

SECTION EC

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When you read wiring diagrams:

- Read GI section, "HOW TO READ WIRING DIAGRAMS".
- Read 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".

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DIAGNOSTIC TROUBLE CODE INDEX

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

| Items (CONSULT screen terms) | DTC*5 | | Reference page |
|---------------------------------|------------------|-------|-------------------|
| | CONSULT GST*2 | ECM*1 | |
| Unable to access ECCS | — | — | EC-76 |
| *COOLAN T SEN/CIRC | P0125 | 0908 | EC-139 |
| ABSL PRES SEN/CIRC | P0105 | 0803 | EC-108 |
| AIR TEMP SEN/CIRC | P0110 | 0401 | EC-115 |
| CAM POS SEN/CIR | P0340 | 0101 | EC-236 |
| CLOSED LOOP | P1148 | 0307 | EC-313 |
| CLOSED TP SW/CIRC | P0510 | 0203 | EC-297 |
| COOLANT T SEN/CIRC | P0115 | 0103 | EC-121 |
| CPS/CIRC (OBD) COG | P1336 | 0905 | EC-322 |
| CPS/CIRCUIT (OBD) | P0335 | 0802 | EC-231 |
| CYL 1 MISFIRE | P0301 | 0608 | EC-222 |
| CYL 2 MISFIRE | P0302 | 0607 | EC-222 |
| CYL 3 MISFIRE | P0303 | 0606 | EC-222 |
| CYL 4 MISFIRE | P0304 | 0605 | EC-222 |
| ECM | P0605 | 0301 | EC-302 |
| EGR SYSTEM | P0400 | 0302 | EC-242 |
| EGR SYSTEM | P1402 | 0514 | EC-338 |
| EGR TEMP SEN/CIRC | P1401 | 0305 | EC-332 |
| EGRC SOLENOID/V | P1400 | 1005 | EC-327 |
| EGRC-BPT VALVE | P0402 | 0306 | EC-250 |
| EVAP PURG FLOW/MON | P1447 | 0111 | EC-367 |
| EVAP SMALL LEAK | P1440 | 0213 | EC-345 |
| EVAP SMALL LEAK | P0440 | 0705 | EC-260 |
| EVAP SYS PRES SEN | P0450 | 0704 | EC-281 |
| FRONT O2 SENSOR | P0130 | 0303 | EC-144 |
| FR O2 SEN HEATER | P0135 | 0901 | EC-175 |
| FRONT O2 SENSOR | P0133 | 0409 | EC-162 |
| FRONT O2 SENSOR | P0132 | 0410 | EC-156 |
| FRONT O2 SENSOR | P0131 | 0411 | EC-150 |
| FRONT O2 SENSOR | P0134 | 0412 | EC-170 |
| FUEL SYS DIAG-LEAN | P0171 | 0115 | EC-208 |
| FUEL SYS DIAG-RICH | P0172 | 0114 | EC-213 |
| FUEL TEMP SEN/CIRC | P0180 | 0402 | EC-218 |
| IACV/AAC VLV/CIRC | P0505 | 0205 | EC-291 |

| Items (CONSULT screen terms) | DTC*5 | | Reference page |
|---|------------------|-----------------|-------------------|
| | CONSULT GST*2 | ECM*1 | |
| IGN SIGNAL-PRIMARY | P1320 | 0201 | EC-315 |
| KNOCK SEN/CIRCUIT | P0325 | 0304 | EC-227 |
| MAF SEN/CIRCUIT*3 | P0100 | 0102 | EC-99 |
| MAP/BAR SW SOL/CIR | P1105 | 1302 | EC-304 |
| MULTI CYL MISFIRE | P0300 | 0701 | EC-222 |
| NO SELF DIAGNOSTIC FAILURE INDICATED | P0000 | 0505 | — |
| NO SELF DIAGNOSTIC FAILURE INDICATED | No DTC | Flash- ing*4 | EC-46 |
| OVERHEAT | — | 0208 | EC-401 |
| P-N POS SW/CIRCUIT | P1706 | 1003 | EC-388 |
| PURG VOLUME CONT/V | P1444 | 0214 | EC-355 |
| PURG VOLUME CONT/V | P0443 | 1008 | EC-270 |
| REAR O2 SENSOR | P0138 | 0510 | EC-186 |
| REAR O2 SENSOR | P0137 | 0511 | EC-179 |
| REAR O2 SENSOR | P0140 | 0512 | EC-199 |
| REAR O2 SENSOR | P0139 | 0707 | EC-193 |
| RR O2 SEN HEATER | P0141 | 0902 | EC-204 |
| THR TL POS SEN/CIRC*3 | P0120 | 0403 | EC-126 |
| TOR CONV CLTCH S/V | P1775 | 0904 | EC-393 |
| TOR CONV CLTCH S/V | P1776 | 0513 | EC-397 |
| TW CATALYST SYSTEM | P0420 | 0702 | EC-255 |
| VC CUT/V BYPASS/V | P1491 | 0311 | EC-383 |
| VCM/V BYPASS/V | P1490 | 0801 | EC-378 |
| VEH SPEED SEN/CIRC | P0500 | 0104 | EC-287 |
| VENT CONTROL VALVE | P1446 | 0215 | EC-362 |
| VENT CONTROL VALVE | P1448 | 0309 | EC-373 |
| VENT CONTROL VALVE | P0446 | 0903 | EC-276 |

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

*2: These numbers are prescribed by SAE J2012.

*3: When the fail-safe operation occurs, the MIL illuminates.

*4: While engine is running.

*5: 1st trip DTC No. is the same as DTC No.

DIAGNOSTIC TROUBLE CODE INDEX

Alphabetical & P No. Index for DTC (Cont'd)

P NO. INDEX FOR DTC

| DTC*5 | | Items (CONSULT screen terms) | Reference page |
|------------------|-----------------|---|-------------------|
| CONSULT GST*2 | ECM*1 | | |
| — | — | Unable to access ECCS | EC-76 |
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| P0100 | 0102 | MAF SEN/CIRCUIT*3 | EC-99 |
| P0105 | 0803 | ABSL PRES SEN/CIRC | EC-108 |
| P0110 | 0401 | AIR TEMP SEN/CIRC | EC-115 |
| P0115 | 0103 | COOLANT T SEN/CIRC | EC-121 |
| P0120 | 0403 | THRTL POS SEN/CIRC*3 | EC-126 |
| P0125 | 0908 | *COOLAN T SEN/CIRC | EC-139 |
| P0130 | 0303 | FRONT O2 SENSOR | EC-144 |
| P0131 | 0411 | FRONT O2 SENSOR | EC-150 |
| P0132 | 0410 | FRONT O2 SENSOR | EC-156 |
| P0133 | 0409 | FRONT O2 SENSOR | EC-162 |
| P0134 | 0412 | FRONT O2 SENSOR | EC-170 |
| P0135 | 0901 | FR O2 SEN HEATER | EC-175 |
| P0137 | 0511 | REAR O2 SENSOR | EC-179 |
| P0138 | 0510 | REAR O2 SENSOR | EC-186 |
| P0139 | 0707 | REAR O2 SENSOR | EC-193 |
| P0140 | 0512 | REAR O2 SENSOR | EC-199 |
| P0141 | 0902 | RR O2 SEN HEATER | EC-204 |
| P0171 | 0115 | FUEL SYS DIAG-LEAN | EC-208 |
| P0172 | 0114 | FUEL SYS DIAG-RICH | EC-213 |
| P0180 | 0402 | FUEL TEMP SEN/CIRC | EC-218 |
| P0300 | 0701 | MULTI CYL MISFIRE | EC-222 |
| P0301 | 0608 | CYL 1 MISFIRE | EC-222 |
| P0302 | 0607 | CYL 2 MISFIRE | EC-222 |
| P0303 | 0606 | CYL 3 MISFIRE | EC-222 |
| P0304 | 0605 | CYL 4 MISFIRE | EC-222 |
| P0325 | 0304 | KNOCK SEN/CIRCUIT | EC-227 |
| P0335 | 0802 | CPS/CIRCUIT (OBD) | EC-231 |
| P0340 | 0101 | CAM POS SEN/CIR | EC-236 |
| P0400 | 0302 | EGR SYSTEM | EC-242 |

| DTC*5 | | Items (CONSULT screen terms) | Reference page |
|------------------|-------|---------------------------------|-------------------|
| CONSULT GST*2 | ECM*1 | | |
| P0402 | 0306 | EGRC-BPT VALVE | EC-250 |
| P0420 | 0702 | TW CATALYST SYSTEM | EC-255 |
| P0440 | 0705 | EVAP SMALL LEAK | EC-260 |
| P0443 | 1008 | PURG VOLUME CONT/V | EC-270 |
| P0446 | 0903 | VENT CONTROL VALVE | EC-276 |
| P0450 | 0704 | EVAPO SYS PRES SEN | EC-281 |
| P0500 | 0104 | VEH SPEED SEN/CIRC | EC-287 |
| P0505 | 0205 | IACV/AAC VLV/CIRC | EC-291 |
| P0510 | 0203 | CLOSED TP SW/CIRC | EC-297 |
| P0605 | 0301 | ECM | EC-302 |
| P1105 | 1302 | MAP/BAR SW SOL/CIR | EC-304 |
| P1148 | 0307 | CLOSED LOOP | EC-313 |
| P1320 | 0201 | IGN SIGNAL-PRIMARY | EC-315 |
| P1336 | 0905 | CPS/CIRC (OBD) COG | EC-322 |
| P1400 | 1005 | EGRC SOLENOID/V | EC-327 |
| P1401 | 0305 | EGR TEMP SEN/CIRC | EC-332 |
| P1402 | 0514 | EGR SYSTEM | EC-338 |
| P1440 | 0213 | EVAP SMALL LEAK | EC-345 |
| P1444 | 0214 | PURG VOLUME CONT/V | EC-355 |
| P1446 | 0215 | VENT CONTROL VALVE | EC-362 |
| P1447 | 0111 | EVAP PURG FLOW/MON | EC-367 |
| P1448 | 0309 | VENT CONTROL VALVE | EC-373 |
| P1490 | 0801 | VC/V BYPASS/V | EC-378 |
| P1491 | 0311 | VC CUT/V BYPASS/V | EC-383 |
| P1706 | 1003 | P-N POS SW/CIRCUIT | EC-388 |
| P1775 | 0904 | TOR CONV CLTCH S/V | EC-393 |
| P1776 | 0513 | TOR CONV CLTCH S/V | EC-397 |
| — | 0208 | OVERHEAT | EC-401 |

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

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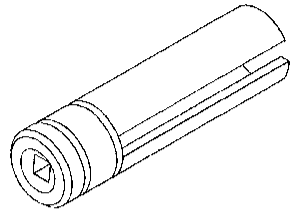
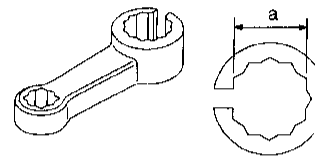
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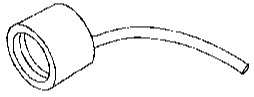
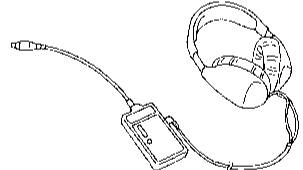
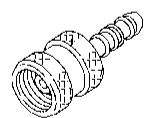
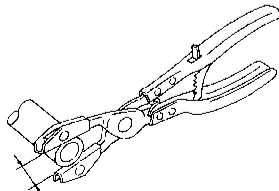
PRECAUTIONS AND PREPARATION

Special Service Tools

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number (Kent-Moore No.) Tool name | Description |
|--|--|
| KV10117100 (J36471-A) Heated oxygen sensor wrench |  <p>Loosening or tightening front heated oxygen sensor with 22 mm (0.87 in) hexagon nut</p> <p>NT379</p> |
| KV10114400 (J-38365) Heated oxygen sensor wrench |  <p>Loosening or tightening rear heated oxygen sensor</p> <p>a: 22 mm (0.87 in)</p> <p>NT636</p> |

Commercial Service Tools

| Tool name | Description |
|--|---|
| Fuel filler cap adapter |  <p>Checking fuel tank vacuum relief valve opening pressure</p> <p>NT653</p> |
| Leak detector (J41416) |  <p>Locating the EVAP leak</p> <p>NT703</p> |
| EVAP service port adapter (J41413-OBDD) |  <p>Applying positive pressure through EVAP service port</p> <p>NT704</p> |
| Hose clipper (—) |  <p>Clamping the EVAP purge hose between the fuel tank and EVAP canister applied to DTC P1440 [EVAP control system (Small leak — Positive pressure)]</p> <p>Approx. 20 mm (0.79 in)</p> <p>NT720</p> |

Supplemental Restraint System (SRS) “AIR BAG”

The Supplemental Restraint System “AIR BAG”, used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and in the instrument panel on the passenger side), a diagnosis sensor unit, a crash zone sensor (4WD models), warning lamp, wiring harness and spiral cable.

The vehicle is equipped with a passenger air bag deactivation switch. Because no rear seat exists where a rear-facing child restraint can be placed, the switch is designed to turn off the passenger air bag so that a rear-facing child restraint can be used in the front passenger seat. The switch is located in the center of the instrument panel, near the ashtray. When the switch is turned to the ON position, the passenger air bag is enabled and could inflate in a frontal collision. When the switch is turned to the OFF position, the passenger air bag is disabled and will not inflate in a frontal collision. A passenger air bag OFF indicator on the instrument panel lights up when the passenger air bag is switched OFF. The driver air bag always remains enabled and is not affected by the passenger air bag deactivation switch.

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 should 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.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or on the complete harness, for easy identification.**
- **The vehicle is equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate in a frontal collision. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate in a frontal collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.**

Precautions for On Board Diagnostic (OBD) System of Engine

The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:

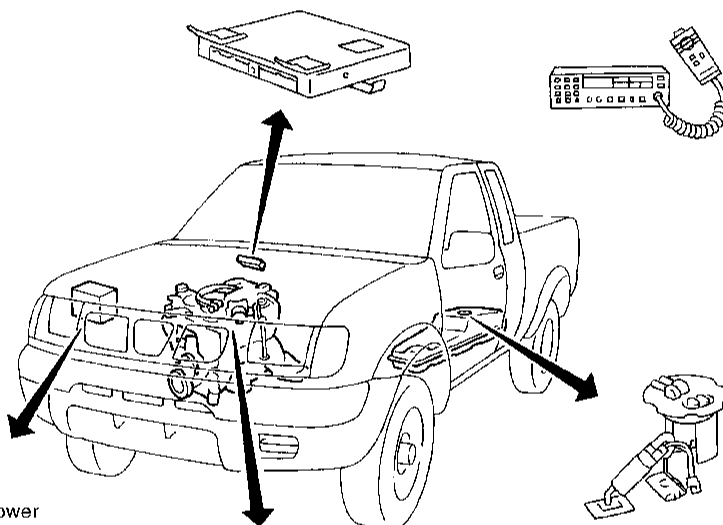
- **Be sure to turn the ignition switch “OFF” and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EGR system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

Engine Fuel & Emission Control System

ECM

- Do not disassemble ECM.
- Do not turn on board diagnostic test 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 CB ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on its installation location.
 - 1) Keep the antenna as far away as possible from the electronic control units.
 - 2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls. Do not let them run parallel for a long distance.
 - 3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
 - 4) Be sure to ground the radio to vehicle body.

BATTERY

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

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.

ECM 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 or crankshaft position sensor (OBD).



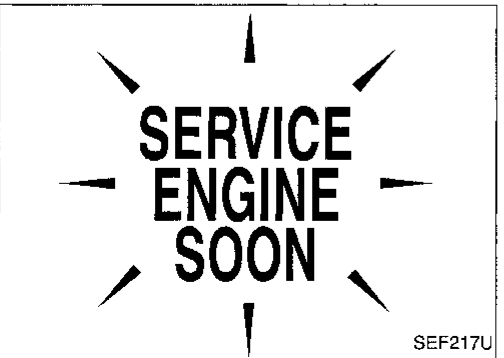
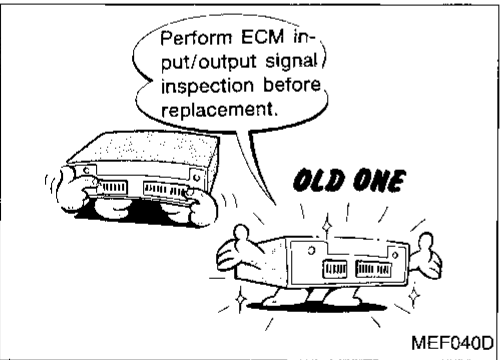
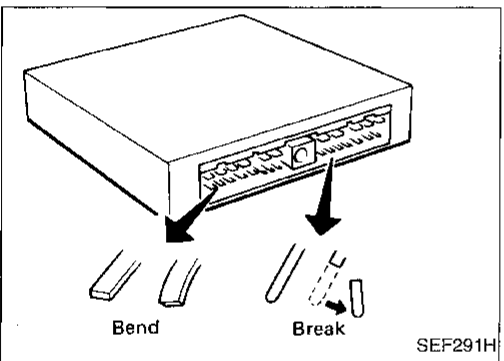
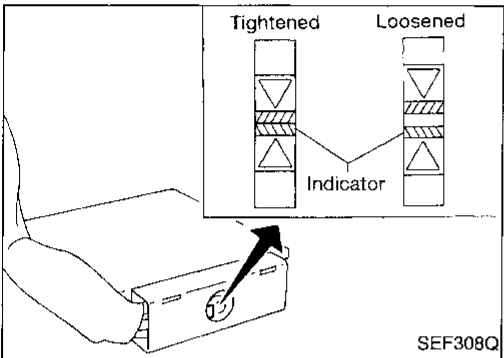
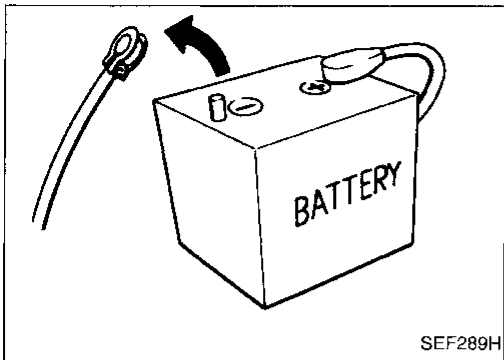
FUEL PUMP

- Do not operate fuel pump when there is no fuel in lines.
- Tighten fuel hose clamps to the specified torque. (Refer to MA section.)

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.

PRECAUTIONS AND PREPARATION



Precautions

- 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.
- When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.
🔧: 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break). Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-84.
- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE". The DTC should not be displayed in the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed.

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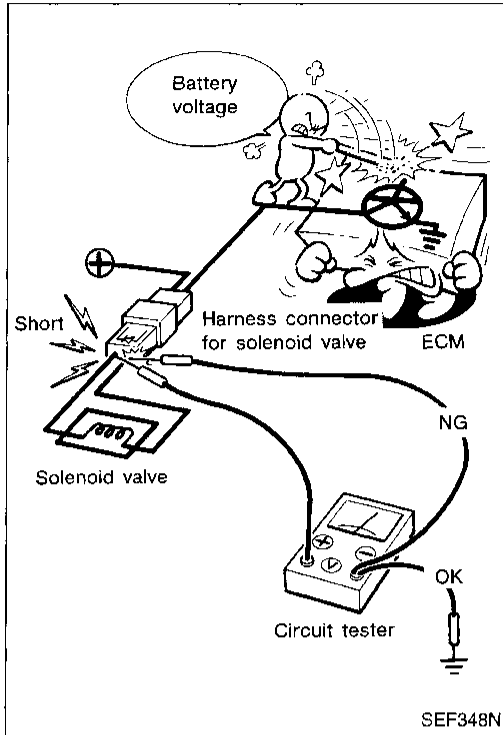
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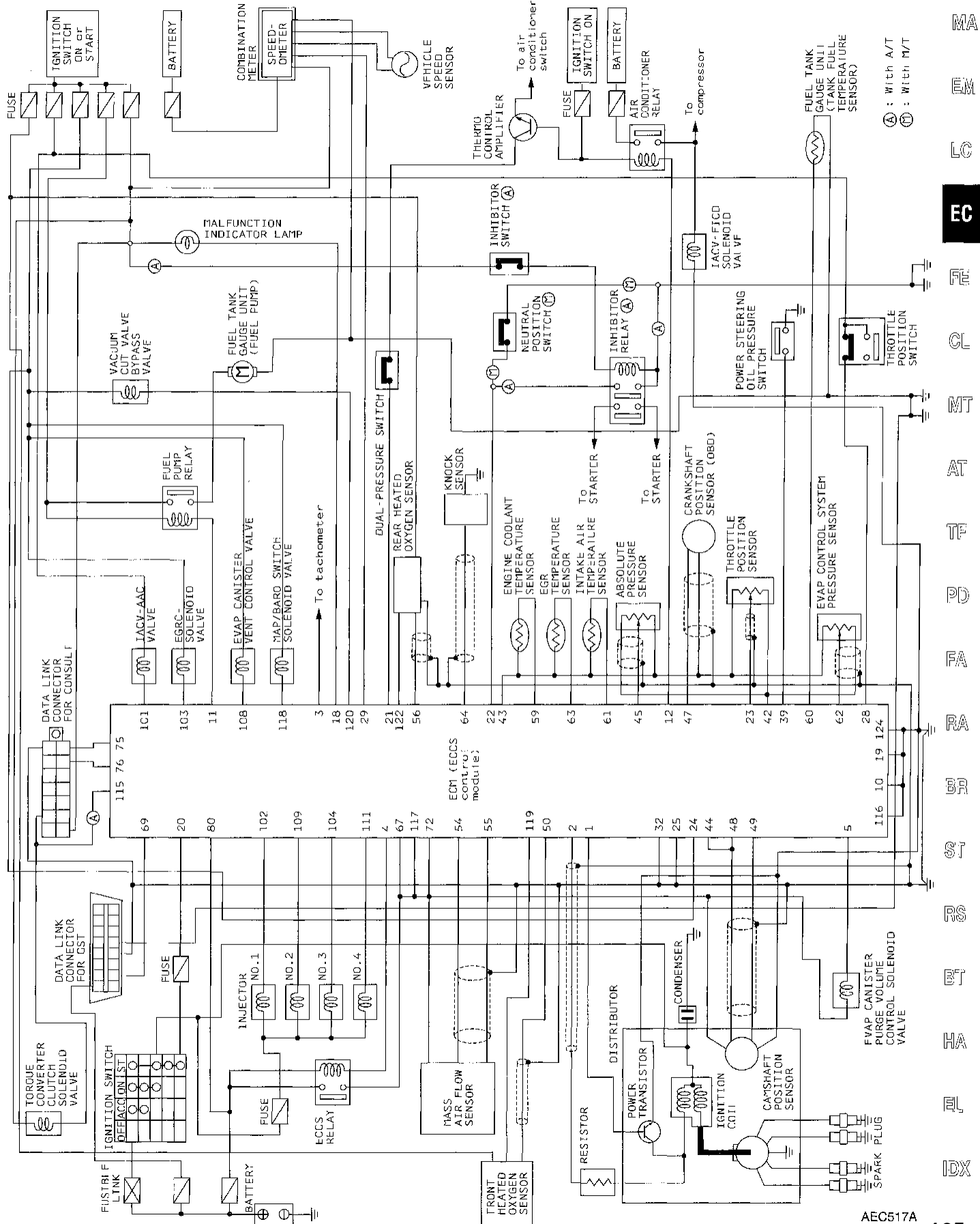
PRECAUTIONS AND PREPARATION

Precautions (Cont'd)

- When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

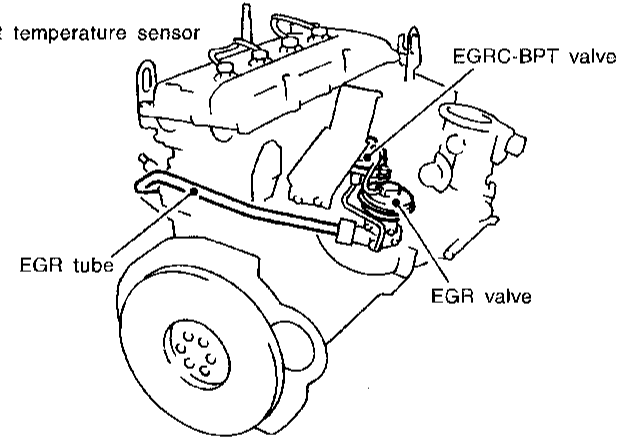
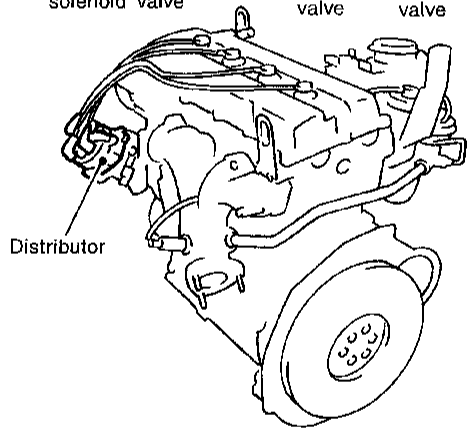
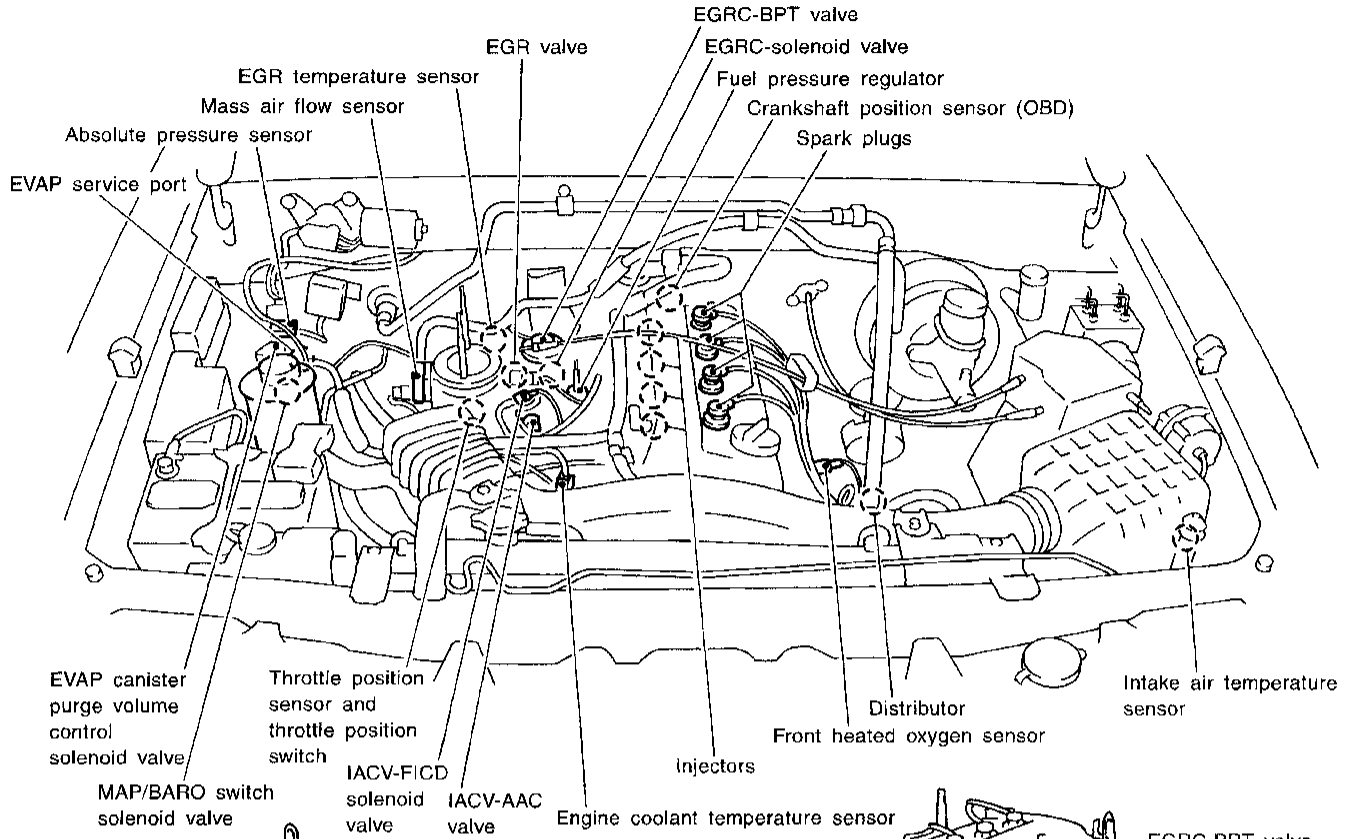


Circuit Diagram

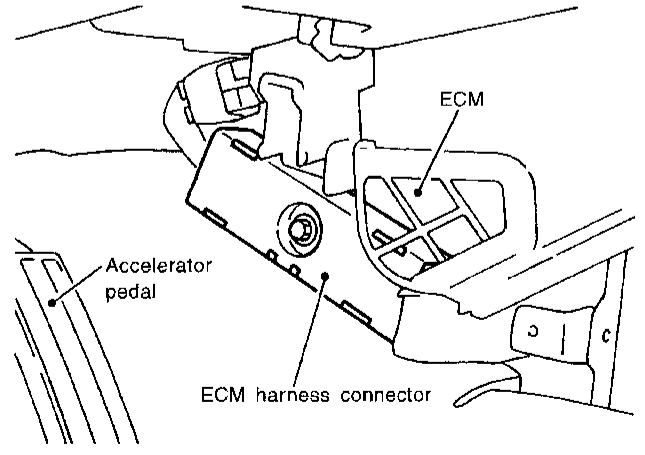
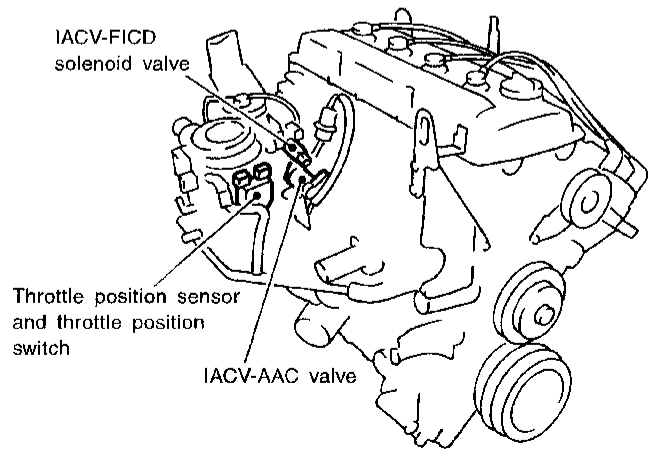


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ECCS Component Parts Location

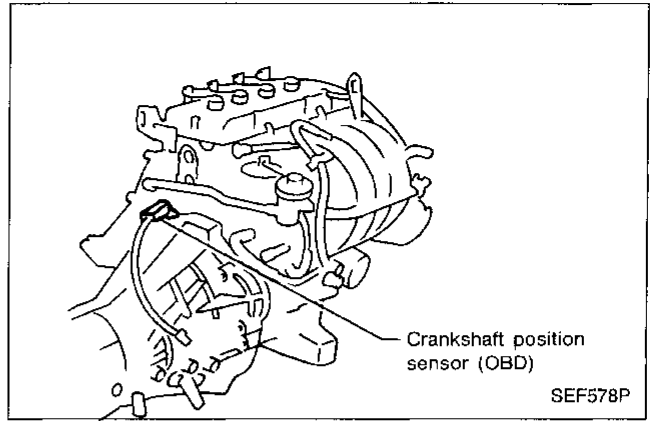
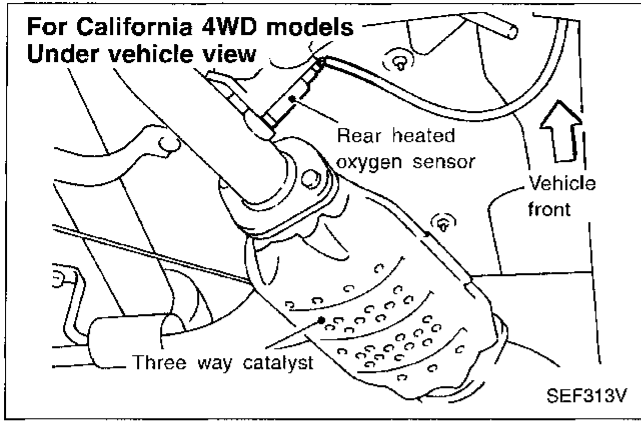


Driver side



ENGINE AND EMISSION CONTROL OVERALL SYSTEM

ECCS Component Parts Location (Cont'd)



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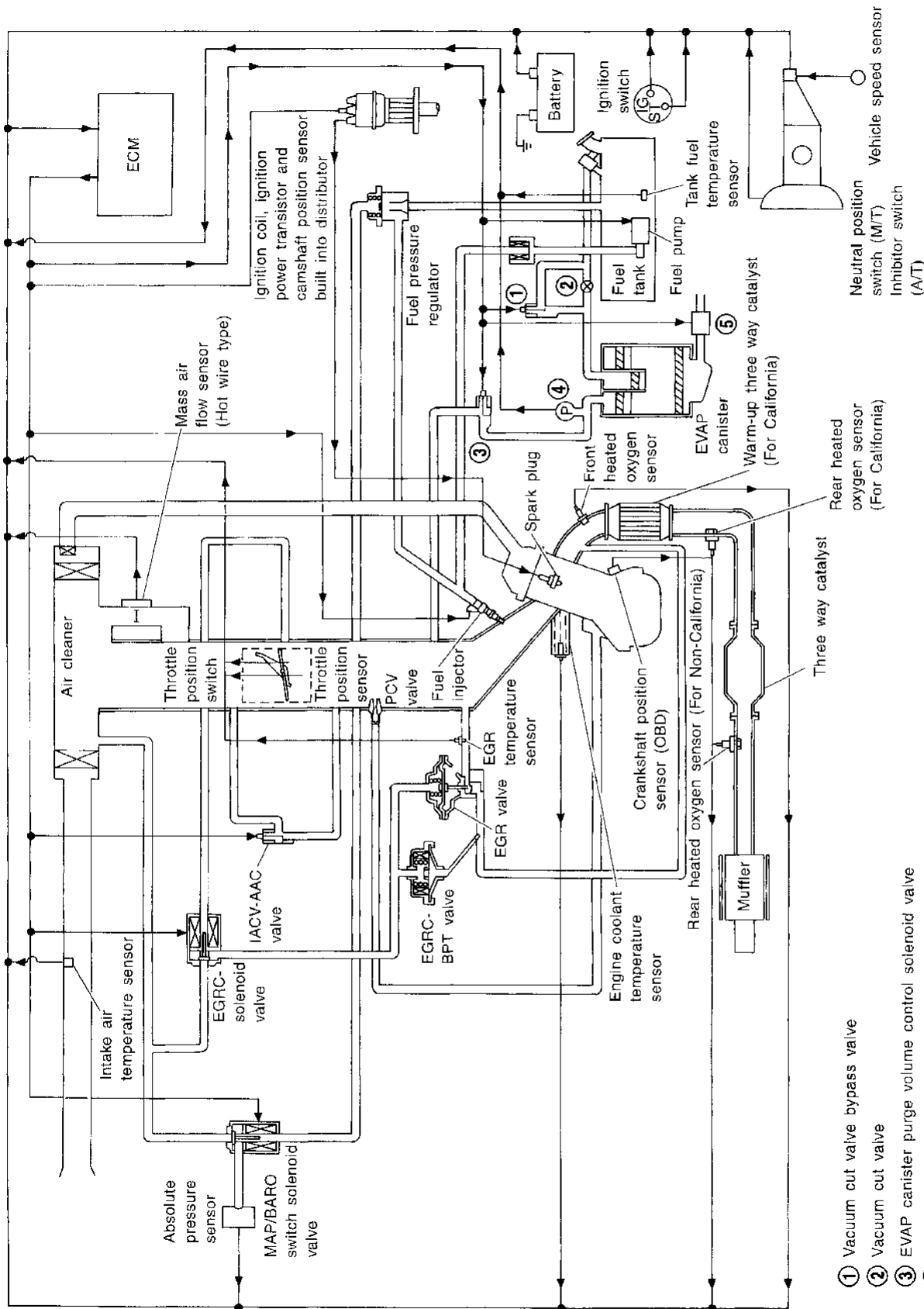
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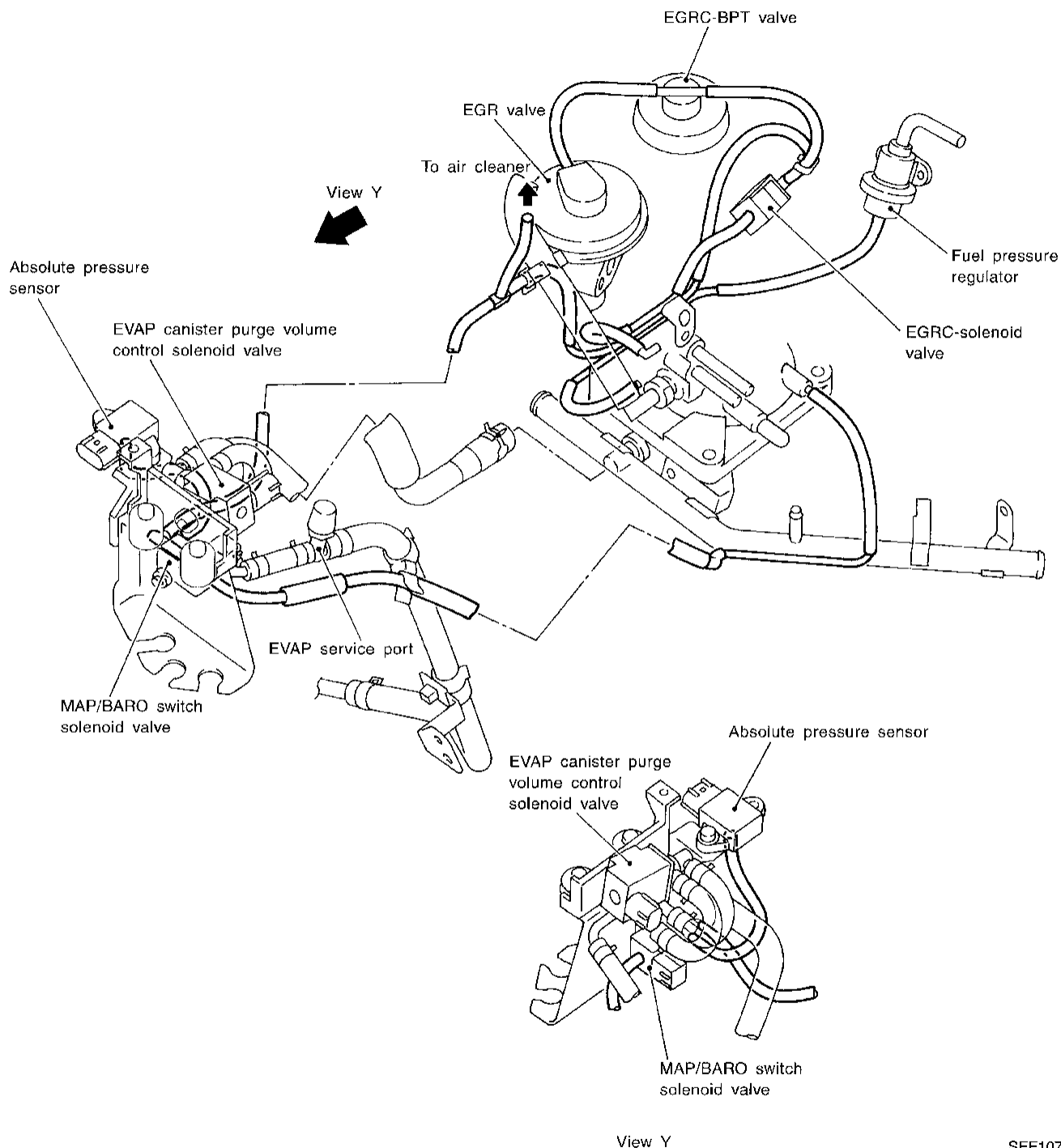
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System Diagram



Vacuum Hose Drawing

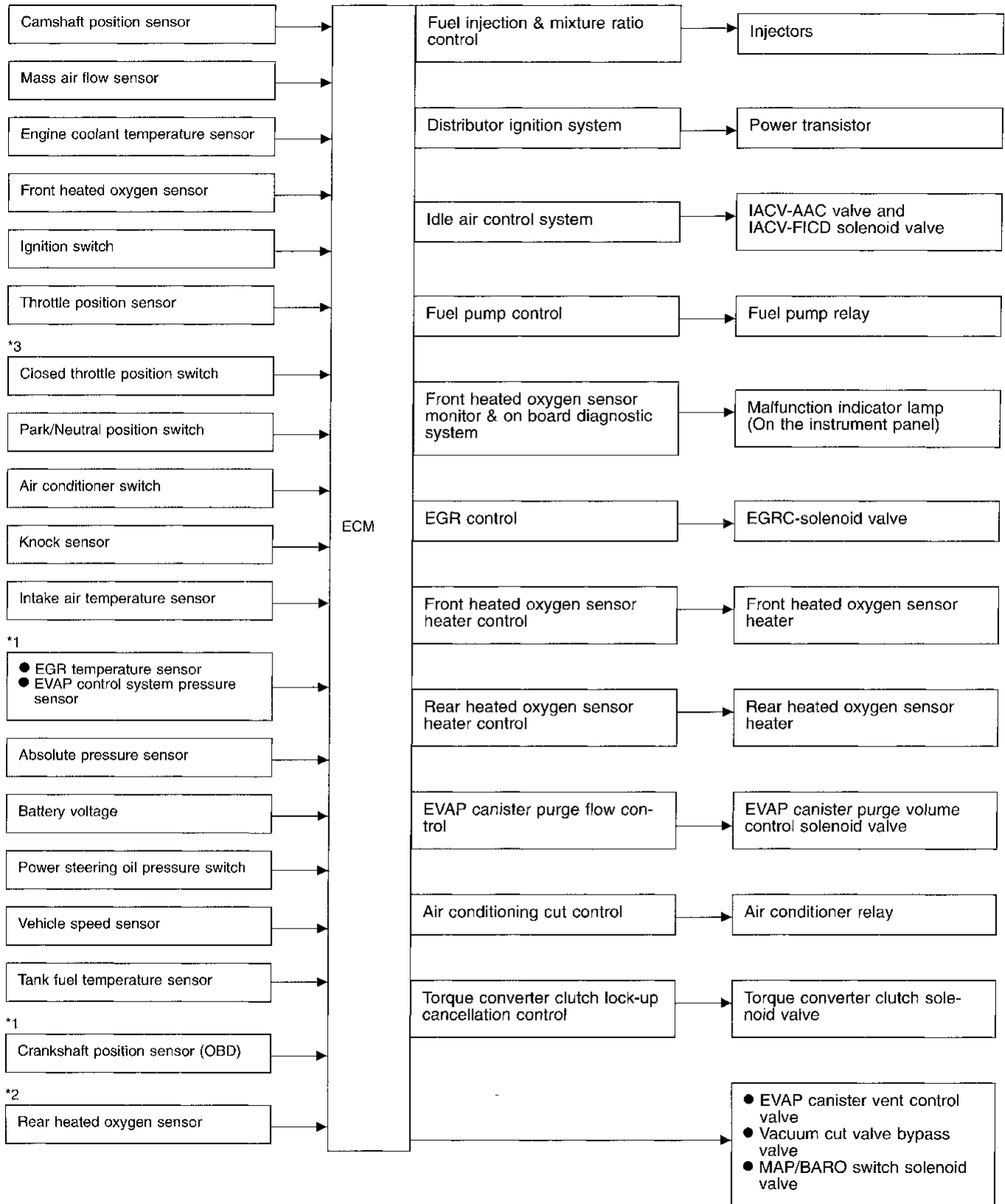


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Note: Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

System Chart



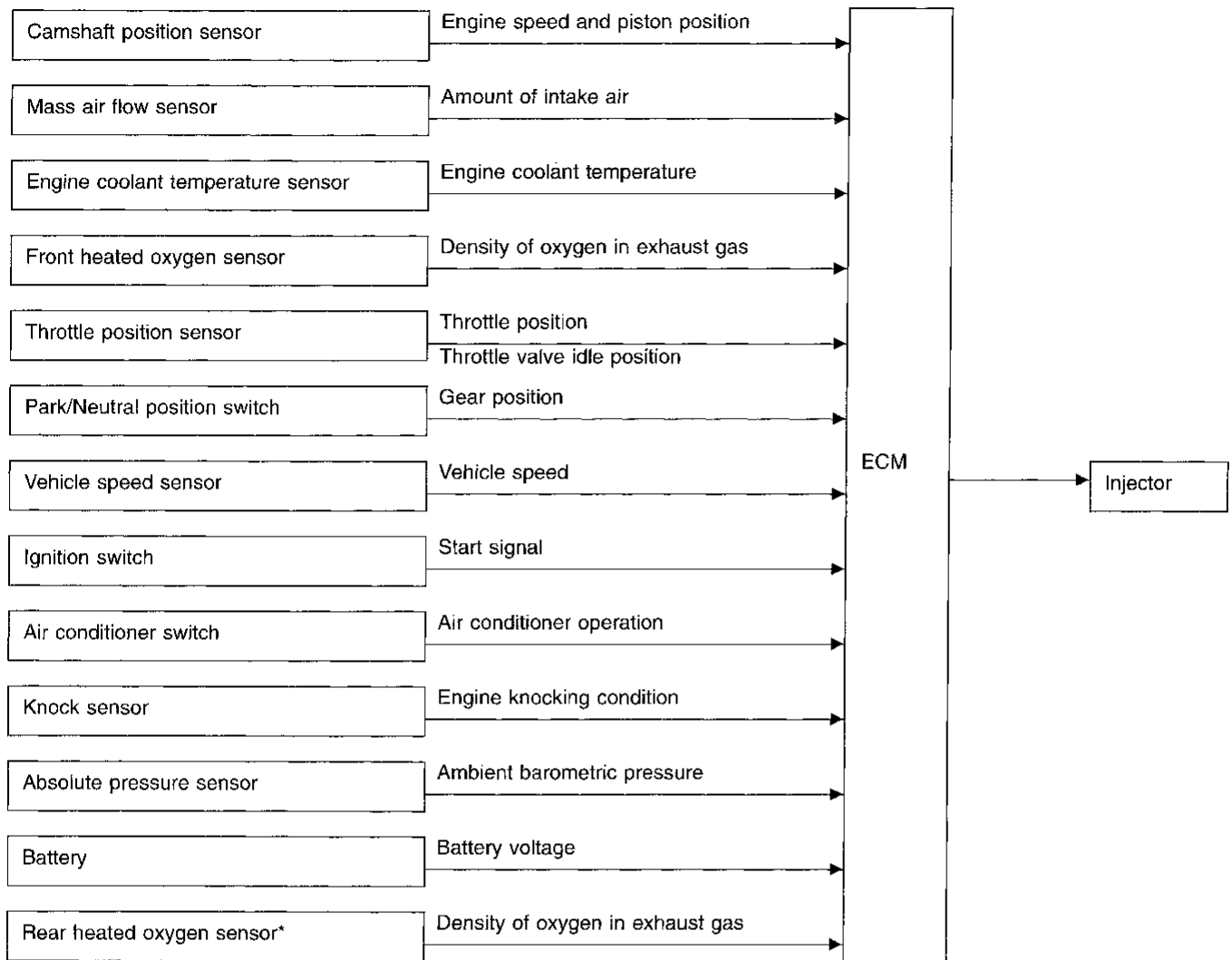
*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.

*2: This sensor is not used to control the engine system under normal conditions.

*3: This switch will operate in place of the throttle position sensor to control EVAP parts if the sensor malfunctions.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



* Under normal conditions, this sensor is not for engine control operation.

BASIC MULTIPOINT FUEL INJECTION SYSTEM

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air) from both the camshaft position sensor and the mass air flow sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

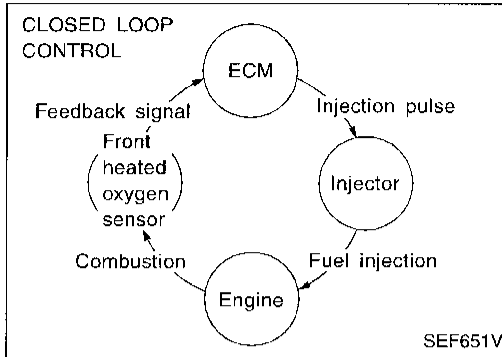
<Fuel increase>

- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

Multipoint Fuel Injection (MFI) System (Cont'd) MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the front heated oxygen sensor, refer to EC-144. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

This stage is referred to as the closed loop control condition.

Rear heated oxygen sensor is located downstream of the three way catalyst. Even if the switching characteristics of the front heated oxygen sensor shift, the air-fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.

OPEN LOOP CONTROL

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of front heated oxygen sensor or its circuit
- Insufficient activation of front heated oxygen sensor at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the front heated oxygen sensor. This feedback signal is then sent to the ECM. The ECM controls the 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 "injection pulse duration" to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.

"Short term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the front heated oxygen sensor indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION

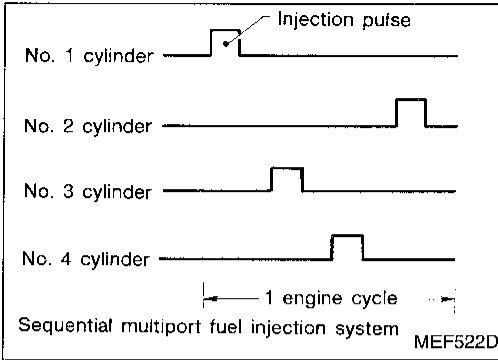
Multiport Fuel Injection (MFI) System (Cont'd)

FUEL INJECTION TIMING

Two types of systems are used.

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.

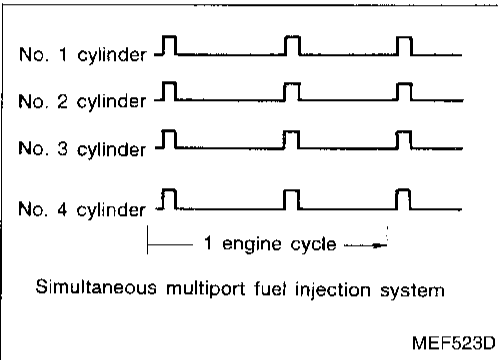


Simultaneous multiport fuel injection system

Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.

The six injectors will then receive the signals two times for each engine cycle.

This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

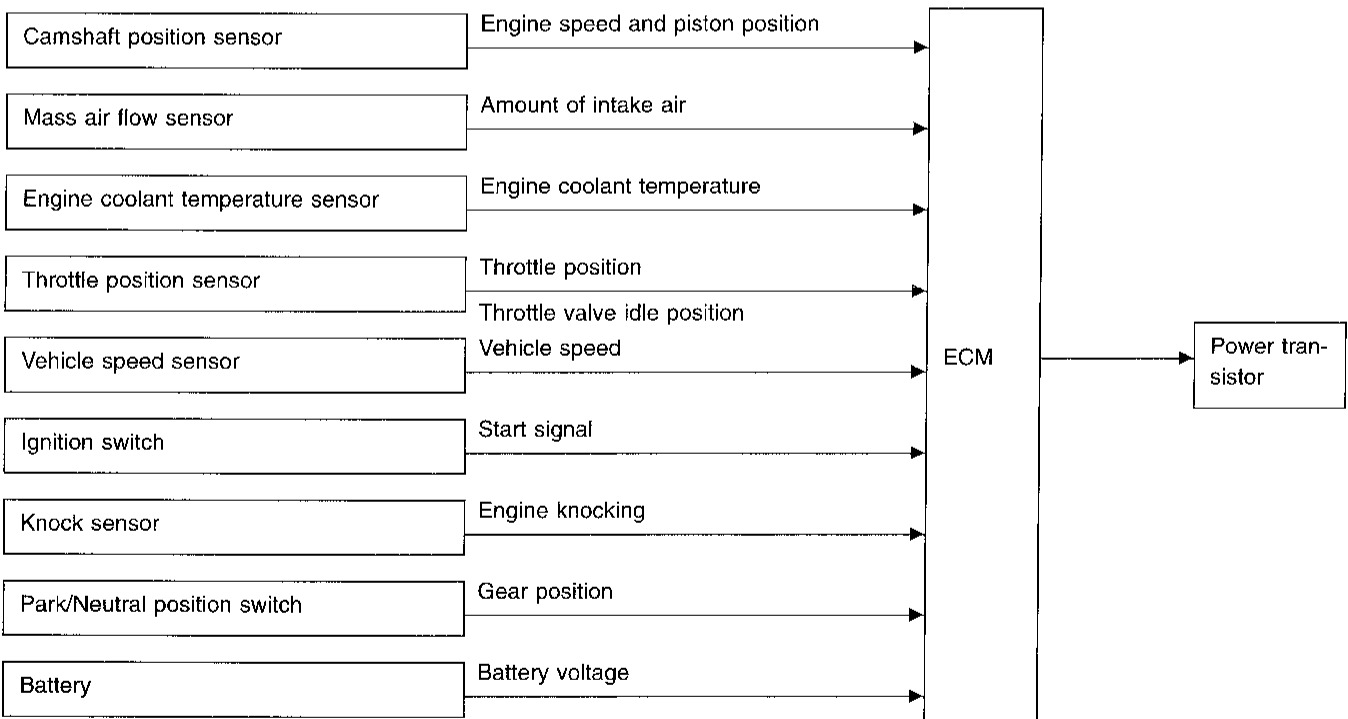


FUEL SHUT-OFF

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

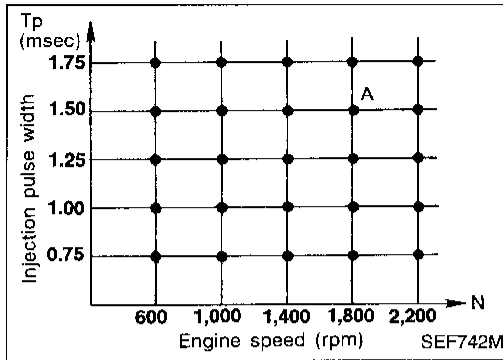
Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION

Distributor Ignition (DI) System (Cont'd) SYSTEM DESCRIPTION



The ignition timing is controlled by the ECM 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.

The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

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

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

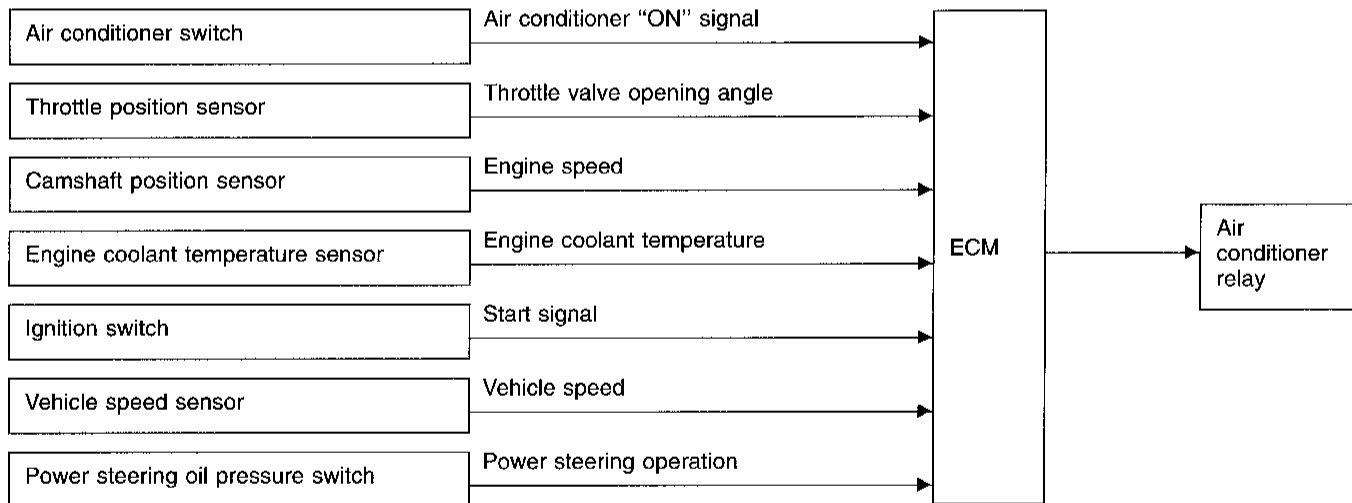
- At starting
- During warm-up
- At idle
- Hot engine operation
- During acceleration

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

If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.

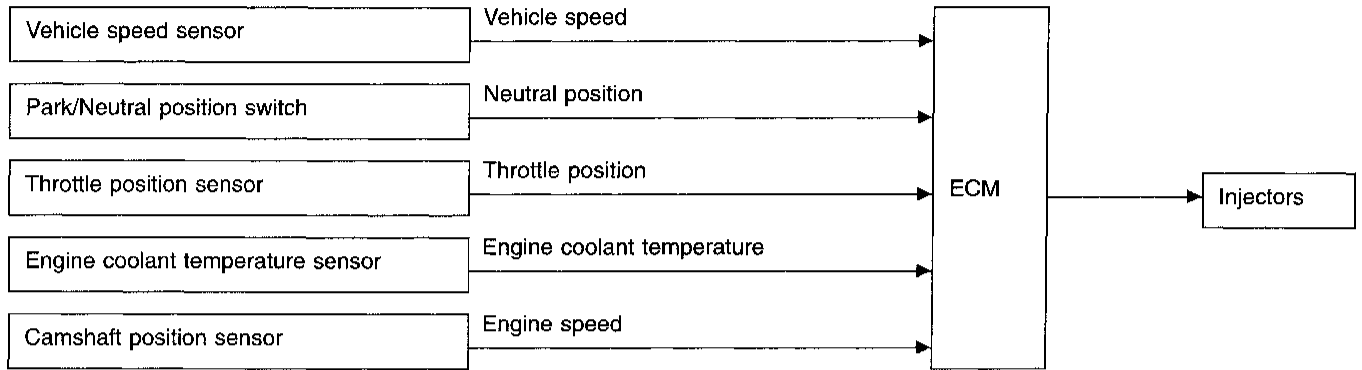
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.

- When the engine coolant temperature becomes excessively high.
- When operating power steering and air conditioner during low engine speed or when fully releasing accelerator pedal.
- When engine speed is excessively low.

Fuel Cut Control (at no load & high engine speed)

INPUT/OUTPUT SIGNAL LINE



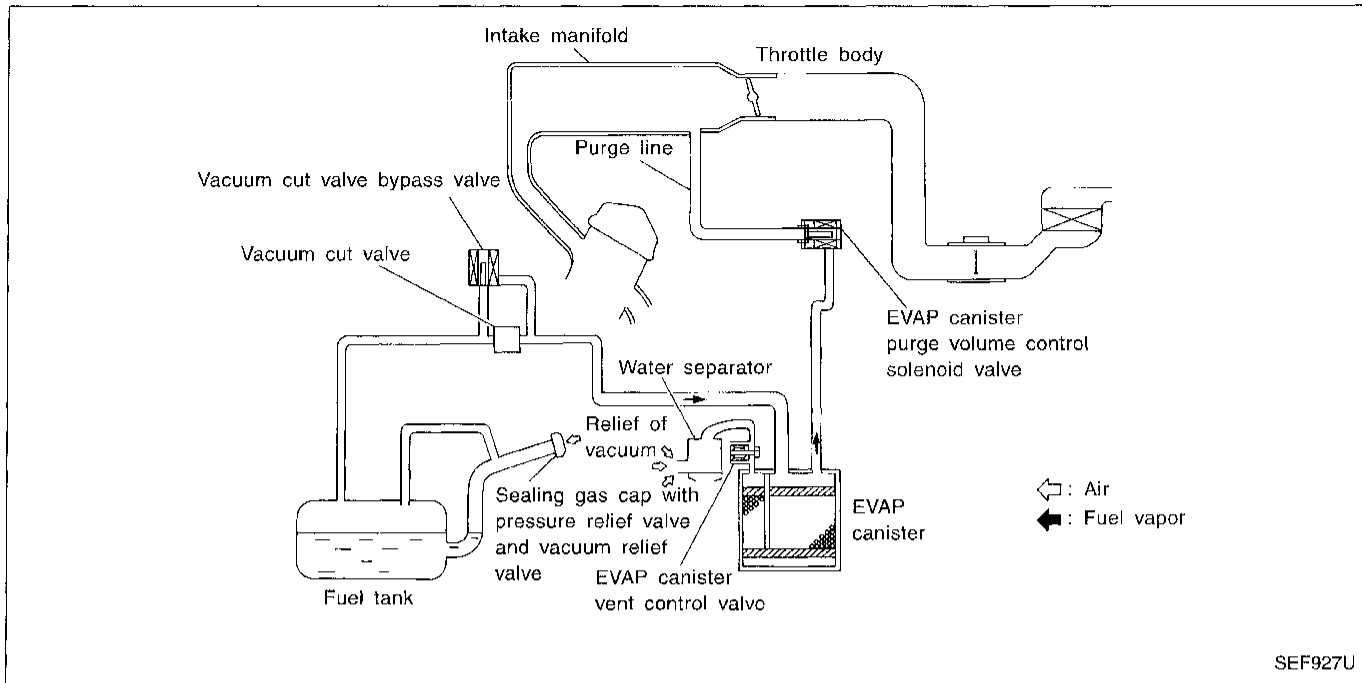
If the engine speed is above 3,000 rpm with no load, (for example, in neutral and engine speed over 3,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-15.

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EVAPORATIVE EMISSION SYSTEM

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 EVAP canister.

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

The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating.

EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

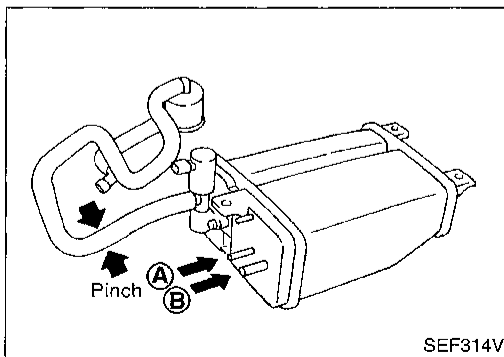
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

Inspection

EVAP CANISTER

Check EVAP canister as follows:

1. Pinch the fresh air hose.
2. Blow air into port (A) and check that air flows freely through port (B).



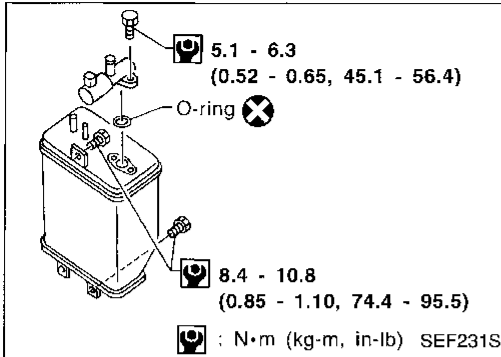
EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

TIGHTENING TORQUE

Tighten EVAP canister as shown in the figure.

Make sure new O-ring is installed properly between EVAP canister and EVAP vent control valve.



FUEL TANK VACUUM RELIEF VALVE (Built into fuel filler cap)

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.

Pressure:

16.0 - 20.0 kPa (0.163 - 0.204 kg/cm², 2.32 - 2.90 psi)

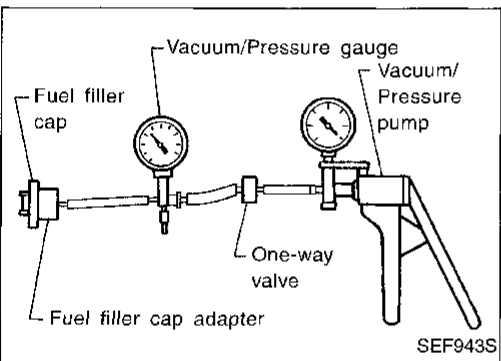
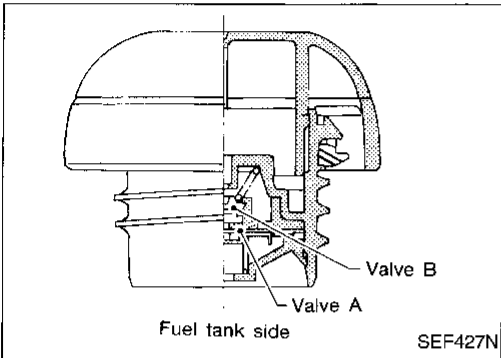
Vacuum:

-6.0 to -3.5 kPa (-0.061 to -0.036 kg/cm², -0.87 to -0.51 psi)

3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:

Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.



VACUUM CUT VALVE AND VACUUM CUT VALVE BYPASS VALVE

Refer to EC-383.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-355.

TANK FUEL TEMPERATURE SENSOR

Refer to EC-218.

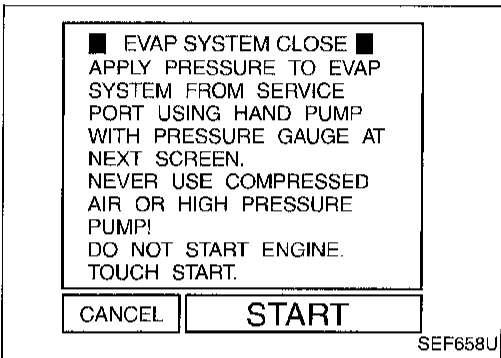
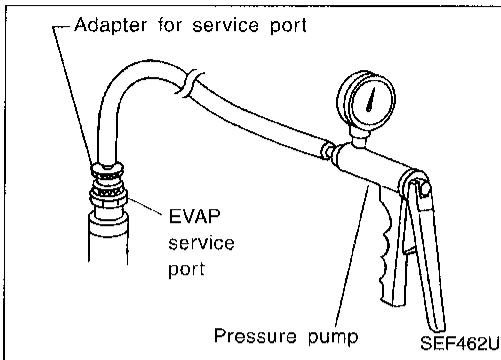
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EVAPORATIVE EMISSION SYSTEM

Inspection (Cont'd)

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leak.



How to detect fuel vapor leakage

CAUTION:

Never use compressed air or a high pressure pump.

NOTE:

Improper installation of adapter to the service port may cause a leak.



1. Attach the adapter securely to the EVAP SERVICE port.
2. Also attach the pressure pump and hose.
3. Turn ignition switch "ON".
4. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
5. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove adapter and hose with pressure pump.
8. Locate the leak using a leak detector. Refer to "Evaporative Emission Line Drawing" on next page.

OR

CAUTION:

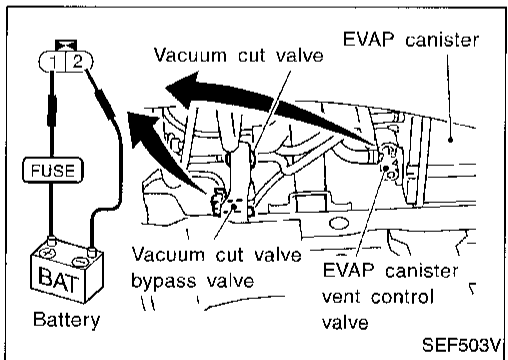
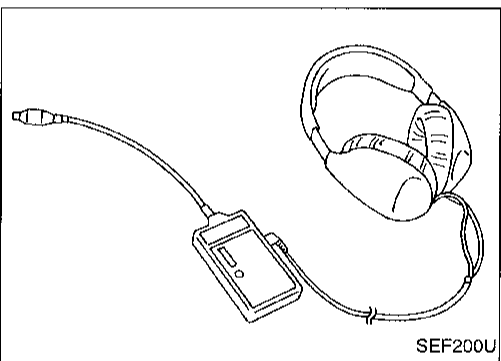
Never use compressed air or a high pressure pump.

NOTE:

Improper installation of adapter to service port may cause a leak.

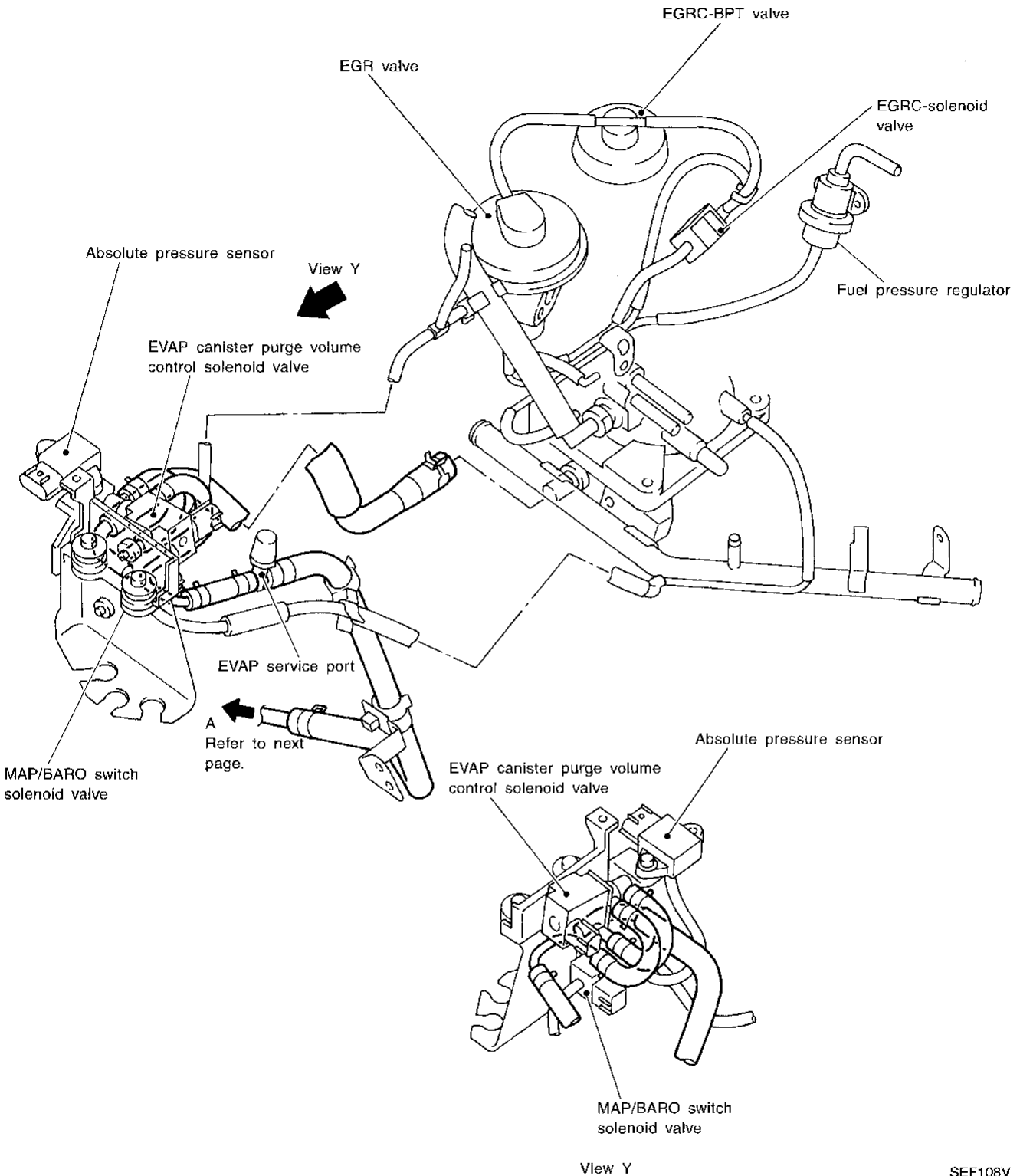


1. Attach the adapter securely to the EVAP service port and pressure pump with pressure gauge to the EVAP service port.
2. Apply battery voltage to between the terminals of both EVAP canister vent control valve and vacuum cut valve bypass valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm², 0.2 to 0.4 psi).
4. Remove adapter and hose with pressure pump.
5. Locate the leak using a leak detector. Refer to "Evaporative Emission Line Drawing" on next page.



EVAPORATIVE EMISSION SYSTEM

Evaporative Emission Line Drawing



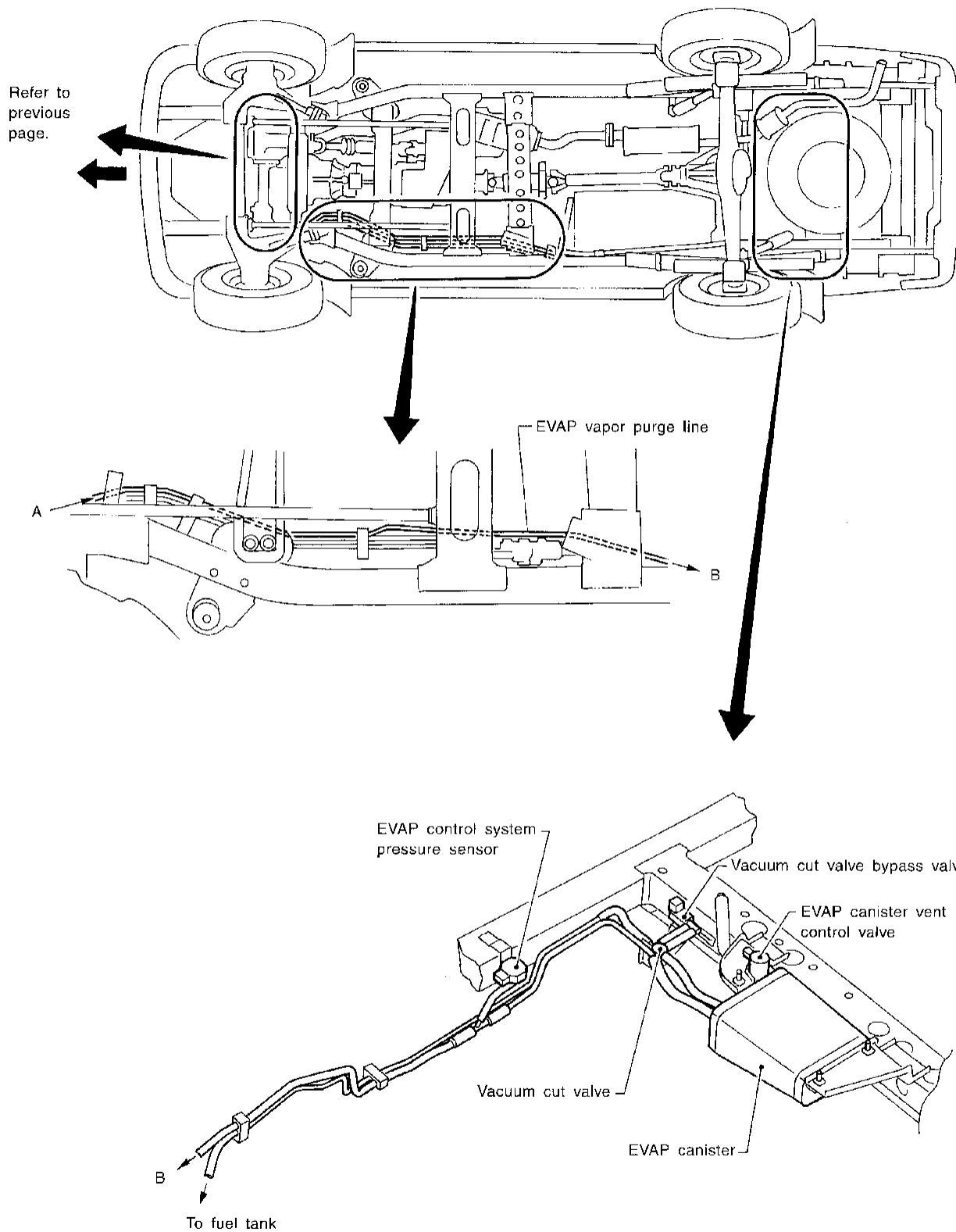
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Note: Do not use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

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EVAPORATIVE EMISSION SYSTEM

Evaporative Emission Line Drawing (Cont'd)



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.

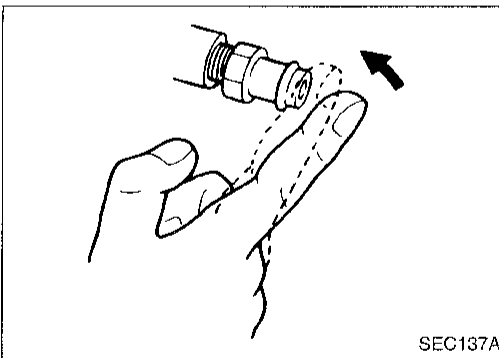
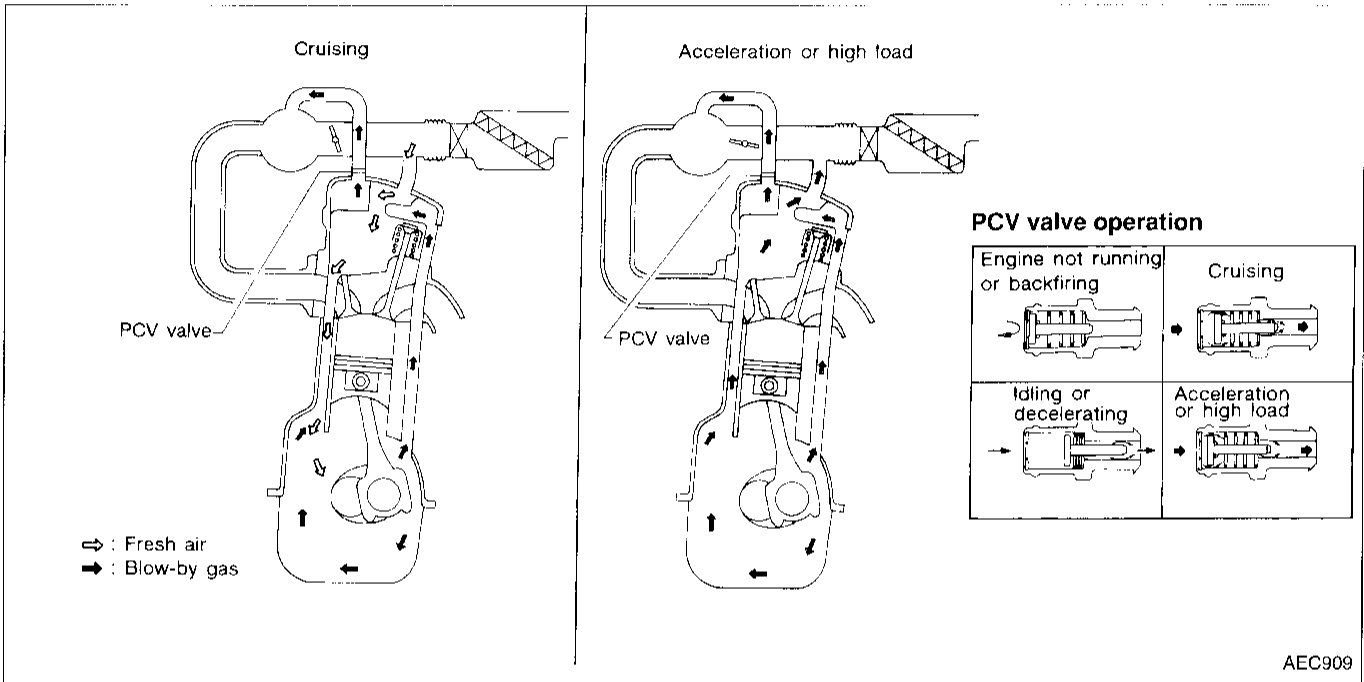
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is then drawn from the air duct

into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

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

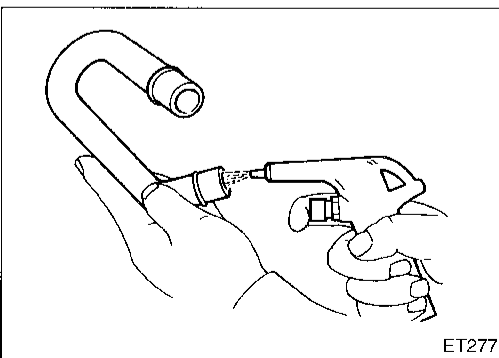
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake collector under all conditions.



Inspection

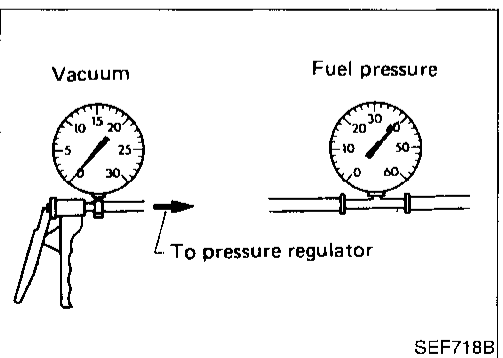
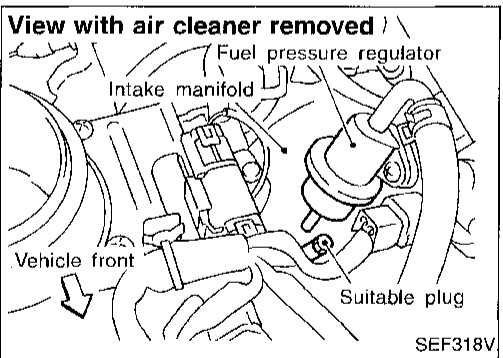
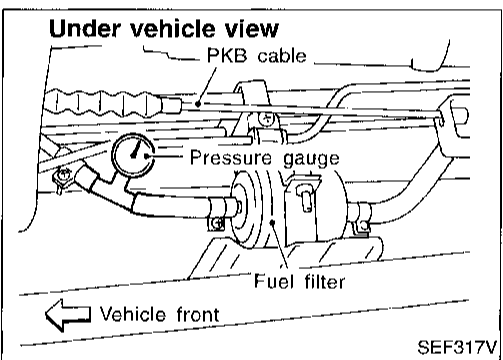
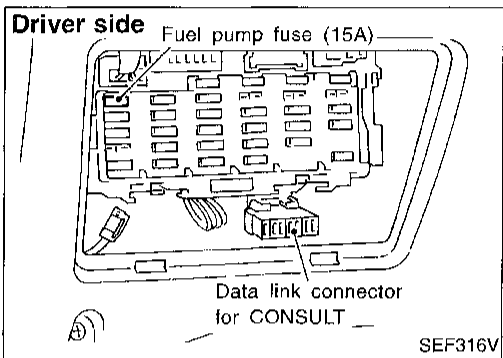
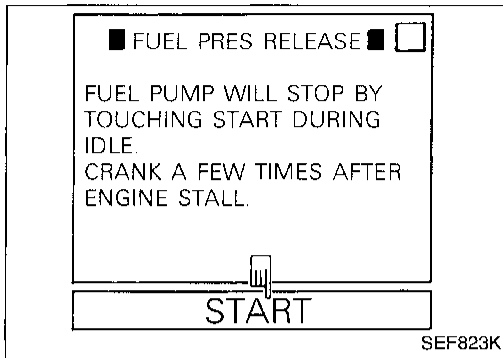
PCV (Positive Crankcase Ventilation) VALVE

With engine running at idle, remove PCV valve from breather separator. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the 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.



Fuel Pressure Release

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

1. Start engine.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
3. After engine stalls, crank it two or three times to make sure that fuel pressure is released.
4. Turn ignition switch "OFF".

OR

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

Fuel Pressure Check

- When reconnecting fuel line, always use new clamps.
- Make sure that clamp screw does not contact adjacent parts.
- Use a torque driver to tighten clamps.
- Use Pressure Gauge to check fuel pressure.
- Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false 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:

With vacuum hose connected

Approximately 235 kPa (2.4 kg/cm², 34 psi)

With vacuum hose disconnected

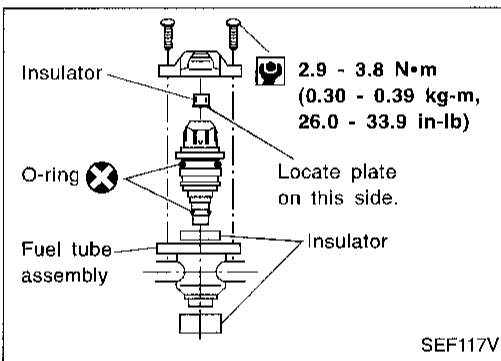
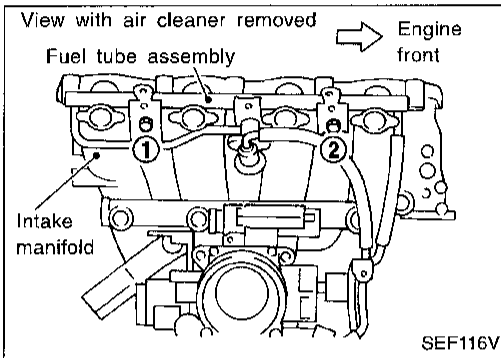
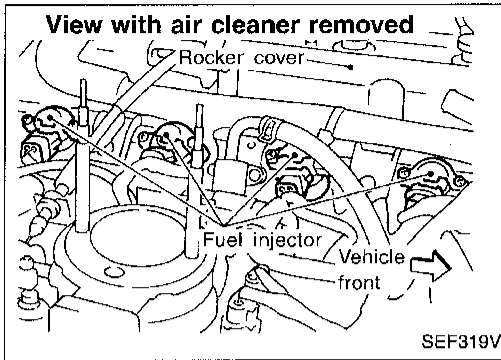
Approximately 294 kPa (3.0 kg/cm², 43 psi)

If results are unsatisfactory, perform "Fuel Pressure Regulator Check".

Fuel Pressure Regulator Check

1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a rubber cap.
3. Connect variable vacuum source to fuel pressure regulator.
4. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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



Injector Removal and Installation

1. Release fuel pressure to zero.
2. Remove injector tube assembly with injectors from intake manifold.
3. Remove injectors from injector tube assembly.
 - Push injector tail piece.
 - Do not pull on the connector.
4. Install injector to fuel tube assembly.
 - a. Clean exterior of injector tail piece.
 - b. Use new O-rings.

Always replace O-rings with new ones.

Lubricate O-rings with a smear of engine oil.

5. Install injectors with fuel tube assembly to intake manifold.

Tighten in numerical order shown in the figure.

- a. First, tighten all bolts to 9.3 to 10.8 N•m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).
- b. Then, tighten all bolts to 21 to 26 N•m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).
6. Install fuel hoses to fuel tube assembly.
7. Reinstall any parts removed in reverse order of removal.

CAUTION:

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

GI

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BR

ST

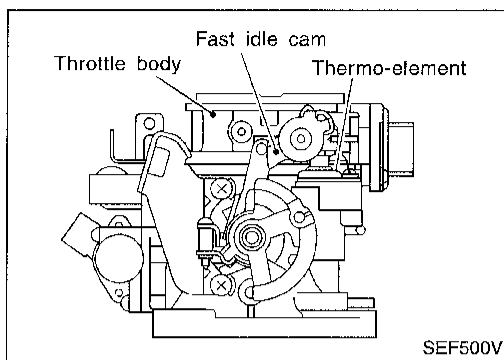
RS

BT

HA

EL

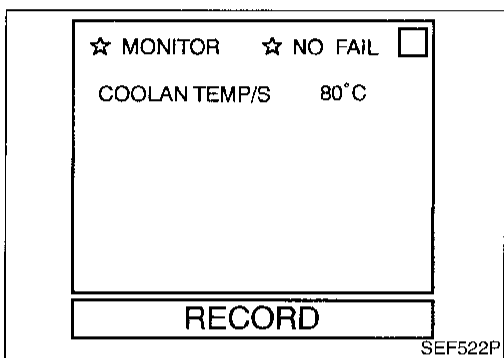
IDX



Fast Idle Cam (FIC)

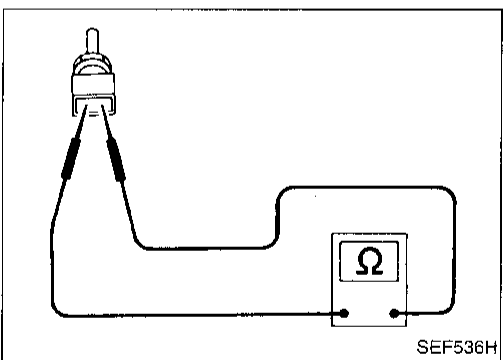
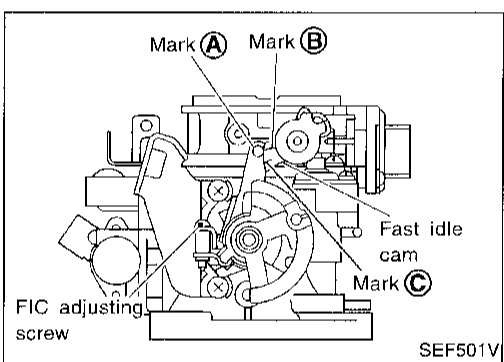
COMPONENT DESCRIPTION

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 operated by engine coolant temperature.



COMPONENT INSPECTION AND ADJUSTMENT

1. Turn ignition switch "ON".
2. See "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
3. Start engine and warm it up.
When engine temperature is $80 \pm 5^\circ\text{C}$ ($176 \pm 9^\circ\text{F}$), make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

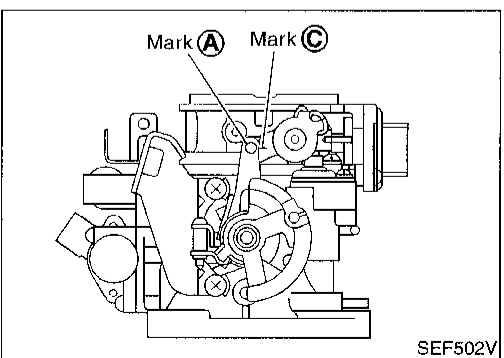


- OR
1. Turn ignition switch "OFF".
 2. Disconnect engine coolant temperature sensor harness connector and check resistance as shown in the figure.
 3. Start engine and warm it up.
When the resistance of engine coolant temperature sensor is 0.26 to 0.39 kΩ, make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

- If NG, adjust by turning adjusting screw.

Adjusting screw tightening torque:

0.98 - 1.96 N·m (10 - 20 kg·cm, 8.7 - 17.4 in·lb)



4. Stop engine.
5. Turn ignition switch "ON" and see "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
6. When engine coolant temperature is $25 \pm 5^\circ\text{C}$ ($77 \pm 9^\circ\text{F}$), make sure that the center of mark (A) is aligned with mark (C) as shown in the figure.

- OR
5. When the resistance of engine coolant temperature sensor is 1.65 to 2.40 kΩ, make sure that the center of mark (A) is aligned with mark (C) as shown in the figure.
- If NG, replace thermo-element and perform the above inspection and adjustment again.

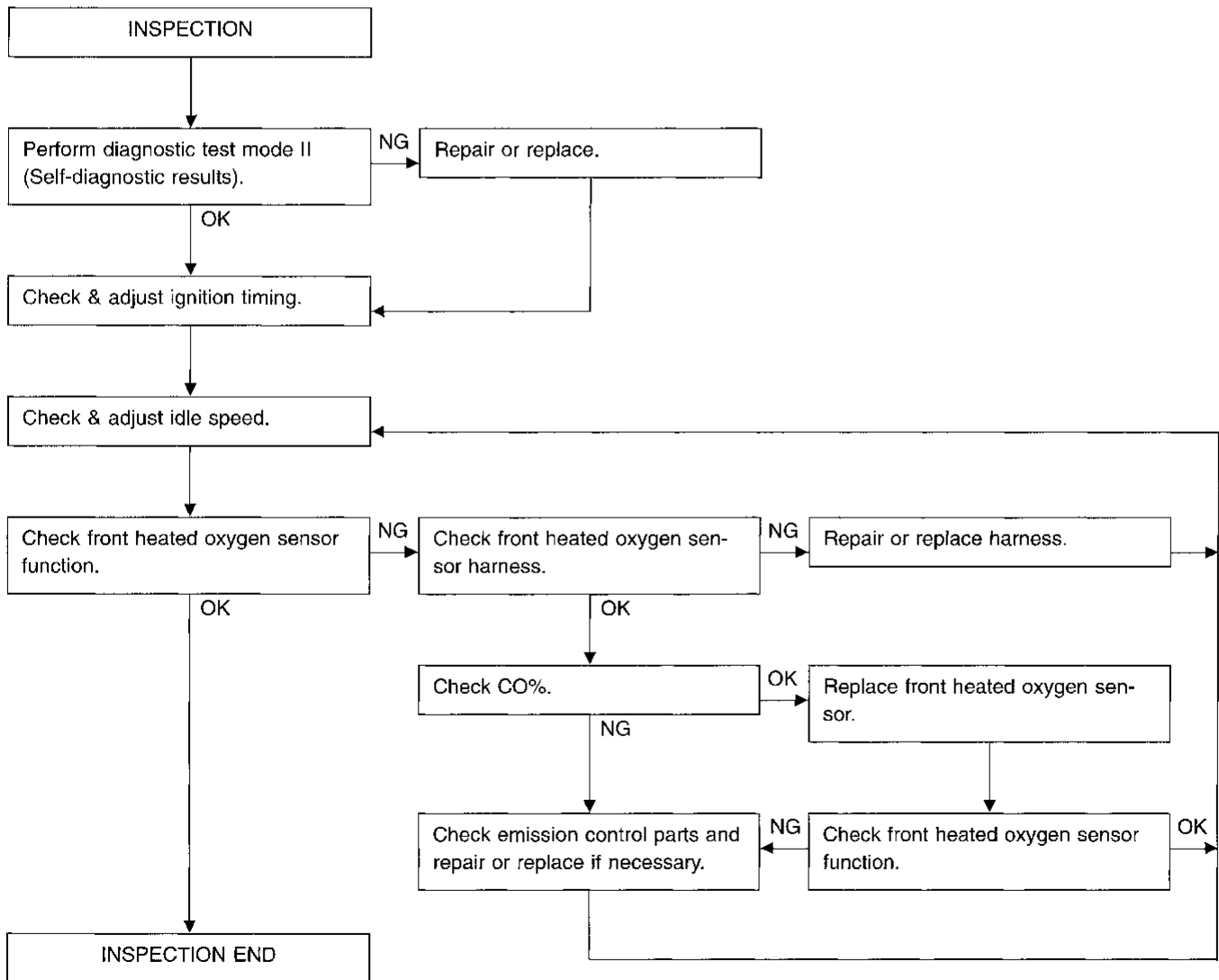
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

PREPARATION

- Make sure that the following parts are in good order.
- (1) Battery
- (2) Ignition system
- (3) Engine oil and coolant levels
- (4) Fuses
- (5) ECM harness connector
- (6) Vacuum hoses
- (7) Air intake system
(Oil filler cap, oil level gauge, etc.)
- (8) Fuel pressure
- (9) Engine compression
- (10) EGR valve operation
- (11) Throttle valve
- (12) EVAP system

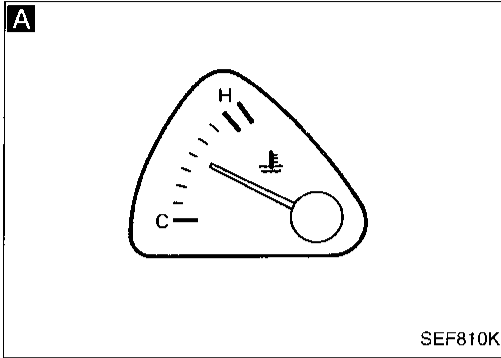
- On models equipped with air conditioner, checks should be carried out while the air conditioner is "OFF".
- On models equipped with automatic transaxle, when checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.
- When measuring "CO"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

Overall inspection sequence



BASIC SERVICE PROCEDURE

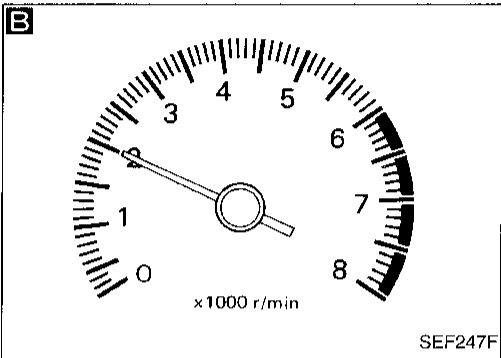
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



START

Visually check the following:

- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gasket
- Throttle valve and throttle position sensor operations

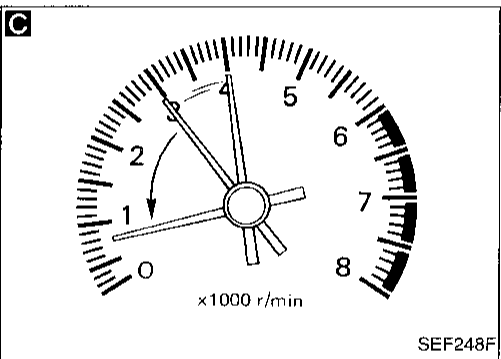


A

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

B

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



Perform ECM Self-diagnosis.

OK → []
NG → Repair or replace components as necessary.

C

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

D

■ IGN TIMING ADJ ■ □

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.

START

SEF546N

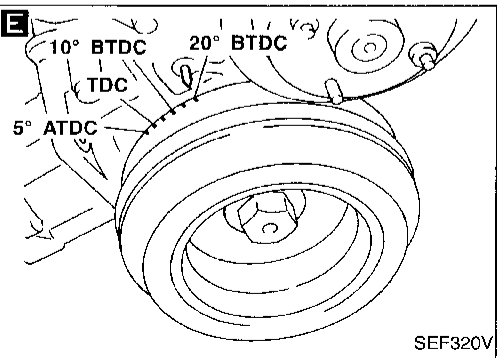
D

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

OR

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

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



E

Check ignition timing with a timing light.
20°±2° BTDC (A/T in "N" position)

OK → **A** (Go to next page.)
NG → **B** (Go to next page.)

BASIC SERVICE PROCEDURE

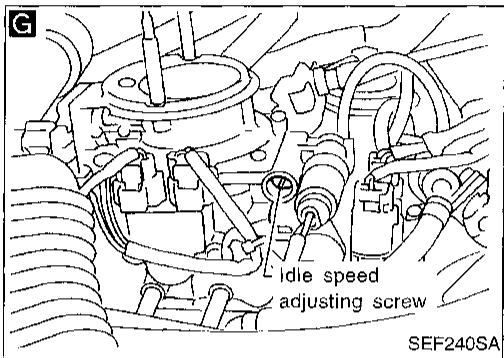
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

F ■ IGN TIMING ADJ ■ □

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.

START

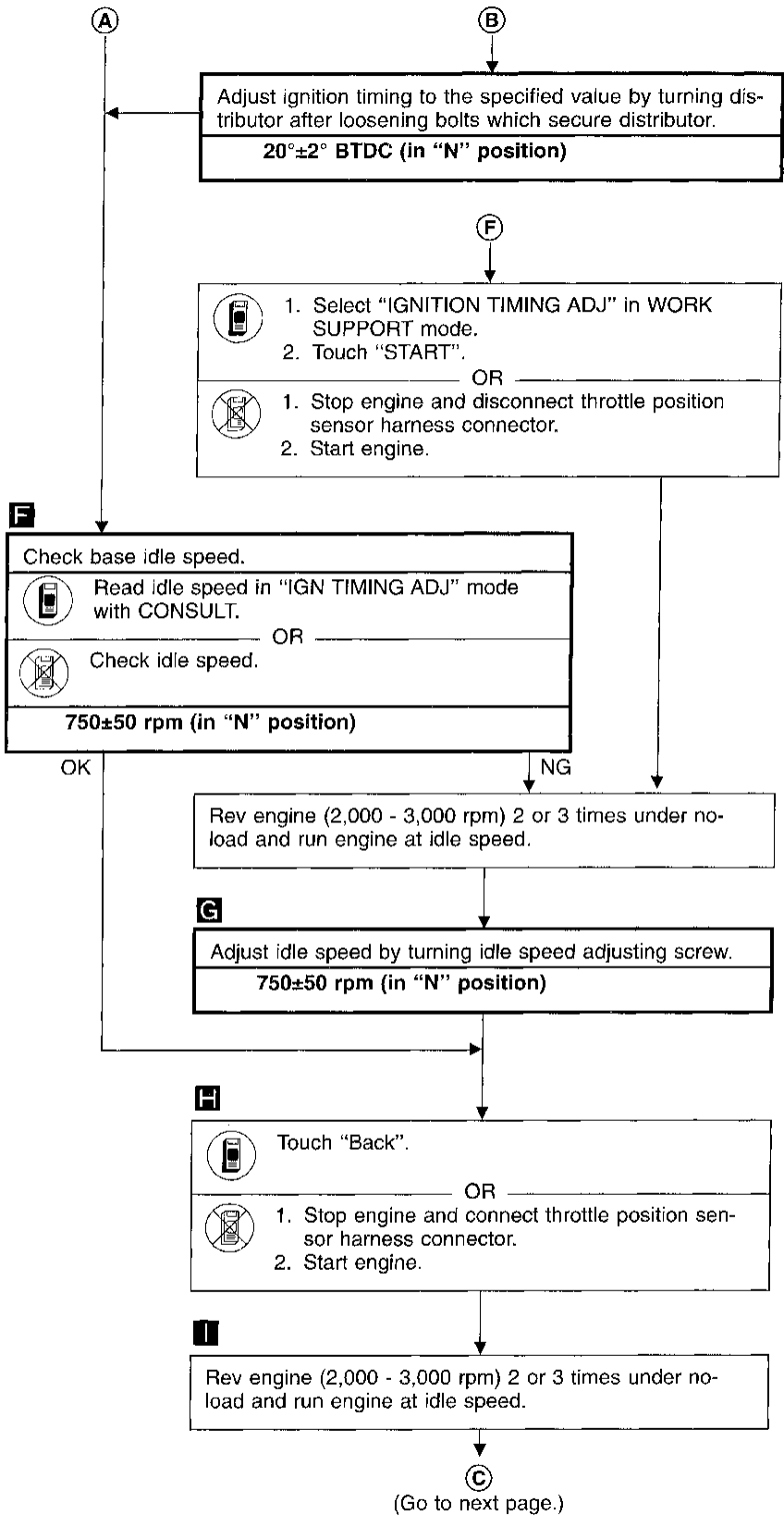
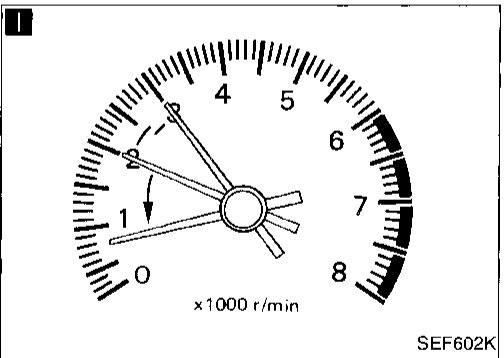
SEF546N



H

| | | | | | |
|------|----------|-----------|---|---|-------|
| BACK | ← | → | ↑ | ↓ | |
| MODE | LIGHT ON | LIGHT OFF | ↑ | ↓ | ENTER |

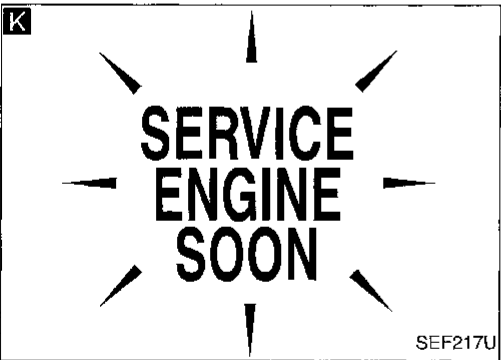
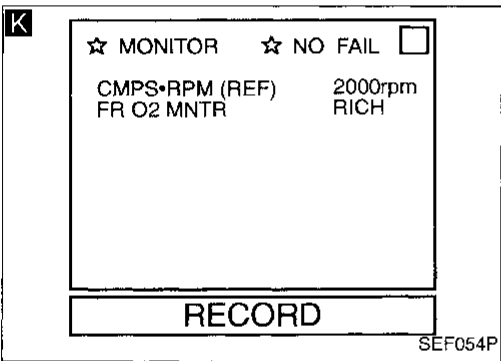
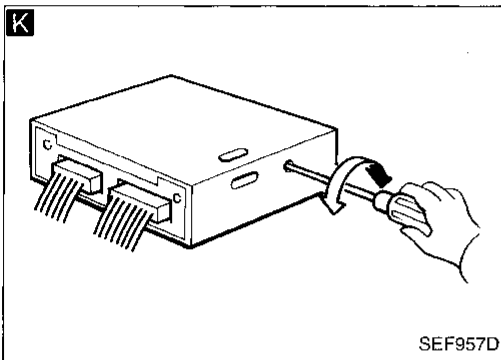
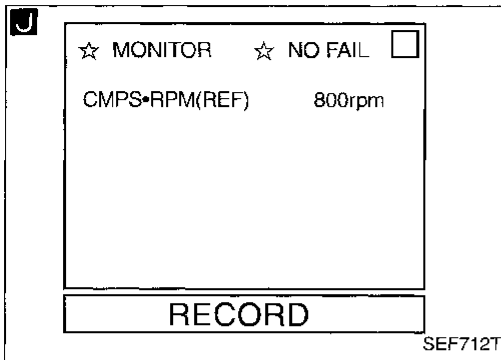
SEF913J



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BASIC SERVICE PROCEDURE

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



Ⓢ

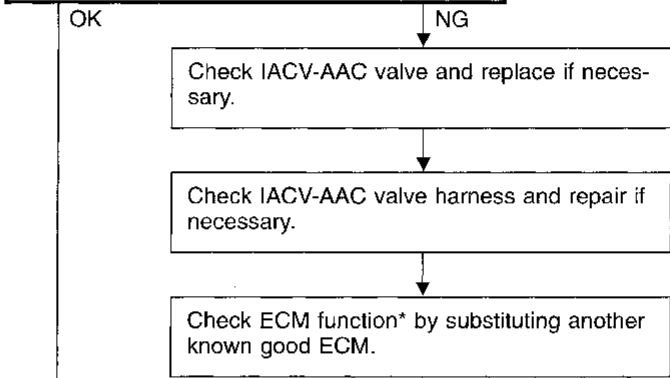
Check target idle speed.

