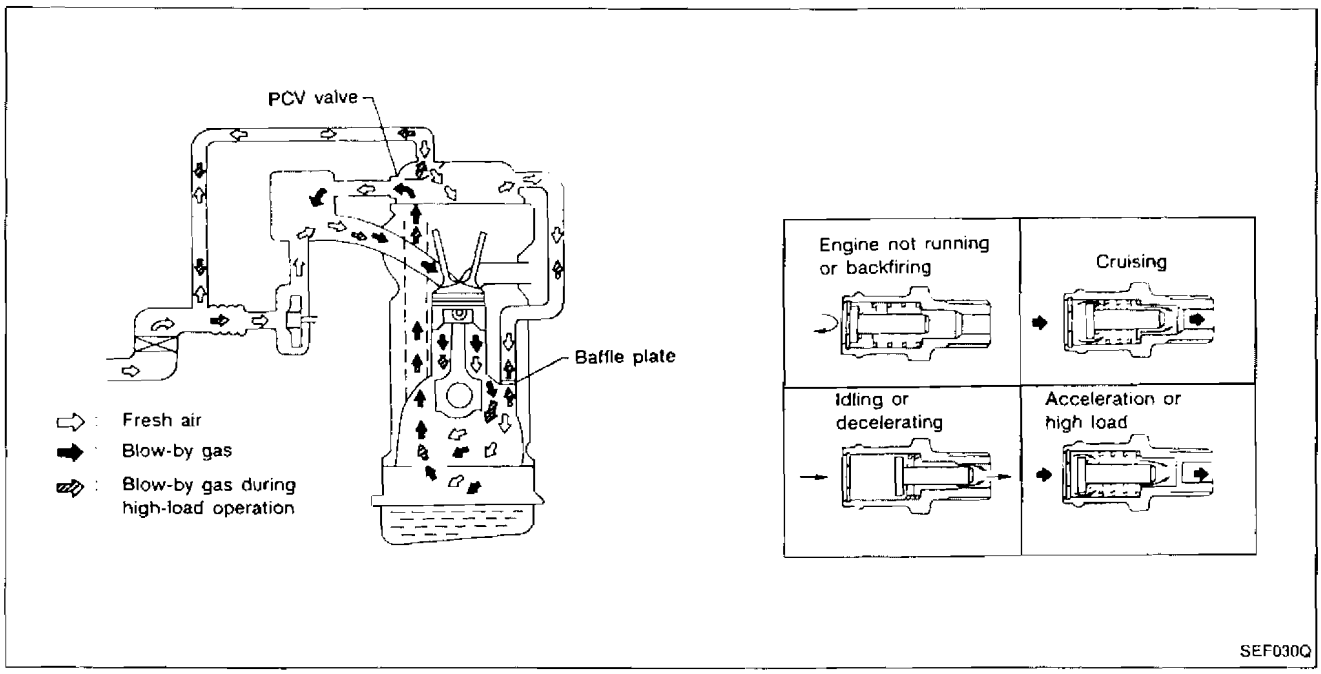
FUEL CHECK VALVE

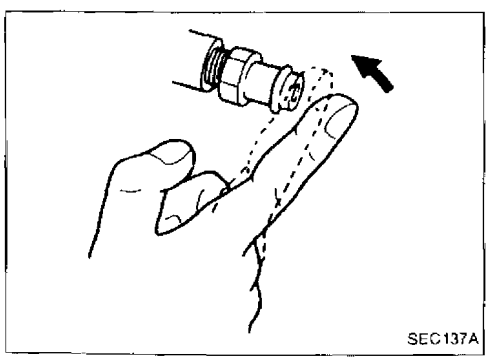
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the canister.
2. Blow air through connector on canister side.
   Air flow should be smoothly directed toward fuel tank.
3. If fuel check valve is suspected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

Description

This system returns blow-by gas to the intake collector.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from 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 valve. 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.

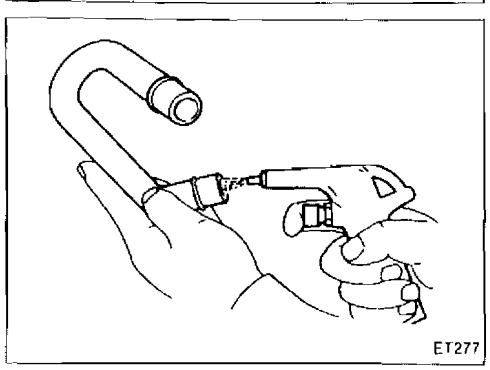




Inspection

PCV (Positive Crankcase Ventilation) VALVE

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	
Fuel pressure at idling kPa (bar, kg/cm², psi)	
Vacuum hose is connected	Approximately 245 (2.45, 2.5, 36)
Vacuum hose is disconnected	Approximately 294 (2.94, 3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2	
M/T & A/T (in "N" position)	800 ± 50
Air conditioner: ON	
M/T & A/T (in "N" position)	800 ± 50
Ignition timing	15° ± 2° BTDC
Throttle position sensor idle position V	0.35 - 0.65

*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 1

ENGINE COOLANT TEMPERATURE SENSOR

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

FUEL PUMP

Resistance	Ω	0.2 - 5.0

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 0.7
Partially released	0.7 - 5
Completely depressed	Approximately 5

Engine Control

System utilizing timers with enhanced real-time processing functions, high-precision A-D converter, and high-speed processing.

Memory with large internal ROM and RAM (M6M72561J) is used.