Read idle speed in "DATA MONITOR" mode with CONSULT.

OR

Check idle speed.

800±50 rpm (in "N" position)



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

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

Ⓢ

Check front heated oxygen sensor signal.

1. See "FR O2 MNTR" in "DATA MONITOR" mode.

2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), 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

1. Set the diagnostic test mode II (front heated oxygen sensor monitor).

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

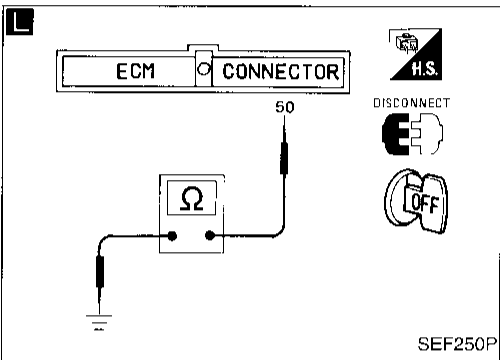
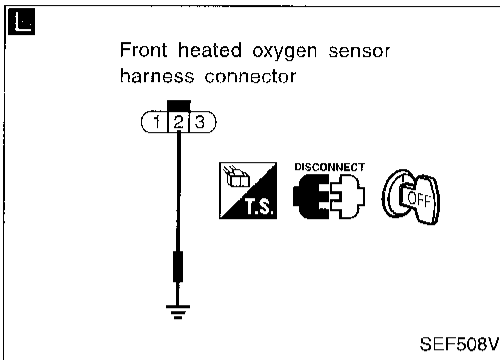
NG → Ⓣ (Go to next page.)

OK

INSPECTION END

BASIC SERVICEPROCEDURE

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



L

Check front heated oxygen sensor harness:

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector from ECM.
3. Disconnect front heated oxygen sensor harness connector and connect terminal for front heated oxygen sensor to ground with a jumper wire.
4. Check for continuity between terminal No. 50 of ECM harness connector and ground metal on vehicle body.

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

OK → Connect ECM harness connector to ECM.

NG → Repair harness. (Go to EC-31.)

I

1. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
2. Set "COOLANT TEMP" at 5°C (41°F).

OR

1. Disconnect engine coolant temperature sensor harness connector.
2. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.

Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
(Be careful to start engine after setting "COOLANT TEMP" or installing a 4.4 kΩ resistor.)

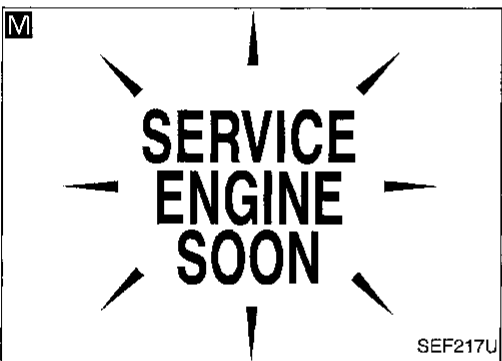
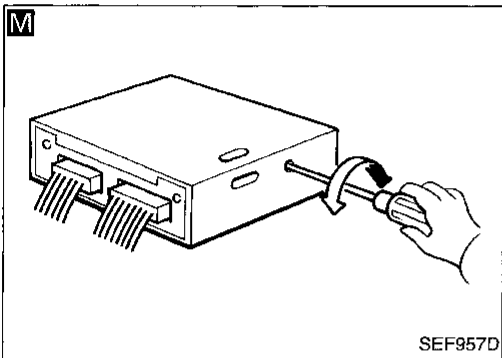
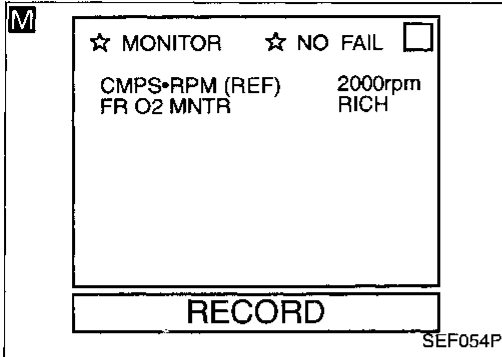
Rev engine two or three times under no-load then run engine at idle speed.

E
(Go to next page.)

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BASIC SERVICE PROCEDURE

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



Ⓔ

Check "CO"%.

Idle CO: 2.9 - 10.8 % and engine runs smoothly.

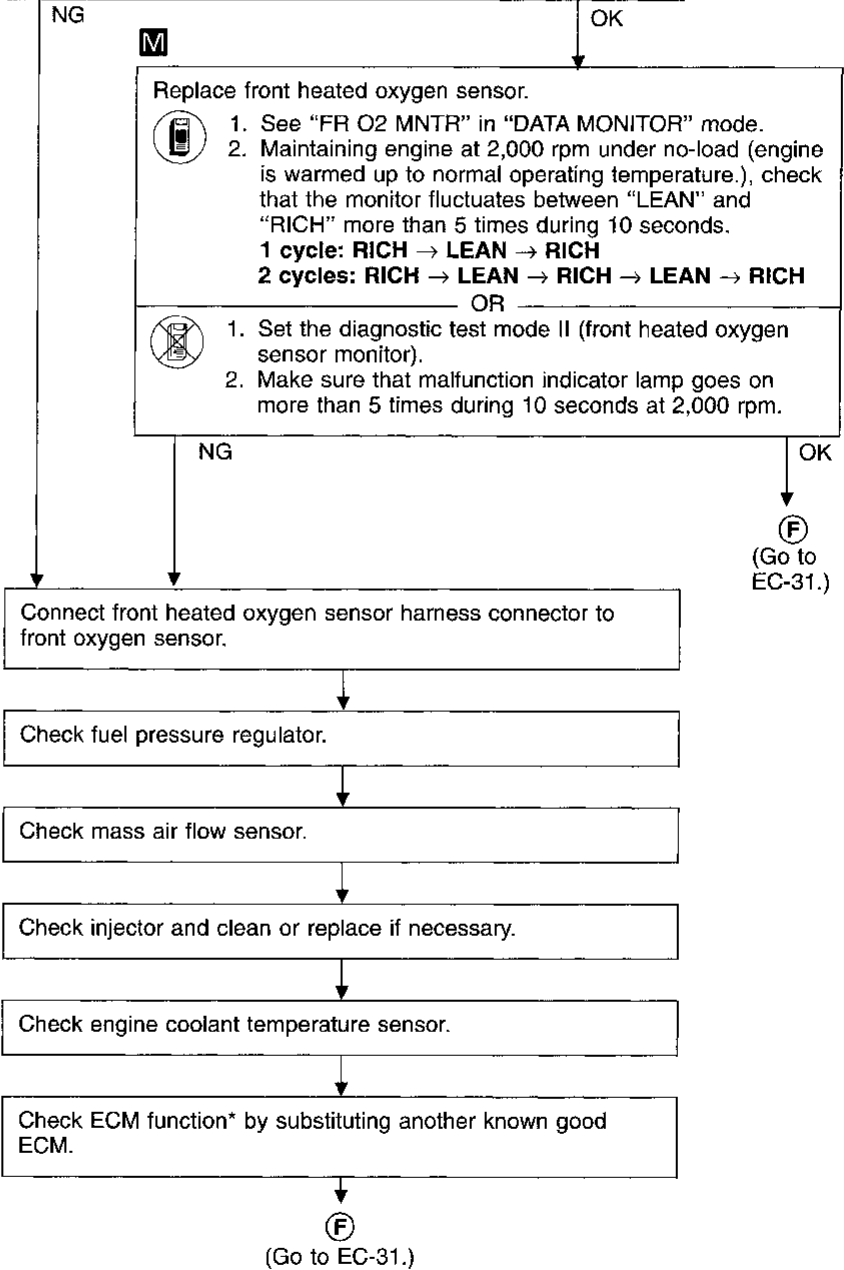
After checking "CO"%

Ⓜ Touch "BACK".

OR

Ⓜ

1. Disconnect the resistor from terminals of engine coolant temperature sensor.
2. Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.



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

- If a vehicle contains a part which is operating outside of design specifications with no MIL illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system cannot reasonably be expected to detect the resulting malfunction.

Introduction

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

- Diagnostic Trouble Code (DTC) Mode 3 of SAE J1979
- Freeze Frame data Mode 2 of SAE J1979
- System Readiness Test (SRT) code Mode 1 of SAE J1979
- 1st Trip Diagnostic Trouble Code (1st Trip DTC) Mode 7 of SAE J1979
- 1st Trip Freeze Frame data
- Test values and Test limits Mode 6 of SAE J1979

The above information can be checked using procedures listed in the table below.

| | DTC | 1st trip DTC | Freeze Frame data | 1st trip Freeze Frame data | SRT code | Test value |
|---|-----|--------------|-------------------|----------------------------|----------|------------|
| Diagnostic test mode II (Self-diagnostic results) | ○ | ○*1 | | | | |
| CONSULT | ○ | ○ | ○ | ○ | ○ | |
| GST | ○ | ○*2 | ○ | | ○ | ○ |

*1: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

*2: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode (Refer to EC-76.).

Two Trip Detection Logic

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

| Items | MIL | | | DTC | | 1st trip DTC | |
|--|----------|-------------|----------------------|---------------------|---------------------|---------------------|---------------------|
| | 1st trip | | 2nd trip lighting up | 1st trip displaying | 2nd trip displaying | 1st trip displaying | 2nd trip displaying |
| | Blinking | Lighting up | | | | | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) is being detected | X | | | X | | X | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) has been detected | | X | | X | | X | |
| Closed loop control — DTC: P1148 (0307) | | X | | X | | X | |
| Fail-safe items (Refer to EC-76.) | | X | | X*1 | | X*1 | |
| Except above | | | X | | X | X | X |

*1: Except “ECM”.

Emission-related Diagnostic Information

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-45.


For malfunctions in which 1st trip DTCs are displayed, refer to EC-43. These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.


1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.


When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to page EC-69. Then perform "Diagnostic trouble code confirmation procedure" or "Overall function check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

How to read DTC and 1st trip DTC

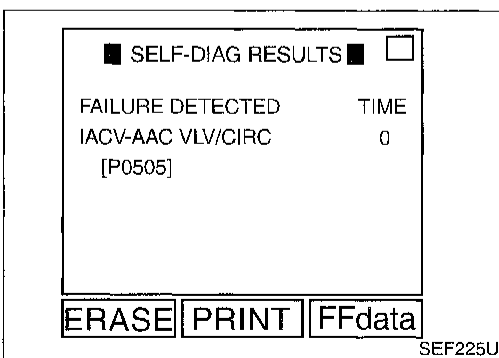
DTC and 1st trip DTC can be read by the following methods.

 1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc.
These DTCs are controlled by NISSAN.

 2. CONSULT or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc.
These DTCs are prescribed by SAE J2012.

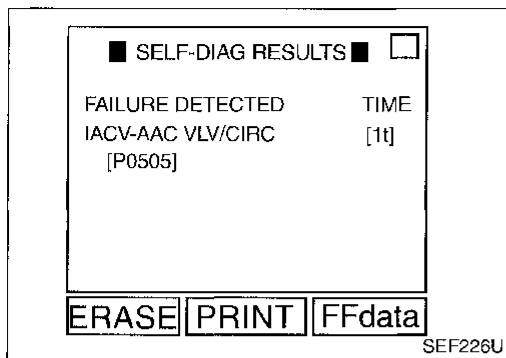
 (CONSULT also displays the malfunctioning component or system.)

- 1st trip DTC No. is the same as DTC No.
- Output of a DTC indicates a malfunction. However, Mode II and GST do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT can identify malfunction status as shown below. Therefore, using CONSULT (if available) is recommended.



A sample of CONSULT display for DTC is shown at left. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT. Time data indicates how many times the vehicle was driven after the last detection of a DTC. If the DTC is being detected currently, the time data will be "0".

Emission-related Diagnostic Information (Cont'd)



If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed and absolute pressure sensor at the moment a malfunction is detected.

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For details, see EC-57.

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

| Priority | Items | |
|----------|----------------------------|--|
| 1 | Freeze frame data | Misfire — DTC: P0300 - P0304 (0701, 0605 - 0608) Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114) |
| 2 | | Except the above items |
| 3 | 1st trip freeze frame data | |

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, first trip freeze data is no longer stored (because only one freeze frame data or first trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-45.

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979. It indicates whether the self-diagnostic tests for non-continuously monitored items have been completed or not.

Inspection/Maintenance (I/M) tests of the on board diagnostic (OBD) II system may become the legal requirements in some states/areas. All SRT codes must be set in this case. Unless all SRT codes are set, conducting the I/M test may not be allowed.

SRT codes are set after self-diagnosis has been performed one or more times. This occurs regardless of whether the diagnosis is in "OK" or "NG", and whether or not the diagnosis is performed in consecutive trips. The following table lists the five SRT items (18 test items) for the ECCS used in D22 models.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

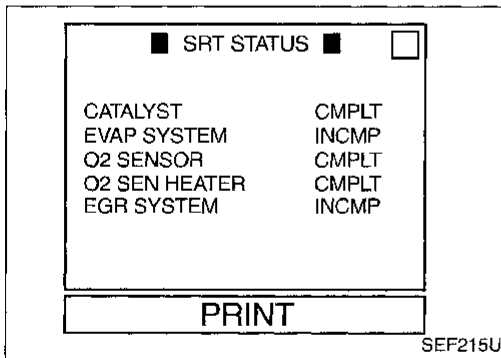
Emission-related Diagnostic Information (Cont'd)

| SRT items | Self-diagnostic test items |
|---------------------------------|---|
| Catalyst monitoring | <ul style="list-style-type: none"> ● Three way catalyst function P0420 (0702) |
| EVAP system monitoring | <ul style="list-style-type: none"> ● EVAP control system (Small leak — Negative pressure) P0440 (0705) ● EVAP control system (Small leak — Positive pressure) P1440 (0213) ● EVAP control system purge flow monitoring P1447 (0111) |
| Oxygen sensor monitoring | <ul style="list-style-type: none"> ● Front heated oxygen sensor (Response monitoring) P0133 (0409) ● Front heated oxygen sensor (Rich shift monitoring) P0132 (0410) ● Front heated oxygen sensor (Lean shift monitoring) P0131 (0411) ● Front heated oxygen sensor (Circuit) P0130 (0303) ● Front heated oxygen sensor (High voltage) P0134 (0412) ● Rear heated oxygen sensor (Response monitoring) P0139 (0707) ● Rear heated oxygen sensor (Max. voltage monitoring) P0138 (0510) ● Rear heated oxygen sensor (Min. voltage monitoring) P0137 (0511) ● Rear heated oxygen sensor (High voltage) P0140 (0512) |
| Oxygen sensor heater monitoring | <ul style="list-style-type: none"> ● Front heated oxygen sensor heater P0135 (0901) ● Rear heated oxygen sensor heater P0141 (0902) |
| EGR system monitoring | <ul style="list-style-type: none"> ● EGR function (Close) P0400 (0302) ● EGR function (Open) P1402 (0514) ● EGRC-BPT valve function P0402 (0306) |

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-45). In addition, after ECCS components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

How to display SRT code

1. Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.
For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT screen; for items whose SRT codes are not set, "INCMP" is displayed.
2. Selecting Mode 1 with GST (Generic Scan Tool)



A sample of CONSULT display for SRT code is shown at left. "INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

How to set SRT code

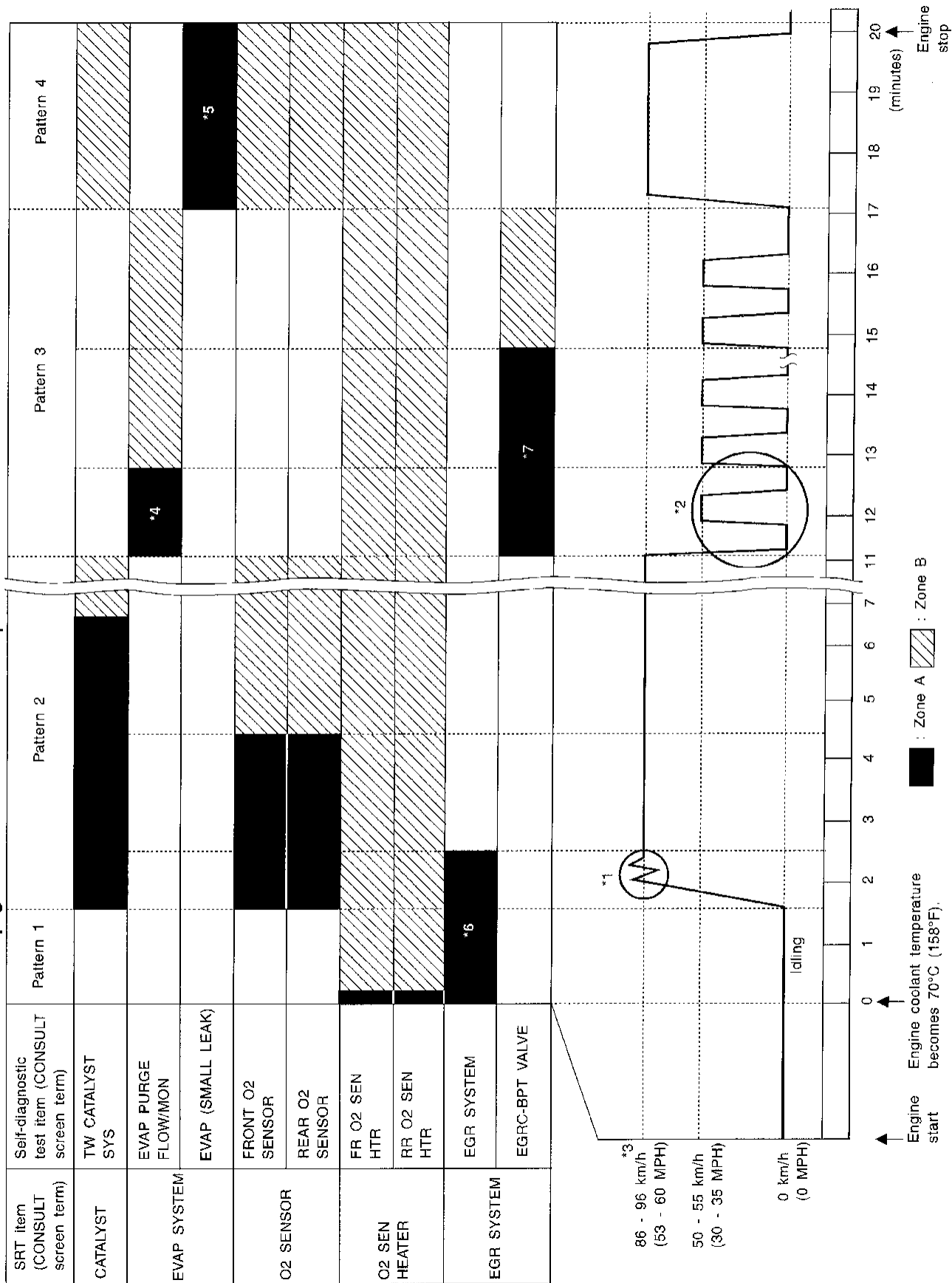
To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions. The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

Driving pattern

Note: Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws. Refer to next page for more information and explanation of chart.



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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time required, for the diagnosis under normal conditions*, is the shortest. Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.

Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

- Pattern 1: ● **The engine is started at the engine coolant temperature of -10 to 35°C (14 to 95°F) (where the voltage between the ECM terminals (59) and (43) is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminals (59) and (43) is lower than 1.4V).**
 - **The engine is started at the tank fuel temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminals (60) and ground is less than 4.1V).**

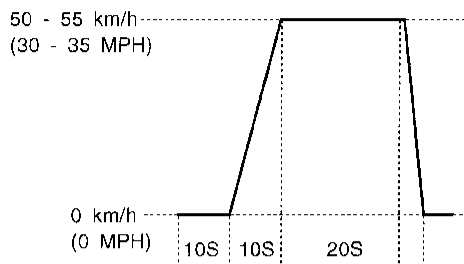
- Pattern 2: ● When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

- Pattern 3: ● The driving pattern outlined in *2 must be repeated at least 3 times.
On M/T models, shift gears following "suggested upshift speeds" schedule on next page.

- Pattern 4: ● Tests are performed after the engine has been operated for at least 17 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
 - If the accelerator pedal is moved, the test must be conducted all over again.

*1: Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again.

- *2: Operate the vehicle in the following driving pattern.
- 1) Decelerate vehicle to 0 km/h and let engine idle.
 - 2) Repeat driving pattern shown below at least 10 times.
 - **During acceleration, hold the accelerator pedal as steady as possible. (The THROTL POS SEN value of CONSULT should be between 0.8 to 1.2V.)**
 - 3) Repeat steps 1 and 2 until the EGR system SRT is set.



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- *3: Checking the vehicle speed with CONSULT or GST is advised.
- *4: The driving pattern may be omitted when "PURGE FLOW P1447" is performed using the "DTC WORK SUPPORT" mode with CONSULT.
- *5: The driving pattern may be omitted when "EVAP SML LEAK P0440" is performed using the "DTC WORK SUPPORT" mode with CONSULT.
- *6: The driving pattern may be omitted when all the followings are performed using the "DTC WORK SUPPORT" mode with CONSULT.
 - "EGR SYSTEM P0400"
 - "EGR SYSTEM P1402"
- *7: The driving pattern may be omitted when all the followings are performed using the "DTC WORK SUPPORT" mode with CONSULT.
 - "PURGE FLOW P1447"
 - "EGRC-BPT/VLV P0402"

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

Suggested transmission gear position for A/T models

Set the selector lever in the "D" position with "OD"
ON.

Suggested upshift speeds for M/T models

Shown below are suggested vehicle speeds for
shifting into a higher gear. These suggestions relate
to fuel economy and vehicle performance. Actual
upshift speeds will vary according to road
conditions, the weather and individual driving habits.

| Gear change (2H and 4H position) | ACCEL shift point km/h (MPH) |
|-------------------------------------|---------------------------------|
| 1st to 2nd | 24 (15) |
| 2nd to 3rd | 40 (25) |
| 3rd to 4th | 64 (40) |
| 4th to 5th | 72 (45) |

Suggested maximum speed in each gear

Downshift to a lower gear if the engine is not running
smoothly, or if you need to accelerate.

Do not exceed the maximum suggested speed
(shown below) in any gear. For level road driving,
use the highest gear suggested for that speed.
Always observe posted speed limits and drive
according to the road conditions to ensure safe
operation. Do not over-rev the engine when shifting
to a lower gear as it may cause engine damage or
loss of vehicle control.

2-wheel drive models

| Gear | km/h (MPH) |
|-----------|------------|
| 1st | 48 (30) |
| 2nd | 88 (55) |
| 3rd | 129 (80) |
| 4th & 5th | — (—) |

4-wheel drive models 2H/4H position

| Gear | km/h (MPH) |
|-----------|------------|
| 1st | 40 (25) |
| 2nd | 69 (43) |
| 3rd | 109 (68) |
| 4th & 5th | — (—) |

GI

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DX

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

TEST VALUE AND TEST LIMIT (GST only — not applicable to CONSULT)

The following is the information specified in Mode 6 of SAE J1979.

The test value is a parameter used to determine whether a system/circuit diagnostic test is "OK" or "NG" while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

Items for which these data (test value and test limit) are displayed are the same as SRT code items (9 test items).

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

X: Applicable
—: Not applicable

| SRT item (CONSULT display) | Self-diagnostic test item | Test value | | Test limit | Application |
|----------------------------------|---|------------|-----|------------|-------------|
| | | TID | CID | | |
| CATALYST | Three way catalyst function | 01H | 01H | Max. | X |
| EVAP SYSTEM | EVAP control system (Small leak) | 05H | 03H | Max. | X |
| | EVAP control system purge flow monitoring | 06H | 83H | Min. | X |
| O2 SENSOR | Front heated oxygen sensor | 09H | 04H | Max. | X |
| | | 0AH | 84H | Min. | X |
| | | 0BH | 04H | Max. | X |
| | | 0CH | 04H | Max. | X |
| | | 0DH | 04H | Max. | X |
| | Rear heated oxygen sensor | 19H | 86H | Min. | X |
| | | 1AH | 86H | Min. | X |
| | | 1BH | 06H | Max. | X |
| 1CH | 06H | Max. | X | | |
| O2 SENSOR HEATER | Front heated oxygen sensor heater | 29H | 08H | Max. | X |
| | | 2AH | 88H | Min. | X |
| | Rear heated oxygen sensor heater | 2DH | 0AH | Max. | X |
| | | 2EH | 8AH | Min. | X |
| EGR SYSTEM | EGR function | 31H | 8CH | Min. | X |
| | | 32H | 8CH | Min. | X |
| | | 33H | 8CH | Min. | X |
| | | 34H | 8CH | Min. | X |
| | | 35H | 0CH | Max. | X |
| | EGRC-BPT valve function | 36H | 0CH | Max. | X |
| | | 37H | 8CH | Min. | X |

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable
—: Not applicable

| Items (CONSULT screen terms) | DTC*4 | | SRT code | Test value/ Test limit (GST only) | 1st trip DTC | Reference page |
|---|------------------|-------------|----------|---|--------------|----------------|
| | CONSULT GST*2 | ECM*1 | | | | |
| NO SELF DIAGNOSTIC FAILURE INDICATED | P0000 | 0505 | — | — | — | — |
| MAF SEN/CIRCUIT | P0100 | 0102 | — | — | X | EC-99 |
| ABSL PRES SEN/CIRC | P0105 | 0803 | — | — | X | EC-108 |
| AIR TEMP SEN/CIRC | P0110 | 0401 | — | — | X | EC-115 |
| COOLANT T SEN/CIRC | P0115 | 0103 | — | — | X | EC-121 |
| THRTL POS SEN/CIRC | P0120 | 0403 | — | — | X | EC-126 |
| *COOLAN T SEN/CIRC | P0125 | 0908 | — | — | X | EC-139 |
| FRONT O2 SENSOR | P0130 | 0303 | X | X | X*3 | EC-144 |
| FRONT O2 SENSOR | P0131 | 0411 | X | X | X*3 | EC-150 |
| FRONT O2 SENSOR | P0132 | 0410 | X | X | X*3 | EC-156 |
| FRONT O2 SENSOR | P0133 | 0409 | X | X | X*3 | EC-162 |
| FRONT O2 SENSOR | P0134 | 0412 | X | X | X*3 | EC-170 |
| FR O2 SEN HEATER | P0135 | 0901 | X | X | X*3 | EC-175 |
| REAR O2 SENSOR | P0137 | 0511 | X | X | X*3 | EC-179 |
| REAR O2 SENSOR | P0138 | 0510 | X | X | X*3 | EC-186 |
| REAR O2 SENSOR | P0139 | 0707 | X | X | X*3 | EC-193 |
| REAR O2 SENSOR | P0140 | 0512 | X | X | X*3 | EC-199 |
| RR O2 SEN HEATER | P0141 | 0902 | X | X | X*3 | EC-204 |
| FUEL SYS DIAG-LEAN | P0171 | 0115 | — | — | X | EC-208 |
| FUEL SYS DIAG-RICH | P0172 | 0114 | — | — | X | EC-213 |
| FUEL TEMP SEN/CIRC | P0180 | 0402 | — | — | X | EC-218 |
| MULTI CYL MISFIRE | P0300 | 0701 | — | — | X | EC-222 |
| CYL 1 MISFIRE | P0301 | 0608 | — | — | X | EC-222 |
| CYL 2 MISFIRE | P0302 | 0607 | — | — | X | EC-222 |
| CYL 3 MISFIRE | P0303 | 0606 | — | — | X | EC-222 |
| CYL 4 MISFIRE | P0304 | 0605 | — | — | X | EC-222 |
| KNOCK SEN/CIRCUIT | P0325 | 0304 | — | — | X | EC-227 |
| CPS/CIRCUIT (OBD) | P0335 | 0802 | — | — | X | EC-231 |
| CAM POS SEN/CIR | P0340 | 0101 | — | — | X | EC-236 |
| EGR SYSTEM | P0400 | 0302 | X | X | X*3 | EC-242 |
| EGRC-BPT VALVE | P0402 | 0306 | X | X | X*3 | EC-250 |
| TW CATALYST SYSTEM | P0420 | 0702 | X | X | X*3 | EC-255 |
| EVAP SMALL LEAK | P0440 | 0705 | X | X | X*3 | EC-260 |
| PURG VOLUME CONT/V | P0443 | 1008 | — | — | X | EC-270 |
| VENT CONTROL VALVE | P0446 | 0903 | — | — | X | EC-276 |
| EVAPO SYS PRES SEN | P0450 | 0704 | — | — | X | EC-281 |

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

*2: These numbers are prescribed by SAE J2012.

*3: These are not displayed with GST.

*4: 1st trip DTC No. is the same as DTC No.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

| Items (CONSULT screen terms) | DTC*4 | | SRT code | Test value/ Test limit (GST only) | 1st trip DTC | Reference page |
|---------------------------------|------------------|-------|----------|---|--------------|----------------|
| | CONSULT GST*2 | ECM*1 | | | | |
| VEH SPEED SEN/CIRC | P0500 | 0104 | — | — | X | EC-287 |
| IACV/AAC VLV/CIRC | P0505 | 0205 | — | — | X | EC-291 |
| CLOSED TP SW/CIRC | P0510 | 0203 | — | — | X | EC-297 |
| ECM | P0605 | 0301 | — | — | X | EC-302 |
| MAP/BAR SW SOL/CIR | P1105 | 1302 | — | — | X | EC-304 |
| CLOSED LOOP | P1148 | 0307 | — | — | X | EC-313 |
| IGN SIGNAL-PRIMARY | P1320 | 0201 | — | — | X | EC-315 |
| CPS/CIRC (OBD) COG | P1336 | 0905 | — | — | X | EC-322 |
| EGRC SOLENOID/V | P1400 | 1005 | — | — | X | EC-327 |
| EGR TEMP SEN/CIRC | P1401 | 0305 | — | — | X | EC-332 |
| EGR SYSTEM | P1402 | 0514 | X | X | X*3 | EC-338 |
| EVAP SMALL LEAK | P1440 | 0213 | X | X | X*3 | EC-345 |
| PURG VOLUME CONT/V | P1444 | 0214 | — | — | X | EC-355 |
| VENT CONTROL VALVE | P1446 | 0215 | — | — | X | EC-362 |
| EVAP PURG FLOW/MON | P1447 | 0111 | X | X | X*3 | EC-367 |
| VENT CONTROL VALVE | P1448 | 0309 | — | — | X | EC-373 |
| VC/V BYPASS/V | P1490 | 0801 | — | — | X | EC-378 |
| VC CUT/V BYPASS/V | P1491 | 0311 | — | — | X | EC-383 |
| P-N POS SW/CIRCUIT | P1706 | 1003 | — | — | X | EC-388 |
| TOR CONV CLTCH S/V | P1775 | 0904 | — | — | X | EC-393 |
| TOR CONV CLTCH S/V | P1776 | 0513 | — | — | X | EC-397 |

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.

*2: These numbers are prescribed by SAE J2012.

*3: These are not displayed with GST.

*4: 1st trip DTC No. is the same as DTC No.

Emission-related Diagnostic Information (Cont'd)

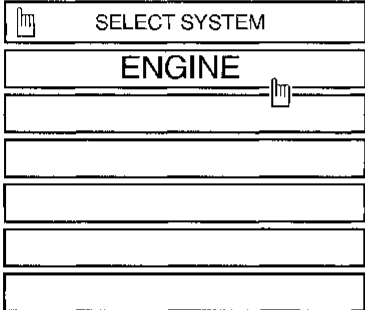
HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to erase DTC (With CONSULT)

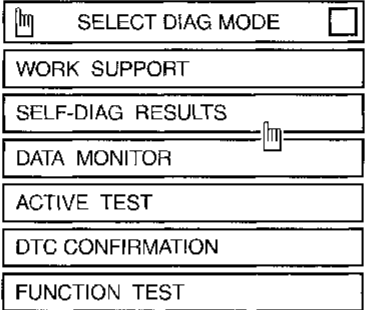
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Turn CONSULT "ON" and touch "ENGINE".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the ECM will be erased.)

How to erase DTC (With CONSULT)

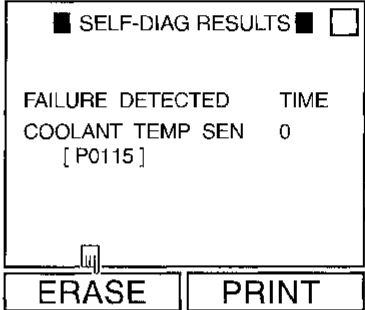
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again.



2. Turn CONSULT "ON" and touch "ENGINE".



3. Touch "SELF-DIAG RESULTS".



4. Touch "ERASE". (The DTC in the ECM will be erased.)

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The emission-related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT.

How to erase DTC (With GST)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Select Mode 4 with GST (Generic Scan Tool). The emission-related diagnostic information in the ECM can be erased by selecting Mode 4 with GST (Generic Scan Tool).

How to erase DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" again.
2. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-47.)

The emission-related diagnostic information in the ECM can be erased by changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by turning the mode selector on the ECM. (Refer to EC-47.)

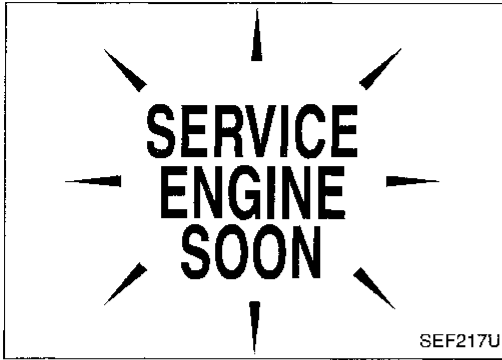
Note:

- If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.
- Erasing the emission-related diagnostic information using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.
- The following data are cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

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Malfunction Indicator Lamp (MIL)

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
 - If the malfunction indicator lamp does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-422.
2. When the engine is started, the malfunction indicator lamp should go off.

If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

1. BULB CHECK : This function checks the MIL bulb for damage (blown, open circuit, etc.).
If the MIL does not come on, check MIL circuit and ECM test mode selector. (See next page.)
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip.
 - "Misfire (Possible three way catalyst damage)"
 - "Closed loop control"
 - Fail-safe mode




Diagnostic Test Mode II

3. SELF-DIAGNOSTIC RESULTS : This function allows DTCs and 1st trip DTCs to be read.
4. FRONT HEATED OXYGEN SENSOR MONITOR : This function allows the fuel mixture condition (lean or rich), monitored by front heated oxygen sensor, to be read.

MIL flashing without DTC

If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM test mode selector following "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page.

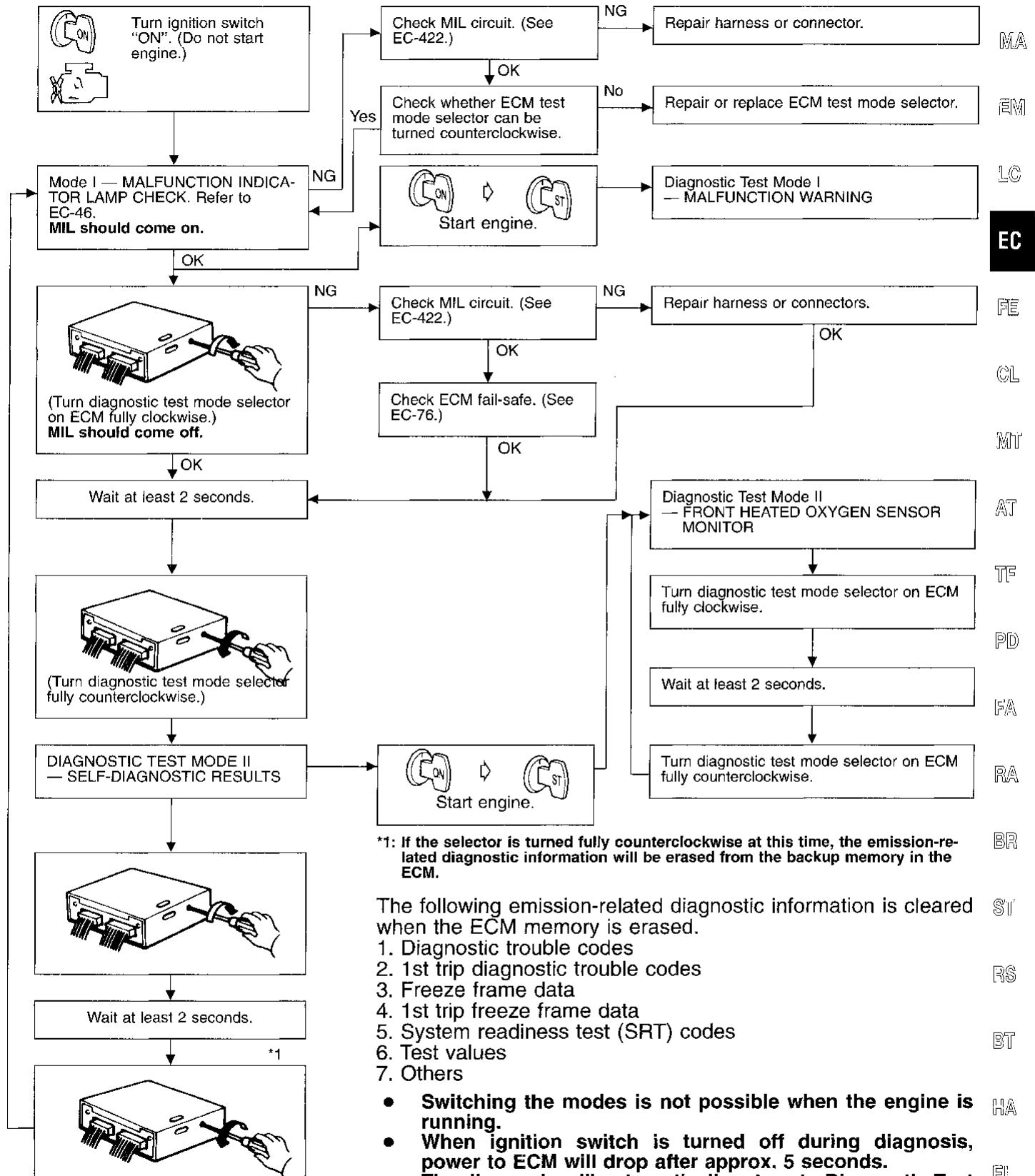
How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-47.)

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



*1: If the selector is turned fully counterclockwise at this time, the emission-related diagnostic information will be erased from the backup memory in the ECM.

The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

- 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. 5 seconds. The diagnosis will automatically return to Diagnostic Test Mode I.
- Turn back diagnostic test mode selector to the fully counterclockwise position whenever vehicle is in use.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section ("WARNING LAMPS AND CHIME") or see EC-422.

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

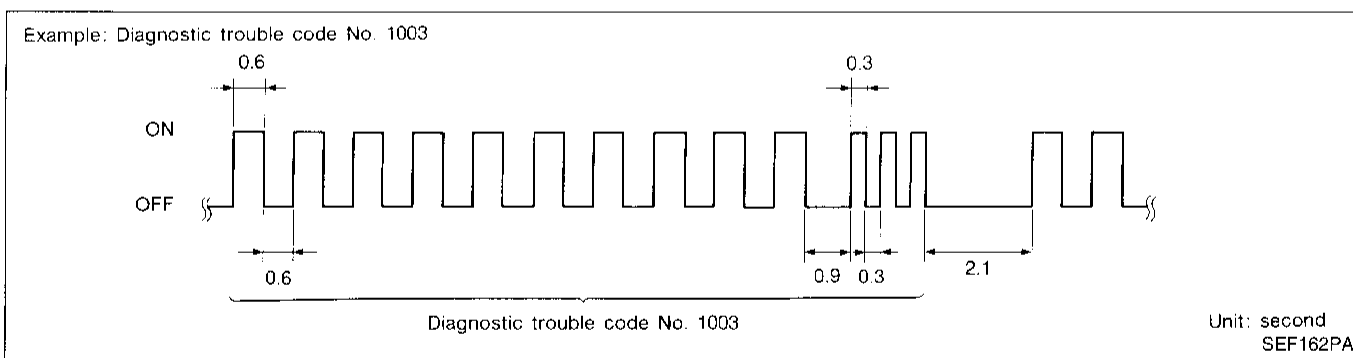
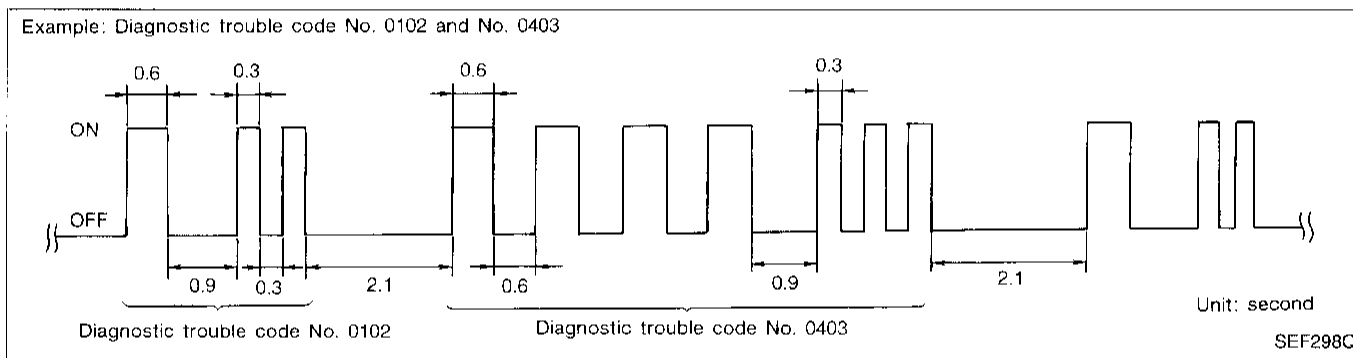
| MALFUNCTION INDICATOR LAMP | Condition |
|----------------------------|--|
| ON | When the malfunction is detected or the ECM's CPU is malfunctioning. |
| OFF | No malfunction. |

- These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS).

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MALFUNCTION INDICATOR LAMP.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode 1 (Malfunction warning), all displayed items are 1st trip DTC's. If only one code is displayed when the MIL illuminates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTC's or 1st trip DTC's. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the consult or GST. A DTC will be used as an example for how to read a code.



Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the malfunction indicator lamp blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times). This indicates the DTC "1003" and refers to the malfunction of the neutral position switch.

In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC "0505" refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE (DTC) INDEX, EC-2.)

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Malfunction Indicator Lamp (MIL) (Cont'd)

How to erase diagnostic test mode II (Self-diagnostic results)

The diagnostic trouble code can be erased from the backup memory in 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".)

- If the battery is disconnected, the diagnostic trouble code will be lost from the backup memory after approx. 24 hours.
- Be careful not to erase the stored memory before starting trouble diagnoses.

DIAGNOSTIC TEST MODE II — FRONT HEATED OXYGEN SENSOR MONITOR

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

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

*: Maintains conditions just before switching to open loop.

To check the front heated oxygen sensor function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.

Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MALFUNCTION INDICATOR LAMP comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

RELATIONSHIP BETWEEN MIL, 1ST TRIP DTC, DTC, AND DETECTABLE ITEMS

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to "Two Trip Detection Logic" on EC-35.
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

SUMMARY CHART

| Items | Fuel Injection System | Misfire | Other |
|-------------------------------------|-----------------------|-------------------|----------------|
| MIL (goes off) | 3 (pattern B) | 3 (pattern B) | 3 (pattern B) |
| DTC, Freeze Frame Data (no display) | 80 (pattern C) | 80 (pattern C) | 40 (pattern A) |
| 1st Trip DTC (clear) | 1 (pattern C), *1 | 1 (pattern C), *1 | 1 (pattern B) |
| 1st Trip Freeze Frame Data (clear) | *1, *2 | *1, *2 | 1 (pattern B) |

For details about patterns "B" and "C" under "Fuel Injection System" and "Misfire", see EC-51.

For details about patterns "A" and "B" under "Other", see EC-53.

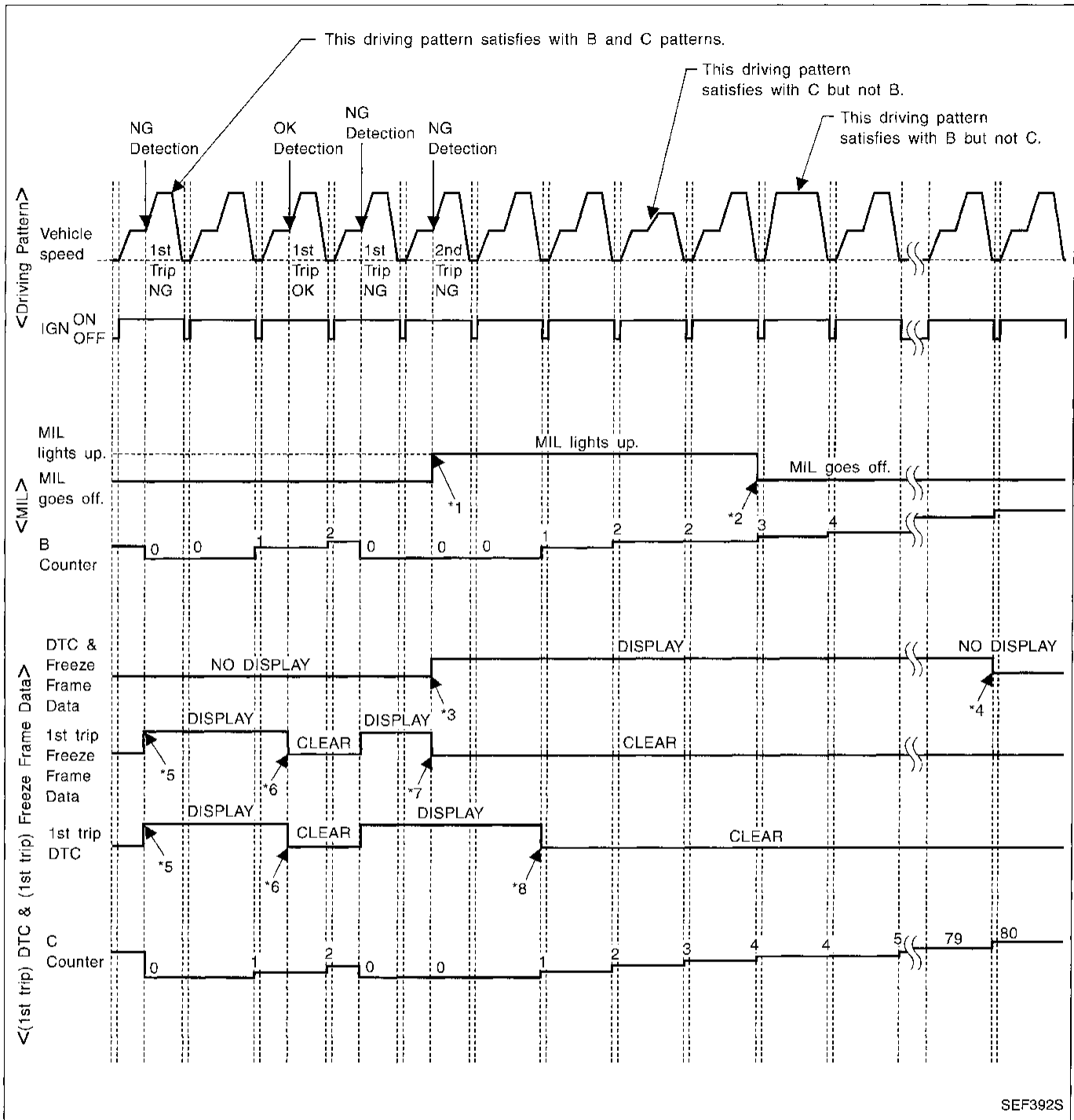
*1: Clear timing is at the moment OK is detected.

*2: Clear timing is when the same malfunction is detected in the 2nd trip.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS FOR "MISFIRE" <EXHAUST QUALITY DETERIORATION>, "FUEL INJECTION SYSTEM"



SEF392S

- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- *3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- *4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

- *5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- *6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.
- *7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.
- *8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

EXPLANATION FOR DRIVING PATTERNS FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving pattern B>

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will go off when the B counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

<Driving pattern C>

Driving pattern C means the vehicle operation as follows:

(1) The following conditions should be satisfied at the same time:

Engine speed: (Engine speed in the freeze frame data) ± 375 rpm

Calculated load value: (Calculated load value in the freeze frame data) $\times (1 \pm 0.1)$ [%]

Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

Example:

If the stored freeze frame data is as follows:

Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)

To be satisfied with driving pattern C, the vehicle should run under the following conditions:

Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of (1).
- The C counter will be counted up when (1) is satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

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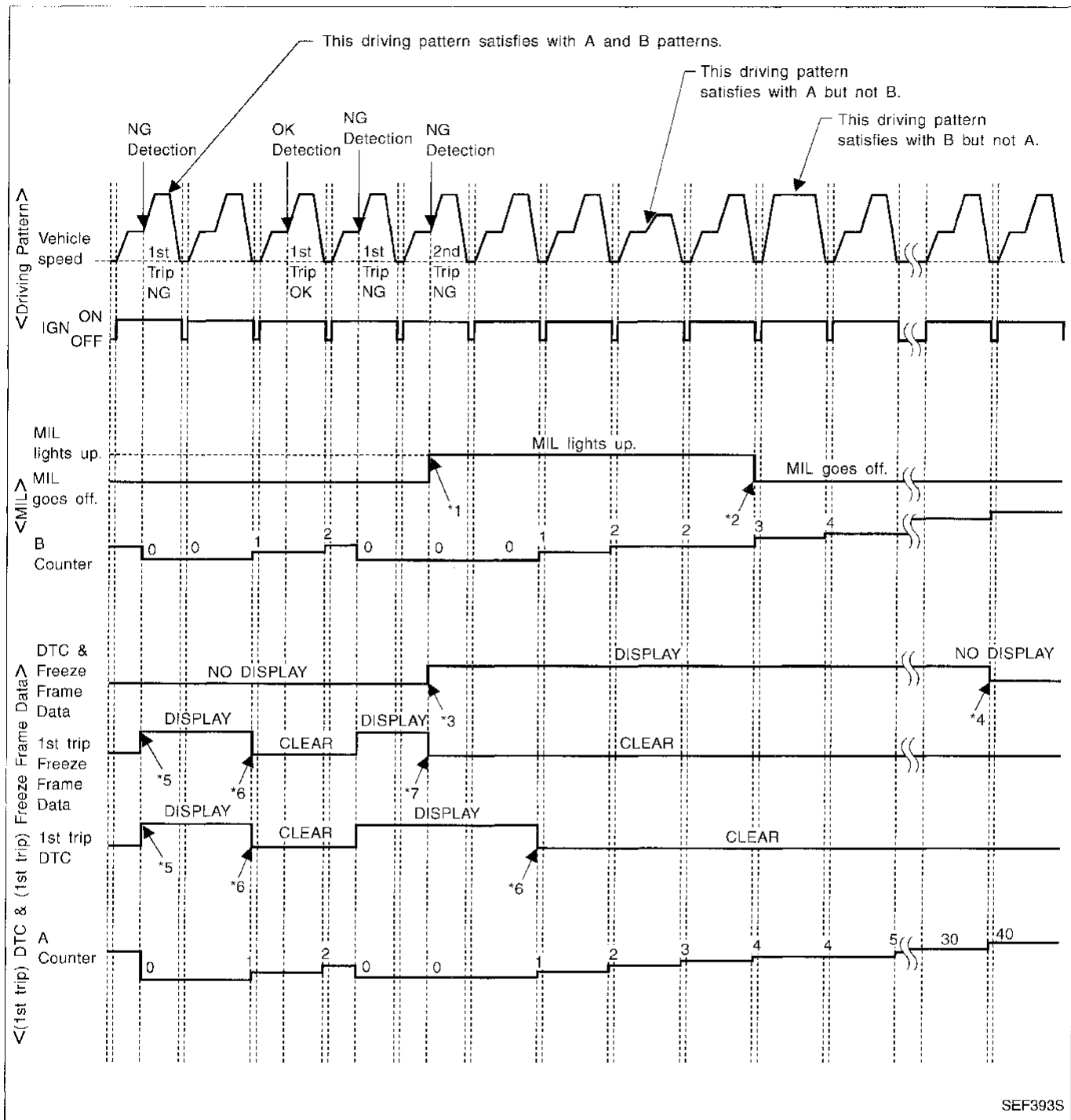
EL

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"



- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- *3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- *4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

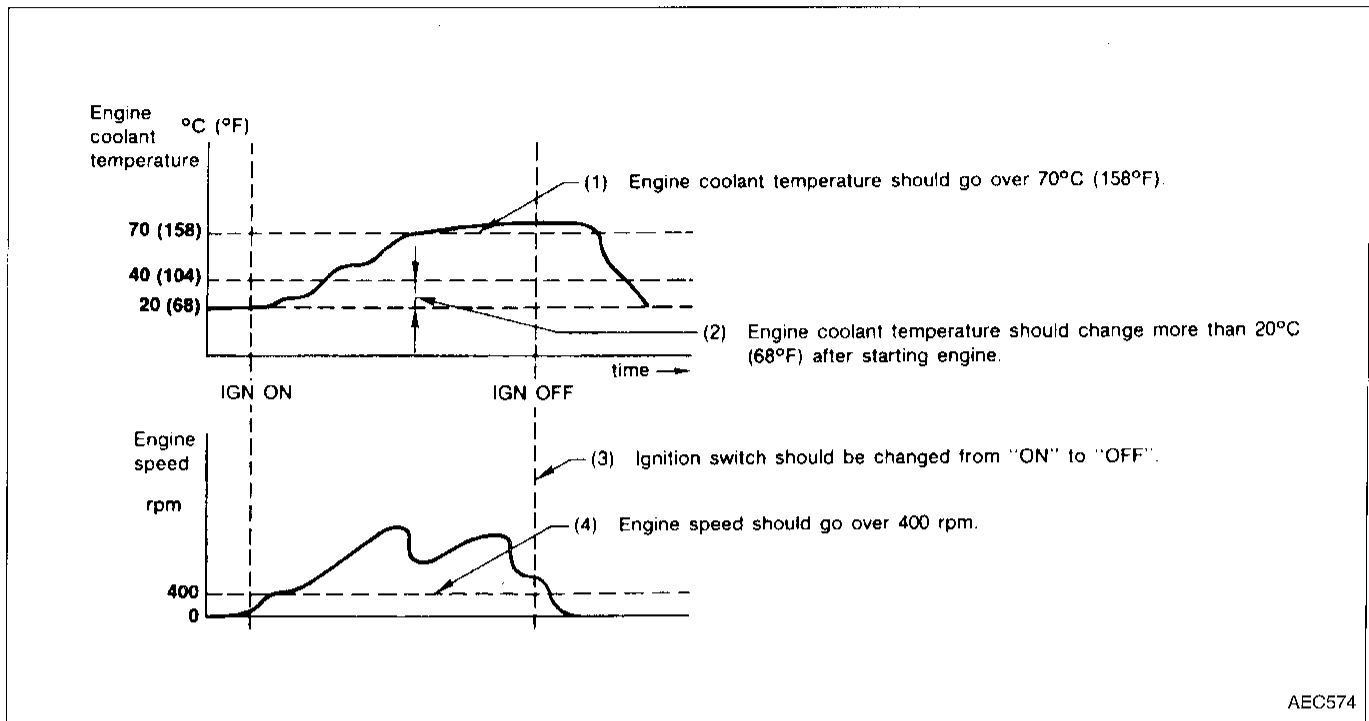
- *5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- *6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.
- *7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

OBD System Operation Chart (Cont'd)

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR "MISFIRE <EXHAUST QUALITY DETERIORATION>", "FUEL INJECTION SYSTEM"

<Driving pattern A>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

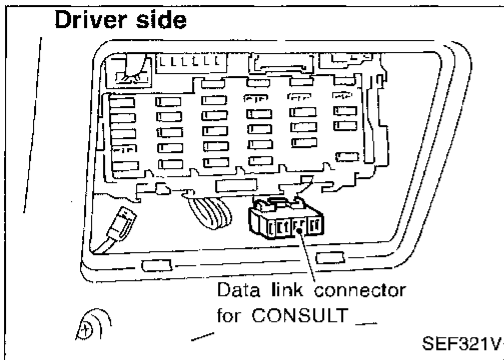
<Driving pattern B>

Driving pattern B means the vehicle operation as follows:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").

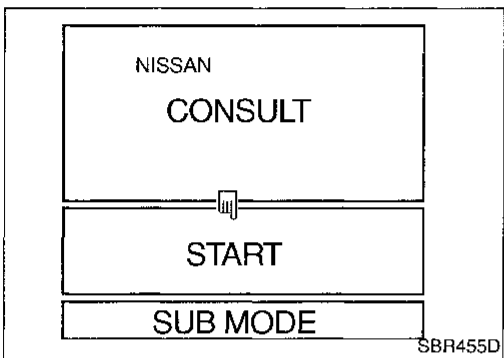
ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



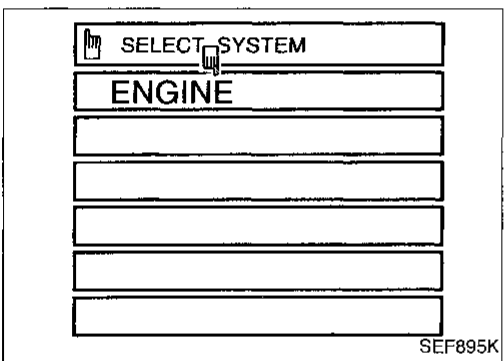
CONSULT

CONSULT INSPECTION PROCEDURE

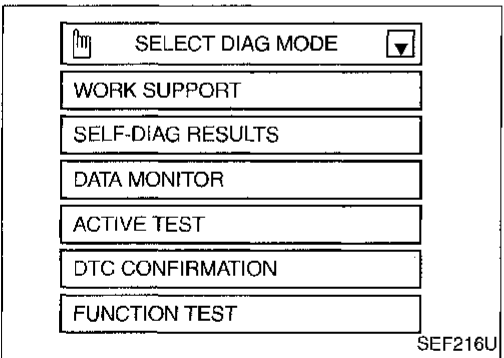
1. Turn ignition switch "OFF".
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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

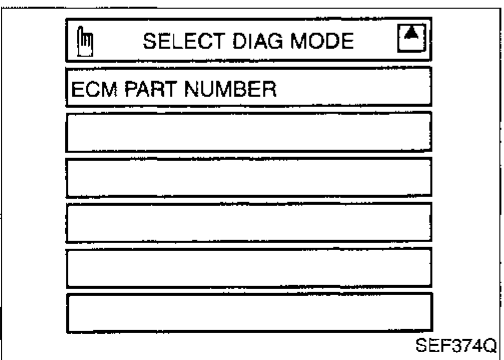


5. Touch "ENGINE".



6. Perform each diagnostic test mode according to each service procedure.

For further information, see the CONSULT Operation Manual. This sample shows the display when using the UEOBD98 program card. Screen differs in accordance with the program card used.



ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

| Item | | DIAGNOSTIC TEST MODE | | | | | | | |
|--|---------------------------------|---|---------------------------|------------------------|--------------|-------------|---------------|------------------|-------------------|
| | | WORK SUP-PORT | SELF-DIAGNOSTIC RESULTS*1 | | DATA MONITOR | ACTIVE TEST | FUNCTION TEST | DTC CONFIRMATION | |
| | | | FREEZE FRAME DATA*2 | | | | | SRT STATUS | DTC WORK SUP-PORT |
| ECCS COMPONENT PARTS | INPUT | Camshaft position sensor | | X | X | X | | | |
| | | Mass air flow sensor | | X | | X | | | |
| | | Engine coolant temperature sensor | | X | X | X | X | | |
| | | Front heated oxygen sensor | | X | | X | | X | X |
| | | Rear heated oxygen sensor | | X | | X | | X | X |
| | | Vehicle speed sensor | | X | X | X | | X | |
| | | Throttle position sensor | X | X | | X | | X | |
| | | Tank fuel temperature sensor | | X | | X | X | | |
| | | EVAP control system pressure sensor | | X | | X | | | |
| | | Absolute pressure sensor | | X | X | X | | | |
| | | EGR temperature sensor | | X | | X | | | |
| | | Intake air temperature sensor | | X | | X | | | |
| | | Crankshaft position sensor (OBD) | | X | | | | | |
| | | Knock sensor | | X | | | | | |
| | | Ignition switch (start signal) | | | | X | | X | |
| | | Closed throttle position switch | | X | | | | | |
| | | Closed throttle position switch (throttle position sensor signal) | | | | X | | X | |
| | | Air conditioner switch | | | | X | | | |
| | | Park/Neutral position switch | | X | | X | | X | |
| | | Power steering oil pressure switch | | | | X | | X | |
| | Air conditioner pressure switch | | | | X | | | | |
| | Battery voltage | | | | X | | | | |
| | OUTPUT | Injectors | | | | X | X | X | |
| | | Power transistor (Ignition timing) | | X (Ignition signal) | | X | X | X | |
| | | IACV-AAC valve | X | X | | X | X | X | |
| | | EVAP canister purge volume control solenoid valve | | X | | X | X | | X |
| | | Air conditioner relay | | | | X | | | |
| | | Fuel pump relay | X | | | X | X | X | |
| EGRC-solenoid valve | | | X | | X | X | X | | |
| Front heated oxygen sensor heater | | | X | | X | | | X | |
| Rear heated oxygen sensor heater | | | X | | X | | | X | |
| Torque converter clutch solenoid valve | | | X | | X | | | X | |
| EVAP canister vent control valve | | | X | | X | X | | | |
| Vacuum cut valve bypass valve | | | X | | X | X | | X | |
| MAP/BARO switch solenoid valve | | X | | X | X | | | | |
| Calculated load value | | | X | X | | | | | |

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-37.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

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 such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1 |
| 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. |
| DTC confirmation | The status of system monitoring tests and the self-diagnosis status/result can be confirmed. |
| Function test | Conducted by CONSULT instead of a technician to determine whether each system is "OK" or "NG". |
| ECM part numbers | ECM part numbers can be read. |

*1 The following emission-related diagnostic information is cleared when the ECM memory is erased.

1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

WORK SUPPORT MODE

| WORK ITEM | CONDITION | USAGE |
|-----------------------|---|--|
| THRTL POS SEN ADJ | CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED | When adjusting throttle position sensor initial position |
| IGNITION TIMING ADJ | <ul style="list-style-type: none"> ● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING "START". AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANK-SHAFT POSITION SENSOR. | When adjusting initial ignition timing |
| IACV-AAC/V ADJ | SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● ENGINE WARMED UP ● NO-LOAD | When adjusting idle speed |
| FUEL PRESSURE RELEASE | <ul style="list-style-type: none"> ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |
| EVAP SYSTEM CLOSE | OPEN THE VACUUM CUT VALVE BYPASS VALVE AND CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> ● BATTERY VOLTAGE IS SUFFICIENT. ● IGN SW "ON" ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● TANK FUEL TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" WHEN TRYING TO EXECUTE "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. NOTE: WHEN STARTING ENGINE, CONSULT MAY DISPLAY "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN IN USING CHARGED BATTERY. | When detecting EVAP vapor leak point of EVAP system |

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

DTC and 1st trip DTC

Regarding items of "DTC and 1st trip DTC", refer to "DIAGNOSTIC TROUBLE CODE INDEX" (See EC-2.).

Freeze frame data and 1st trip freeze frame data

| Freeze frame data item* | Description |
|---|---|
| DIAG TROUBLE CODE [PXXXX] | <ul style="list-style-type: none"> ECCS component part/control system has a trouble code, it is displayed as "PXXXX". [Refer to "Alphabetical & P No. Index for DTC" (EC-2).] |
| FUEL SYS | <ul style="list-style-type: none"> "Fuel injection system status" at the moment a malfunction is detected is displayed. One mode in the following is displayed. <ul style="list-style-type: none"> "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop |
| CAL/LD VALUE [%] | <ul style="list-style-type: none"> The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | <ul style="list-style-type: none"> The engine coolant temperature at the moment a malfunction is detected is displayed. |
| S-FUEL TRIM [%] | <ul style="list-style-type: none"> "Short-term fuel trim" at the moment a malfunction is detected is displayed. The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. |
| L-FUEL TRIM [%] | <ul style="list-style-type: none"> "Long-term fuel trim" at the moment a malfunction is detected is displayed. The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| ENGINE SPEED [rpm] | <ul style="list-style-type: none"> The engine speed at the moment a malfunction is detected is displayed. |
| VHCL SPEED [km/h] or [mph] | <ul style="list-style-type: none"> The vehicle speed at the moment a malfunction is detected is displayed. |
| ABSOL PRESS [kPa] or [kg/cm ²] or [psi] | <ul style="list-style-type: none"> The absolute pressure at the moment a malfunction is detected is displayed. |

*: The items are the same as those of 1st trip freeze frame data.

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

DATA MONITOR MODE

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|----------------------------------|-------------------------|-----------------|--|---|
| CMPS-RPM (REF) [rpm] | ○ | ○ | <ul style="list-style-type: none"> Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor. | |
| MAS AIR/FL SE [V] | ○ | ○ | <ul style="list-style-type: none"> The signal voltage of the mass air flow sensor is displayed. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| COOLAN TEMP/S [°C] or [°F] | ○ | ○ | <ul style="list-style-type: none"> The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | <ul style="list-style-type: none"> When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed. |
| FR O2 SENSOR [V] | ○ | ○ | <ul style="list-style-type: none"> The signal voltage of the front heated oxygen sensor is displayed. | |
| RR O2 SENSOR [V] | ○ | ○ | <ul style="list-style-type: none"> The signal voltage of the rear heated oxygen sensor is displayed. | |
| FR O2 MNTR [RICH/LEAN] | ○ | ○ | <ul style="list-style-type: none"> Display of front heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture. | <ul style="list-style-type: none"> After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously. |
| RR O2 MNTR [RICH/LEAN] | ○ | | <ul style="list-style-type: none"> Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large. | <ul style="list-style-type: none"> When the engine is stopped, a certain value is indicated. |
| VHCL SPEED SE [km/h] or [mph] | ○ | ○ | <ul style="list-style-type: none"> The vehicle speed computed from the vehicle speed sensor signal is displayed. | |
| BATTERY VOLT [V] | ○ | ○ | <ul style="list-style-type: none"> The power supply voltage of ECM is displayed. | |
| THRTL POS SEN [V] | ○ | ○ | <ul style="list-style-type: none"> The throttle position sensor signal voltage is displayed. | |
| TANK F/TMP SE [°C] or [°F] | ○ | | <ul style="list-style-type: none"> The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed. | |
| EGR TEMP SEN [V] | ○ | | <ul style="list-style-type: none"> The signal voltage of the EGR temperature sensor is displayed. | |
| INT/A TEMP SE [°C] or [°F] | ○ | | <ul style="list-style-type: none"> The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated. | |
| START SIGNAL [ON/OFF] | ○ | ○ | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the starter signal. | <ul style="list-style-type: none"> After starting the engine, [OFF] is displayed regardless of the starter signal. |
| CLSD THL/P SW [ON/OFF] | ○ | ○ | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the throttle position sensor signal. | |
| AIR COND SIG [ON/OFF] | ○ | ○ | <ul style="list-style-type: none"> Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| P/N POSI SW [ON/OFF] | ○ | ○ | <ul style="list-style-type: none"> Indicates [ON/OFF] condition from the park/neutral position switch signal. | |

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks | |
|---------------------------|-------------------------|-----------------|--|--|-----------|
| PW/ST SIGNAL [ON/OFF] | ○ | ○ | <ul style="list-style-type: none"> ● [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated. | | GI MA |
| IGNITION SW [ON/OFF] | ○ | | <ul style="list-style-type: none"> ● Indicates [ON/OFF] condition from ignition switch. | | EM |
| INJ PULSE [msec] | | ○ | <ul style="list-style-type: none"> ● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | <ul style="list-style-type: none"> ● When the engine is stopped, a certain computed value is indicated. | LC |
| B/FUEL SCHDL [msec] | | ○ | <ul style="list-style-type: none"> ● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | | EC |
| IGN TIMING [BTDC] | | ○ | <ul style="list-style-type: none"> ● Indicates the ignition timing computed by ECM according to the input signals. | <ul style="list-style-type: none"> ● When the engine is stopped, a certain value is indicated. | FE |
| IACV-AAC/V [%] | | ○ | <ul style="list-style-type: none"> ● Indicates the IACV-AAC valve control value computed by ECM according to the input signals. | | CL |
| PURG VOL C/V [%] | | ○ | <ul style="list-style-type: none"> ● Indicates the EVAP canister purge volume control solenoid valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases. | | MT |
| A/F ALPHA [%] | | | <ul style="list-style-type: none"> ● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | <ul style="list-style-type: none"> ● When the engine is stopped, a certain value is indicated. ● This data also includes the data for the air-fuel ratio learning control. | AT |
| EVAP SYS PRES [V] | | ○ | <ul style="list-style-type: none"> ● The signal voltage of EVAP control system pressure sensor is displayed. | | TF |
| AIR COND RLY [ON/OFF] | | | <ul style="list-style-type: none"> ● The air conditioner relay control condition (determined by ECM according to the input signal) is indicated. | | PD |
| FUEL PUMP RLY [ON/OFF] | | | <ul style="list-style-type: none"> ● Indicates the fuel pump relay control condition determined by ECM according to the input signals. | | FA |
| EGRC SOL/V [ON/OFF] | | | <ul style="list-style-type: none"> ● The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated. ● ON ... EGR operation is cut-off ● OFF ... EGR is operational | | RA |
| TCC SOL/V | | | <ul style="list-style-type: none"> ● The control condition of the torque converter clutch solenoid valve (determined by ECM according to the input signal) is indicated. ● ON ... Lock-up is cancelled ● OFF ... Lock-up is operational | | BR ST |
| VENT CONT/V [ON/OFF] | | | <ul style="list-style-type: none"> ● The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated. ● ON ... Closed ● OFF ... Open | | RS BT |
| FR O2 HEATER [ON/OFF] | | | <ul style="list-style-type: none"> ● Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals. | | HA |
| RR O2 HEATER [ON/OFF] | | | <ul style="list-style-type: none"> ● Indicates [ON/OFF] condition of rear heated oxygen sensor heater determined by ECM according to the input signals. | | EL |
| VC/V BYPASS/V [ON/OFF] | | | <ul style="list-style-type: none"> ● The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated. ● ON ... Open ● OFF ... Closed | | IDX |

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|--------------------------------|-------------------------|-----------------|--|---|
| CAL/LD VALUE [%] | | | <ul style="list-style-type: none"> ● "Calculated load value" indicates the value of the current airflow divided by peak airflow. | |
| ABSOL TH-P/S [%] | | | <ul style="list-style-type: none"> ● "Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor. | |
| MASS AIRFLOW [g·m/s] | | | <ul style="list-style-type: none"> ● Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor. | |
| MAP/BARO SW/V [MAP/BARO] | | | <ul style="list-style-type: none"> ● The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated. MAP ... Intake manifold absolute pressure BARO ... Barometric pressure | |
| ABSOL PRES/SE [V] | | | <ul style="list-style-type: none"> ● The signal voltage of the absolute pressure sensor is displayed. | |
| VOLTAGE [V] | | | <ul style="list-style-type: none"> ● Voltage measured by the voltage probe. | |
| PULSE [msec] or [Hz] or [%] | | | <ul style="list-style-type: none"> ● Pulse width, frequency or duty cycle measured by the pulse probe. | <ul style="list-style-type: none"> ● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured. |

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

ACTIVE TEST MODE

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---------------------|--|--|--|
| FUEL INJECTION | <ul style="list-style-type: none"> ● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> ● Harness and connector ● Fuel injectors ● Front heated oxygen sensor |
| IACV-AAC/V OPENING | <ul style="list-style-type: none"> ● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | <ul style="list-style-type: none"> ● Harness and connector ● IACV-AAC valve |
| ENG COOLANT TEMP | <ul style="list-style-type: none"> ● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> ● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors |
| IGNITION TIMING | <ul style="list-style-type: none"> ● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | <ul style="list-style-type: none"> ● Adjust initial ignition timing |
| POWER BALANCE | <ul style="list-style-type: none"> ● Engine: After warming up, idle the engine. ● A/C switch "OFF" ● Shift lever "N" ● Cut off each injector signal one at a time using CONSULT. | Engine runs rough or dies. | <ul style="list-style-type: none"> ● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils |
| FUEL PUMP RELAY | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound. | Fuel pump relay makes the operating sound. | <ul style="list-style-type: none"> ● Harness and connector ● Fuel pump relay |
| EGRC SOLENOID VALVE | <ul style="list-style-type: none"> ● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> ● Harness and connector ● Solenoid valve |
| SELF-LEARNING CONT | <ul style="list-style-type: none"> ● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. | | |
| PURG VOL CONT/V | <ul style="list-style-type: none"> ● Engine: After warming up, idle the engine. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | <ul style="list-style-type: none"> ● Harness and connector ● EVAP canister purge volume control solenoid valve |
| TANK F/TEMP SEN | <ul style="list-style-type: none"> ● Change the tank fuel temperature using CONSULT. | | |
| VENT CONTROL/V | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> ● Harness and connector ● Solenoid valve |
| VC/V BYPASS/V | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | <ul style="list-style-type: none"> ● Harness and connector ● Solenoid valve |
| MAP/BARO SW/V | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Turn the MAP/BARO switch solenoid valve between "MAP" and "BARO" using CONSULT and listen for operating sound. | MAP/BARO switch solenoid valve makes an operating sound. | <ul style="list-style-type: none"> ● Harness and connector ● MAP/BARO switch solenoid valve |

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

DTC CONFIRMATION MODE

SRT STATUS mode

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-37.

DTC WORK SUPPORT mode

| TEST MODE | TEST ITEM | CONDITION | REFERENCE PAGE |
|--------------------|---------------------|---|----------------|
| EVAPORATIVE SYSTEM | PURGE FLOW P1447 | Refer to corresponding trouble diagnosis for DTC. | EC-367 |
| | VC CUT/V BP/V P1491 | | EC-383 |
| | PURG VOL CN/V P1444 | | EC-355 |
| | EVAP SML LEAK P0440 | | EC-260 |
| | EVAP SML LEAK P1440 | | EC-345 |
| FR O2 SENSOR | FR O2 SENSOR P0130 | | EC-144 |
| | FR O2 SENSOR P0131 | | EC-150 |
| | FR O2 SENSOR P0132 | | EC-156 |
| | FR O2 SENSOR P0133 | | EC-162 |
| RR O2 SENSOR | RR O2 SENSOR P0137 | | EC-179 |
| | RR O2 SENSOR P0138 | | EC-186 |
| | RR O2 SENSOR P0139 | | EC-193 |
| EGR SYSTEM | EGR SYSTEM P0400 | | EC-242 |
| | EGRC-BPT/VLV P0402 | | EC-250 |
| | EGR SYSTEM P1402 | | EC-338 |
| A/T (TCC S/V) | TCC S/V FNCTN P1776 | | EC-397 |

FUNCTION TEST MODE

| FUNCTION TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|-----------------------|--|---|----------------|--|
| SELF-DIAG RESULTS | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Displays the results of on board diagnostic system. | — | | Objective system |
| CLOSED THROTTLE POSI | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.) | Throttle valve: opened | OFF | <ul style="list-style-type: none"> ● Harness and connector ● Throttle position sensor (Closed throttle position) ● Throttle position sensor (Closed throttle position) adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode. |
| | | Throttle valve: closed | ON | |
| THROTTLE POSI SEN CKT | <ul style="list-style-type: none"> ● 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 | <ul style="list-style-type: none"> ● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode. |
| PARK/NEUT POSI SW CKT | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Inhibitor position switch circuit is tested when shift lever is manipulated. | Out of N/P positions | OFF | <ul style="list-style-type: none"> ● Harness and connector ● Inhibitor switch ● Linkage or Inhibitor switch adjustment |
| | | In N/P positions | ON | |
| FUEL PUMP CIRCUIT | <ul style="list-style-type: none"> ● 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. | | <ul style="list-style-type: none"> ● Harness and connector ● Fuel pump ● Fuel pump relay ● Fuel filter clogging ● Fuel level |
| EGRC SOL/V CIRCUIT | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise. | The solenoid valve makes an operating sound every 3 seconds. | | <ul style="list-style-type: none"> ● Harness and connector ● EGRC-solenoid valve |

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

| FUNCTION TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|-----------------------|--|---|-----|---|
| START SIGNAL CIRCUIT | <ul style="list-style-type: none"> ● Ignition switch: ON → START ● Start signal circuit is tested when engine is started by operating the starter. Battery voltage and engine coolant temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed. | Start signal: OFF → ON | | <ul style="list-style-type: none"> ● Harness and connector ● Ignition switch |
| PW/ST SIGNAL CIRCUIT | <ul style="list-style-type: none"> ● 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 | <ul style="list-style-type: none"> ● Harness and connector ● Power steering oil pressure switch ● Power steering oil pump |
| | | Neutral position | OFF | |
| VEHICLE SPEED SEN CKT | <ul style="list-style-type: none"> ● 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). | | <ul style="list-style-type: none"> ● Harness and connector ● Vehicle speed sensor ● Speedometer |
| IGN TIMING ADJ | <ul style="list-style-type: none"> ● After warming up, idle the engine. ● Ignition timing 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. | | <ul style="list-style-type: none"> ● Adjust ignition timing (by moving camshaft position sensor or distributor) ● Camshaft position sensor drive mechanism |
| MIXTURE RATIO TEST | <ul style="list-style-type: none"> ● Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the front heated oxygen sensor output at 2,000 rpm under non-loaded state. | Front heated oxygen sensor COUNT: More than 5 times during 10 seconds | | <ul style="list-style-type: none"> ● 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) ● Front heated oxygen sensor circuit ● Front heated oxygen sensor operation ● Fuel pressure high or low ● Mass air flow sensor |
| POWER BALANCE | <ul style="list-style-type: none"> ● 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. | | <ul style="list-style-type: none"> ● Injector circuit (Injector, harness or connector) ● Ignition circuit (Spark plug, ignition coil with power transistor harness or connector) ● Compression ● Valve timing |
| IACV-AAC/V SYSTEM | <ul style="list-style-type: none"> ● 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% and 20%. | | <ul style="list-style-type: none"> ● Harness and connector ● IACV-AAC valve ● Air passage restriction between air inlet and IACV-AAC valve ● IAS (Idle adjusting screw) adjustment |

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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

CONSULT (Cont'd)

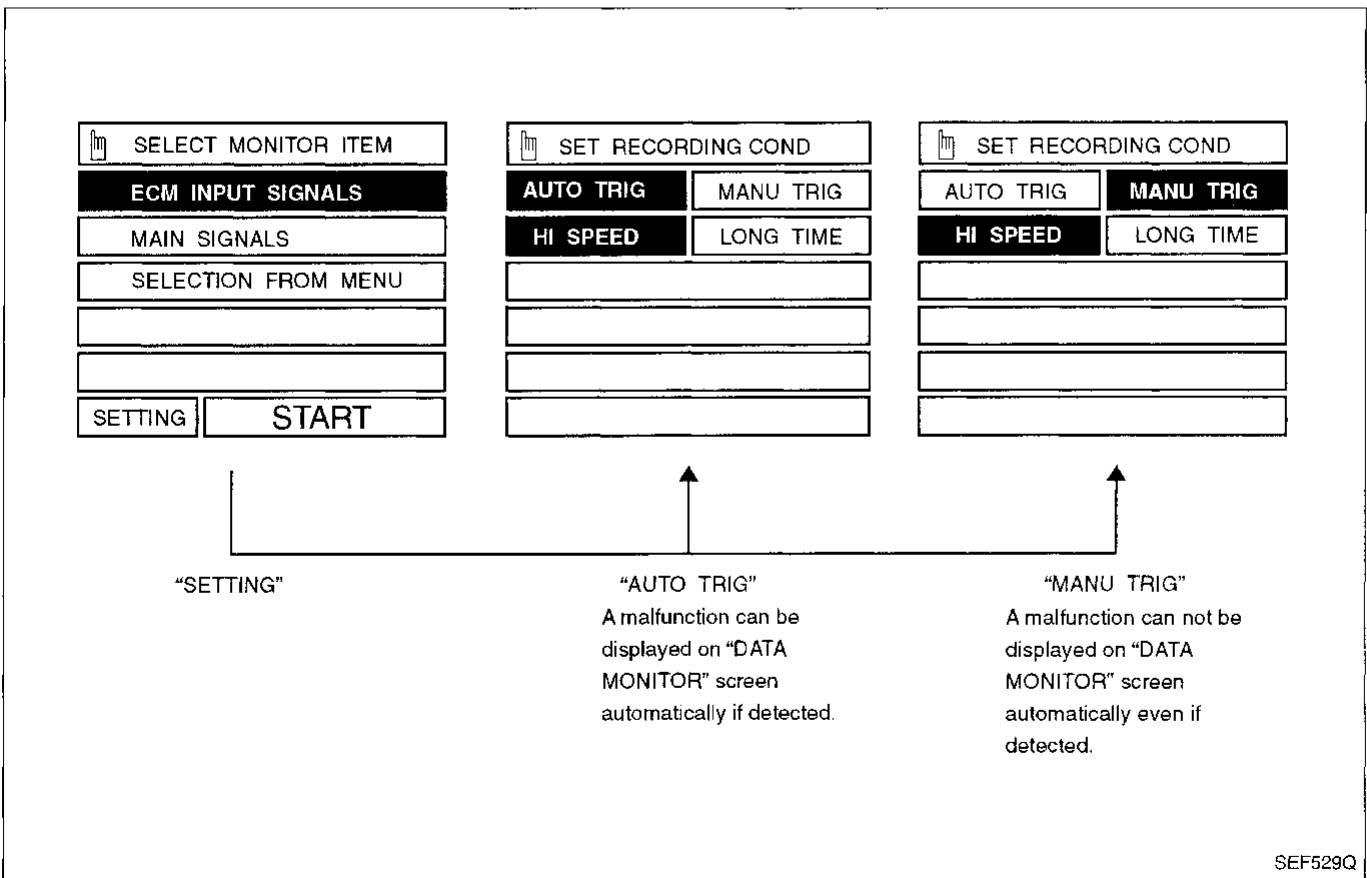
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (Recording vehicle data)

CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

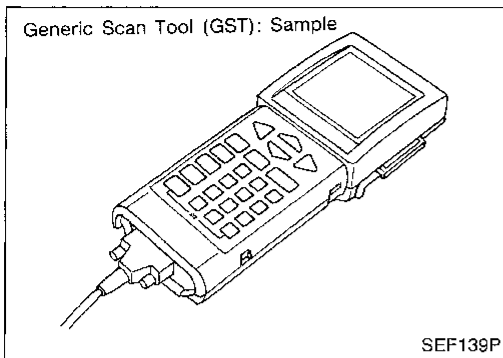
1. "AUTO TRIG" (Automatic trigger):
 - The malfunction will be identified on the CONSULT screen in real time.
In other words, DTC/1st trip DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM.
DATA MONITOR can be performed continuously until a malfunction is detected. However, DATA MONITOR cannot continue any longer after the malfunction detection.
2. "MANU TRIG" (Manual trigger):
 - DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT screen even though a malfunction is detected by ECM.
DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

1. "AUTO TRIG"
 - While trying to detect the DTC/1st trip DTC by performing the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
 - While narrowing down the possible causes, CONSULT should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent.
When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE", the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)
2. "MANU TRIG"
 - If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.



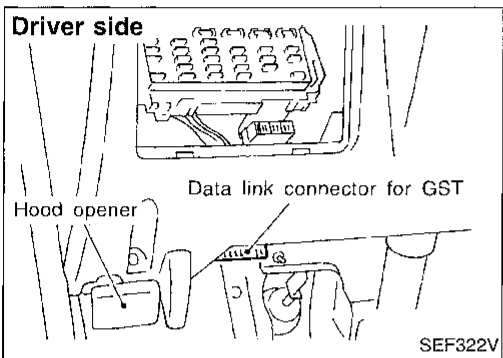
ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



Generic Scan Tool (GST)

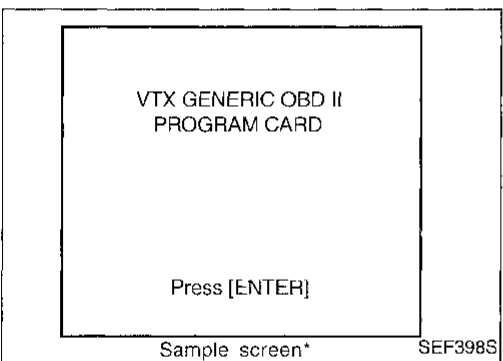
DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 7 different functions explained on the next page. ISO9141 is used as the protocol. The name "GST" or "Generic Scan Tool" is used in this service manual.



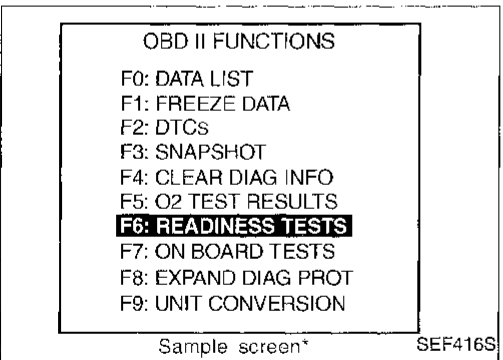
GST INSPECTION PROCEDURE

1. Turn ignition switch "OFF".
2. Connect "GST" to data link connector for GST. (Data link connector for GST is located under LH dash panel near the fuse box cover.)



3. Turn ignition switch "ON".
4. Enter the program according to instruction on the screen or in the operation manual.

(*: Regarding GST screens in this section, sample screens are shown.)



5. Perform each diagnostic mode according to each service procedure.

For further information, see the GST Operation Manual of the tool maker.

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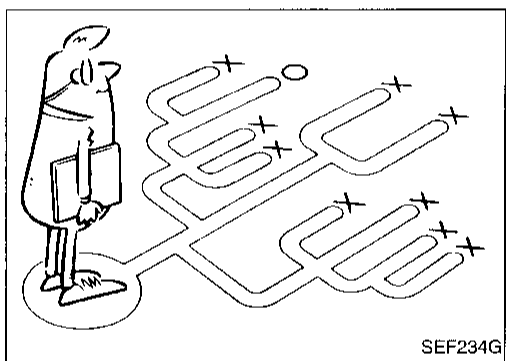
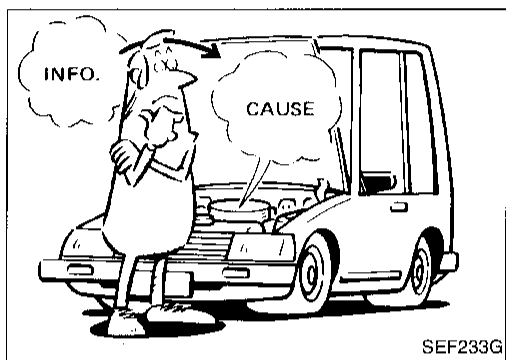
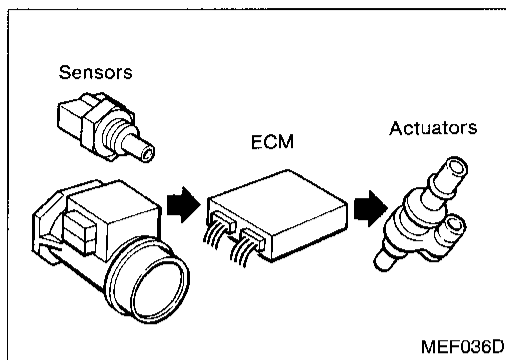
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ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Generic Scan Tool (GST) (Cont'd)

FUNCTION

| Diagnostic test mode | | Function |
|----------------------|------------------|---|
| MODE 1 | READINESS TESTS | This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information. |
| MODE 2 | (FREEZE DATA) | This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to "Freeze Frame Data" (EC-57).] |
| MODE 3 | DTCs | This mode gains access to emission-related power train trouble codes which were stored by ECM. |
| MODE 4 | CLEAR DIAG INFO | This mode can clear all emission-related diagnostic information. This includes: <ul style="list-style-type: none"> ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7) |
| MODE 6 | (ON BOARD TESTS) | This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored. |
| MODE 7 | (ON BOARD TESTS) | This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions. |
| MODE 8 | — | This mode can close EVAP system in ignition switch "ON" position (Engine stopped). When this mode is performed, following parts can be opened or closed. <ul style="list-style-type: none"> ● EVAP canister vent control valve open ● Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function. <ul style="list-style-type: none"> ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch "OFF" ● Low fuel temperature ● Too much pressure is applied to EVAP system |



KEY POINTS

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

SEF907L

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 input and output signals are proper and stable. At the same time, it is important that there are no 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. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow" on EC-69.

Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such problems, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A "Diagnostic Worksheet" like the example on next page should be used.

Start your diagnosis by looking for "conventional" problems first. This will help troubleshoot driveability problems on an electronically controlled engine vehicle.

Diagnostic Worksheet

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make trouble-shooting faster and more accurate.

In general, each customer feels differently about a problem. It is important to fully understand the symptoms or conditions for a customer complaint.

Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere [for the models with EVAP (SMALL LEAK) diagnosis].

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TROUBLE DIAGNOSIS — Introduction

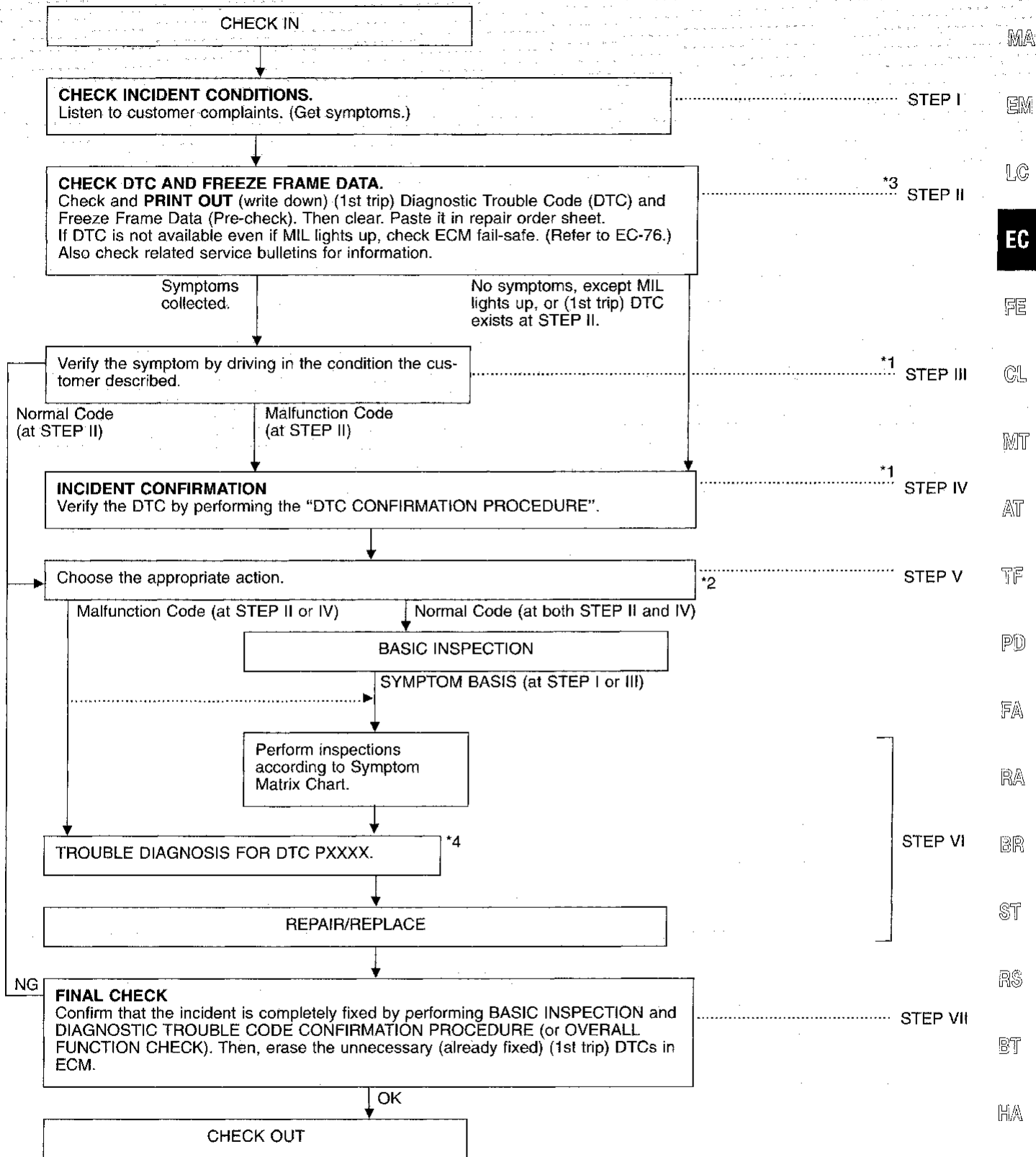
Diagnostic Worksheet (Cont'd)

WORKSHEET SAMPLE

| | | | |
|----------------------------|---------------------------------------|--|-----------------|
| Customer name MR/MS | | Model & Year | VIN |
| Engine # | | Trans. | Mileage |
| Incident Date | | Manuf. Date | In Service Date |
| Fuel and fuel filler cap | | <input type="checkbox"/> Vehicle ran out of fuel causing misfire <input type="checkbox"/> Fuel filler cap was left off or incorrectly screwed on. | |
| Symptoms | <input type="checkbox"/> Startability | <input type="checkbox"/> Impossible to start <input type="checkbox"/> No combustion <input type="checkbox"/> Partial combustion <input type="checkbox"/> Partial combustion affected by throttle position <input type="checkbox"/> Partial combustion NOT affected by throttle position <input type="checkbox"/> Possible but hard to start <input type="checkbox"/> Others [] | |
| | <input type="checkbox"/> Idling | <input type="checkbox"/> No fast idle <input type="checkbox"/> Unstable <input type="checkbox"/> High idle <input type="checkbox"/> Low idle <input type="checkbox"/> Others [] | |
| | <input type="checkbox"/> Driveability | <input type="checkbox"/> Stumble <input type="checkbox"/> Surge <input type="checkbox"/> Knock <input type="checkbox"/> Lack of power <input type="checkbox"/> Intake backfire <input type="checkbox"/> Exhaust backfire <input type="checkbox"/> Others [] | |
| | <input type="checkbox"/> Engine stall | <input type="checkbox"/> At the time of start <input type="checkbox"/> While idling <input type="checkbox"/> While accelerating <input type="checkbox"/> While decelerating <input type="checkbox"/> Just after stopping <input type="checkbox"/> While loading | |
| Incident occurrence | | <input type="checkbox"/> Just after delivery <input type="checkbox"/> Recently <input type="checkbox"/> In the morning <input type="checkbox"/> At night <input type="checkbox"/> In the daytime | |
| Frequency | | <input type="checkbox"/> All the time <input type="checkbox"/> Under certain conditions <input type="checkbox"/> Sometimes | |
| Weather conditions | | <input type="checkbox"/> Not affected | |
| | Weather | <input type="checkbox"/> Fine <input type="checkbox"/> Raining <input type="checkbox"/> Snowing <input type="checkbox"/> Others [] | |
| | Temperature | <input type="checkbox"/> Hot <input type="checkbox"/> Warm <input type="checkbox"/> Cool <input type="checkbox"/> Cold <input type="checkbox"/> Humid °F | |
| Engine conditions | | <input type="checkbox"/> Cold <input type="checkbox"/> During warm-up <input type="checkbox"/> After warm-up Engine speed | |
| Road conditions | | <input type="checkbox"/> In town <input type="checkbox"/> In suburbs <input type="checkbox"/> Highway <input type="checkbox"/> Off road (up/down) | |
| Driving conditions | | <input type="checkbox"/> Not affected <input type="checkbox"/> At starting <input type="checkbox"/> While idling <input type="checkbox"/> At racing <input type="checkbox"/> While accelerating <input type="checkbox"/> While cruising <input type="checkbox"/> While decelerating <input type="checkbox"/> While turning (RH/LH) Vehicle speed | |
| Malfunction indicator lamp | | <input type="checkbox"/> Turned on <input type="checkbox"/> Not turned on | |

TROUBLE DIAGNOSIS — Work Flow

Work Flow

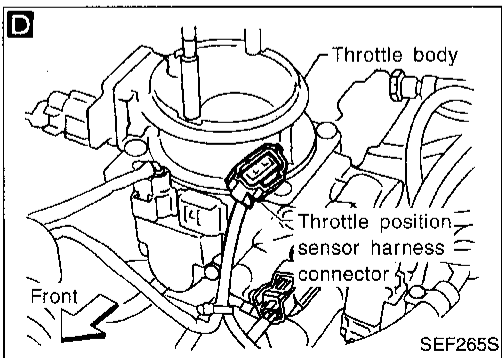
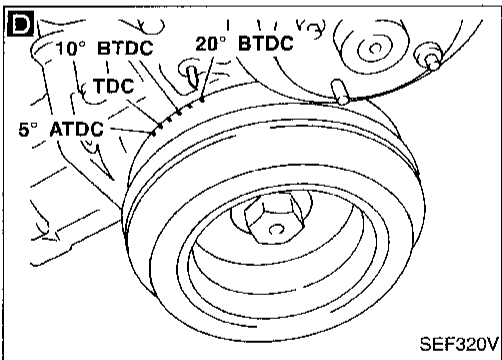
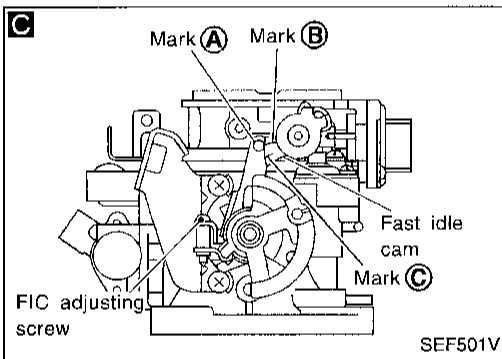
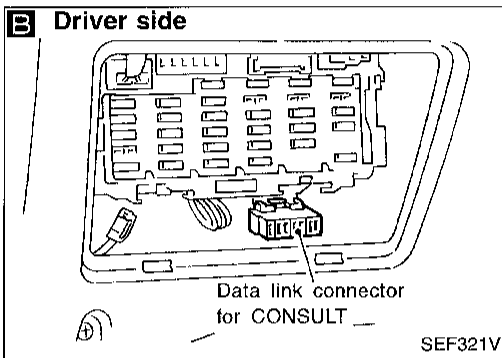
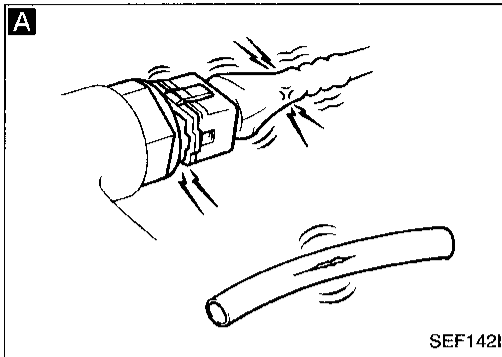


- *1: If the incident cannot be duplicated, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.
- *2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-94.
- *3: If time data of "SELF-DIAG RESULTS" is other than "0" or "1t" refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.
- *4: If the malfunctioning part cannot be found, refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

TROUBLE DIAGNOSIS — Work Flow

Description for Work Flow

| STEP | DESCRIPTION |
|----------|---|
| STEP I | Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-68. |
| STEP II | <p>Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-45.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV.</p> <p>Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. See EC-77.)</p> <p>Also check related service bulletins for information.</p> |
| STEP III | <p>Try to confirm the symptom and under what conditions the incident occurs.</p> <p>The "DIAGNOSTIC WORK SHEET" and the freeze frame data are useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.</p> <p>If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.)</p> <p>If the malfunction code is detected, skip STEP IV and perform STEP V.</p> |
| STEP IV | <p>Try to detect the (1st trip) Diagnostic Trouble Code by driving in (or performing) the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT or Generic Scan Tool.</p> <p>During the (1st trip) DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.</p> <p>If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.)</p> <p>In case the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative.</p> <p>The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the (1st trip) DTC detection.</p> |
| STEP V | <p>Take the appropriate action based on the results of STEP I through IV.</p> <p>If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX.</p> <p>If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-71.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-77.)</p> |
| STEP VI | <p>Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts". Gently shake the related connectors, components or wiring harness with CONSULT set in "DATA MONITOR (AUTO TRIG)" mode.</p> <p>Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT. Refer to EC-80.</p> <p>The "DIAGNOSTIC PROCEDURE" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section ("HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", "Circuit Inspection").</p> <p>Repair or replace the malfunction parts.</p> |
| STEP VII | <p>Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint.</p> <p>Perform the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" and confirm the normal code [Diagnostic trouble code No. P0000 or 0505] is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one.</p> <p>Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM. (Refer to EC-43.)</p> |



Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

- Headlamp switch is OFF,
- Air conditioner switch is OFF,
- Steering wheel is in the straight-ahead position, etc.

A

BEFORE STARTING

1. Check service records for repairs of related problems, 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, or cuts

B

CONNECT CONSULT TO THE VEHICLE. Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. (Refer to page EC-54.)

C

Warm engine up to normal operating temperature and make sure that the center of mark (A) is aligned with mark (B) as shown in the figure.

NG → Check FI cam. Refer to EC-28.

OK ↓

D

CHECK IGNITION TIMING.

1. Warm engine up to normal operating temperature.
2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".
4. Check ignition timing at idle using timing light.
Ignition timing: $20^{\circ} \pm 2^{\circ}$ BTDC

OR

1. Warm engine up to normal operating temperature.
2. Stop engine and disconnect throttle position sensor harness connector.
3. Start engine.
4. Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no-load and then run engine at idle speed.
5. Check ignition timing at idle using timing light.
Ignition timing: $20^{\circ} \pm 2^{\circ}$ BTDC

NG → Adjust ignition timing by turning distributor.

OK ↓

(Go to next page.)

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TROUBLE DIAGNOSIS — Basic Inspection

Basic Inspection (Cont'd)

E

■ IGN TIMING ADJ ■ □

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.

START

SEF555N

F

DISCONNECT Closed throttle position switch connector

SEF403T

G

Closed throttle position switch idle position switching engine rpm

Decrease Increase Throttle body

Throttle position sensor with throttle position switch

SEF548V

E

CHECK BASE IDLE SPEED.
Warm engine up to normal operating temperature.

1. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
2. When touching "START", does engine speed fall to 750 ± 50 rpm (in "P" or "N" position)?

OR

Does engine run at 750 ± 50 rpm (in "P" or "N" position)?

NG → Adjust base idle speed by turning idle speed adjusting screw. Refer to "Idle Speed/ Ignition Timing/Idle Mixture Ratio Adjustment", EC-29.

F

CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION.

- Warm engine up to normal operating temperature.
- Check FI cam. Refer to procedure **G**.
- Always check ignition timing and base idle speed before performing followings.

- Disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
- Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no-load and then run engine at idle speed.
- Check harness continuity between closed throttle position switch terminals ⑤ and ⑥ under the following condition.
 - Raise engine speed to 2,000 rpm.
 - Lower engine speed as gradually as possible.

Engine speed at the point closed throttle position switch switches from OFF → ON (No continuity to continuity exists): 950 ± 150 rpm

G

ADJUSTMENT

Adjust closed throttle position switch idle position by rotating throttle position sensor body as follows.

- Start engine and warm it up to normal operating temperature.
- Stop engine and disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
- Set the circuit tester leads to the closed throttle position switch terminals ⑤ and ⑥.
- Loosen throttle position sensor body fixing bolts and move the sensor.
- Start engine and adjust the sensor body while engine speed at the point closed throttle position switch switches from OFF → ON (No continuity to continuity exists): 950 ± 150 rpm.
- Temporarily tighten the sensor body fixing bolts.
- Raise engine speed to 2,000 rpm and lower the engine speed as gradually as possible, confirm that above adjustment is performed correctly.
- Tighten throttle position sensor body.
- Reconfirm that the closed throttle position idle position is switched from "OFF" to "ON" at 950 ± 50 rpm while reducing engine speed from 2,000 rpm.

If NG, repeat from the step 4.

B
(Go to next page.)

C
(Go to next page.)

TROUBLE DIAGNOSIS — Basic Inspection

Basic Inspection (Cont'd)

THRTL POS SEN ADJ

CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITION

- IGN SW "ON"
- ENG NOT RUNNING
- ACC PEDAL KEPT OFF

START

SEF549V

CONNECT

ECM CONNECTOR

28

V

SEF422Q

CONNECT

ECM CONNECTOR

23 28

V

SEF550V

- B**
- Reconnect throttle position sensor harness connector and throttle position switch harness connector.
 - Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no-load and then run engine at idle speed.

OK

C

RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.

1. Warm engine up to normal operating temperature and stop engine.

Select "CLSD THL/P SW" in "DATA MONITOR" mode (Manual trigger) with CONSULT before stopping engine.

2. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.

3. Turn ignition switch "ON".
4. Turn ignition switch "OFF" and wait at least 5 seconds.

5. Repeat steps 3 and 4 until "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT changes to "ON". Repeat steps 3 and 4 20 times.

OK

NG

CHECK THROTTLE POSITION SENSOR IDLE POSITION.

1. Stop engine.
2. Perform "THRTL POS SEN ADJ" in "WORK SUPPORT" mode.
3. Check that output voltage of throttle position sensor is approx. 0.3 to 0.7V. At the same time, measure voltage between ECM terminal **28** (Closed throttle position switch) and ground with CONSULT on tester.

The voltage is between 11 to 14V (Battery voltage).

OR

1. Stop engine.
2. Measure voltage between ECM terminal **23** (Throttle position sensor) and ground. The voltage is approx. 0.3 to 0.7V. At the same time, measure voltage between ECM terminal **28** (Closed throttle position switch) and ground with CONSULT on tester.

The voltage is between 11 to 14V (Battery voltage).

OK

D

(Go to next page.)

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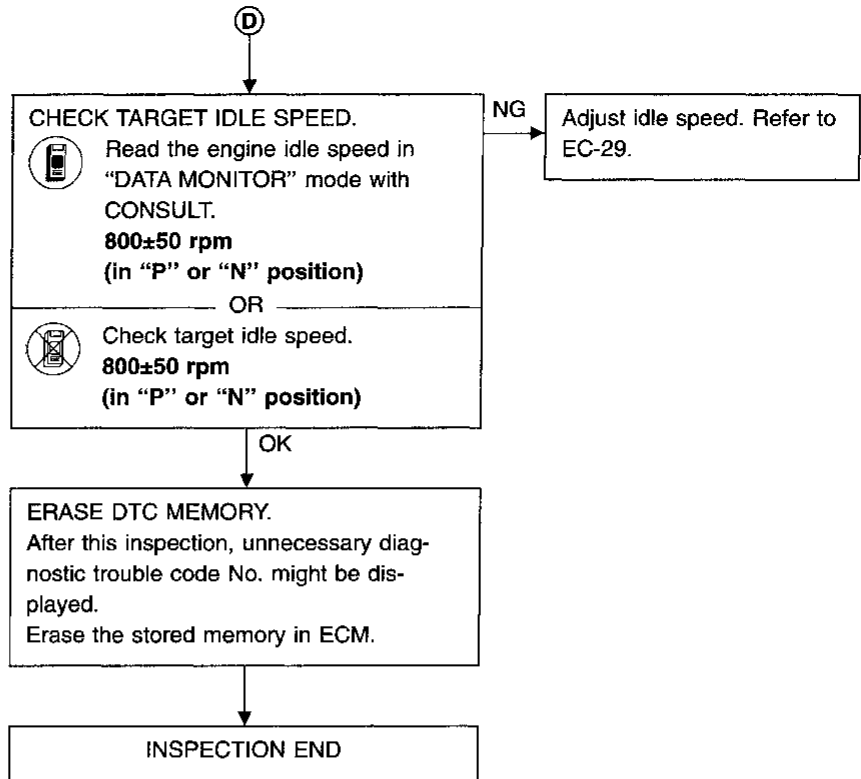
BT

HA

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Basic Inspection (Cont'd)



Diagnostic Trouble Code (DTC) Inspection Priority Chart

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

| Priority | Detected items (DTC) | | |
|----------|---|--|--|
| 1 | <ul style="list-style-type: none"> ● ECM (P0605, 0301) ● Mass air flow sensor (P0100, 0102) ● Throttle position sensor (P0120, 0403) ● EGRC-solenoid valve (P1400, 1005) | <ul style="list-style-type: none"> ● Camshaft position sensor (P0340, 0101) ● Vehicle speed sensor (P0500, 0104) ● Intake air temperature sensor (P0110, 0401) ● Knock sensor (P0325, 0304) ● Tank fuel temperature sensor (P0180, 0402) | <ul style="list-style-type: none"> ● Engine coolant temperature sensor (P0115, 0103) (P0125, 0908) ● Ignition signal (P1320, 0201) ● Park/Neutral position switch (P1706, 1003) |
| 2 | <ul style="list-style-type: none"> ● EGR temperature sensor (P1401, 0305) ● Absolute pressure sensor (P0105, 0803) ● MAP/BARO switch solenoid valve (P1105, 1302) ● Closed throttle position switch (P0510, 0203) | <ul style="list-style-type: none"> ● Front heated oxygen sensor heater (P0135, 0901) ● Crankshaft position sensor (OBD) (P0335, 0802) (P1336, 0905) ● Torque converter clutch solenoid valve (P1775, 0904) (P1776, 0513) ● Vacuum cut valve bypass valve (P1491, 0311) (P1490, 0801) | <ul style="list-style-type: none"> ● Front heated oxygen sensor (P0130 - P0134, 0303 - 0412) ● Rear heated oxygen sensor (P0137 - P0140, 0510 - 0707) ● Rear heated oxygen sensor heater (P0141, 0902) ● EVAP control system pressure sensor (P0450, 0704) ● EVAP canister vent control valve (P1448, 0309) (P0446, 0903) (P1446, 0215) ● EVAP canister purge volume control solenoid valve (P1444, 0214) (P0443, 1008) ● EVAP control system purge flow monitoring (P1447, 0111) |
| 3 | <ul style="list-style-type: none"> ● EGR function (P0400, 0302) (P1402, 0514) ● EVAP control system (SMALL LEAK) (P0440, 0705) (P1440, 0213) ● EGRC-BPT valve function (P0402, 0306) ● IACV-AAC valve (P0505, 0205) | <ul style="list-style-type: none"> ● Misfire (P0304 - P0300, 0605 - 0701) ● Closed loop control (P1148, 0307) | <ul style="list-style-type: none"> ● Fuel injection system function (P0172, 0114), (P0171, 0115) ● Three way catalyst function (P0420, 0702) |

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Fail-Safe Chart

The ECM enters fail-safe mode, if any of the following malfunctions is detected due to the open or short circuit. When the ECM enters the fail-safe mode, the MIL illuminates.

| DTC No. | | Detected items | Engine operating condition in fail-safe mode | | | | | | | | | | | | |
|--|--|---|--|-------------------------|--|---|--|--|--|-----------------------|--|-----------|--|----------------|-----------|
| CONSULT GST | ECM*1 | | | | | | | | | | | | | | |
| P0100 | 0102 | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | | | | | | | | | |
| P0115 | 0103 | Engine coolant temperature sensor circuit | <p>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Condition</th> <th style="text-align: center;">Engine coolant temperature decided (CONSULT display)</th> </tr> </thead> <tbody> <tr> <td>Just as ignition switch is turned ON or Start</td> <td style="text-align: center;">40°C (104°F)</td> </tr> <tr> <td>More than approx. 4 minutes after ignition ON or Start</td> <td style="text-align: center;">80°C (176°F)</td> </tr> <tr> <td>Except as shown above</td> <td style="text-align: center;">40 - 80°C (104 - 176°F) (Depends on the time)</td> </tr> </tbody> </table> | Condition | Engine coolant temperature decided (CONSULT display) | Just as ignition switch is turned ON or Start | 40°C (104°F) | More than approx. 4 minutes after ignition ON or Start | 80°C (176°F) | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) | | | | |
| Condition | Engine coolant temperature decided (CONSULT display) | | | | | | | | | | | | | | |
| Just as ignition switch is turned ON or Start | 40°C (104°F) | | | | | | | | | | | | | | |
| More than approx. 4 minutes after ignition ON or Start | 80°C (176°F) | | | | | | | | | | | | | | |
| Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) | | | | | | | | | | | | | | |
| P0120 | 0403 | Throttle position sensor circuit | <p>Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Condition</th> <th style="text-align: center;">Driving condition</th> </tr> </thead> <tbody> <tr> <td>When engine is idling</td> <td style="text-align: center;">Normal</td> </tr> <tr> <td>When accelerating</td> <td style="text-align: center;">Poor acceleration</td> </tr> </tbody> </table> | Condition | Driving condition | When engine is idling | Normal | When accelerating | Poor acceleration | | | | | | |
| Condition | Driving condition | | | | | | | | | | | | | | |
| When engine is idling | Normal | | | | | | | | | | | | | | |
| When accelerating | Poor acceleration | | | | | | | | | | | | | | |
| Unable to access ECM | Unable to access Diagnostic Test Mode II | ECM | <p>ECM fail-safe activating condition The computing function of the ECM was judged to be malfunctioning. When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver. However it is not possible to access ECM and DTC cannot be confirmed.</p> <p>Engine control with fail-safe When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, and IACV-AAC valve operation are controlled under certain limitations.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">ECM fail-safe operation</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Engine speed</td> <td style="text-align: center;">Engine speed will not rise more than 3,000 rpm.</td> </tr> <tr> <td>Fuel injection</td> <td style="text-align: center;">Simultaneous multiport fuel injection system</td> </tr> <tr> <td>Ignition timing</td> <td style="text-align: center;">Ignition timing is fixed at the preset valve.</td> </tr> <tr> <td>Fuel pump</td> <td style="text-align: center;">Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls.</td> </tr> <tr> <td>IACV-AAC valve</td> <td style="text-align: center;">Full open</td> </tr> </tbody> </table> <p>Replace ECM, if ECM fail-safe condition is confirmed.</p> | ECM fail-safe operation | | Engine speed | Engine speed will not rise more than 3,000 rpm. | Fuel injection | Simultaneous multiport fuel injection system | Ignition timing | Ignition timing is fixed at the preset valve. | Fuel pump | Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls. | IACV-AAC valve | Full open |
| ECM fail-safe operation | | | | | | | | | | | | | | | |
| Engine speed | Engine speed will not rise more than 3,000 rpm. | | | | | | | | | | | | | | |
| Fuel injection | Simultaneous multiport fuel injection system | | | | | | | | | | | | | | |
| Ignition timing | Ignition timing is fixed at the preset valve. | | | | | | | | | | | | | | |
| Fuel pump | Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls. | | | | | | | | | | | | | | |
| IACV-AAC valve | Full open | | | | | | | | | | | | | | |

*1: In Diagnostic Test Mode II (Self-diagnostic results)

Symptom Matrix Chart

| SYSTEM — Basic engine control system | | SYMPTOM | | | | | | | | | | | | | Reference page |
|---|---------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|------------------|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | EC-410 |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-26 |
| | Injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-404 |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-20 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | EC-25 |
| | Incorrect idle speed adjustment | 3 | 3 | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-71 |
| | IACV-AAC valve circuit | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | EC-291 |
| | IACV-FICD solenoid valve circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | | EC-418 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-71 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-315 |
| EGR | EGRC-solenoid valve circuit | | 2 | 2 | 3 | 3 | | | | | | 3 | | | EC-327 |
| | EGR system | 2 | 1 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | | 3 | | | EC-242, 250, 338 |
| Main power supply and ground circuit | | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | 2 | EC-94 |
| Air conditioner circuit | | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | HA section |

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

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TROUBLE DIAGNOSIS — General Description

Symptom Matrix Chart (Cont'd)

| SYSTEM — ECCS system | | SYMPTOM | | | | | | | | | | | | | | Reference page |
|-------------------------|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-------------|----------------|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | | |
| ECCS | Camshaft position sensor circuit | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | | 3 | | | EC-236 | |
| | Mass air flow sensor circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-99 | |
| | Front heated oxygen sensor circuit | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-144, 150 | |
| | Engine coolant temperature sensor circuit | 1 | 1 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | | 2 | | | EC-121, 139 | |
| | Throttle position sensor circuit | | 1 | 2 | | 2 | 2 | 2 | 2 | 2 | | 2 | | | EC-126 | |
| | Incorrect throttle position sensor adjustment | | 3 | 1 | | 1 | 1 | 1 | 1 | 1 | | 1 | | | EC-71 | |
| | Vehicle speed sensor circuit | | 2 | 3 | | 3 | | | | | | 3 | | | EC-287 | |
| | Knock sensor circuit | | | 2 | | | | | | | | 3 | | | EC-227 | |
| | ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | EC-302, 76 | |
| | Start signal circuit | 2 | | | | | | | | | | | | | EC-407 | |
| | Park/Neutral position switch circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-388 | |
| | Power steering oil pressure switch circuit | | 2 | | | | | 3 | 3 | | | | | | EC-415 | |

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

TROUBLE DIAGNOSIS — General Description

Symptom Matrix Chart (Cont'd)

| SYSTEM | | SYMPTOM | | | | | | | | | | | | | Reference page |
|-----------------------|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|--------------------|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | HA | |
| Fuel | Fuel tank | 5 | | | | | | | | | | | | | FE section |
| | Fuel piping | | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | |
| | Vapor lock | | 5 | | | | | | | | | | | | |
| | Valve deposit | | | | | | | | | | | | | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | 5 | 5 | 5 | | 5 | 5 | | | | 5 | | |
| Air | Air duct | | | | | | | | | | | | | | |
| | Air cleaner | | | | | | | | | | | | | | |
| | Air leakage from air duct (Mass air flow sensor — throttle body) | | 5 | 5 | | 5 | | 5 | 5 | | | 5 | | | |
| | Throttle body, Throttle wire | 5 | | | 5 | | 5 | | 5 | 5 | | | | | FE section |
| | Air leakage from intake manifold/Collector/Gasket | | | | | | | | | | | | | | |
| Cranking | Battery | 1 | 1 | 1 | | 1 | | 1 | 1 | | | 1 | | 1 | EL section |
| | Alternator circuit | | | | | | | | | | | | | | |
| | Starter circuit | 3 | | | | | | | | | | | | | |
| | Flywheel/Drive plate | 6 | | | | | | | | | | | | | EM section |
| | Inhibitor switch | 4 | | | | | | | | | | | | | AT section |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | 3 | | |
| | Cylinder head gasket | | | | | | | | | | 4 | | | | |
| | Cylinder block | | | | | | | | | | | | 4 | | |
| | Piston | | | | | | | | | | | | | | |
| | Piston ring | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | | EM section |
| | Connecting rod | | | | | | | | | | | | | | |
| | Bearing | | | | | | | | | | | | | | |
| Valve mechanism | Crankshaft | | | | | | | | | | | | | | |
| | Timing chain | | | | | | | | | | | | | | |
| | Camshaft | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | |
| | Intake valve | | | | | | | | | | | | 3 | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | | | 5 | | | FE section |
| | Three way catalyst | | | | | | | | | | | | | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | MA, EM, LC section |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | |
| | Thermostat | | | | | | | | | 5 | | | | | LC section |
| | Water pump | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | |
| | Water gallery | | | | | | | | | | | | | | |
| | Cooling fan | | | | | | | | | 5 | | | | | |
| | Coolant level (low)/Contaminated coolant | | | | | | | | | | | | | | MA section |

1 - 6: The numbers refer to the order of inspection.

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CONSULT Reference Value in Data Monitor Mode

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- * Specification data may not be directly related to their components signals/values/operations.
 i.e. 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 not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on board diagnostic system 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 |
|----------------|--|--|---|
| CMPS-RPM (REF) | <ul style="list-style-type: none"> ● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value. | | Almost the same speed as the CONSULT value. |
| MAS AIR/FL SE | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 0.9 - 1.8V |
| | | 2,500 rpm | 1.9 - 2.3V |
| COOLAN TEMP/S | <ul style="list-style-type: none"> ● Engine: After warming up | | More than 70°C (158°F) |
| FR O2 SENSOR | <ul style="list-style-type: none"> ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| FR O2 MNTR | | | LEAN ↔ RICH Changes more than 5 times during 10 seconds. |
| RR O2 SENSOR | <ul style="list-style-type: none"> ● Engine: After warming up | Revsing engine from idle to 3,000 rpm quickly | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| RR O2 MNTR | | | LEAN ↔ RICH |
| VHCL SPEED SE | <ul style="list-style-type: none"> ● Turn drive wheels and compare speedometer indication with the CONSULT value | | Almost the same speed as the CONSULT value |
| BATTERY VOLT | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) | | 11 - 14V |
| THRTL POS SEN | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Engine: After warming up | Throttle valve: fully closed | 0.3 - 0.7V |
| | | Throttle valve: fully opened | Approx. 4.0V |
| EGR TEMP SEN | <ul style="list-style-type: none"> ● Engine: After warming up | | Less than 4.5V |
| START SIGNAL | <ul style="list-style-type: none"> ● Ignition switch: ON → START → ON | | OFF → ON → OFF |
| CLSD THL/P SW | <ul style="list-style-type: none"> ● Engine: After warming up ● Ignition switch: ON (Engine stopped) | Throttle valve: Idle position | ON |
| | | Throttle valve: Slightly open | OFF |
| AIR COND SIG | <ul style="list-style-type: none"> ● Engine: After warming up, idle the engine | Air conditioner switch: "OFF" | OFF |
| | | Air conditioner switch: "ON" (Compressor operates.) | ON |
| P/N POSI SW | <ul style="list-style-type: none"> ● Ignition switch: ON | Shift lever: "P" or "N" | ON |
| | | Except above | OFF |
| PW/ST SIGNAL | <ul style="list-style-type: none"> ● Engine: After warming up, idle the engine | Steering wheel in neutral position (forward direction) | OFF |
| | | The steering wheel is fully turned | ON |

TROUBLE DIAGNOSIS — General Description

CONSULT Reference Value in Data Monitor Mode (Cont'd)

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---------------|--|---|--------------------|
| IGNITION SW | ● Ignition switch: ON → OFF → ON | | ON → OFF → ON |
| INJ PULSE | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 2.5 - 3.3 msec |
| | | 2,000 rpm | 2.4 - 3.2 msec |
| B/FUEL SCHDL | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 0.8 - 1.2 msec |
| | | 2,000 rpm | 0.8 - 1.2 msec |
| IGN TIMING | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | Approx. 20° BTDC |
| | | 2,000 rpm | More than 25° BTDC |
| IACV-AAC/V | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | Approx. 30% |
| | | 2,000 rpm | — |
| PURG VOL C/V | ● Engine: After warming up ● Air conditioner switch "OFF" ● No-load | Idle | 0% |
| | | 2,000 rpm (More than 200 seconds after starting engine) | — |
| A/F ALPHA | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 50 - 159% |
| EVAP SYS PRES | ● Ignition switch: ON | | Approx. 3.4V |
| AIR COND RLY | ● Air conditioner switch: OFF → ON | | OFF → ON |
| FUEL PUMP RLY | ● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking | | ON |
| | Except as shown above | | OFF |
| EGRC SOL/V | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | ON |
| | | Engine speed: Revving engine from idle to 3,000 rpm quickly | OFF |
| TCC SOL/V | ● Engine: After warming up | Idle | ON |
| | | 2,000 rpm | OFF |
| VENT CONT/V | ● Ignition switch: ON | | OFF |
| FR O2 HEATER | ● Engine speed: Below 3,000 rpm (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only) | | ON |
| | ● Engine speed: Above 3,000 rpm (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models) | | OFF |
| RR O2 HEATER | ● Engine running | | ON |
| | ● Ignition switch: ON | | OFF |
| VCM BYPASS/V | ● Ignition switch: ON | | OFF |
| CAL/LD VALUE | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 9.5 - 34.0% |
| | | 2,500 rpm | 13.9 - 24.9% |
| ABSOL TH-P/S | ● Engine: After warming up, engine stopped ● Ignition switch: ON | Throttle valve: fully closed | 0.0% |
| | | Throttle valve: fully opened | Approx. 80% |
| MASS AIRFLOW | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 0.9 - 5.8 g·m/s |
| | | 2,500 rpm | 7.5 - 13.2 gm/s |
| MAP/BARO SW/V | ● Engine: For 5 seconds after starting engine | | BARO |
| | ● Ignition switch: More than 5 seconds after turning ignition switch "ON" ● Engine: More than 5 seconds after starting engine | | MAP |
| ABSOL PRES/SE | ● Ignition switch: ON | | Approx. 4.4V |
| | ● Engine: For 5 seconds after starting engine ● Engine: More than 5 seconds after starting engine (After warming up) | | Approx. 1.2V |

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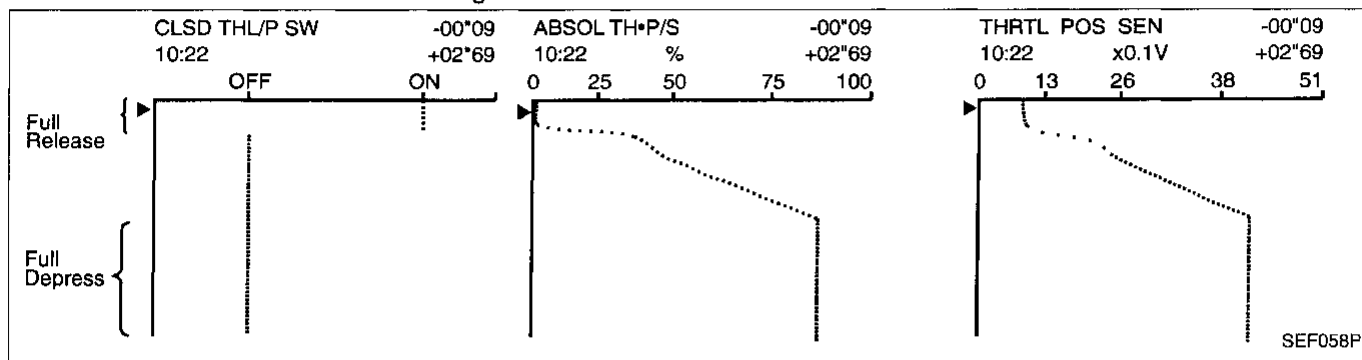
Major Sensor Reference Graph in Data Monitor Mode

The following are the major sensor reference graphs in "DATA MONITOR" mode.
(Select "HI SPEED" in "DATA MONITOR" with CONSULT.)

THRTL POS SEN, ABSOL TH·P/S, CLSD THL/P SW

Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL/P SW" when depressing the accelerator pedal with the ignition switch "ON".

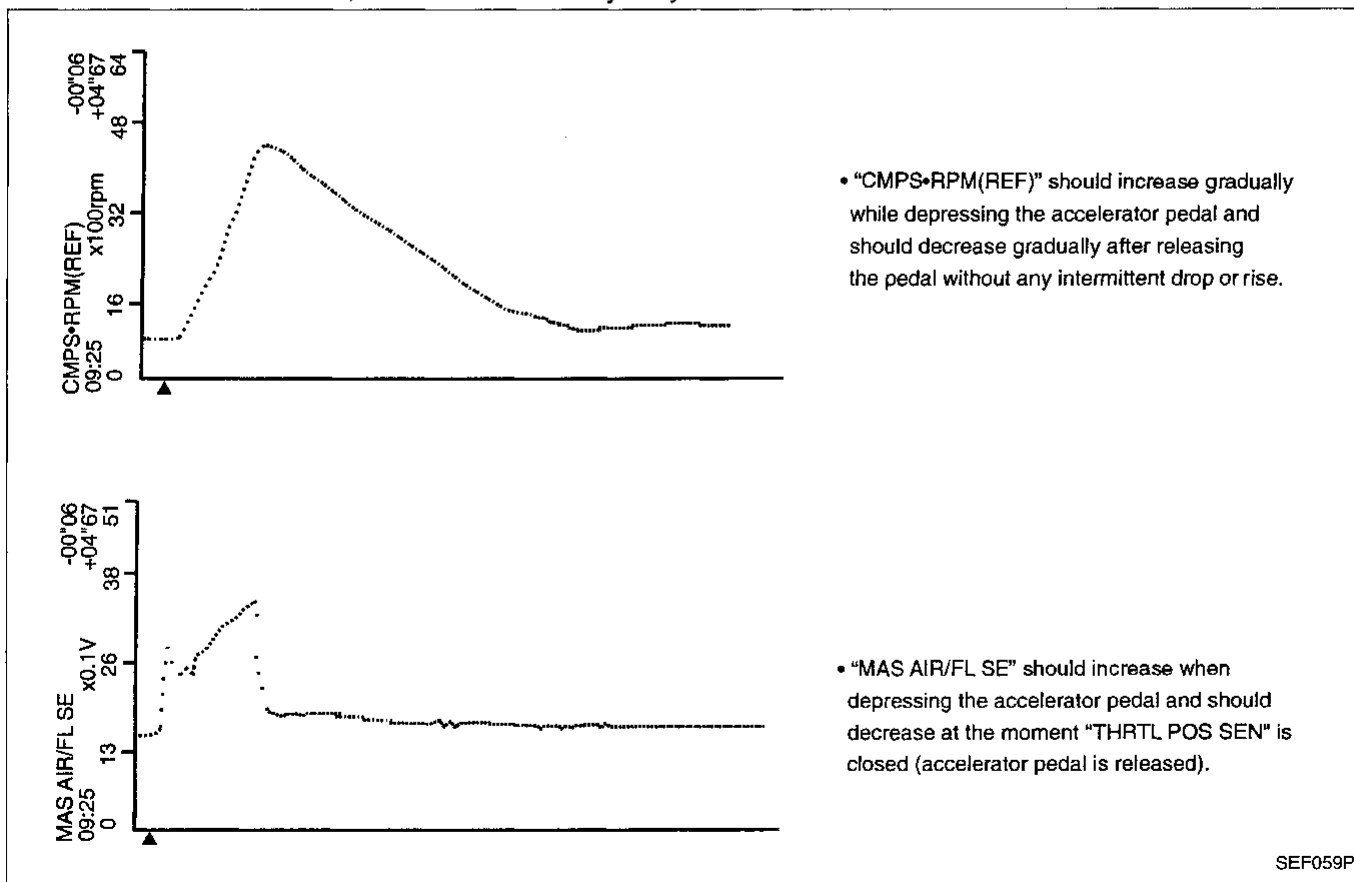
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



CMPS·RPM (REF), MAS AIR/FL SE, THRTL POS SEN, RR O2 SEN, FR O2 SEN, INJ PULSE

Below is the data for "CMPS·RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SEN", "FR O2 SEN" and "INJ PULSE" when revving engine quickly up to 4,800 rpm under no load after warming up engine to normal operating temperature.

Each value is for reference, the exact value may vary.



TROUBLE DIAGNOSIS — General Description

Major Sensor Reference Graph in Data Monitor Mode (Cont'd)

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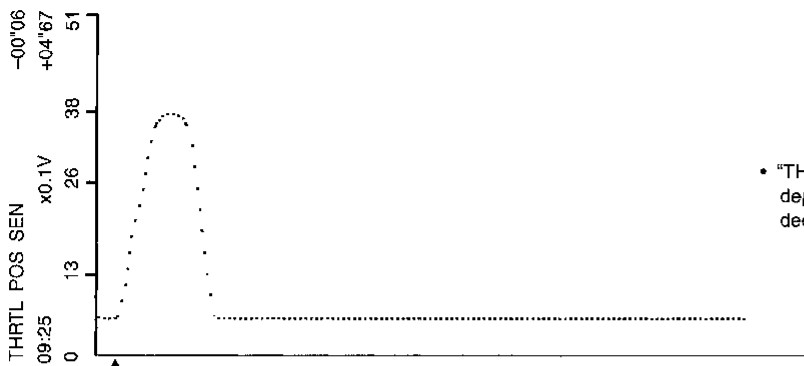
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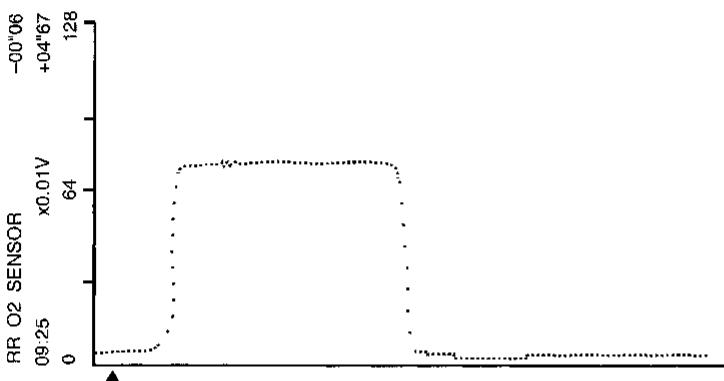
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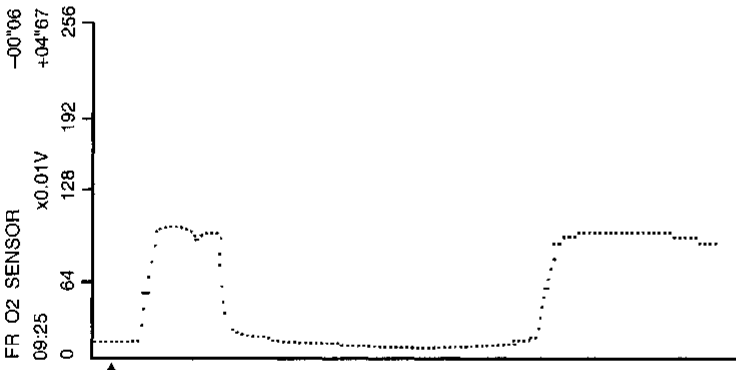
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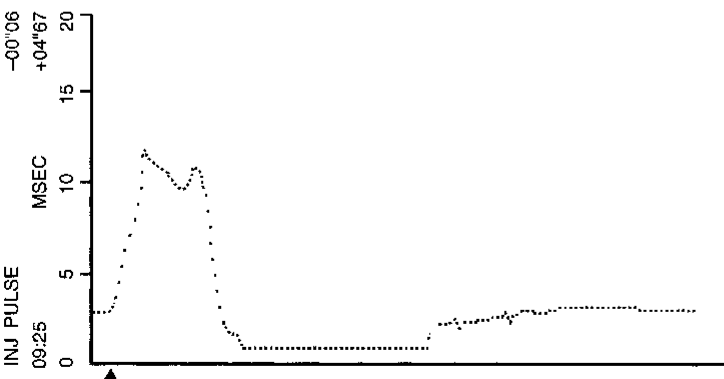
- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



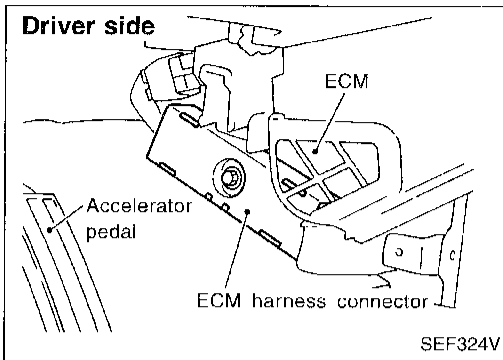
- "RR O2 SENSOR" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



- "FR O2 SENSOR" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



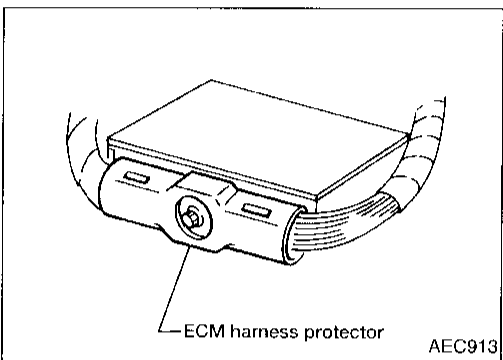
- "INJ PULSE" should increase when depressing the accelerator pedal and should decrease when the pedal is released.



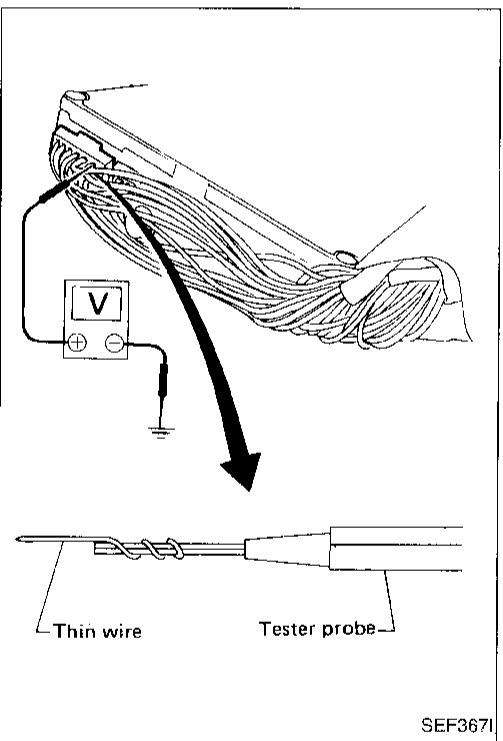
ECM Terminals and Reference Value

PREPARATION

- ECM is located behind the instrument lower cover. For this inspection:
 - Remove instrument lower cover.

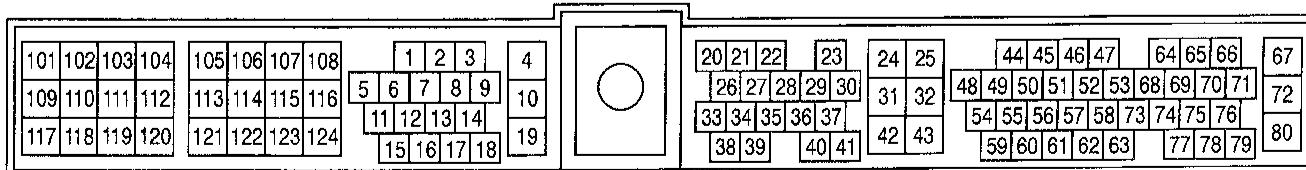


- Remove ECM harness protector.



- Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
 - Open harness securing clip to make testing easier.
 - Use extreme care not to touch 2 pins at one time.
 - Data is for comparison and may not be exact.

ECM HARNESS CONNECTOR TERMINAL LAYOUT



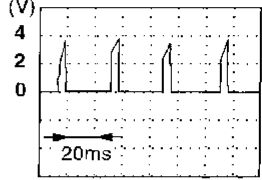
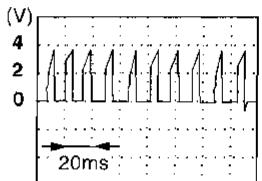
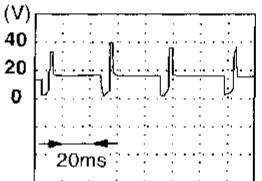
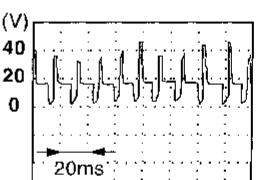
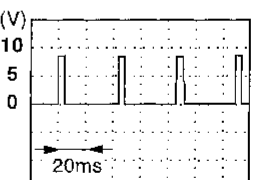
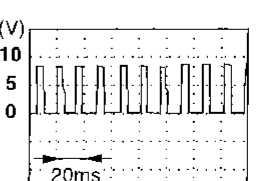
SEF533P

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------|---|---|
| 1 | PU/W | Ignition signal | <p>Engine is running. (Warm-up condition)</p> <p>└ Idle speed</p> | <p>0 - 0.5V</p>  |
| | | | <p>Engine is running.</p> <p>└ Engine speed is 2,000 rpm.</p> | <p>0.2 - 1.0V</p>  |
| 2 | B | Ignition check | <p>Engine is running. (Warm-up condition)</p> <p>└ Idle speed</p> | <p>12 - 14V</p>  |
| | | | <p>Engine is running.</p> <p>└ Engine speed is 2,000 rpm.</p> | <p>12 - 13V</p>  |
| 3 | P/L | Tachometer | <p>Engine is running. (Warm-up condition)</p> <p>└ Idle speed</p> | <p>0 - 1V</p>  |
| | | | <p>Engine is running.</p> <p>└ Engine speed is 2,000 rpm.</p> | <p>0.5 - 2V</p>  |

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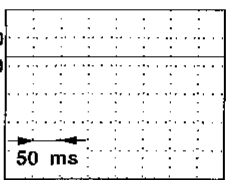
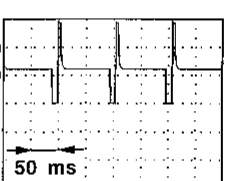
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TROUBLE DIAGNOSIS — General Description

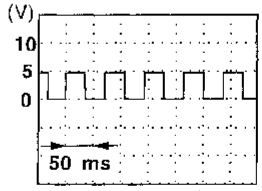
ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|--|--|
| 4 | LG/R | ECCS relay (Self-shutoff) | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "OFF"</div> For a few seconds after turning ignition switch "OFF" | 0 - 1V |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "OFF"</div> A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 5 | R/Y | EVAP canister purge volume control solenoid valve | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Idle speed | BATTERY VOLTAGE (11 - 14V)  <div style="text-align: right; font-size: small;">SEF109V</div> |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Engine speed is 2,000 rpm. (More than 200 seconds after starting engine) | 12 - 13V  <div style="text-align: right; font-size: small;">SEF110V</div> |
| 10 | B/R | ECM ground | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Idle speed | Engine ground |
| 11 | W/R | Fuel pump relay | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> For 5 seconds after turning ignition switch "ON" | 0 - 1V |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 12 | P | Air conditioner relay | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Both A/C switch and blower switch are "ON"* | Approximately 0V |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> A/C switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 18 | R/W | Malfunction indicator lamp | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> | 0 - 1V |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 19 | B/R | ECM ground | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Idle speed | Engine ground |

*: Any mode except "OFF", ambient air temperature above 10°C (50°F).

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|---|---|
| 20 | L/OR | Start signal | Ignition switch "ON" | Approximately 0V |
| | | | Ignition switch "START" | BATTERY VOLTAGE (11 - 14V) |
| 21 | G/R | Air conditioner dual-pres- sure switch | Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates) | Approximately 0V |
| | | | Engine is running. └ Air conditioner switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 22 | L/B | Neutral position switch (M/T models) Inhibitor switch (A/T mod- els) | Ignition switch "ON" └ Gear position is "N" or "P". | Approximately 0V |
| | | | Ignition switch "ON" └ Except the above gear position | Approximately 5V |
| 23 | L | Throttle position sensor | Ignition switch "ON" (Warm-up condition) └ Accelerator pedal fully released | 0.3 - 0.7V |
| | | | Ignition switch "ON" └ Accelerator pedal fully depressed | Approximately 4V |
| 24 | W/G | Ignition switch | Ignition switch "OFF" | 0V |
| | | | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 25 | B/Y | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 28 | BR/W | Throttle position switch (Closed position) | Ignition switch "ON" (Warm-up condition) └ Accelerator pedal fully released | BATTERY VOLTAGE (11 - 14V) |
| | | | Ignition switch "ON" └ Accelerator pedal depressed | Approximately 0V |
| 29 | G/B | Vehicle speed sensor | Engine is running. └ Lift up the vehicle. └ In 2nd gear position └ 40 km/h (25 MPH) | 1 - 4V  SEF111V |
| 32 | B/Y | ECM ground | Engine is running. └ Idle speed | Engine ground (Probe this terminal with ⊖ tester probe when measuring.) |
| 39 | GY/R | Power steering oil pres- sure switch | Engine is running. └ Steering wheel is fully turned. | Approximately 0V |
| | | | Engine is running. └ Steering wheel is not turned. | Approximately 5V |

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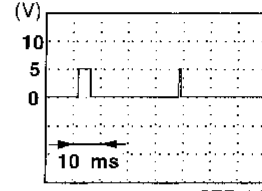
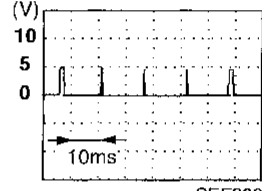
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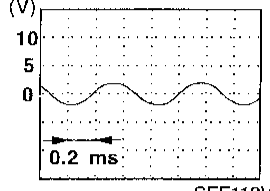
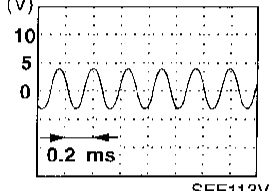
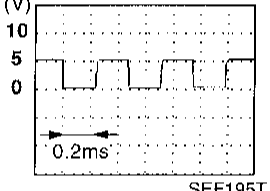
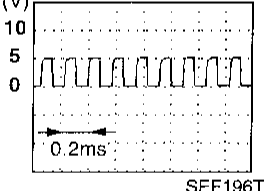
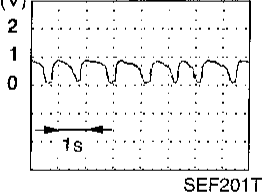
TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|---|--|
| 42 | BR | Sensors' power supply | Ignition switch "ON" | Approximately 5V |
| 43 | B/W | Sensors' ground | Engine is running. └ Idle speed | Approximately 0V |
| 44 | PU | Camshaft position sensor (Reference signal) | Engine is running. (Warm-up condition) └ Idle speed | 0.2 - 0.5V  SEF114V |
| 48 | PU | | Engine is running. └ Engine speed is 2,000 rpm. | 0 - 0.5V  SEF200T |
| 45 | B/R | Absolute pressure sensor | Ignition switch "ON" └ Engine is not running. Engine is running. └ For 5 seconds after starting engine | Approximately 4.4V |
| | | | Engine is running. (Warm-up condition) └ More than 5 seconds after starting engine | Approximately 1.2V |

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--|---|---|
| 47 | L | Crankshaft position sensor (OBD) | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Idle speed | Approximately 0V  |
| | | | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> Engine speed is 2,000 rpm. | Approximately 0V  |
| 49 | LG | Camshaft position sensor (Position signal) | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Idle speed | Approximately 2.6V  |
| | | | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> Engine speed is 2,000 rpm. | Approximately 2.5 - 2.6V  |
| 50 | B | Front heated oxygen sensor | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> After warming up to normal operating temperature and engine speed is 2,000 rpm. | 0 - Approximately 1.0V  |
| 54 | R | Mass air flow sensor | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Idle speed | 1.0 - 1.7V |
| | | | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Engine speed is 2,500 rpm. | 1.8 - 2.4V |
| 55 | G | Mass air flow sensor ground | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Idle speed | Approximately 0V |

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TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-------------------------------------|---|--|
| 56 | OR | Rear heated oxygen sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly | 0 - Approximately 1.0V |
| 59 | LG/R | Engine coolant temperature sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> | Approximately 0 - 4.8V Output voltage varies with engine coolant temperature. |
| 60 | Y/B | Tank fuel temperature sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> | Approximately 0 - 4.8V Output voltage varies with fuel temperature. |
| 61 | PU/R | Intake air temperature sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> | Approximately 0 - 4.8V Output voltage varies with intake air temperature. |
| 62 | Y | EVAP control system pressure sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> | Approximately 3.4V |
| 63 | G/OR | EGR temperature sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed | Less than 4.5V |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ EGR system is operating. | 0 - 1.5V |
| 64 | W | Knock sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | Approximately 2.4V |
| 67 | B/P | Power supply for ECM | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/P | | | |
| 69 | LG/R | Data link connector for GST | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed (GST is disconnected.) | 0.2 - 14V |
| 75 | Y/R | Data link connector for CONSULT | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed (CONSULT is connected and turned on.) | 0 - 4V |
| 76 | GY/L | | | 3 - 10V |
| 80 | SB | Power supply (Back-up) | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "OFF"</div> | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--|---|---|
| 101 | OR/L | IACV-AAC valve | Engine is running. (Warm-up condition) └ Idle speed | 10.5 - 11.5V SEF645U |
| | | | Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm. | 1 - 13V SEF646U |
| 102 | W/B | Injector No. 1 | Engine is running. (Warm-up condition) └ Idle speed | BATTERY VOLTAGE (11 - 14V) SEF204T |
| 104 | W/R | Injector No. 3 | | |
| 109 | W/L | Injector No. 2 | Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) SEF205T |
| 111 | W/PU | Injector No. 4 | | |
| 103 | G/W | EGRC-solenoid valve | Engine is running. (Warm-up condition) └ Idle speed | 0 - 1V |
| | | | Engine is running. (Warm-up condition) └ Revving engine from idle to 3,000 rpm quickly | BATTERY VOLTAGE (11 - 14V) |
| 108 | R/G | EVAP canister vent control valve | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 115 | L/Y | Torque converter clutch solenoid valve (A/T models only) | Engine is running. └ Idle speed | Approximately 1V |
| | | | Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) |

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TROUBLE DIAGNOSIS — General Description

ECM Terminals and Reference Value (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|------------------------------------|--|-------------------------------|
| 116 | B/R | ECM ground | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Idle speed | Engine ground |
| 117 | B/P | Current return | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 118 | LG/B | MAP/BARO switch sole-noid valve | <div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ For 5 seconds after turning ignition switch "ON" | 0 - 1V |
| | | | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ For 5 seconds after starting engine | |
| 119 | BR/Y | Front heated oxygen sen-sor heater | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Engine speed is below 3,000 rpm. (All models) └ For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only) | Approximately 0.4V |
| | | | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Engine speed is above 3,000 rpm. (2WD mod-els) └ More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models) | BATTERY VOLTAGE (11 - 14V) |
| 120 | P/B | Vacuum cut valve bypass valve | <div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> | BATTERY VOLTAGE (11 - 14V) |
| 122 | R/B | Rear heated oxygen sen-sor heater | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> | Approximately 0.4V |
| | | | <div style="border: 1px solid black; padding: 2px;">Ignition switch "ON"</div> <ul style="list-style-type: none"> └ Engine is not running. | BATTERY VOLTAGE (11 - 14V) |
| 124 | B/R | ECM ground | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> <ul style="list-style-type: none"> └ Idle speed | Engine ground |

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

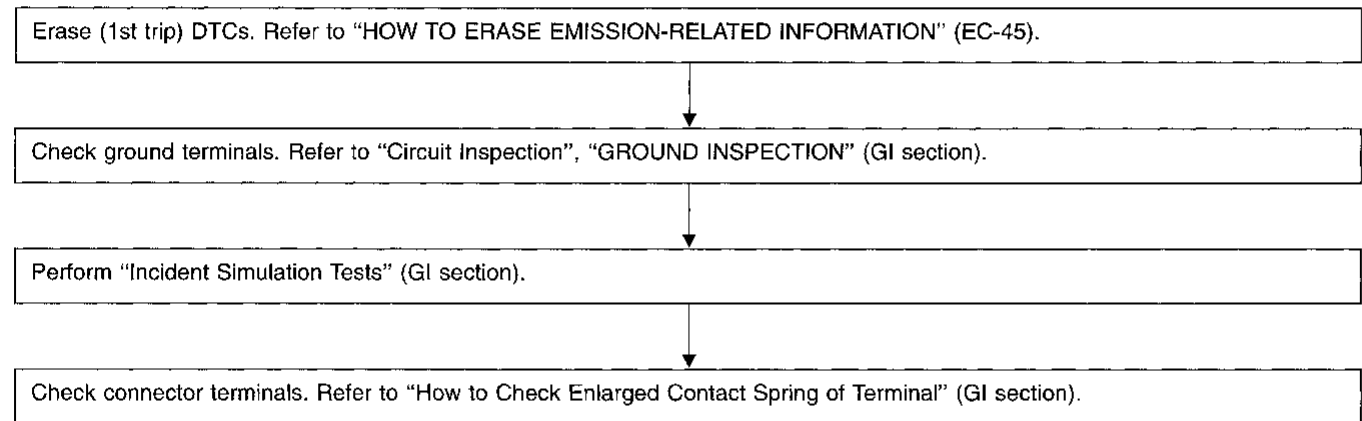
Description

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on DTC (1st trip) visits. Realize also that the most frequent cause of I/I occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific problem area.

Common I/I Report Situations

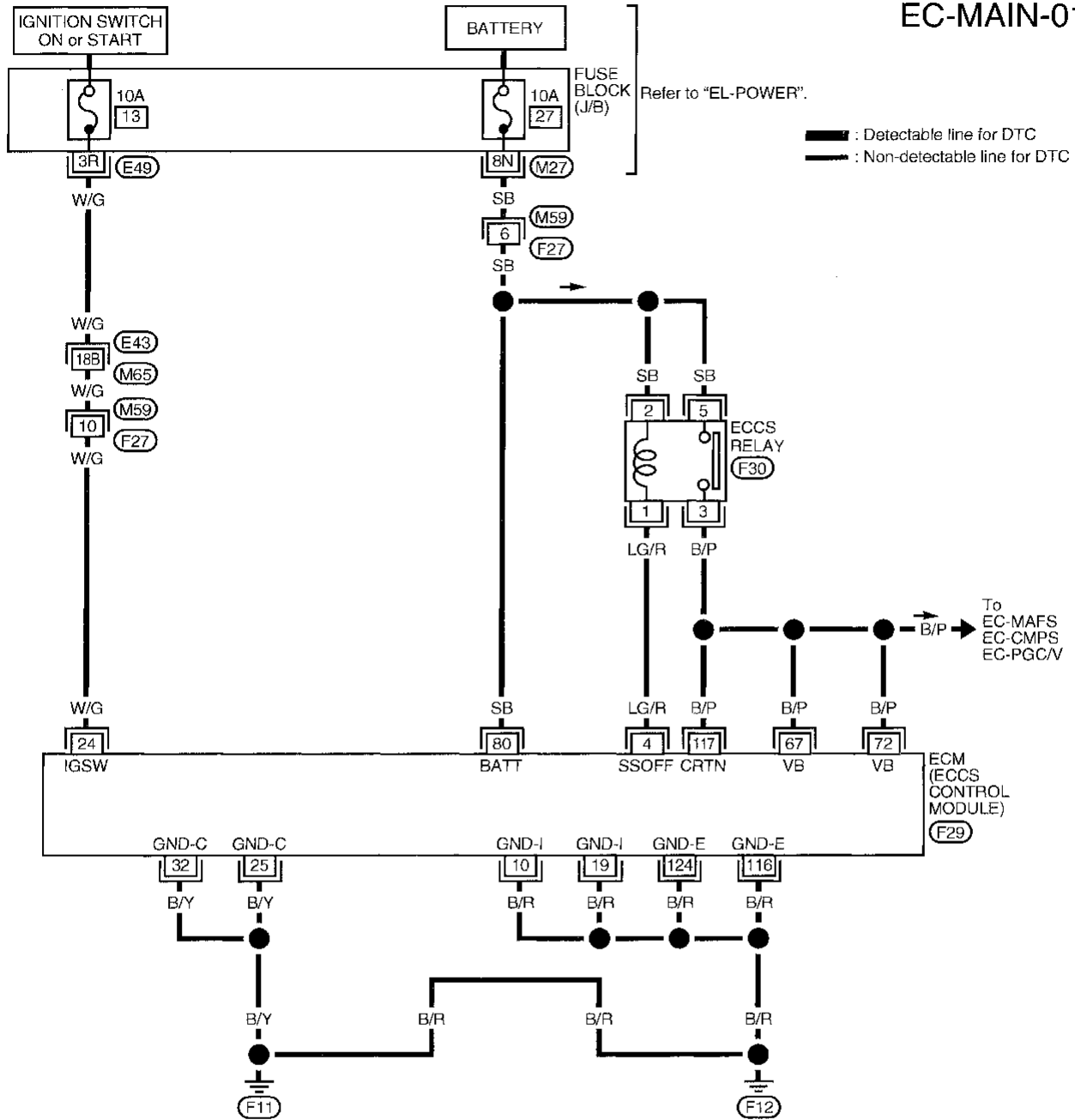
| STEP in Work Flow | Situation |
|-------------------|---|
| II | The CONSULT is used. The SELF-DIAG RESULTS screen shows time data other than "0" or "1t". |
| III | The symptom described by the customer does not recur. |
| IV | (1st trip) DTC data does not appear during the DTC CONFIRMATION PROCEDURE. |
| VI | The TROUBLE DIAGNOSIS for PXXXX does not indicate the problem area. |

Diagnostic Procedure

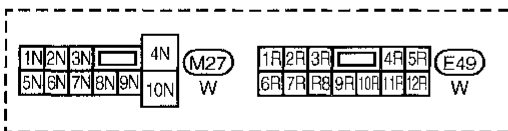


Main Power Supply and Ground Circuit

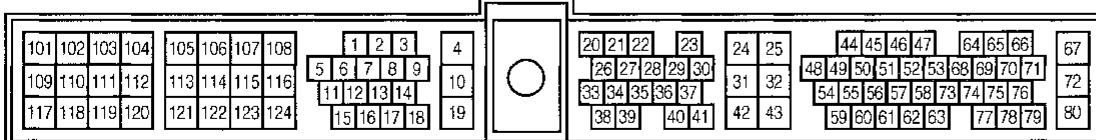
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Refer to last page (Foldout page).



M65, E43



TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------|--|---|
| 4 | LG/R | ECCS relay (Self-shutoff) | Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF" | 0 - 1V |
| | | | Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 10 | B/R | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 19 | B/R | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 24 | W/G | Ignition switch | Ignition switch "OFF" | 0V |
| | | | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 25 | B/Y | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 32 | B/Y | ECM ground | Engine is running. └ Idle speed | Engine ground (Probe this terminal with ⊖ tester probe when measuring.) |
| 67 | B/P | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/P | | | |
| 80 | SB | Power supply (Back-up) | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 116 | B/R | ECM ground | Engine is running. └ Idle speed | Engine ground |
| 117 | B/P | Current return | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 124 | B/R | ECM ground | Engine is running. └ Idle speed | Engine ground |

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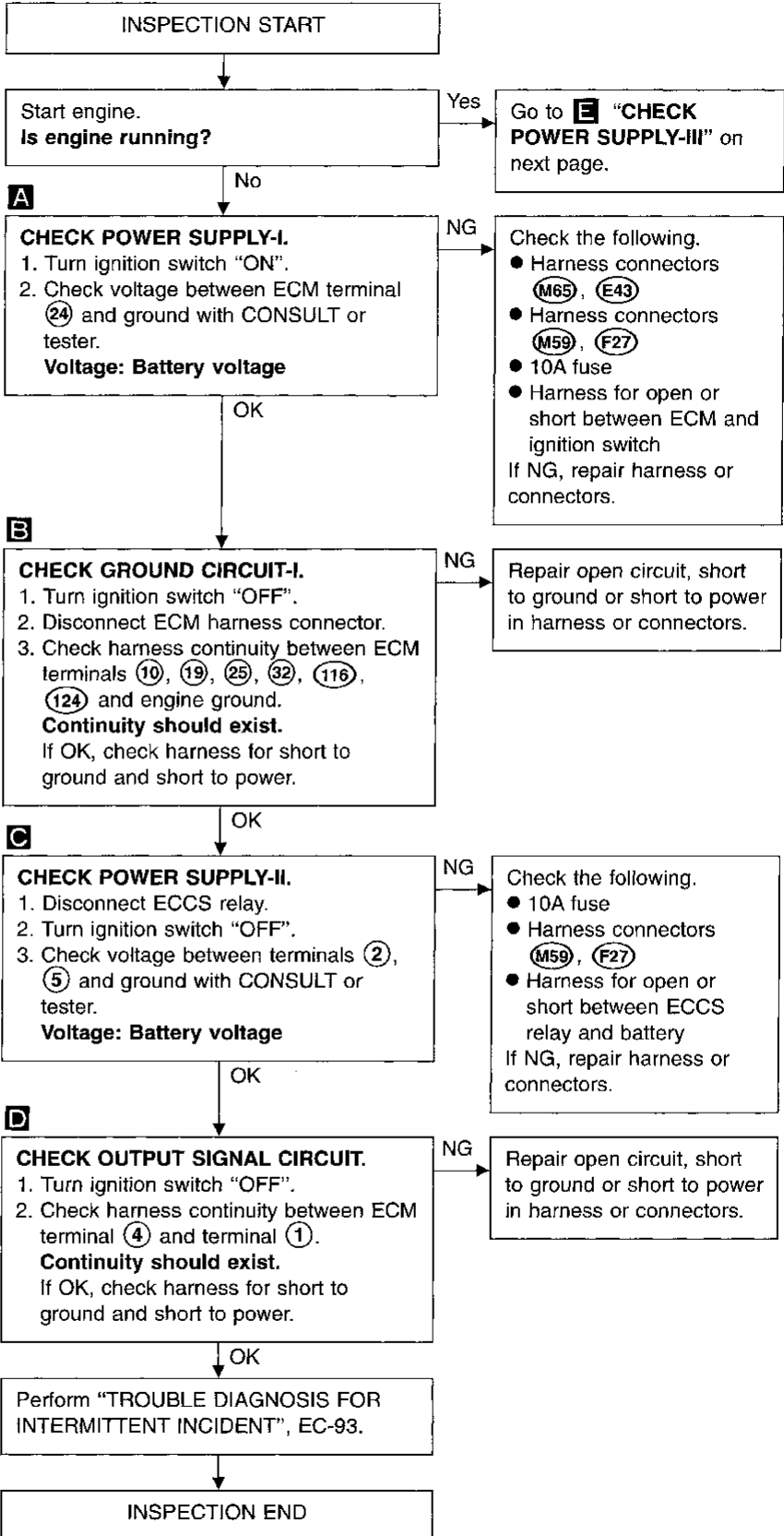
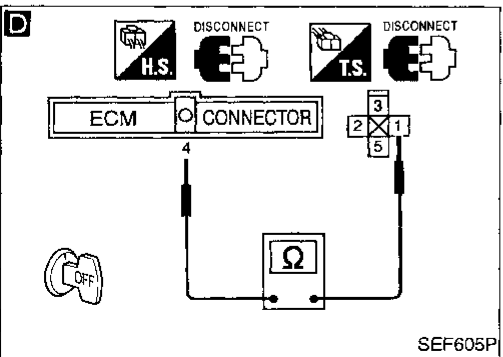
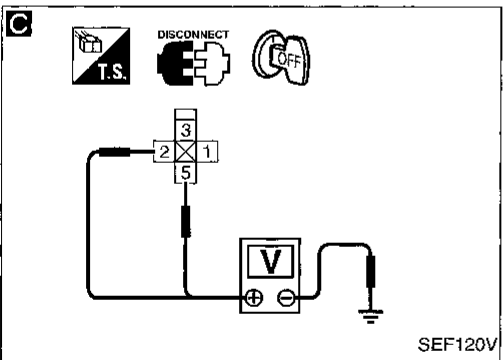
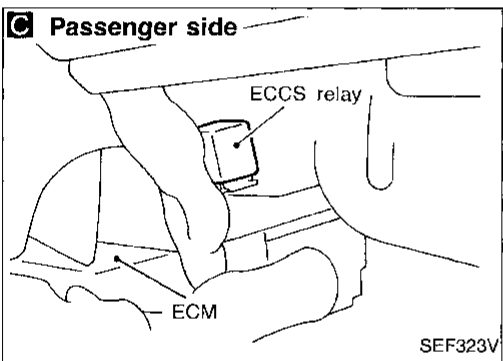
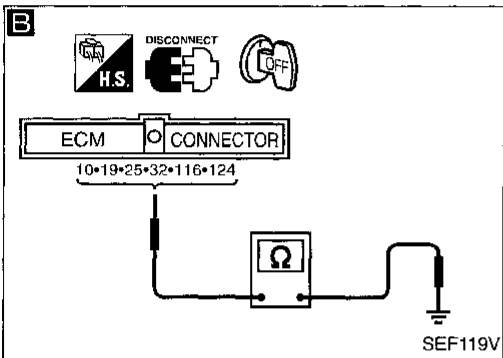
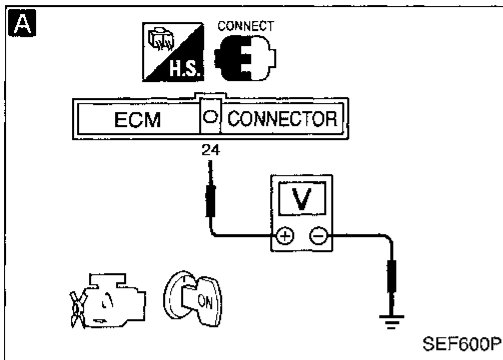
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TROUBLE DIAGNOSIS FOR POWER SUPPLY

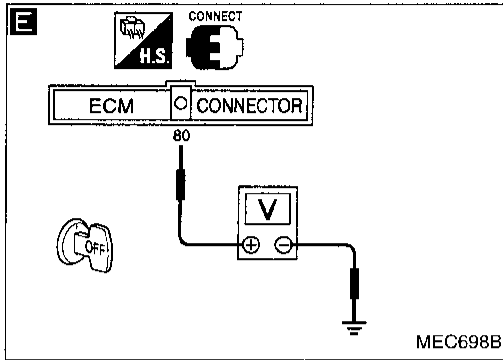
Main Power Supply and Ground Circuit (Cont'd)

DIAGNOSTIC PROCEDURE



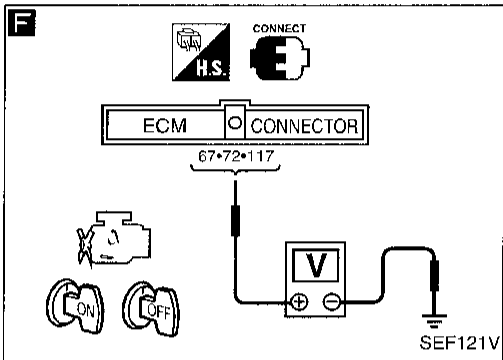
TROUBLE DIAGNOSIS FOR POWER SUPPLY

Main Power Supply and Ground Circuit (Cont'd)



E
CHECK POWER SUPPLY-III.
 Check voltage between ECM terminals (80) and ground with CONSULT or tester.
Voltage: Battery voltage

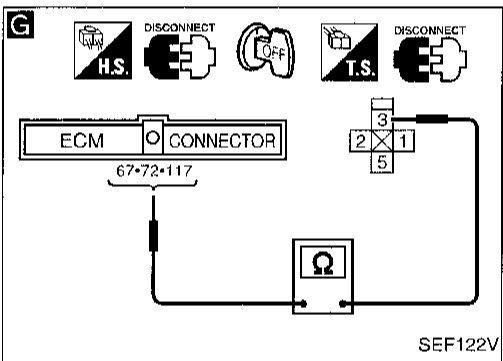
NG → Check the following.
 ● Harness connectors (F27), (M59)
 ● 10A fuse
 ● Harness for open or short between ECM and battery
 If NG, repair harness or connectors.



F
CHECK POWER SUPPLY-IV.
 1. Turn ignition switch "ON" and then "OFF".
 2. Check voltage between ECM terminals (67), (72), (117) and ground with CONSULT or tester.
Voltage:
After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

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

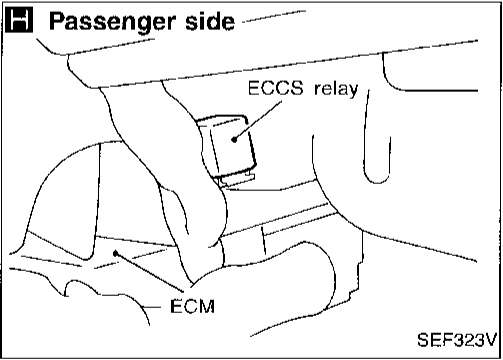
Case-1: Battery voltage does not exist.
 Case-2: Battery voltage exists for more than a few seconds.



G
CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
 1. Disconnect ECM harness connector.
 2. Disconnect ECCS relay.
 3. Check harness continuity between ECM terminals (67), (72), (117) and relay terminal (3).
Continuity should exist.
 If OK, check harness for short to ground and short to power.

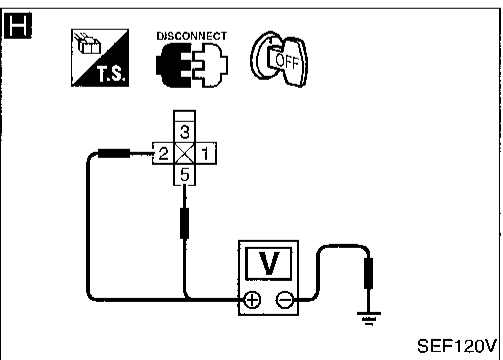
Case-2 → Go to **J** "CHECK ECCS RELAY" on next page.

NG → If NG, repair open circuit or short to ground or short to power in harness or connectors.



H
CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
 Check voltage between relay terminals (2), (5) and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
 ● Harness connectors (F27), (M59)
 ● 10A fuse
 ● Harness for open or short between ECCS relay and battery
 If NG, repair harness or connectors.

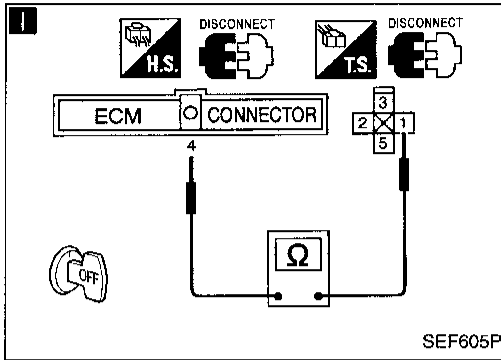


OK → (Go to next page.)

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TROUBLE DIAGNOSIS FOR POWER SUPPLY

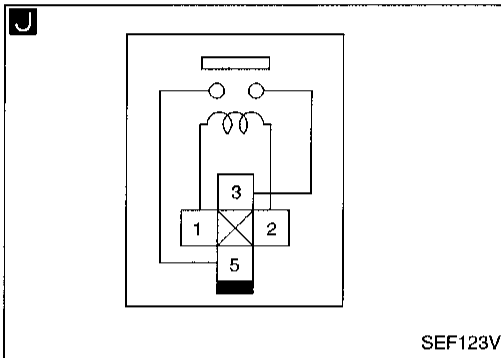
Main Power Supply and Ground Circuit (Cont'd)



I

CHECK OUTPUT SIGNAL CIRCUIT.
Check harness continuity between ECM terminal (4) and relay terminal (1).
Continuity should exist.
If OK, check harness for short to ground and short to power.

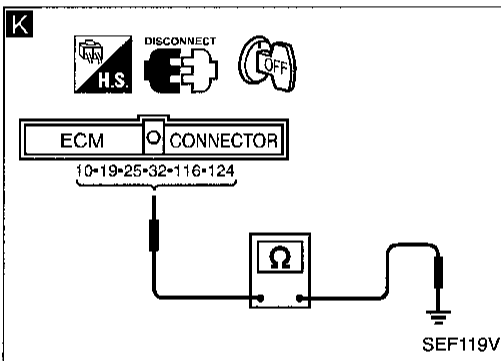
NG → Repair open circuit, short to ground or short to power in harness or connectors.



J

CHECK ECCS RELAY.
1. Apply 12V direct current between relay terminals (1) and (2).
2. Check continuity between relay terminals (3) and (5).
12V (1 - 2) applied:
Continuity exists.
No voltage applied:
No continuity

NG → Replace ECCS relay.



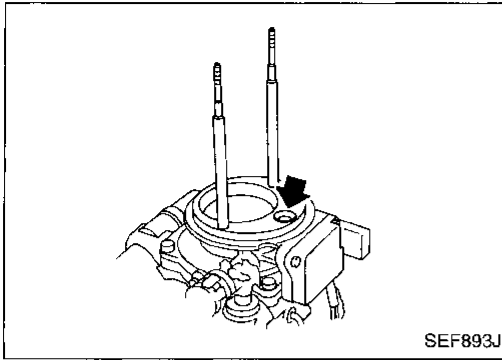
K

CHECK GROUND CIRCUIT-II.
Check harness continuity between ECM terminals (10), (19), (25), (32), (116), (124) and engine ground.
Continuity should exist.
If OK, check harness for short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END



Mass Air Flow Sensor (MAFS)

COMPONENT DESCRIPTION

The mass air flow sensor is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. It consists of a hot wire that is supplied with electric current from the ECM. The temperature of the hot wire is controlled by the ECM a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The more air, the greater the heat loss.

Therefore, the ECM must supply more electric current to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---------------|--|-----------|------------------|
| MAS AIR/FL SE | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 0.9 - 1.8V |
| | | 2,500 rpm | 1.9 - 2.3V |
| CAL/LD VALUE | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 9.5 - 34.0% |
| | | 2,500 rpm | 13.9 - 24.9% |
| MASS AIRFLOW | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | 0.9 - 5.8 g·m/s |
| | | 2,500 rpm | 7.5 - 13.2 g·m/s |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------------------|--|-------------------|
| 54 | R | Mass air flow sensor | Engine is running. (Warm-up condition) └ Idle speed | 0.9 - 1.8V |
| | | | Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm. | 1.9 - 2.3V |
| 55 | G | Mass air flow sensor ground | Engine is running. (Warm-up condition) └ Idle speed | Approximately 0V |

TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0100 0102 | A) An excessively high voltage from the sensor is sent to ECM when engine is not running. | <ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor |
| | C) A high voltage from the sensor is sent to ECM under light load driving condition. | |
| | B) An excessively low voltage from the sensor is sent to ECM* when engine is running. | <ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor |
| | D) A low voltage from the sensor is sent to ECM under heavy load driving condition. | |

*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

| Detected items | Engine operating condition in fail-safe mode |
|------------------------------|---|
| Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. |

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

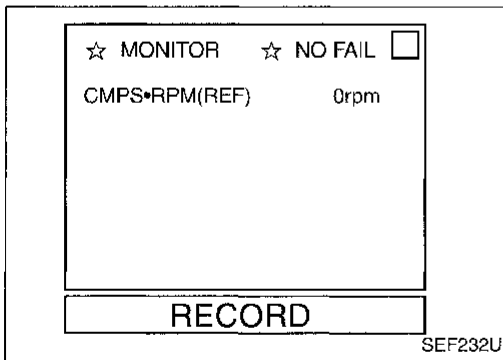
Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B". If there is no problem on "Procedure for malfunction B", perform "Procedure for malfunction C". If there is no problem on "Procedure for malfunction C", perform "Procedure for malfunction D".

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



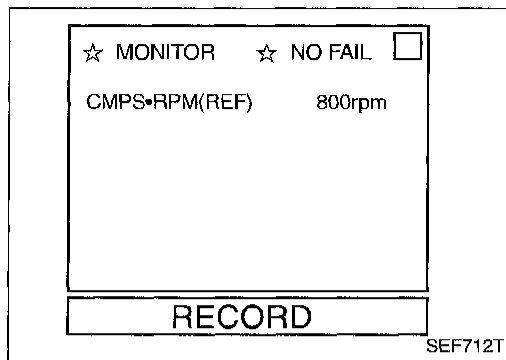
Procedure for malfunction A


- 1) Turn ignition switch "ON".
 - 2) Select "DATA MONITOR" mode with CONSULT.
 - 3) Wait at least 6 seconds.
- OR
- 1) Turn ignition switch "ON", and wait at least 6 seconds.
 - 2) Select "MODE 7" with GST.
- OR
- 1) Turn ignition switch "ON", and wait at least 6 seconds.
 - 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

TROUBLE DIAGNOSIS FOR DTC P0100


Mass Air Flow Sensor (MAFS) (Cont'd)

Procedure for malfunction B




-  1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait 5 seconds at most.

OR

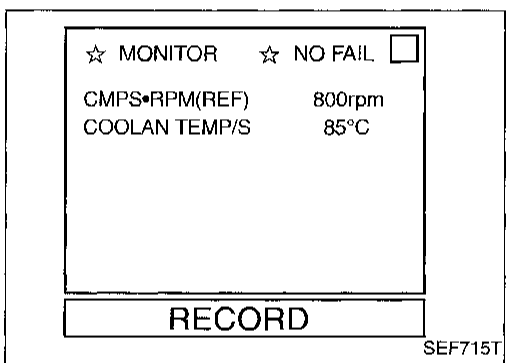
-  1) Turn ignition switch "ON".
2) Start engine and wait 5 seconds at most.
3) Select "MODE 7" with GST.

OR

-  1) Turn ignition switch "ON".
2) Start engine and wait 5 seconds at most.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

NOTE:

If 1st trip DTC is confirmed after more than 5 seconds, there may be malfunction C.



Procedure for malfunction C


-  1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.

NOTE:

If engine will not start or stops soon after starting at next step, wait at least 10 seconds with engine stopped. (Ignition switch "ON")


- 3) Start engine and warm it up to normal operating temperature.
4) Run engine for at least 10 seconds at idle speed.

OR

-  **NOTE:**
If engine will not start or stops soon after starting at next step, wait at least 10 seconds with engine stopped. (Ignition switch "ON")

- 1) Start engine and warm it up to normal operating temperature.
2) Run engine for at least 10 seconds at idle speed.
3) Select "MODE 7" with GST.

OR

-  **NOTE:**
If engine will not start or stops soon after starting at next step, wait at least 10 seconds with engine stopped. (Ignition switch "ON")

- 1) Start engine and warm it up to normal operating temperature.
2) Run engine for at least 10 seconds at idle speed.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)

Procedure for malfunction D



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.

If engine cannot be started, go to "DIAGNOSTIC PROCEDURE", EC-104.

- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Start engine.
- 5) Check the voltage of MAS AIR/FL SE with "DATA MONITOR".
- 6) Increases engine speed to about 4,000 rpm.
- 7) Monitor the linear voltage rise in response to engine speed increases.

If NG, go to "DIAGNOSTIC PROCEDURE", EC-104.

If OK, go to following step.

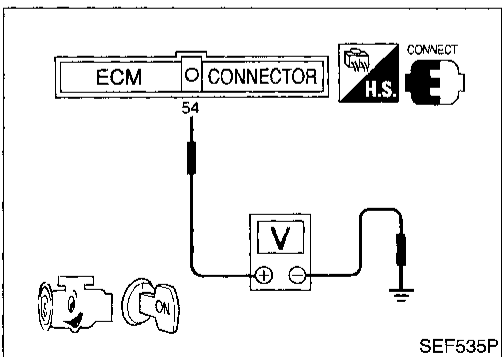
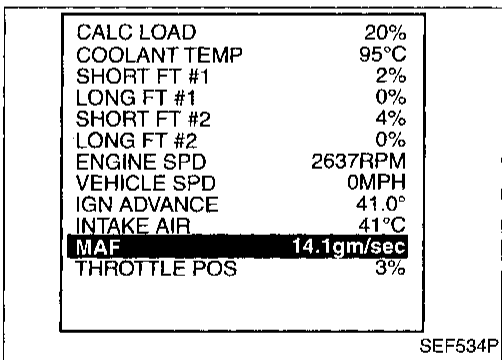
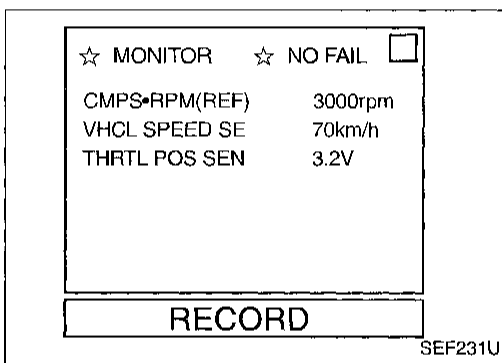
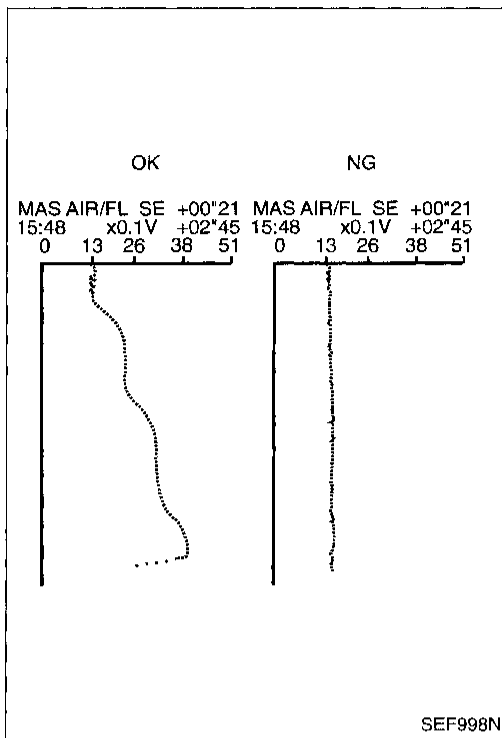
- 8) Maintain the following conditions for at least 10 consecutive seconds.

CMPS-RPM (REF): More than 2,000 rpm

THRTL POS SEN: More than 3V

Selector lever: Suitable position

Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Procedure for malfunction D



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Select "MODE 1" with GST.
- 4) Check the mass air flow with "MODE 1".
- 5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.

OR

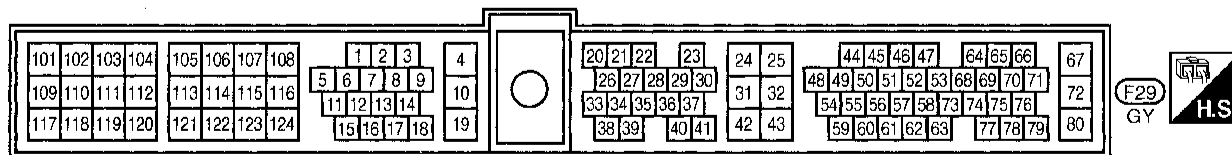
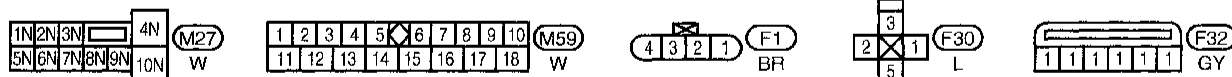
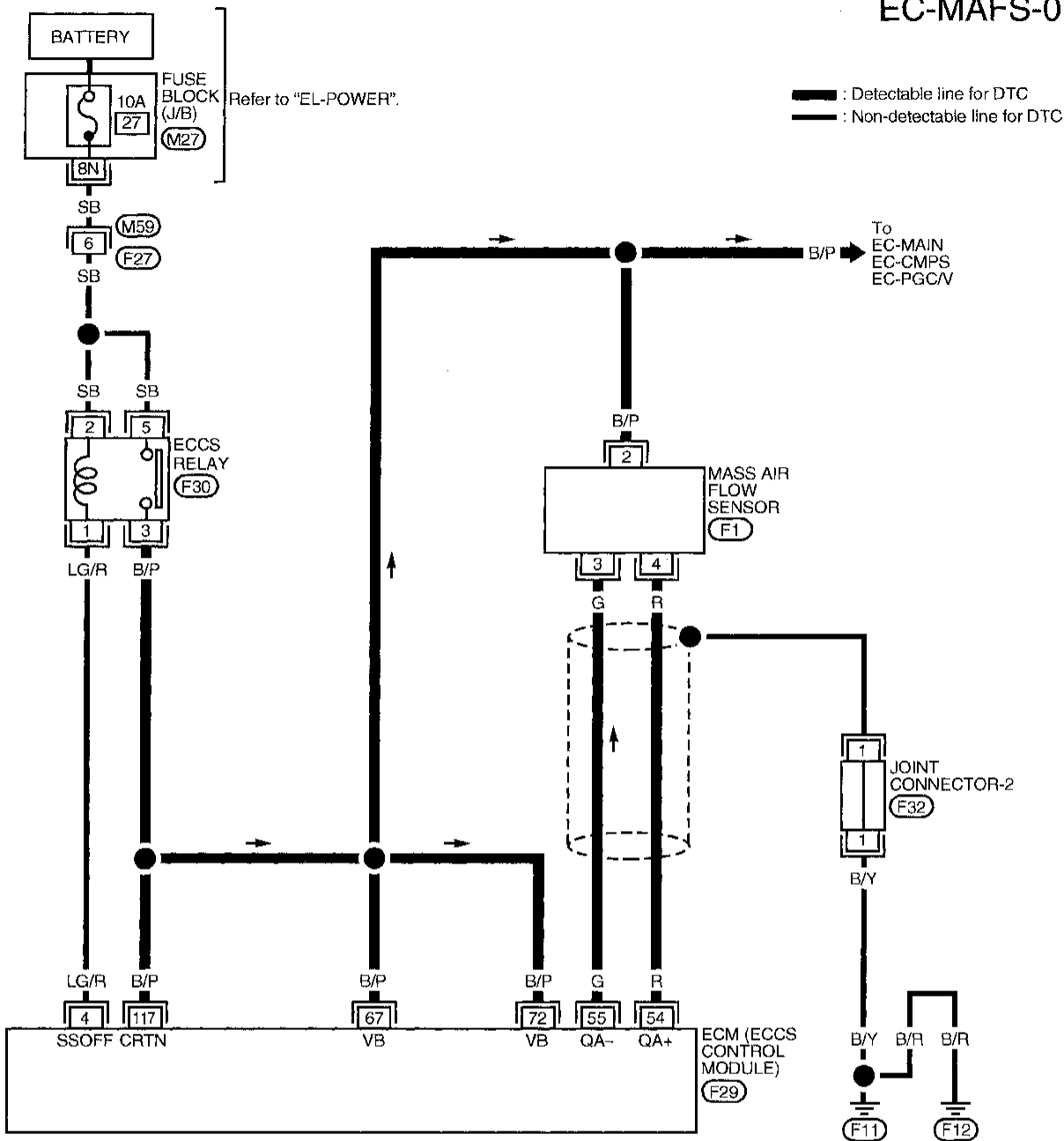


- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Check the voltage between ECM terminal 54 and ground.
- 4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)

EC-MAFS-01



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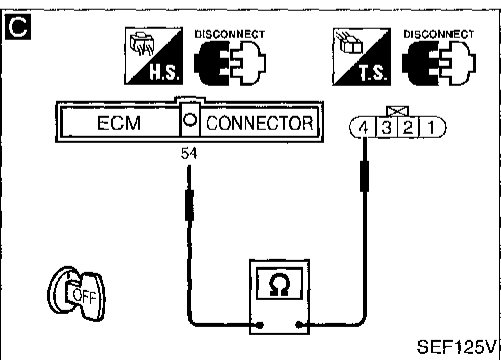
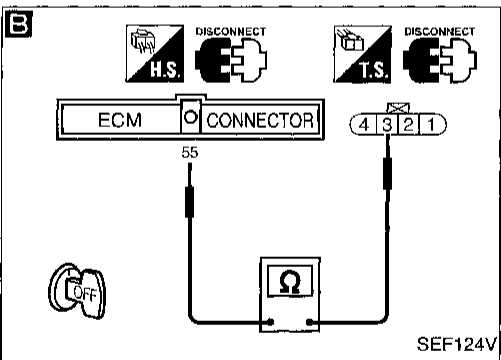
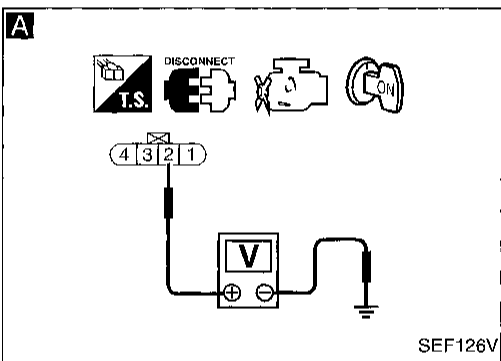
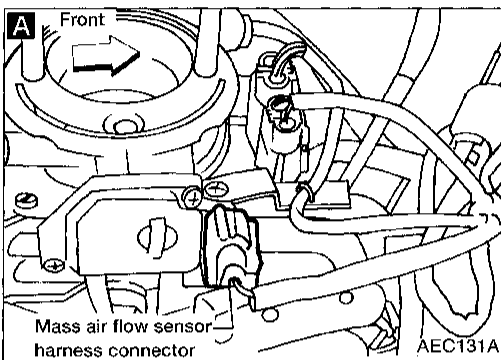
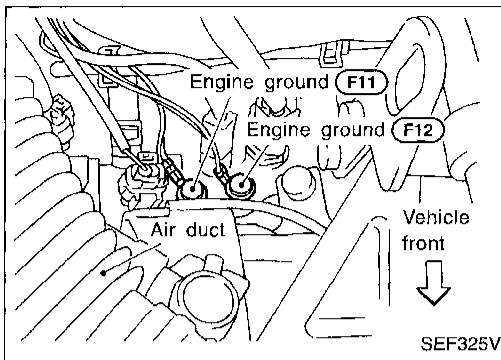
TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)

DIAGNOSTIC PROCEDURE

If the trouble is duplicated after "Procedure for malfunction A or C", perform "Procedure A" below. If the trouble is duplicated after "Procedure for malfunction B or D", perform "Procedure B" on next page.

Procedure A



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

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

NG → Check the following.
 ● Harness for open or short between ECCS relay and mass air flow sensor
 ● Harness for open or short between mass air flow sensor and ECM
 If NG, repair harness or connectors.

B
CHECK GROUND CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Check harness continuity between terminal ③ and ECM terminal ⑤⑤.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

C
CHECK INPUT SIGNAL CIRCUIT.
 Check harness continuity between terminal ④ and ECM terminal ⑤④.
Continuity should exist.
 If OK, check harness for short.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

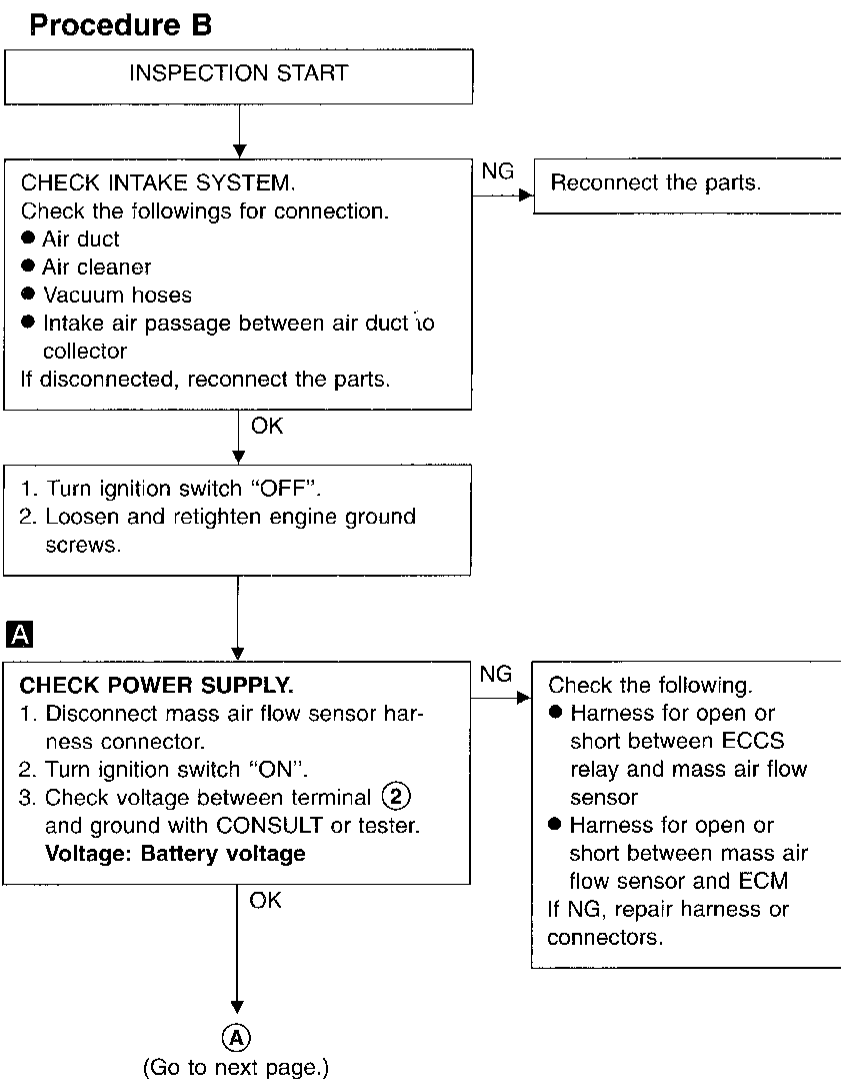
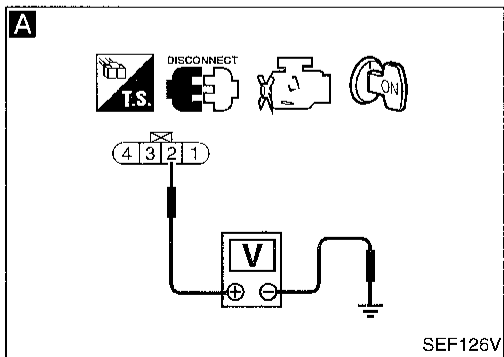
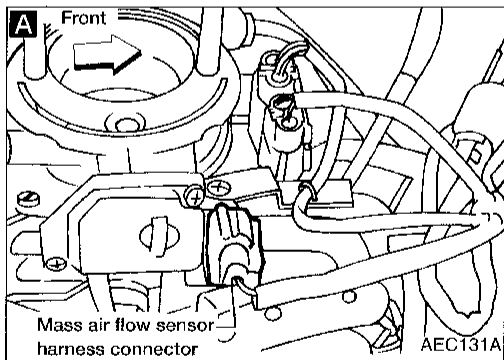
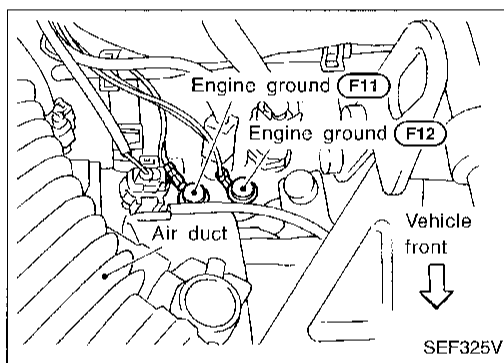
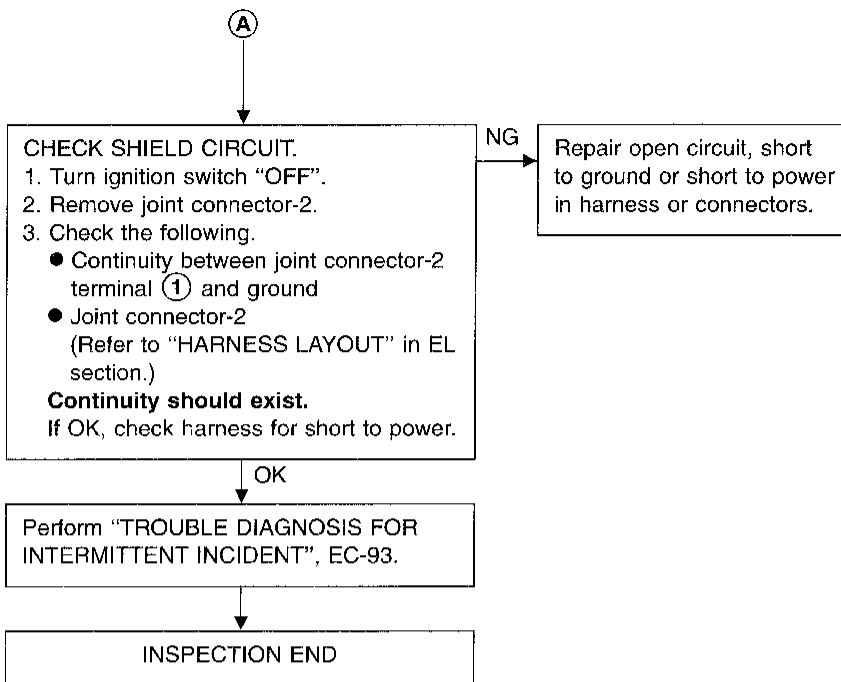
CHECK COMPONENT
 (Mass air flow sensor).
 Refer to "COMPONENT INSPECTION", EC-107.

NG → Replace mass air flow sensor.

OK
 (Go to next page.)

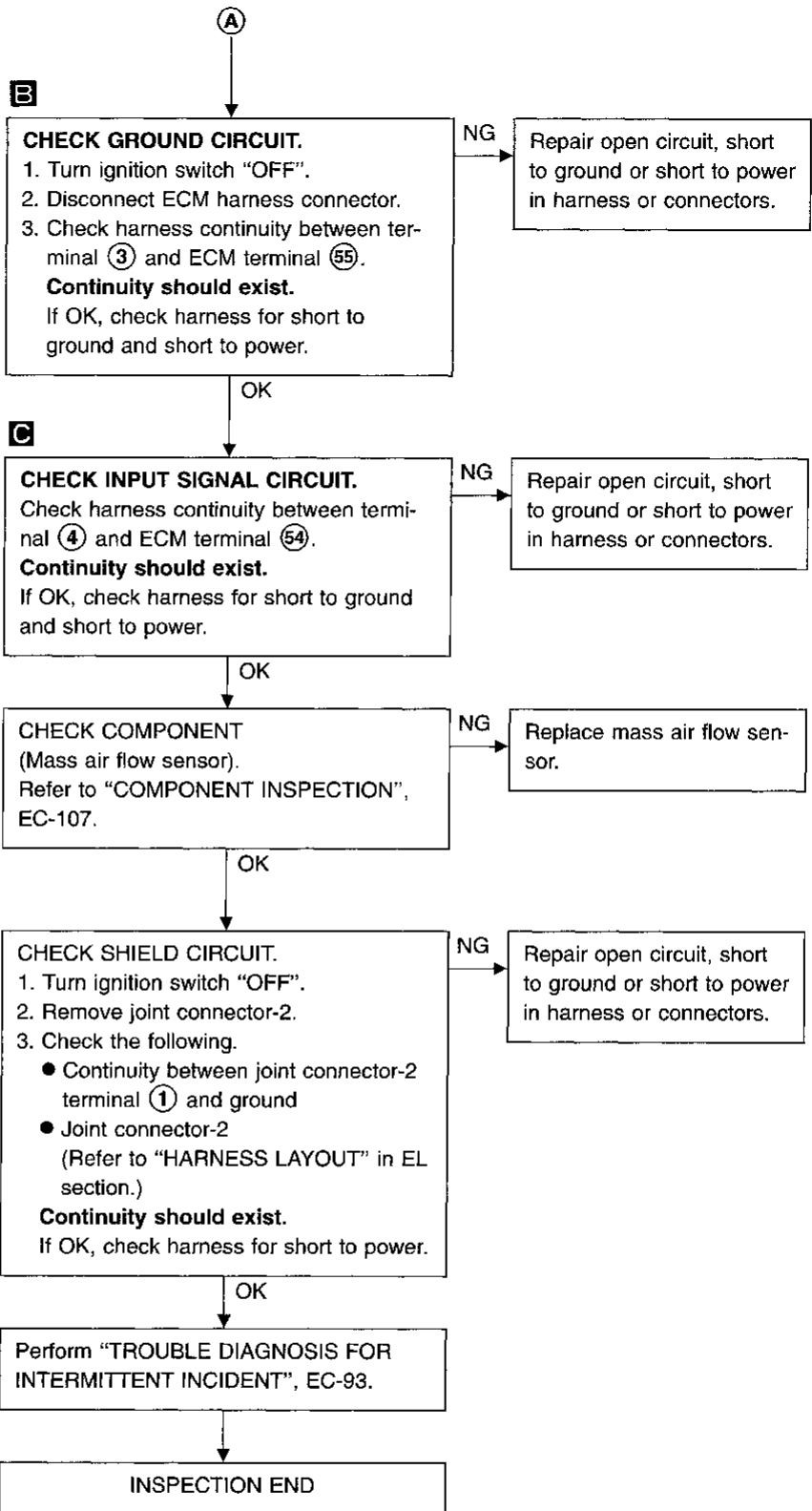
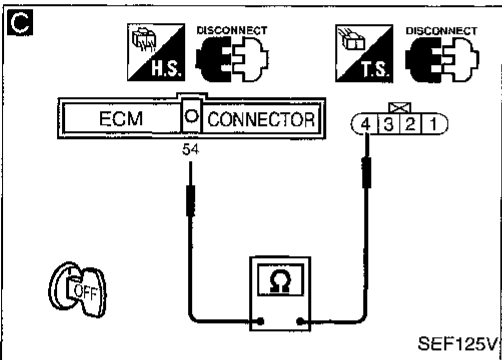
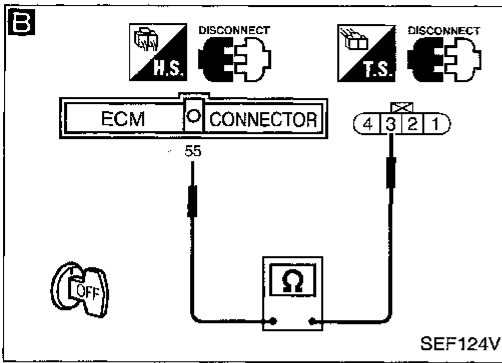
TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)



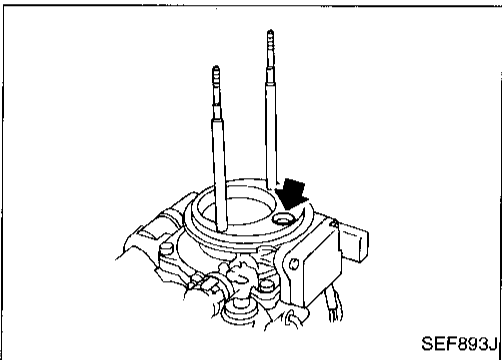
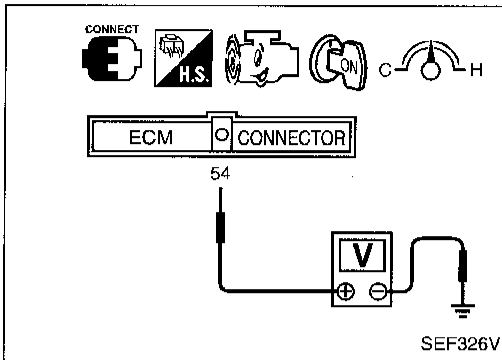
TROUBLE DIAGNOSIS FOR DTC P0100

Mass Air Flow Sensor (MAFS) (Cont'd)

COMPONENT INSPECTION

Mass air flow sensor

1. Turn ignition switch "ON".
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between terminal ⑤4 and ground.



| Conditions | Voltage V |
|--|------------------------|
| Ignition switch "ON" (Engine stopped.) | Less than 1.0 |
| Idle (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.9 - 2.3 |
| Idle to about 4,000 rpm* | 1.3 - 1.7 to Approx. 3 |

*: Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Repeat above check.
5. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.

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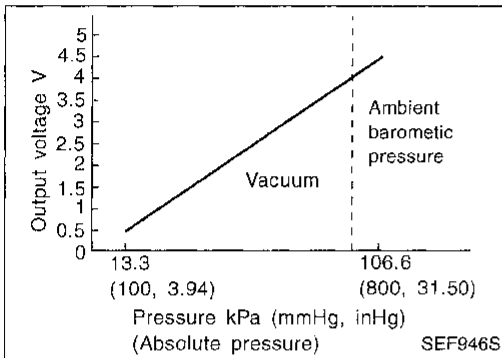
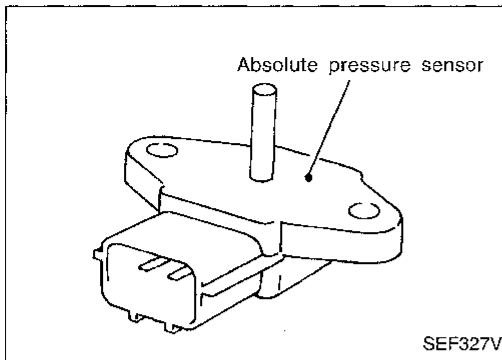
IDX

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor

COMPONENT DESCRIPTION

The absolute pressure sensor is connected to the MAP/BARO switch solenoid valve by a hose. The sensor detects ambient barometric pressure and intake manifold pressure and sends the voltage signal to the ECM. As the pressure increases, the voltage rises.



ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0105 0803 | A) An excessively low or high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> ● Harness or connectors (Absolute pressure sensor circuit is open or shorted.) ● Absolute pressure sensor |
| | B) A high voltage from the sensor is sent to ECM under light load driving conditions. | <ul style="list-style-type: none"> ● Hoses (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.) ● Intake air leaks ● MAP/BARO switch solenoid valve ● Absolute pressure sensor |
| | C) A low voltage from the sensor is sent to ECM under heavy load driving conditions. | <ul style="list-style-type: none"> ● Absolute pressure sensor |

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B". If the 1st trip DTC is not confirmed on "Procedure for malfunction B", perform "Procedure for malfunction C".

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

Procedure for malfunction A

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 6 seconds.

OR

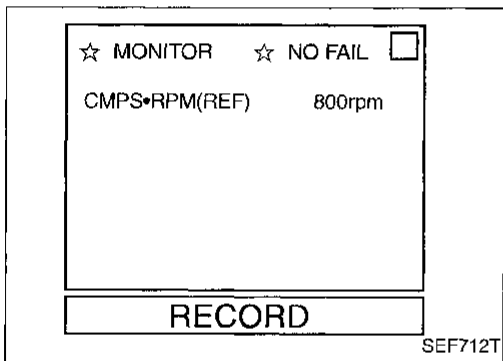
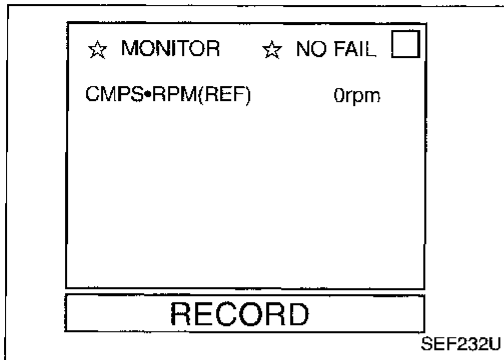


- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Select "MODE 7" with GST.

OR



- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



Procedure for malfunction B

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and let it idle.
- 5) Wait at least 10 seconds.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 10 seconds.
- 5) Select "MODE 7" with GST.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 10 seconds.
- 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

Procedure for malfunction C

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



1) Turn ignition switch "ON".

2) Select "DATA MONITOR" mode with CONSULT.

The voltage of "ABSOL PRES/SE" should be more than 1.74 [V].

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-112.

If the check result is OK, go to following step.

3) Start engine and warm it up to normal operating temperature.

4) Turn ignition switch "OFF" and wait at least 5 seconds.

5) Start engine and let it idle for at least 10 seconds.

6) Select "DATA MONITOR" mode with CONSULT.

7) Drive the vehicle at least 3 consecutive seconds under the following conditions,

B/FUEL SCHDL: More than 4 ms

CMPS-RPM (REF): 3,000 - 4,800 rpm

Selector lever: Suitable position

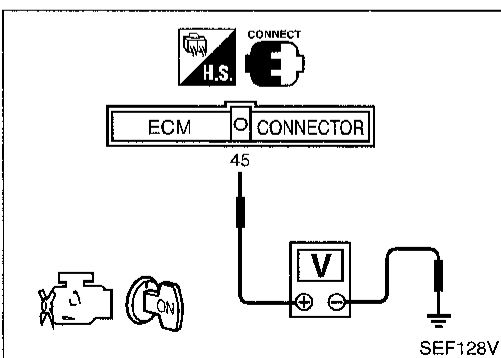
Driving pattern: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

| | | |
|---------------|-----------|--------------------------|
| ☆ MONITOR | ☆ NO FAIL | <input type="checkbox"/> |
| CMPS-RPM(REF) | 4000rpm | |
| VHCL SPEED SE | 70km/h | |
| B/FUEL SCHDL | 4.8msec | |
| ABSOL PRES/SE | 4.4V | |
| RECORD | | |

SEF127V

| | |
|--------------|-----------------|
| ENGINE SPD | 0RPM |
| COOLANT TEMP | 69°C |
| VEHICLE SPD | 0MPH |
| IGN ADVANCE | 3.0° |
| CALC LOAD | 0.0% |
| MAP | 101 kPaA |
| MAF | 0.25gm/s |
| THROTTLE POS | 0.0% |
| INTAKE AIR | 27°C |
| FUEL SYS #1 | OL |
| FUEL SYS #2 | UNUSED |
| SHORT FT #1 | 0.0% |
| LONG FT #1 | 0.0% |
| O2S B1 S1 | 0.000V |
| O2FT B1 S1 | 0.0% |
| O2S B1 S2 | 0.000V |

SEF518R



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Procedure for malfunction C



1) Turn ignition switch "ON".

2) Select "MAP" in "MODE 1" with GST.

3) Make sure that the pressure of "MAP" is more than 46 kPa (0.47 kg/cm², 6.7 psi).

OR



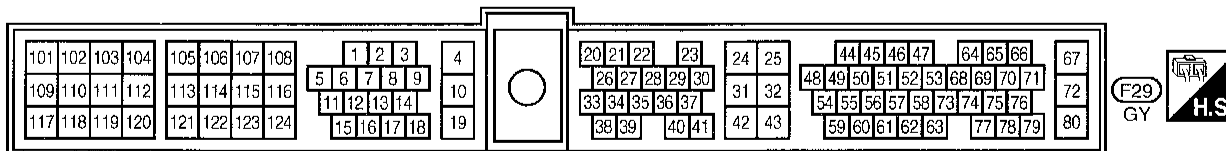
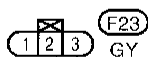
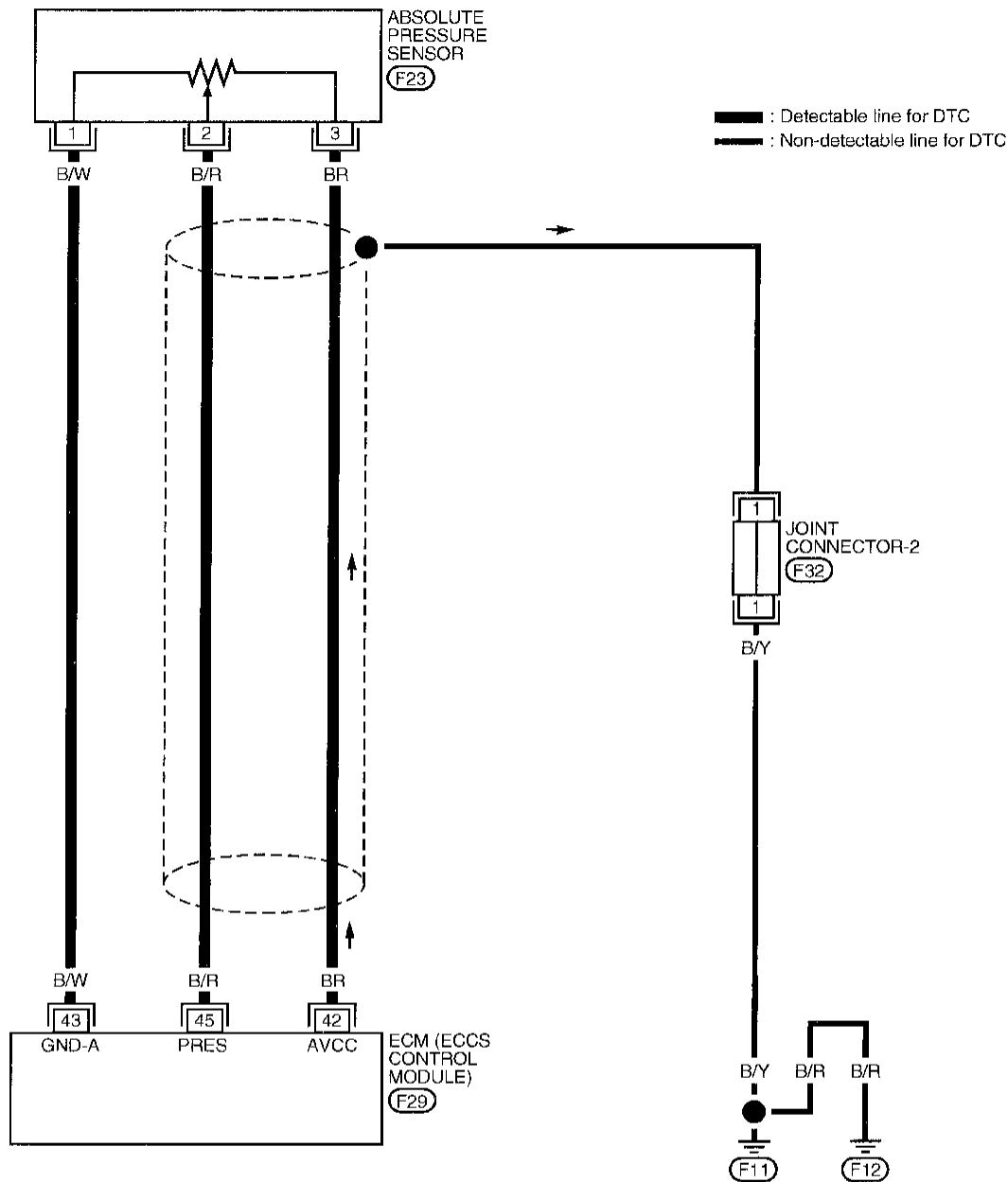
1) Turn ignition switch "ON".

2) Make sure that the voltage between ECM terminal ④5 and ground is more than 1.74 [V].

TROUBLE DIAGNOSIS FOR DTC P0105

Absolute Pressure Sensor (Cont'd)

EC-AP/SEN-01



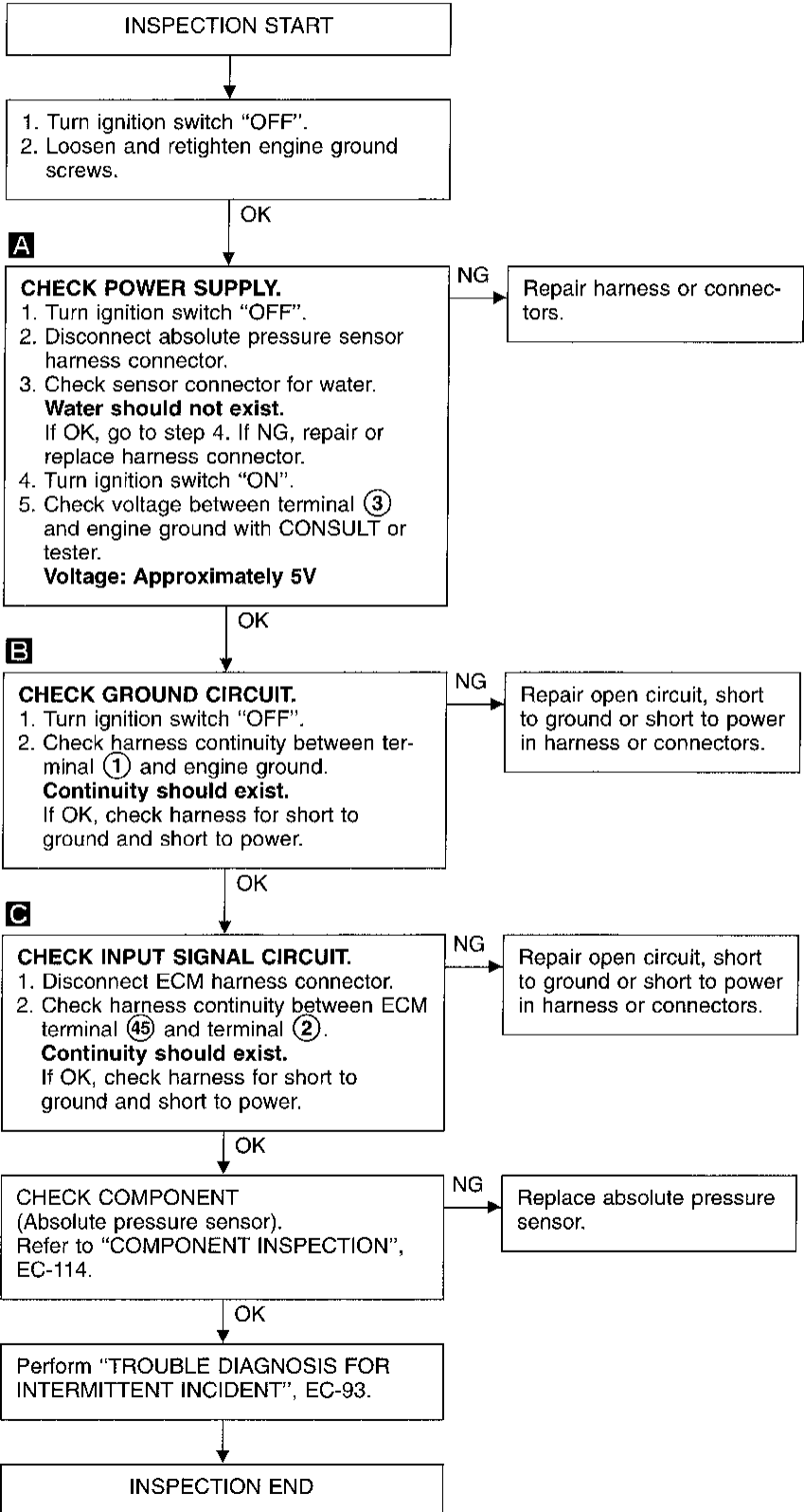
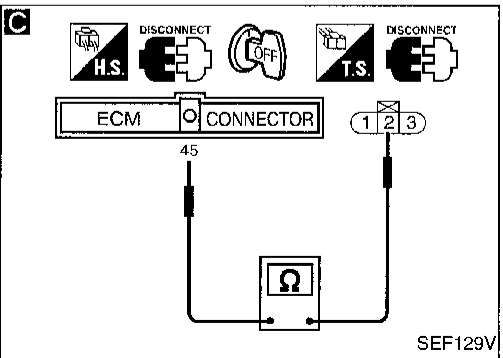
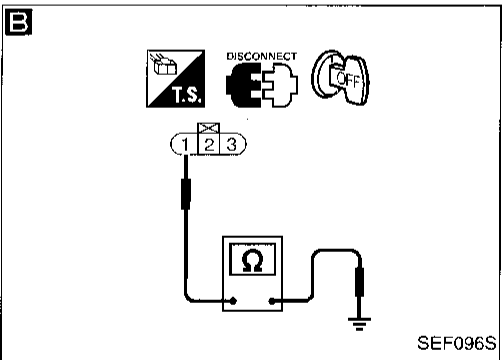
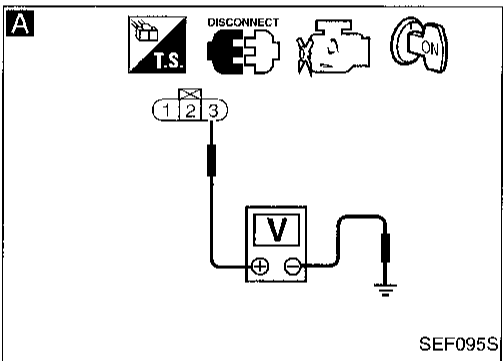
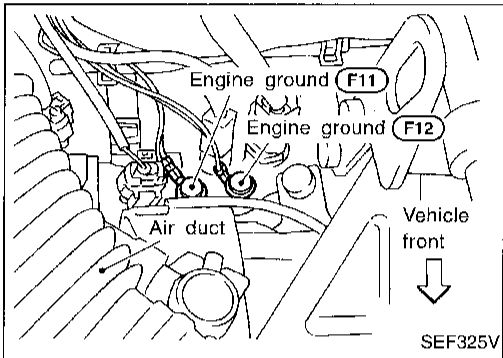
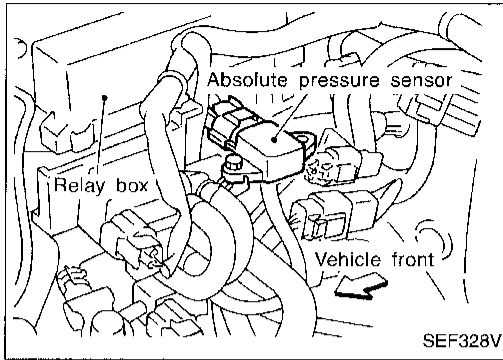
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Absolute Pressure Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

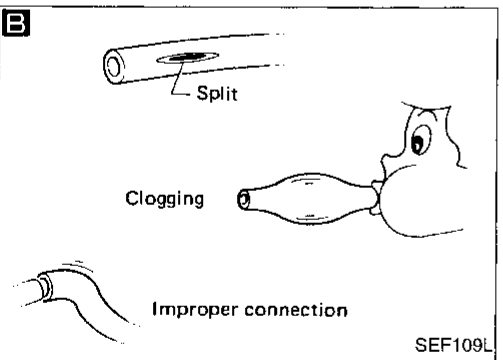
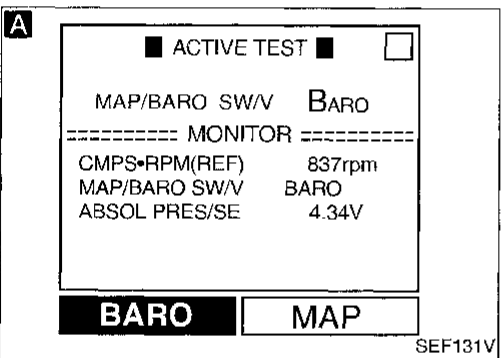
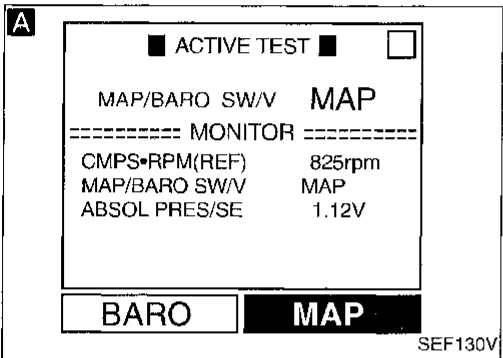
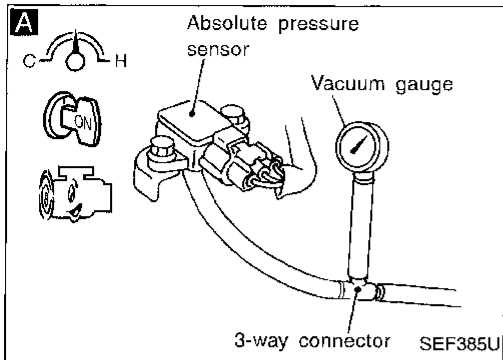
If the trouble is duplicated after "Procedure for malfunction A or C", perform "Procedure A" below. If the trouble is duplicated after "Procedure for malfunction B", perform "Procedure B" on next page.

Procedure A



Absolute Pressure Sensor (Cont'd)

Procedure B



INSPECTION START

A

CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR.

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Connect MAP/BARO switch solenoid valve and absolute pressure sensor with a rubber tube that has vacuum gauge.
4. Turn ignition switch "ON".
5. Select "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
6. Start engine and let it idle.
7. Touch "MAP" and "BARO" alternately and check for vacuum.

| | |
|---------------|------------------|
| MAP/BARO SW/V | Vacuum |
| BARO | Should not exist |
| MAP | Should exist |

OR

4. Turn ignition switch "ON".
5. Start engine and check for vacuum.
For 5 seconds after starting engine:
Vacuum should not exist.
6. More than 5 seconds after starting engine.
Vacuum should exist.

B

CHECK HOSE BETWEEN ABSOLUTE PRESSURE SENSOR AND MAP/BARO SWITCH SOLENOID VALVE.

1. Turn ignition switch "OFF".
2. Check hose for clogging, cracks, disconnection or improper connection.

CHECK COMPONENT (Absolute pressure sensor).
Refer to "COMPONENT INSPECTION" on next page.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

NG → **CHECK VACUUM HOSE.**
Check vacuum hose for clogging, cracks, disconnection or improper connection.
If NG, repair or replace the hose.

OK → Check vacuum port for clogging.
If NG, clean it.

OK → **CHECK COMPONENT (MAP/BARO switch solenoid valve).**
Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P1105", EC-312.

NG → **Replace MAP/BARO switch solenoid valve.**

OK → **CHECK INTAKE SYSTEM.**
Check intake system for air leaks.

NG → **Repair or reconnect hose.**

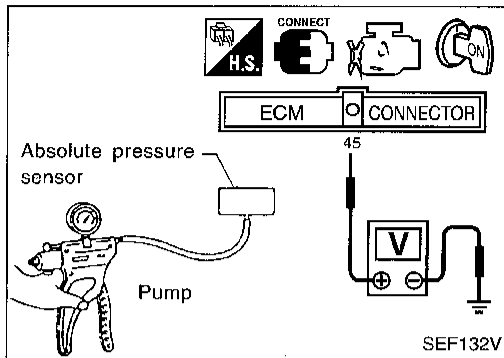
NG → **Replace absolute pressure sensor.**

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Absolute Pressure Sensor (Cont'd)

COMPONENT INSPECTION

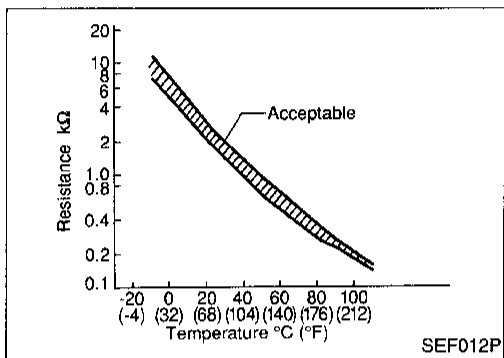
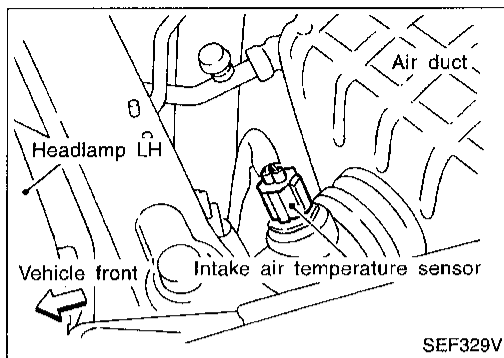
Absolute pressure sensor



1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between ECM terminal ④5 and engine ground.
The voltage should be 3.2 to 4.8 V.
4. Use pump to apply vacuum of -26.7 kPa (-200 mmHg, -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.
The voltage should be 1.0 to 1.4 V lower than the value measured in step 3.

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
5. If NG, replace absolute pressure sensor.



Intake Air Temperature Sensor

COMPONENT DESCRIPTION

The intake air temperature sensor is mounted to the air duct housing. The sensor detects intake air temperature and transmits a signal to the ECM.

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

<Reference data>

| Intake air temperature °C (°F) | Voltage* V | Resistance kΩ |
|-----------------------------------|---------------|------------------|
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 80 (176) | 1.23 | 0.27 - 0.38 |

*: These data are reference values and are measured between ECM terminal ⑥1 (Intake air temperature sensor) and ECM terminal ③2 (ECM ground).

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P0110 0401 | A) An excessively low or high voltage from the sensor is sent to ECM. B) Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor. | <ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air temperature sensor |

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B".

NOTE:

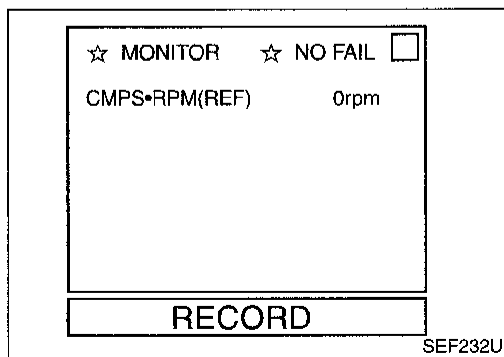
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

Procedure for malfunction A

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.

OR

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select MODE 7 with GST.



TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

| | |
|---------------|-----------|
| ☆ MONITOR | ☆ NO FAIL |
| COOLAN TEMP/S | 30°C |
| VHCL SPEED SE | 75km/h |
| RECORD | |

SEF233U

Procedure for malfunction B

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Select "DATA MONITOR" mode with CONSULT.
 - (c) Check the engine coolant temperature.
 - (d) If the engine coolant temperature is above 90°C (194°F), turn ignition switch "OFF" and cool down engine.
 - Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 2) Turn ignition switch "ON".
- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Start engine.
- 5) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.

OR



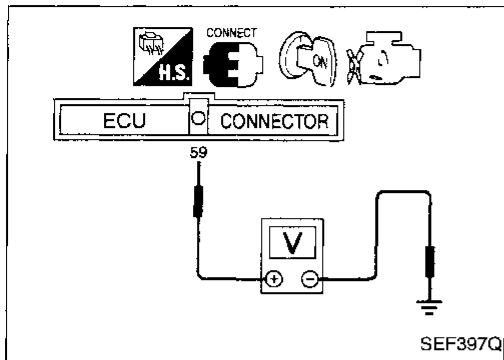
- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Select MODE 1 with GST.
 - (c) Check the engine coolant temperature.
 - (d) If the engine coolant temperature is above 90°C (194°F), turn ignition switch "OFF" and cool down engine.
 - Perform the following steps before engine coolant temperature is above 90°C (194°F).
- 2) Start engine.
- 3) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
- 4) Select MODE 7 with GST.

| | |
|---------------------|-------------|
| FUEL SYS #1 | OPEN |
| FUEL SYS #2 | UNUSED |
| CALC LOAD | 0% |
| COOLANT TEMP | 28°C |
| SHORT FT #1 | 0% |
| LONG FT #1 | 0% |
| ENGINE SPD | 0RPM |
| VEHICLE SPD | 0km/h |
| IGN ADVANCE | 5.0° |
| INTAKE AIR | 25°C |
| MAF | 0.0gm/sec |
| THROTTLE POS | 0% |
| O2S LOCATION | 3 |
| O2S B1,S1 | 0.380V |
| O2FT B1,S1 | 0% |
| O2S B1,S2 | 0.000V |

SEF950N

TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)



- OR
- 1) Wait until engine coolant temperature is less than 90°C (194°F).
 - (a) Turn ignition switch "ON".
 - (b) Check voltage between ECM terminal ⑤9 and ground.
Voltage: More than 1.0 (V)
 - (c) If the voltage is below 1.0 (V), turn ignition switch "OFF" and cool down engine.
 - Perform the following steps before the voltage is below 1.0V.
 - 2) Start engine.
 - 3) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
 - 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 - 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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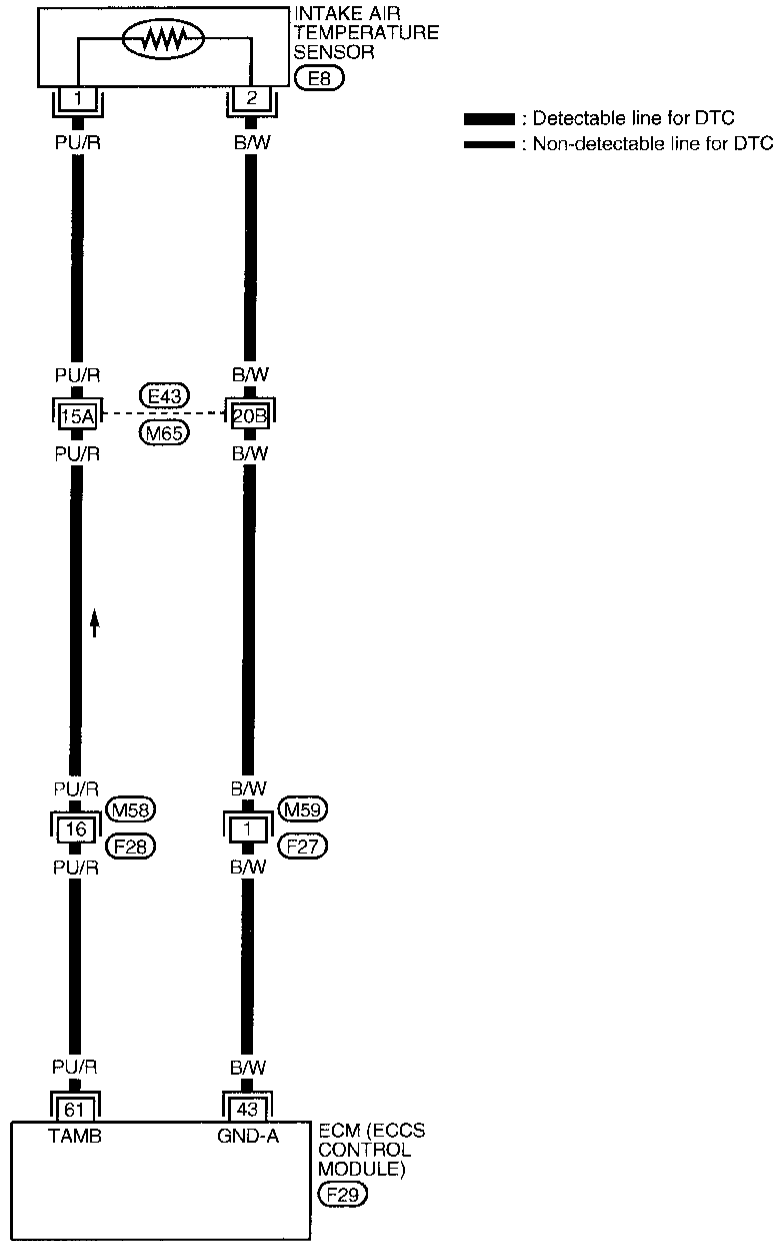
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TROUBLE DIAGNOSIS FOR DTC P0110

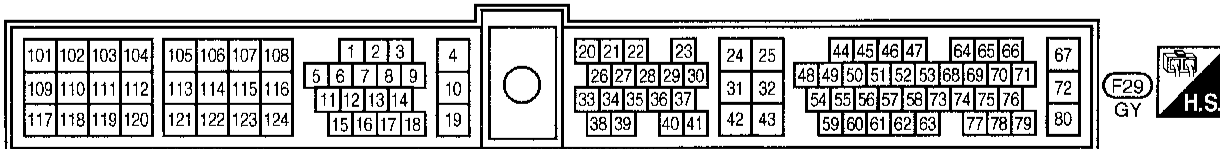
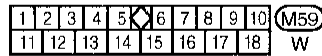
Intake Air Temperature Sensor (Cont'd)

EC-IATS-01



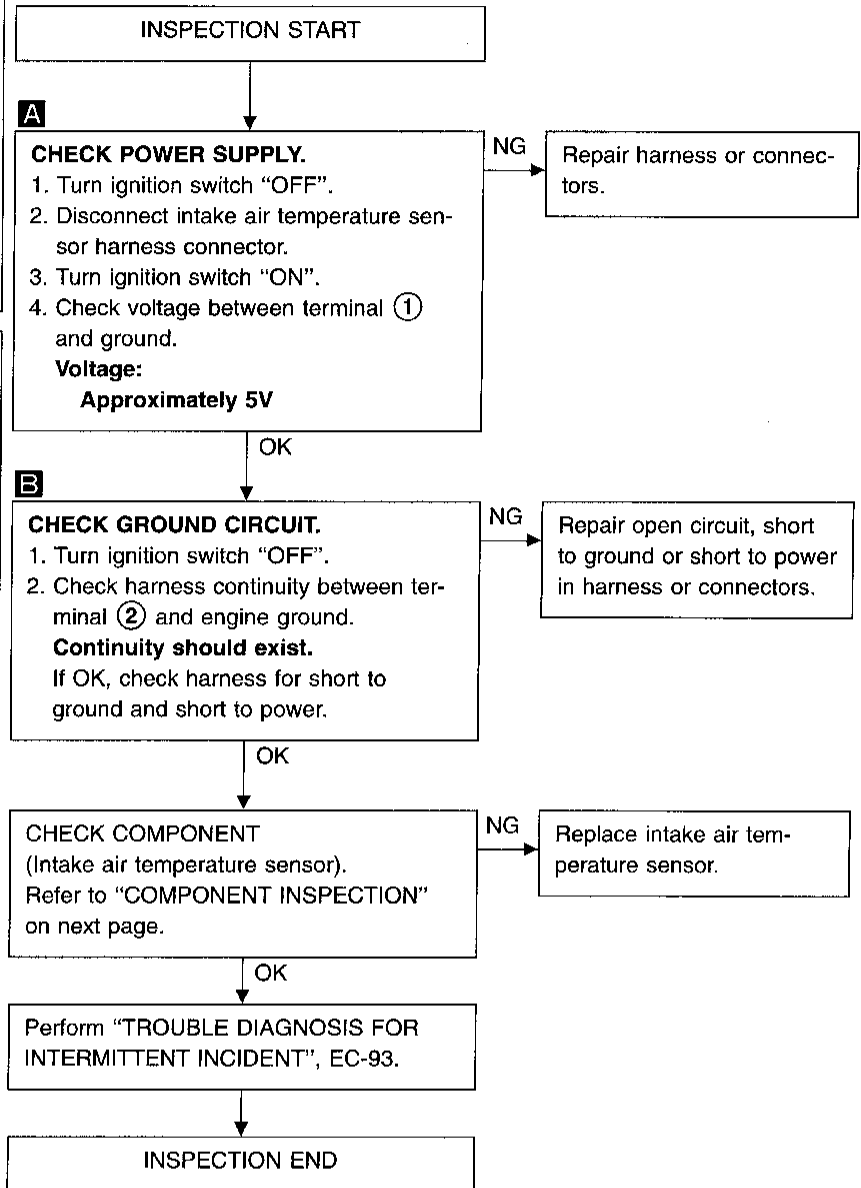
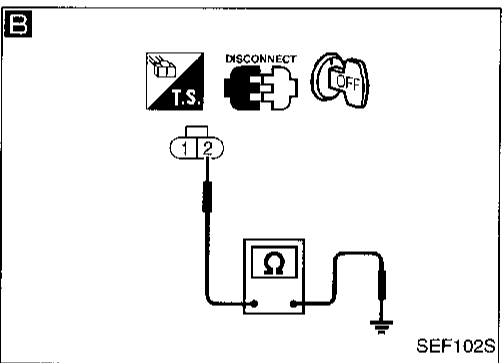
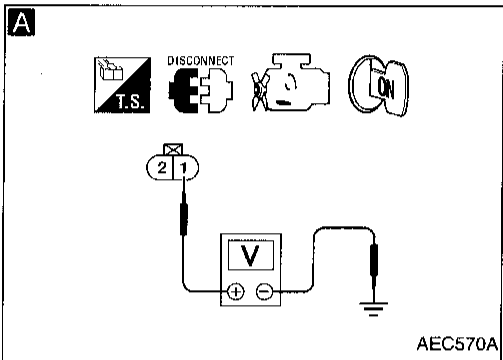
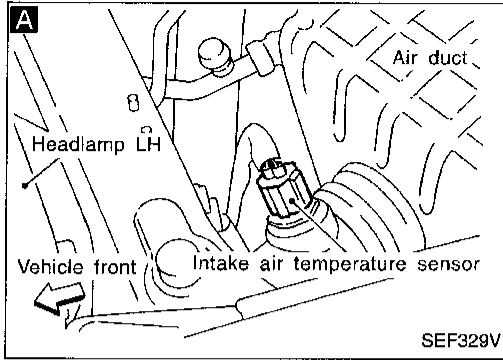
Refer to last page (Foldout page).

(M65), (E43)



TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd) DIAGNOSTIC PROCEDURE



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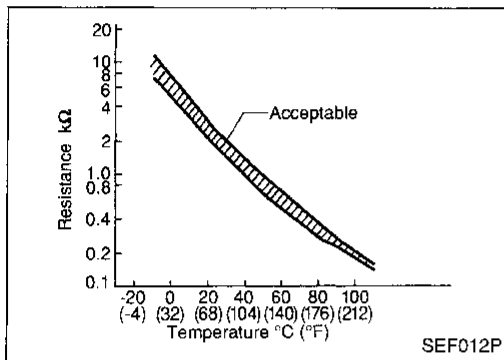
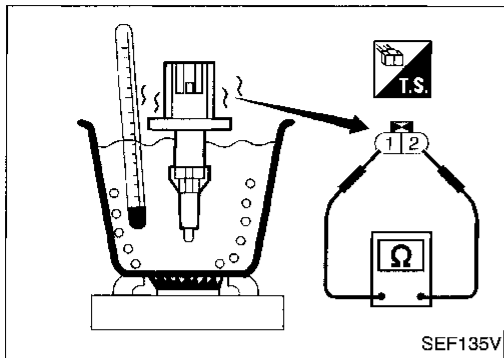
TROUBLE DIAGNOSIS FOR DTC P0110

Intake Air Temperature Sensor (Cont'd)

COMPONENT INSPECTION

Intake air temperature sensor

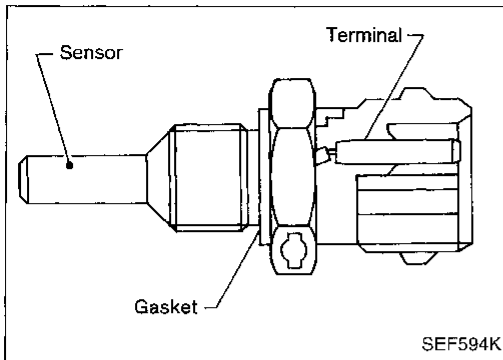
Check resistance as shown in the figure.



<Reference data>

| Intake air temperature °C (°F) | Resistance kΩ |
|-----------------------------------|---------------|
| 20 (68) | 2.1 - 2.9 |
| 80 (176) | 0.27 - 0.38 |

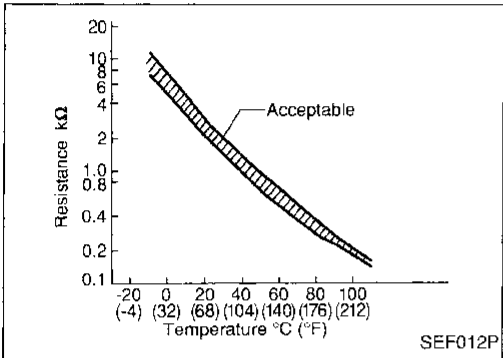
If NG, replace intake air temperature sensor.



Engine Coolant Temperature Sensor (ECTS) (Circuit)

COMPONENT DESCRIPTION

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

| Engine coolant temperature °C (°F) | Voltage* V | Resistance kΩ |
|---------------------------------------|---------------|------------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

*: These data are reference values and are measured between ECM terminal (59) (Engine coolant temperature sensor) and ECM terminal (32) (ECM ground).

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0115 0103 | <ul style="list-style-type: none"> An excessively high or low voltage from the sensor is sent to ECM.* | <ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Engine coolant temperature sensor |

*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

| Detected items | Engine operating condition in fail-safe mode | | | | | | | | |
|--|--|-----------|--|---|--------------|--|--------------|-----------------------|--|
| Engine coolant temperature sensor circuit | <p>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT displays the engine coolant temperature decided by ECM.</p> <table border="1"> <thead> <tr> <th>Condition</th> <th>Engine coolant temperature decided (CONSULT display)</th> </tr> </thead> <tbody> <tr> <td>Just as ignition switch is turned ON or Start</td> <td>40°C (104°F)</td> </tr> <tr> <td>More than approx. 4 minutes after ignition ON or Start</td> <td>80°C (176°F)</td> </tr> <tr> <td>Except as shown above</td> <td>40 - 80°C (104 - 176°F) (Depends on the time)</td> </tr> </tbody> </table> | Condition | Engine coolant temperature decided (CONSULT display) | Just as ignition switch is turned ON or Start | 40°C (104°F) | More than approx. 4 minutes after ignition ON or Start | 80°C (176°F) | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) |
| Condition | Engine coolant temperature decided (CONSULT display) | | | | | | | | |
| Just as ignition switch is turned ON or Start | 40°C (104°F) | | | | | | | | |
| More than approx. 4 minutes after ignition ON or Start | 80°C (176°F) | | | | | | | | |
| Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) | | | | | | | | |

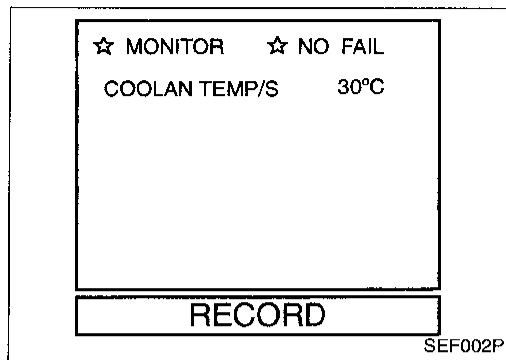
TROUBLE DIAGNOSIS FOR DTC P0115

Engine Coolant Temperature Sensor (ECTS) (Circuit) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.

OR

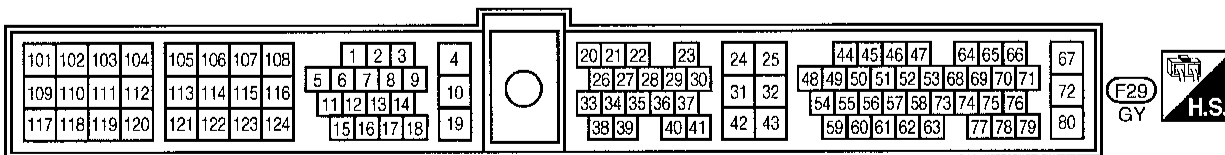
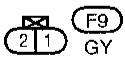
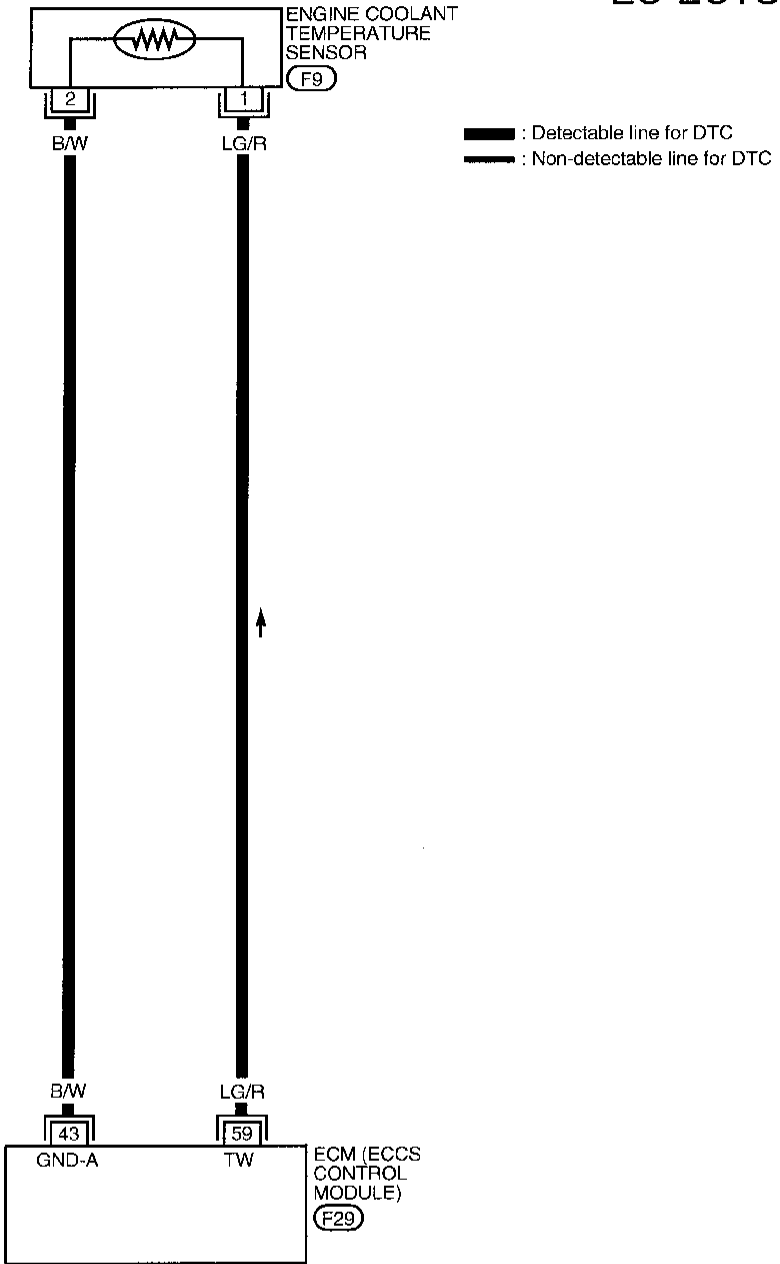


- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

TROUBLE DIAGNOSIS FOR DTC P0115

Engine Coolant Temperature Sensor (ECTS) (Circuit) (Cont'd)

EC-ECTS-01

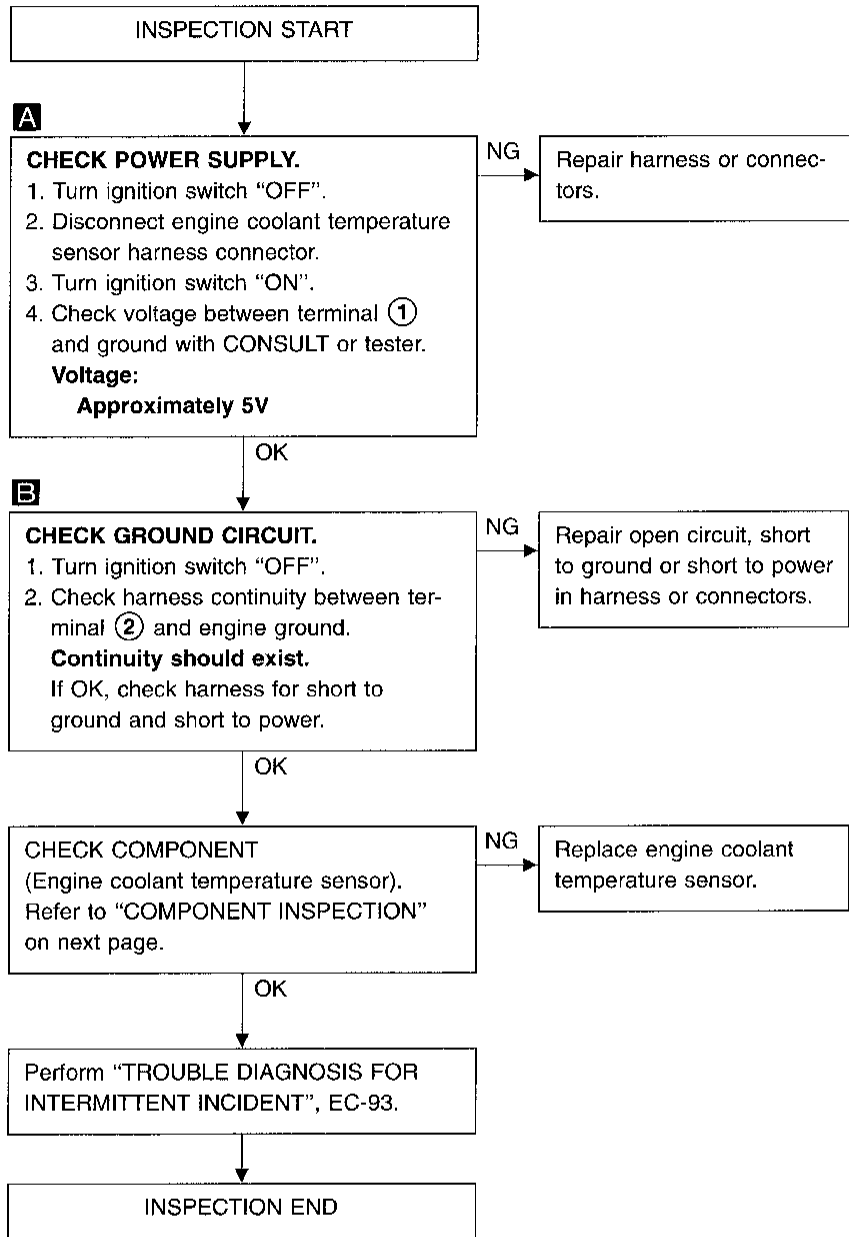
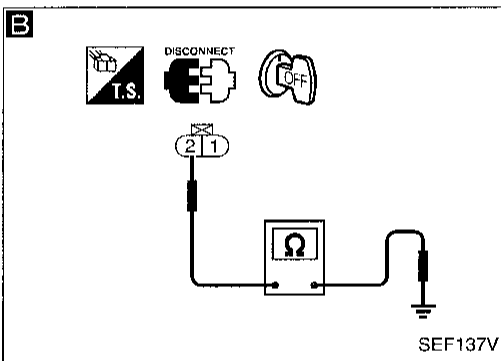
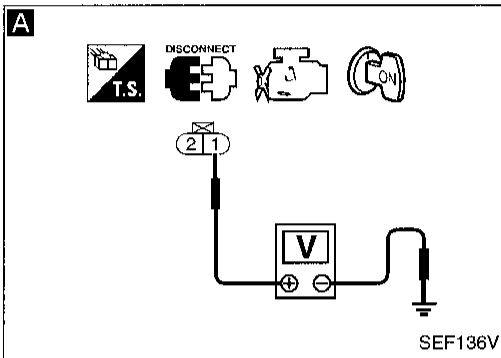
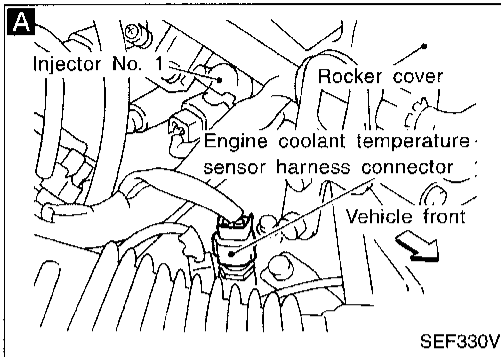


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TROUBLE DIAGNOSIS FOR DTC P0115

Engine Coolant Temperature Sensor (ECTS) (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P0115

Engine Coolant Temperature Sensor (ECTS) (Circuit) (Cont'd)

COMPONENT INSPECTION

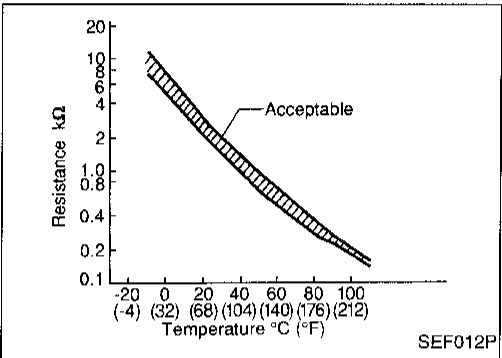
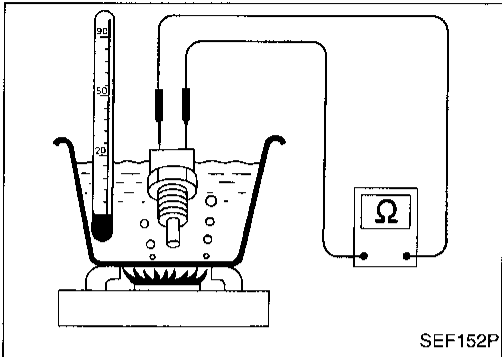
Engine coolant temperature sensor

Check resistance as shown in the figure.

<Reference data>

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68) | 2.1 - 2.9 |
| 50 (122) | 0.68 - 1.00 |
| 90 (194) | 0.236 - 0.260 |

If NG, replace engine coolant temperature sensor.



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TROUBLE DIAGNOSIS FOR DTC P0120

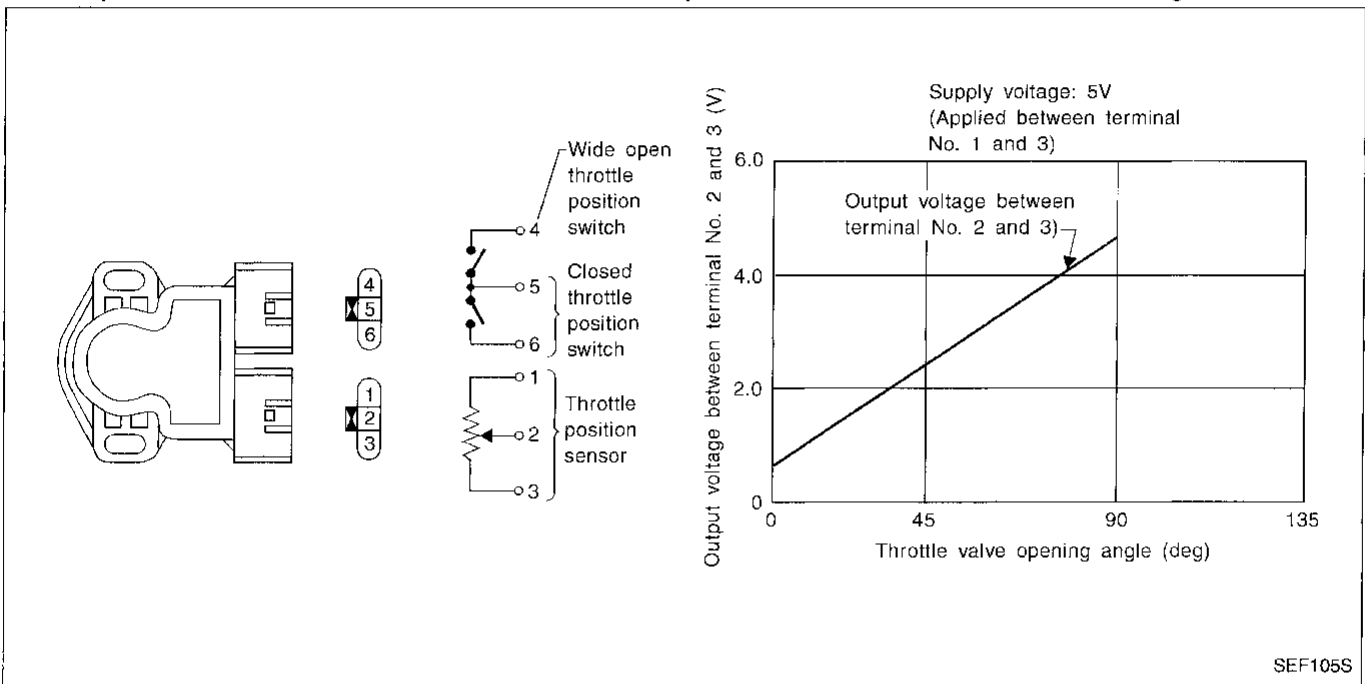
Throttle Position Sensor

Note: If both DTC P0120 (0403) and DTC P0510 (0203) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0510 first. (See EC-297.)

COMPONENT DESCRIPTION

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

Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This sensor controls engine operation such as fuel cut. On the other hand, the "Wide open and closed throttle position switch", which is built into the throttle position sensor unit, is not used for engine control.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---------------|--|------------------------------|---------------|
| THRTL POS SEN | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Engine: After warming up | Throttle valve: fully closed | 0.3 - 0.7V |
| | | Throttle valve: fully opened | Approx. 4.0V |
| ABSOL THP/S | <ul style="list-style-type: none"> ● Ignition switch: ON (Engine stopped) ● Engine: After warming up | Throttle valve: fully closed | 0.0% |
| | | Throttle valve: fully opened | Approx. 80% |

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓜ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--------------------------|--|-------------------|
| 23 | L | Throttle position sensor | Ignition switch "ON" (Warm-up condition) └ Accelerator pedal fully released | 0.3 - 0.7V |
| | | | Ignition switch "ON" └ Accelerator pedal fully depressed | Approximately 4V |
| 42 | BR | Sensors' power supply | Ignition switch "ON" | Approximately 5V |
| 43 | B/W | Sensors' ground | Engine is running. └ Idle speed | Approximately 0V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P0120 0403 | A) An excessively low or high voltage from the sensor is sent to ECM.* | <ul style="list-style-type: none"> ● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor |
| | B) A high voltage from the sensor is sent to ECM under light load driving condition. | <ul style="list-style-type: none"> ● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor ● Fuel injector ● Camshaft position sensor ● Mass air flow sensor |
| | C) A low voltage from the sensor is sent to ECM under heavy load driving condition. | <ul style="list-style-type: none"> ● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Intake air leaks ● Throttle position sensor |

*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

| Detected items | Engine operating condition in fail-safe mode | | | | | |
|----------------------------------|--|-----------|-------------------|-----------------------|--------|-------------------|
| Throttle position sensor circuit | Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor. | | | | | |
| | <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>Condition</th> <th>Driving condition</th> </tr> </thead> <tbody> <tr> <td>When engine is idling</td> <td>Normal</td> </tr> <tr> <td>When accelerating</td> <td>Poor acceleration</td> </tr> </tbody> </table> | Condition | Driving condition | When engine is idling | Normal | When accelerating |
| Condition | Driving condition | | | | | |
| When engine is idling | Normal | | | | | |
| When accelerating | Poor acceleration | | | | | |

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the DTC cannot be confirmed, perform "Procedure for malfunction B". If there is no problem on "Procedure for malfunction B", perform "Procedure for malfunction C".

Procedure for malfunction A

NOTE:

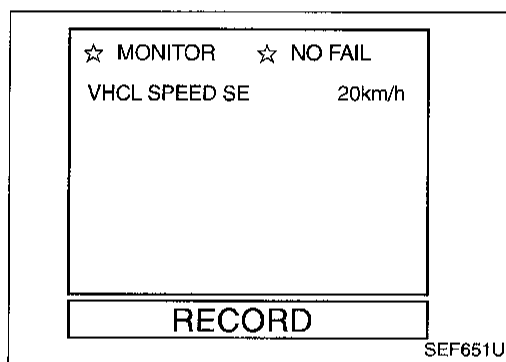
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 10V at idle.
- This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.

2) Start engine and maintain the following conditions for at least 5 consecutive seconds.

VHCL SPEED SE: More than 4 km/h (2 MPH)

Selector lever: Suitable position except "P" or "N" position

OR



1) Start engine and maintain the following conditions for at least 5 consecutive seconds.

Vehicle speed: More than 4 km/h (2 MPH)

Selector lever: Suitable position except "P" or "N" position

2) Select "MODE 7" with GST.

OR



1) Start engine and maintain the following conditions for at least 5 consecutive seconds.

Vehicle speed: More than 4 km/h (2 MPH)

Selector lever: Suitable position except "P" or "N" position

2) Turn ignition switch "OFF" and wait at least 5 seconds.

3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

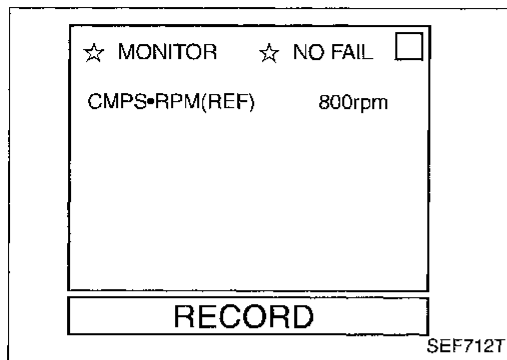
TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure for malfunction B

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

A/T model

Selector lever: Suitable position except "P" or "N"

Brake pedal: Depressed

Vehicle speed: 0 km/h (0 MPH)

M/T model

Selector lever: Suitable position except "N"

(Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)

Accelerator pedal: Released

Vehicle speed: As slow as possible

OR



- 1) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

A/T model

Selector lever: Suitable position except "P" or "N"

Brake pedal: Depressed

Vehicle speed: 0 km/h (0 MPH)

M/T model

Selector lever: Suitable position except "N"

(Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)

Accelerator pedal: Released

Vehicle speed: As slow as possible

- 2) Select "MODE 7" with GST.

OR



- 1) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.

A/T model

Selector lever: Suitable position except "P" or "N"

Brake pedal: Depressed

Vehicle speed: 0 km/h (0 MPH)

M/T model

Selector lever: Suitable position except "N"

(Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)

Accelerator pedal: Released

Vehicle speed: As slow as possible

- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

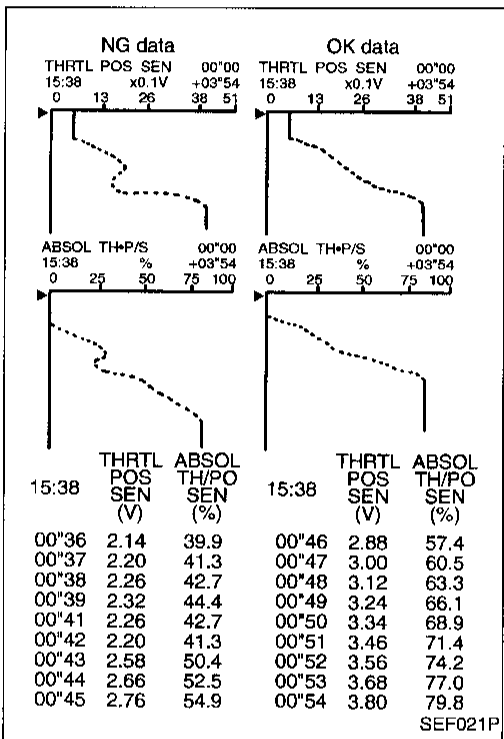
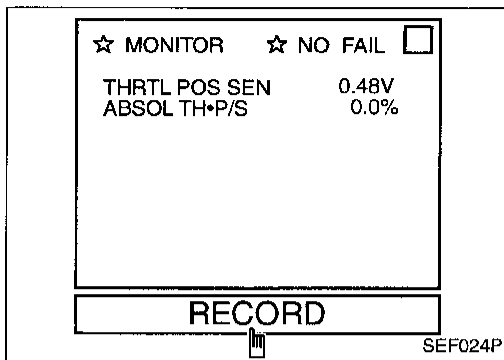
Procedure for malfunction C

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
- 5) Select "THRTL POS SEN" and "ABSOL TH+P/S" in "DATA MONITOR" mode with CONSULT.
- 6) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
- 7) Print out the recorded graph and check the following:
 - The voltage rise is linear in response to accelerator pedal depression.
 - The voltage when accelerator pedal is fully depressed is approximately 4V.
- 8) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT.
- 9) Maintain the following conditions for at least 10 consecutive seconds.

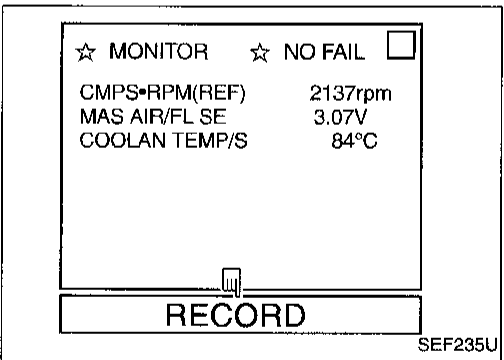
CMPS-RPM (REF): More than 2,000 rpm

MAS AIR/FL SE: More than 3V

COOLAN TEMP/S: More than 70°C (158°F)

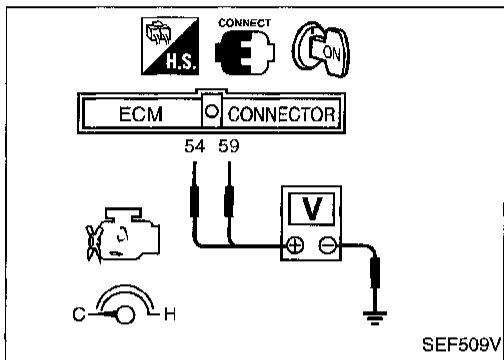
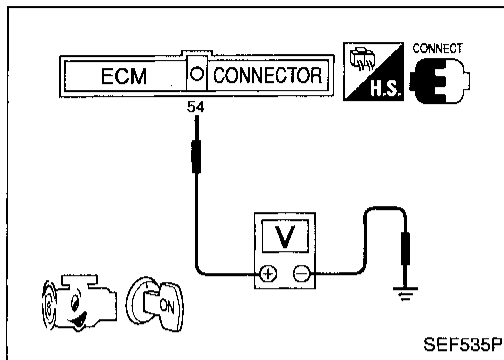
Selector lever: Suitable position

Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



- OR
- 1) Maintain the following conditions for at least 10 consecutive seconds.

Gear position: Suitable position

Engine speed: More than 2,000 rpm

Engine coolant temperature: More than 70°C (158°F)

**Voltage between ECM terminal 54 and ground:
More than 3V**



- OR
- 1) Maintain the following conditions for at least 10 consecutive seconds.

Gear position: Suitable position

Engine speed: More than 2,000 rpm

**Voltage between ECM terminal 54 and ground:
More than 3V**

**Voltage between ECM terminal 59 and ground:
Less than 4V**

- 2) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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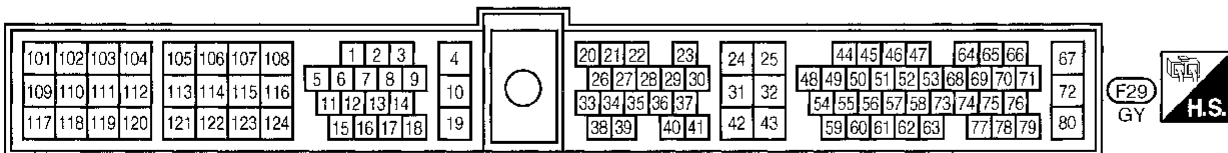
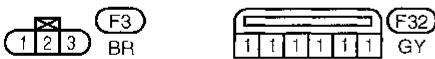
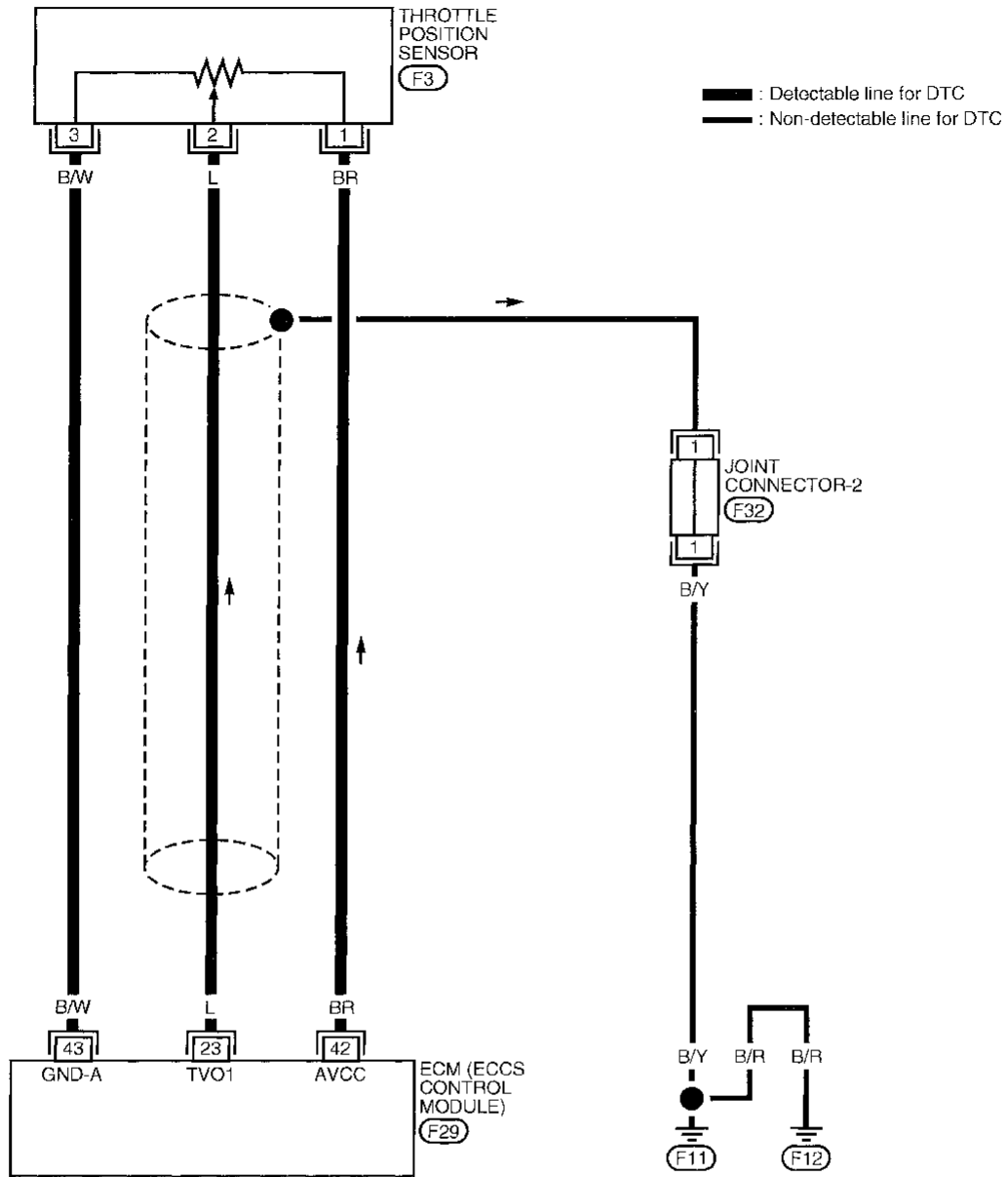
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TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

EC-TPS-01



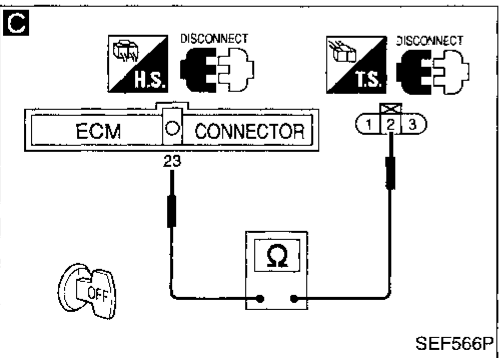
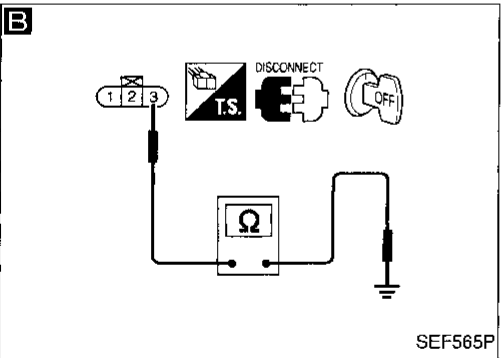
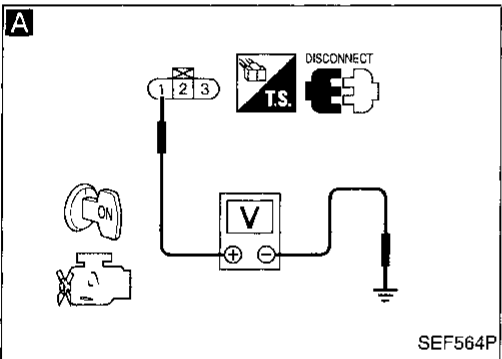
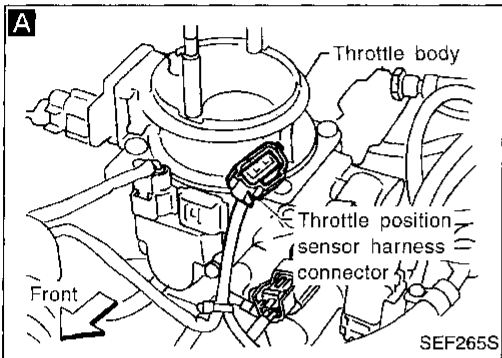
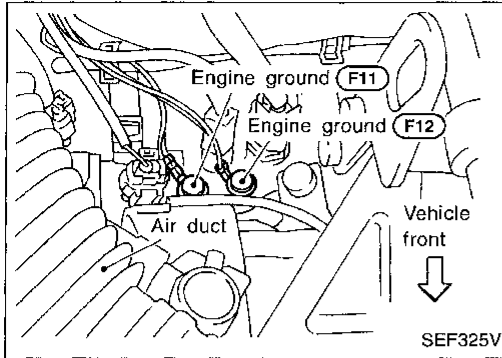
TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

DIAGNOSTIC PROCEDURE

If the trouble is duplicated after "Procedure for malfunction A", perform "Procedure A" below. If the trouble is duplicated after "Procedure for malfunction B", perform "Procedure B" on EC-135. If the trouble is duplicated after "Procedure for malfunction C", perform "Procedure C" on EC-137.

Procedure A



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

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

NG Repair harness or connectors.

B
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ③ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG Repair open circuit, short to ground or short to power in harness or connectors.

C
CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ②③ and terminal ②.
Continuity should exist.
If OK, check harness for short to ground and short to power.

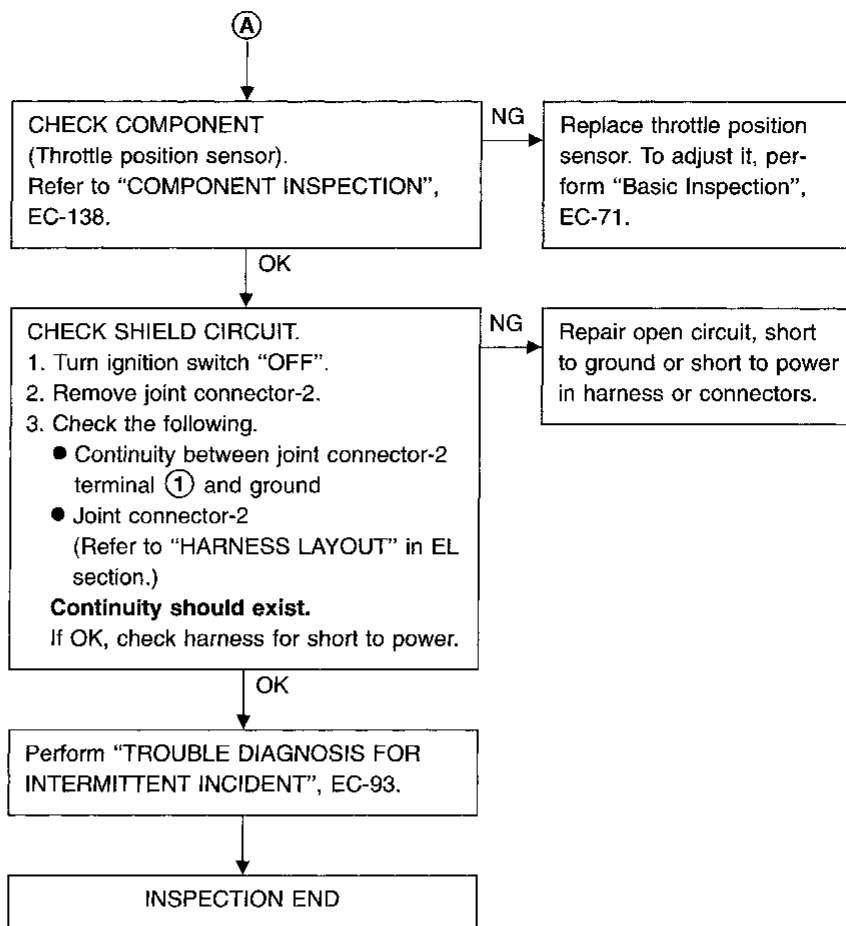
NG Repair open circuit, short to ground or short to power in harness or connectors.

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TROUBLE DIAGNOSIS FOR DTC P0120

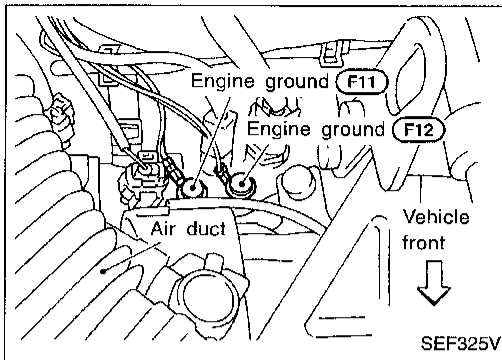
Throttle Position Sensor (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure B



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

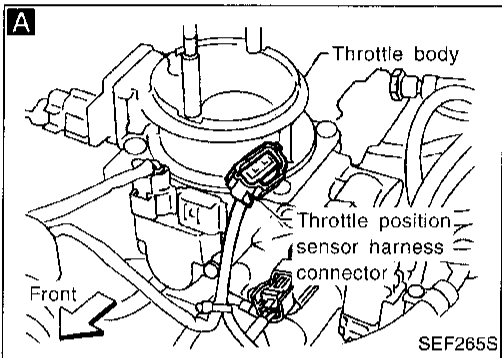
A

CHECK POWER SUPPLY.

1. Disconnect throttle position sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.
Voltage: Approximately 5V

NG → Repair harness or connectors.

OK →



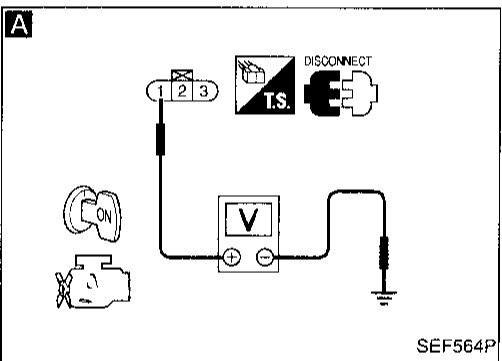
B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ③ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK →



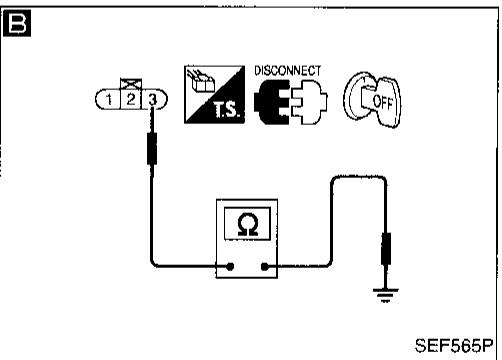
C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ②③ and terminal ②.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

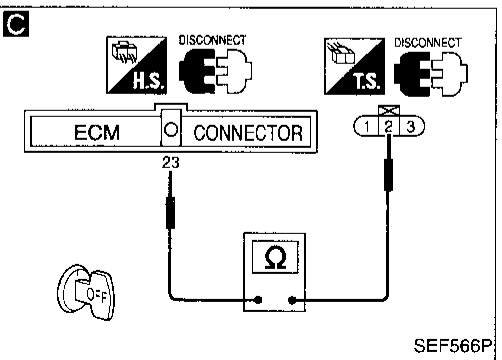
OK →



CHECK COMPONENT
(Throttle position sensor).
Refer to "COMPONENT INSPECTION", EC-138.

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-71.

OK →



CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-107.

NG → Replace mass air flow sensor.

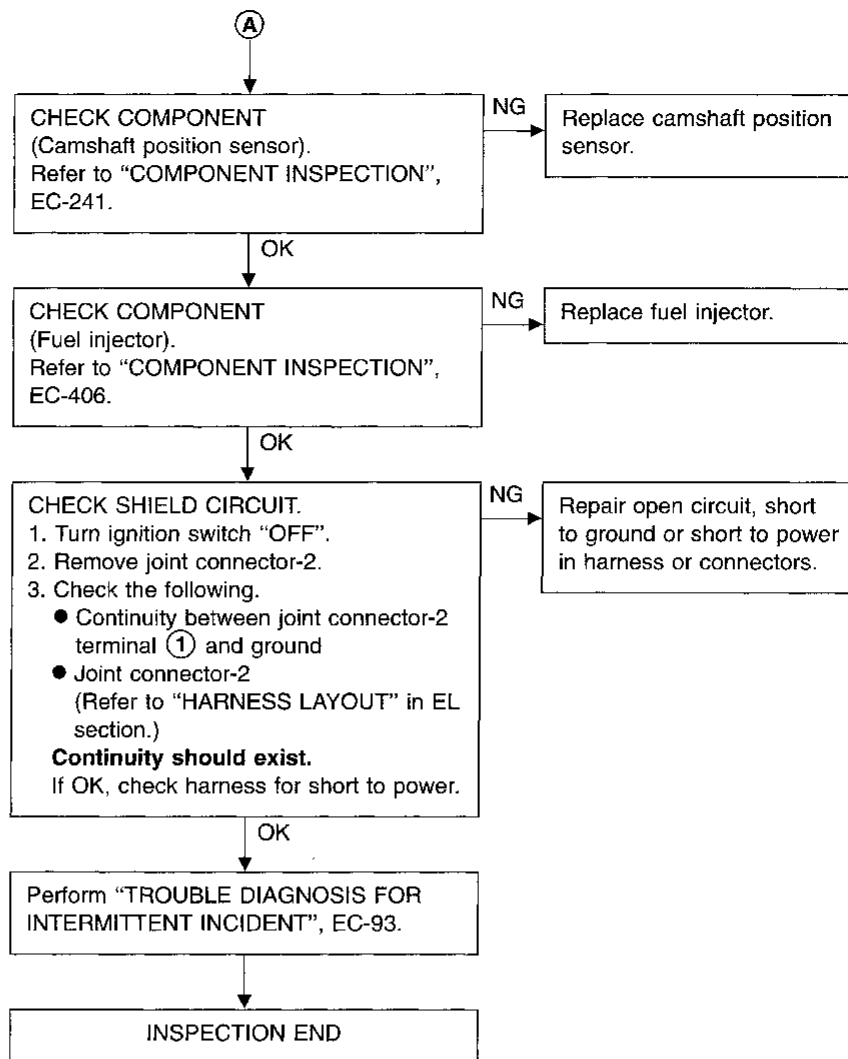
OK →

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TROUBLE DIAGNOSIS FOR DTC P0120

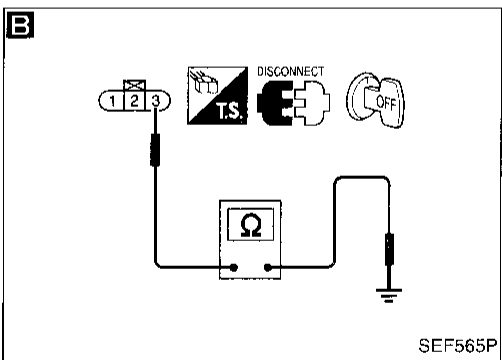
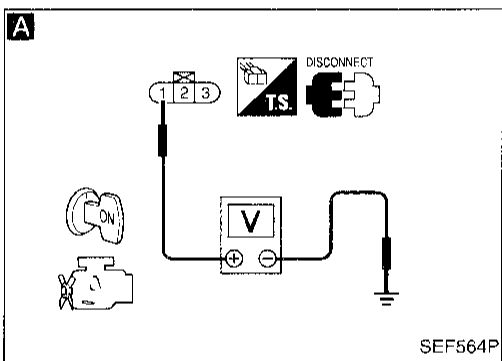
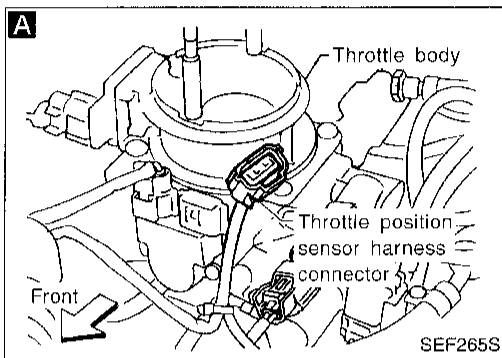
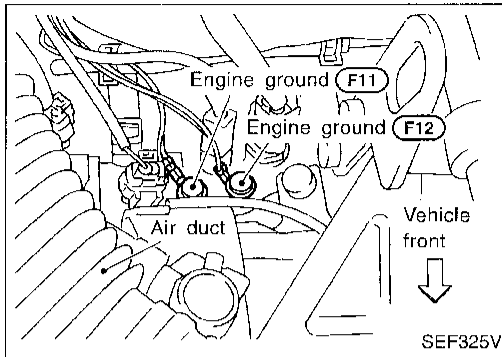
Throttle Position Sensor (Cont'd)



TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)

Procedure C



INSPECTION START

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-71.

OK

CHECK INTAKE SYSTEM.
Check the followings for connection.

- Air duct
- Air cleaner
- Vacuum hoses
- Intake air passage between air duct to collector

If disconnected, reconnect the parts.

NG

Reconnect the parts.

EC

OK

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A
CHECK POWER SUPPLY.

1. Disconnect throttle position sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Approximately 5V

NG

Repair harness or connectors.

PD

OK

B
CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ③ and engine ground.

Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Repair open circuit, short to ground or short to power in harness or connectors.

BR
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OK

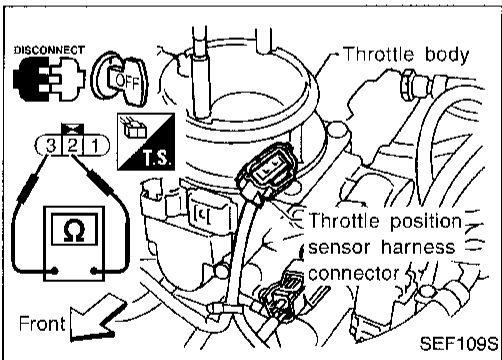
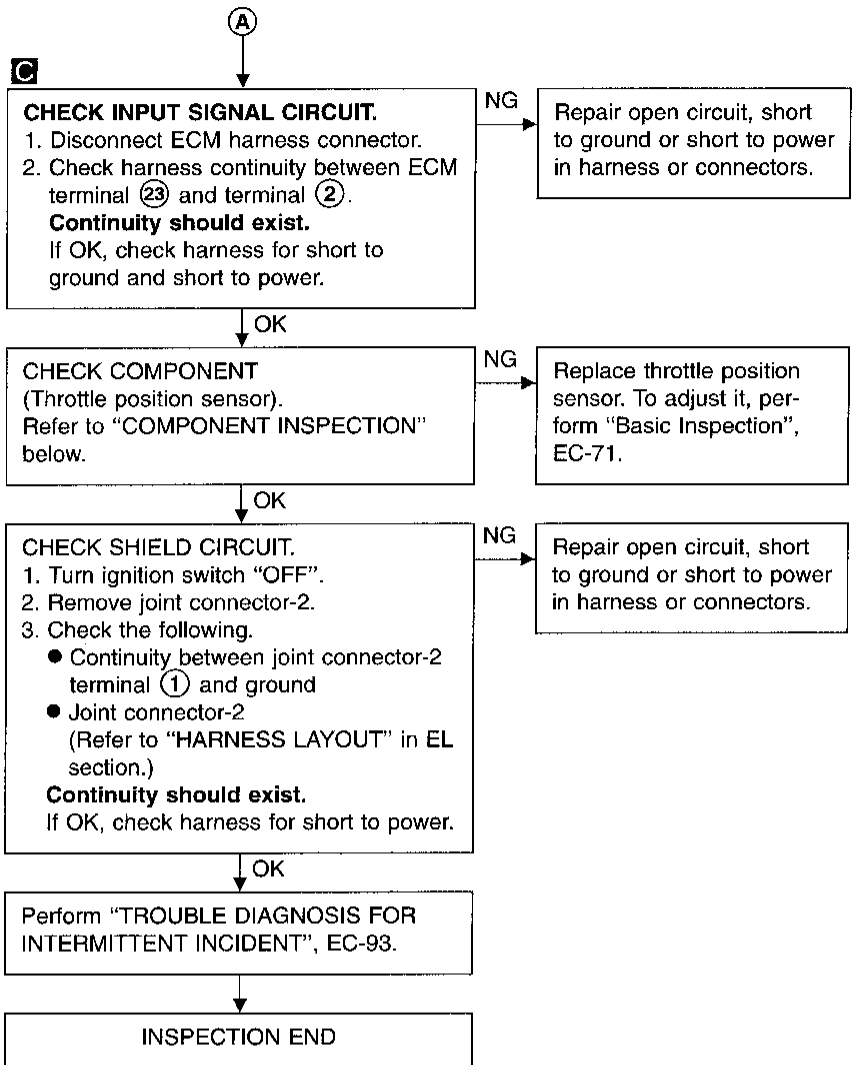
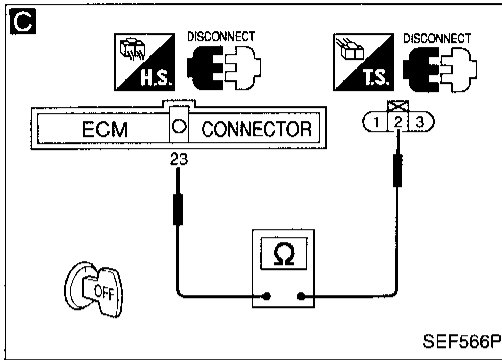
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TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont'd)



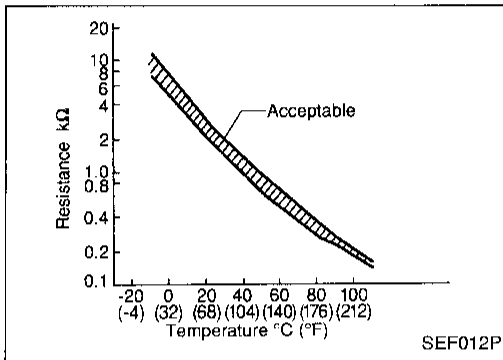
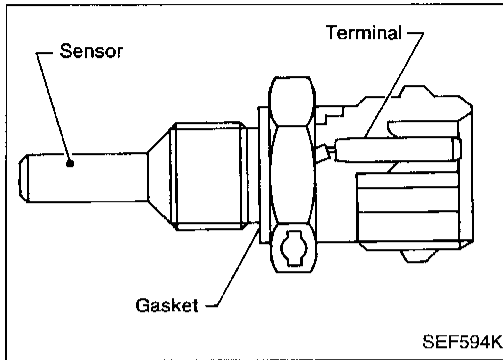
COMPONENT INSPECTION

Throttle position sensor

1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals 2 and 3 changes when opening throttle valve manually.

| Throttle valve conditions | Resistance [at 25°C (77°F)] |
|---------------------------|-----------------------------|
| Completely closed | Approximately 0.5 kΩ |
| Partially open | 0.5 - 4 kΩ |
| Completely open | Approximately 4 kΩ |

If NG, replace throttle position sensor.
 To adjust it, perform "Basic Inspection", EC-71.



Engine Coolant Temperature (ECT) Sensor

COMPONENT DESCRIPTION

The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

| Engine coolant temperature °C (°F) | Voltage* V | Resistance kΩ |
|---------------------------------------|---------------|------------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

*: These data are reference values and are measured between ECM terminal ⑤⑨ (Engine coolant temperature sensor) and ECM terminal ③② (ECM ground).

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0125 0908 | <ul style="list-style-type: none"> ● Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. ● Engine coolant temperature is insufficient for closed loop fuel control. | <ul style="list-style-type: none"> ● Harness or connectors (High resistance in the circuit) ● Engine coolant temperature sensor ● Thermostat |

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TROUBLE DIAGNOSIS FOR DTC P0125

Engine Coolant Temperature (ECT) Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Be careful not to overheat engine.

NOTE:

- If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform "TROUBLE DIAGNOSIS FOR DTC P0115". Refer to EC-121.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for 65 minutes at idle speed.

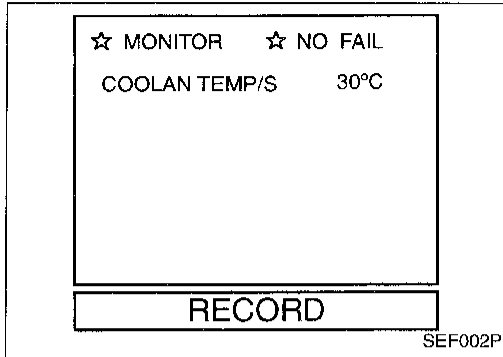
If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.

OR

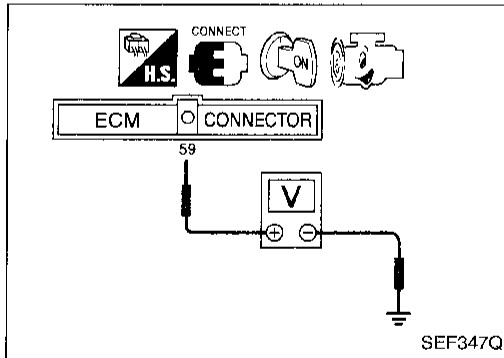


- 1) Start engine and run it for 65 minutes at idle speed.
- 2) Select "MODE 7" with GST.

If engine coolant temperature increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.



SEF002P



SEF347Q

OR



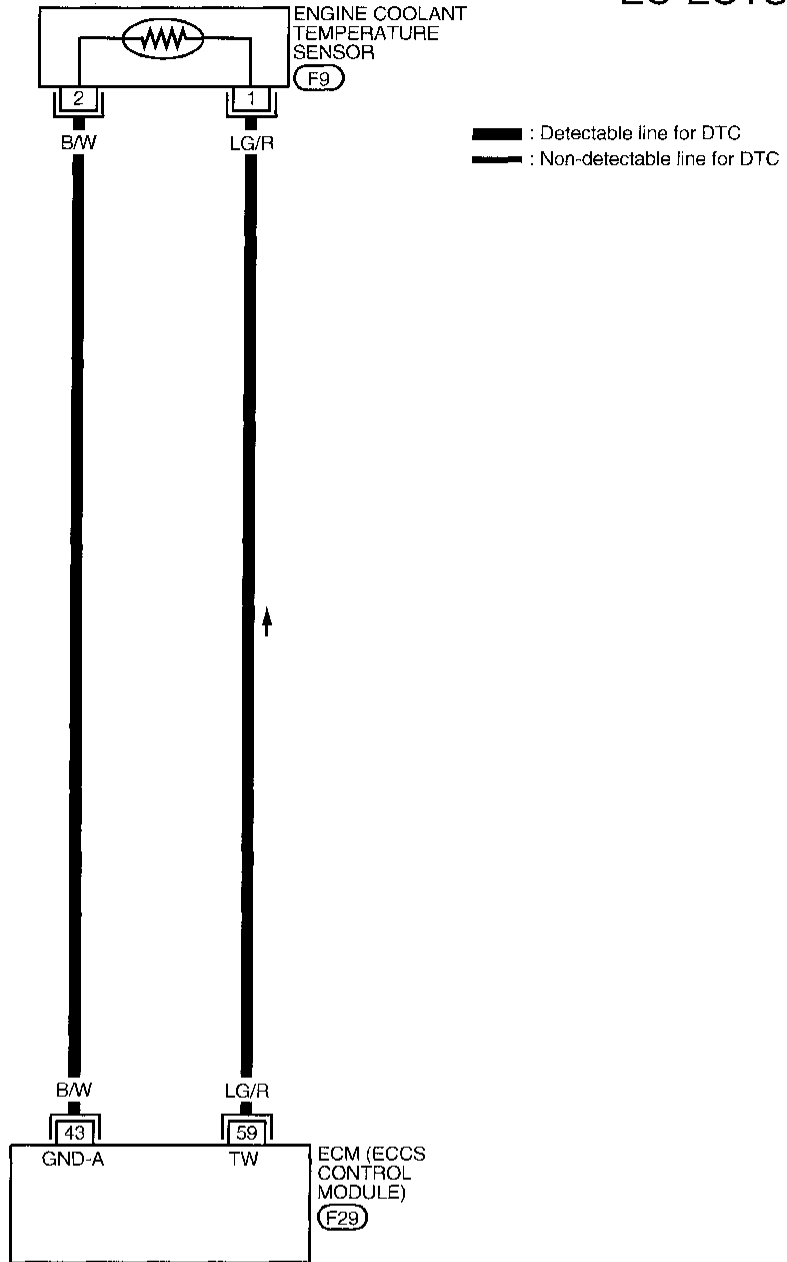
- 1) Start engine and run it for 65 minutes at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

If voltage between ECM terminals ⑤⑨ and ground decreases to less than 3.8V within 65 minutes, stop engine because the test result will be OK.

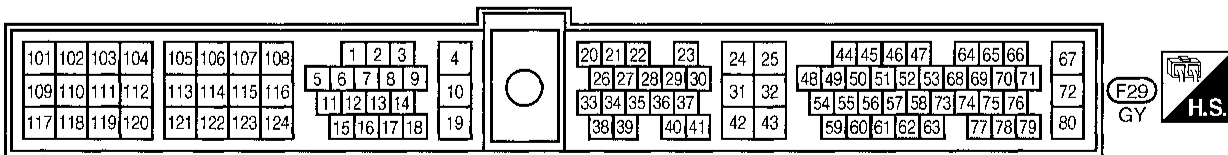
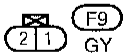
TROUBLE DIAGNOSIS FOR DTC P0125

Engine Coolant Temperature (ECT) Sensor (Cont'd)

EC-ECTS-01



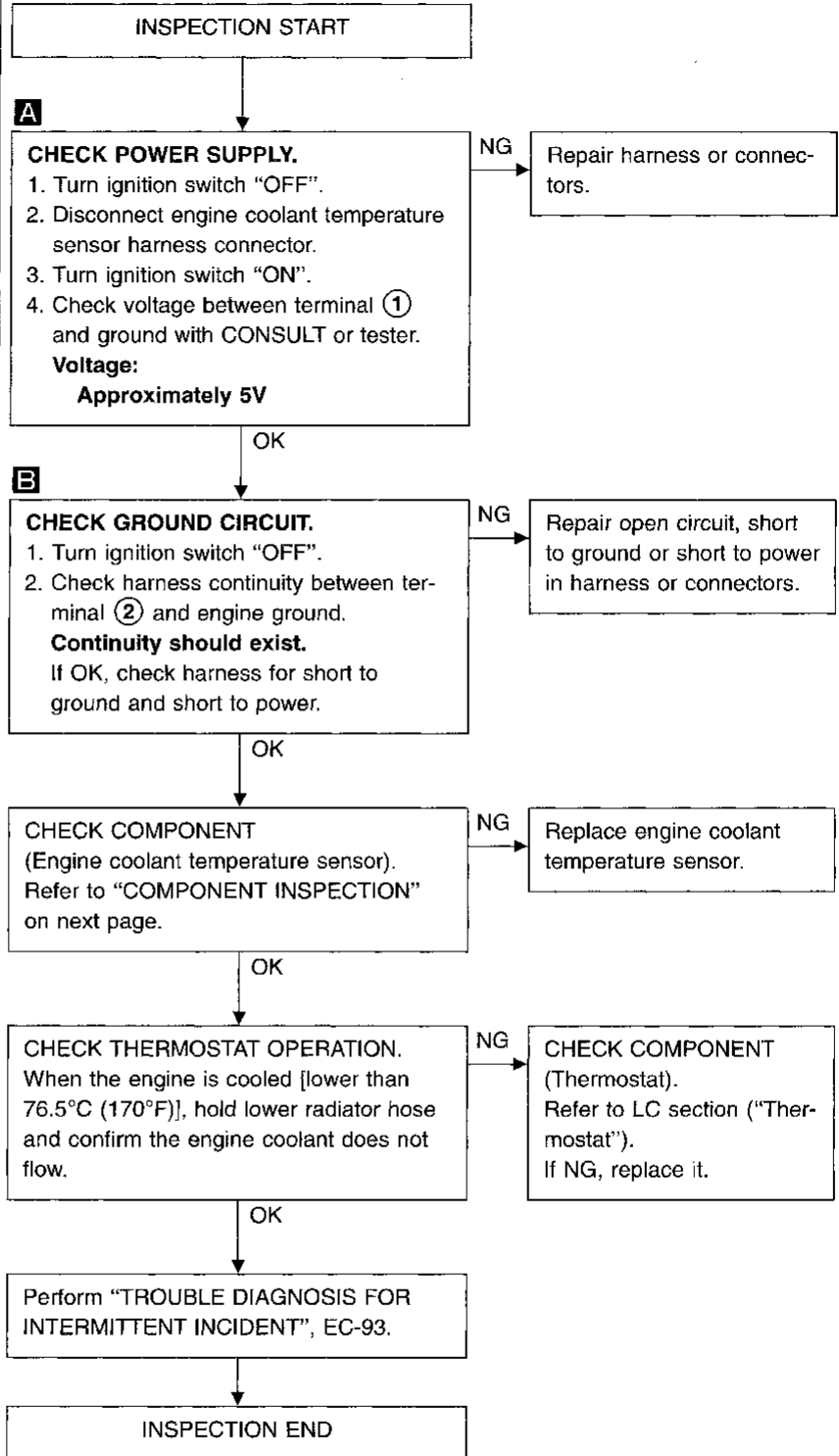
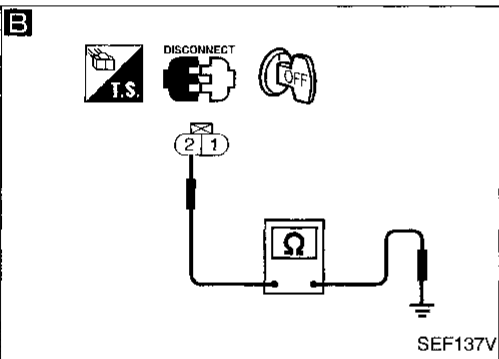
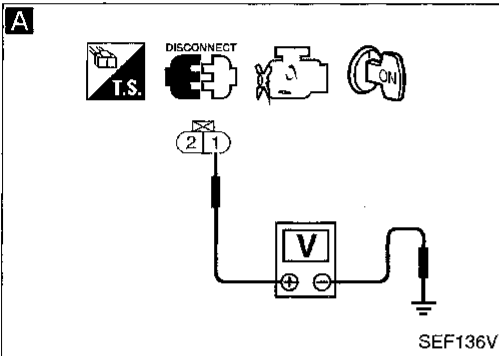
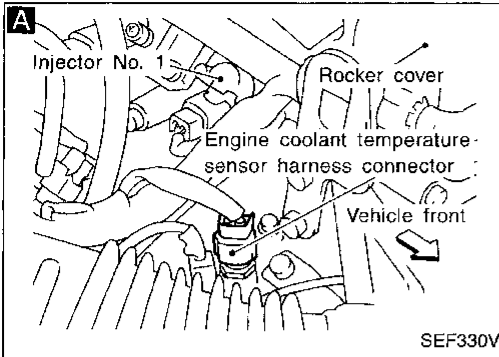
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TROUBLE DIAGNOSIS FOR DTC P0125

Engine Coolant Temperature (ECT) Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P0125

Engine Coolant Temperature (ECT) Sensor (Cont'd)

COMPONENT INSPECTION

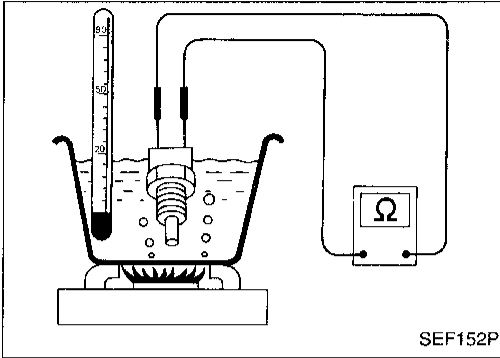
Engine coolant temperature sensor

Check resistance as shown in the figure.

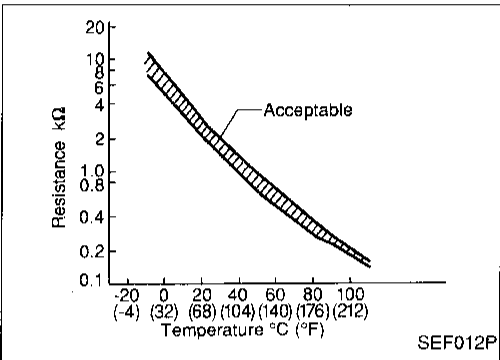
<Reference data>

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68) | 2.1 - 2.9 |
| 50 (122) | 0.68 - 1.0 |
| 90 (194) | 0.236 - 0.260 |

If NG, replace engine coolant temperature sensor.



SEF152P



SEF012P

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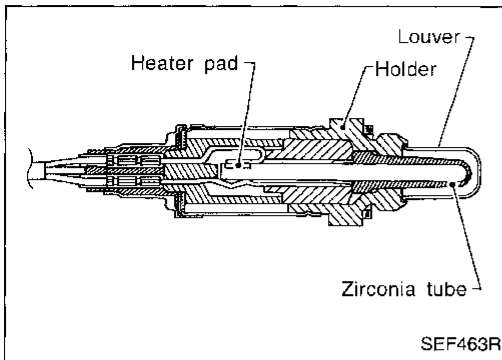
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TROUBLE DIAGNOSIS FOR DTC P0130

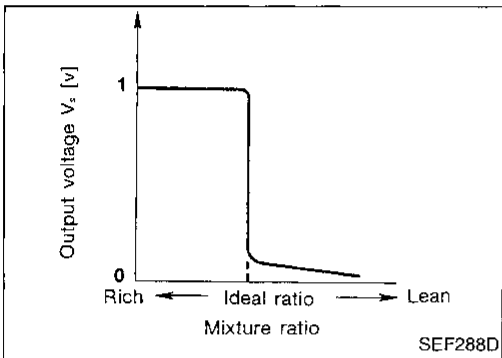
Front Heated Oxygen Sensor (Circuit) (Front HO2S)

COMPONENT DESCRIPTION

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



SEF463R



SEF288D

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|---|---|
| FR O2 SENSOR | ● Engine: After warming up Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| FR O2 MNTR | | LEAN ↔ RICH Changes more than 5 times during 10 seconds. |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ⓓ (ECM ground).

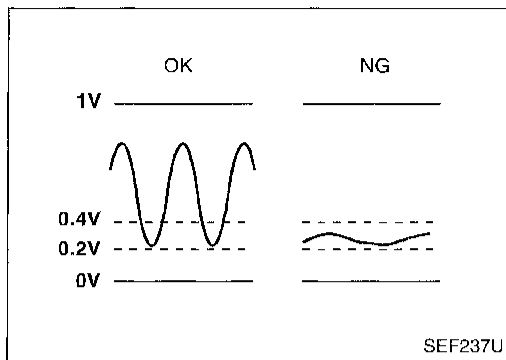
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------|---|---------------------------------------|
| 50 | B | Front heated oxygen sensor | Engine is running. After warming up to normal operating temperature and engine speed is 2,000 rpm. | 0 - Approximately 1.0V SEF201T |

TROUBLE DIAGNOSIS FOR DTC P0130

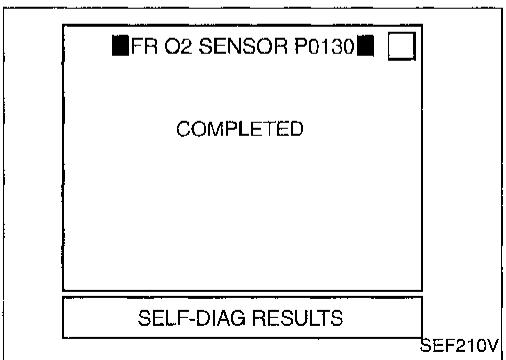
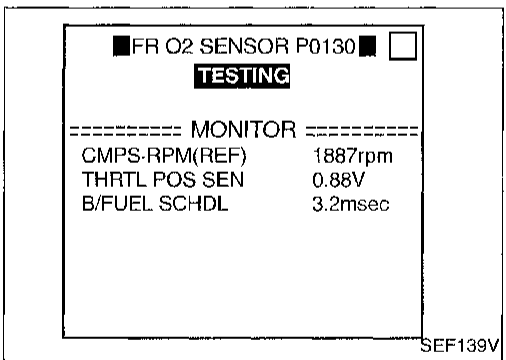
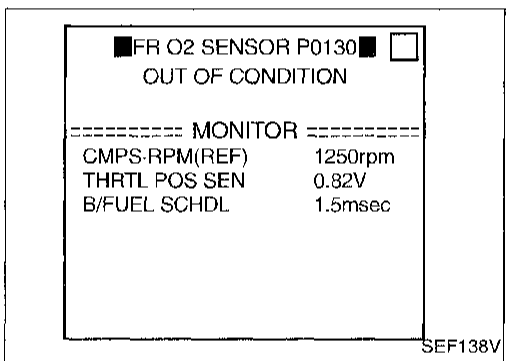
Front Heated Oxygen Sensor (Circuit) (Front HO2S) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Under the condition in which the front heated oxygen sensor signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0130 0303 | <ul style="list-style-type: none"> The voltage from the sensor is constantly approx. 0.3V. | <ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Front heated oxygen sensor |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is in between 11V and 16V at idle.
- Never raise engine speed above 3,000 rpm during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 4).



- Start engine and warm it up to normal operating temperature.
 - Select "FR O2 SENSOR P0130" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
 - Touch "START".
 - Let it idle for at least 3 minutes.
 - When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 10 to 50 seconds.)
 - CMPS-RPM (REF): 1,700 - 2,700 rpm (A/T)
1,700 - 3,000 rpm (M/T)
 - Vehicle speed: 80 - 100 km/h (50 - 62 MPH)
 - B/FUEL SCHDL: 1.1 - 4.8 ms (A/T)
1.1 - 5.2 ms (M/T)
- Selector lever: Suitable position

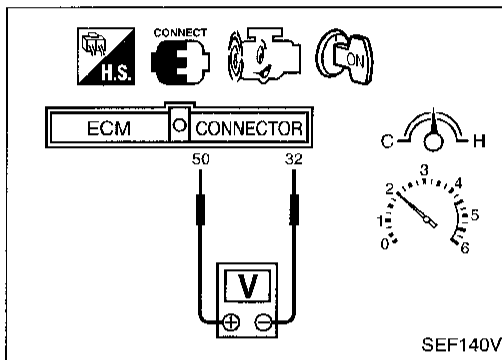
TROUBLE DIAGNOSIS FOR DTC P0130

Front Heated Oxygen Sensor (Circuit) (Front HO2S) (Cont'd)

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 6) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-148.

During this test, P1148 may be displayed on CONSULT screen.



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

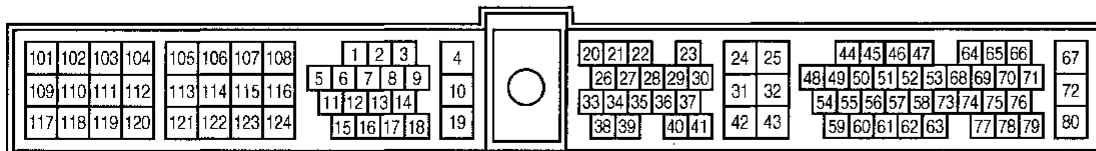
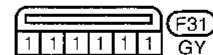
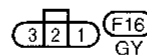
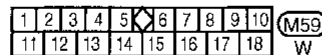
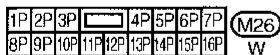
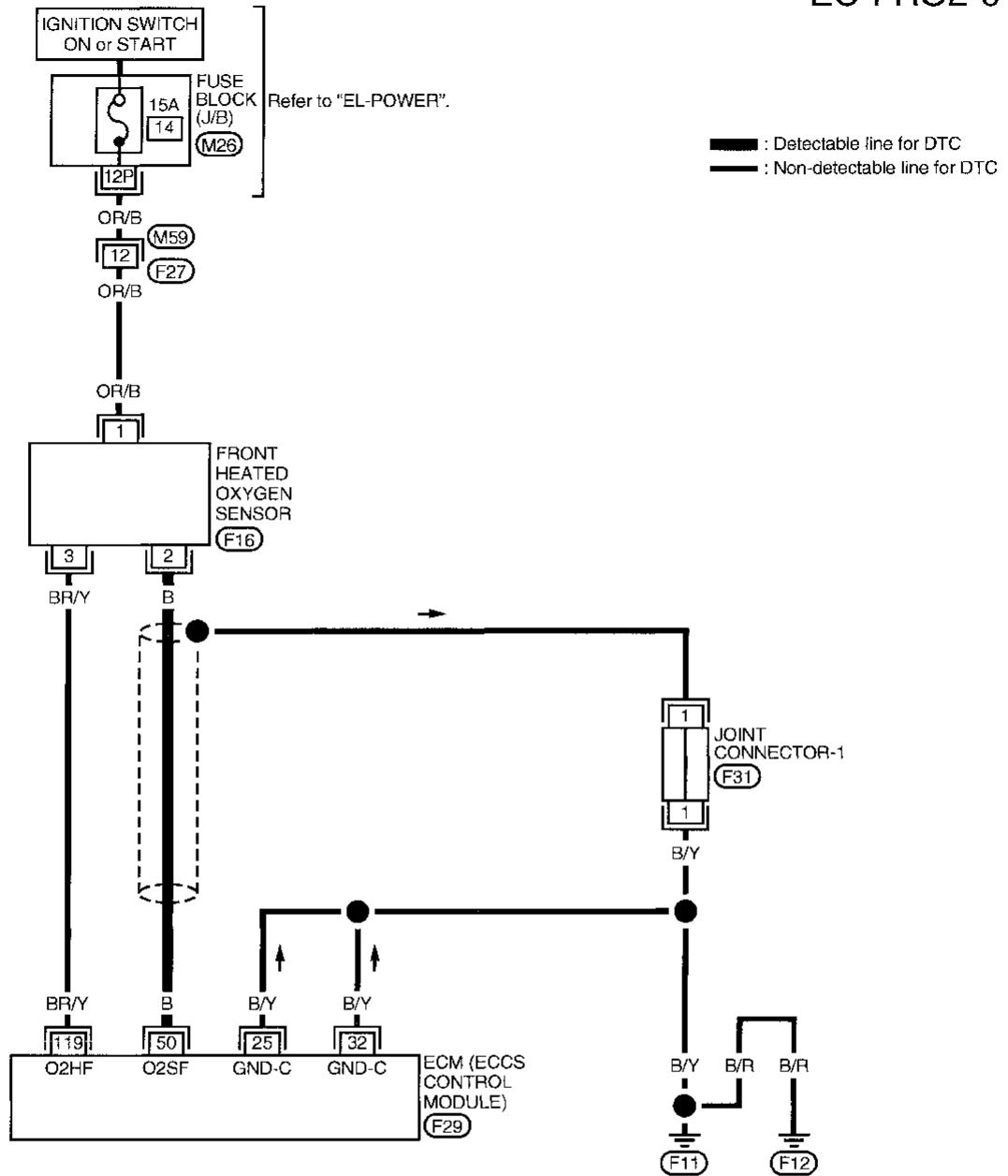


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑩ (sensor signal) and ③② (ECM ground).
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - The voltage does not remain in the range of 0.2 - 0.4V.

TROUBLE DIAGNOSIS FOR DTC P0130

Front Heated Oxygen Sensor (Circuit) (Front HO2S) (Cont'd)

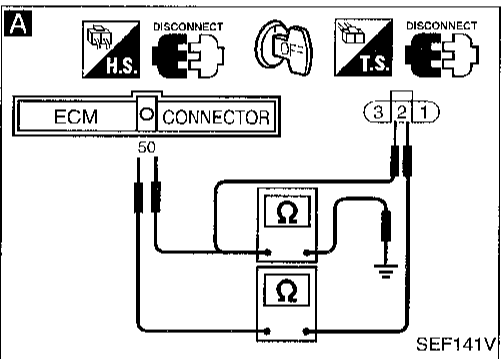
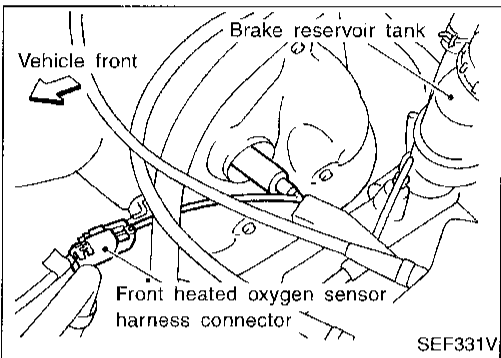
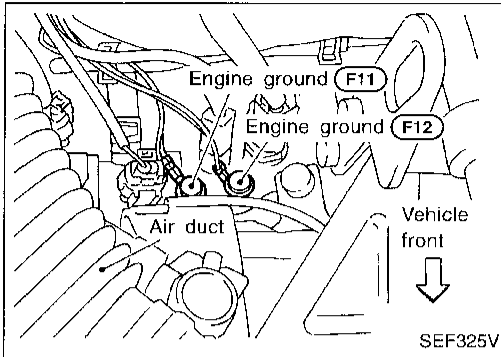
EC-FRO2-01



TROUBLE DIAGNOSIS FOR DTC P0130

Front Heated Oxygen Sensor (Circuit) (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal ⑤① and terminal ②.

Continuity should exist.

3. Check harness continuity between ECM terminal ⑤① (or terminal ②) and ground.

Continuity should not exist.

If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

CHECK COMPONENT
(Front heated oxygen sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace front heated oxygen sensor.

OK

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Remove joint connector-1.
3. Check the following.
 - Continuity between joint connector-1 terminal ① and ground
 - Joint connector-1 (Refer to "HARNES LAYOUT" in EL section.)

Continuity should exist.

If OK, check harness for short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0130

Front Heated Oxygen Sensor (Circuit) (Front HO2S) (Cont'd)

COMPONENT INSPECTION

Front heated oxygen sensor

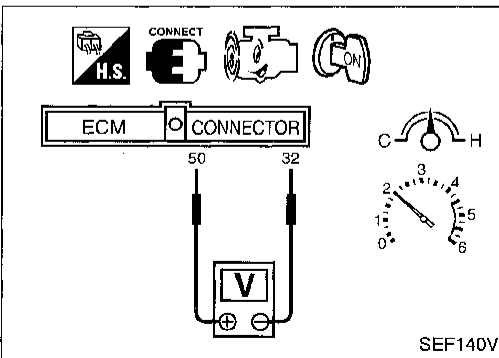
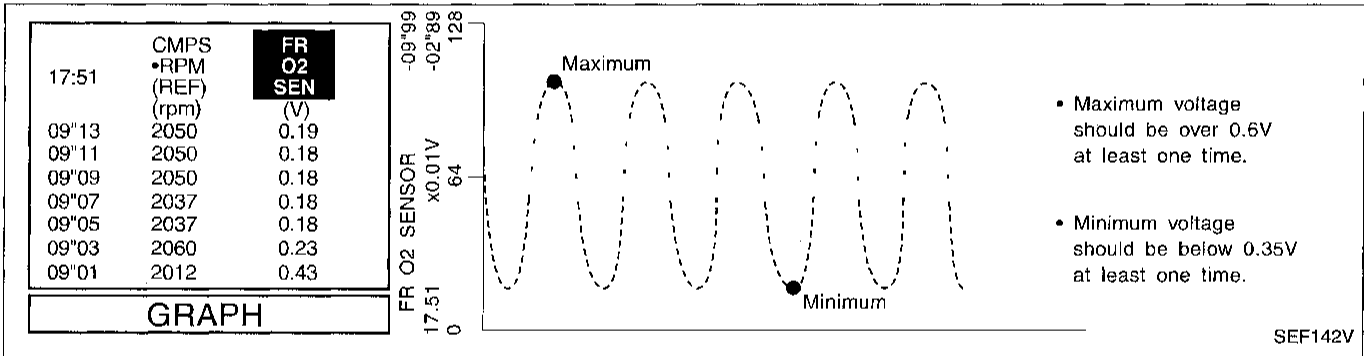
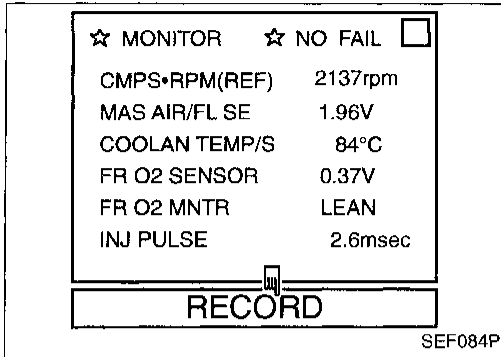


- 1) Start engine and warm it up to normal operating temperature.
 - 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
 - 3) Hold engine speed at 2,000 rpm under no load during the following steps.
 - 4) Touch "RECORD" on CONSULT screen.
 - 5) Check the following.
 - "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
- 5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |
FR O2 MNTR R-L-R-L-R-L-R-L-R-L-R

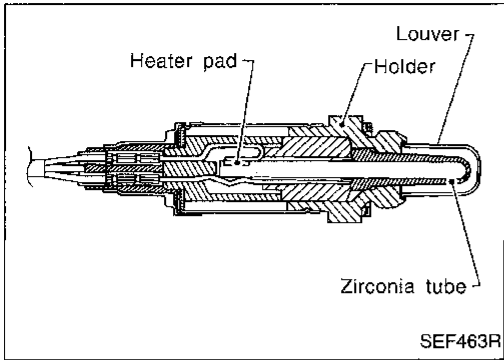
R = "FR O2 MNTR", "RICH"
L = "FR O2 MNTR", "LEAN"

- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.



- OR
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminals ⑤⑩ (sensor signal) and ③② (ECM ground).
 - 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0131

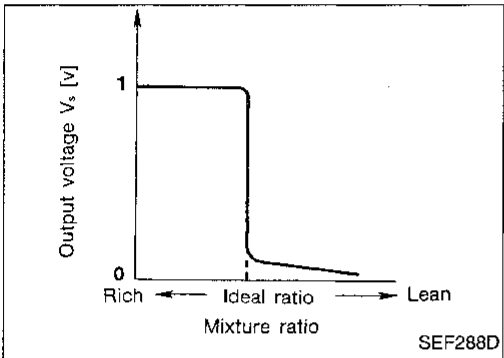


SEF463R

Front Heated Oxygen Sensor (Lean Shift Monitoring) (Front HO2S)

COMPONENT DESCRIPTION

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



SEF288D

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|-------------------------------------|---|--|
| FR O2 SENSOR FR O2 MNTR | ● Engine: After warming up Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V LEAN ↔ RICH Changes more than 5 times during 10 seconds. |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓢ (ECM ground).

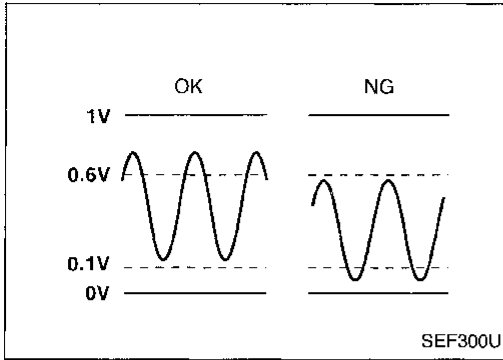
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------|---|---|
| 50 | B | Front heated oxygen sensor | Engine is running. After warming up to normal operating temperature and engine speed is 2,000 rpm. | 0 - Approximately 1.0V SEF201T |

TROUBLE DIAGNOSIS FOR DTC P0131

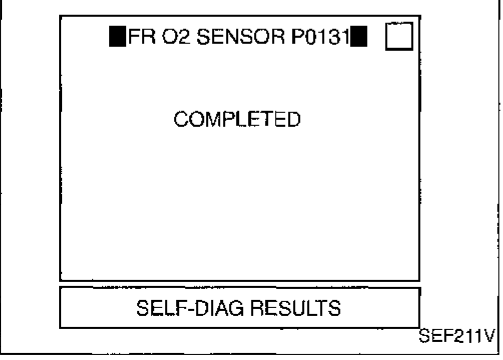
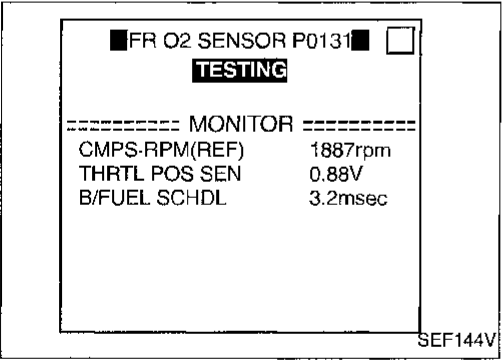
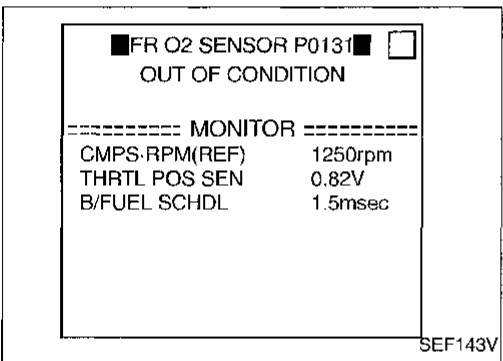
Front Heated Oxygen Sensor (Lean Shift Monitoring) (Front HO2S) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

To judge the malfunction, the output from the front heated oxygen sensor is monitored to determine whether the "rich" output is sufficiently high and whether the "lean" output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0131 0411 | <ul style="list-style-type: none"> The maximum and minimum voltages from the sensor are not reached to the specified voltages. | <ul style="list-style-type: none"> Front heated oxygen sensor Front heated oxygen sensor heater Fuel pressure Injectors Intake air leaks |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

- TESTING CONDITION:**
- Always perform at a temperature above -10°C (14°F).
 - Before performing the following procedure, confirm that battery voltage is in between 11V and 16V at idle.
 - Never raise engine speed above 3,000 rpm during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 5).

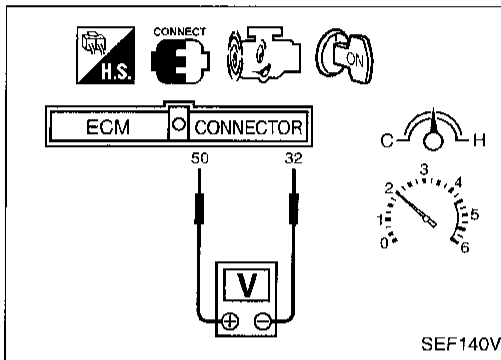
- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SENSOR P0131" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine and let it idle for at least 3 minutes.
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)
CMPS-RPM (REF): 1,700 - 3,000 rpm
Vehicle speed: 80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL: 1.1 - 4.8 ms
Selector lever: Suitable position

TROUBLE DIAGNOSIS FOR DTC P0131

Front Heated Oxygen Sensor (Lean Shift Monitoring) (Front HO2S) (Cont'd)

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-153.



OR OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

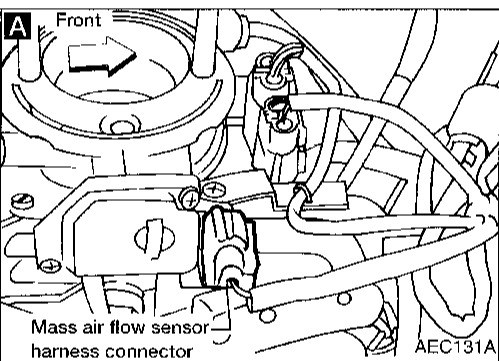
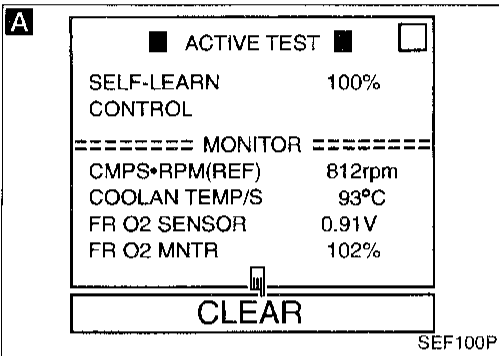
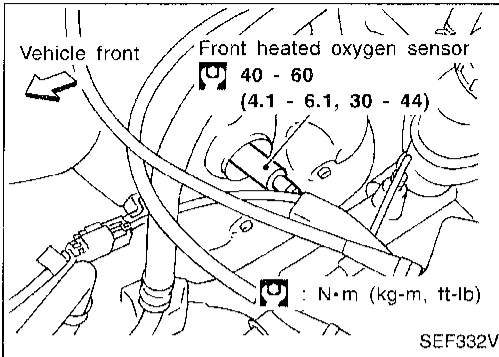


- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminals ⑤⑩ (sensor signal) and ③② (ECM ground).
 - 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - The maximum voltage is over 0.6V at least one time.
- OR
- The minimum voltage is over 0.1V at least one time.

TROUBLE DIAGNOSIS FOR DTC P0131

Front Heated Oxygen Sensor (Lean Shift Monitoring) (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten front heated oxygen sensor.
Tightening torque:
40 - 60 N·m
(4.1 - 6.1 kg-m, 30 - 44 ft-lb)

- A**
- CLEAR THE SELF-LEARNING DATA.**
1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0171 detected? Is it difficult to start engine?
- OR
2. Turn ignition switch "OFF".
 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
 4. Stop engine and reconnect mass air flow sensor harness connector.
 5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
 7. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC 0115 detected? Is it difficult to start engine?

Yes
Go to "TROUBLE DIAGNOSIS FOR DTC P0171", EC-208.

No

CHECK COMPONENT
(Front heated oxygen sensor heater). Refer to "COMPONENT INSPECTION" on next page.

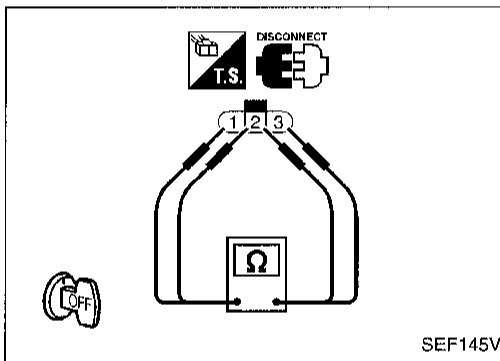
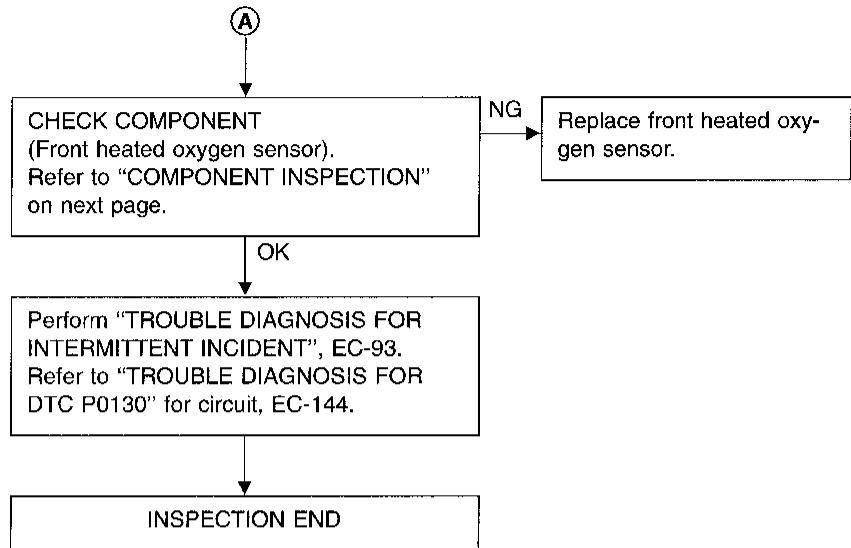
NG
Replace front heated oxygen sensor.

OK
A
(Go to next page.)

GI
MA
EM
LC
EC
FE
CL
MT
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX

TROUBLE DIAGNOSIS FOR DTC P0131

Front Heated Oxygen Sensor (Lean Shift Monitoring) (Front HO2S) (Cont'd)



COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

Check continuity between terminals ② and ①, ③ and ②.

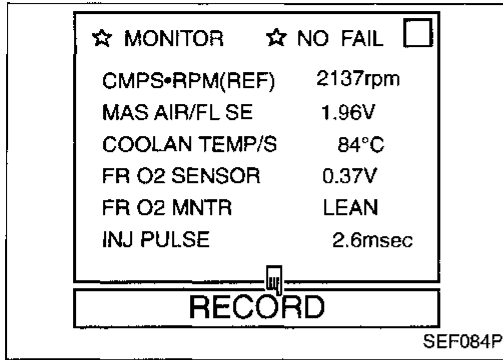
Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

Front Heated Oxygen Sensor (Lean Shift Monitoring) (Front HO2S) (Cont'd)



Front heated oxygen sensor

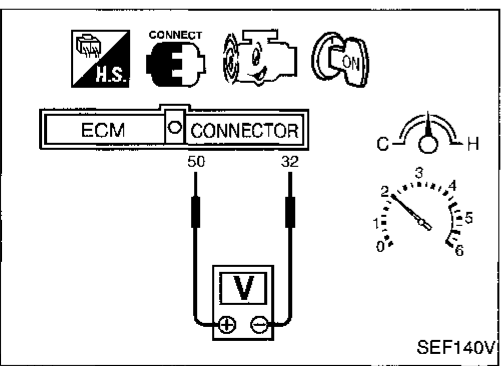
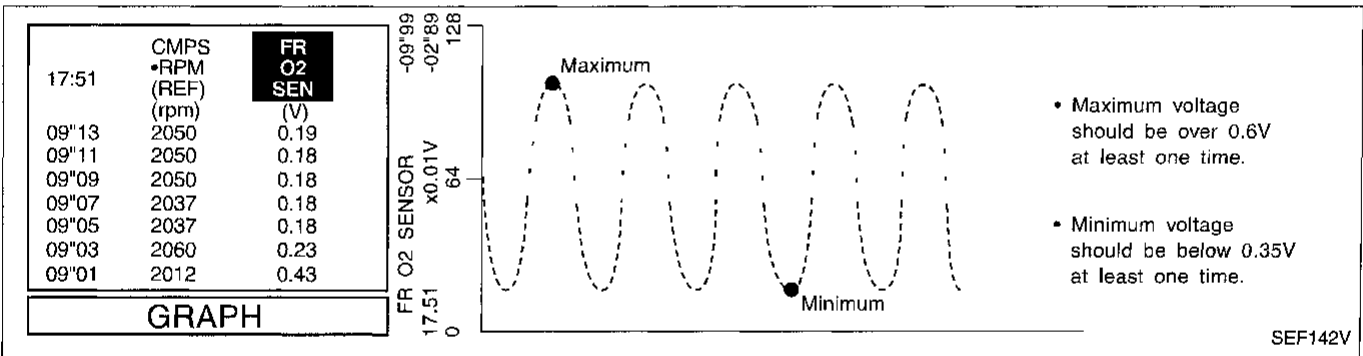
- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Check the following.
 - "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |
FR O2 MNTR R-L-R-L-R-L-R-L-R

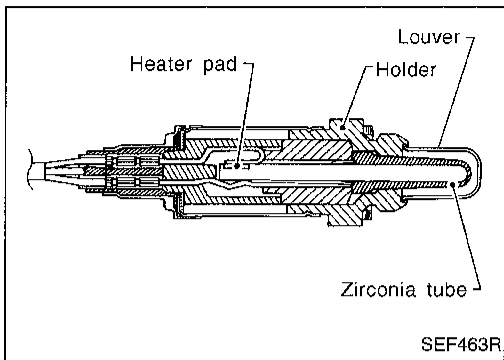
R = "FR O2 MNTR", "RICH"
L = "FR O2 MNTR", "LEAN"

- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.



OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑩ (sensor signal) and ③② (ECM ground).
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

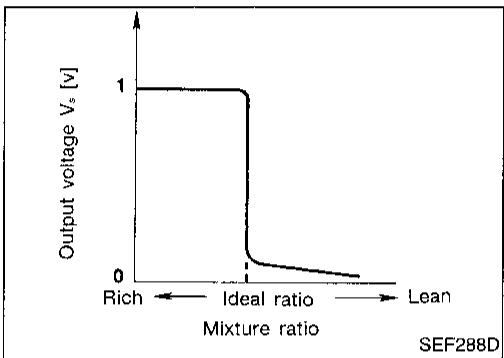


SEF463R

Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO2S)

COMPONENT DESCRIPTION

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



SEF288D

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|-------------------------------------|--|--|
| FR O2 SENSOR FR O2 MNTR | <ul style="list-style-type: none"> Engine: After warming up Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V LEAN ↔ RICH Changes more than 5 times during 10 seconds. |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------|---|----------------------------|
| 50 | B | Front heated oxygen sensor | Engine is running. After warming up to normal operating temperature and engine speed is 2,000 rpm. | 0 - Approximately 1.0V |

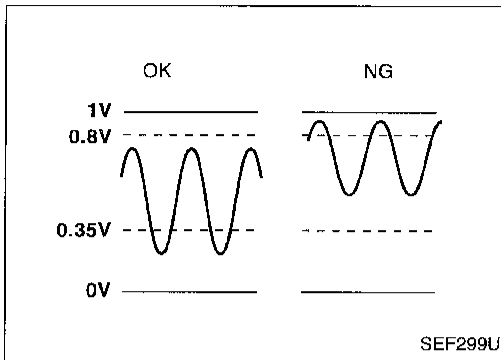
SEF201T

TROUBLE DIAGNOSIS FOR DTC P0132

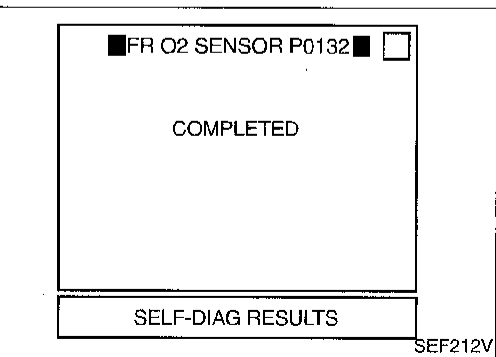
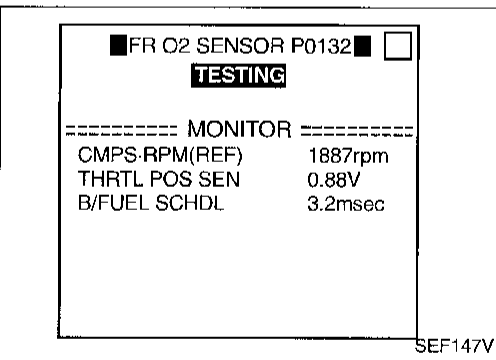
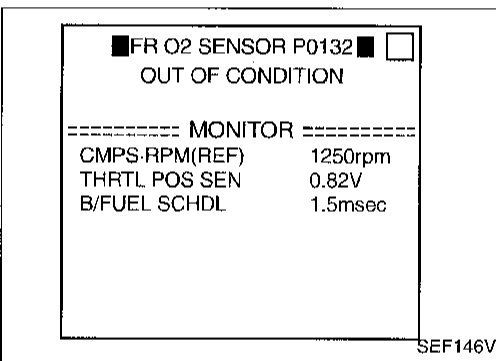
Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO2S) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

To judge the malfunction, the output from the front heated oxygen sensor is monitored to determine whether the "rich" output is sufficiently high. The "lean" output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0132 0410 | <ul style="list-style-type: none"> The maximum and minimum voltages from the sensor are beyond the specified voltages. | <ul style="list-style-type: none"> Front heated oxygen sensor Front heated oxygen sensor heater Fuel pressure Injectors |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Always perform at a temperature above -10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is in between 11V and 16V at idle.
- Never raise engine speed above 3,000 rpm during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 5).



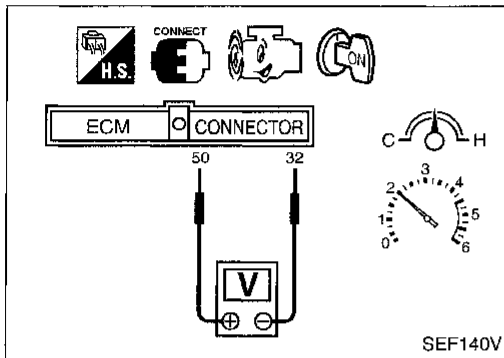
- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SENSOR P0132" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine and let it idle for at least 3 minutes.
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)
CMPS-RPM (REF): 1,700 - 3,000 rpm
Vehicle speed: 80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL: 1.1 - 4.8 ms
Selector lever: Suitable position

TROUBLE DIAGNOSIS FOR DTC P0132

Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO2S) (Cont'd)

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-159.



OR OVERALL FUNCTION CHECK

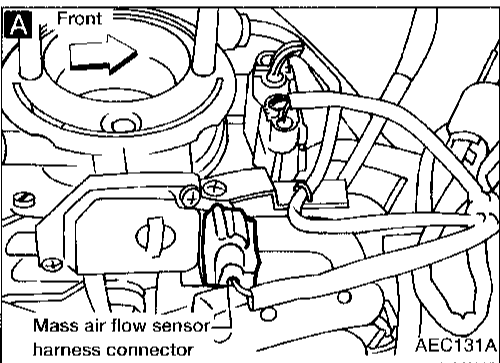
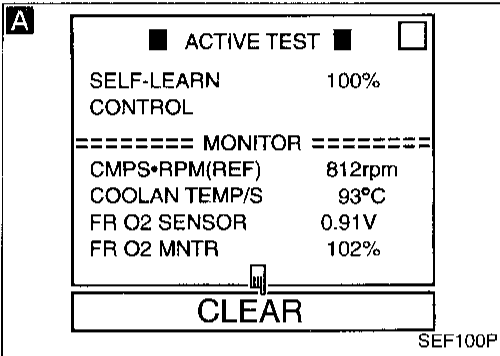
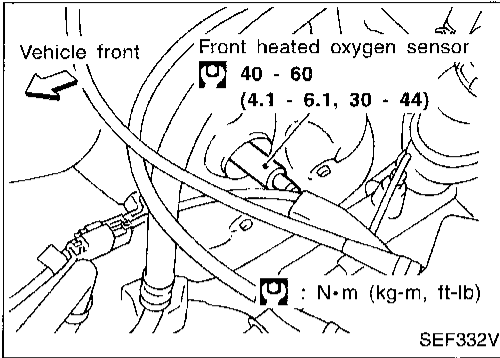
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminals ⑤⑩ (sensor signal) and ③② (ECM ground).
 - 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - The maximum voltage is below 0.8V at least one time.
- OR
- The minimum voltage is below 0.35V at least one time.

TROUBLE DIAGNOSIS FOR DTC P0132

Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
 2. Loosen and retighten front heated oxygen sensor.
- Tightening torque:**
40 - 60 N·m
(4.1 - 6.1 kg-m, 30 - 44 ft-lb)

A

CLEAR THE SELF-LEARNING DATA

1. Start engine and warm it up to normal operating temperature.
2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0172", EC-213.

OR

2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC 0114 detected? Is it difficult to start engine?

No

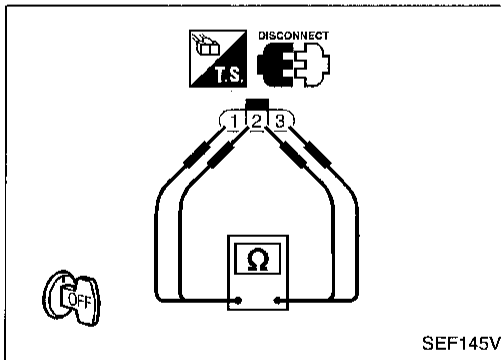
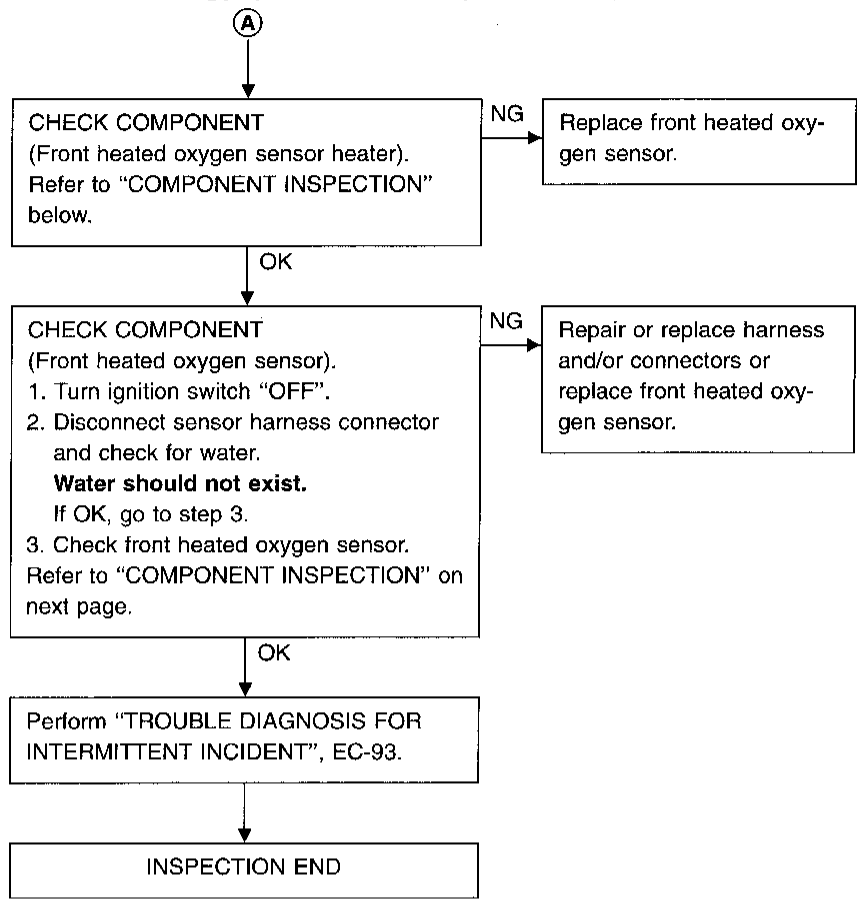


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TROUBLE DIAGNOSIS FOR DTC P0132

Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO₂S) (Cont'd)



COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

Check continuity between terminals ② and ①, ③ and ②.

Continuity should not exist.

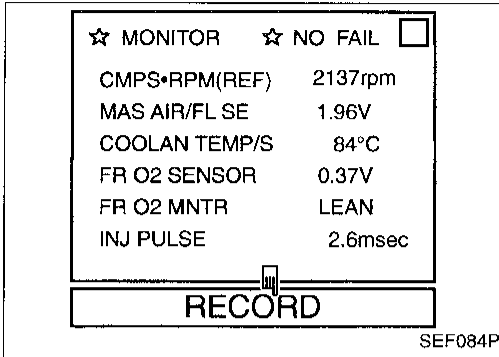
If NG, replace the front heated oxygen sensor.

CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

TROUBLE DIAGNOSIS FOR DTC P0132

Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO2S) (Cont'd)



Front heated oxygen sensor

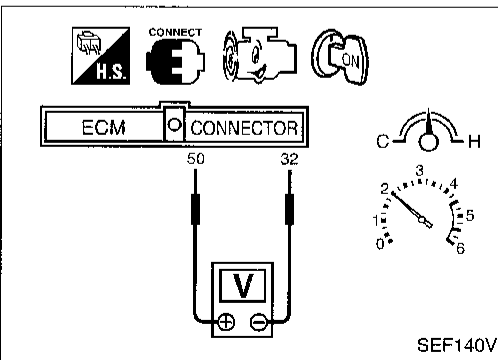
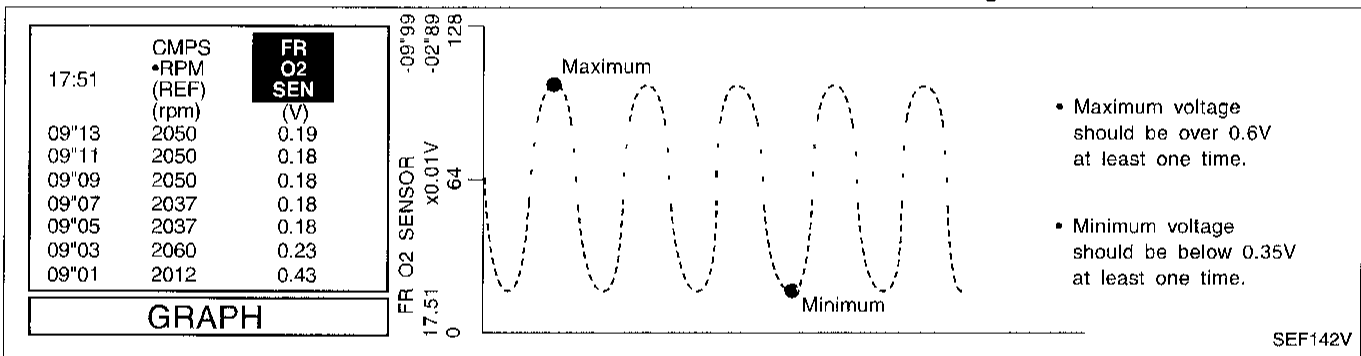
- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Check the following.
 - "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

5 times (cycles) are counted as shown below:

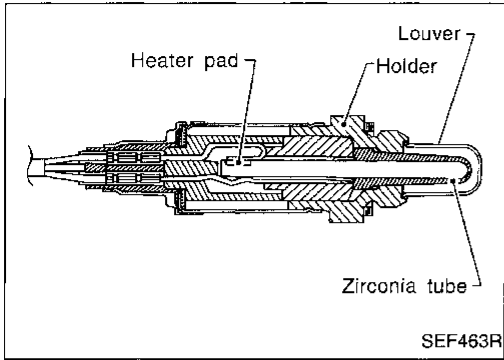
cycle | 1 | 2 | 3 | 4 | 5 |
FR O2 MNTR R-L-R-L-R-L-R-L-R

R = "FR O2 MNTR", "RICH"
L = "FR O2 MNTR", "LEAN"

- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.



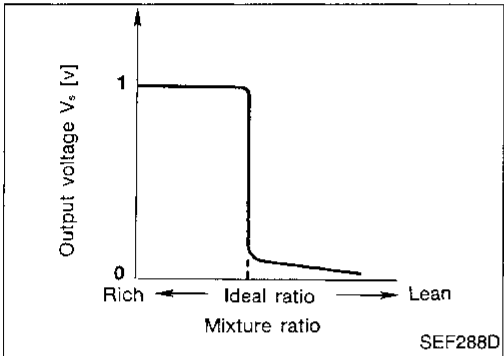
- OR
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminals ⑤① (sensor signal) and ③② (ECM ground).
 - 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.



Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S)

COMPONENT DESCRIPTION

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



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|-------------------------------------|--|--|
| FR O2 SENSOR FR O2 MNTR | <ul style="list-style-type: none"> ● Engine: After warming up Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V LEAN ↔ RICH Changes more than 5 times during 10 seconds. |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

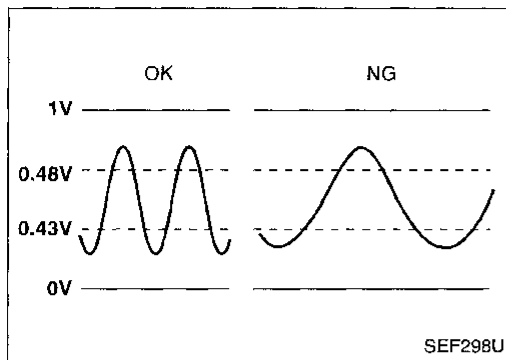
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------|---|----------------------------|
| 50 | B | Front heated oxygen sensor | Engine is running. After warming up to normal operating temperature and engine speed is 2,000 rpm. | 0 - Approximately 1.0V |

TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

To judge the malfunction of front heated oxygen sensor, this diagnosis measures front heated oxygen sensor cycling time. The time is compensated by engine operating (speed and load), fuel feedback control constant, and front heated oxygen sensor temperature index. Judgment is based on whether the compensated time (front heated oxygen sensor cycling time index) is inordinately long or not.



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P0133 0409 | <ul style="list-style-type: none"> The cycle of the voltage signal from the sensor is more than the specified time. | <ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Front heated oxygen sensor Front heated oxygen sensor heater Fuel pressure Injectors Intake air leaks Exhaust gas leaks PCV Mass air flow sensor |

■ FR O2 SENSOR P0133 ■

OUT OF CONDITION

===== MONITOR =====

CMPS-RPM(REF) 1250rpm
 THRTL POS SEN 0.82V
 B/FUEL SCHDL 1.5msec

SEF148V

■ FR O2 SENSOR P0133 ■

TESTING

===== MONITOR =====

CMPS-RPM(REF) 1887rpm
 THRTL POS SEN 0.88V
 B/FUEL SCHDL 3.2msec

SEF149V

■ FR O2 SENSOR P0133 ■

COMPLETED

SELF-DIAG RESULTS

SEF213V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Always perform at a temperature above -10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is between 11V and 16V at idle.
- Never raise engine speed above 3,000 rpm during the "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE". If the engine speed limit is exceeded, retry the procedure from step 5).



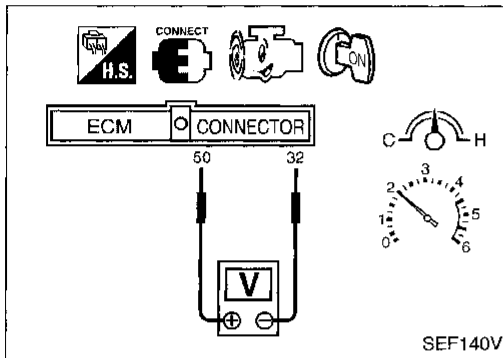
- Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 SENSOR P0133" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine and let it idle for at least 3 minutes.
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 20 seconds or more.)
CMPS-RPM (REF): 1,700 - 3,000 rpm
Vehicle speed: 80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL: 1.1 - 4.8 ms
Selector lever: Suitable position

TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-166.



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

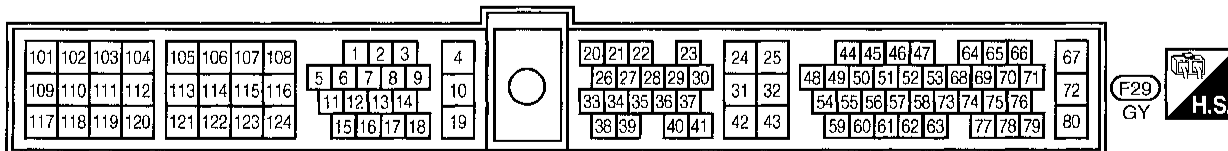
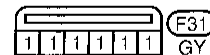
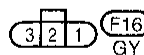
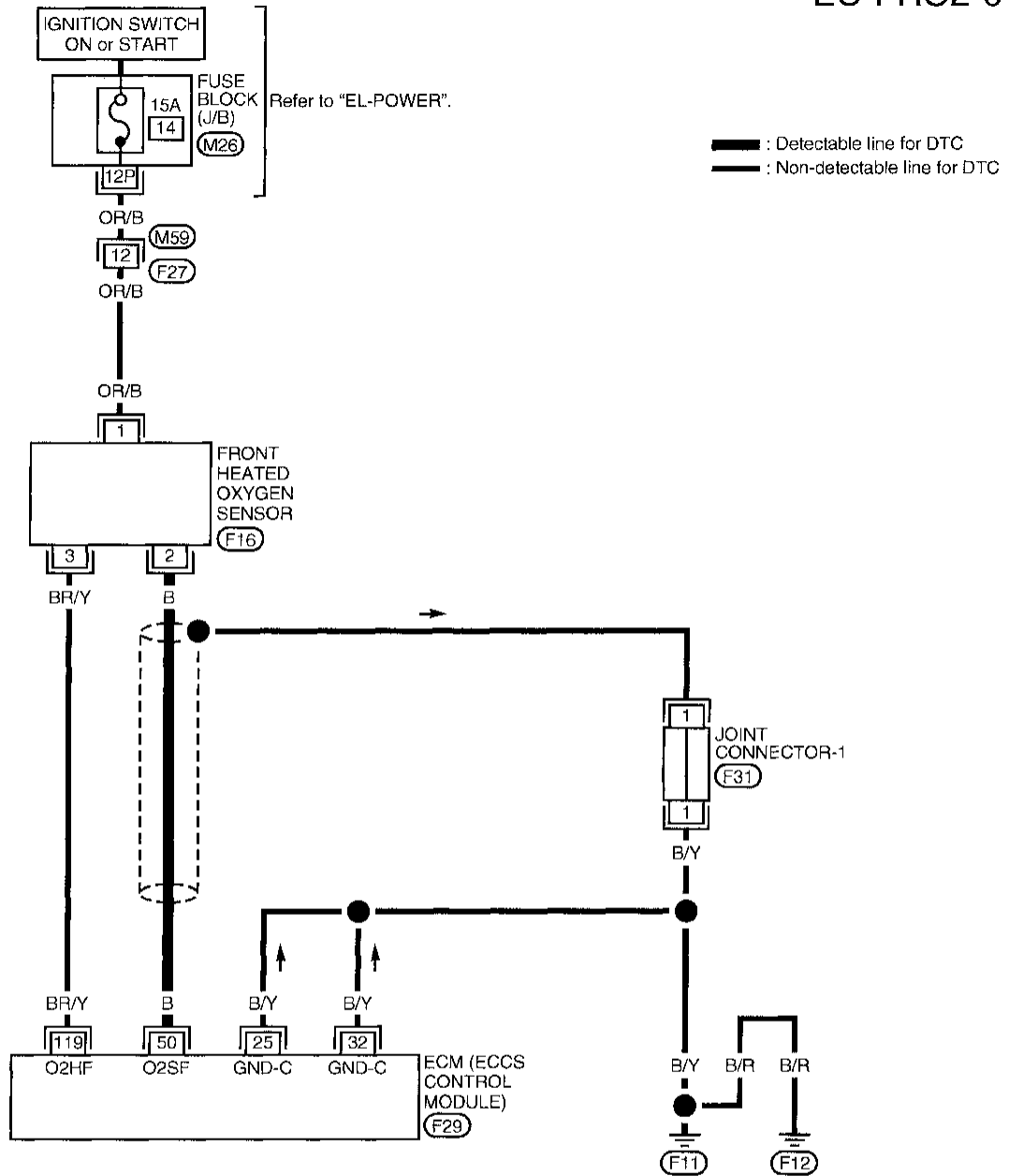


- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑩ (sensor signal) and ③② (ECM ground).
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).

TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)

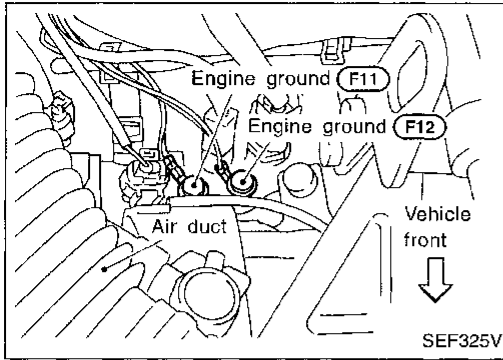
EC-FRO2-01



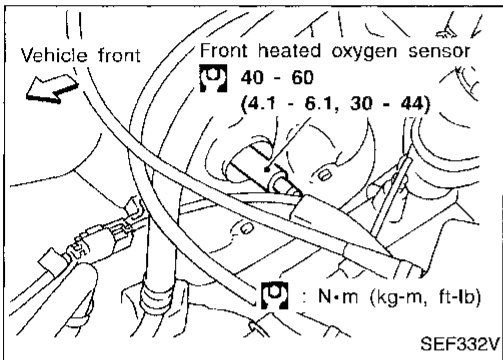
TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)

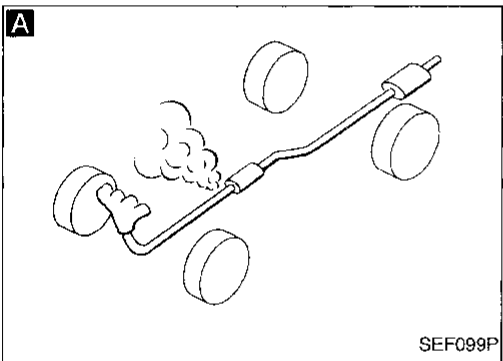
DIAGNOSTIC PROCEDURE



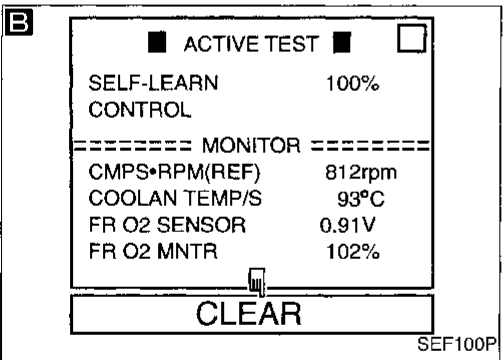
SEF325V



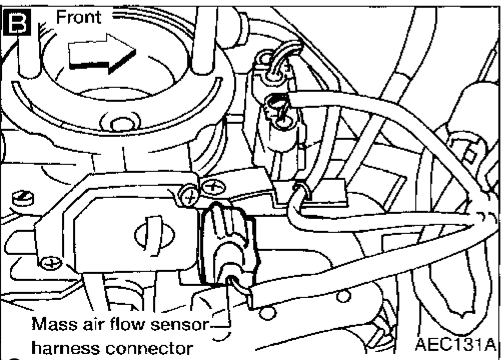
SEF332V



SEF099P



SEF100P



AEC131A

INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

Loosen and retighten front heated oxygen sensor.
Tightening torque:
 40 - 60 N·m
 (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

A
CHECK EXHAUST AIR LEAK.
 Start engine and run it at idle. Listen for an exhaust air leak before three way catalyst.

NG

Repair or replace.

OK

CHECK FOR INTAKE AIR LEAK.
 Start engine and run it at idle. Listen for an intake air leak between the mass air flow sensor and the intake manifold.

NG

Repair or replace.

OK

B
CLEAR THE SELF-LEARNING DATA.
 1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

Yes

Go to "TROUBLE DIAGNOSIS FOR DTC P0171", EC-208 or "TROUBLE DIAGNOSIS FOR DTC P0172", EC-213.

OR

2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
Is the 1st trip DTC 0115 or 0114 detected? Is it difficult to start engine?

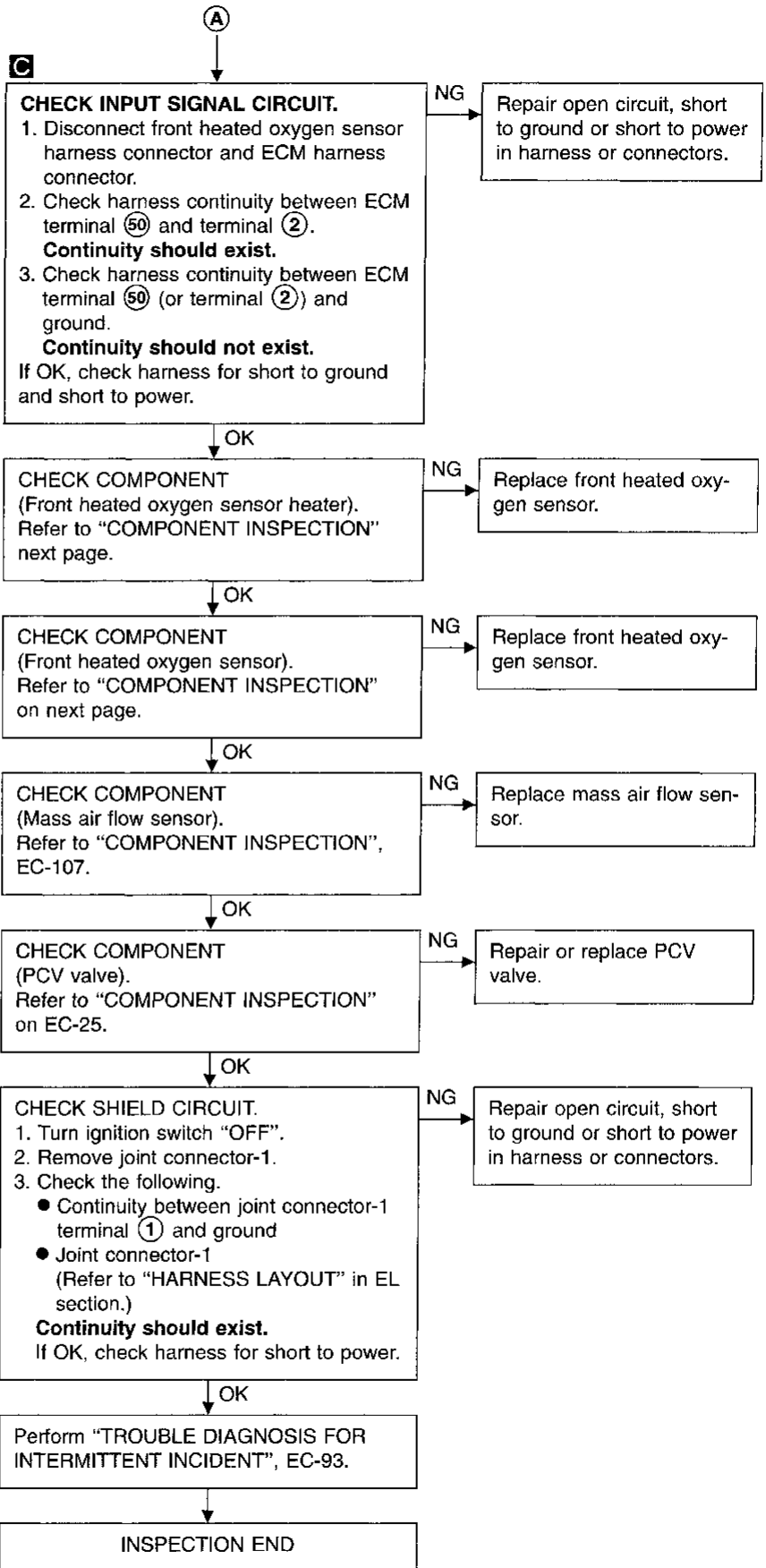
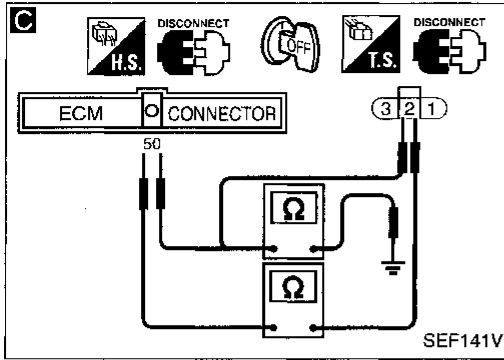
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TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)

COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

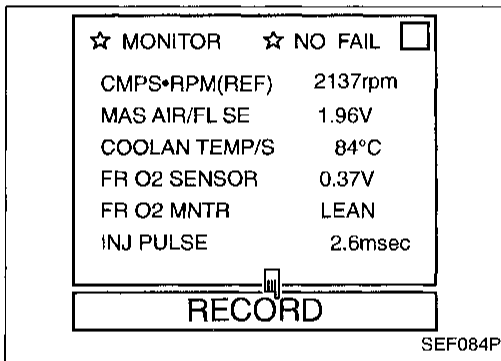
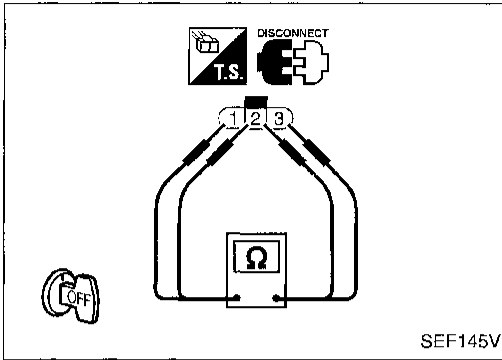
Check continuity between terminals ② and ①, ③ and ②.

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



Front heated oxygen sensor



- 1) Start engine and warm it up to normal operating temperature.
 - 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
 - 3) Hold engine speed at 2,000 rpm under no load during the following steps.
 - 4) Touch "RECORD" on CONSULT screen.
 - 5) Check the following.
 - "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
- 5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |
FR O2 MNTR R-L-R-L-R-L-R-L-R

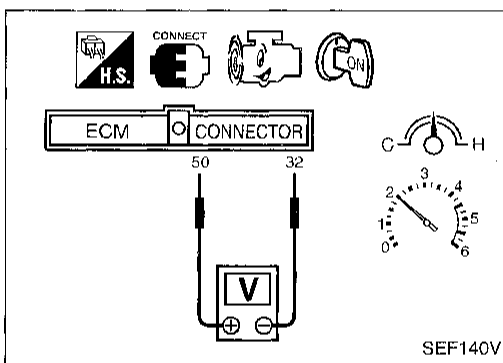
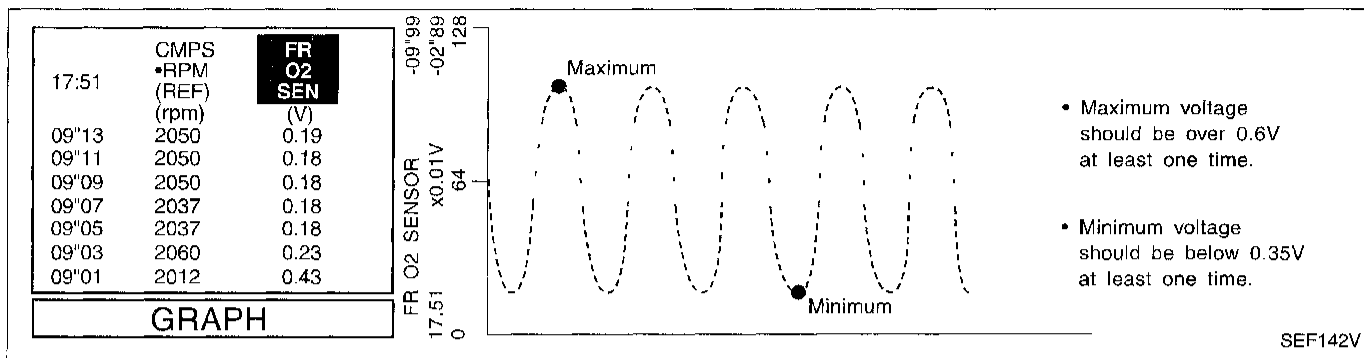
R = "FR O2 MNTR", "RICH"

L = "FR O2 MNTR", "LEAN"

- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.

TROUBLE DIAGNOSIS FOR DTC P0133

Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)



OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals 50 (sensor signal) and 32 (ECM ground).
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

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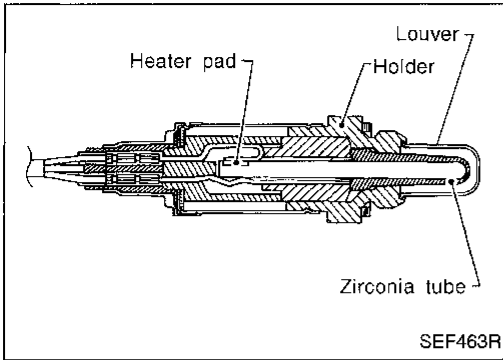
RS

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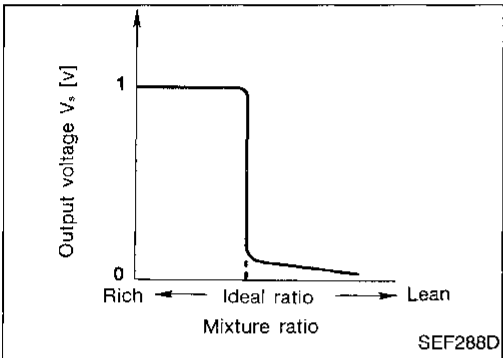
IDX



Front Heated Oxygen Sensor (High Voltage) (Front HO2S)

COMPONENT DESCRIPTION

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



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|-------------------------------------|--|--|
| FR O2 SENSOR FR O2 MNTR | <ul style="list-style-type: none"> Engine: After warming up Maintaining engine speed at 2,000 rpm | 0 - 0.3V ↔ Approx. 0.6 - 1.0V LEAN ↔ RICH Changes more than 5 times during 10 seconds. |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

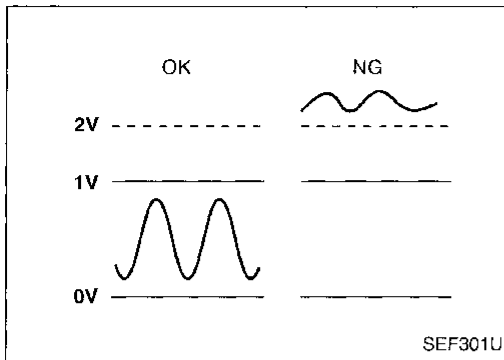
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------|---|----------------------------|
| 50 | B | Front heated oxygen sensor | Engine is running. After warming up to normal operating temperature and engine speed is 2,000 rpm. | 0 - Approximately 1.0V |

TROUBLE DIAGNOSIS FOR DTC P0134

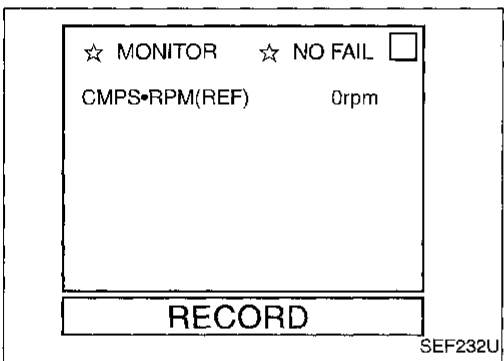
Front Heated Oxygen Sensor (High Voltage) (Front HO2S) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

To judge the malfunction, the diagnosis checks that the front heated oxygen sensor output is not inordinately high.



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0134 0412 | <ul style="list-style-type: none"> An excessively high voltage from the sensor is sent to ECM. | <ul style="list-style-type: none"> Harness or connectors (The sensor circuit is open or shorted.) Front heated oxygen sensor |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

- 1) Turn ignition switch "ON".
 2) Select "DATA MONITOR" mode with CONSULT and wait at least 5 seconds.

OR

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
 2) Select "MODE 3" with GST.

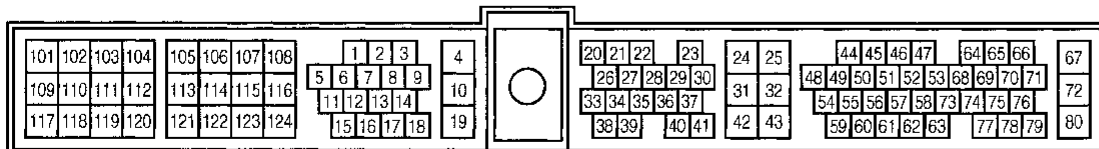
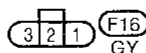
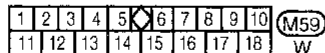
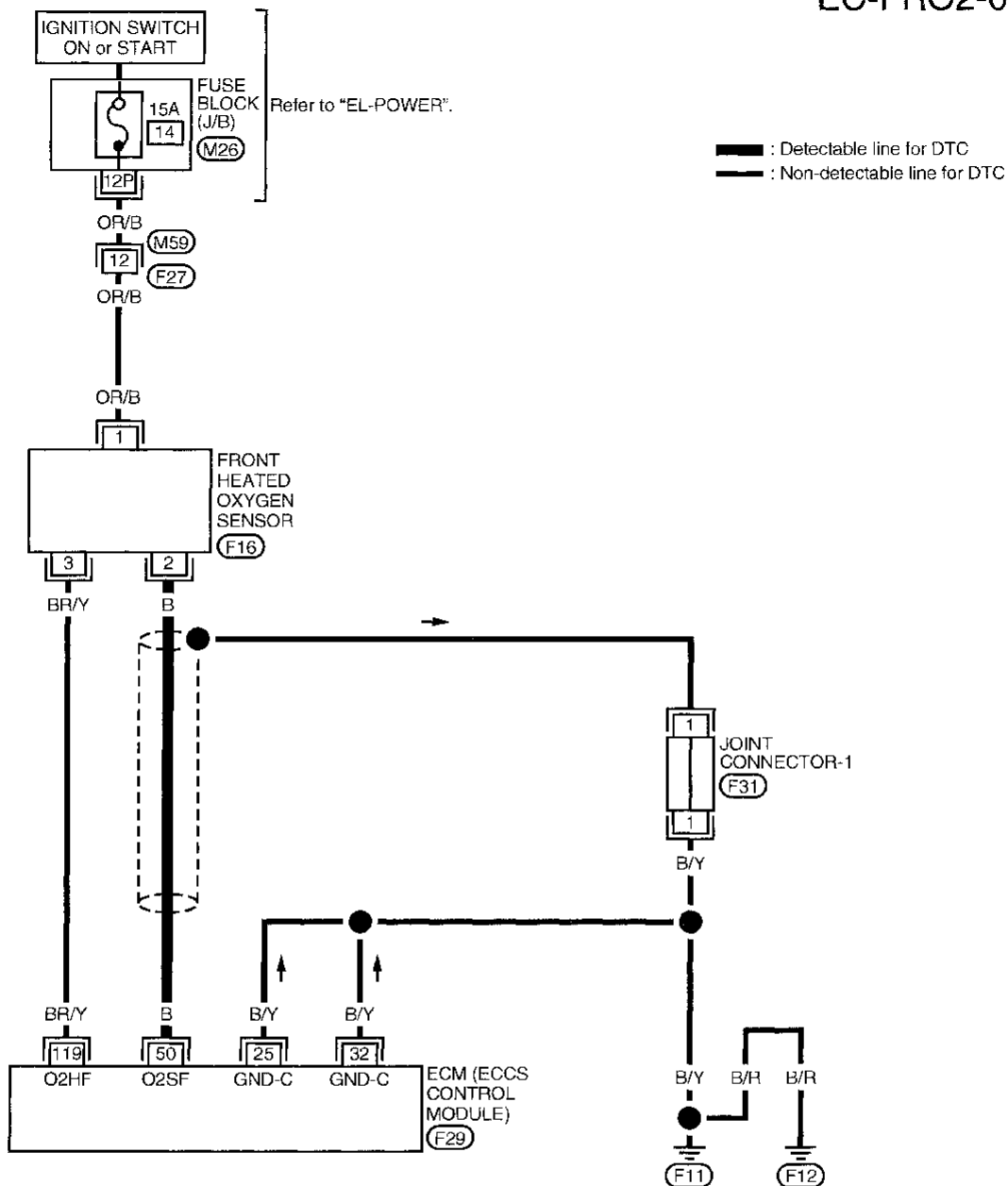
OR

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

TROUBLE DIAGNOSIS FOR DTC P0134

Front Heated Oxygen Sensor (High Voltage) (Front HO2S) (Cont'd)

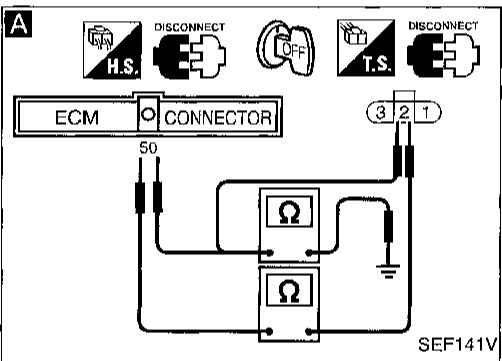
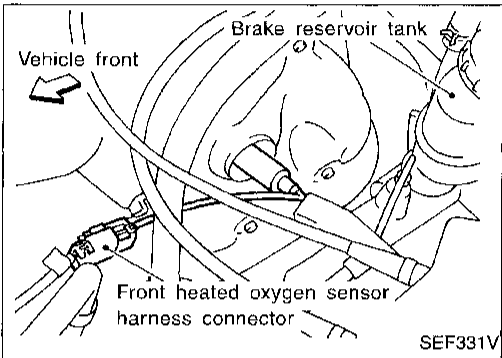
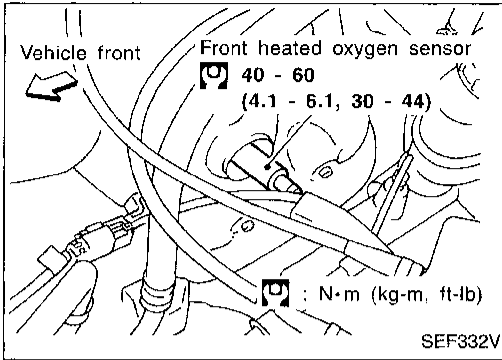
EC-FRO2-01



TROUBLE DIAGNOSIS FOR DTC P0134

Front Heated Oxygen Sensor (High Voltage) (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
 2. Loosen and retighten front heated oxygen sensor.
- Tightening torque:**
40 - 60 N·m
(4.1 - 6.1 kg-m, 30 - 44 ft-lb)

A

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal 50 and terminal 2.

Continuity should exist.

3. Check harness continuity between ECM terminal 50 (or terminal 2) and ground.

Continuity should not exist.

If OK, check harness for short to ground and short to power.

NG

Repair open circuit, short to ground or short to power in harness or connectors.

OK

CHECK COMPONENT
(Front heated oxygen sensor).

1. Turn ignition switch "OFF".
2. Disconnect sensor harness connector and check for water.

Water should not exist.

If OK, go to step 3.

3. Check front heated oxygen sensor. Refer to "COMPONENT INSPECTION" on next page.

NG

Repair or replace harness and/or connectors or replace front heated oxygen sensor.

OK

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Remove joint connector-1.
3. Check the following.
 - Continuity between joint connector-1 terminal 1 and ground
 - Joint connector-1 (Refer to "HARNESS LAYOUT" in EL section.)

Continuity should exist.

If OK, check harness for short to power.

NG

Repair open circuit, short to ground or short to power in harness or connectors.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P0134

Front Heated Oxygen Sensor (High Voltage) (Front HO2S) (Cont'd)

COMPONENT INSPECTION

Front heated oxygen sensor

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- 5) Check the following.
 - "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

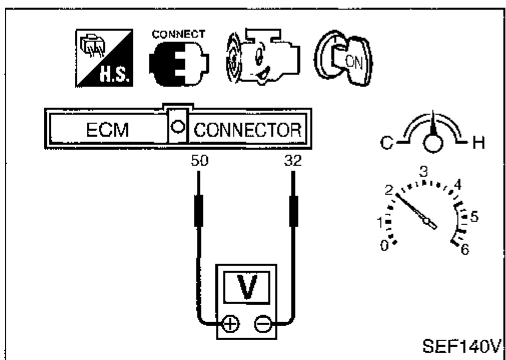
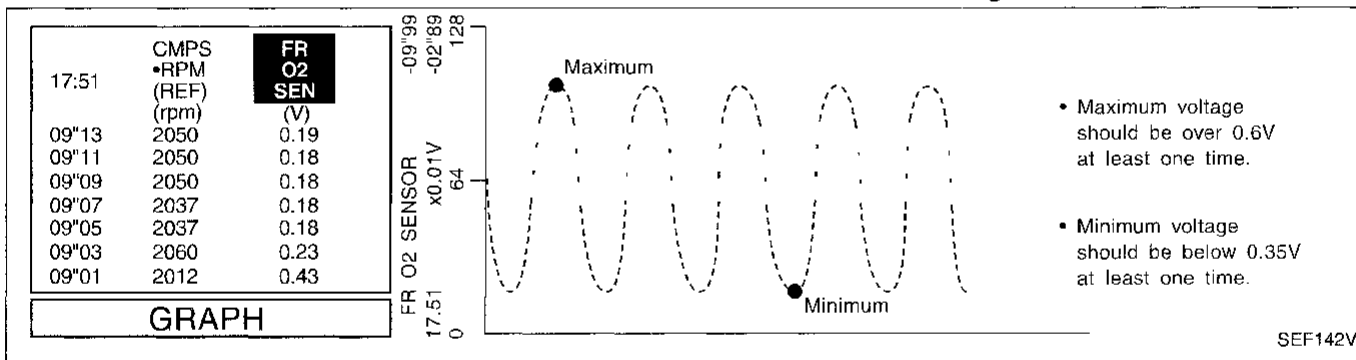
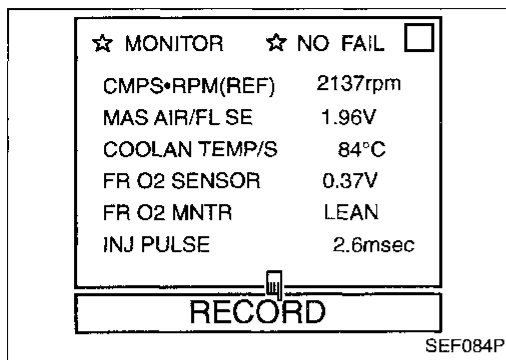
5 times (cycles) are counted as shown below:

cycle | 1 | 2 | 3 | 4 | 5 |
FR O2 MNTR R-L-R-L-R-L-R-L-R-L-R

R = "FR O2 MNTR", "RICH"

L = "FR O2 MNTR", "LEAN"

- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.

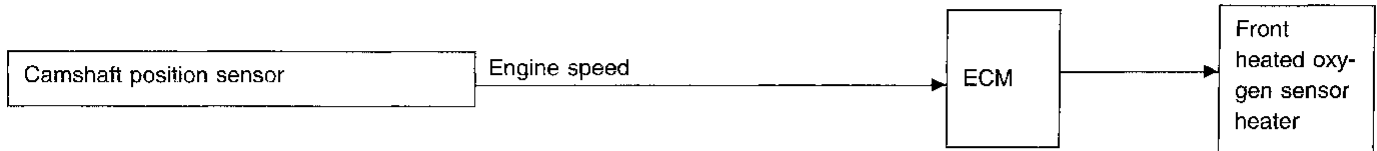


OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤① (sensor signal) and ③② (ECM ground).
- 3) Check the following with engine speed held at 2,000 rpm constant under no load.
 - Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
 - The maximum voltage is over 0.6V at least one time.
 - The minimum voltage is below 0.35V at least one time.
 - The voltage never exceeds 1.0V.

Front Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

OPERATION

| Engine speed rpm | Front heated oxygen sensor heater |
|---|-----------------------------------|
| Above 3,000 rpm (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models) | OFF |
| Below 3,000 rpm (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only) | ON |

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|--|---------------|
| FR O2 HEATER | <ul style="list-style-type: none"> Engine speed: Below 3,000 rpm (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only) | ON |
| | <ul style="list-style-type: none"> Engine speed: Above 3,000 rpm (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models) | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------------------------|--|----------------------------|
| 119 | BR/Y | Front heated oxygen sensor heater | Engine is running. Engine speed is below 3,000 rpm. (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only) | Approximately 0.4V |
| | | | Engine is running. Engine speed is above 3,000 rpm. (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models) | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0135 0901 | <ul style="list-style-type: none"> The current amperage in the front heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.) | <ul style="list-style-type: none"> Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) Front heated oxygen sensor heater |

TROUBLE DIAGNOSIS FOR DTC P0135

Front Heated Oxygen Sensor Heater (Cont'd)

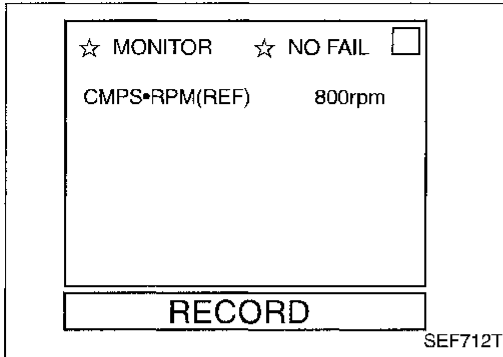
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is in between 10.5V and 16V at idle.



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 6 seconds at idle speed.

OR



- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and run it for at least 5 seconds at idle speed.
- 4) Select "MODE 3" with GST.

OR



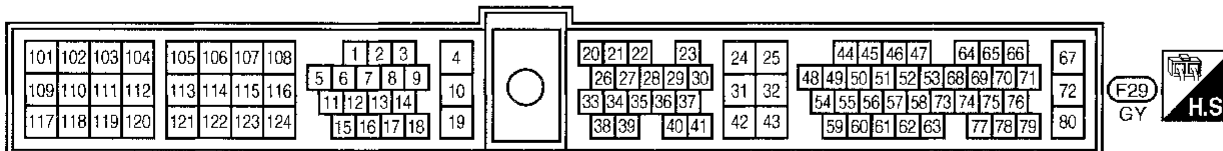
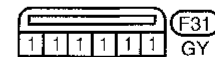
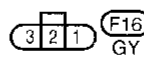
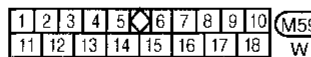
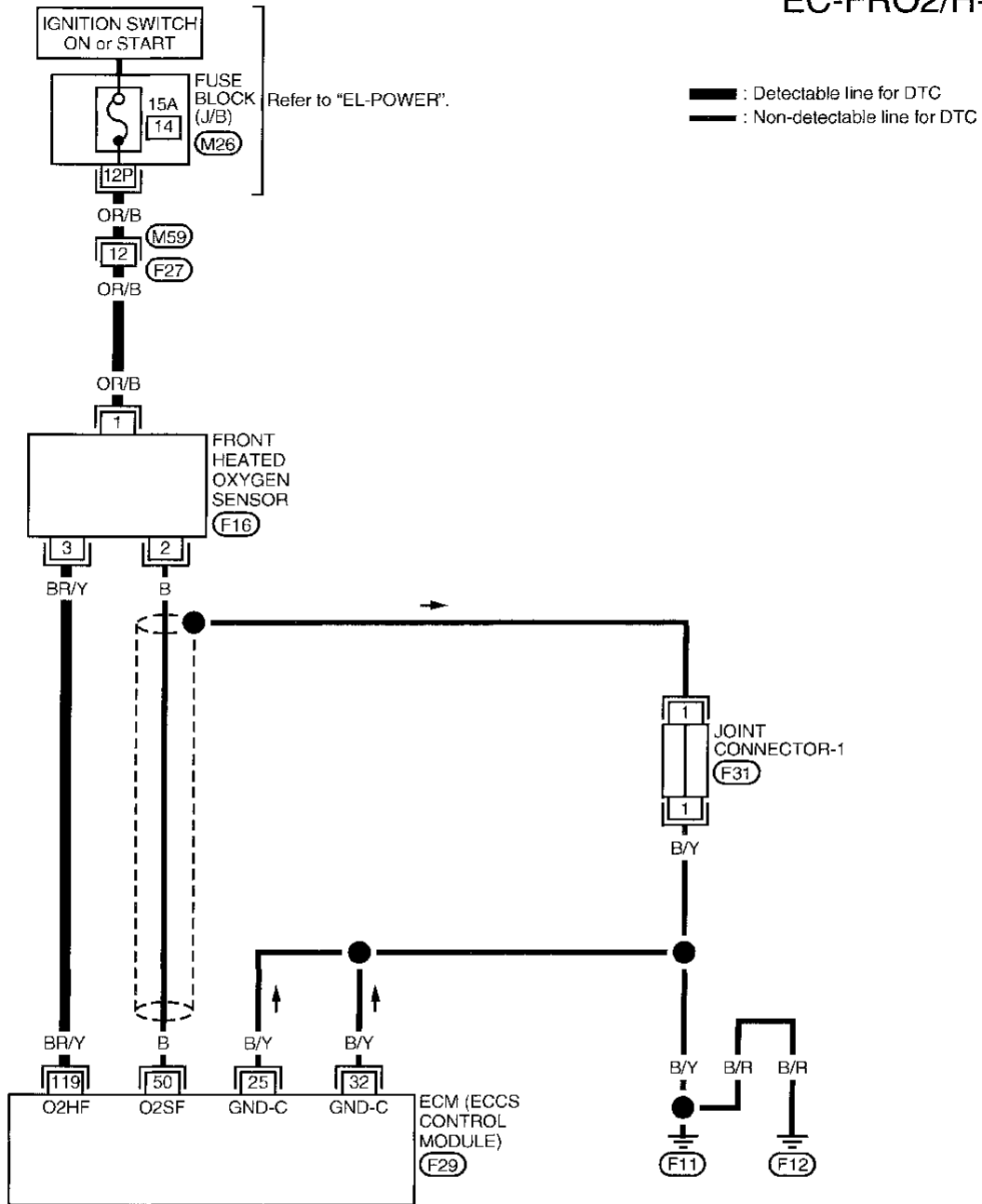
- 1) Start engine and run it for at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

- When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

TROUBLE DIAGNOSIS FOR DTC P0135

Front Heated Oxygen Sensor Heater (Cont'd)

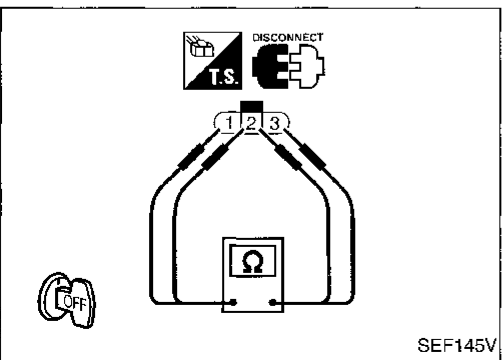
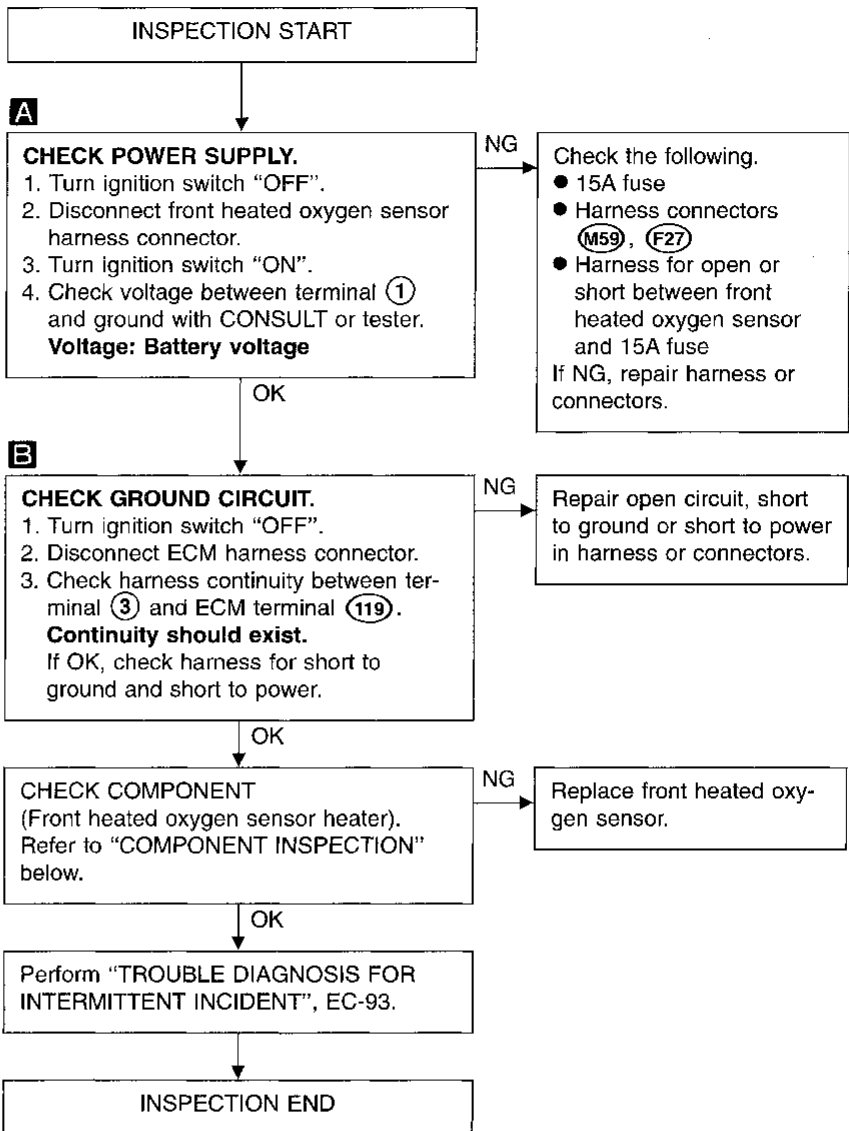
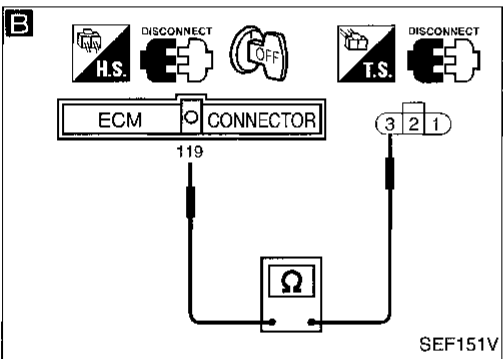
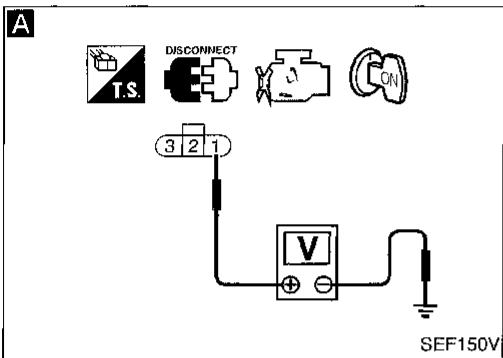
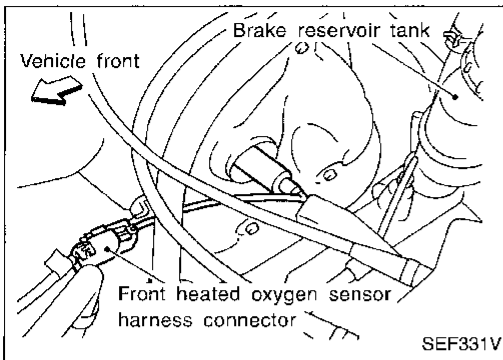
EC-FRO2/H-01



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TROUBLE DIAGNOSIS FOR DTC P0135

Front Heated Oxygen Sensor Heater (Cont'd) DIAGNOSTIC PROCEDURE



COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

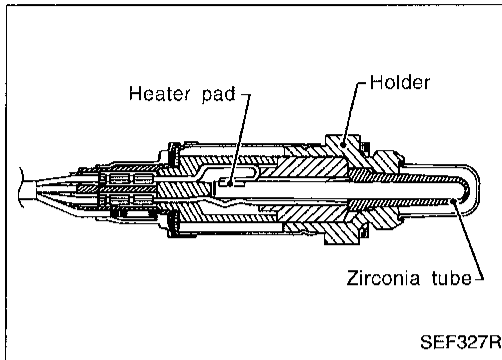
Check continuity between terminals ② and ①, ③ and ②.

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

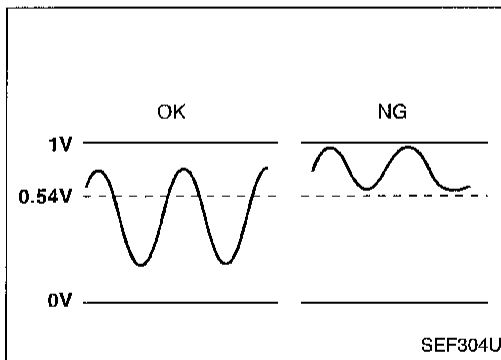
Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|--------------|----------------------------|---|-------------------------------|
| RR O2 SENSOR | ● Engine: After warming up | Revving engine from idle to 3,000 rpm quickly | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| RR O2 MNTR | | | LEAN ↔ RICH |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------|--|------------------------|
| 56 | OR | Rear heated oxygen sensor | Engine is running. After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly | 0 - Approximately 1.0V |



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge malfunctions of the rear heated oxygen sensor, ECM monitors whether the minimum voltage of the sensor is sufficiently low during various driving conditions such as fuel-cut.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P0137 0511 | ● The minimum voltage from the sensor has not reached the specified voltage. | ● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors |

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- "COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Never stop engine during this test. If the engine is stopped, reperform this test from step 2).
- Always perform at a temperature above -10°C (14°F).



Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SENSOR P0137" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 10 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
If "COMPLETED" appears on CONSULT screen, go to step 10).
If "COMPLETED" does not appear on CONSULT screen, go to the following step.
- 7) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds.)

CMPS-RPM (REF): 1,400 - 3,000 rpm

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 1 - 4.8 ms

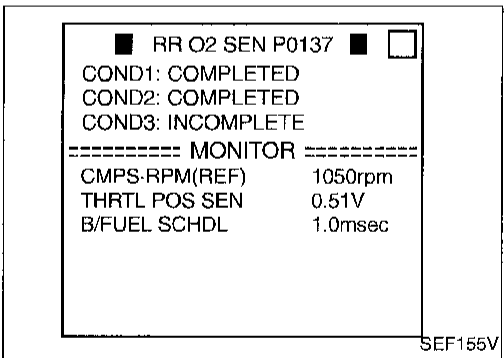
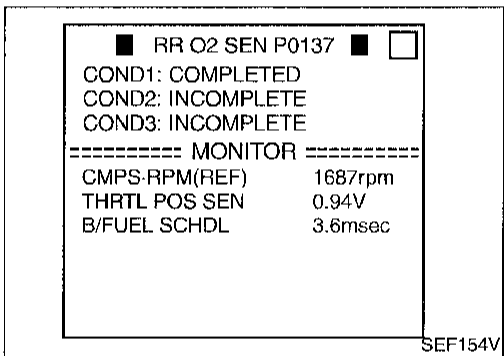
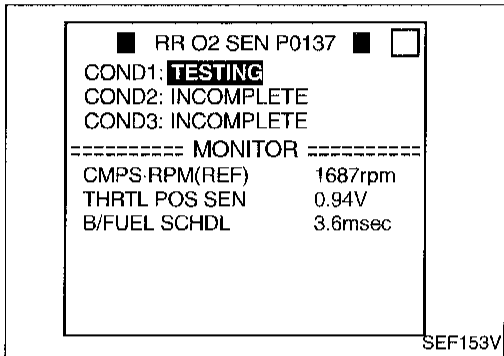
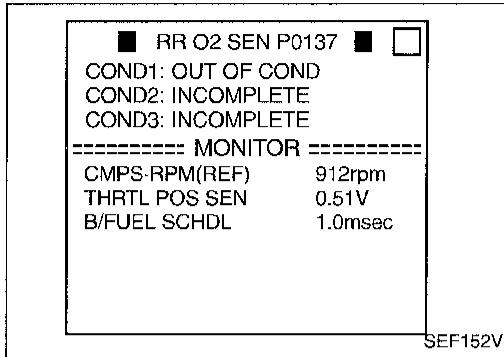
Selector lever: Suitable position

NOTE:

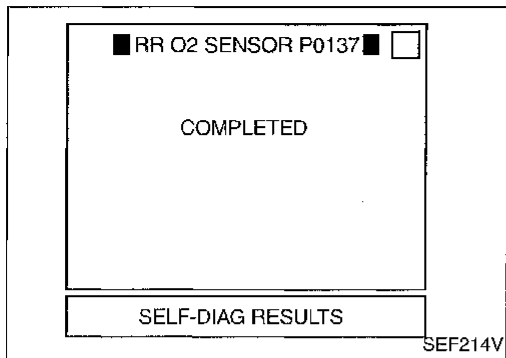
- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 8).

Procedure for COND2

- 8) While driving, release accelerator pedal completely [with "OD" OFF (A/T models only)] from the above condition [step 7] until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". [It will take approximately 1 second (A/T), 4 seconds (M/T).]



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)



NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 9).

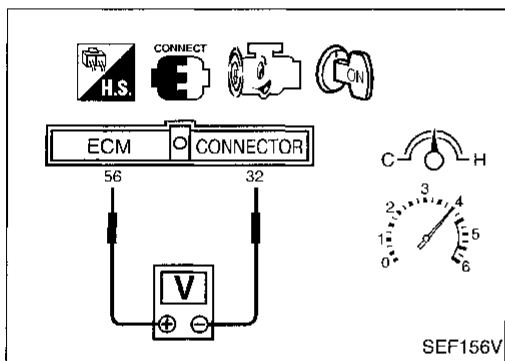
Procedure for COND3

9) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)

NOTE:

If "TESTING" is not displayed after 5 minutes, retry from step 2).

10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-183.



OR
OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)

The voltage should be below 0.54V at least once during this procedure.

If the voltage can be confirmed in step 3, step 4 is not necessary.

- 4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).

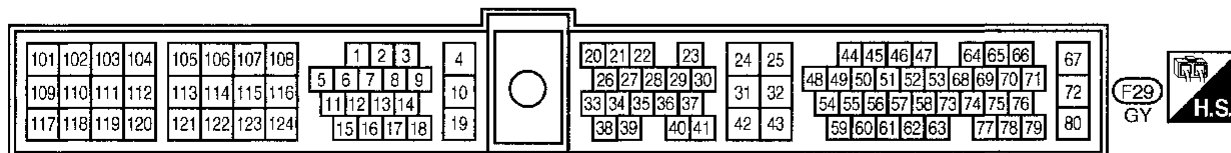
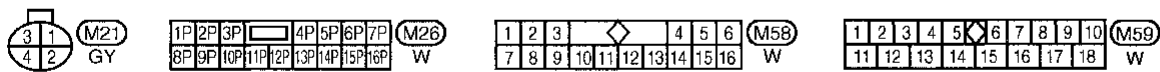
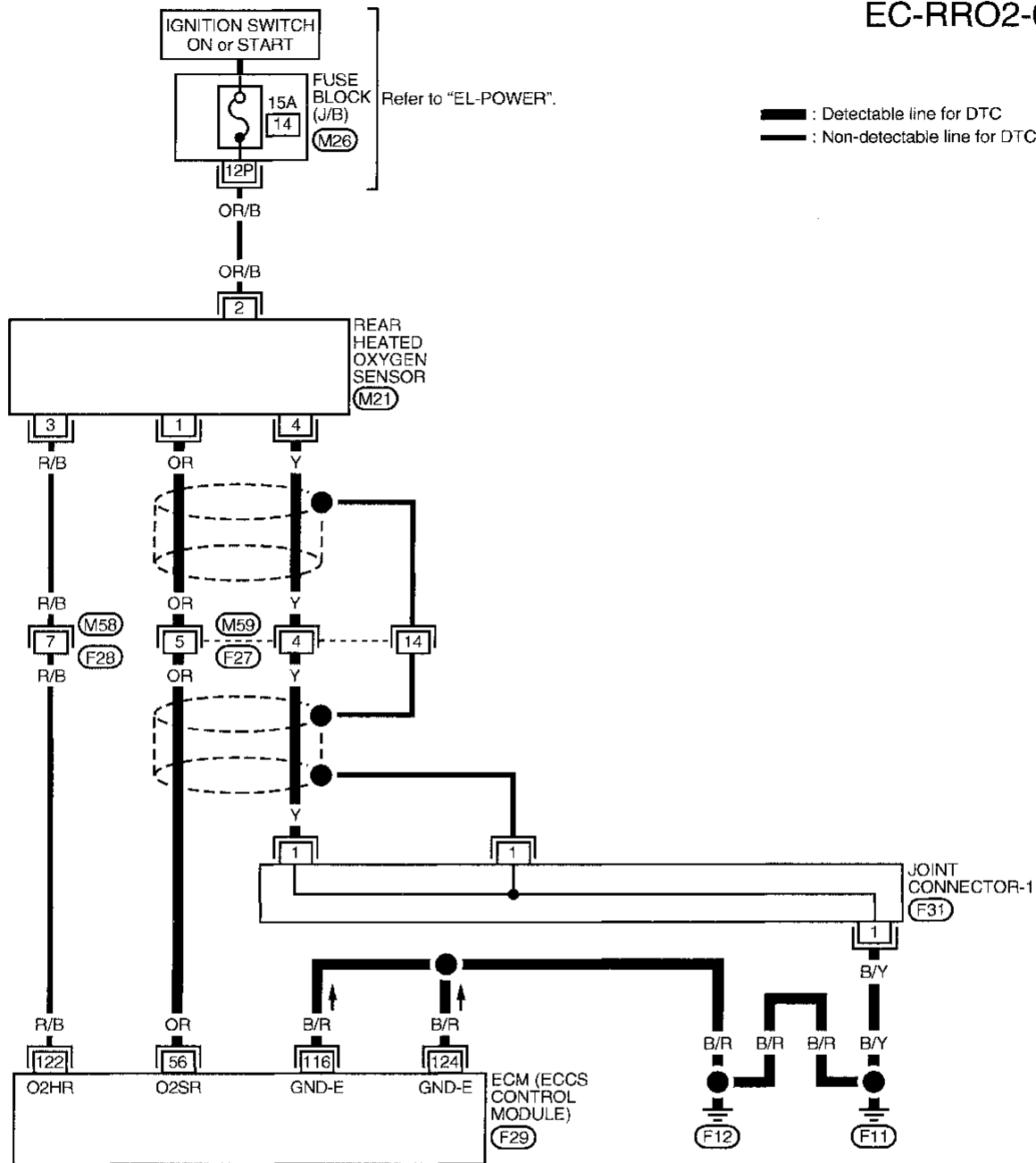
The voltage should be below 0.54V at least once during this procedure.

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TROUBLE DIAGNOSIS FOR DTC P0137

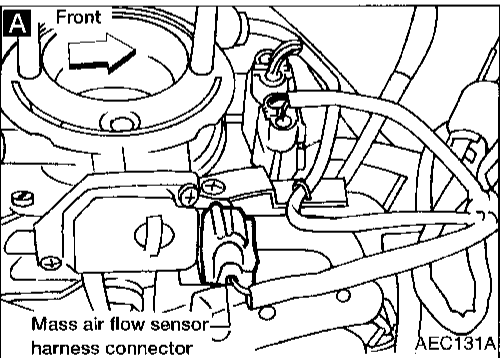
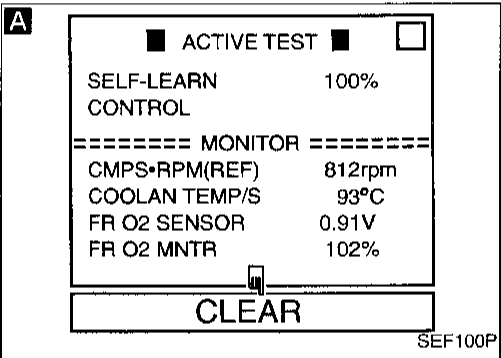
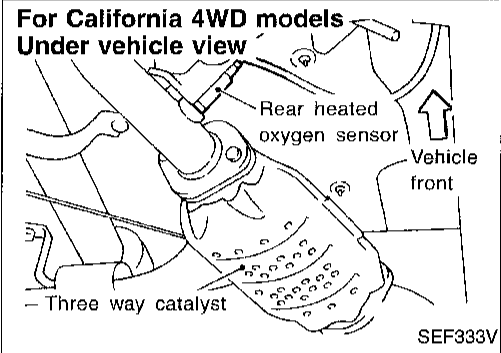
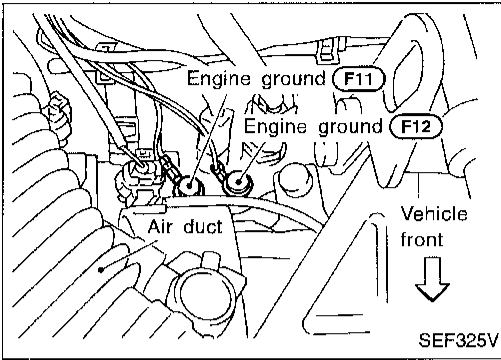
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

EC-RRO2-01



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

- CLEAR THE SELF-LEARNING DATA.**
1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC P0172 detected? Is it difficult to start engine?**

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0172", EC-213.

OR

2. Turn ignition switch "OFF".
 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
 4. Stop engine and reconnect mass air flow sensor harness connector.
 5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
 7. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC 0114 detected? Is it difficult to start engine?**

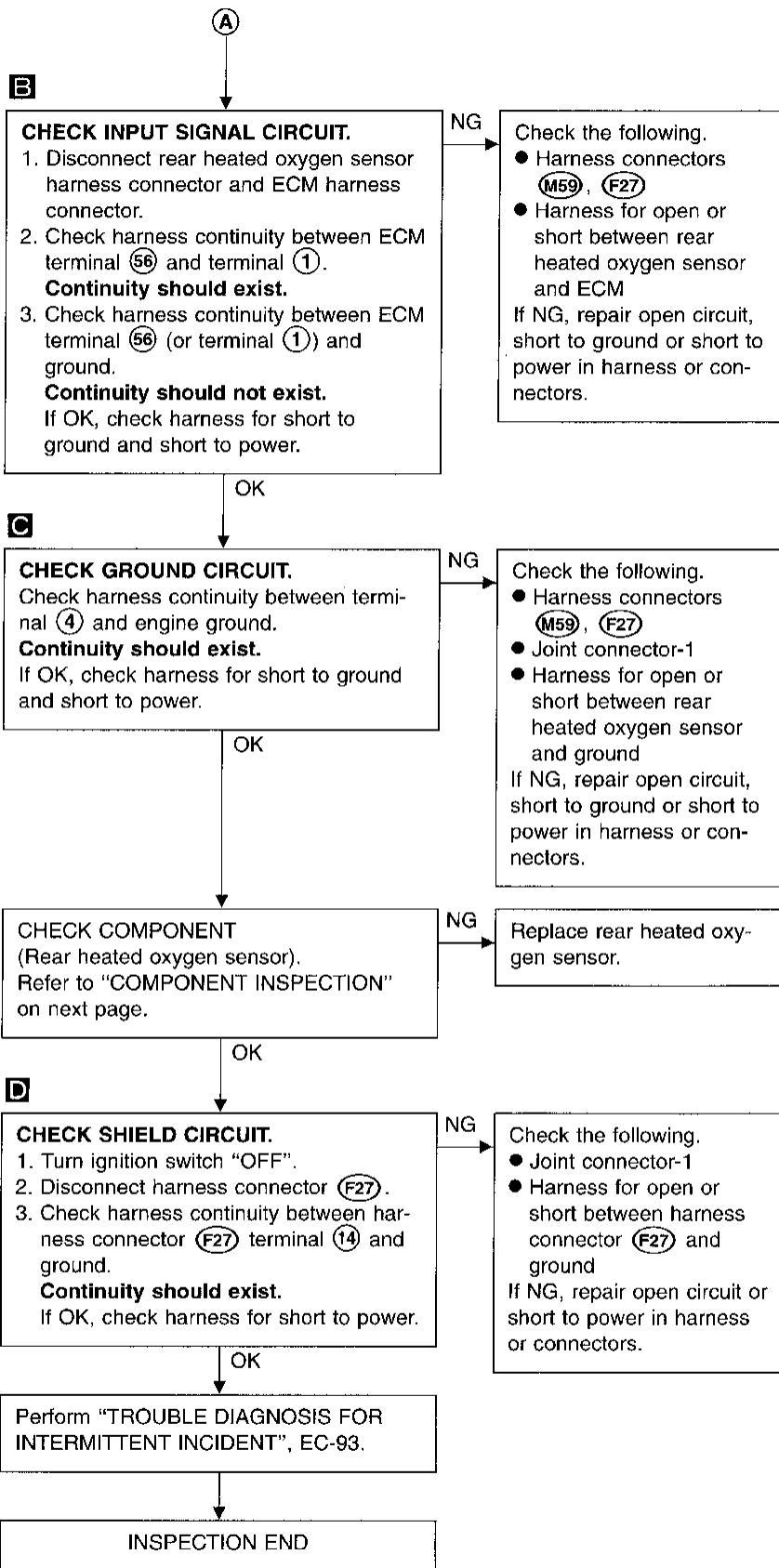
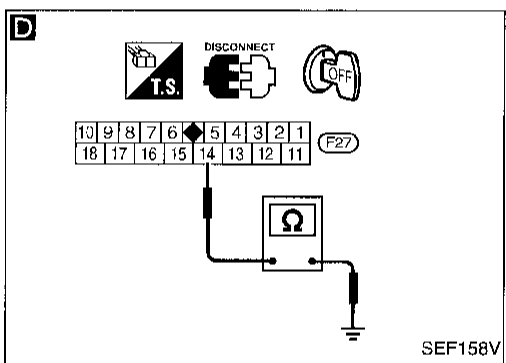
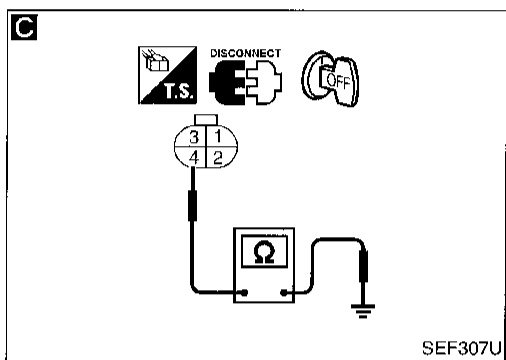
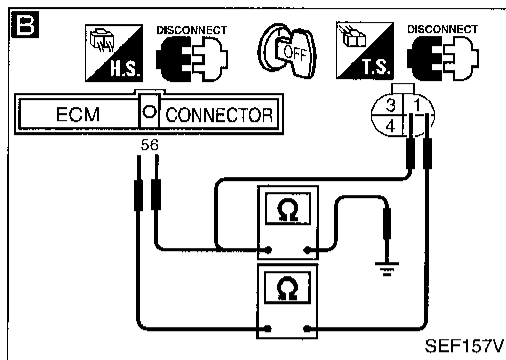
No

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(Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P0137

Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)



Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)

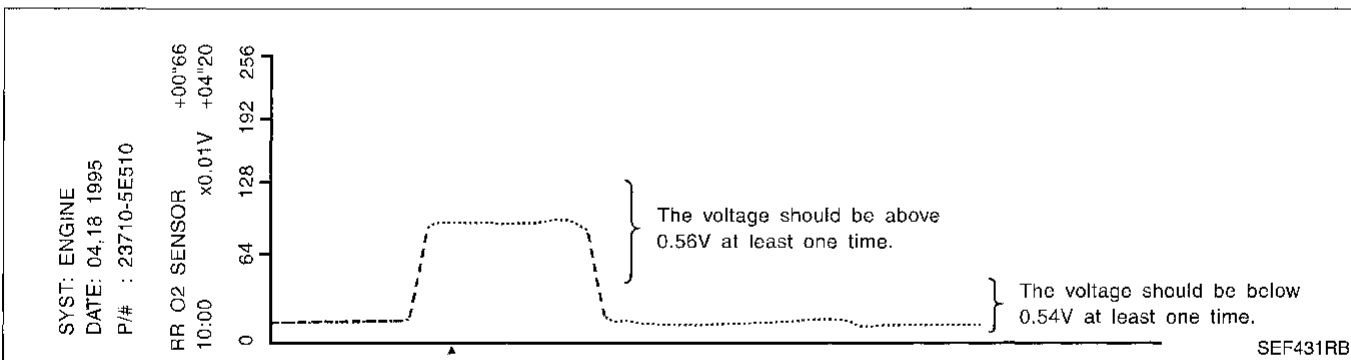
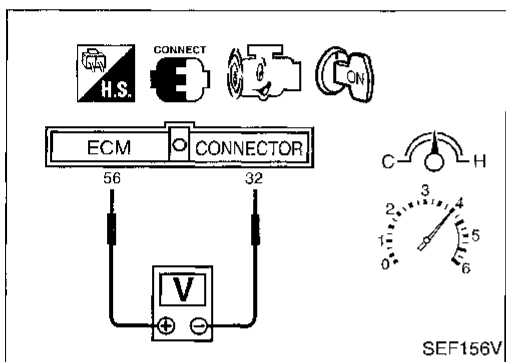
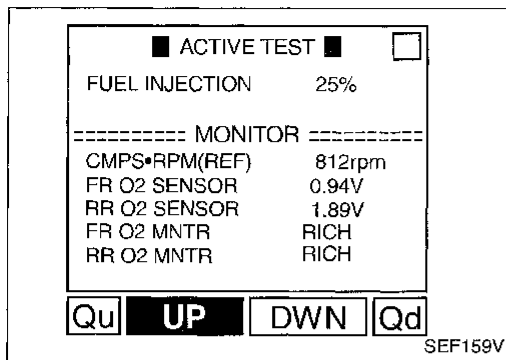
COMPONENT INSPECTION

Rear heated oxygen sensor

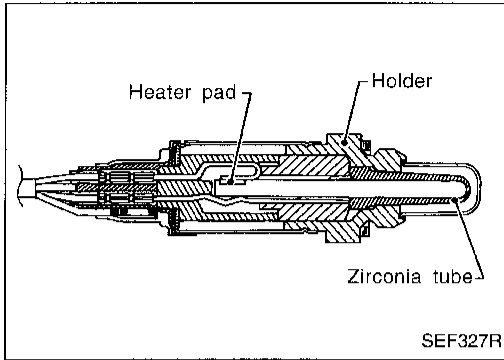
- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR" as the monitor item with CONSULT.
- 3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
"RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
 (Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.56V at least once.
If the voltage is above 0.56V at step 3, step 4 is not necessary.
- 4) Check the voltage when racing up to 5,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be below 0.54V at least once.



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Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

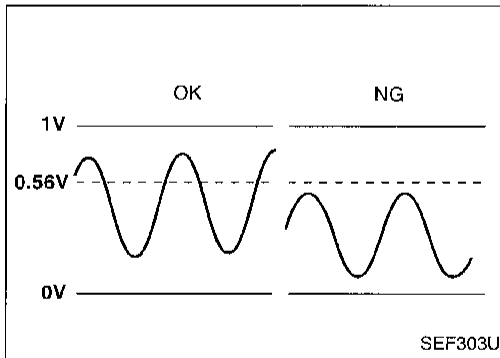
Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|---|-------------------------------|
| RR O2 SENSOR | ● Engine: After warming up Revving engine from idle to 3,000 rpm quickly | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| RR O2 MNTR | | LEAN ↔ RICH |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------|--|------------------------|
| 56 | OR | Rear heated oxygen sensor | Engine is running. After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly | 0 - Approximately 1.0V |



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge malfunctions of the rear heated oxygen sensor, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P0138 0510 | ● The maximum voltage from the sensor has not reached the specified voltage. | <ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks |

TROUBLE DIAGNOSIS FOR DTC P0138

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- "COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Never stop engine during this test. If the engine is stopped, reperform this test from step 2).
- Always perform at a temperature above -10°C (14°F).



Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SENSOR P0138" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 10 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.

If "COMPLETED" appears on CONSULT screen, go to step 10).

If "COMPLETED" does not appear on CONSULT screen, go to the following step.

- 7) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds.)

CMPS-RPM (REF): 1,400 - 3,000 rpm

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 1 - 4.8 ms

Selector lever: Suitable position

NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 8).

Procedure for COND2

- 8) While driving, release accelerator pedal completely [with "OD" OFF (A/T models only)] from the above condition [step 7] until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". [It will take approximately 1 second (A/T), 4 seconds (M/T).]

| | |
|---|---------|
| ■ RR O2 SENSOR P0138 ■ <input type="checkbox"/> | |
| COND1: OUT OF COND | |
| COND2: INCOMPLETE | |
| COND3: INCOMPLETE | |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 912rpm |
| THRTL POS SEN | 0.51V |
| B/FUEL SCHDL | 1.0msec |

SEF160V

| | |
|---|---------|
| ■ RR O2 SENSOR P0138 ■ <input type="checkbox"/> | |
| COND1: TESTING | |
| COND2: INCOMPLETE | |
| COND3: INCOMPLETE | |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 1687rpm |
| THRTL POS SEN | 0.94V |
| B/FUEL SCHDL | 3.6msec |

SEF161V

| | |
|---|---------|
| ■ RR O2 SENSOR P0138 ■ <input type="checkbox"/> | |
| COND1: COMPLETED | |
| COND2: INCOMPLETE | |
| COND3: INCOMPLETE | |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 1687rpm |
| THRTL POS SEN | 0.94V |
| B/FUEL SCHDL | 3.6msec |

SEF162V

| | |
|---|---------|
| ■ RR O2 SENSOR P0138 ■ <input type="checkbox"/> | |
| COND1: COMPLETED | |
| COND2: COMPLETED | |
| COND3: INCOMPLETE | |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 1050rpm |
| THRTL POS SEN | 0.51V |
| B/FUEL SCHDL | 1.0msec |

SEF163V

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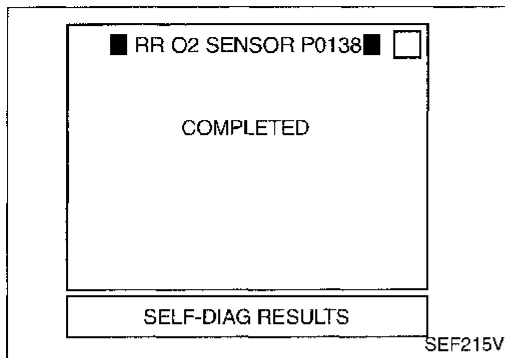
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TROUBLE DIAGNOSIS FOR DTC P0138

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)



NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 9).

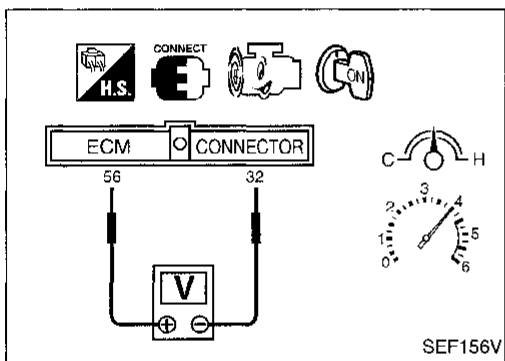
Procedure for COND3

- 9) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)

NOTE:

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-190.



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)

The voltage should be above 0.56V at least once during this procedure.

If the voltage can be confirmed in step 3, step 4 is not necessary.

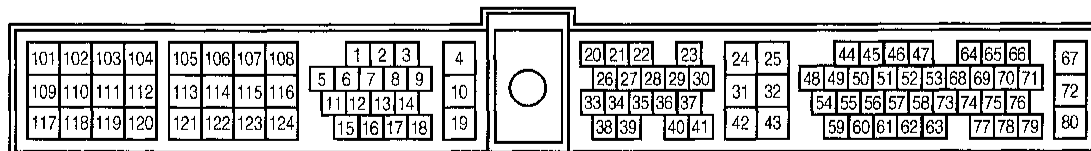
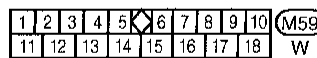
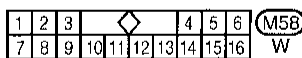
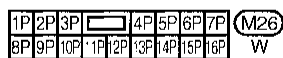
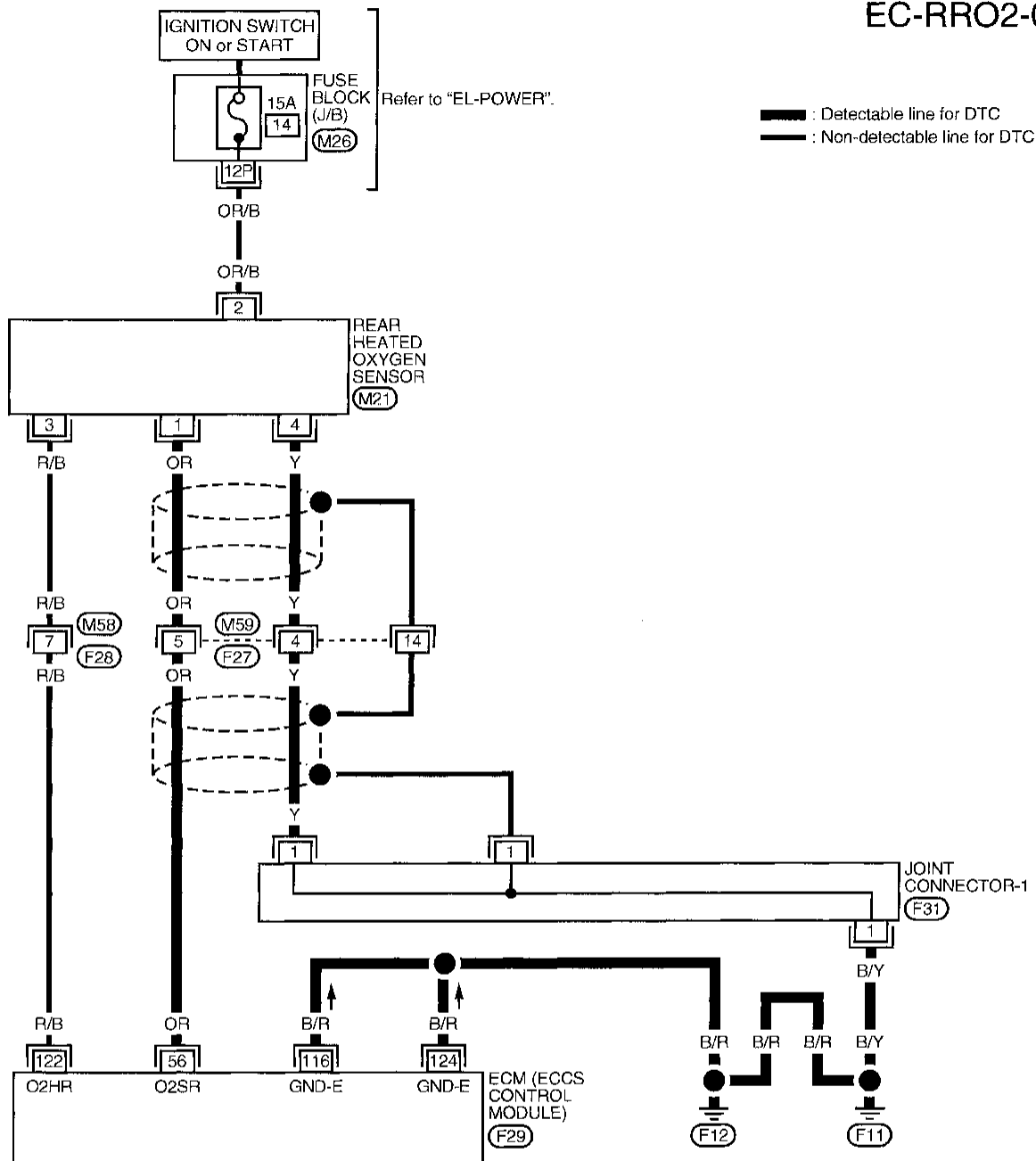
- 4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).

The voltage should be above 0.56V at least once during this procedure.

TROUBLE DIAGNOSIS FOR DTC P0138

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

EC-RRO2-01

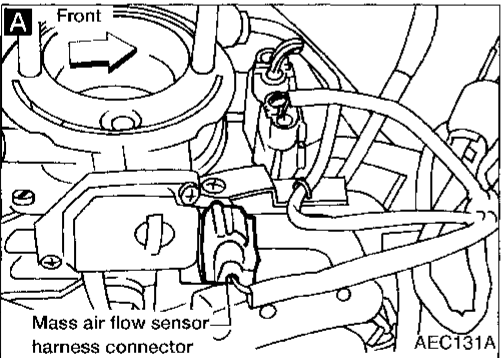
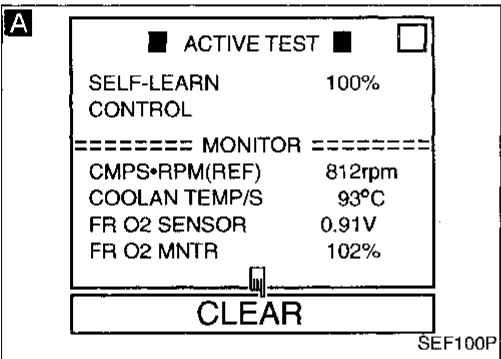
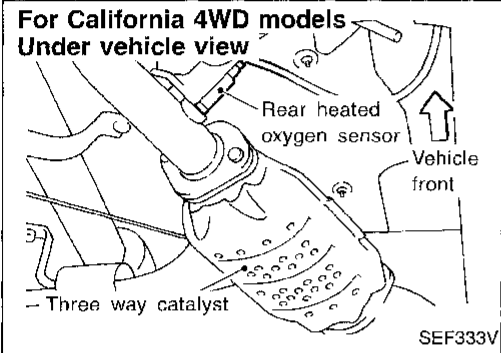
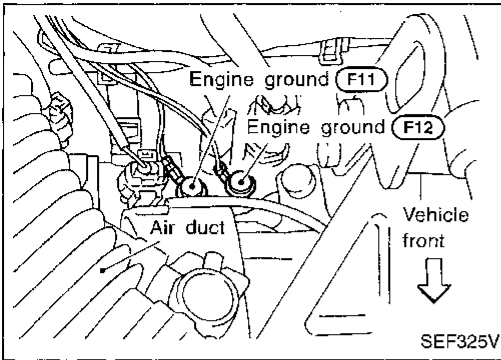


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TROUBLE DIAGNOSIS FOR DTC P0138

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CLEAR THE SELF-LEARNING DATA

1. Start engine and warm it up to normal operating temperature.
 2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
 3. Clear the self-learning control coefficient by touching "CLEAR".
 4. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC P0171 detected? Is it difficult to start engine?**

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171", EC-208.

OR

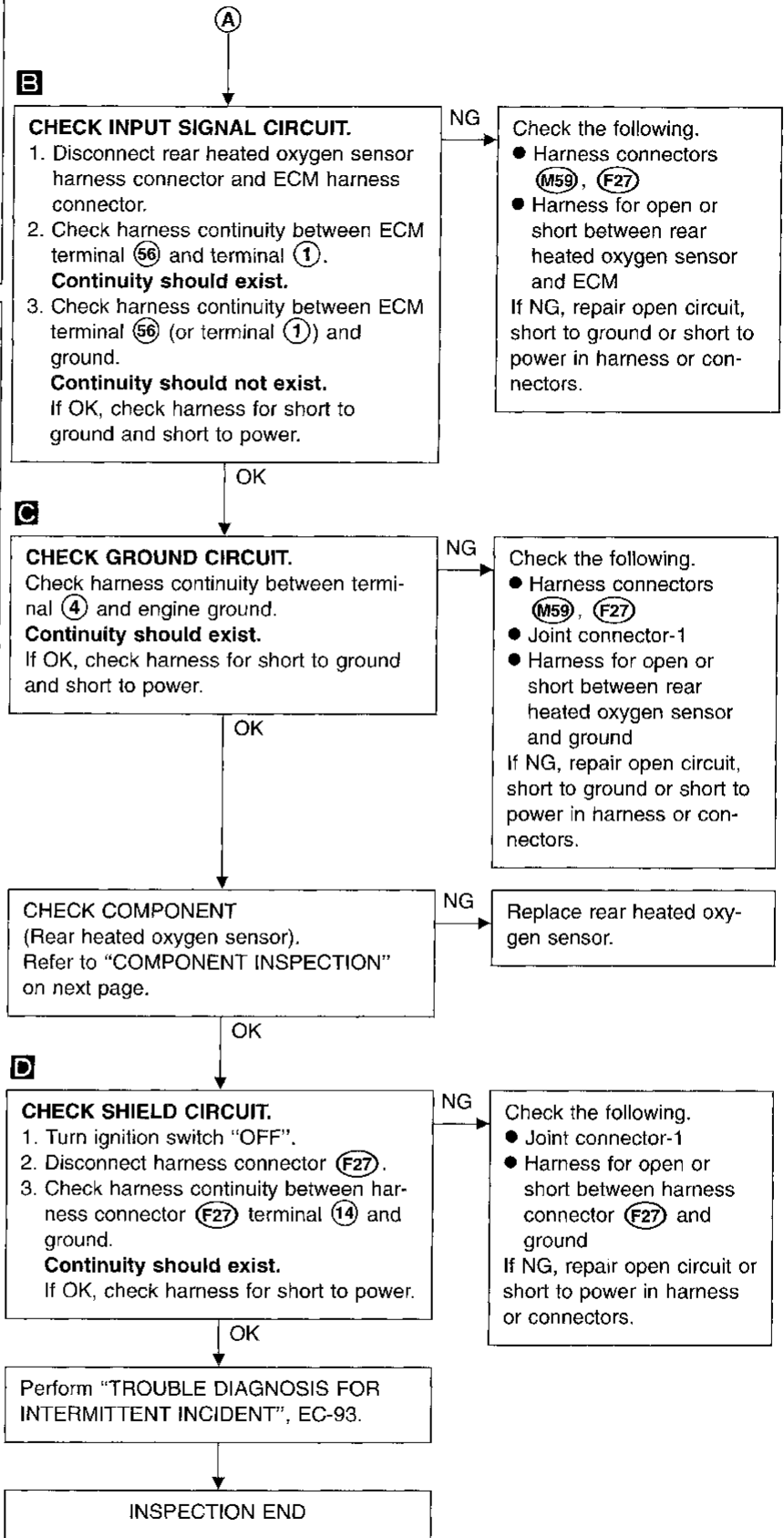
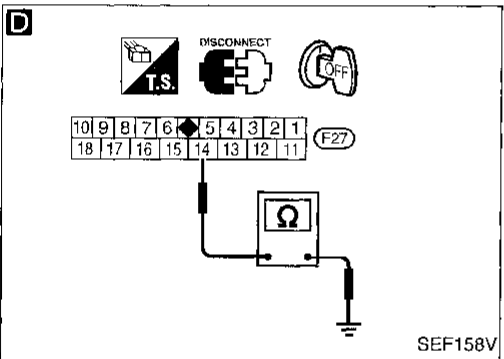
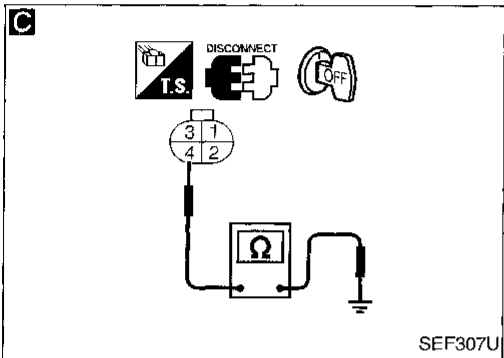
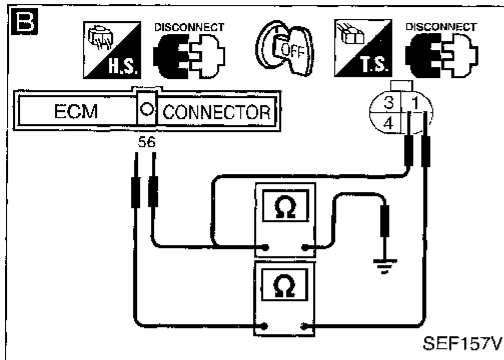
2. Turn ignition switch "OFF".
 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
 4. Stop engine and reconnect mass air flow sensor harness connector.
 5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
 7. Run engine for at least 10 minutes at idle speed.
- Is the 1st trip DTC 0115 detected? Is it difficult to start engine?**

No ↓

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(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P0138

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P0138

Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

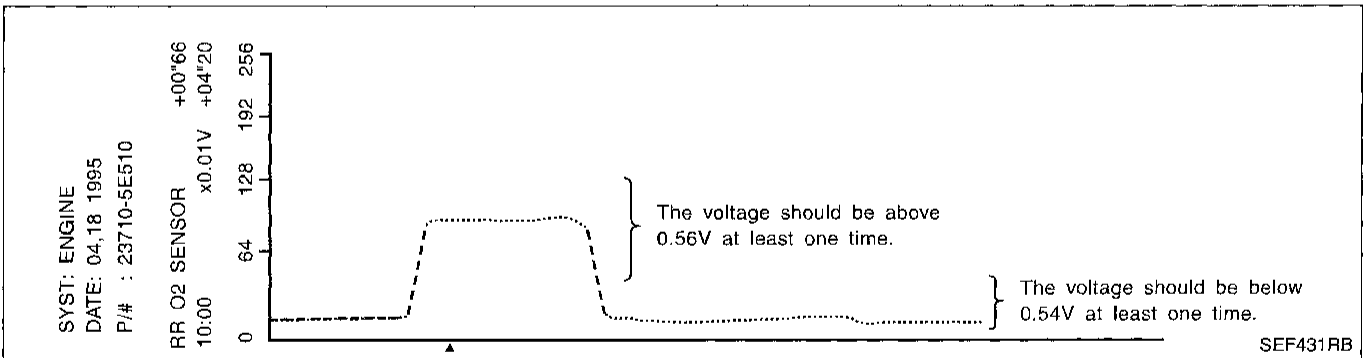
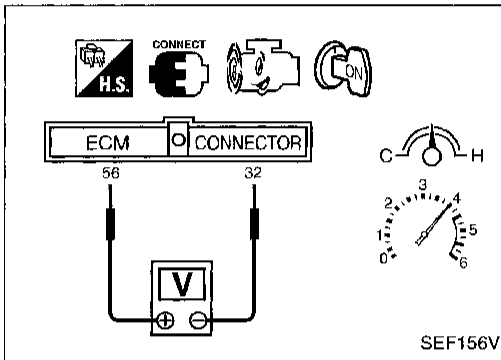
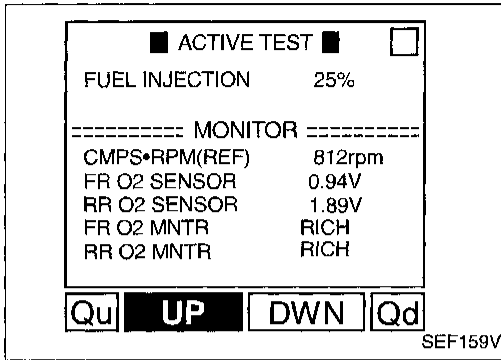
COMPONENT INSPECTION

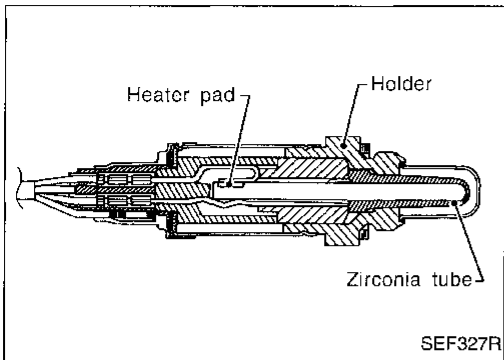
Rear heated oxygen sensor

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR" as the monitor item with CONSULT.
- 3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
"RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
 (Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.56V at least once.
If the voltage is above 0.56V at step 3, step 4 is not necessary.
- 4) Check the voltage when racing up to 5,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be below 0.54V at least once.





Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

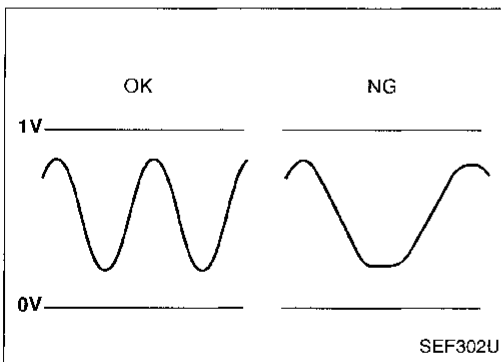
Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|----------------------------|-------------------------------|
| RR O2 SENSOR | ● Engine: After warming up | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| RR O2 MNTR | | LEAN ↔ RICH |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------|--|------------------------|
| 56 | OR | Rear heated oxygen sensor | Engine is running. After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly | 0 - Approximately 1.0V |



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge malfunctions of the rear heated oxygen sensor, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel-cut.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0139 0707 | ● It takes more time for the sensor to respond between rich and lean than the specified time. | <ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks |

TROUBLE DIAGNOSIS FOR DTC P0139

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- "COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Never stop engine during this test. If the engine is stopped, reperform this test from step 2).
- Always perform at a temperature above -10°C (14°F).



Procedure for COND1

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "RR O2 SENSOR P0139" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and let it idle for at least 10 seconds.
- 6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.

If "COMPLETED" appears on CONSULT screen, go to step 10).

If "COMPLETED" does not appear on CONSULT screen, go to the following step.

- 7) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds.)

CMPS-RPM (REF): 1,400 - 3,000 rpm

Vehicle speed: 64 - 120 km/h (40 - 75 MPH)

B/FUEL SCHDL: 1 - 4.8 ms

Selector lever: Suitable position

NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 8).

Procedure for COND2

- 8) While driving, release accelerator pedal completely [with "OD" OFF (A/T models only)] from the above condition [step 7] until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". [It will take approximately 1 second (A/T), 4 seconds (M/T).]

| | |
|--------------------------|-------------|
| ■ RR O2 SENSOR P0139 ■ □ | |
| COND1: | OUT OF COND |
| COND2: | INCOMPLETE |
| COND3: | INCOMPLETE |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 912rpm |
| THRTL POS SEN | 0.51V |
| B/FUEL SCHDL | 1.0msec |

SEF164V

| | |
|--------------------------|------------|
| ■ RR O2 SENSOR P0139 ■ □ | |
| COND1: | TESTING |
| COND2: | INCOMPLETE |
| COND3: | INCOMPLETE |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 1687rpm |
| THRTL POS SEN | 0.94V |
| B/FUEL SCHDL | 3.6msec |

SEF165V

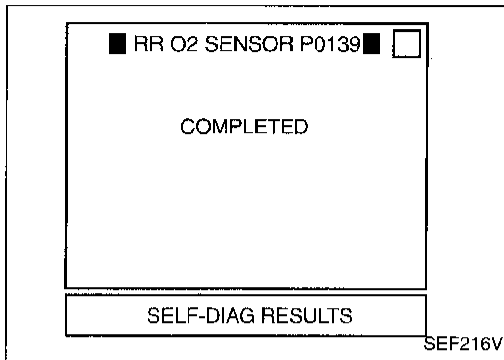
| | |
|--------------------------|------------|
| ■ RR O2 SENSOR P0139 ■ □ | |
| COND1: | COMPLETED |
| COND2: | INCOMPLETE |
| COND3: | INCOMPLETE |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 1687rpm |
| THRTL POS SEN | 0.94V |
| B/FUEL SCHDL | 3.6msec |

SEF166V

| | |
|--------------------------|------------|
| ■ RR O2 SENSOR P0139 ■ □ | |
| COND1: | COMPLETED |
| COND2: | COMPLETED |
| COND3: | INCOMPLETE |
| ===== MONITOR ===== | |
| CMPS-RPM(REF) | 1050rpm |
| THRTL POS SEN | 0.51V |
| B/FUEL SCHDL | 1.0msec |

SEF167V

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)



NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 9).

Procedure for COND3

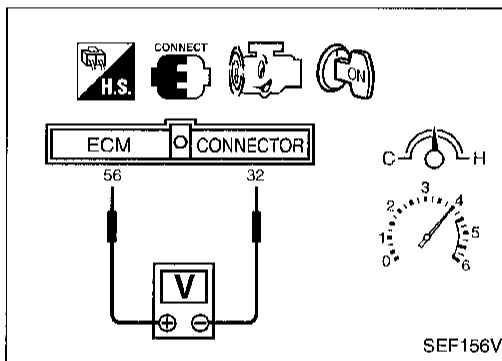
- 9) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)

NOTE:

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 10) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".

If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-197.



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑥⑥(sensor signal) and ③②(ECM ground).
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.

(Depress and release accelerator pedal as soon as possible.)

The voltage should change at more than 0.06V for 1 second during this procedure.

If the voltage can be confirmed in step 3, step 4 is not necessary.

- 4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).

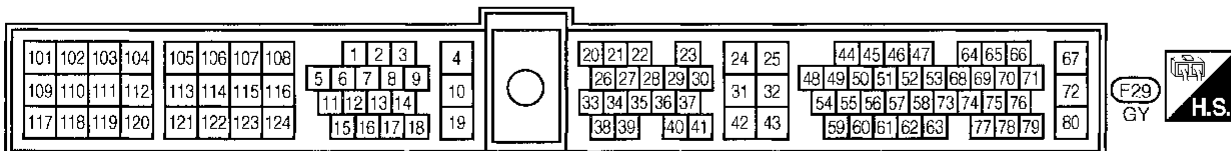
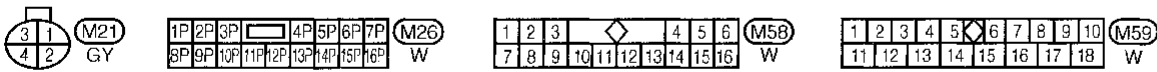
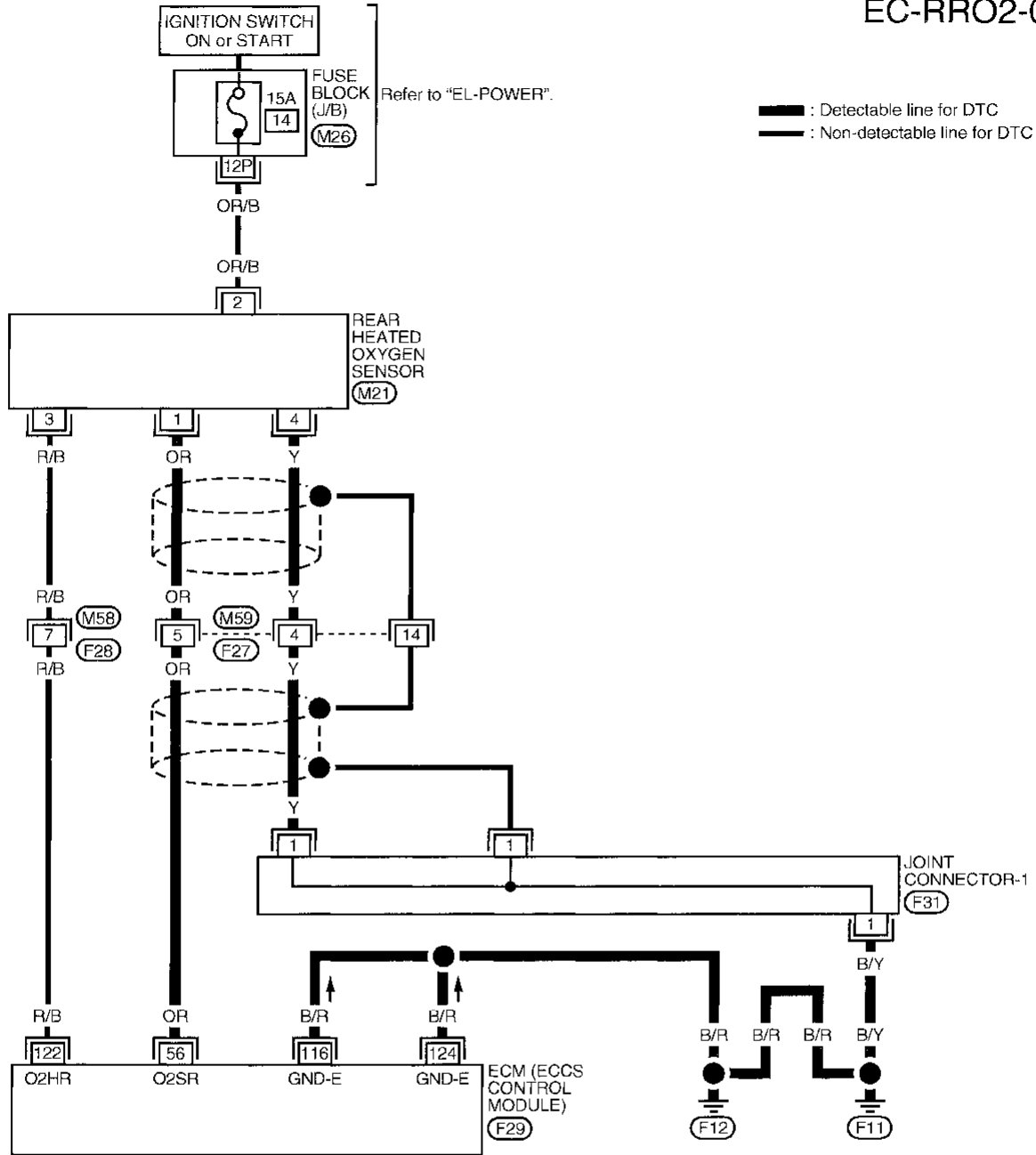
The voltage should change at more than 0.06V for 1 second during this procedure.

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TROUBLE DIAGNOSIS FOR DTC P0139

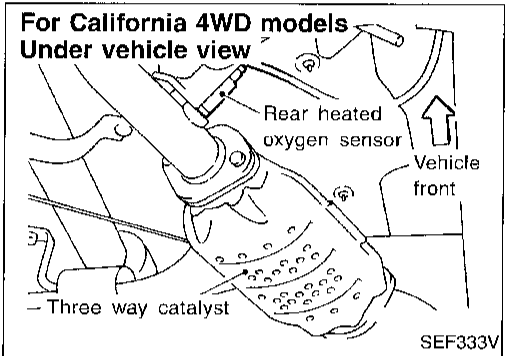
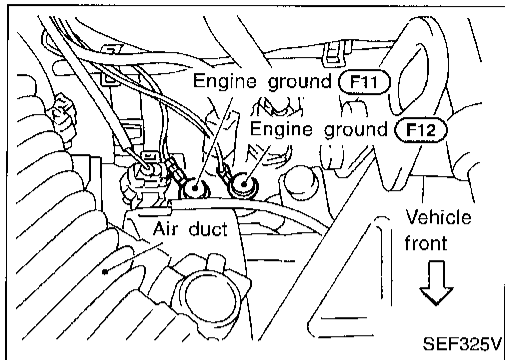
Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

EC-RRO2-01



Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CHECK INPUT SIGNAL CIRCUIT.

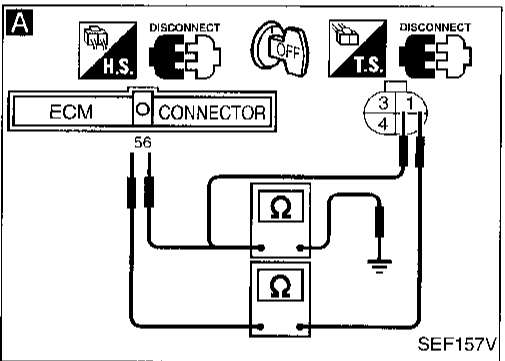
1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (56) and terminal (1).
Continuity should exist.
3. Check harness continuity between ECM terminal (56) (or terminal (1)) and ground.
Continuity should not exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (M59), (F27)
- Harness for open or short between rear heated oxygen sensor and ECM

If NG, repair open circuit, short to ground or short to power in harness or connectors.



OK

B

CHECK GROUND CIRCUIT.

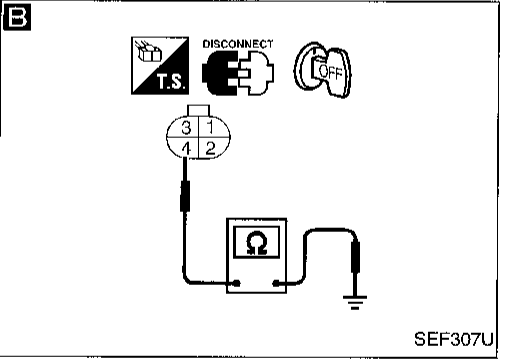
Check harness continuity between terminal (4) and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (M59), (F27)
- Joint connector-1
- Harness for open or short between rear heated oxygen sensor and ground

If NG, repair open circuit, short to ground or short to power in harness or connectors.

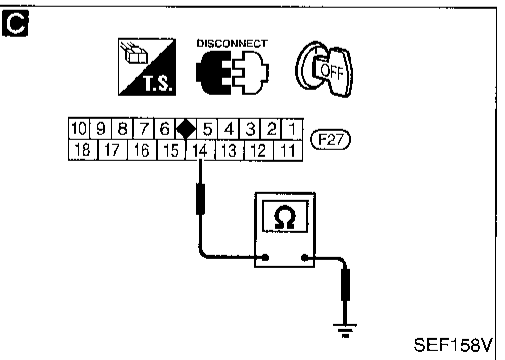


OK

CHECK COMPONENT
(Rear heated oxygen sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG

Replace rear heated oxygen sensor.



OK

C

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect harness connector (F27).
3. Check harness continuity between harness connector (F27) terminal (14) and ground.
Continuity should exist.
If OK, check harness for short to power.

NG

Check the following.

- Joint connector-1
- Harness for open or short between harness connector (F27) and ground

If NG, repair open circuit or short to power in harness or connectors.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P0139

Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

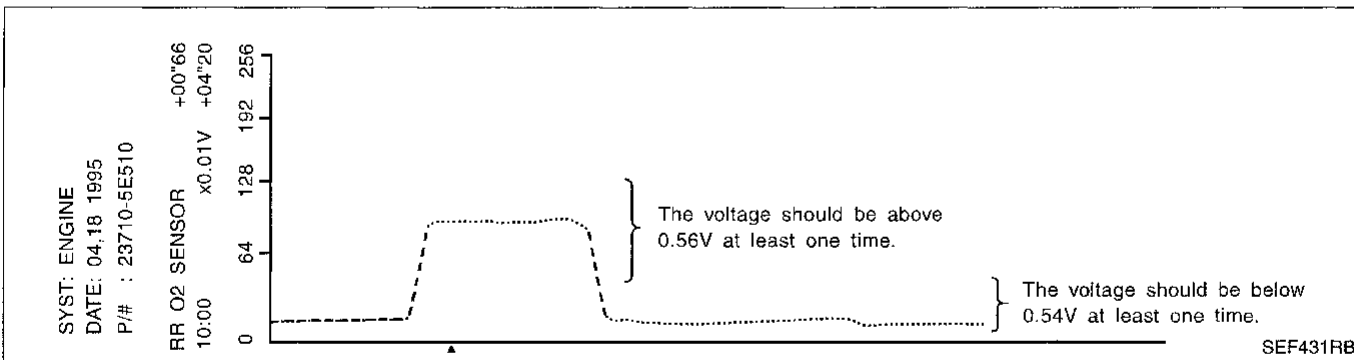
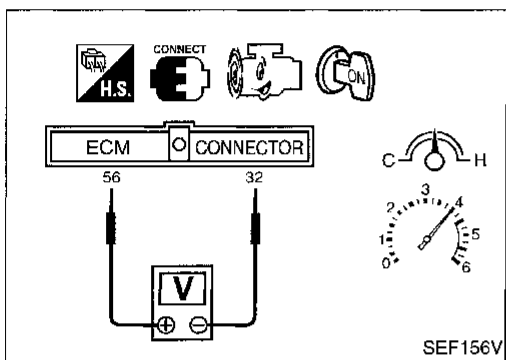
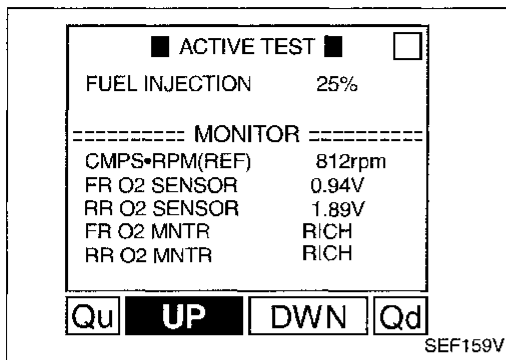
COMPONENT INSPECTION

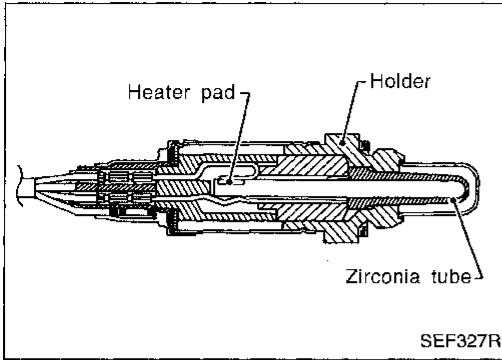
Rear heated oxygen sensor

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR" as the monitor item with CONSULT.
- 3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
"RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
 (Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.56V at least once.
If the voltage is above 0.56V at step 3, step 4 is not necessary.
- 4) Check the voltage when racing up to 5,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be below 0.54V at least once.





Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.

Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.

Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

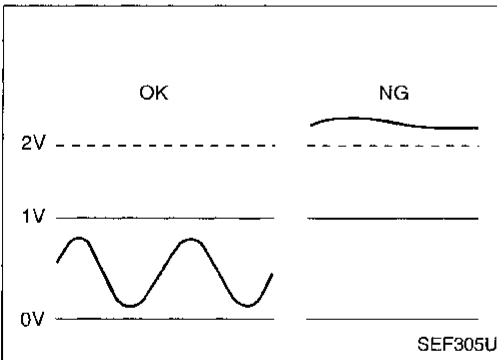
Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|---|-------------------------------|
| RR O2 SENSOR | ● Engine: After warming up Revving engine from idle to 3,000 rpm quickly | 0 - 0.3V ↔ Approx. 0.6 - 1.0V |
| RR O2 MNTR | | LEAN ↔ RICH |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------|--|------------------------|
| 56 | OR | Rear heated oxygen sensor | Engine is running. After warming up to normal operating temperature and revving engine from idle to 3,000 rpm quickly | 0 - Approximately 1.0V |



ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge malfunctions of the rear heated oxygen sensor, ECM monitors whether or not the voltage is too high during various driving conditions such as fuel-cut.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0140 0512 | ● An excessively high voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor |

TROUBLE DIAGNOSIS FOR DTC P0140

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

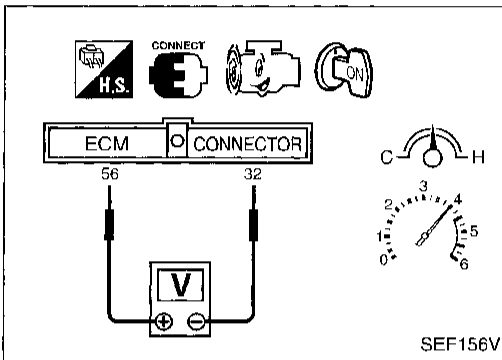
Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

| | |
|---------------|------------------------------------|
| ☆ MONITOR | ☆ NO FAIL <input type="checkbox"/> |
| CMPS-RPM(REF) | 2040rpm |
| COOLAN TEMP/S | 82°C |
| VHCL SPEED SE | 76km/h |
| B/FUEL SCHDL | 2.5msec |
| RECORD | |

SEF168V



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Meet the following conditions once.
CMPS-RPM (REF): 1,400 - 3,000 rpm
VHCL SPEED SE: 64 - 120 km/h (40 - 75 MPH)
B/FUEL SCHDL: 1 - 4.8 ms
COOLAN TEMP/S: 70 - 100°C (158 - 212°F)
Selector lever: Suitable position
- 3) Stop vehicle with engine running.

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.



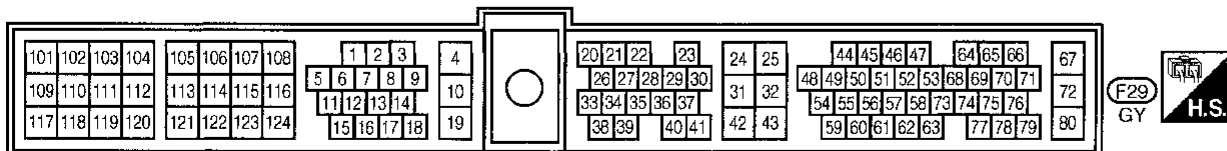
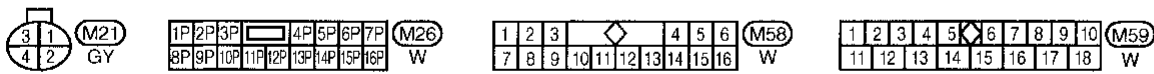
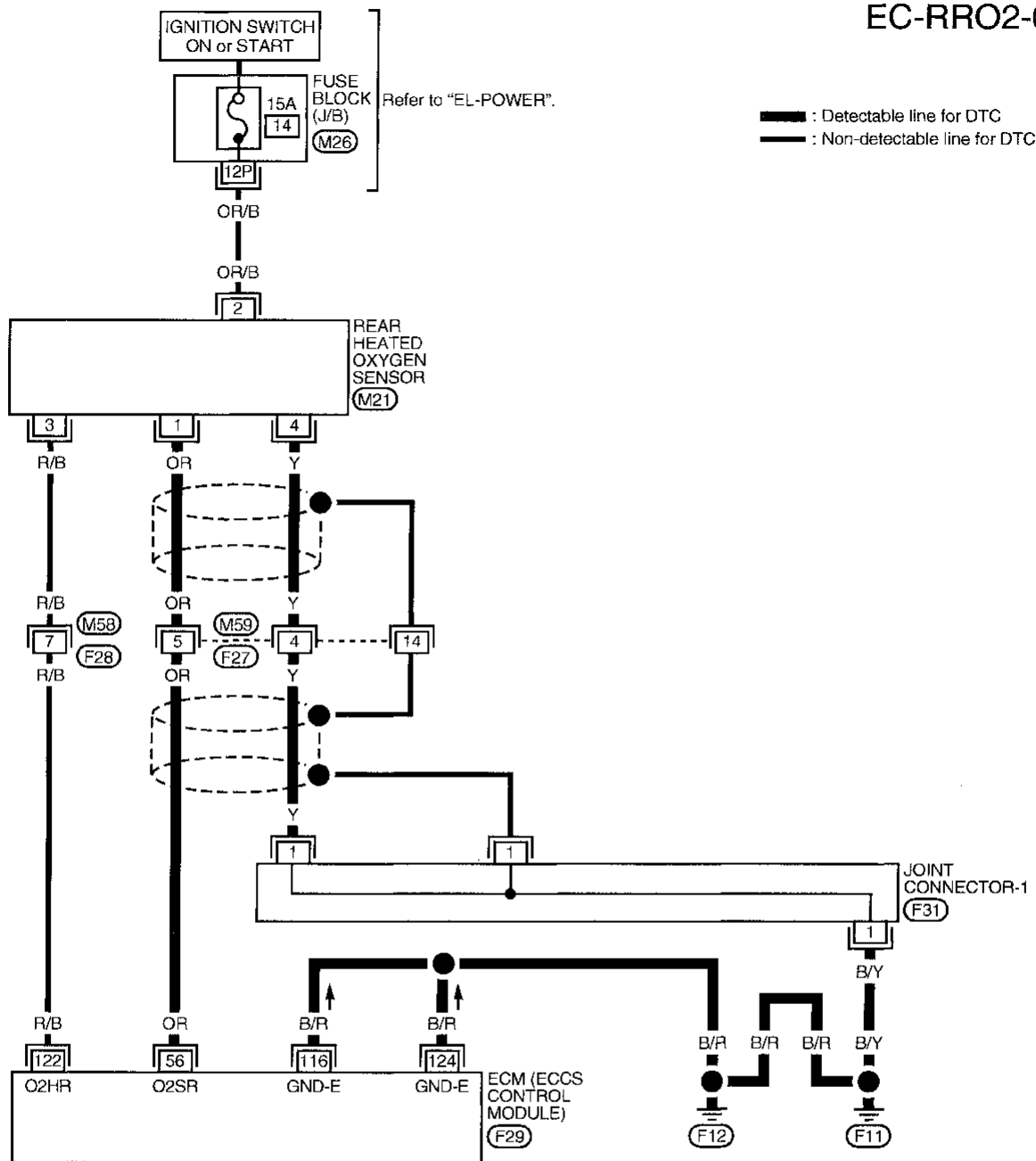
- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage after racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)

The voltage should be below 2V during this procedure.

TROUBLE DIAGNOSIS FOR DTC P0140

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont'd)

EC-RRO2-01



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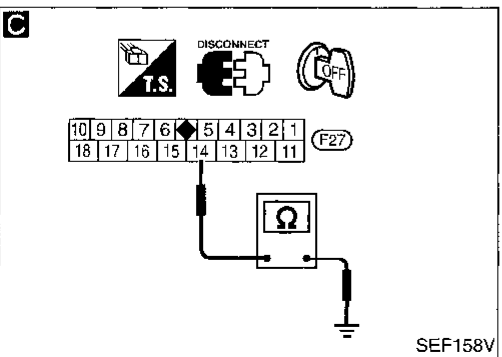
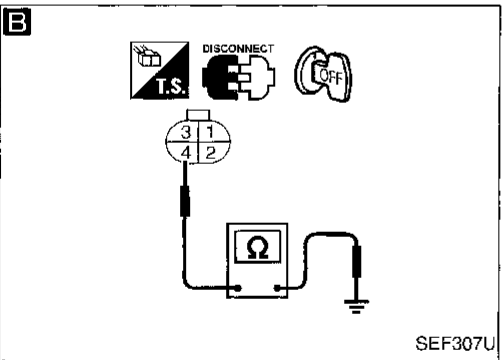
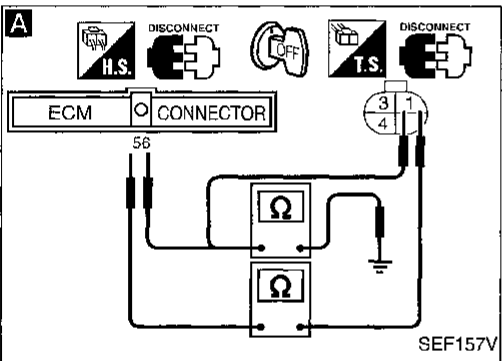
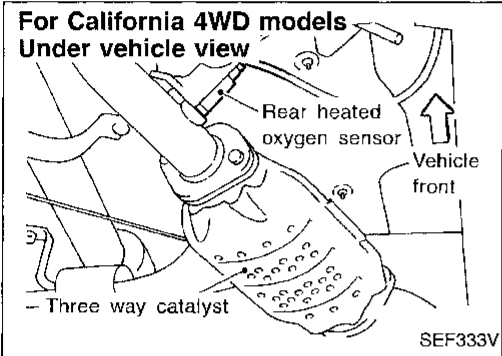
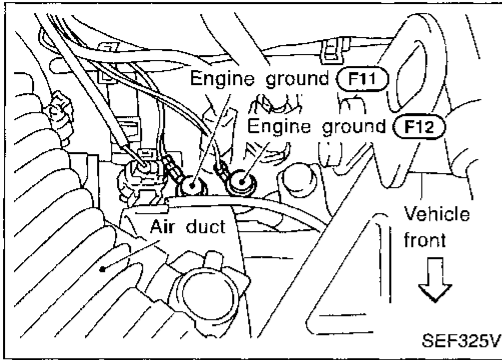
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TROUBLE DIAGNOSIS FOR DTC P0140

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (56) and terminal (1).
Continuity should exist.
3. Check harness continuity between ECM terminal (56) (or terminal (1)) and ground.
Continuity should not exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors (M59, F27)
- Harness for open or short between rear heated oxygen sensor and ECM

If NG, repair open circuit, short to ground or short to power in harness or connectors.

B

CHECK GROUND CIRCUIT.

Check harness continuity between terminal (4) and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors (M59, F27)
- Joint connector-1
- Harness for open or short between rear heated oxygen sensor and ground

If NG, repair open circuit, short to ground or short to power in harness or connectors.

CHECK COMPONENT
(Rear heated oxygen sensor).

1. Turn ignition switch "OFF".
2. Disconnect sensor harness connector and check for water.
Water should not exist.
If OK, go to step 3.
3. Check rear heated oxygen sensor. Refer to "COMPONENT INSPECTION" on next page.

NG → Replace rear heated oxygen sensor.

C

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect harness connector (F27).
3. Check harness continuity between harness connector (F27) terminal (14) and ground.
Continuity should exist.
If OK, check harness for short to power.

NG → Check the following.

- Joint connector-1
- Harness for open or short between harness connector (F27) and ground

If NG, repair open circuit or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0140

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont'd)

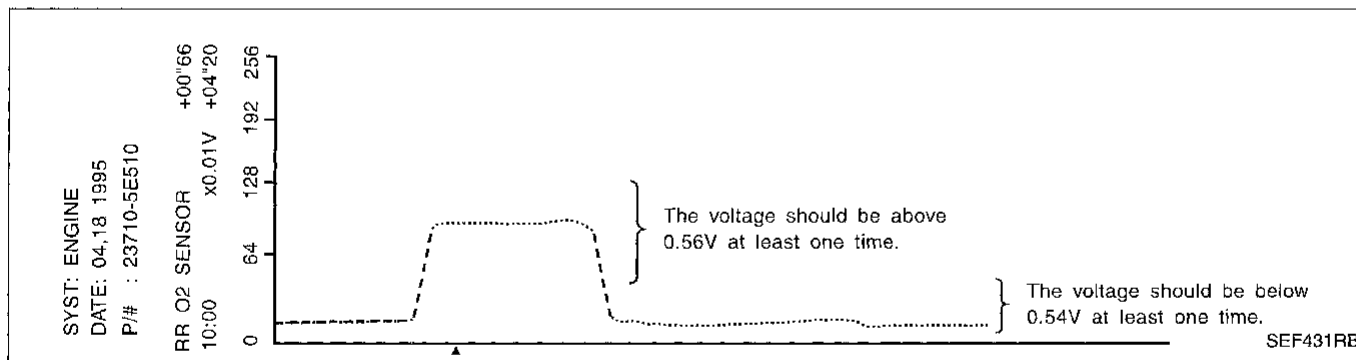
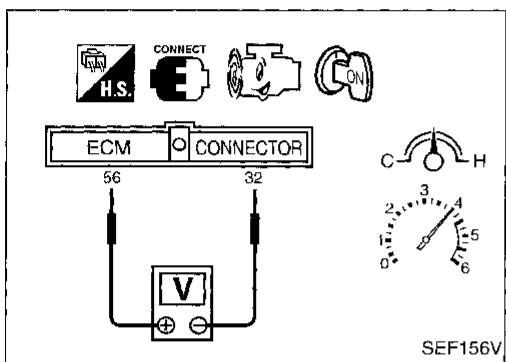
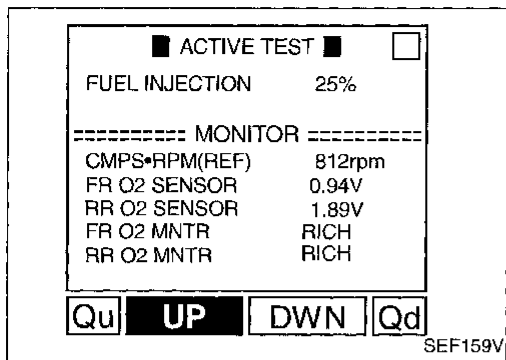
COMPONENT INSPECTION

Rear heated oxygen sensor

- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR" as the monitor item with CONSULT.
- 3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to $\pm 25\%$.
"RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
"RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeter probes between ECM terminals ⑤⑥ (sensor signal) and ③② (ECM ground).
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.56V at least once.
If the voltage is above 0.56V at step 3, step 4 is not necessary.
- 4) Check the voltage when racing up to 5,000 rpm under no load. Or keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), D position with "OD" OFF (A/T).
The voltage should be below 0.54V at least once.

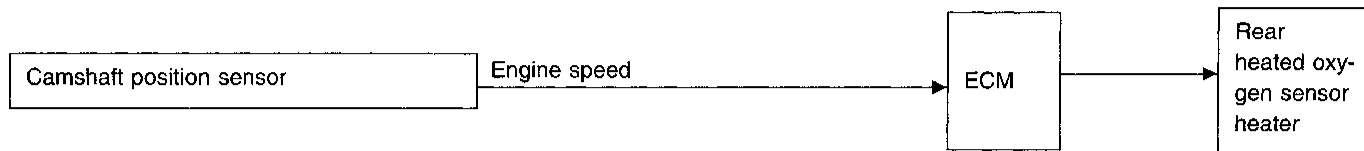


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TROUBLE DIAGNOSIS FOR DTC P0141

Rear Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

OPERATION

| Engine speed rpm | Rear heated oxygen sensor heater |
|--|----------------------------------|
| Ignition switch "ON" (Engine is stopped.) | OFF |
| Engine is running. | ON |

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|-----------------------|---------------|
| RR O2 HEATER | ● Ignition switch: ON | ON |
| | ● Engine running | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓜ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------------|--|----------------------------|
| 122 | R/B | Rear heated oxygen sensor heater | Engine is running. | Approximately 0.4V |
| | | | Ignition switch "ON" └ Engine is not running. | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0141 0902 | <ul style="list-style-type: none"> The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.) | <ul style="list-style-type: none"> Harness or connectors (The rear heated oxygen sensor heater circuit is open or shorted.) Rear heated oxygen sensor heater |

TROUBLE DIAGNOSIS FOR DTC P0141

Rear Heated Oxygen Sensor Heater (Cont'd)

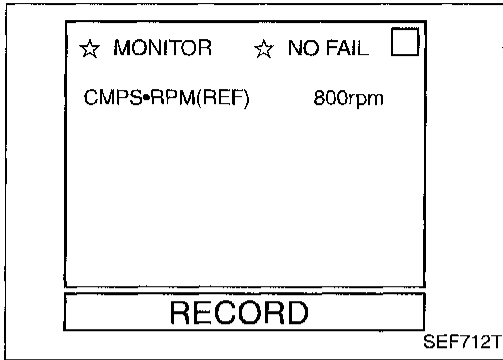
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5V and 16V at idle.



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 6 seconds at idle speed.

OR



- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and run it for at least 5 seconds at idle speed.
- 4) Select "MODE 3" with GST.

OR



- 1) Start engine and run it for at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

- When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

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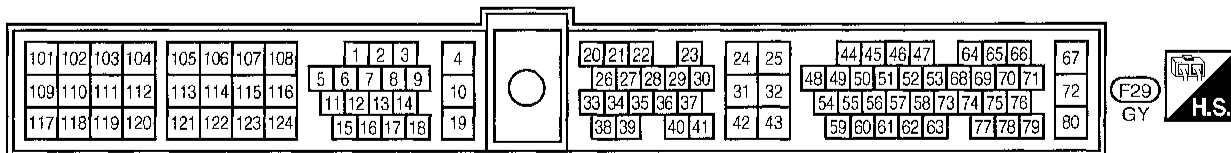
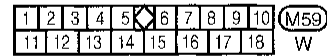
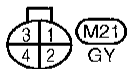
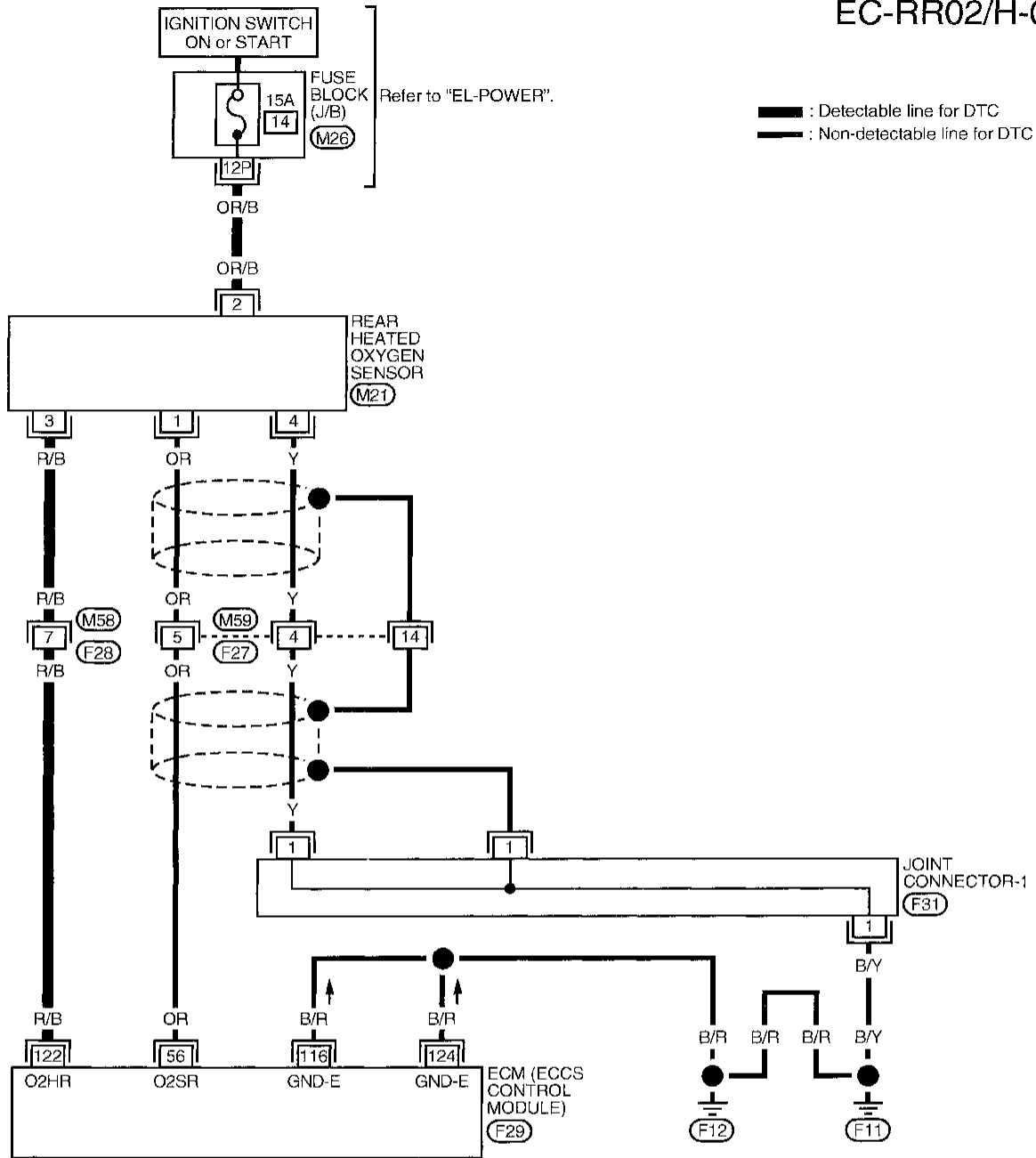
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TROUBLE DIAGNOSIS FOR DTC P0141

Rear Heated Oxygen Sensor Heater (Cont'd)

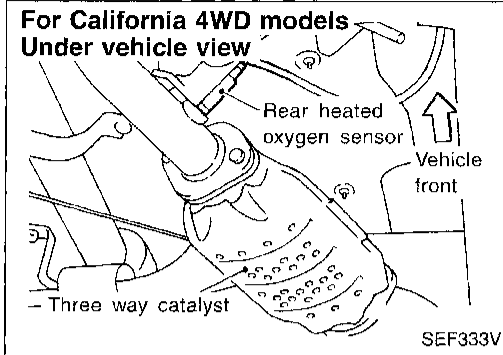
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TROUBLE DIAGNOSIS FOR DTC P0141

Rear Heated Oxygen Sensor Heater (Cont'd)

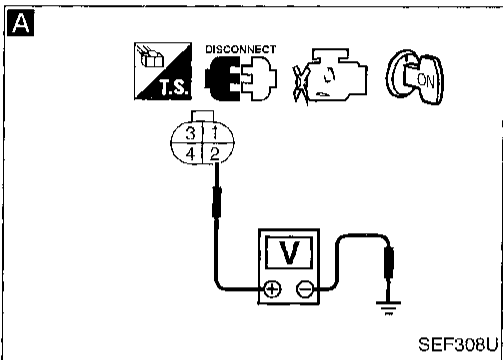
DIAGNOSTIC PROCEDURE



INSPECTION START

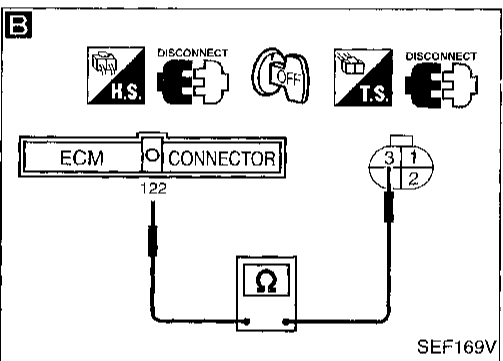
A
CHECK POWER SUPPLY.
 1. Turn ignition switch "OFF".
 2. Disconnect rear heated oxygen sensor harness connector.
 3. Turn ignition switch "ON".
 4. Check voltage between terminal ② and ground.
Voltage: Battery voltage

NG → Check the following.
 ● 15A fuse
 ● Harness for open or short between rear heated oxygen sensor and 15A fuse
 If NG, repair harness or connectors.



B
CHECK GROUND CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Check harness continuity between terminal ③ and ECM terminal ⑫⑫.
Continuity should exist.
 If OK, check harness for short to ground and short to power.

NG → Check the following.
 ● Harness connectors (M58, F28)
 ● Harness for open or short between rear heated oxygen sensor and ECM
 If NG, repair open circuit, short to ground or short to power in harness or connectors.



CHECK COMPONENT
 (Rear heated oxygen sensor heater).
 Refer to "COMPONENT INSPECTION" below.

NG → Replace rear heated oxygen sensor.

OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

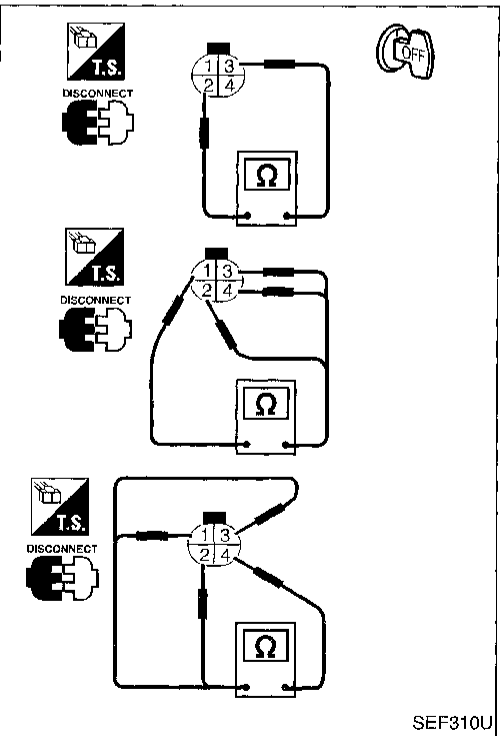
- Check resistance between terminals ② and ③.
Resistance: 2.3 - 4.3Ω at 25°C (77°F)
- Check continuity.

| Terminal No. | Continuity |
|---------------|------------|
| ① and ②, ③, ④ | No |
| ④ and ①, ②, ③ | |

If NG, replace the rear heated oxygen sensor.

CAUTION:

Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

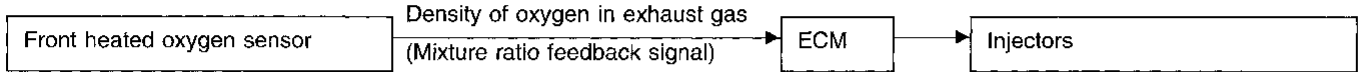


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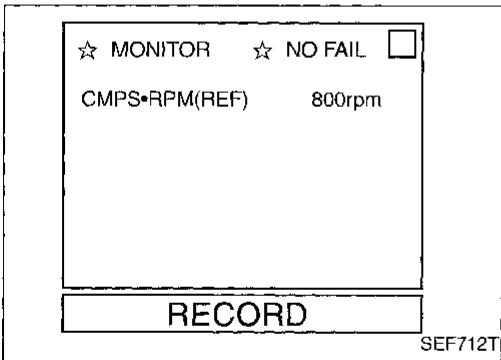
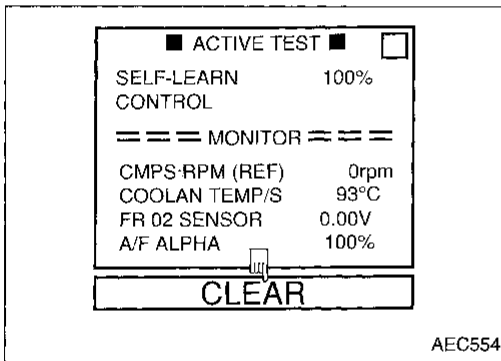
Fuel Injection System Function (Lean side)

ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0171 0115 | <ul style="list-style-type: none"> ● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | <ul style="list-style-type: none"> ● Intake air leaks ● Front heated oxygen sensor ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

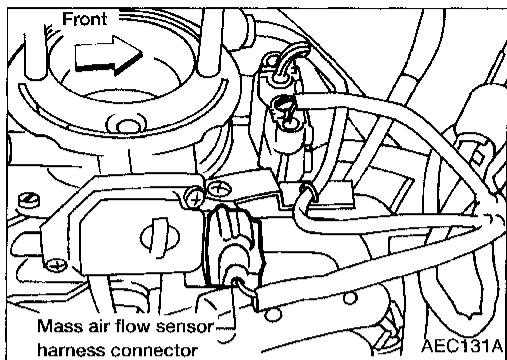
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.
- 6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
- 8) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-211. If engine does not start, visually check for exhaust and intake air leak.

OR

**Fuel Injection System Function (Lean side)
(Cont'd)**



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- 6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- 7) Start engine again and run it for at least 10 minutes at idle speed.
- 8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-211. If engine does not start, visually check for exhaust and intake air leak.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Turn ignition switch "ON".
- 6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
- 7) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 8) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
- 9) Start engine again and run it for at least 10 minutes at idle speed. The 1st trip DTC 0115 should be detected at this stage, if a malfunction exists.
- 10) If it is difficult to start engine at step 9, the fuel injection system also has a malfunction.
- 11) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-211. If engine does not start, visually check for exhaust and intake air leak.

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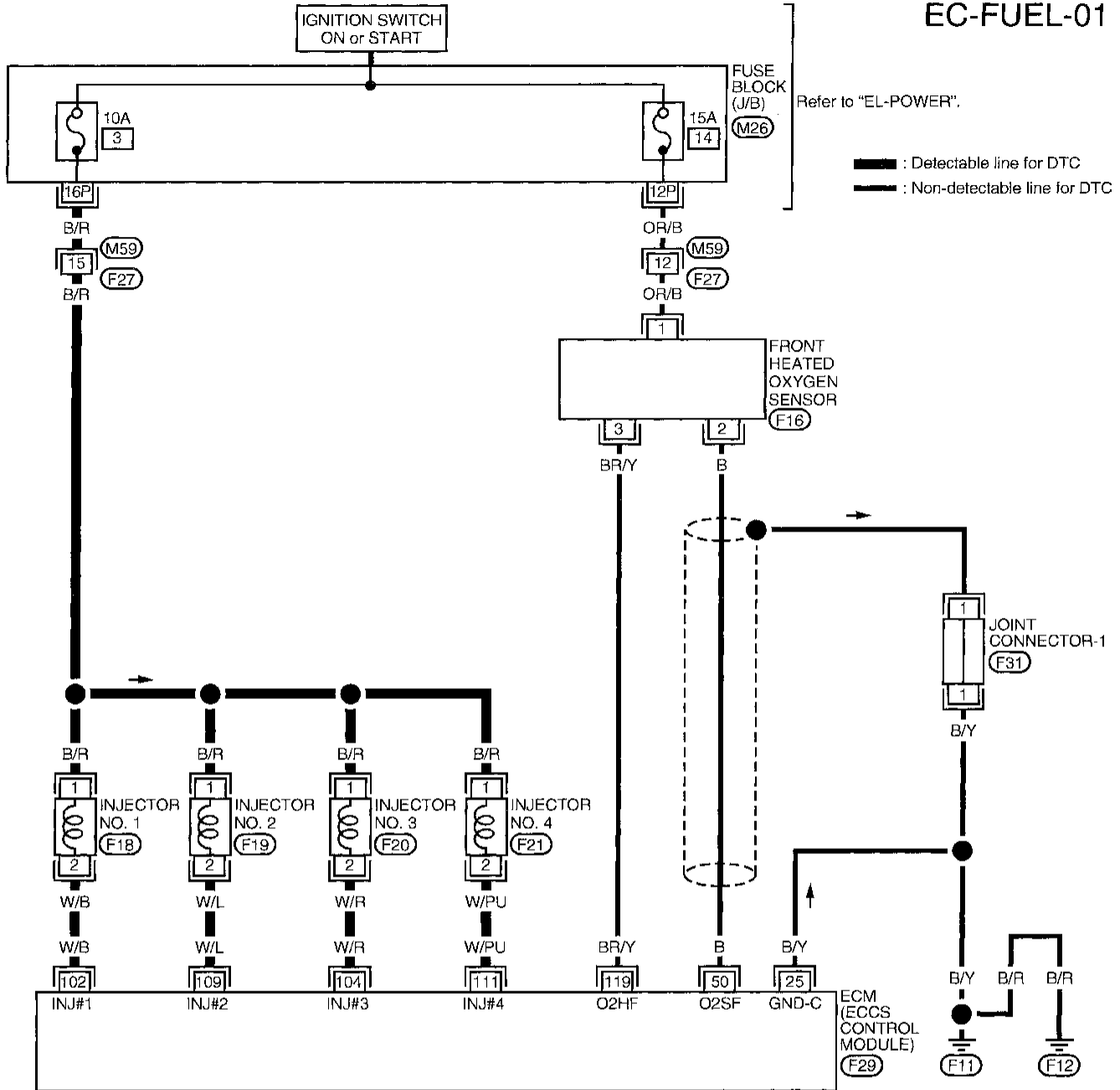
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TROUBLE DIAGNOSIS FOR DTC P0171

Fuel Injection System Function (Lean side) (Cont'd)

EC-FUEL-01



| | | | | | | | | |
|----|----|-----|-----|-----|-----|-----|-----|-----|
| 1P | 2P | 3P | 4P | 5P | 6P | 7P | | |
| 8P | 9P | 10P | 11P | 12P | 13P | 14P | 15P | 16P |

(M26) W

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|---|----|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | |

(M59) W

| | | |
|---|---|---|
| 3 | 2 | 1 |
|---|---|---|

(F16) GY

| | |
|---|---|
| 2 | 1 |
|---|---|

(F18) B, (F19) B, (F20) B, (F21) B

| | | | | | |
|---|---|---|---|---|---|
| 1 | 1 | 1 | 1 | 1 | 1 |
|---|---|---|---|---|---|

(F31) GY

| | | | | | | | | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|----|----|----|----|----|----|----|----|----|
| 101 | 102 | 103 | 104 | 105 | 106 | 107 | 108 | 1 | 2 | 3 | 4 | | | | | |
| 109 | 110 | 111 | 112 | 113 | 114 | 115 | 116 | 5 | 6 | 7 | 8 | 9 | 10 | | | |
| 117 | 118 | 119 | 120 | 121 | 122 | 123 | 124 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |

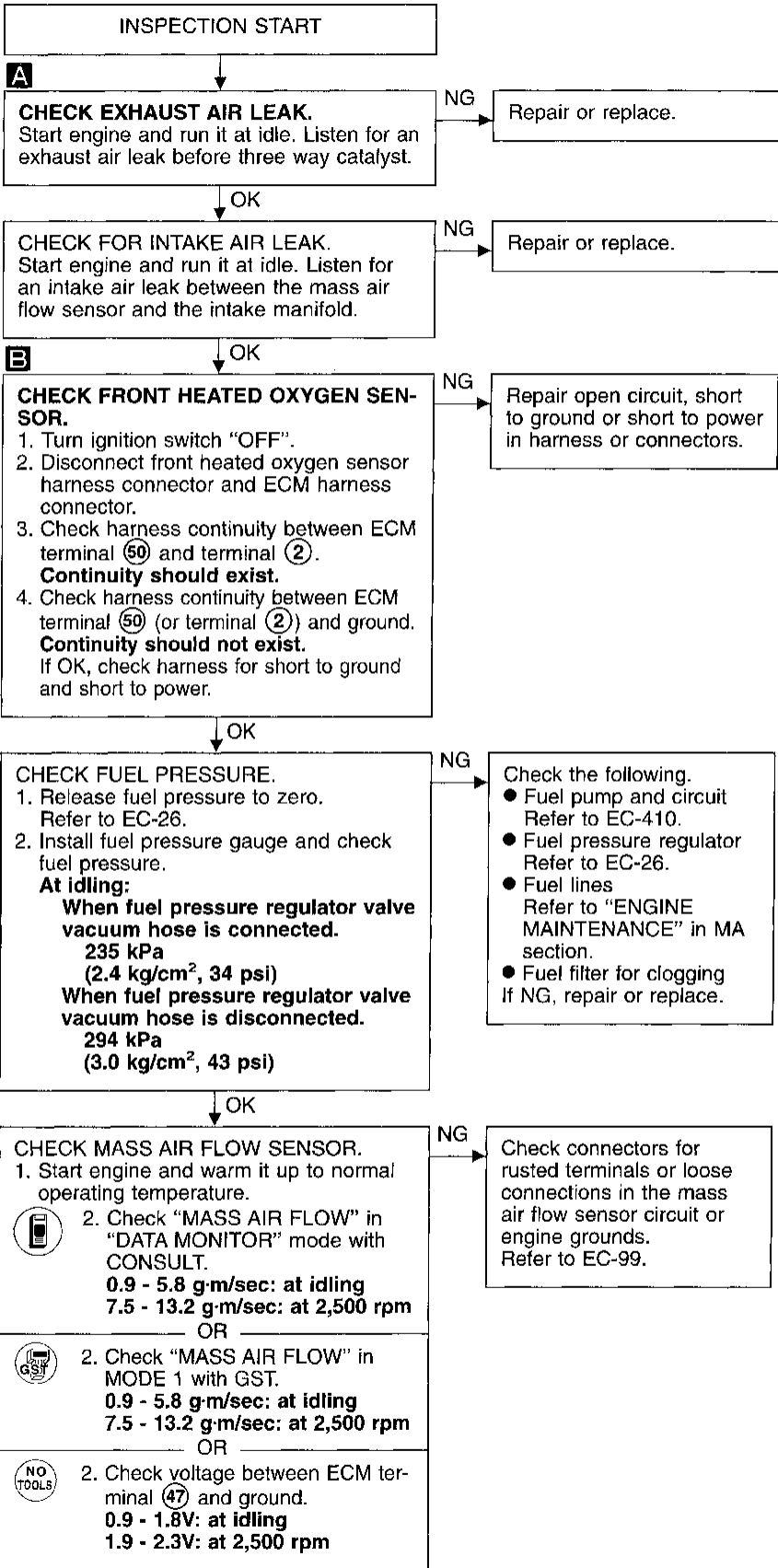
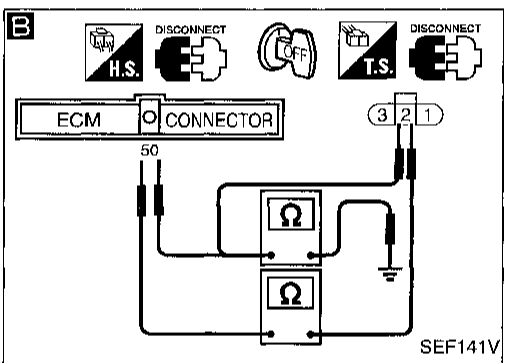
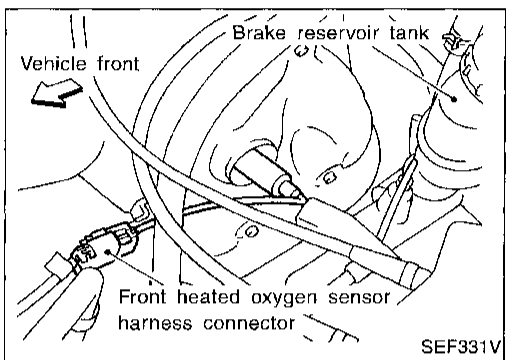
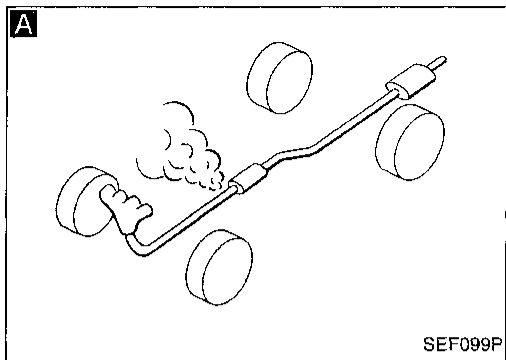
| | | | | | | | | | | | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 20 | 21 | 22 | 23 | 24 | 25 | 44 | 45 | 46 | 47 | 64 | 65 | 66 | 67 | | | | | | |
| 26 | 27 | 28 | 29 | 30 | 31 | 32 | 48 | 49 | 50 | 51 | 52 | 53 | 68 | 69 | 70 | 71 | 72 | | |
| 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 54 | 55 | 56 | 57 | 58 | 73 | 74 | 75 | 76 |
| 59 | 60 | 61 | 62 | 63 | 77 | 78 | 79 | 80 | | | | | | | | | | | |

(F29) GY



Fuel Injection System Function (Lean side)
(Cont'd)

DIAGNOSTIC PROCEDURE

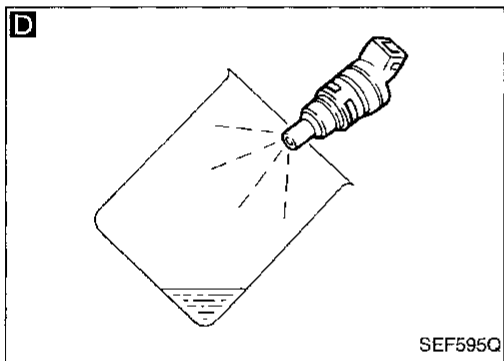
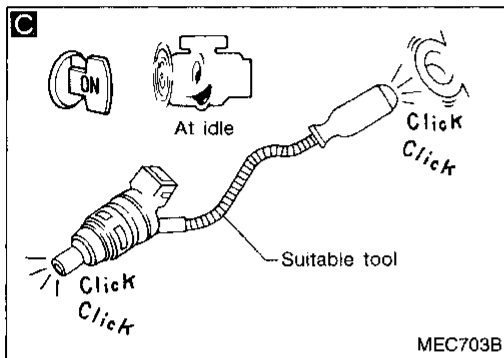
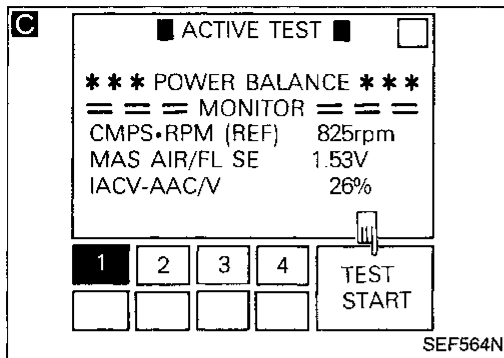


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TROUBLE DIAGNOSIS FOR DTC P0171

Fuel Injection System Function (Lean side) (Cont'd)



- C**
- CHECK FUNCTION OF INJECTORS.**
1. Install all parts removed.
 2. Start engine.
 3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
 4. Make sure that each circuit produces a momentary engine speed drop.
- OR
3. Listen to each injector operating sound.
Clicking noise should be heard.

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-404. Repair harness or connectors.

OK → Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

1. Turn ignition switch "OFF".
2. Remove injector with fuel tube assembly. Refer to EC-27. Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors should remain connected.

- D**
1. Disconnect all ignition coil harness connectors.
 2. Place pans or saucers under each cylinder.
 3. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.
Fuel should be sprayed evenly for each cylinder.

NG → Replace injectors from which fuel does not spray out. Refer to EC-27. Always replace O-ring with new one.

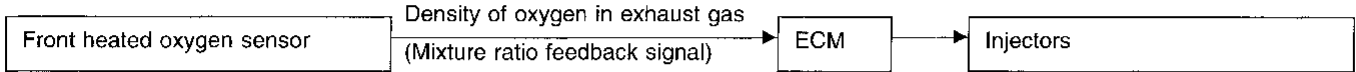
OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

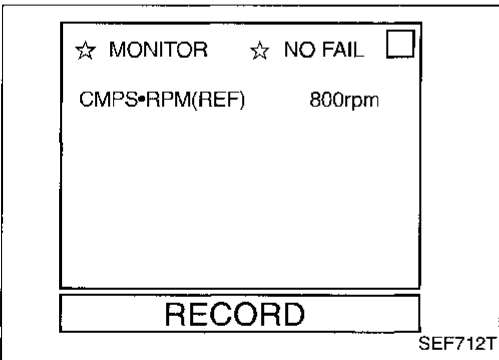
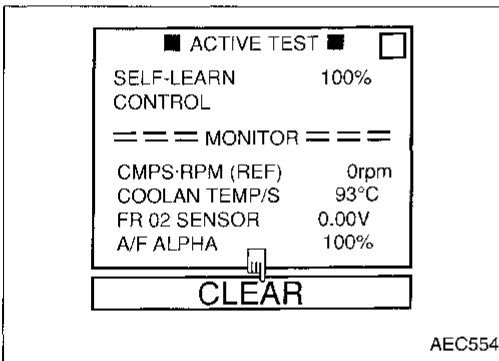
Fuel Injection System Function (Rich side)

ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and lights up the MIL (2 trip detection logic).



| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0172 0114 | <ul style="list-style-type: none"> ● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | <ul style="list-style-type: none"> ● Front heated oxygen sensor ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

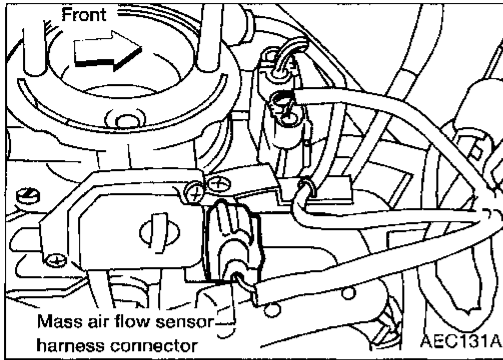
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
- 4) Clear the self-learning control coefficient by touching "CLEAR".
- 5) Select "DATA MONITOR" mode with CONSULT.
- 6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists.
- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
- 8) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-216. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

TROUBLE DIAGNOSIS FOR DTC P0172

Fuel Injection System Function (Rich side) (Cont'd)



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- 6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- 7) Start engine again and run it for at least 10 minutes at idle speed.
- 8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-211. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

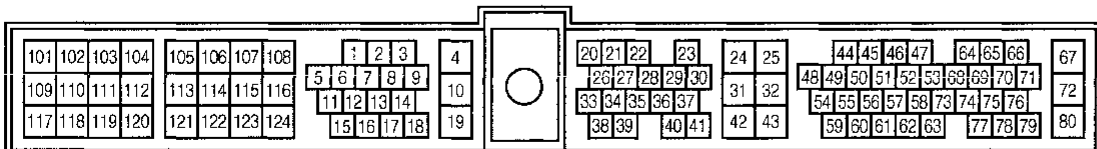
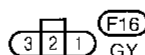
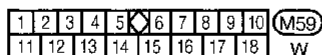
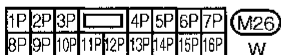
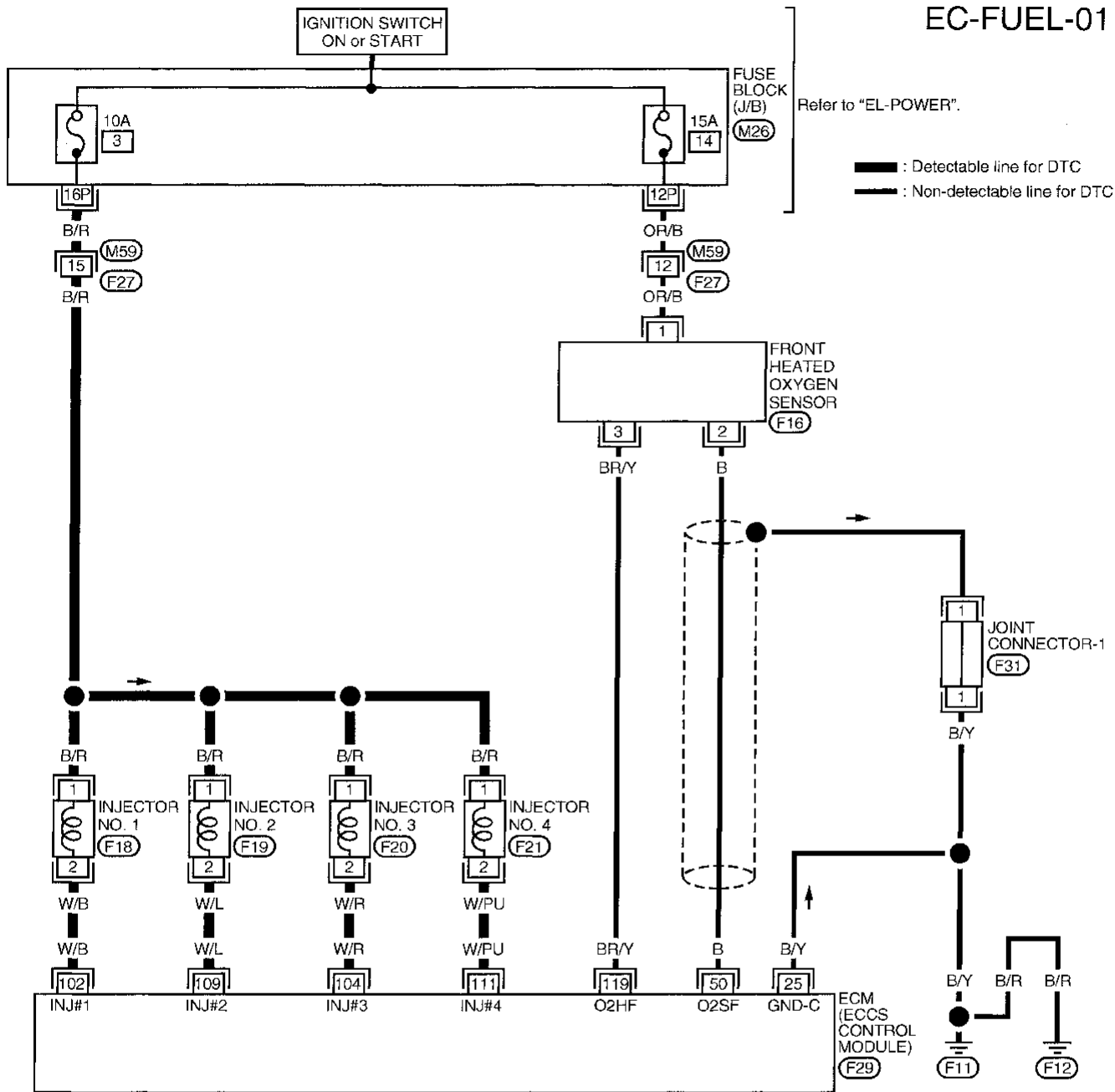


- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Disconnect mass air flow sensor harness connector. Then restart engine and run it for at least 3 seconds at idle speed.
- 4) Stop engine and reconnect mass air flow sensor harness connector.
- 5) Turn ignition switch "ON".
- 6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
- 7) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 8) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
- 9) Start engine again and run it for at least 10 minutes at idle speed. The 1st trip DTC 0114 should be detected at this stage, if a malfunction exists.
- 10) If it is difficult to start engine at step 9, the fuel injection system also has a malfunction.
- 11) Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-211. If engine does not start, remove ignition plugs and check for fouling, etc.

TROUBLE DIAGNOSIS FOR DTC P0172

Fuel Injection System Function (Rich side) (Cont'd)

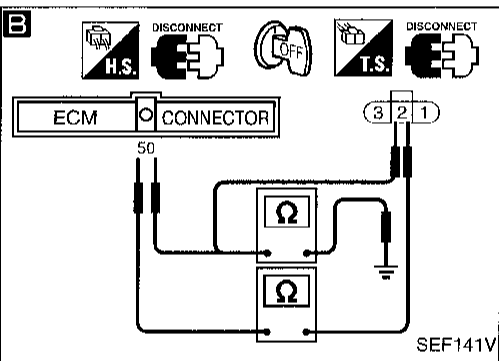
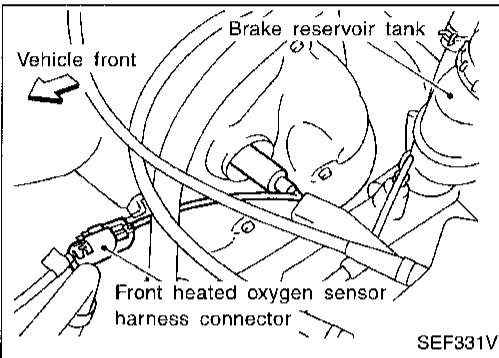
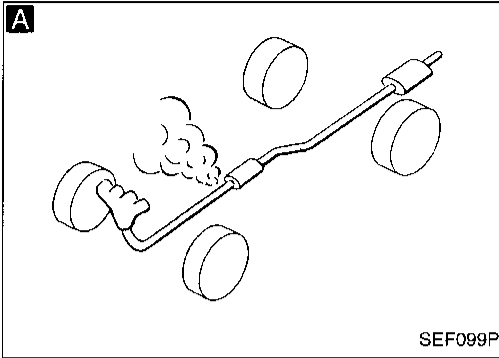
EC-FUEL-01



TROUBLE DIAGNOSIS FOR DTC P0172

Fuel Injection System Function (Rich side) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK FOR EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the warm-up three way catalyst (California model), the three way catalyst (Non-California model).




NG → Repair or replace.

B
CHECK FRONT HEATED OXYGEN SENSOR.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor RH harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal (50) and terminal (2).
Continuity should exist.
4. Check harness continuity between ECM terminal (50) (or terminal (2)) and ground.
Continuity should not exist.
If OK, check harness for short to ground and short to power.

NG → Repair harness or connectors.

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-26.
2. Install fuel pressure gauge and check fuel pressure.
At idling:
When fuel pressure regulator valve vacuum hose is connected.
Approximately 235 kPa (2.4 kg/cm², 34 psi)
When fuel pressure regulator valve vacuum hose is disconnected.
Approximately 294 kPa (3.0 kg/cm², 43 psi)

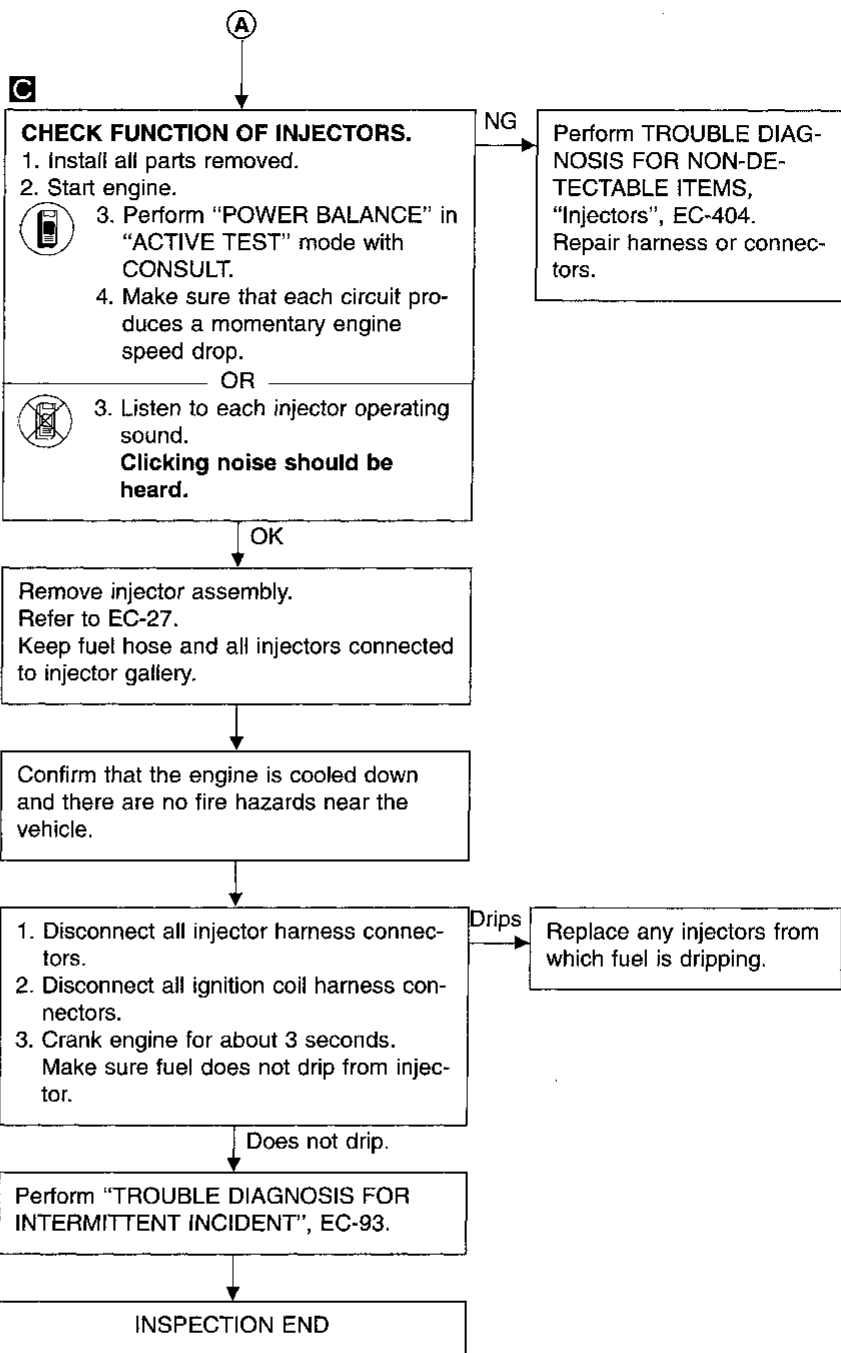
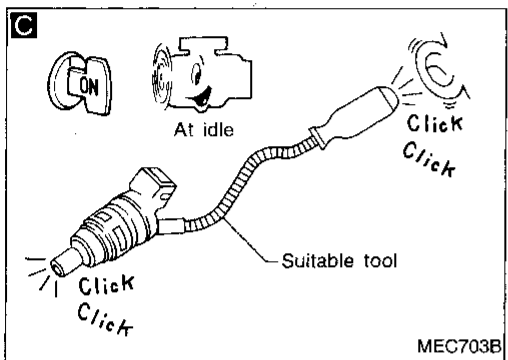
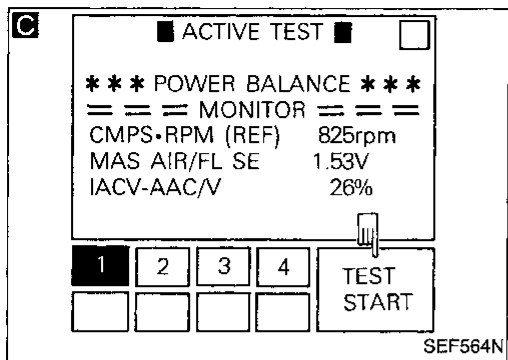
NG → Check the following.
● Fuel pump and circuit Refer to EC-410.
● Fuel pressure regulator Refer to EC-26.
If NG, repair or replace.

CHECK MASS AIR FLOW SENSOR.
1. Start engine and warm it up to normal operating temperature.
 2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
0.9 - 5.8 g-m/sec: at idling
7.5 - 13.2 g-m/sec: at 2,500 rpm
OR
 2. Check "MASS AIR FLOW" in MODE 1 with GST.
0.9 - 5.8 g-m/sec: at idling
7.5 - 13.2 g-m/sec: at 2,500 rpm
OR
 2. Check voltage between ECM terminal (47) and ground.
0.9 - 1.8V: at idling
1.9 - 2.3V: at 2,500 rpm

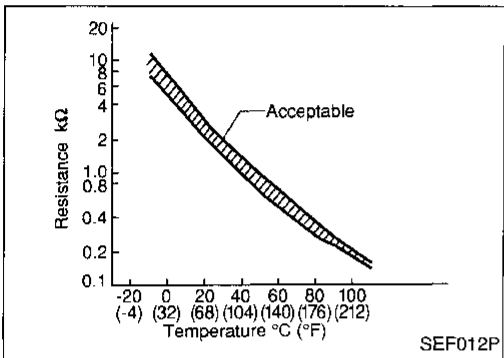
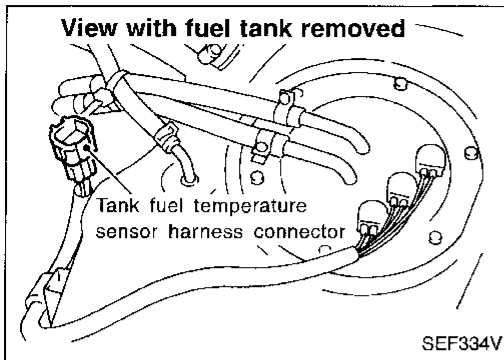
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-99.

OK
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(Go to next page.)

Fuel Injection System Function (Rich side)
(Cont'd)



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Tank Fuel Temperature Sensor

COMPONENT DESCRIPTION

The tank fuel temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

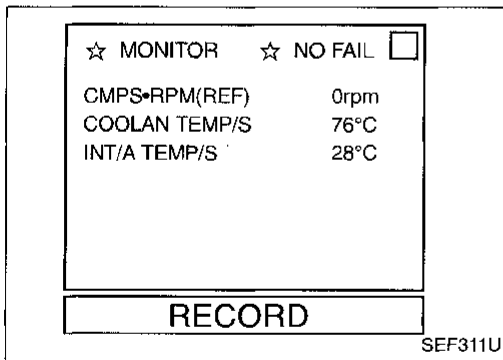
<Reference data>

| Fluid temperature °C (°F) | Voltage* V | Resistance kΩ |
|------------------------------|---------------|------------------|
| 20 (68) | 3.5 | 2.3 - 2.7 |
| 50 (122) | 2.2 | 0.79 - 0.90 |

*: These data are reference values and are measured between ECM terminal ⑥⑩ (Tank fuel temperature sensor) and ECM terminal ③② (ECM ground).

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Causes) |
|-----------------------------|--|--|
| P0180 0402 | <ul style="list-style-type: none"> ● An excessively high or low voltage is sent to ECM. ● Rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | <ul style="list-style-type: none"> ● Harness or connectors (The sensor circuit is open or shorted.) ● Tank fuel temperature sensor |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 10 seconds.

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-221.

If the result is OK, go to following step.

NOTE: If "COOLAN TEMP/S" is already less than 90°C (194°F) before step 4), the result will be OK.

If "COOLAN TEMP/S" is above 90°C (194°F), go to the following step.

- 4) Cool engine down until "COOLAN TEMP/S" is less than 90°C (194°F).
- 5) Wait at least 10 seconds.

TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)



- OR
- 1) Turn ignition switch "ON" and wait at least 10 seconds.
 - 2) Select "MODE 7" with GST.
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-221.
 - 3) Select "MODE 1" with GST and check for the engine coolant temperature.
 - 4) Cool engine down until the engine coolant temperature is less than 90°C (194°F). If the temperature is already less than 90°C (194°F) before step 4), the result will be OK.
 - 5) Wait at least 10 seconds.
 - 6) Select "MODE 7" with GST.

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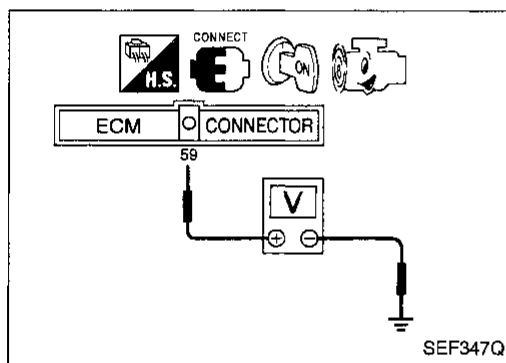
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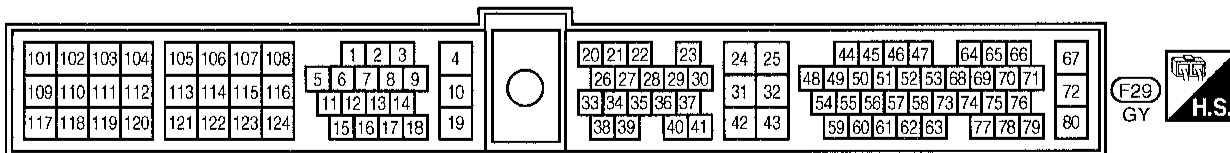
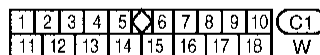
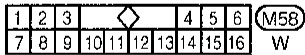
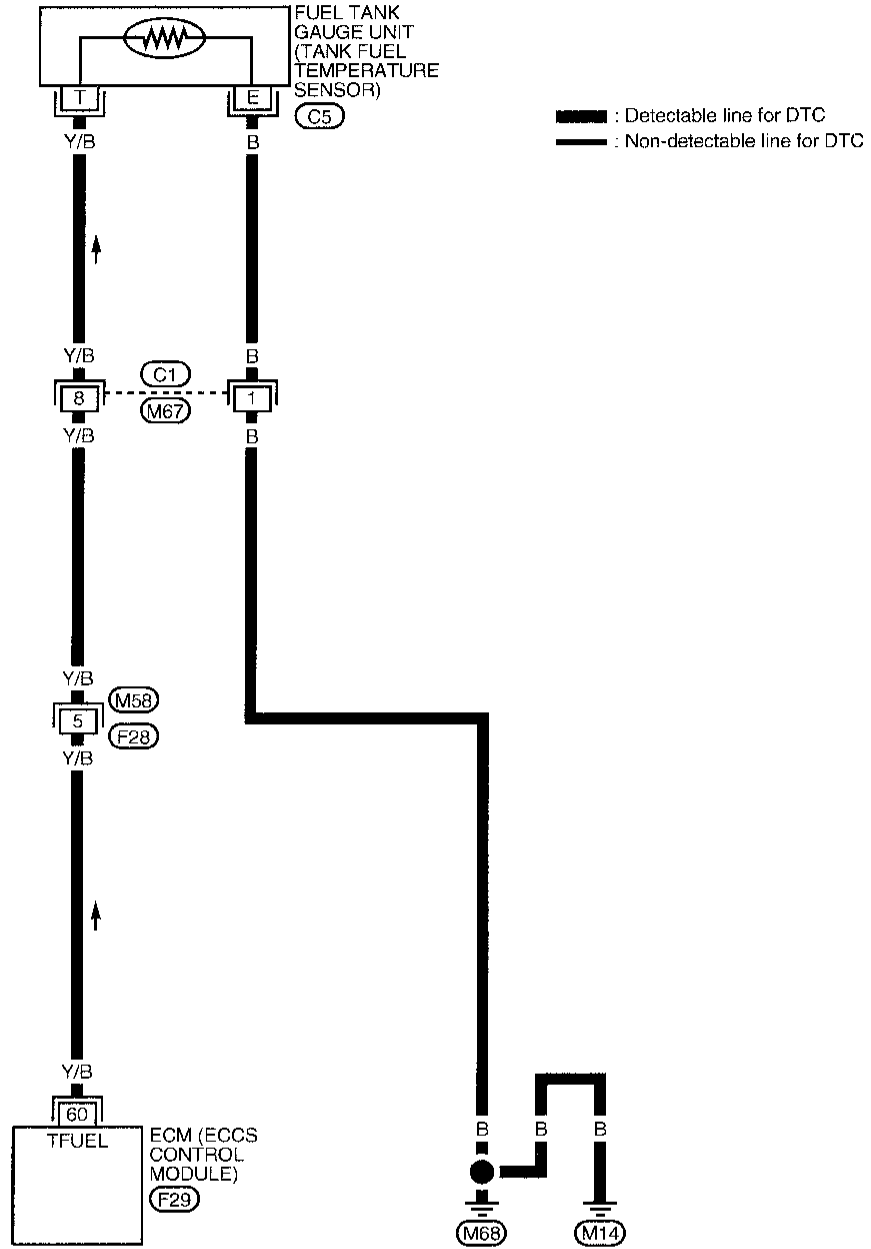


- OR
- 1) Turn ignition switch "ON" and wait at least 10 seconds.
 - 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-221.
 - 4) Cool engine down until the voltage between ECM terminal 59 (Engine coolant temperature sensor) and ground becomes more than 1.0V.
If the voltage is already more than 1.0V before step 4), the result will be OK.
 - 5) Wait at least 10 seconds.
 - 6) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 - 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

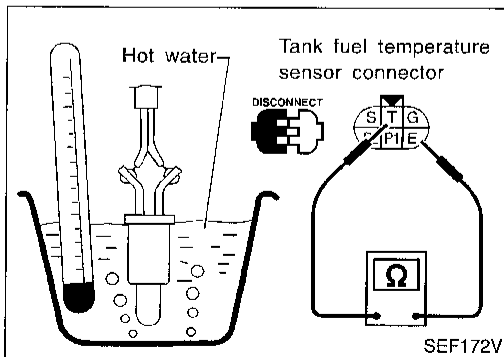
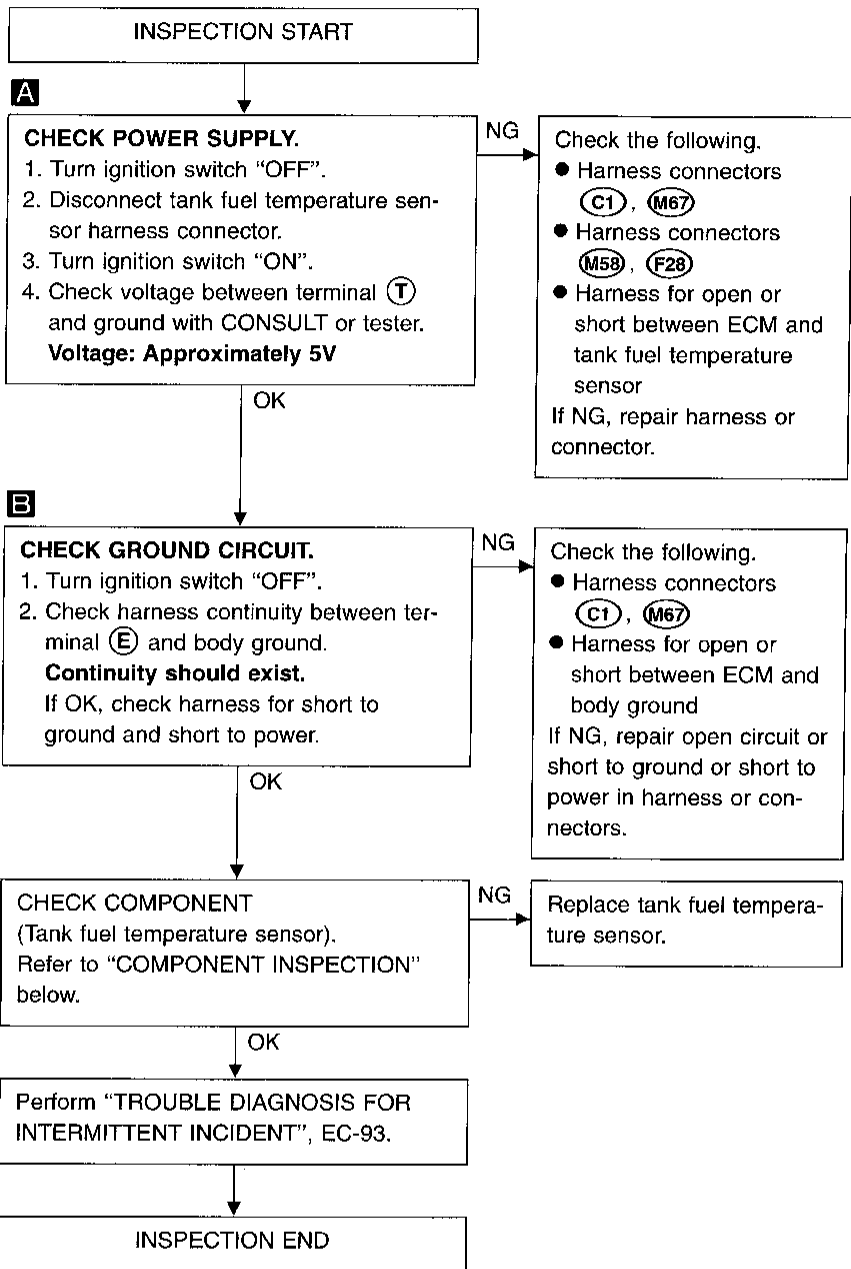
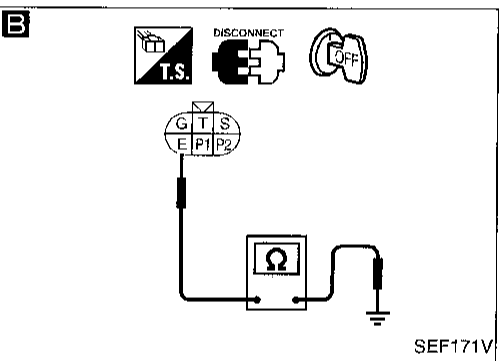
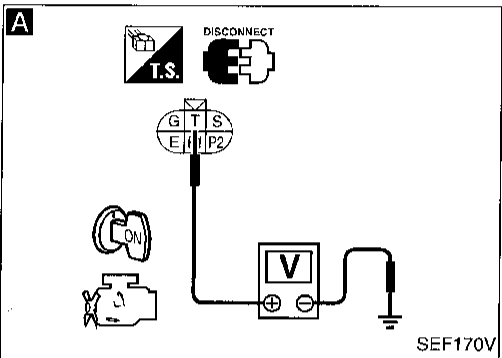
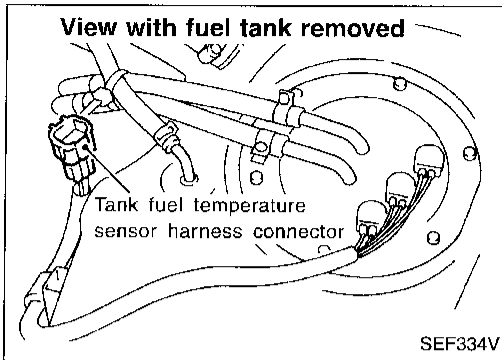
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TROUBLE DIAGNOSIS FOR DTC P0180

Tank Fuel Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



COMPONENT INSPECTION

Tank fuel temperature sensor

Check resistance by heating with hot water as shown in the figure or a heat gun.

| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68) | 2.3 - 2.7 |
| 50 (122) | 0.79 - 0.90 |

If NG, replace tank fuel temperature sensor.

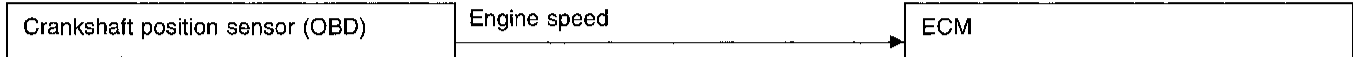
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No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire

ON BOARD DIAGNOSIS LOGIC

If a misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (OBD), the misfire is diagnosed.

The misfire detection logic consists of the following two conditions.



1. One Trip Detection Logic (Three Way Catalyst Damage)

When a misfire is detected which will overheat and damage the three way catalyst, the malfunction indicator lamp (MIL) will start blinking; even during the first trip. In this condition, ECM monitors the misfire every 200 revolutions.

If the misfire frequency decreases to a level that will not damage the three way catalyst, the MIL will change from blinking to lighting up.

(After the first trip detection, the MIL will light up from engine starting. If a misfire is detected that will cause three way catalyst damage, the MIL will start blinking.)

2. Two Trip Detection Logic (Exhaust quality deterioration)

When a misfire that will not damage the three way catalyst (but will affect exhaust emission) occurs, the malfunction indicator lamp will light up based on two trip detection logic. In this condition, ECM monitors the misfire for every 1,000 revolutions of the engine.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|----------------------------------|--|
| P0300 (0701) | ● Multiple cylinders misfire. | ● Improper spark plug ● Insufficient compression |
| P0301 (0608) | ● No. 1 cylinder misfires. | ● Incorrect fuel pressure ● EGR valve |
| P0302 (0607) | ● No. 2 cylinder misfires. | ● The injector circuit is open or shorted ● Injectors |
| P0303 (0606) | ● No. 3 cylinder misfires. | ● Intake air leak ● The ignition secondary circuit is open or shorted |
| P0304 (0605) | ● No. 4 cylinder misfires. | ● Lack of fuel ● Drive plate/Flywheel ● Front heated oxygen sensor |

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

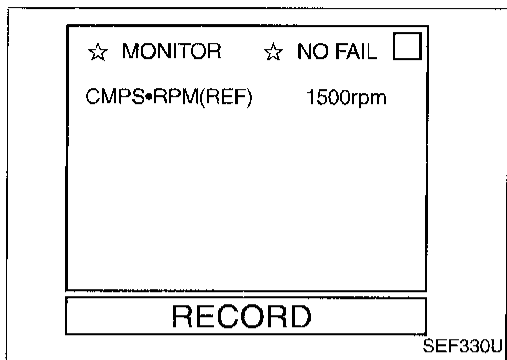
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
 Hold the accelerator pedal as steady as possible.
Note: Refer to the freeze frame data for the test driving conditions.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
 Hold the accelerator pedal as steady as possible.
Note: Refer to the freeze frame data for the test driving conditions.
- 4) Select "MODE 7" with GST.

OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
 Hold the accelerator pedal as steady as possible.
- 4) Turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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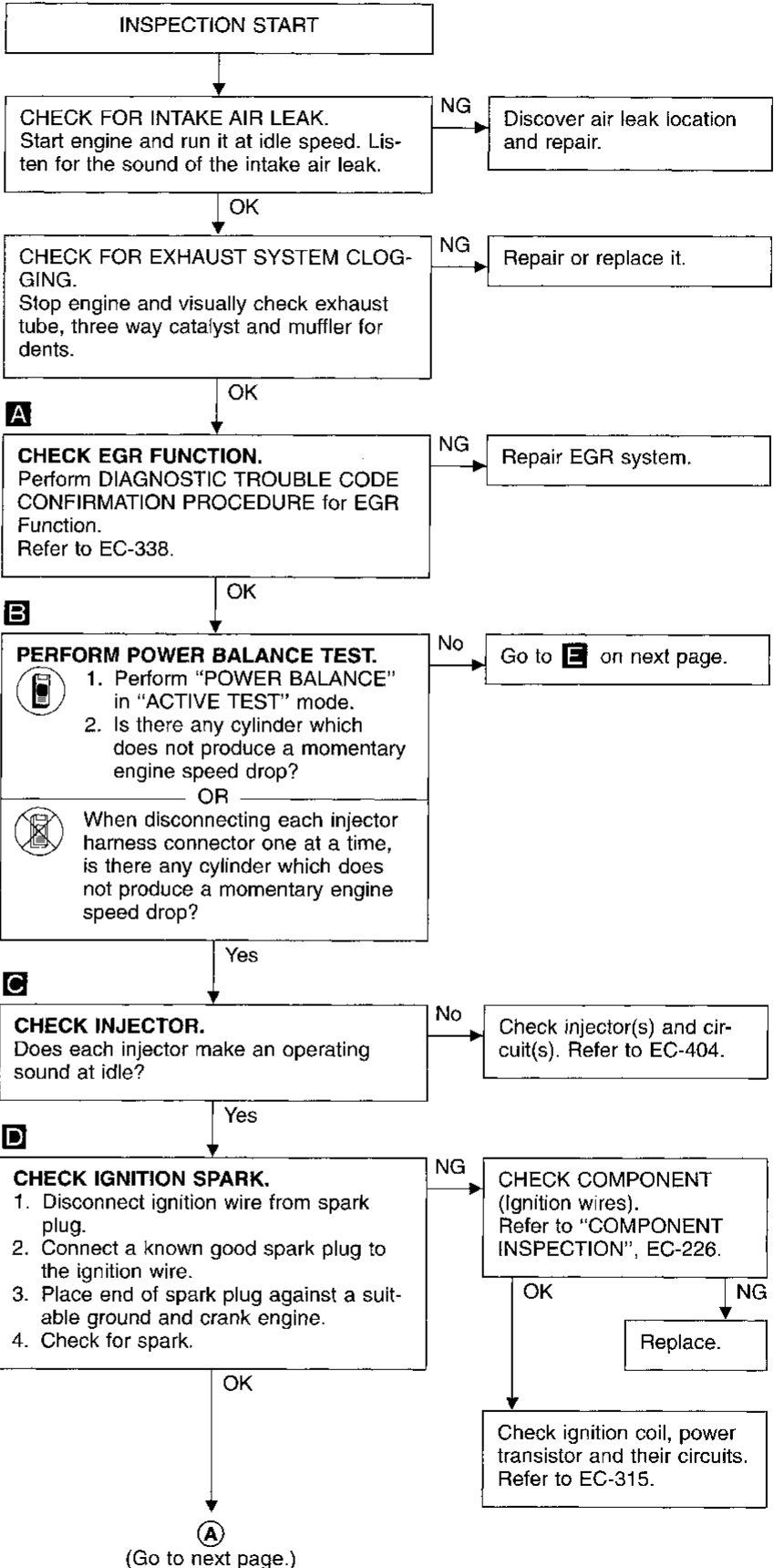
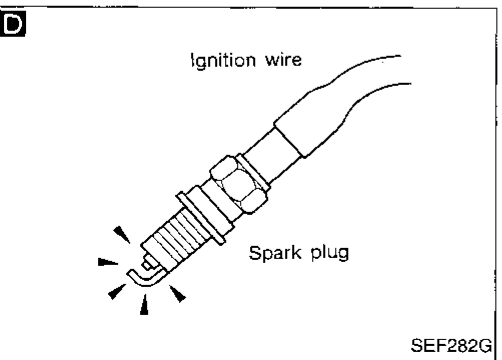
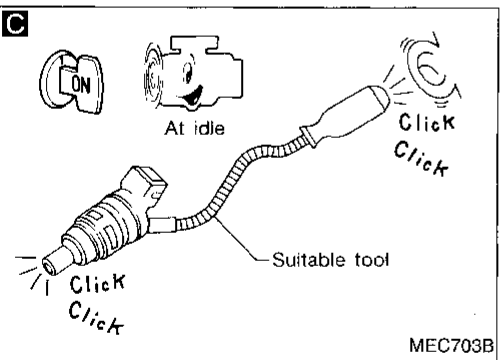
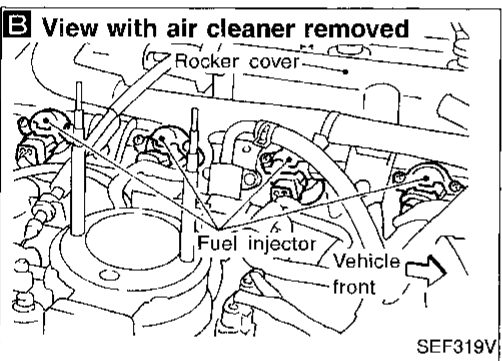
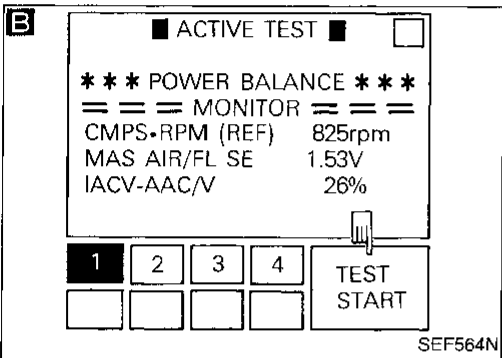
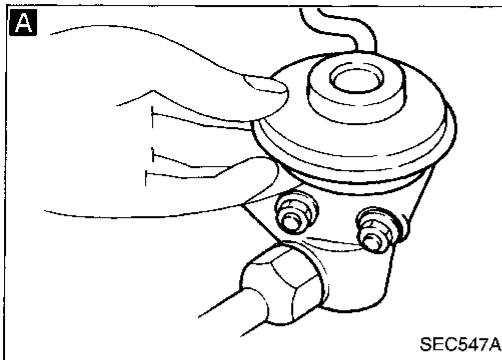
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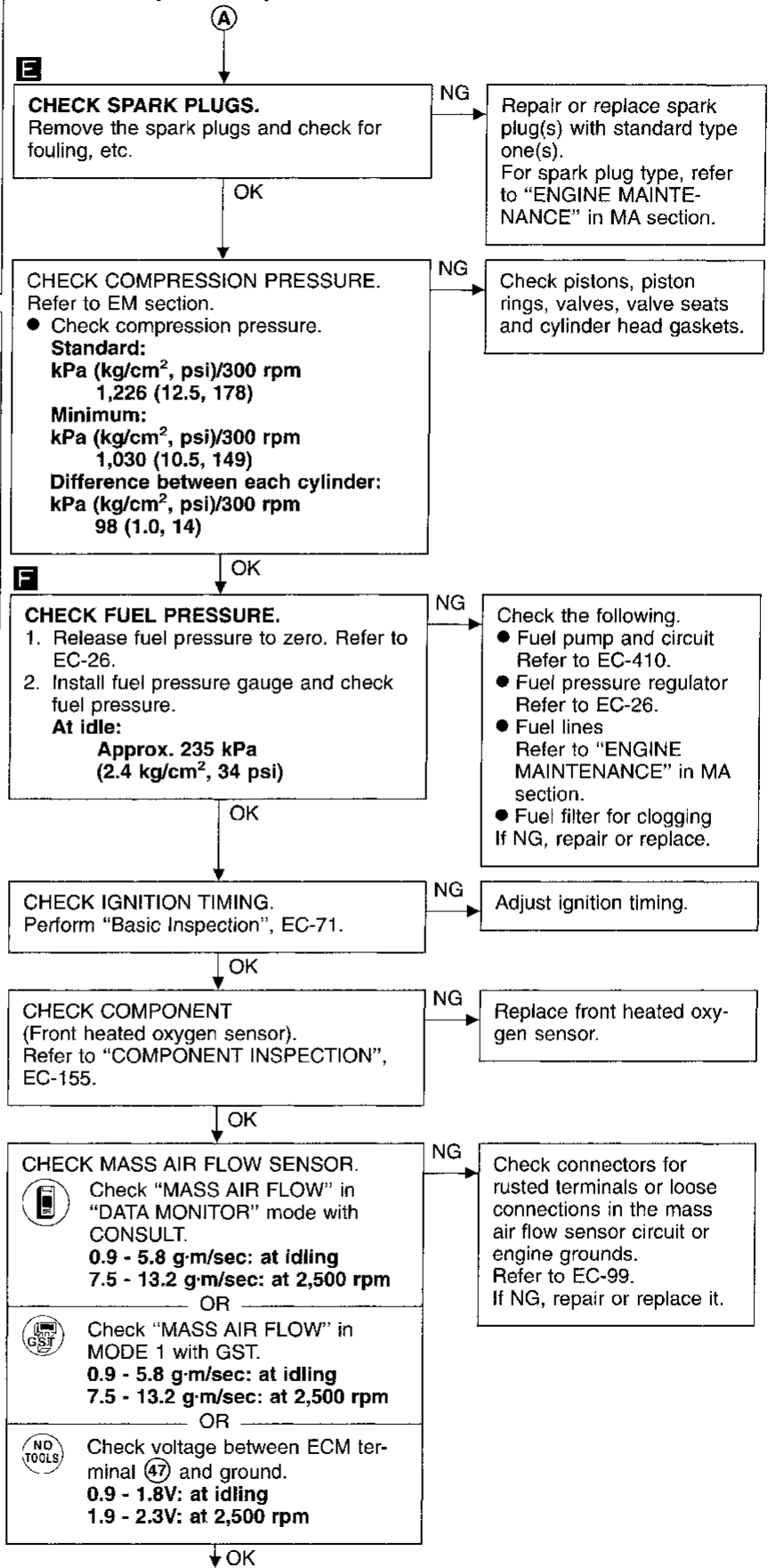
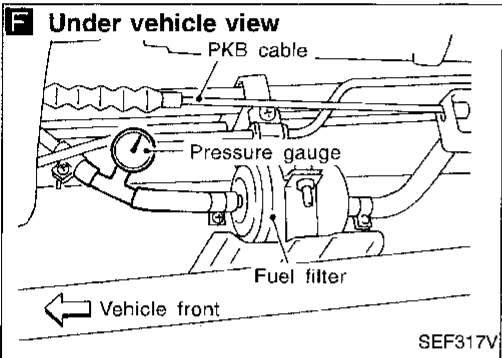
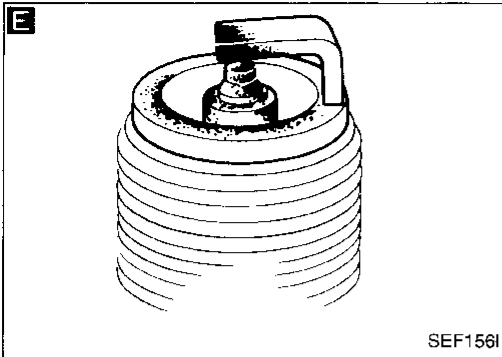
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No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

DIAGNOSTIC PROCEDURE



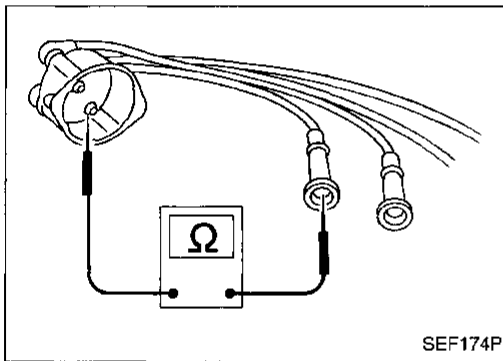
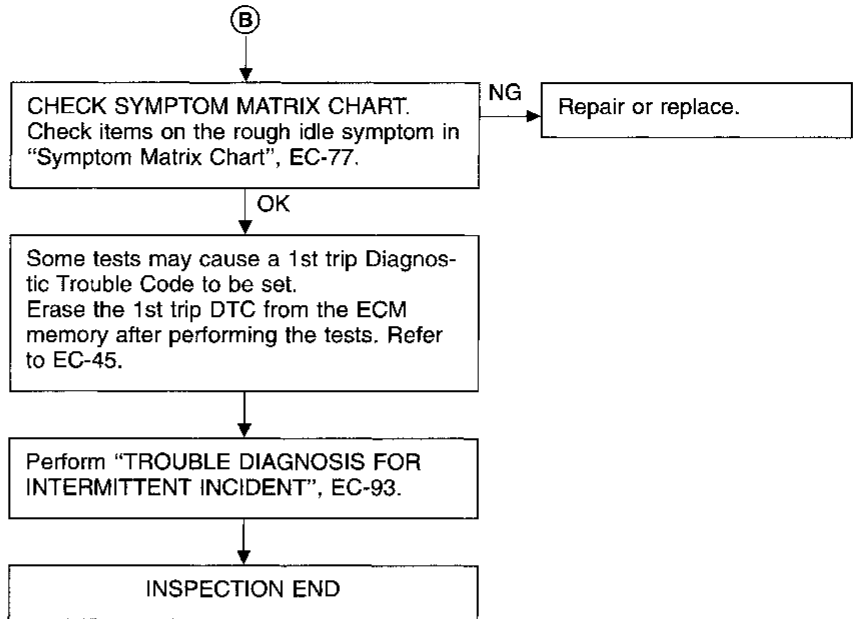
No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)



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No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)



COMPONENT INSPECTION

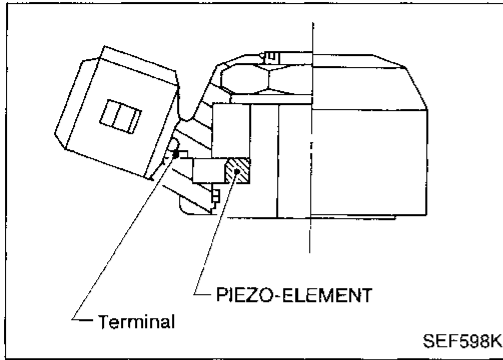
Ignition wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

Resistance:

13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft) at 25°C (77°F)

If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.



Knock Sensor (KS)

COMPONENT DESCRIPTION

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

* Freeze frame data will not be stored in the ECM for the knock sensor. The MIL will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

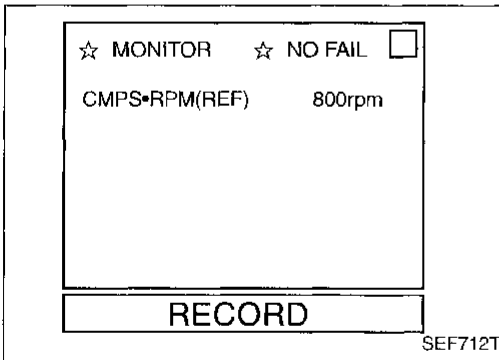
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--------------|------------------------------------|--------------------|
| 64 | W | Knock sensor | Engine is running. └ Idle speed | Approximately 2.4V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P0325 0304 | ● An excessively low or high voltage from the knock sensor is sent to ECM. | ● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10V at idle.

- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 5 seconds at idle speed.

OR

- 1) Start engine and run it for at least 5 seconds at idle speed.
- 2) Select "MODE 3" with GST.

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TROUBLE DIAGNOSIS FOR DTC P0325

Knock Sensor (KS) (Cont'd)

OR

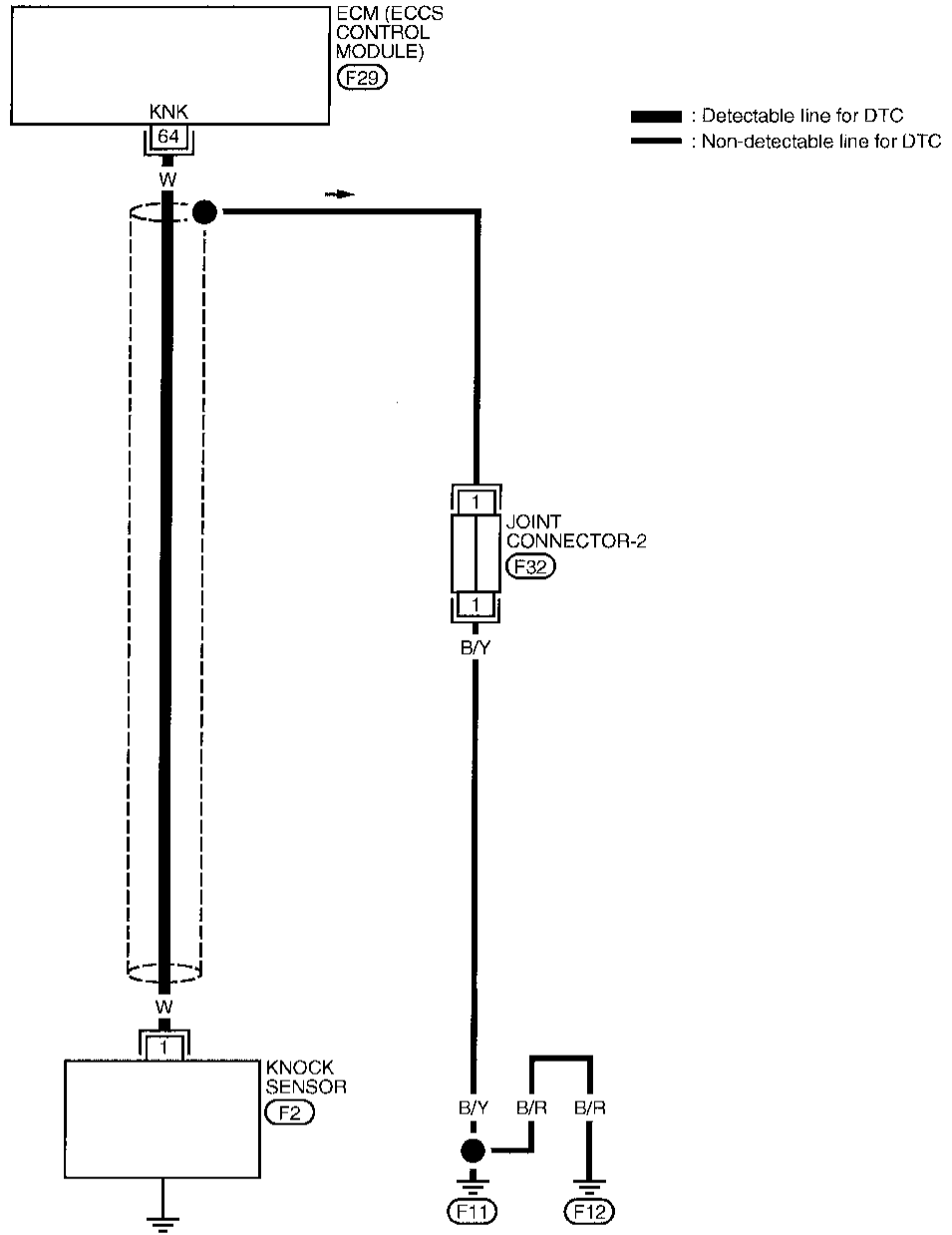


- 1) Start engine and run it for at least 5 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

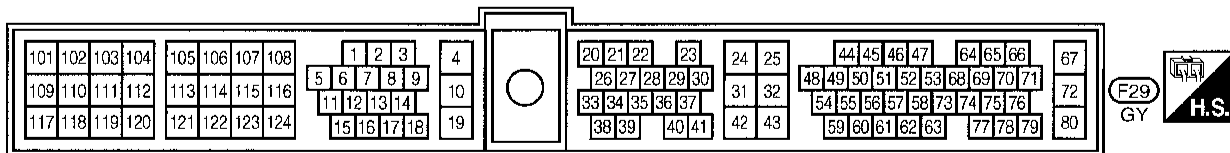
TROUBLE DIAGNOSIS FOR DTC P0325

Knock Sensor (KS) (Cont'd)

EC-KS-01

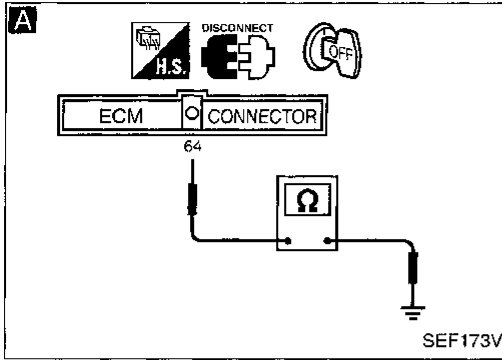


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TROUBLE DIAGNOSIS FOR DTC P0325

Knock Sensor (KS) (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

A
CHECK INPUT SIGNAL CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Check harness continuity between ECM terminal ⑥4 and ground.
Resistance:
Approximately 500 - 620 kΩ
[at 25°C (77°F)]
 If OK, check harness for short to ground and short to power.
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

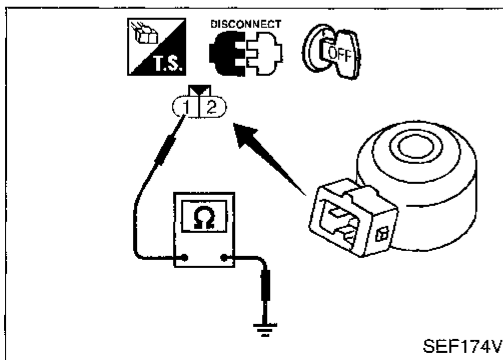
NG → Check the following.
 ● Harness for open or short between knock sensor and ECM
 If NG, repair open circuit or short to ground or short to power in harness or connectors.
 ● Knock sensor (Refer to "COMPONENT INSPECTION" below.)
 If NG, replace knock sensor.

OK →
CHECK SHIELD CIRCUIT.
 1. Turn ignition switch "OFF".
 2. Remove joint connector-2.
 3. Check the following.
 ● Continuity between joint connector-2 terminal ① and ground
 ● Joint connector-2
 (Refer to "HARNESS LAYOUT" in EL section.)
Continuity should exist.
 If OK, check harness for short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

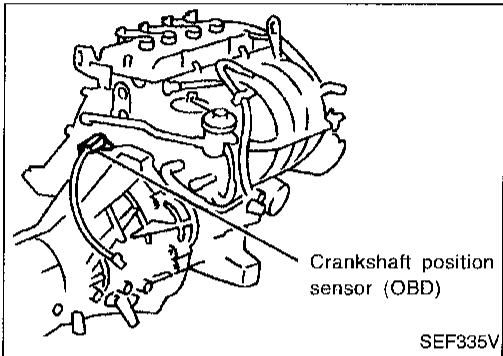
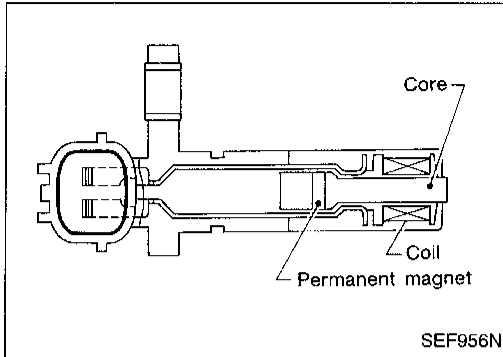


COMPONENT INSPECTION

Knock sensor

- Use an ohmmeter which can measure more than 10 MΩ.
- 1. Disconnect knock sensor harness connector.
- 2. Check resistance between terminal ① and ground.
Resistance: 500 - 620 kΩ [at 25°C (77°F)]

CAUTION:
 Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



Crankshaft Position Sensor (CKPS) (OBD)

COMPONENT DESCRIPTION

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet, core and coil.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

This sensor is not directly used to control the engine system. It is used only for the on board diagnosis of misfire.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (AC Voltage) |
|---------------|------------|----------------------------------|--|----------------------|
| 47 | L | Crankshaft position sensor (OBD) | Engine is running. (Warm-up condition) Idle speed | Approximately 0V |
| | | | Engine is running. Engine speed is 2,000 rpm. | |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0335 0802 | <ul style="list-style-type: none"> The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed. | <ul style="list-style-type: none"> Harness or connectors (The crankshaft position sensor (OBD) circuit is open.) Crankshaft position sensor (OBD) |

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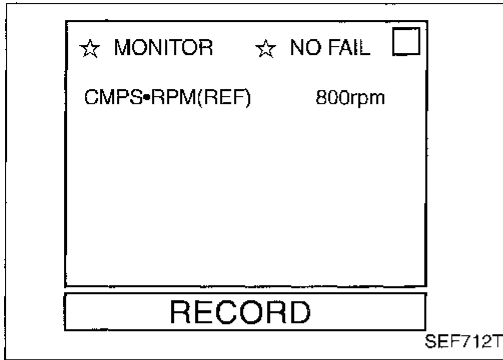
TROUBLE DIAGNOSIS FOR DTC P0335

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 15 seconds at idle speed.

OR



- 1) Start engine and run it for at least 15 seconds at idle speed.
- 2) Select "MODE 7" with GST.

OR

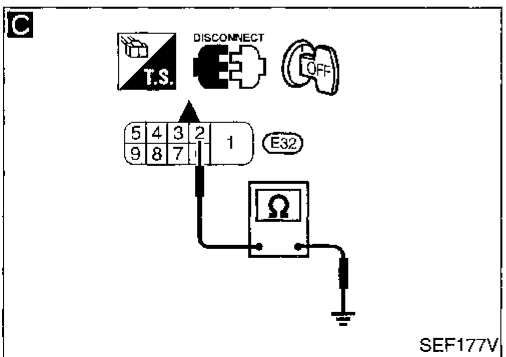
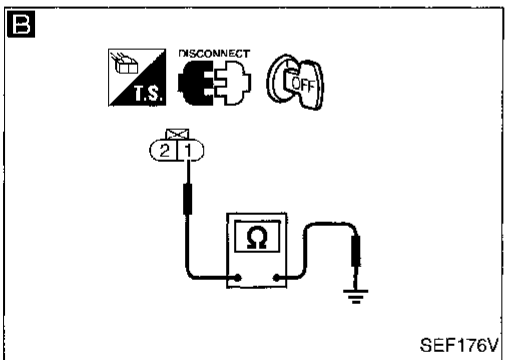
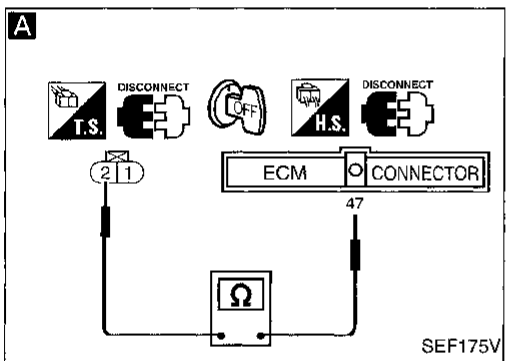
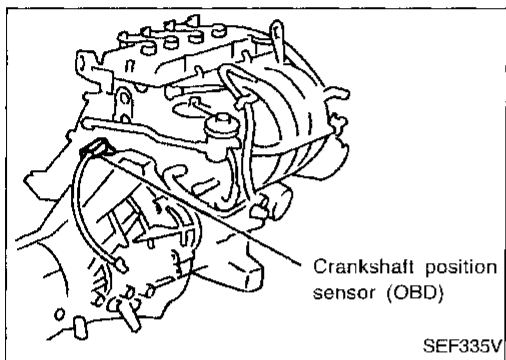
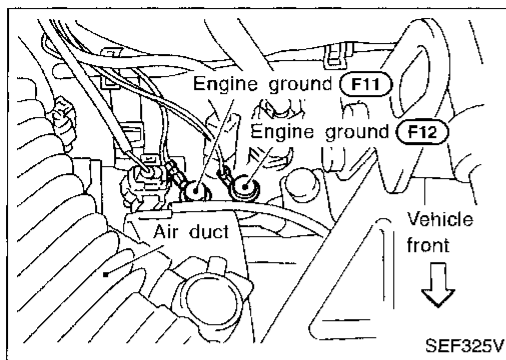


- 1) Start engine and run it for at least 15 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

TROUBLE DIAGNOSIS FOR DTC P0335

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.
2. Check continuity between ECM terminal ④⑦ and terminal ②①.

Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (E202), (E32)
- Harness connectors (E41), (F25)
- Harness for open or short between ECM and crankshaft position sensor (OBD)

If NG, repair open circuit or short to ground or short to power in harness or connectors.

B

CHECK GROUND CIRCUIT.

1. Reconnect ECM harness connector.
2. Check harness continuity between terminal ① and engine ground.

Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (E202), (E32)
- Harness connectors (E41), (F25)
- Harness for open or short between crankshaft position sensor (OBD) and ECM

If NG, repair open circuit or short to ground or short to power in harness or connectors.

CHECK COMPONENT
[Crankshaft position sensor (OBD)].
Refer to "COMPONENT INSPECTION" on next page.

NG

Replace crankshaft position sensor (OBD).

C

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect harness connector (E32).
3. Check harness continuity between harness connector (E32) terminal ② and ground.

Continuity should exist.
If OK, check harness for short to power.

NG

Check the following.

- Harness connectors (E41), (F25)
- Joint connector-1
- Harness for open or short between harness connector (E32) and ground

If NG, repair open circuit or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

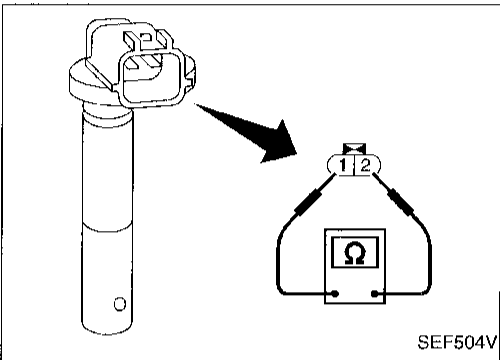
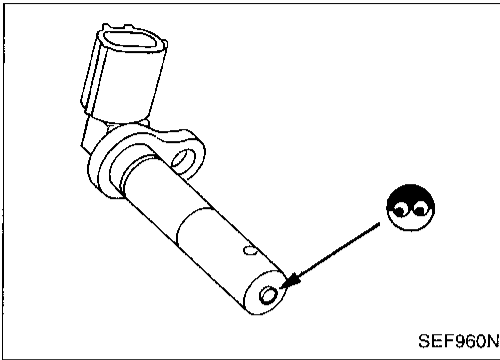
TROUBLE DIAGNOSIS FOR DTC P0335

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

COMPONENT INSPECTION

Crankshaft position sensor (OBD)

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.
Resistance: Approximately 166.5 - 203.5Ω
[at 20°C (68°F)]
If NG, replace crankshaft position sensor (OBD).



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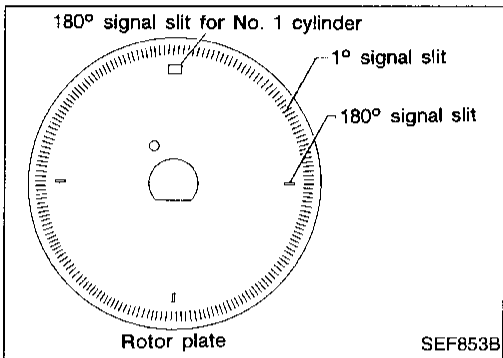
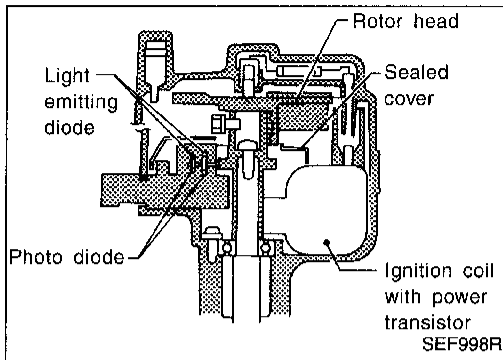
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Camshaft Position Sensor (CMPS)

COMPONENT DESCRIPTION

The camshaft position sensor is a basic component of the ECCS. It monitors engine speed and piston position. These input signals to the ECM are used 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 a 1° (POS) signal and 4 slits for a 180° (REF) signal. The wave-forming circuit consists of Light Emitting Diodes (LED) and photo diodes.

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

The distributor is not repairable and must be replaced as an assembly except distributor cap.

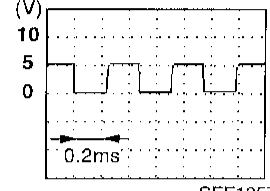
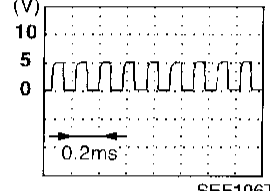
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|--|----------------------------|
| 4 | LG/R | ECCS relay (Self-shutoff) | Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF" | 0 - 1V |
| | | | Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 44 | PU | Camshaft position sensor (Reference signal) | Engine is running. (Warm-up condition) └ Idle speed | 0.2 - 0.5V SEF114V |
| 48 | PU | | Engine is running. └ Engine speed is 2,000 rpm. | 0 - 0.5V SEF200T |

TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--|--|---|
| 49 | LG | Camshaft position sensor (Position signal) | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed | Approximately 2.6V  |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Engine speed is 2,000 rpm. | Approximately 2.5 - 2.6V  |
| 67 | B/P | Power supply for ECM | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Ignition switch "ON"</div> | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/P | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Idle speed | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P0340 0101 | A) Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking. ----- B) Either 1° or 180° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed. ----- C) The relation between 1° and 180° signal is not in the normal range during the specified engine speed. | <ul style="list-style-type: none"> ● Harness or connectors (The camshaft position sensor circuit is open or shorted.) ● Camshaft position sensor ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● Dead (Weak) battery |

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B and C".

TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)

Procedure for malfunction A

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Crank engine for at least 2 seconds.

OR

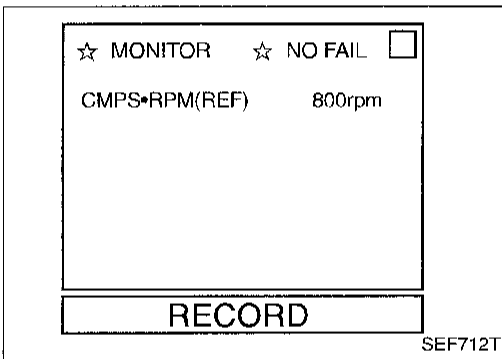
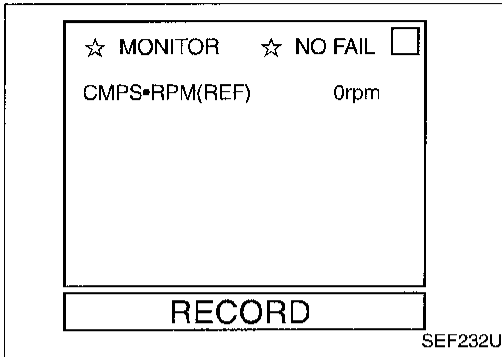


- 1) Crank engine for at least 2 seconds.
- 2) Select "MODE 7" with GST.

OR



- 1) Crank engine for at least 2 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.



Procedure for malfunction B and C

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it for at least 2 seconds at idle speed.

OR



- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Select "MODE 7" with GST.

OR



- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd)

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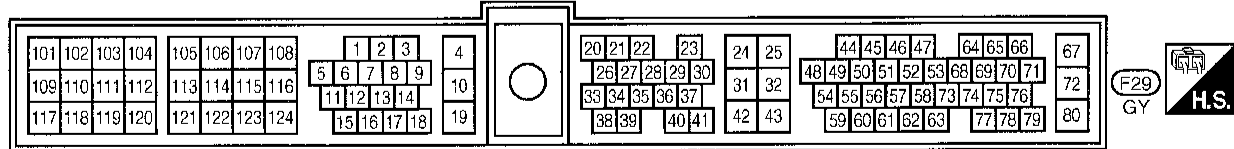
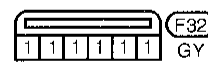
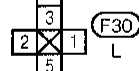
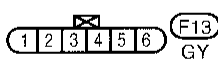
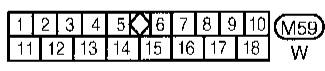
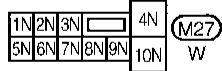
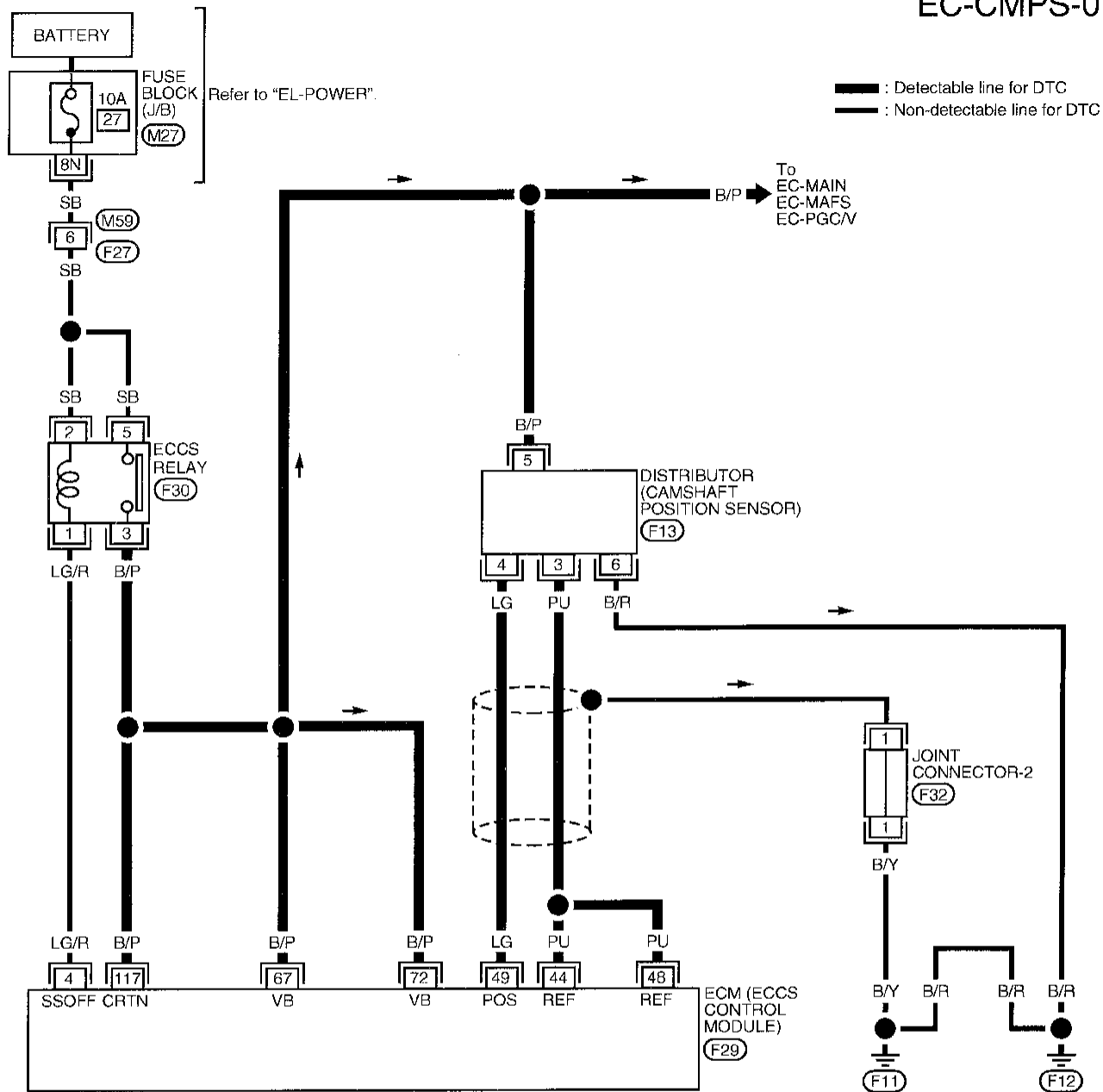
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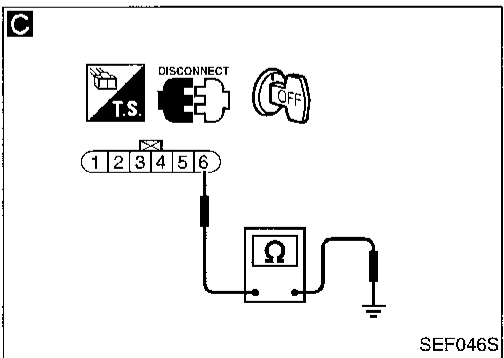
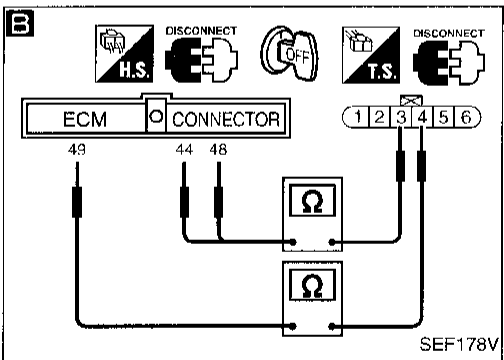
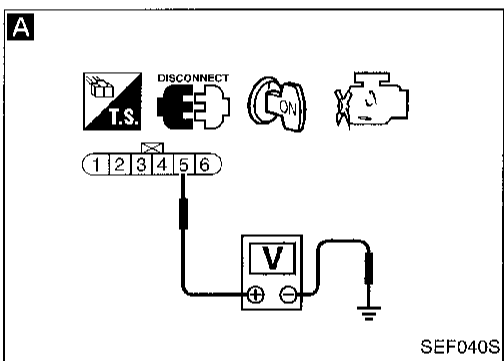
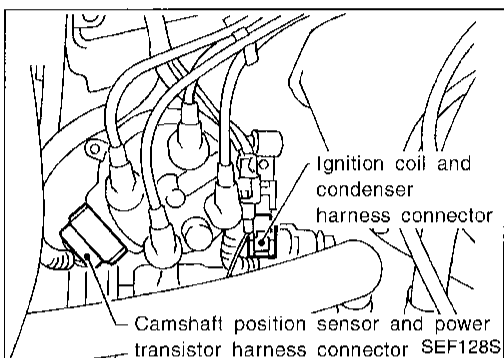
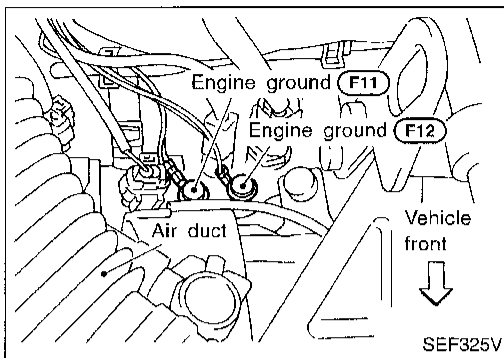
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TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd) DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A
CHECK POWER SUPPLY.
1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ⑤ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
● Harness for open or short between camshaft position sensor and ECM
● Harness for open or short between camshaft position sensor and ECCS relay
If NG, repair harness or connectors.

B
CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between sensor terminal ④ and ECM terminals ④⑨, sensor terminal ③ and ECM terminals ④④, ④⑧.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

C
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector.
3. Check harness continuity between sensor terminal ⑥ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

CHECK COMPONENT
(Camshaft position sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace camshaft position sensor.

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Remove joint connector-2.
3. Check the following.
● Continuity between joint connector-2 terminal ① and ground
● Joint connector-2 (Refer to "HARNESS LAYOUT" in EL section.)
Continuity should exist.
If OK, check harness for short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

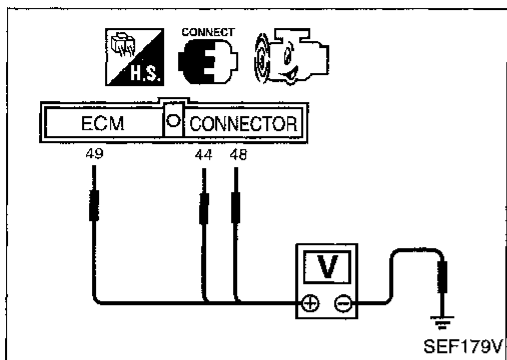
INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P0340

Camshaft Position Sensor (CMPS) (Cont'd) COMPONENT INSPECTION

Camshaft position sensor

1. Start engine and warm it up to the normal operating temperature.
2. Check voltage between ECM terminal ④⑨ and ground, ECM terminal ④④ or ④⑧ and ground.



| Condition | Terminal | Voltage |
|---------------------------|---------------------|------------------------------|
| Engine running at idle | ④⑨ and ground | Approximately 2.6V |
| | ④④ or ④⑧ and ground | 0.2 - 0.5V |
| Engine speed is 2,000 rpm | ④⑨ and ground | Approximately 2.5 - 2.6V |
| | ④④ or ④⑧ and ground | 0 - 0.5V |

If NG, replace distributor assembly with camshaft position sensor.

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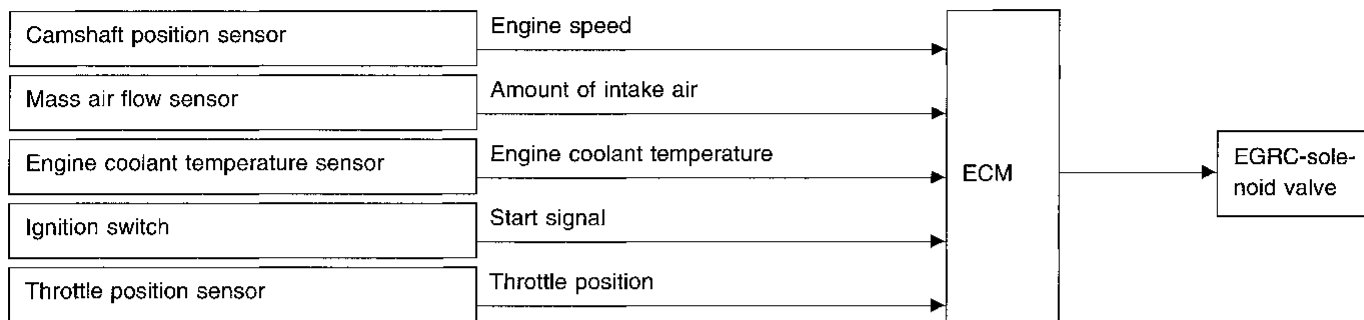
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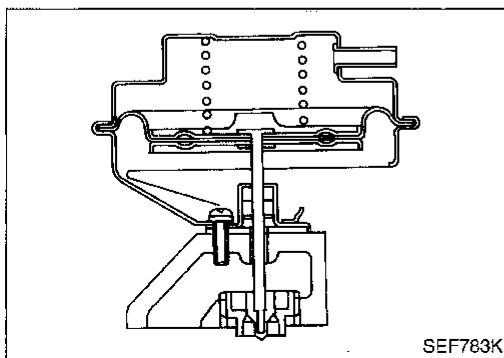
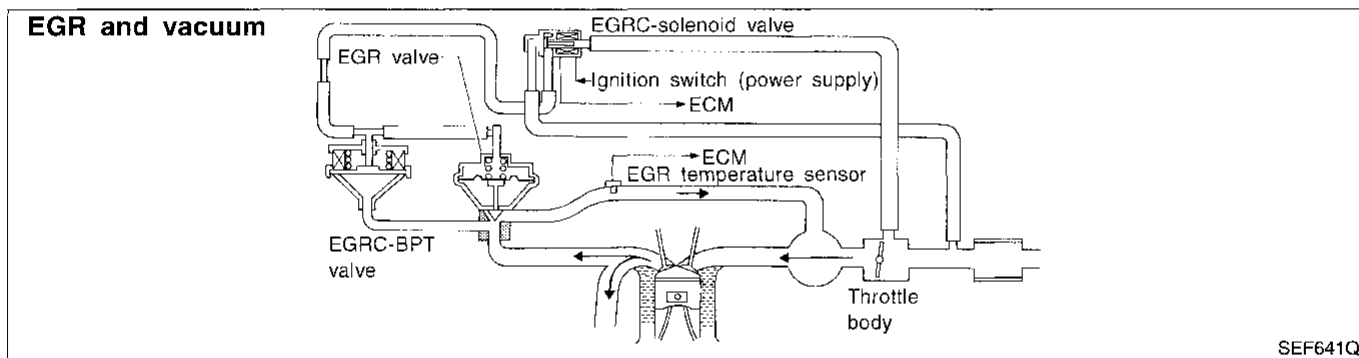
EGR Function (Close)

SYSTEM DESCRIPTION



This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-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 remains closed.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction



COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

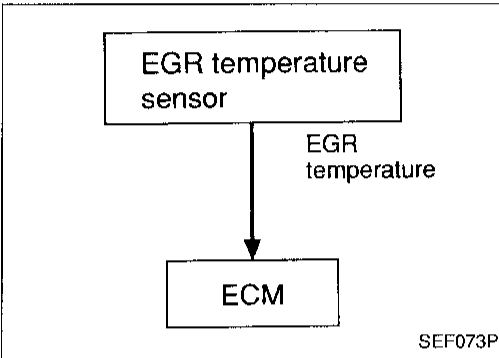
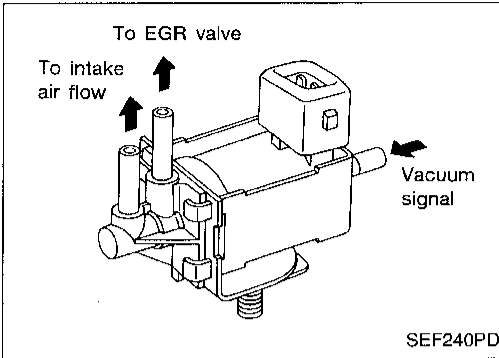
TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.

When the ECM sends an OFF signal, a plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.



ON BOARD DIAGNOSIS LOGIC

If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0400 0302 | <ul style="list-style-type: none"> The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition. | <ul style="list-style-type: none"> EGR valve stuck closed EGRC-BPT valve Vacuum hose EGRC-solenoid valve EGR passage EGR temperature sensor Exhaust gas leaks |

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EGR Function (Close) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- P0400 will not be displayed at "SELF-DIAG RESULTS" mode with CONSULT even though DTC work support test result is "NG".

TESTING CONDITION:

Always perform the test at a temperature of 5°C (41°F) or higher.



- 1) Turn ignition switch "ON"
- 2) Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
Confirm COOLAN TEMP/S value is within the range listed below.

COOLAN TEMP/S: Less than 40°C (104°F)

If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

- 3) Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 70°C (158°F), immediately go to the next step.
- 4) Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 5) Touch "START".
- 6) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running.
If "COMPLETED" with "OK" appears on CONSULT screen, go to step 9).
If "COMPLETED" does not appear on CONSULT screen, go to the following step.
- 7) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
- 8) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)

CMPS-RPM (REF): 2,000 - 2,600 rpm

Vehicle speed: Suitable speed

B/FUEL SCHDL: 2.5 - 3.5 ms

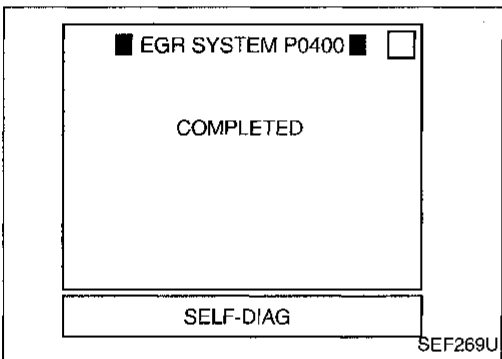
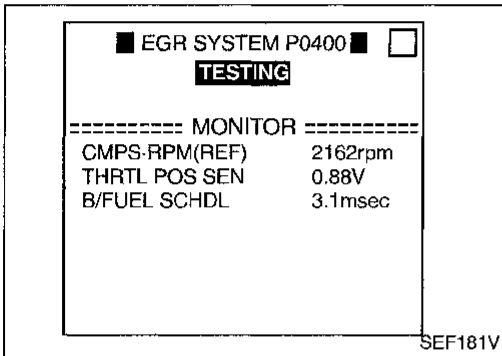
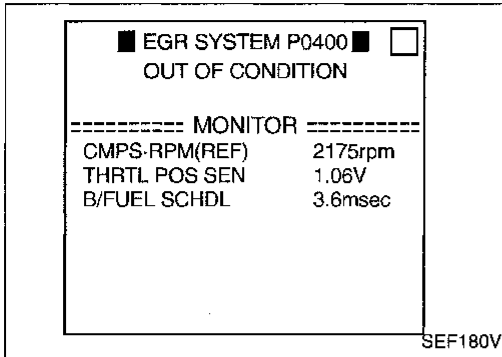
THRTL POS SEN: (X + 0.10) - (X + 0.52) V

X = Voltage value measured at step 7)

Selector lever: Suitable position

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 9) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-247.



TROUBLE DIAGNOSIS FOR DTC P0400

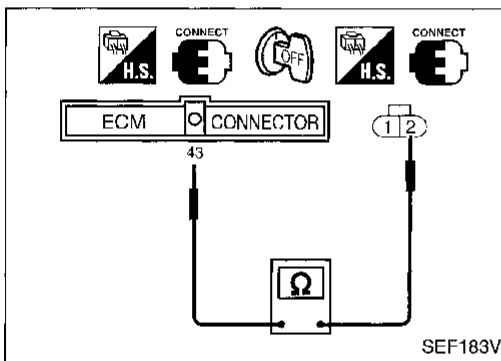
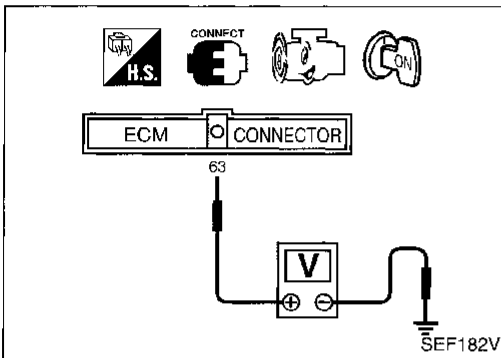
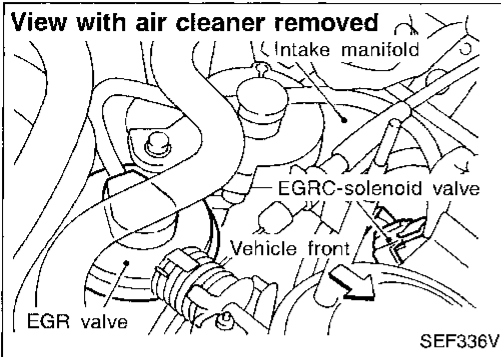
EGR Function (Close) (Cont'd)

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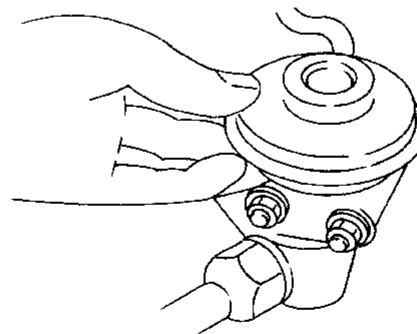
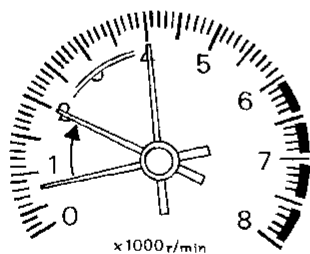
OVERALL FUNCTION CHECK

Use this procedure to check the overall EGR function. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm quickly under no load using the following methods.
 - Disconnect EGRC-solenoid valve harness connector. (The DTC for EGRC-solenoid valve will be displayed, however, ignore it.)
 - **EGR valve should lift up and down without sticking.** If NG, go to **A** in DIAGNOSTIC PROCEDURE on EC-247.
- 3) Check voltage between ECM terminal 63 (EGR temperature sensor) and ground at idle speed. **Less than 4.5V should exist.**
- 4) Turn ignition switch "OFF".
- 5) Check harness continuity between EGR temperature sensor harness connector terminal 2 and ECM terminal 43 (ECM ground). **Continuity should exist.**
- 6) Perform "COMPONENT INSPECTION", "EGR temperature sensor". Refer to EC-249.



Overall function check



Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

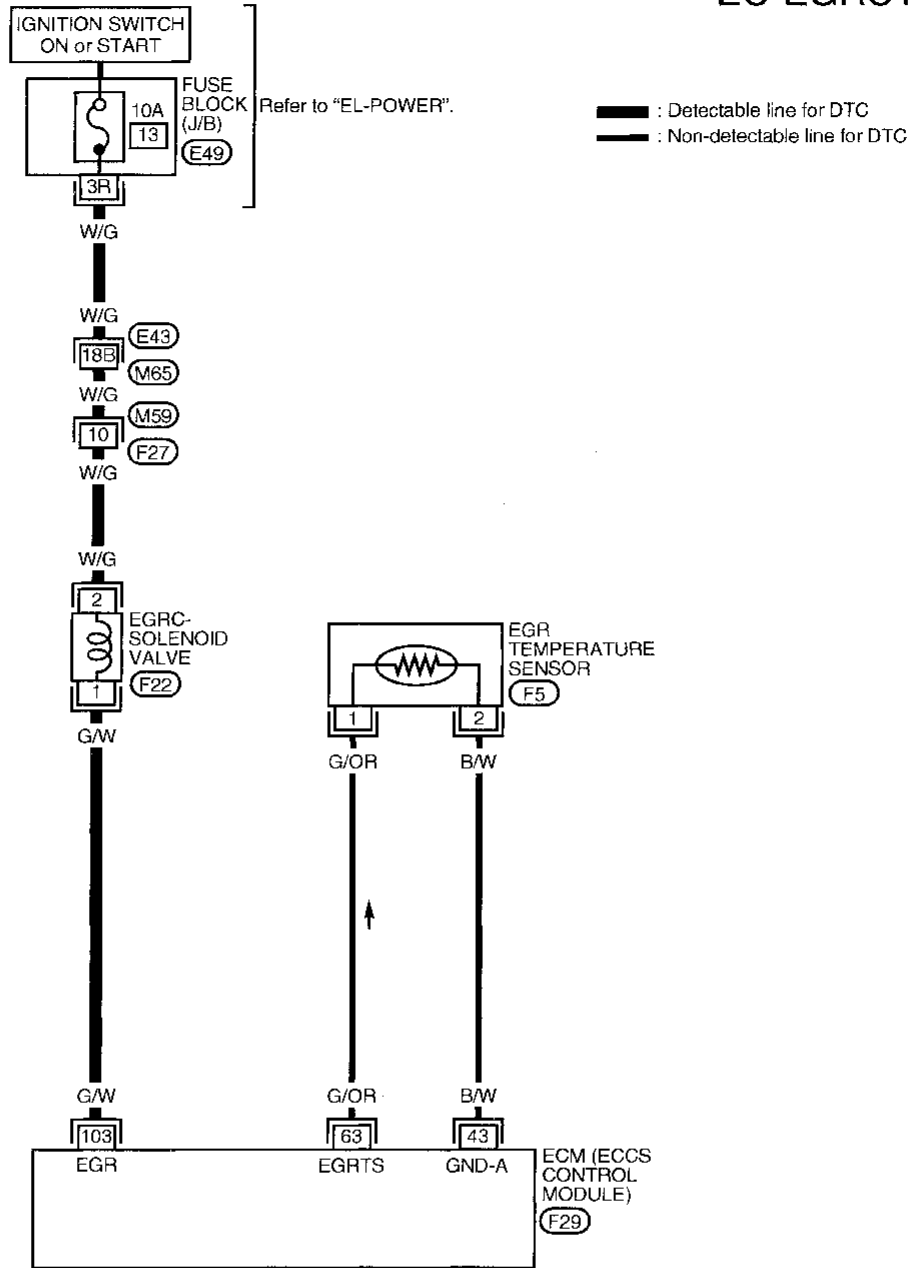
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TROUBLE DIAGNOSIS FOR DTC P0400

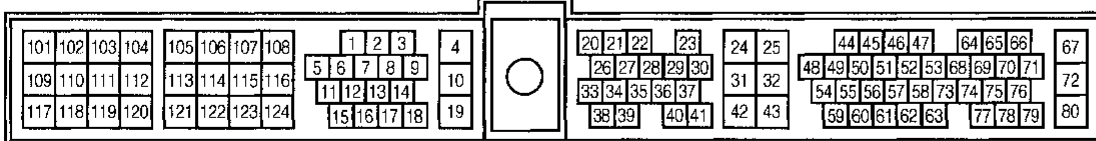
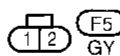
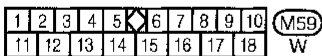
EGR Function (Close) (Cont'd)

EC-EGRC1-01



Refer to last page (Foldout page).

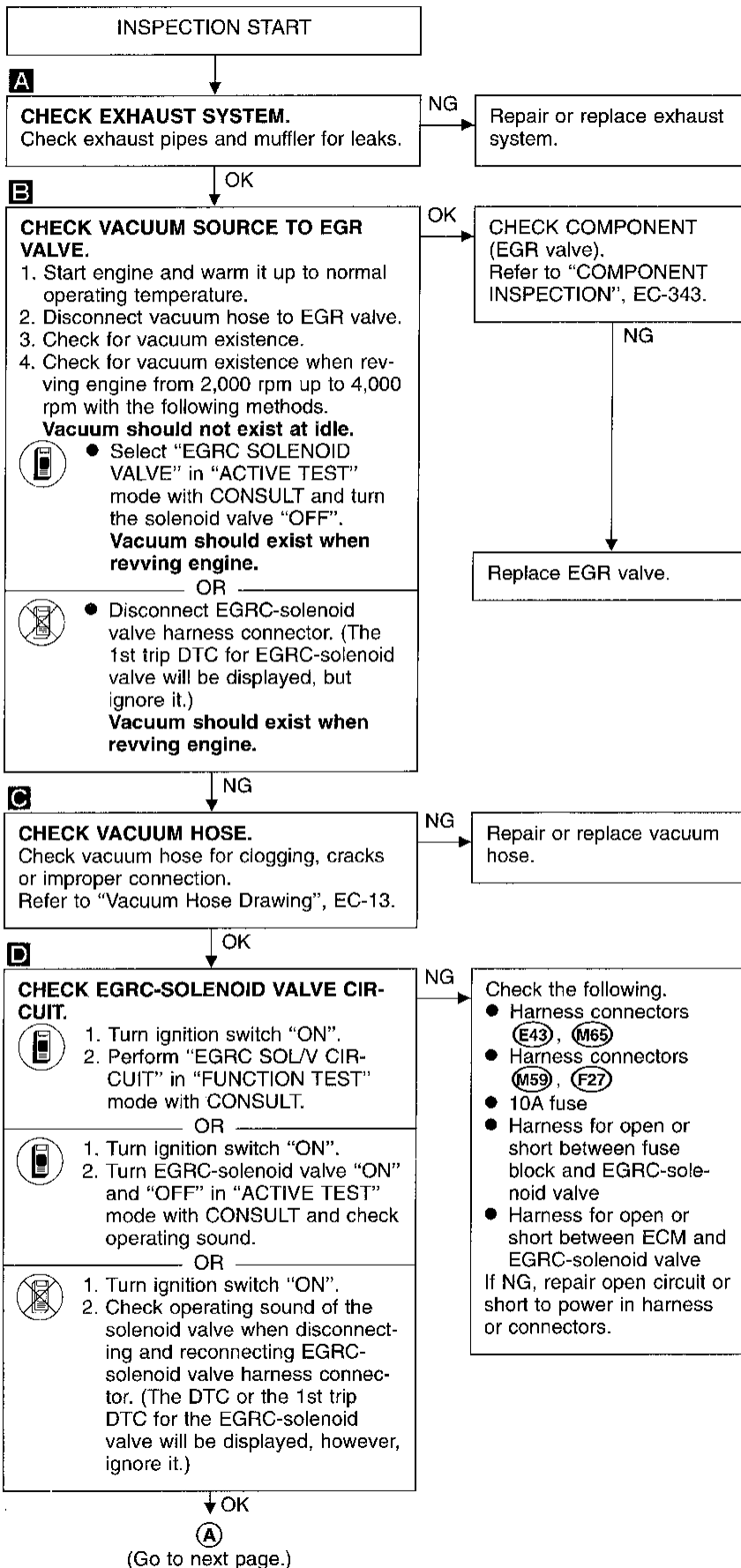
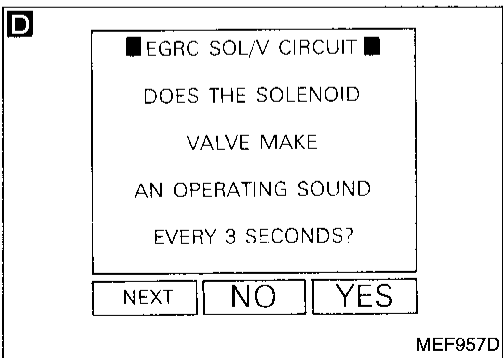
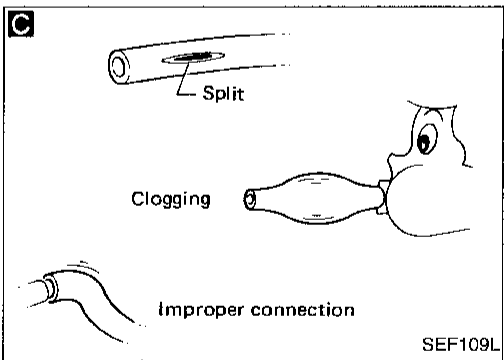
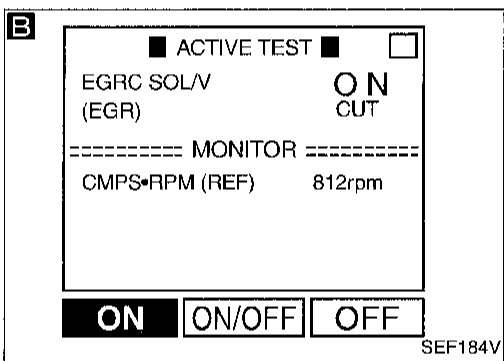
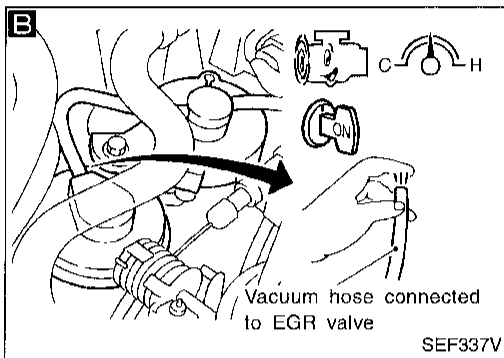
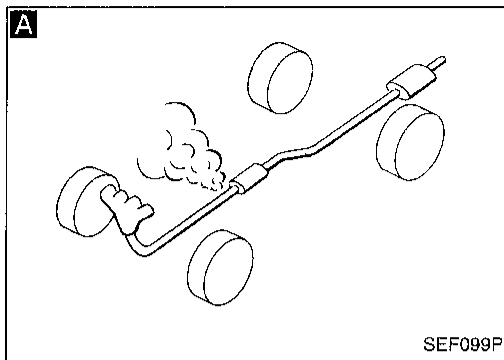
(M65) (E43)



TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

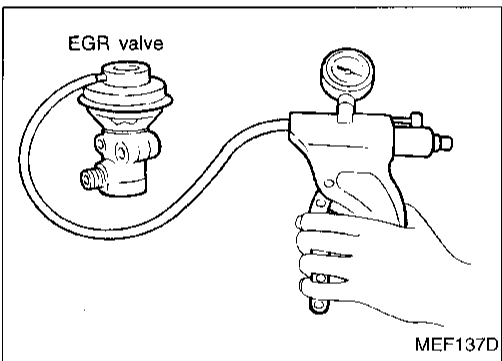
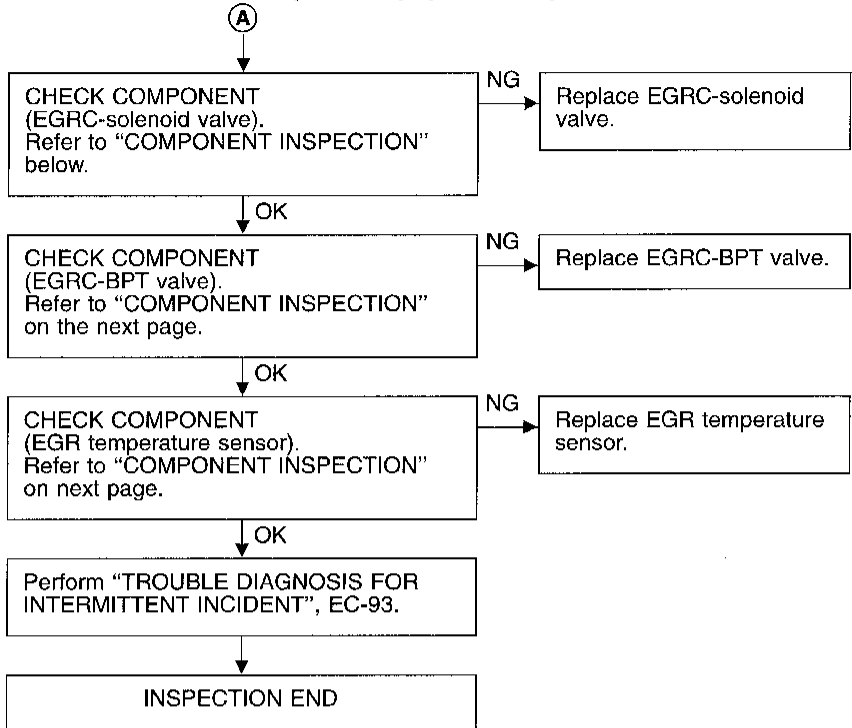
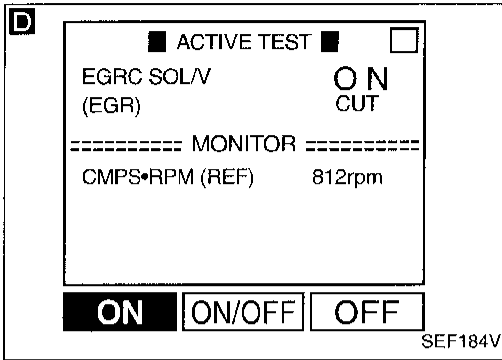
DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)



COMPONENT INSPECTION

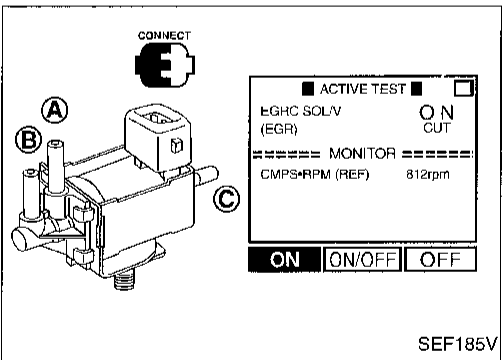
EGR valve

- Apply vacuum to EGR vacuum port with a hand vacuum pump. **EGR valve spring should lift.**
 - Check for sticking.
- If NG, repair or replace EGR valve.

EGRC-solenoid valve

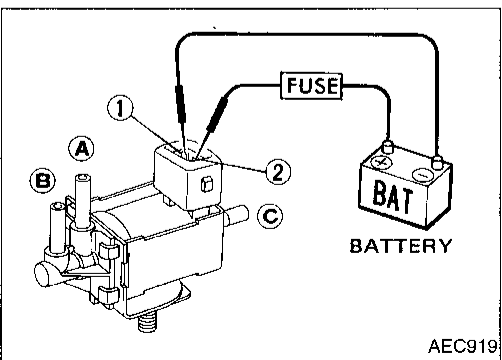
Check air passage continuity.

- Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.



| Condition EGRC SOLENOID VALVE | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|----------------------------------|---|---|
| ON | Yes | No |
| OFF | No | Yes |

OR



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

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.

TROUBLE DIAGNOSIS FOR DTC P0400

EGR Function (Close) (Cont'd)

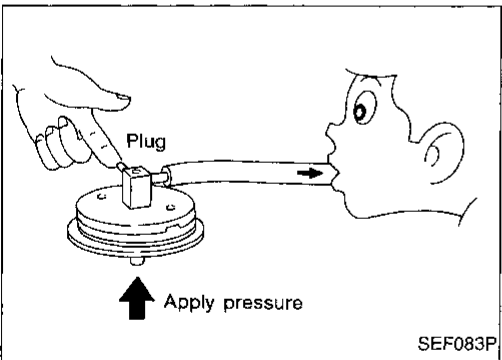
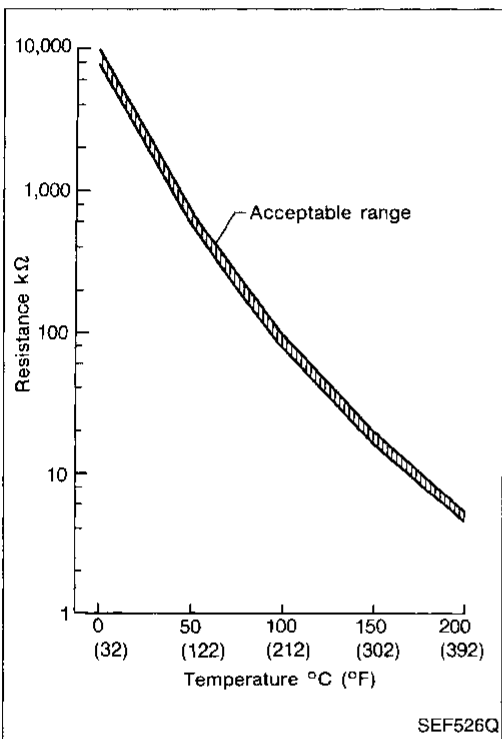
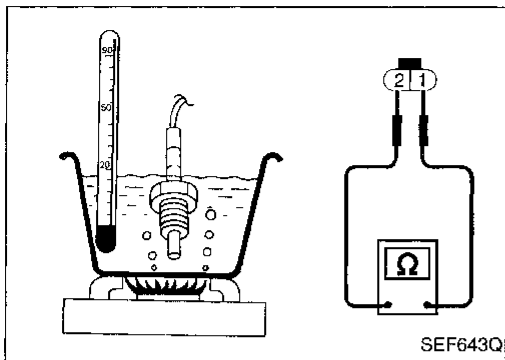
EGR temperature sensor

Check resistance change and resistance value.

<Reference data>

| EGR temperature °C (°F) | Voltage V | Resistance MΩ |
|----------------------------|--------------|------------------|
| 0 (32) | 4.81 | 7.9 - 9.7 |
| 50 (122) | 2.82 | 0.57 - 0.70 |
| 100 (212) | 0.8 | 0.08 - 0.10 |

If NG, replace EGR temperature sensor.



EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH₂O, 3.94 inH₂O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

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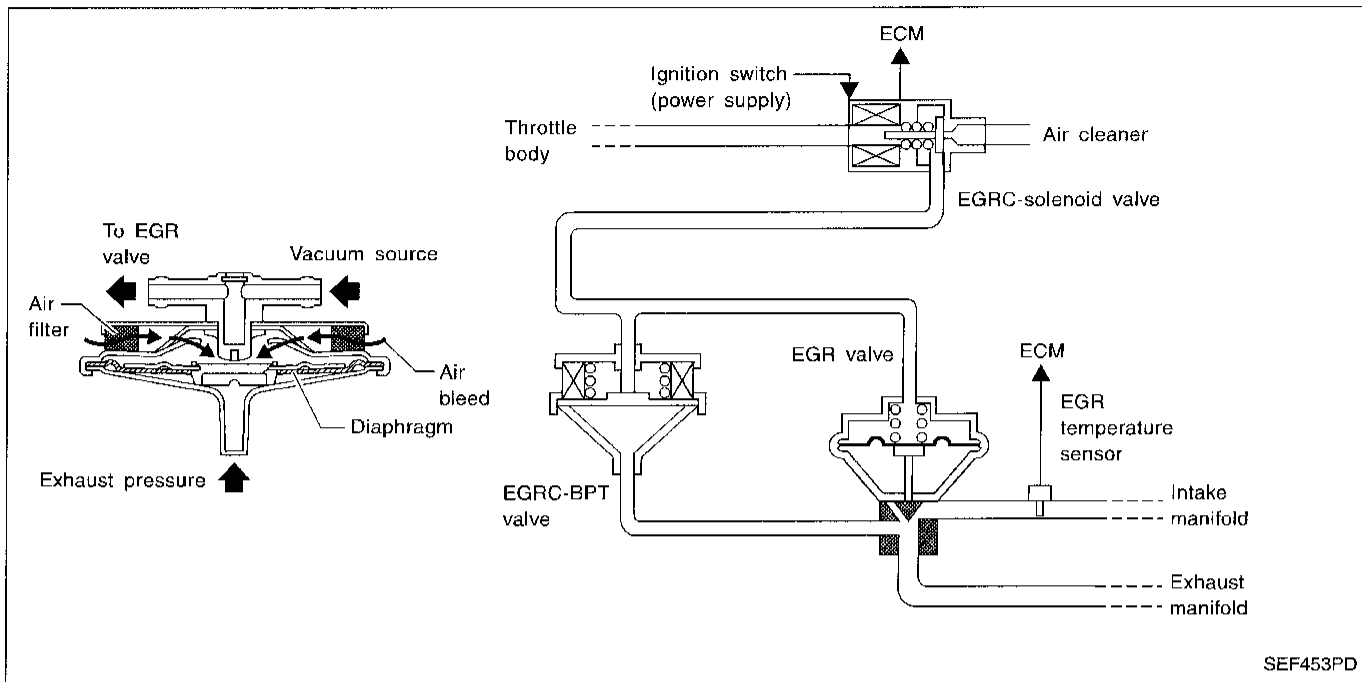
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EGRC-BPT Valve Function



SYSTEM DESCRIPTION

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.

ON BOARD DIAGNOSIS LOGIC

If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is large, then the vacuum to the EGR valve is interrupted through the EGRC-solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0402 0306 | <ul style="list-style-type: none"> ● The EGRC-BPT valve does not operate properly. | <ul style="list-style-type: none"> ● EGRC-BPT valve ● EGR valve ● Misconnected rubber tube ● Blocked rubber tube ● Camshaft position sensor ● Blocked exhaust system ● Orifice ● Mass air flow sensor ● EGRC-solenoid valve |

TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always perform the test at a temperature of 5°C (41°F) or higher.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Always drive vehicle at a safe speed.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "EGRC-BPT/V P0402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 4) Start engine and let it idle.
- 5) Touch "START".
- 6) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
- 7) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen and the bar chart may increase. Maintain the conditions many times until "COMPLETED" appears.

Selector lever: Suitable position

CMPS-RPM (REF): 1,400 - 1,600 rpm (A/T)
1,600 - 1,800 rpm (M/T)

Vehicle speed: 30 - 54 km/h (19 - 34 MPH) (A/T)
30 - 100 km/h (19 - 62 MPH) (M/T)

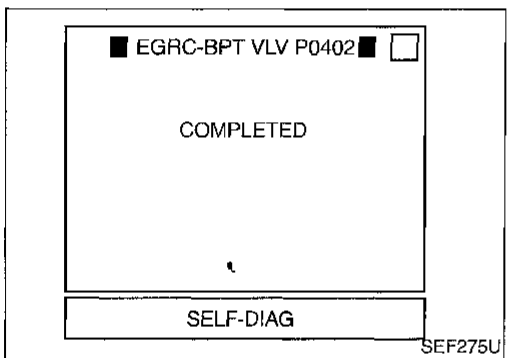
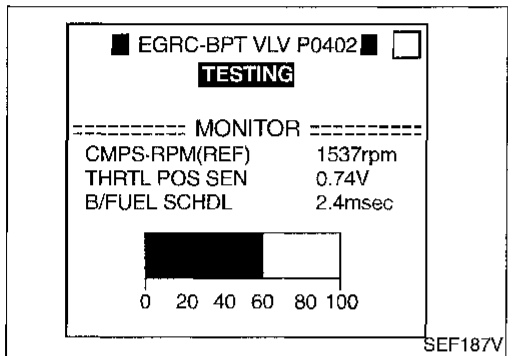
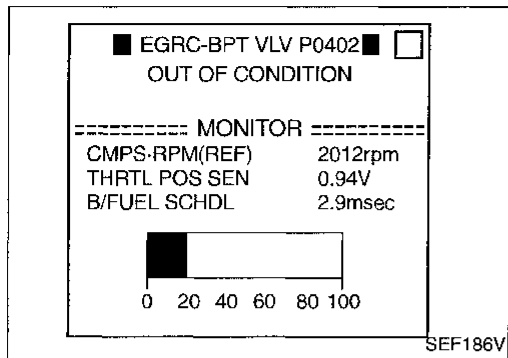
B/FUEL SCHDL: 2.3 - 2.5 ms

THRTL POS SEN: (X + 0.16) - (X + 0.26) V (A/T)
(X + 0.19) - (X + 0.30) V (M/T)

X = Voltage value measured at step 6)

- The bar chart on CONSULT screen indicates the status of this test. However, the test may be finished before the bar chart becomes full scale.
 - If the bar chart indication does not continue to progress, completely release accelerator pedal once and try to meet the conditions again.
 - If "TESTING" does not appear on CONSULT screen, retry from step 2).
- 8) If "OK" is displayed, carry out "OVERALL FUNCTION CHECK" on next page. If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-253.

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TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd)

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGRC-BPT valve. During this check, a 1st trip DTC might not be confirmed.



- 1) Disconnect the rubber tube to the fuel pressure regulator from the throttle body at the throttle body.
- 2) Disconnect the rubber tube to the EGRC-solenoid valve at the EGRC-BPT valve.

Connect the throttle body and the EGRC-BPT valve directly with a rubber tube that has 0.5 mm (0.020 in) dia. orifice. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)

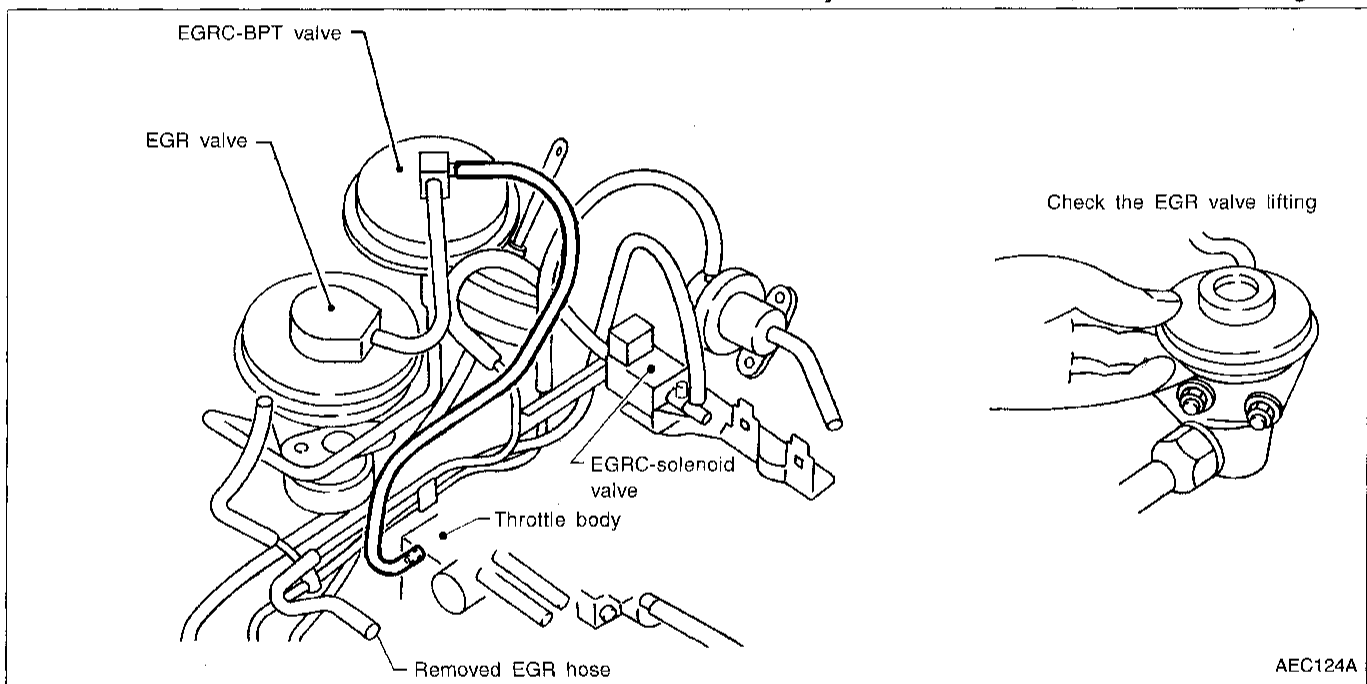
- 3) Start engine.
- 4) Check for the EGR valve lifting with engine at idle speed.

EGR valve should remain closed.

- 5) Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm quickly under no load.

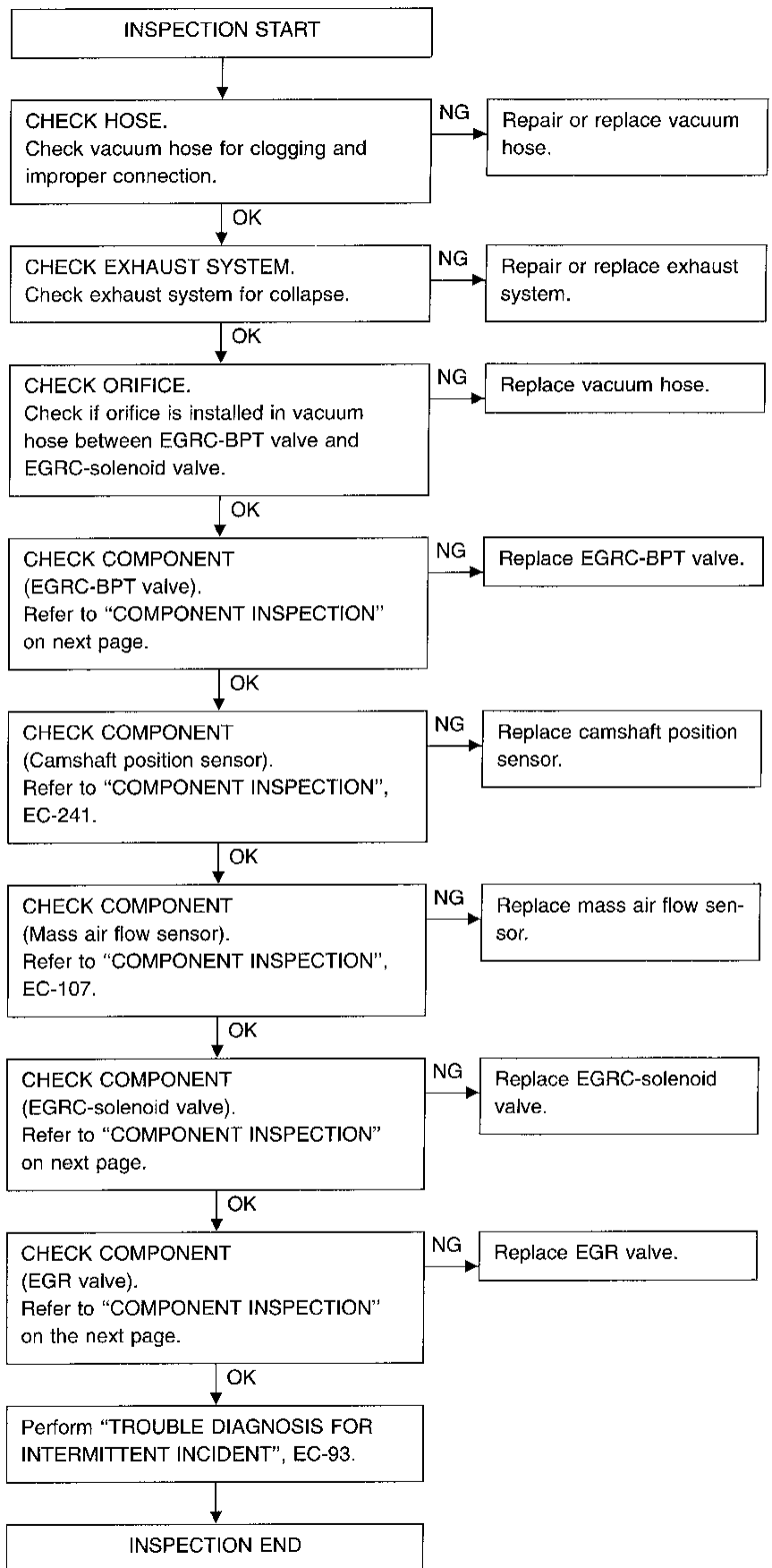
EGR valve should lift up, and go down without sticking when the engine is returned to idle.

- 6) Check rubber tube between EGRC-solenoid valve and throttle body for misconnection, cracks or blockages.



EGRC-BPT Valve Function (Cont'd)

DIAGNOSTIC PROCEDURE



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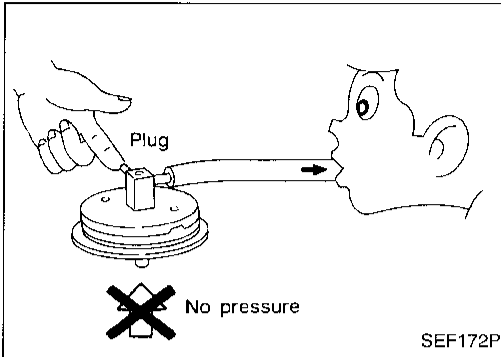
TROUBLE DIAGNOSIS FOR DTC P0402

EGRC-BPT Valve Function (Cont'd)

COMPONENT INSPECTION

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check leakage without applying any pressure from under EGR-BPT valve.
Leakage should exist.

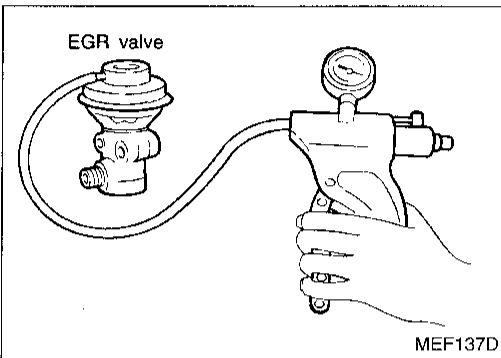


EGR valve

- Apply vacuum to EGR vacuum port with a hand vacuum pump.

EGR valve spring should lift.

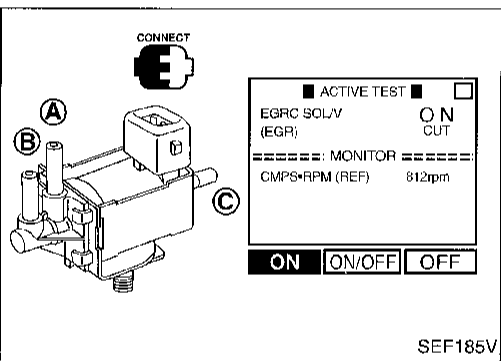
- Check for sticking.
- If NG, repair or replace EGR valve.



EGRC-solenoid valve

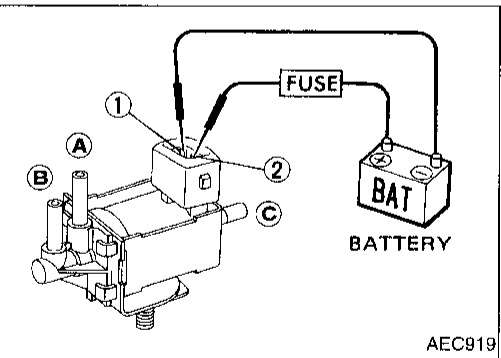
Check air passage continuity.

- Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.



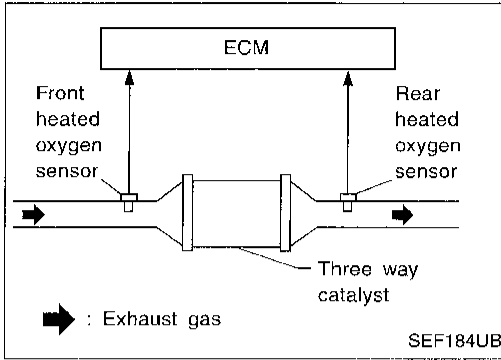
| Condition EGRC SOLENOID VALVE | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|----------------------------------|---|---|
| ON | Yes | No |
| OFF | No | Yes |

OR



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

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.



Three-Way Catalyst Function

ON BOARD DIAGNOSIS LOGIC

The ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.

Three-way catalyst* with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.

When the frequency ratio of front and rear heated oxygen sensors approaches a specified limit value, the three-way catalyst* malfunction is diagnosed.

*: Warm-up three-way catalyst (For California)

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0420 0702 | <ul style="list-style-type: none"> ● Three-way catalyst* does not operate properly. ● Three-way catalyst* does not have enough oxygen storage capacity. | <ul style="list-style-type: none"> ● Three-way catalyst* ● Exhaust tube ● Intake air leaks ● Injectors ● Injector leaks ● Spark plug ● Improper ignition timing |

*: Warm-up three-way catalyst (For California)

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TROUBLE DIAGNOSIS FOR DTC P0420

Three-Way Catalyst Function (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

| | | |
|----------------|-----------|--------------------------|
| ☆ MONITOR | ☆ NO FAIL | <input type="checkbox"/> |
| CMPS-RPM (REF) | 2037rpm | |
| FR O2 SEN | 0.68V | |
| RR O2 SEN | 0.04V | |
| FR O2 MNTR | RICH | |
| RR O2 MNTR | LEAN | |
| VHCL SPEED SE | 0km/h | |
| RECORD | | |

SEF321U

| | | |
|---------------|-------|--------------------------|
| ■ SRT STATUS | ■ | <input type="checkbox"/> |
| CATALYST | CMPLT | |
| EVAP SYSTEM | INCMP | |
| O2 SENSOR | CMPLT | |
| O2 SEN HEATER | CMPLT | |
| EGR SYSTEM | INCMP | |
| PRINT | | |

SEF215U



- 1) Start engine and warm it up to normal operating temperature.
- 2) Set "MANU TRIG" and "HI SPEED", then select "FR O2 SENSOR", "RR O2 SENSOR", "FR O2 MNTR", "RR O2 MNTR" in "DATA MONITOR" mode with CONSULT.
- 3) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constantly under no load.
- 4) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 MNTR" is much less than that of "FR O2 MNTR" as shown below.

Switching frequency ratio =

Rear heated oxygen sensor switching frequency

Front heated oxygen sensor switching frequency

This ratio should be less than 0.75.

If the ratio is greater than above, the warm-up three-way catalyst (Models for California), the three-way catalyst (Models except for California) is not operating properly.

If the "FR O2 MNTR" does not indicate "RICH" and "LEAN" periodically more than 5 times within 10 seconds at step 3), perform "TROUBLE DIAGNOSES FOR DTC P0133" first. (See EC-162.)

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-258.

If the result is OK, go to following step.

- 5) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT.
- 6) Drive vehicle at a speed of approximately 84 to 96 km/h (52 to 60 MPH) with the following for at least 10 consecutive minutes.

(Drive the vehicle in an area where vehicle speed and accelerator pressure can be held steady and constant.)

M/T: 5th position

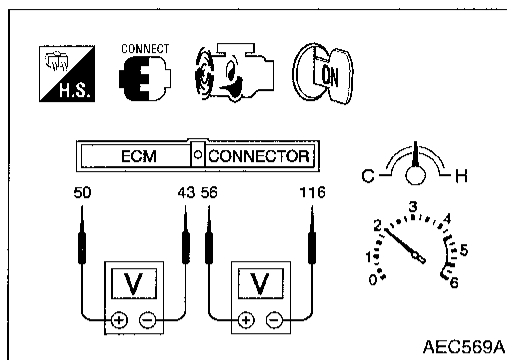
A/T: D position ("OD" ON)

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-258.

- 7) Select "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.
- 8) Verify that "CATALYST" is "CMPLT".
If not "CMPLT", repeat the test from step 5).

TROUBLE DIAGNOSIS FOR DTC P0420

Three-Way Catalyst Function (Cont'd)



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the three-way catalyst.

During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Set voltmeters probes between ECM terminals ⑤⑩ (front heated oxygen sensor signal) and ④③ (ECM ground), and ECM terminals ⑥⑥ (rear heated oxygen sensor signal) and ⑪⑥ (ECM ground).
- 3) Keep engine speed at 2,000 rpm constant under no load.
- 4) Make sure that the voltage switching frequency (high & low) between ECM terminals ⑥⑥ and ⑪⑥ is much less than that of ECM terminals ⑤⑩ and ④③.

Switching frequency ratio =

Rear heated oxygen sensor voltage switching frequency

Front heated oxygen sensor voltage switching frequency

This ratio should be less than 0.75.

If the ratio is greater than above, it means three-way catalyst does not operate properly.

Note: If the voltage at terminal ⑤⑩ does not switch periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC P0133 first. (See EC-144.)

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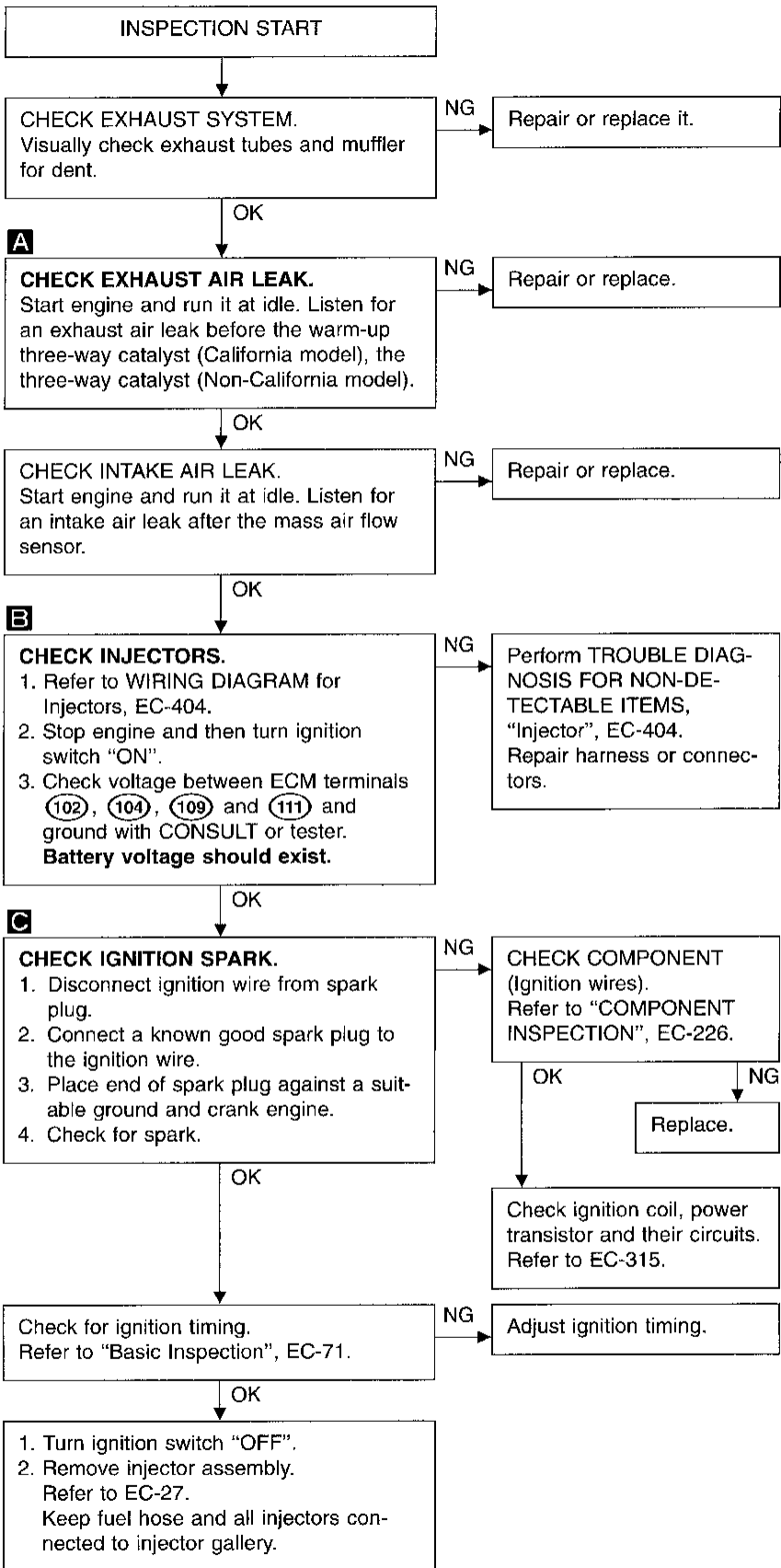
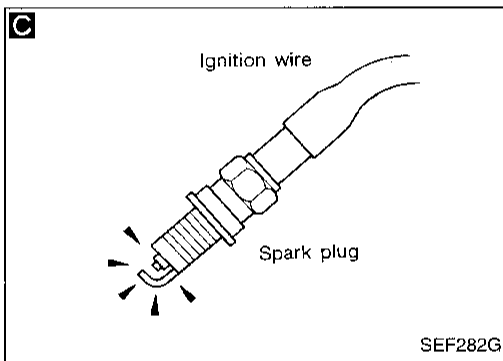
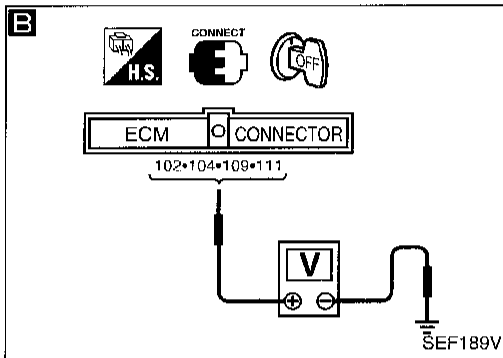
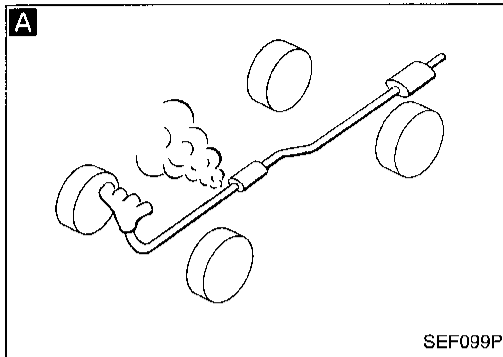
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TROUBLE DIAGNOSIS FOR DTC P0420

Three-Way Catalyst Function (Cont'd)

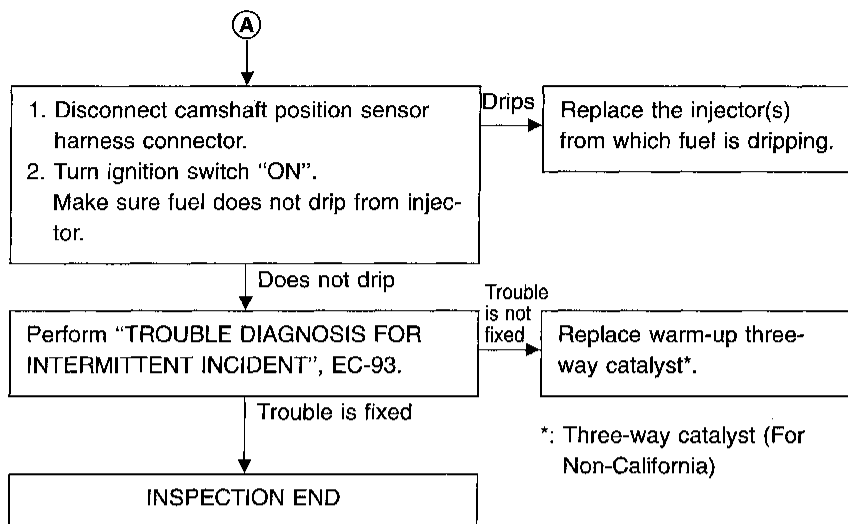
DIAGNOSTIC PROCEDURE



(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P0420

Three-Way Catalyst Function (Cont'd)



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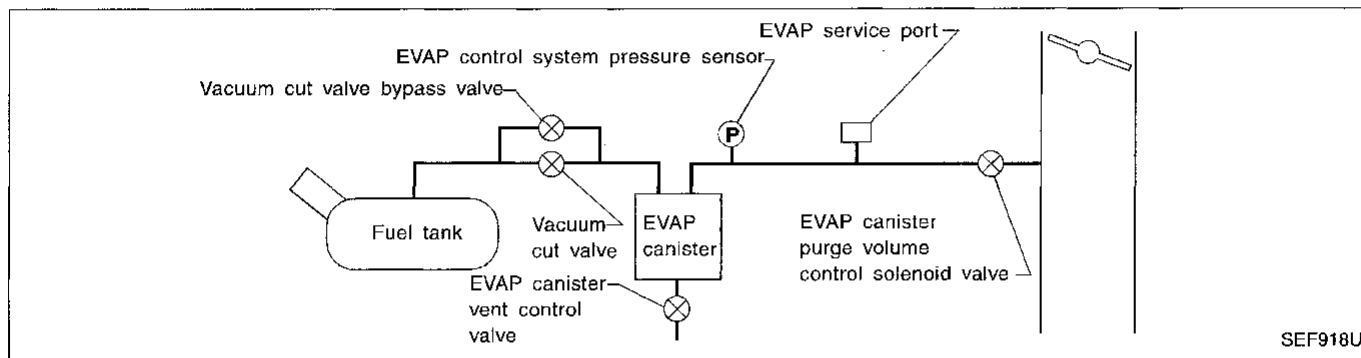
TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure)

Note: If both DTC P0440 and P1448 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-362.)

ON BOARD DIAGNOSIS LOGIC

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum. If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve under the following "Vacuum test" conditions. The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0440 0705 | <ul style="list-style-type: none"> ● EVAP control system has a leak. ● EVAP control system does not operate properly. | <ul style="list-style-type: none"> ● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Absolute pressure sensor ● Tank fuel temperature sensor ● MAP/BARO switch solenoid valve and the circuit ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● O-ring of EVAP canister vent control valve is missing or damaged. ● Water separator ● EVAP canister is saturated with water. ● EVAP control system pressure sensor |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine rubber tube as a replacement.

TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If both DTC P0440 and P1448 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-373.)
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 30°C (41 to 86°F).
- It is better that the fuel level is low.



- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 5 - 60°C (41 - 140°F)
- 5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
Follow the instruction displayed.

NOTE:

- If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest. (Use a fan to reduce the stabilization time.)
- If the engine speed cannot be maintained within the range displayed on CONSULT screen, go to "Basic Inspection", EC-71.
- The engine idle portion of this test (See illustration at left.) will take approximately 5 minutes.
- 6) Make sure that "OK" is displayed.
If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-263.

NOTE:

- Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

■ EVAP SML LEAK P0440 ■ □

1)PERFORM TEST AT A LOCATION OF 5-30C (41-86F)
2)OPEN ENGINE HOOD.
3)START ENGINE WITH VEHICLE STOPPED. IF ENG IS ON, STOP FOR 5 SEC. THEN RESTART.
4)TOUCH START.

EXIT START

SEF296U

■ EVAP SML LEAK P0440 ■ □

CAN NOT BE DIAGNOSED

FUEL TEMPERATURE IS TOO HIGH. RETEST AFTER FUEL HAS COOLED.

EXIT PRINT

SEF669U

■ EVAP SML LEAK P0440 ■ □

WAIT...

KEEP ENGINE RUNNING AT IDLE SPEED.

SEF551V

■ EVAP SML LEAK P0440 ■ □

***** OK *****

END PRINT

SEF297U

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Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

OR

NOTE:

Be sure to read the explanation of "Driving pattern" on EC-39 before driving vehicle.



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-39.
- 3) Stop vehicle.
- 4) Select "MODE 1" with GST.
 - If SRT of EVAP system is not set yet, go to the following step.
 - If SRT of EVAP system is set, the result will be OK.
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine.

It is not necessary to cool engine down before driving.

- 7) Drive vehicle again according to the "Driving pattern", EC-39.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.
 - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-367.
 - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE", EC-263.
 - If P1440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC P1440", EC-348.
 - If P0440, P1440 and P1447 are not displayed on the screen, go to the following step.
- 10) Select "MODE 1" with GST.
 - If SRT of EVAP system is set, the result will be OK.
 - If SRT of EVAP system is not set, go to step 6).

OR

NOTE:

- Be sure to read the explanation of "Driving pattern" on EC-39 before driving vehicle.
- It is better that the fuel level is low.

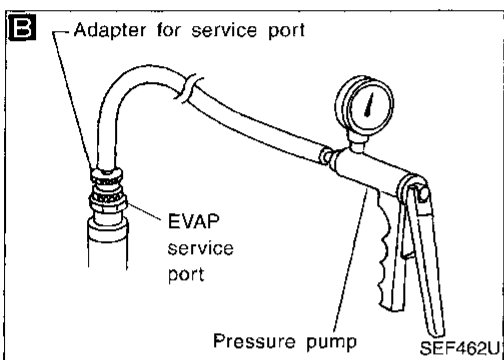
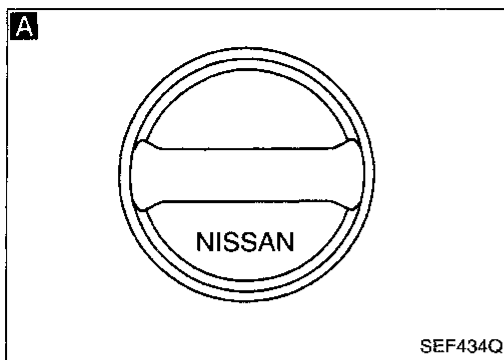


- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-39.
- 3) Stop vehicle.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Perform the step 1) to 4) again.
- 6) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

DIAGNOSTIC PROCEDURE

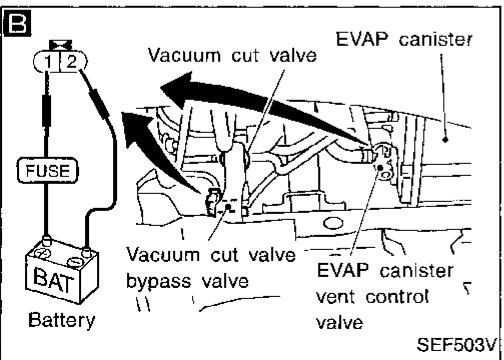
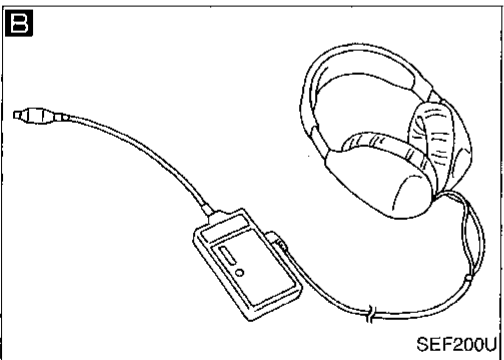


B

■ EVAP SYSTEM CLOSE ■
APPLY PRESSURE TO EVAP SYSTEM FROM SERVICE PORT USING HAND PUMP WITH PRESSURE GAUGE AT NEXT SCREEN. NEVER USE COMPRESSED AIR OR HIGH PRESSURE PUMP! DO NOT START ENGINE. TOUCH START.

CANCEL START

SEF658U



INSPECTION START

A

CHECK FUEL FILLER CAP.

1. Check for genuine NISSAN fuel filler cap design.
2. Check for air releasing sound while opening the fuel filler cap. If the air releasing sound is heard, go to **B**.

If the air releasing sound is not heard, check the following.

Was the cap tightened properly?
If Yes, check fuel filler cap vacuum relief valve. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-20.
If No, open fuel filler cap, then clean cap and filler neck thread using air blower. Retighten until ratcheting sound is heard.

NG

If genuine NISSAN filler cap is not used, replace with genuine NISSAN fuel filler cap.

OK

B

CHECK FOR EVAP LEAK.

- Never use compressed air or high pressure pump.
- Improper installation of service port may cause leaking.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

To locate EVAP leak portion, proceed with the following steps.

1. Install the EVAP service port adapter and the pressure pump securely.
2. Turn ignition switch "ON". Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply vacuum into the EVAP line until the pressure indicator reaches the middle of bar graph.
4. Using EVAP leak detector, locate the leak portion. For the leak detector, refer to instruction manual for more details. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-20.

OR

2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12 volts until the end of test.)
5. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg).
6. Locate the leak using a leak detector. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-23.

NG

Repair or replace.

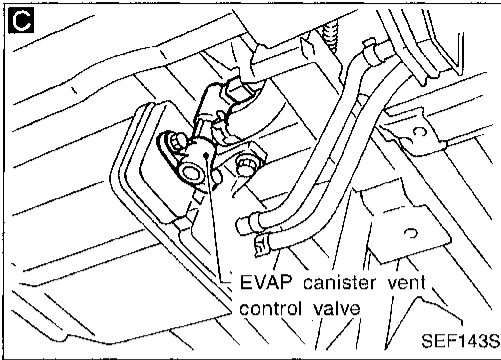
OK

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TROUBLE DIAGNOSIS FOR DTC P0440

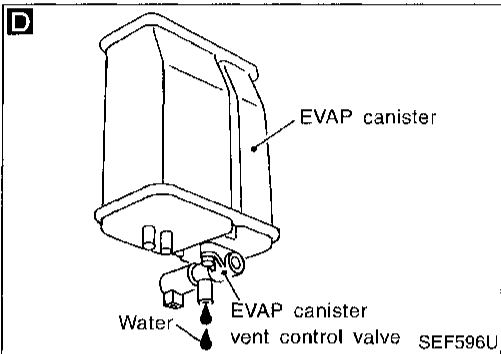
Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)



C

CHECK COMPONENT AND CIRCUIT (EVAP canister vent control valve, O-ring and water separator). Refer to "TROUBLE DIAGNOSIS FOR DTC P0446" for circuit, EC-276 and "COMPONENT INSPECTION", EC-280.

NG → Repair or replace EVAP canister vent control valve and O-ring or harness/connector.



D

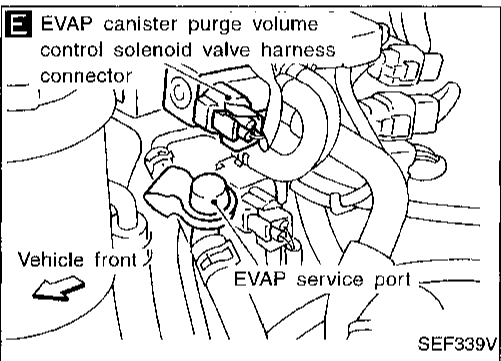
CHECK IF EVAP CANISTER SATURATED WITH WATER.

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister. If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Check the following.

1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator. Refer to "COMPONENT INSPECTION", EC-366. If NG, repair hose or replace EVAP canister or water separator.



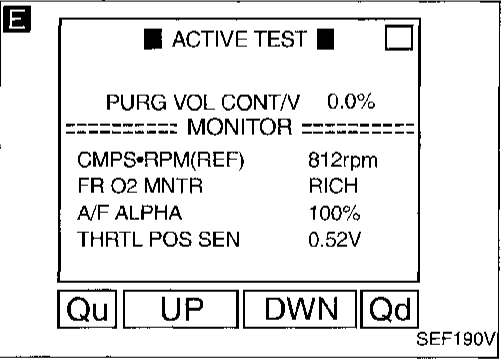
E

CHECK COMPONENT (EVAP canister purge volume control solenoid valve).

1. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check EVAP hose for vacuum. **Vacuum should exist.**

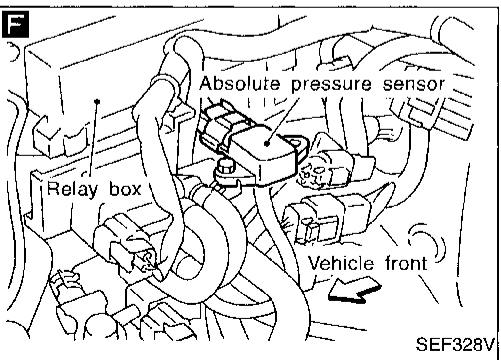
NG → Check the following.

- EVAP canister purge volume control solenoid valve. Refer to "COMPONENT INSPECTION", EC-266.
- Vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-13.



OR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve.
4. Start engine and let it idle for at least 60 seconds.
5. Check EVAP hose for vacuum. **Vacuum should exist.**



F

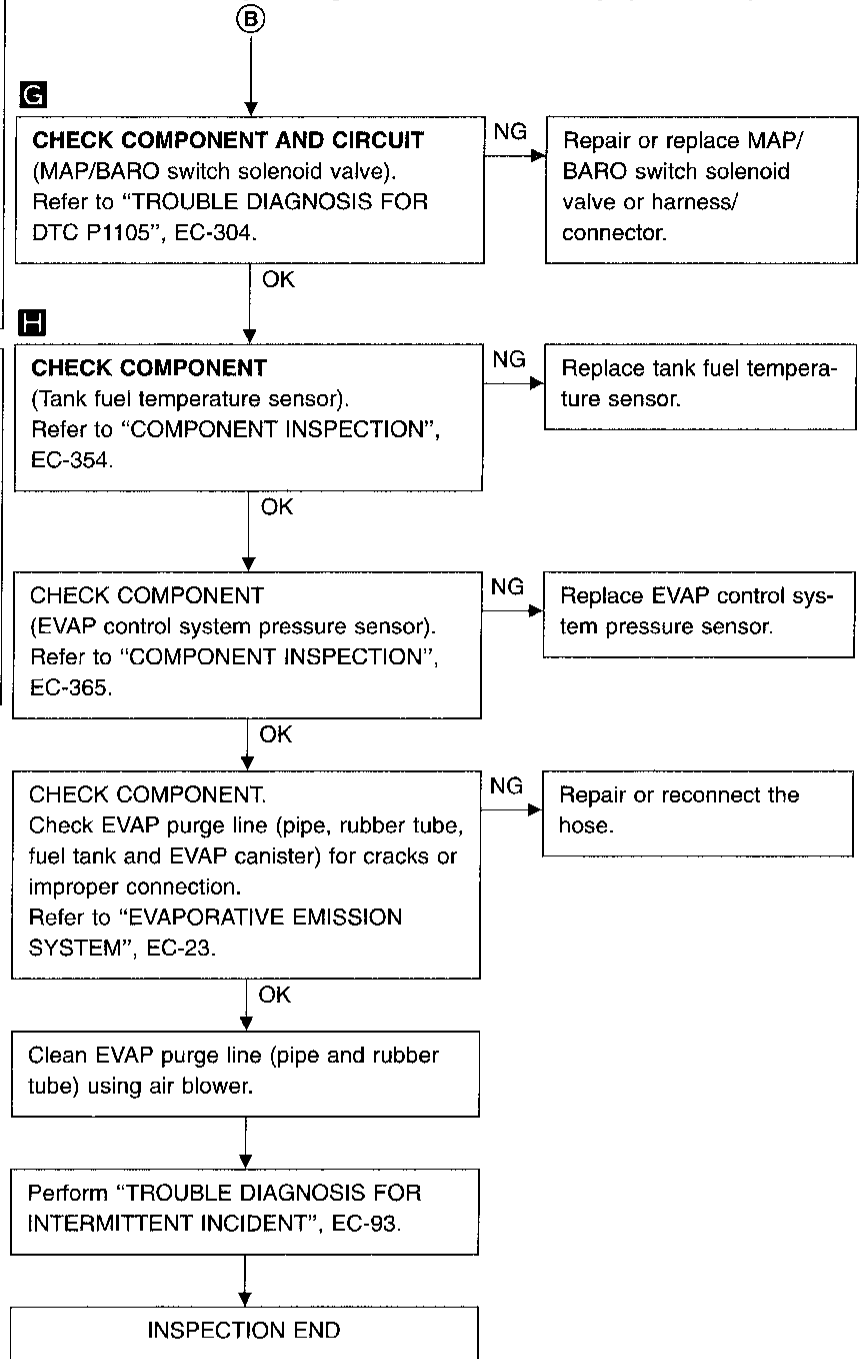
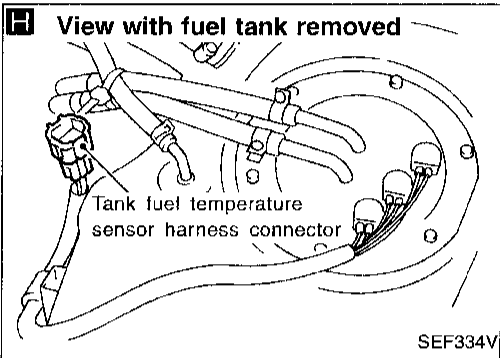
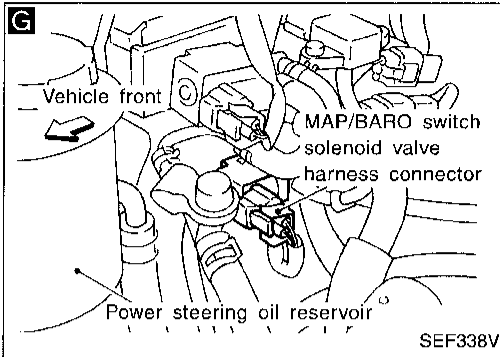
CHECK COMPONENT (Absolute pressure sensor). Refer to "COMPONENT INSPECTION", EC-353.

NG → Replace absolute pressure sensor.

OK → **B**
(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)



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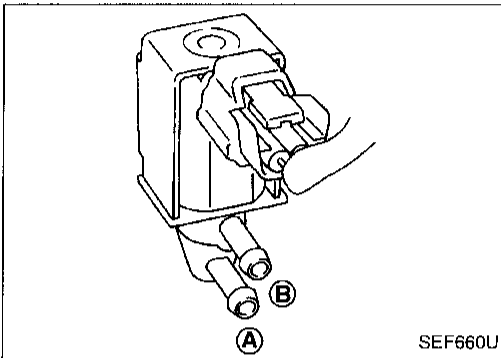
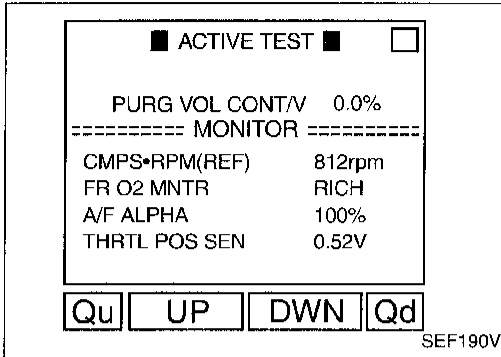
TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



| Condition PURG VOL CONT/V value | Air passage continuity between (A) and (B) |
|------------------------------------|---|
| 100.0% | Yes |
| 0.0% | No |

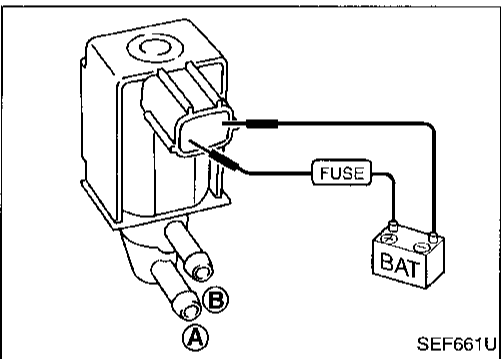
If NG, replace the EVAP canister purge volume control solenoid valve.

OR

⊗ Check air passage continuity.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

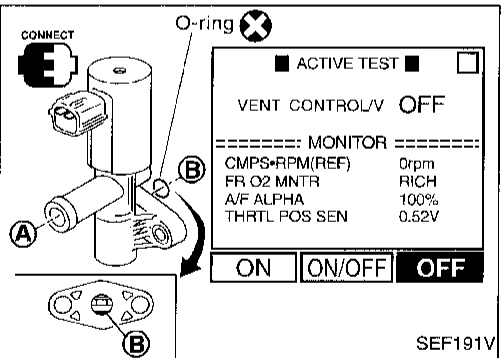
If NG or operation takes more than 1 second, replace solenoid valve.



EVAP canister vent control valve

Check air passage continuity.

⊗ Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



| Condition VENT CONTROL/V | Air passage continuity between (A) and (B) |
|-----------------------------|---|
| ON | No |
| OFF | Yes |

OR

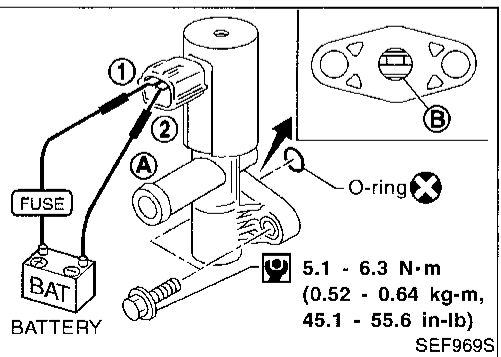
⊗

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals ① and ② | No |
| No supply | Yes |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

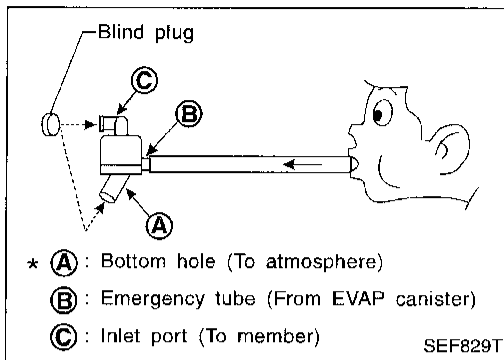
If portion (B) is rusted, replace control valve.

Make sure new O-ring is installed properly.



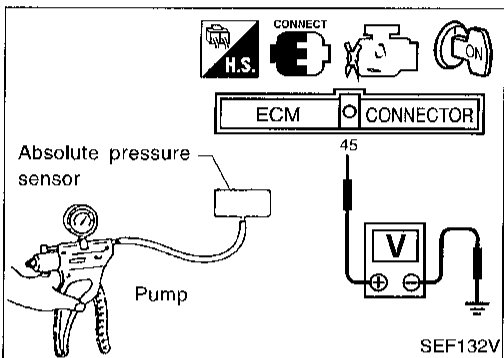
TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)



Water separator

1. Check visually for insect nests in the water separator air inlet.
 2. Check visually for cracks or flaws in the appearance.
 3. Check visually for cracks or flaws in the hose.
 4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
 5. In case of NG in items 2 - 4, replace the parts.
- **Do not disassemble water separator.**



Absolute pressure sensor

1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between ECM terminal (45) and engine ground.
The voltage should be 3.2 to 4.8V.
4. Use pump to apply vacuum of -26.7 kPa (-200 mmHg, -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.
The voltage should be 1.0 to 1.4V lower than the value measured in step 3.

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -93.3 kPa (-700 mmHg, -27.56 inHg) or pressure over 101.3 kPa (760 mmHg, 29.92 inHg).
5. If NG, replace absolute pressure sensor.

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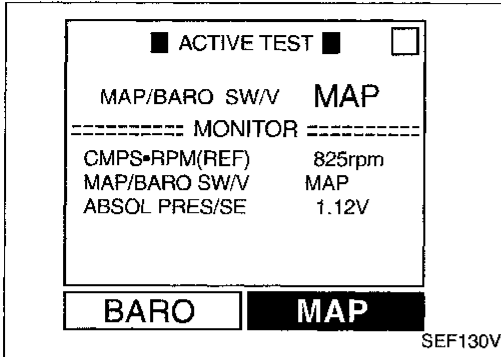
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TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

MAP/BARO switch solenoid valve

1. Start engine and warm it up to normal operating temperature.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
 - Condition: At idle under no-load
 - CONSULT display



| MAP/BARO | ABSOL PRES/SE (Voltage) |
|----------|-------------------------------|
| BARO | More than 2.6V |
| MAP | Less than the voltage at BARO |

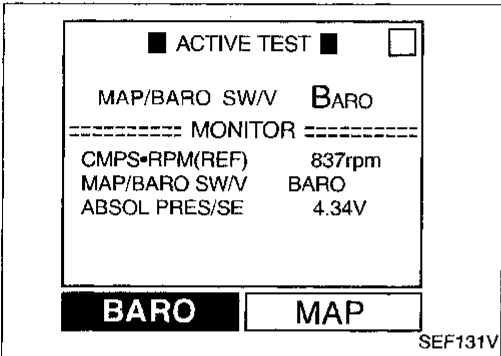
- Time for voltage to change

| MAP/BARO SW/V | Time to switch |
|---------------|--------------------|
| BARO to MAP | Less than 1 second |
| MAP to BARO | |

4. If NG, check solenoid valve as shown below.

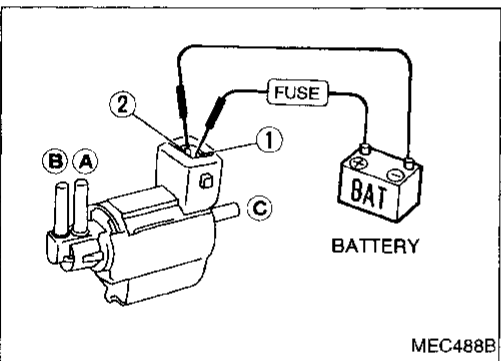
OR

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.



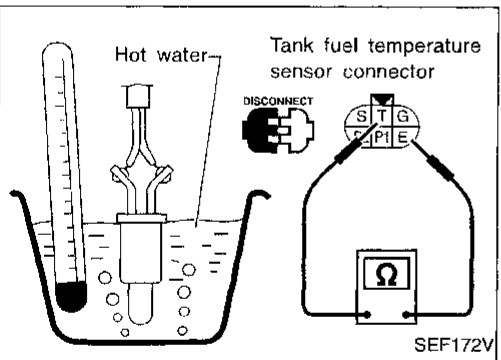
| Condition | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|---|--|--|
| 12V direct current supply between terminals ① and ② | Yes | No |
| No supply | No | Yes |

3. If NG or operation takes more than 1 second, replace solenoid valve.



Tank fuel temperature sensor

Check resistance by heating with hot water or heat gun as shown in the figure.



| Temperature °C (°F) | Resistance kΩ |
|---------------------|---------------|
| 20 (68) | 2.3 - 2.7 |
| 50 (122) | 0.79 - 0.90 |

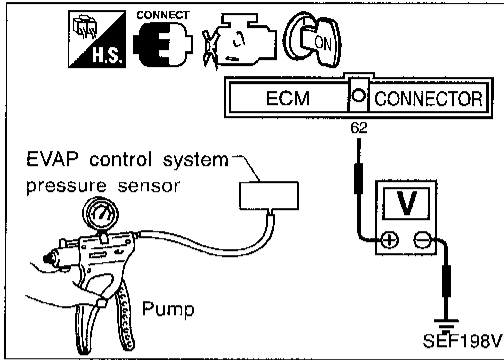
If NG, replace tank fuel temperature sensor.

TROUBLE DIAGNOSIS FOR DTC P0440

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

COMPONENT INSPECTION

EVAP control system pressure sensor



1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal ⑥2 and engine ground.

| Pressure (Relative to atmospheric pressure) | Voltage (V) |
|---|-------------|
| 0 kPa (0 mmHg, 0 inHg) | 3.0 - 3.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg) | 0.4 - 0.6 |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.

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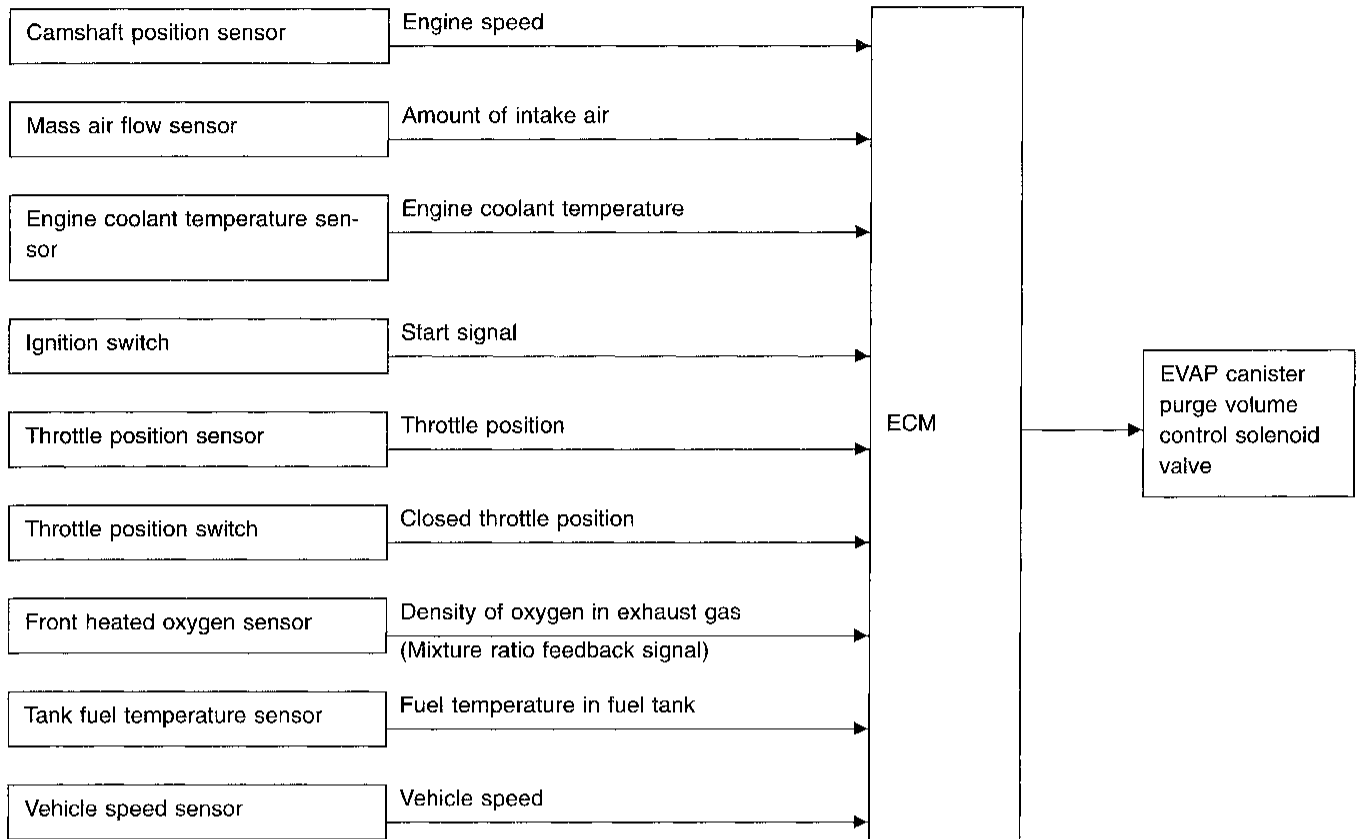
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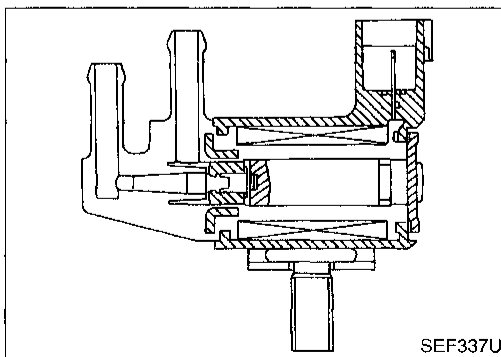
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Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit)

SYSTEM DESCRIPTION



This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

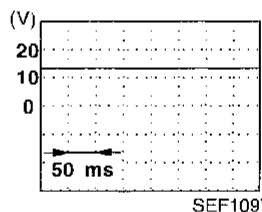
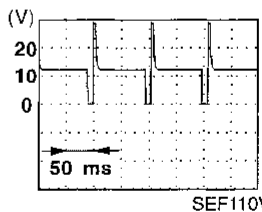
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|--------------|---|---|---------------|
| PURG VOL C/V | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch "OFF" ● No-load | Idle | 0 % |
| | | 2,000 rpm (More than 200 seconds after starting engine) | — |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

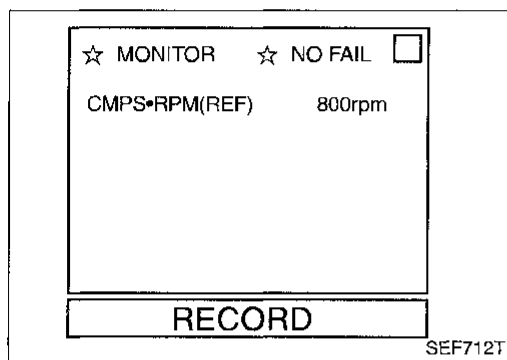
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|--|---|
| 4 | LG/R | ECCS relay (Self-shutoff) | Engine is running. | 0 - 1V |
| | | | Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF" | |
| | | | Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 5 | R/Y | EVAP canister purge volume control solenoid valve | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V)  |
| | | | Engine is running. └ Engine speed is 2,000 rpm. (More than 200 seconds after starting engine) | 12 - 13V  |
| 67 | B/P | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/P | | | |
| 117 | B/P | Current return | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P0443 1008 | <ul style="list-style-type: none"> ● An improper voltage signal is sent to ECM through the valve. | <ul style="list-style-type: none"> ● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is between 11V and 16V at idle.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 14 seconds.

OR



- 1) Start engine and let it idle for at least 14 seconds.
- 2) Select "MODE 7" with GST.

OR

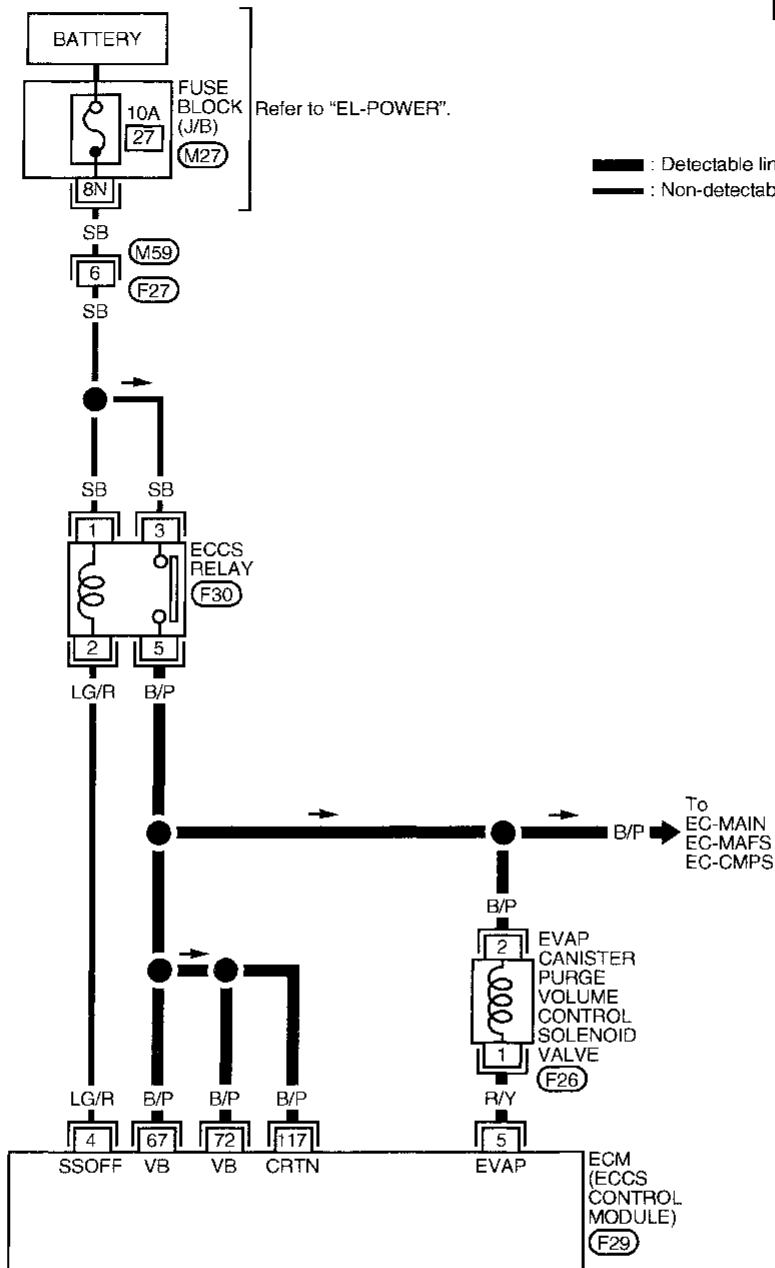


- 1) Start engine and let it idle for at least 14 seconds.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

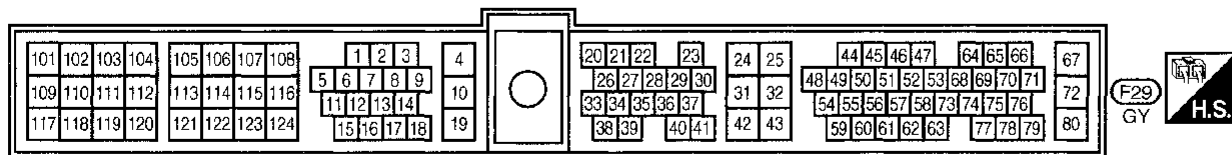
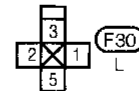
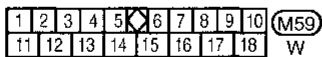
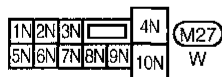
TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

EC-PGC/V-01



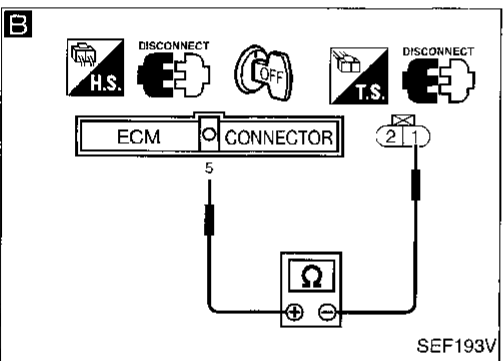
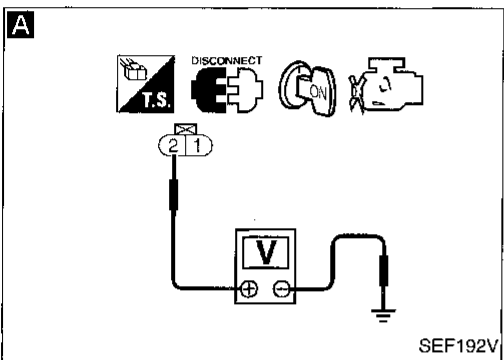
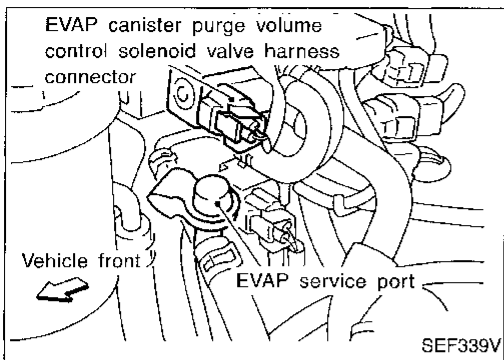
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TROUBLE DIAGNOSIS FOR DTC P0443

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and engine ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECCS relay
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

If NG, repair harness or connectors.

B

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑤ and terminal ①.

Continuity should exist.

If OK, check harness for short to ground and short to power.

NG

Repair open circuit, short to ground or short to power in harness or connectors.

CHECK COMPONENT
(EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

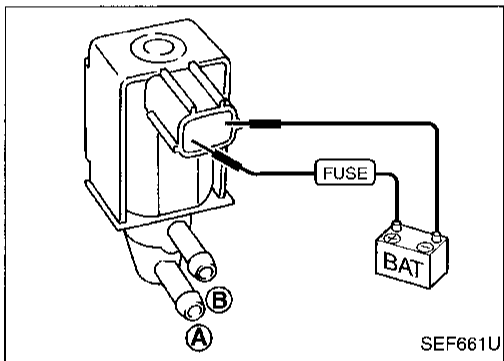
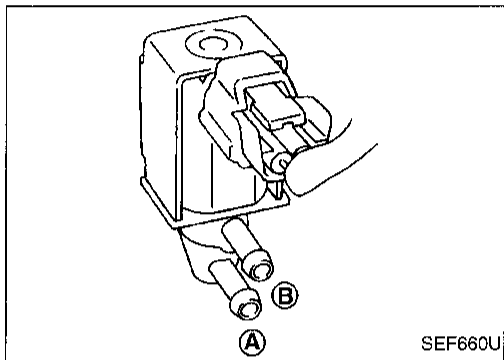
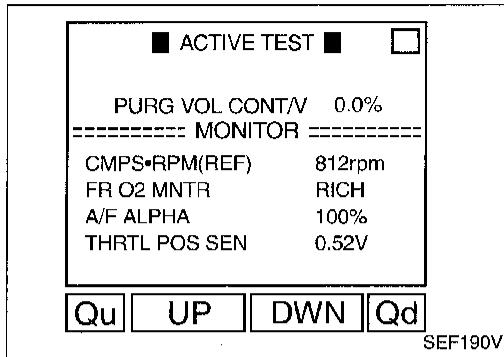
NG

Replace EVAP canister purge volume control solenoid valve.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)



COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening. If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.

| Condition PURG VOL CONT/V value | Air passage continuity between (A) and (B) |
|------------------------------------|---|
| 100.0% | Yes |
| 0.0% | No |

If NG, replace the EVAP canister purge volume control solenoid valve.

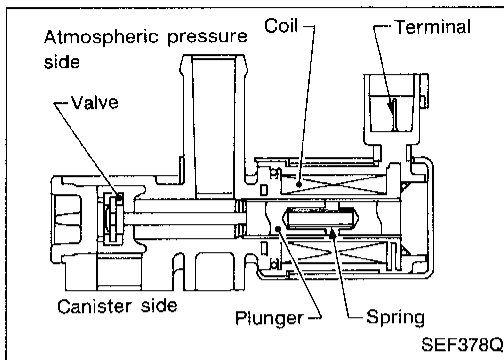
OR

Check air passage continuity.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG or operation takes more than 1 second, replace solenoid valve.

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Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit)

COMPONENT DESCRIPTION

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

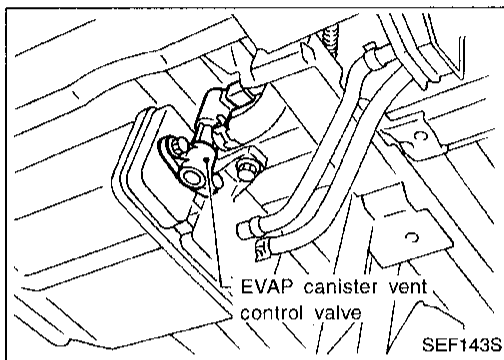
This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|-----------------------|---------------|
| VENT CONT/V | ● Ignition switch: ON | OFF |

ECM TERMINALS AND REFERENCE VALUE

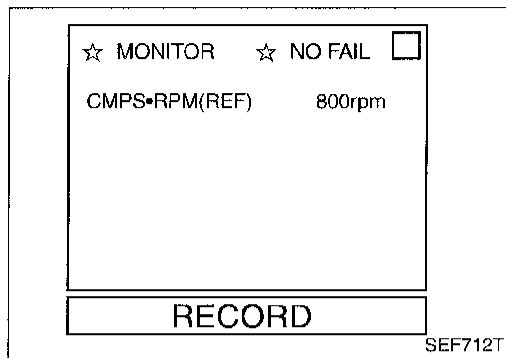
Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------------|----------------------|----------------------------|
| 108 | R/G | EVAP canister vent control valve | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0446 0903 | ● An improper voltage signal is sent to ECM through EVAP canister vent control valve. | <ul style="list-style-type: none"> ● Harness or connectors (EVAP canister vent control valve circuit is open or shorted.) ● EVAP canister vent control valve |

TROUBLE DIAGNOSIS FOR DTC P0446



Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:




Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

-  1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 5 seconds.
- _____ OR _____
-  1) Start engine and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- _____ OR _____
-  1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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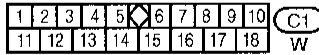
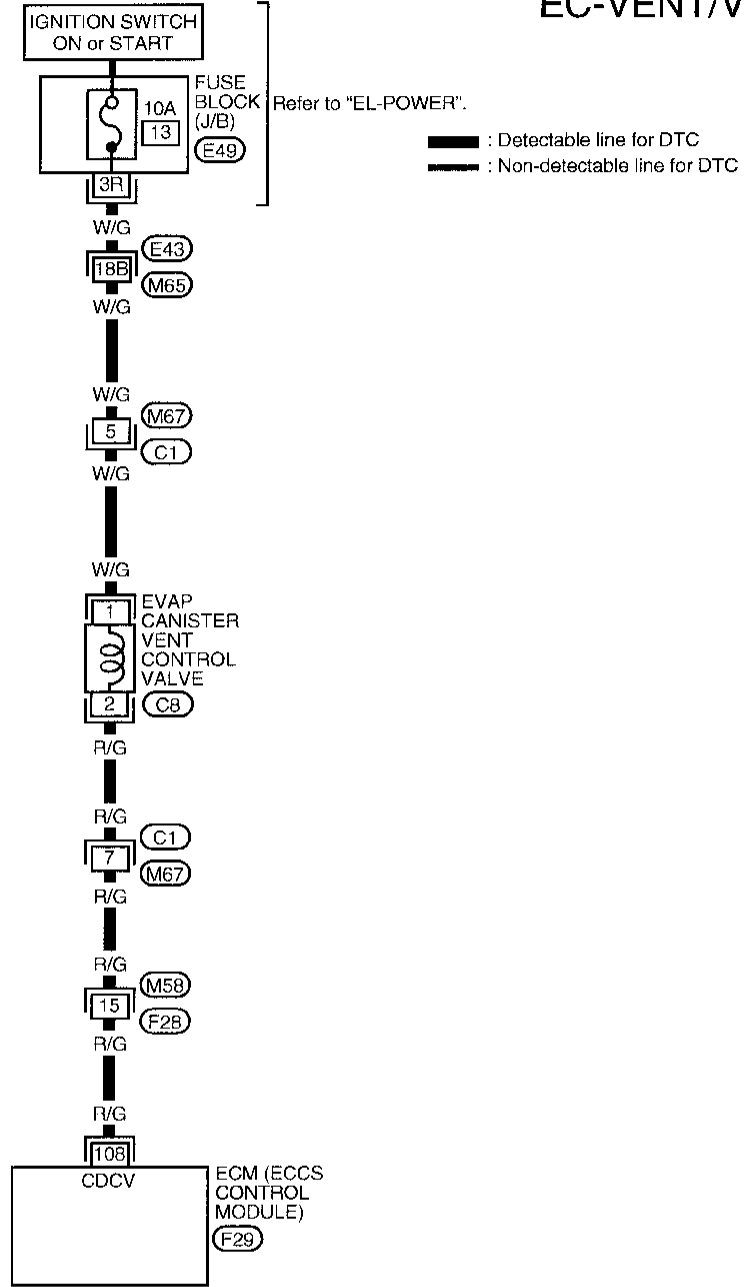
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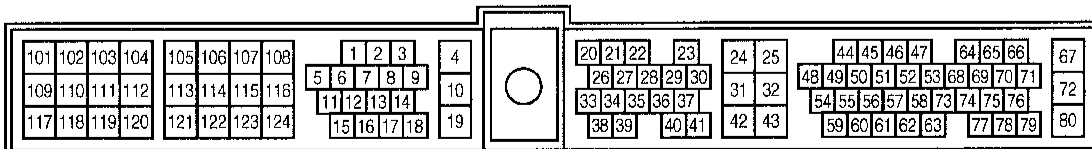
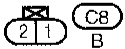
TROUBLE DIAGNOSIS FOR DTC P0446

Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

EC-VENT/V-01



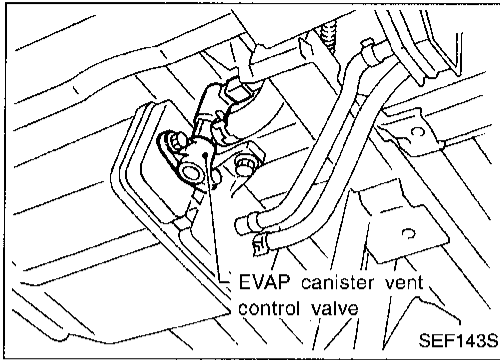
Refer to last page (Foldout page).
 (M65) (E43)



TROUBLE DIAGNOSIS FOR DTC P0446

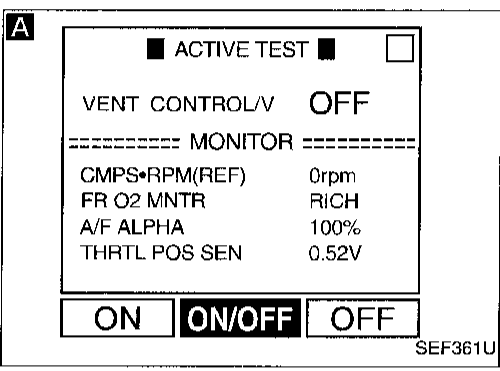
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

With CONSULT → Without CONSULT
Go to CHECK POWER SUPPLY **B**.



A CHECK CIRCUIT.

1. Turn ignition switch "ON".
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
3. Make sure that ratcheting sound is heard from the vent control valve.

OK → Go to "CHECK COMPONENT" after procedure **C**.

B CHECK POWER SUPPLY.

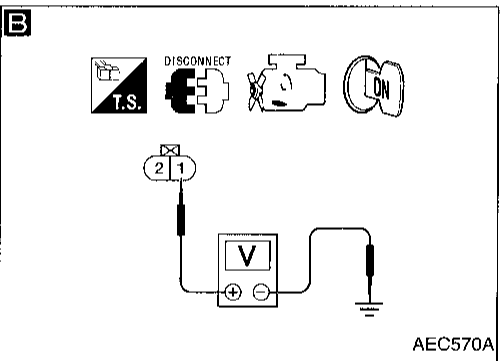
1. Disconnect EVAP canister vent control valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.

- Harness connectors (E43, M65)
- Harness connectors (M67, C1)
- 10A fuse
- Harness for open or short between EVAP canister vent control valve and 10A fuse

If NG, repair open circuit, short to ground or short to power in harness or connectors.



C CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑩ and terminal ②.

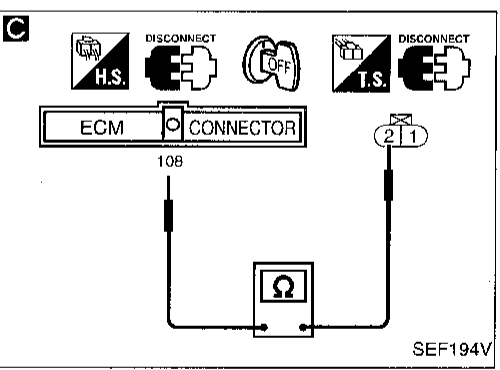
Continuity should exist.

If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors (C1, M67)
- Harness connectors (M58, F28)
- Harness for open or short between EVAP canister vent control valve and ECM

If NG, repair open circuit or short to ground or short to power in harness or connectors.



CHECK COMPONENT (EVAP canister vent control valve and O-ring).

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister vent control valve and O-ring.

OK → Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P0446

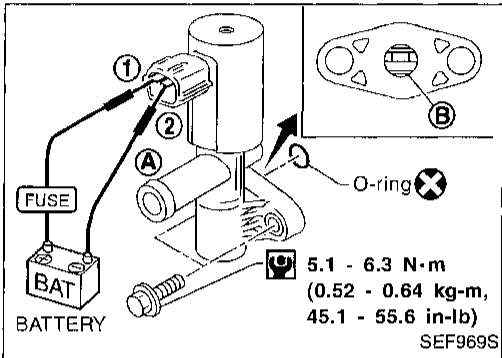
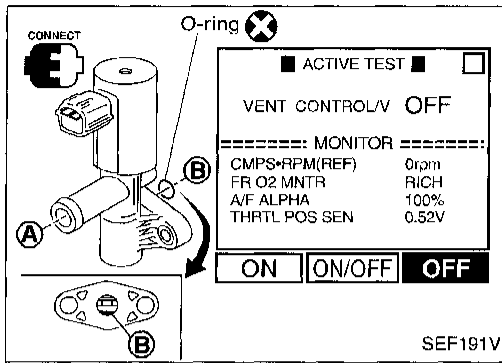
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



| Condition VENT CONTROL/V | Air passage continuity between (A) and (B) |
|-----------------------------|---|
| ON | No |
| OFF | Yes |

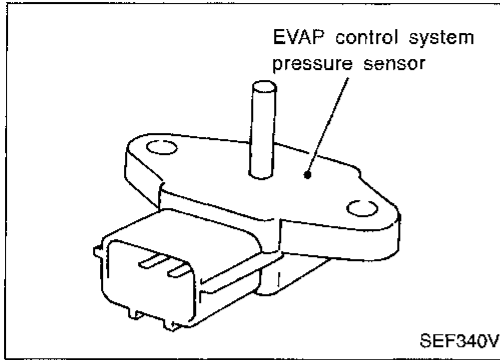
OR

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals (1) and (2) | No |
| No supply | Yes |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If portion (B) is rusted, replace EVAP canister vent control valve.

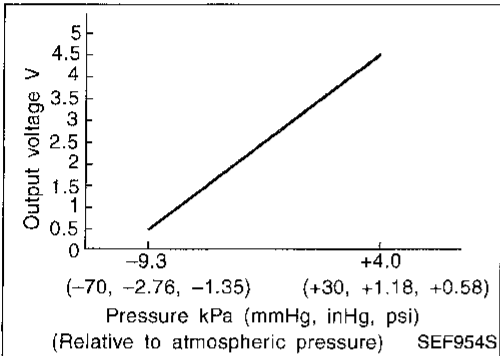
Make sure new O-ring is installed properly.



Evaporative Emission (EVAP) Control System Pressure Sensor

COMPONENT DESCRIPTION

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---------------|-----------------------|---------------|
| EVAP SYS PRES | ● Ignition switch: ON | Approx. 3.4V |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-------------------------------------|--|--------------------|
| 42 | BR | Sensors' power supply | Ignition switch "ON" | Approximately 5V |
| 43 | B/W | Sensors' ground | Engine is running. (Warm-up condition) └ Idle speed | Approximately 0V |
| 62 | Y | EVAP control system pressure sensor | Ignition switch "ON" | Approximately 3.4V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0450 0704 | ● An improper voltage signal from EVAP control system pressure sensor is sent to ECM. | <ul style="list-style-type: none"> ● Harness or connectors (The EVAP control system pressure sensor circuit is open or shorted.) ● Rubber hose to EVAP control system pressure is clogged, vent, kinked, disconnected or improper connection. ● EVAP control system pressure sensor ● EVAP canister vent control valve ● EVAP canister purge volume control solenoid valve ● EVAP canister ● Rubber hose from EVAP canister vent control valve to water separator |

TROUBLE DIAGNOSIS FOR DTC P0450

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

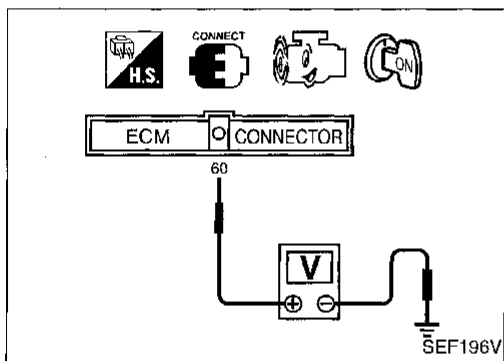
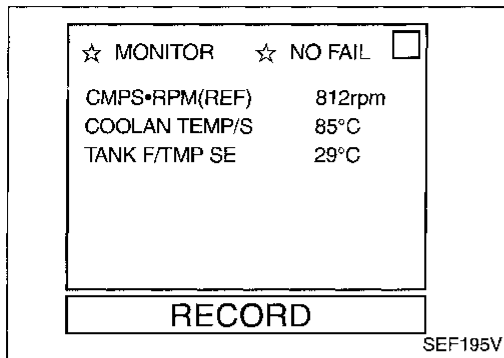
NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Make sure that "TANK F/TEMP SE" is more than 0°C (32°F).
- 6) Start engine and wait at least 20 seconds.



OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Check that voltage between ECM terminal 60 and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine and wait at least 20 seconds.
- 5) Select "MODE 7" with GST.

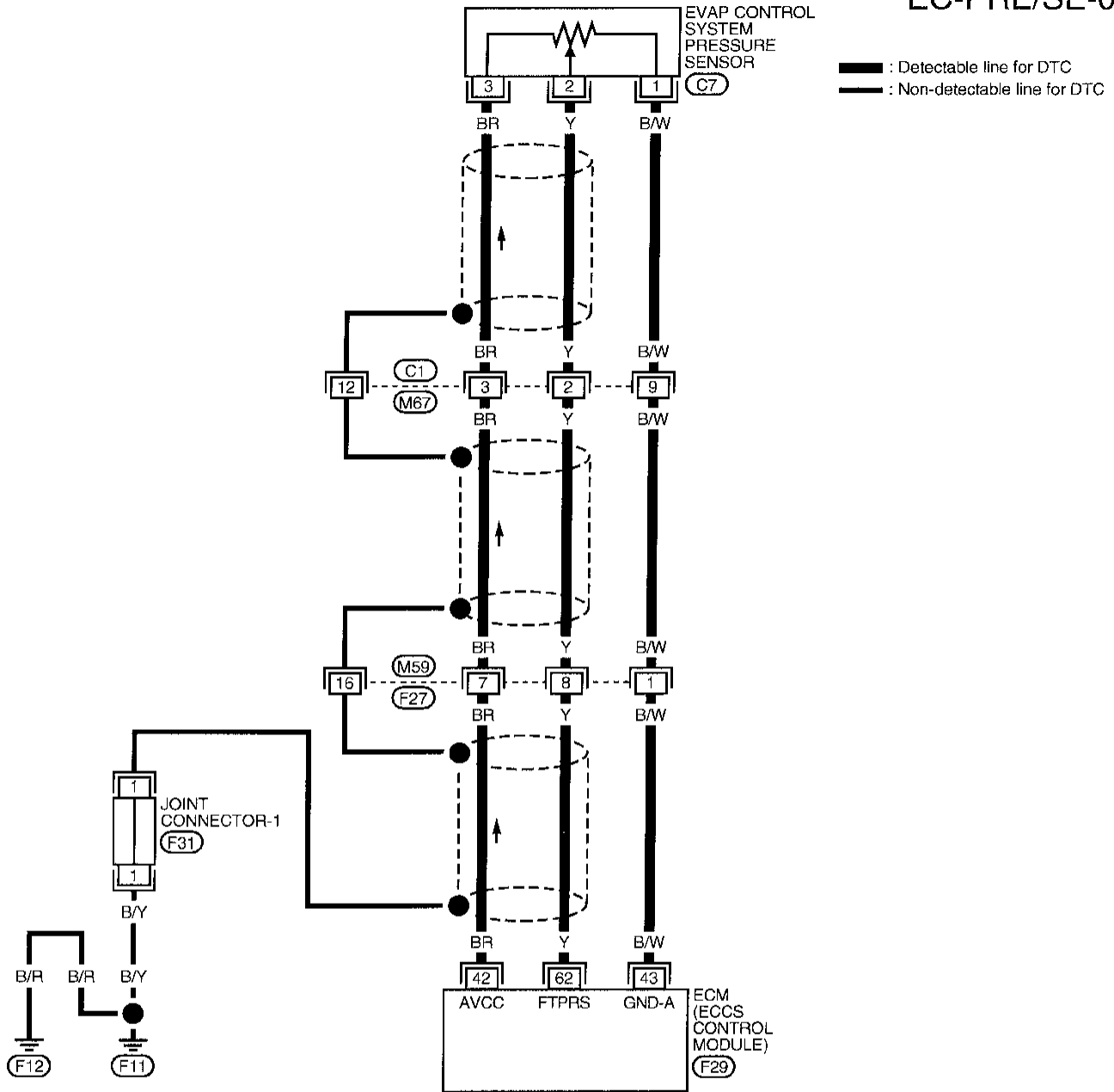
OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Check that voltage between ECM terminal 60 and ground is less than 4.2V.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine and wait at least 20 seconds.
- 5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

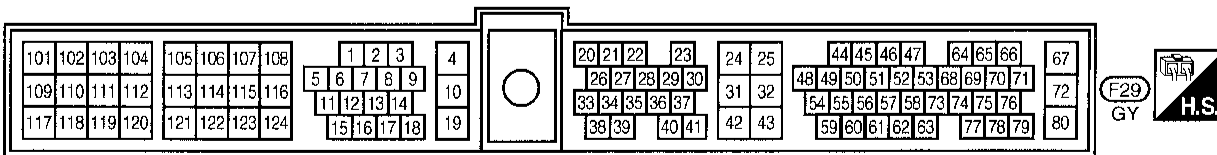
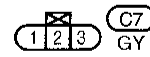
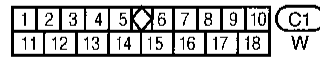
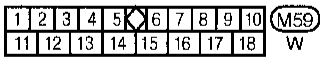
TROUBLE DIAGNOSIS FOR DTC P0450

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

EC-PRE/SE-01



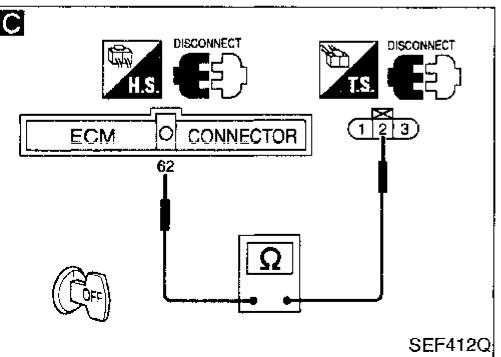
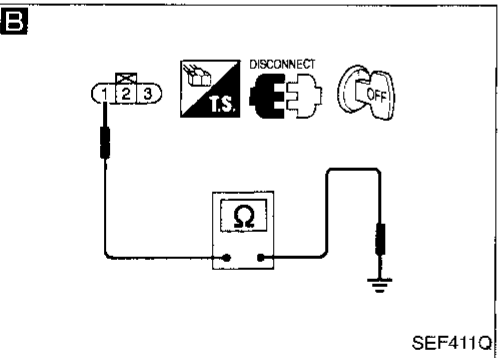
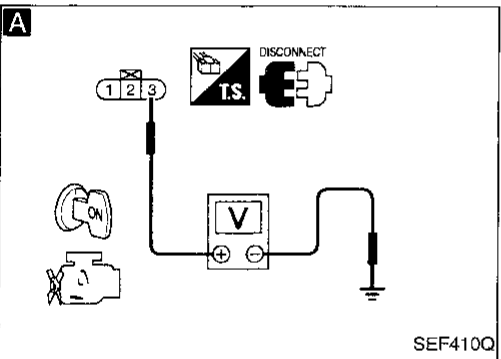
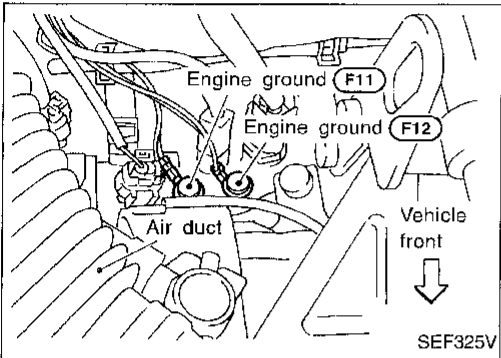
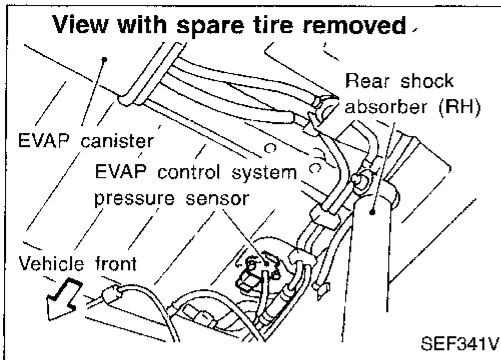
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TROUBLE DIAGNOSIS FOR DTC P0450

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK RUBBER TUBE CONNECTED TO THE SENSOR.
Check rubber tube connected to the sensor for clogging, vent, kink, disconnection or improper connection.

NG

Reconnect, repair or replace.

OK

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CHECK POWER SUPPLY.

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.
Water should not exist.
If OK, go to step 3. If NG, repair or replace harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal (3) and engine ground with CONSULT or tester.
Voltage: Approximately 5V

NG

Check the following.

- Harness connectors (C1), (M67)
- Harness connectors (M59), (F27)
- Harness for open or short between EVAP control system pressure sensor and ECM

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal (1) and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (C1), (M67)
- Harness connectors (M59), (F27)
- Harness for open or short between EVAP control system pressure sensor and ECM

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (62) and terminal (2).
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (C1), (M67)
- Harness connectors (M59), (F27)
- Harness for open or short between EVAP control system pressure sensor and ECM

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

CHECK COMPONENT
(EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION" on EC-275.

NG

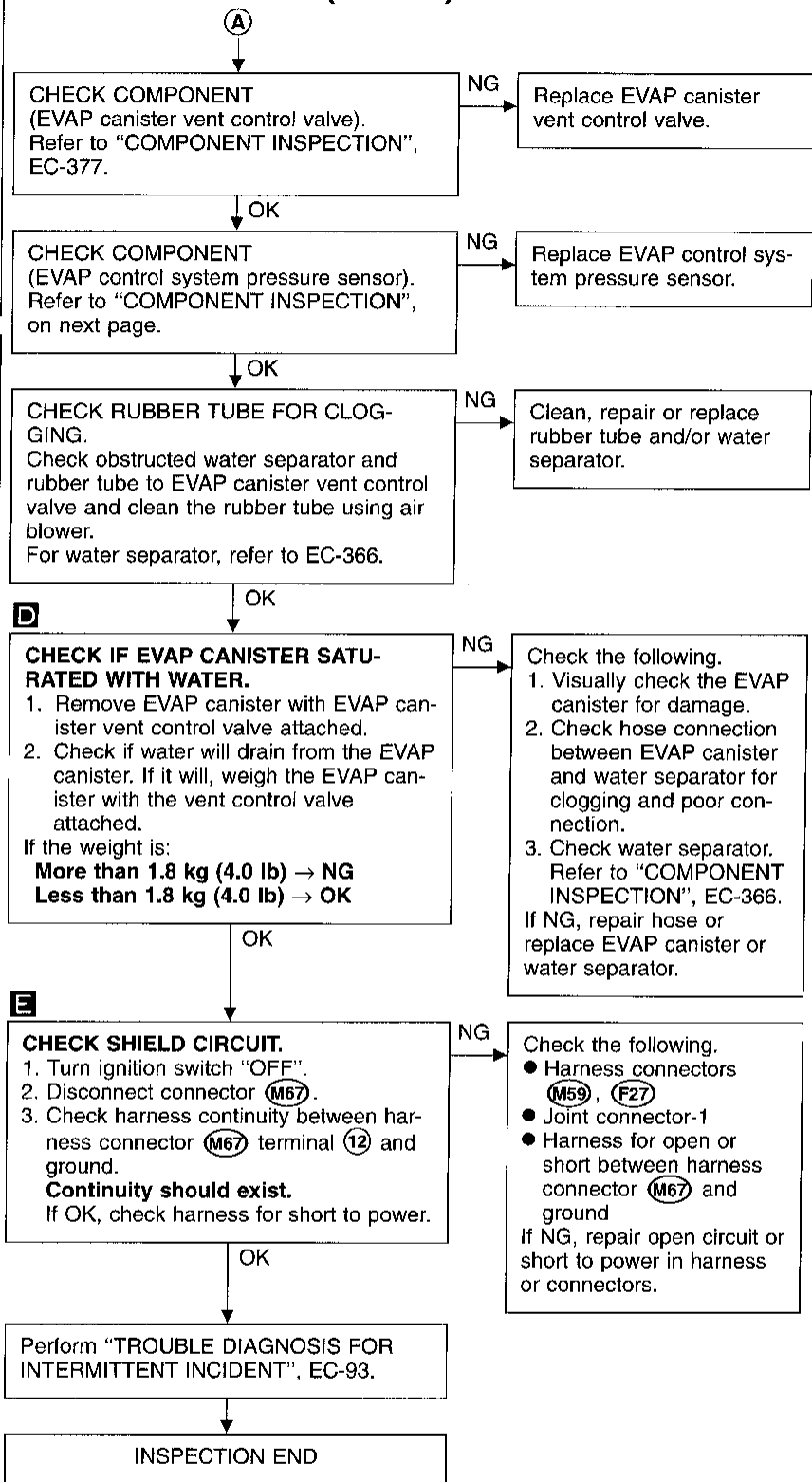
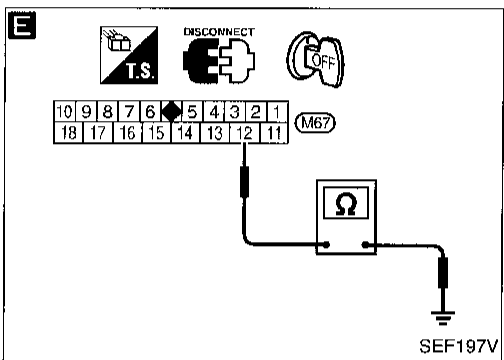
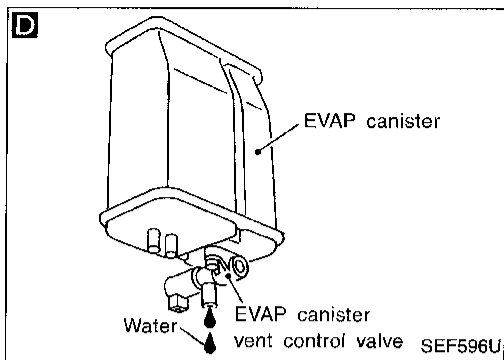
Replace EVAP canister purge volume control solenoid valve.

OK

A

(Go to next page.)

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)



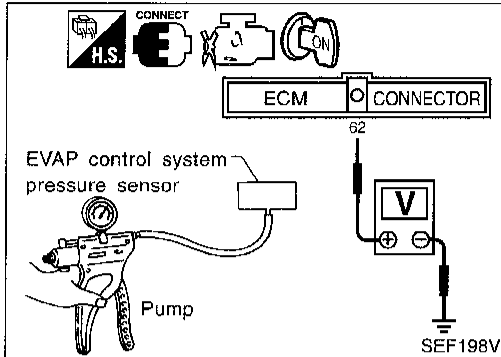
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TROUBLE DIAGNOSIS FOR DTC P0450

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

COMPONENT INSPECTION

EVAP control system pressure sensor



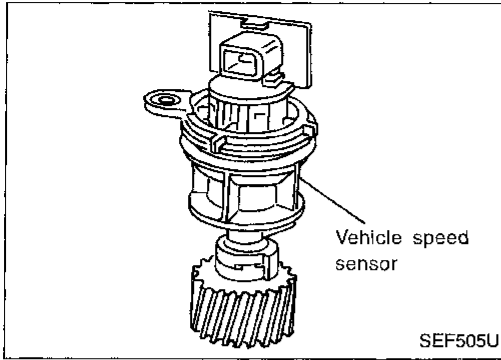
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal 62 and engine ground.

| Pressure (Relative to atmospheric pressure) | Voltage (V) |
|---|-------------|
| 0 kPa (0 mmHg, 0 inHg) | 3.0 - 3.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg) | 0.4 - 0.6 |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.

TROUBLE DIAGNOSIS FOR DTC P0500



Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------|--|-------------------|
| 29 | G/B | Vehicle speed sensor | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> <ul style="list-style-type: none"> — Lift up the vehicle. — In 2nd gear position 40 km/h (25 MPH) | 1 - 4V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P0500 0104 | <ul style="list-style-type: none"> ● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven. | <ul style="list-style-type: none"> ● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor |

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TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

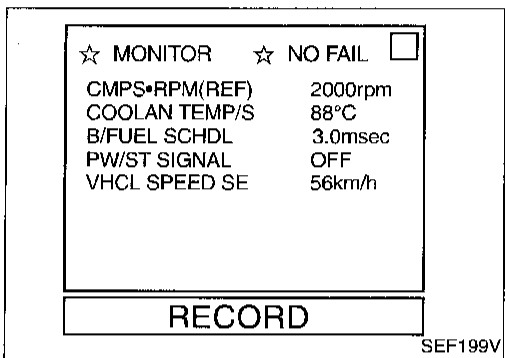
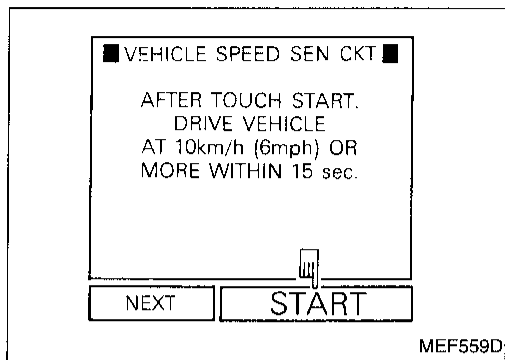
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

- Always drive vehicle at a safe speed.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



- 1) Start engine.
2) Perform "VEHICLE SPEED SEN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

- 1) Start engine
2) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT. The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

If NG, go to "DIAGNOSTIC PROCEDURE", EC-290.

If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT.
4) Warm engine up to normal operating temperature.
5) Maintain the following conditions for at least 10 consecutive seconds.

**CMPS-RPM (REF): 1,800 - 2,500 rpm (A/T)
1,500 - 2,500 rpm (M/T)**

**COOLAN TEMP/S: More than 70°C (158°F)
B/FUEL SCHDL: 2.2 - 3.1 ms (A/T)
1.9 - 5.2 ms (M/T)**

**Selector lever: Suitable position
PW/ST SIGNAL: OFF**

OR

OVERALL FUNCTION CHECK

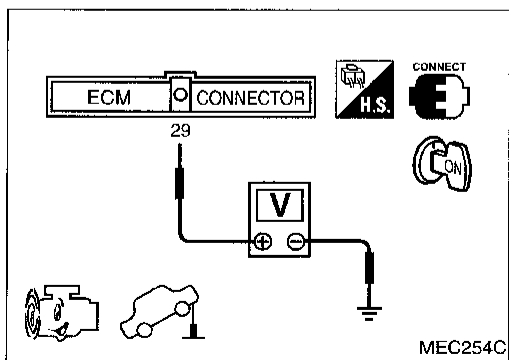
Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

- 1) Lift up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "MODE 1" with GST.

The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

OR

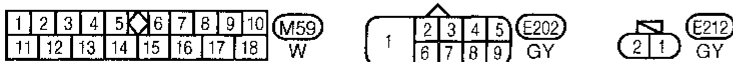
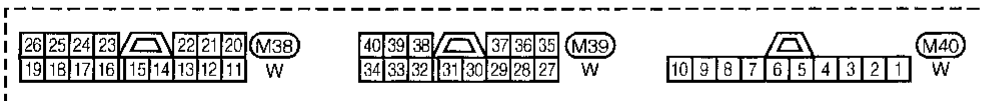
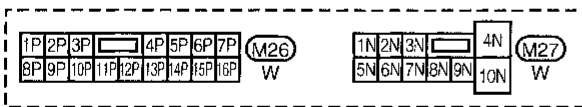
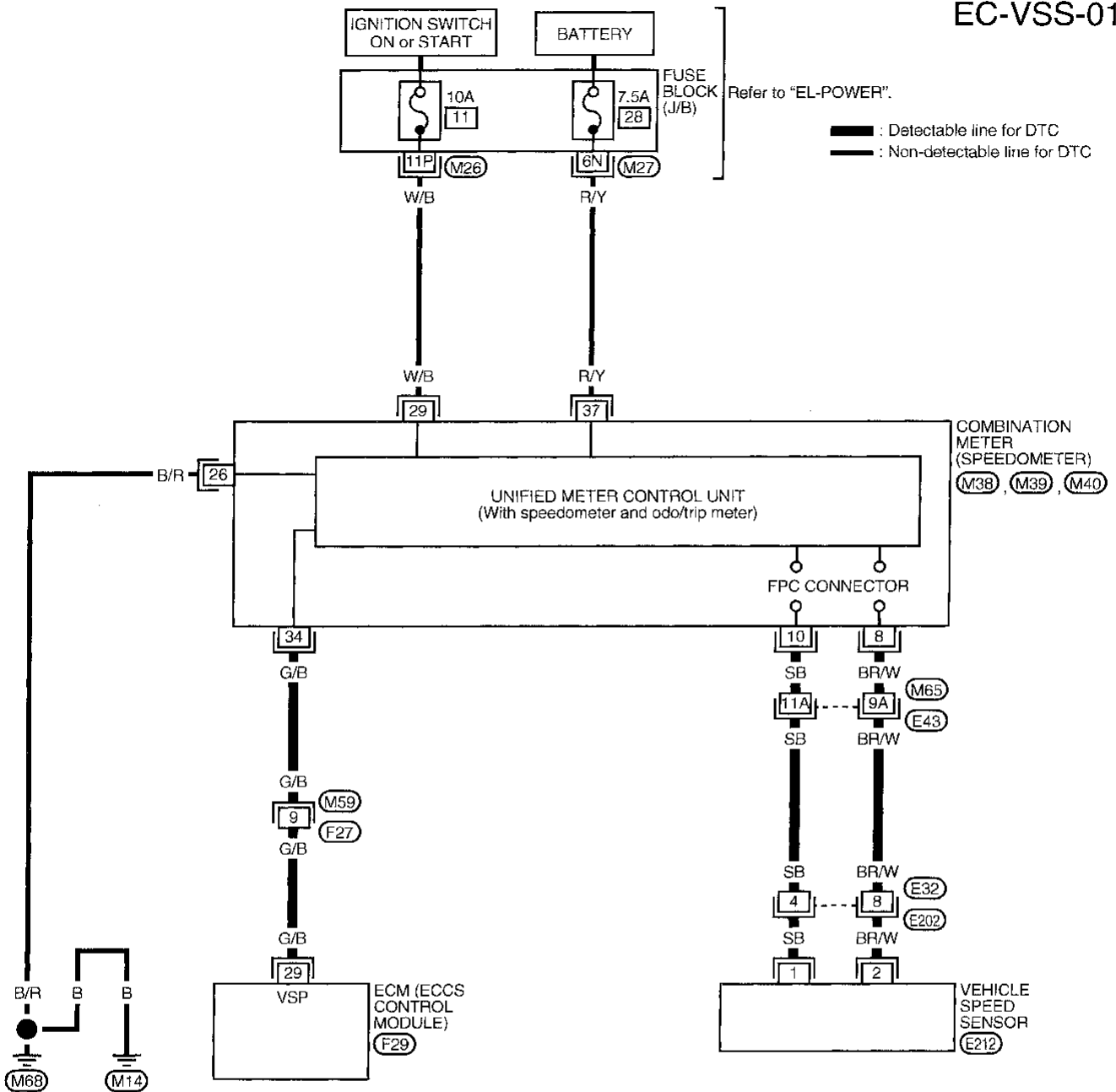
- 1) Lift up drive wheels.
2) Start engine.
3) Read the voltage signal between ECM terminal 29 (Vehicle speed sensor signal) and ground with oscilloscope.
4) Verify that the oscilloscope screen shows the signal wave as shown at "ECM TERMINALS AND REFERENCE VALUE" on the previous page.



TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01



Refer to last page (Foldout page).

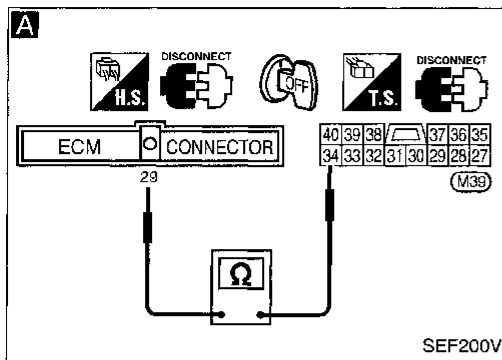
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TROUBLE DIAGNOSIS FOR DTC P0500

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector (M39).
3. Check harness continuity between ECM terminal (29) and meter terminal (34).
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (M59), (F27)
- Harness for open or short between ECM and combination meter

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG

Check the following.

- Harness connectors (E43), (E65)
- Harness connectors (E32), (E202)
- Harness for open or short between combination meter and vehicle speed sensor

If NG, repair open circuit or short to ground or short to power in harness or connectors.

Check vehicle speed sensor and its circuit.
Refer to EL section.

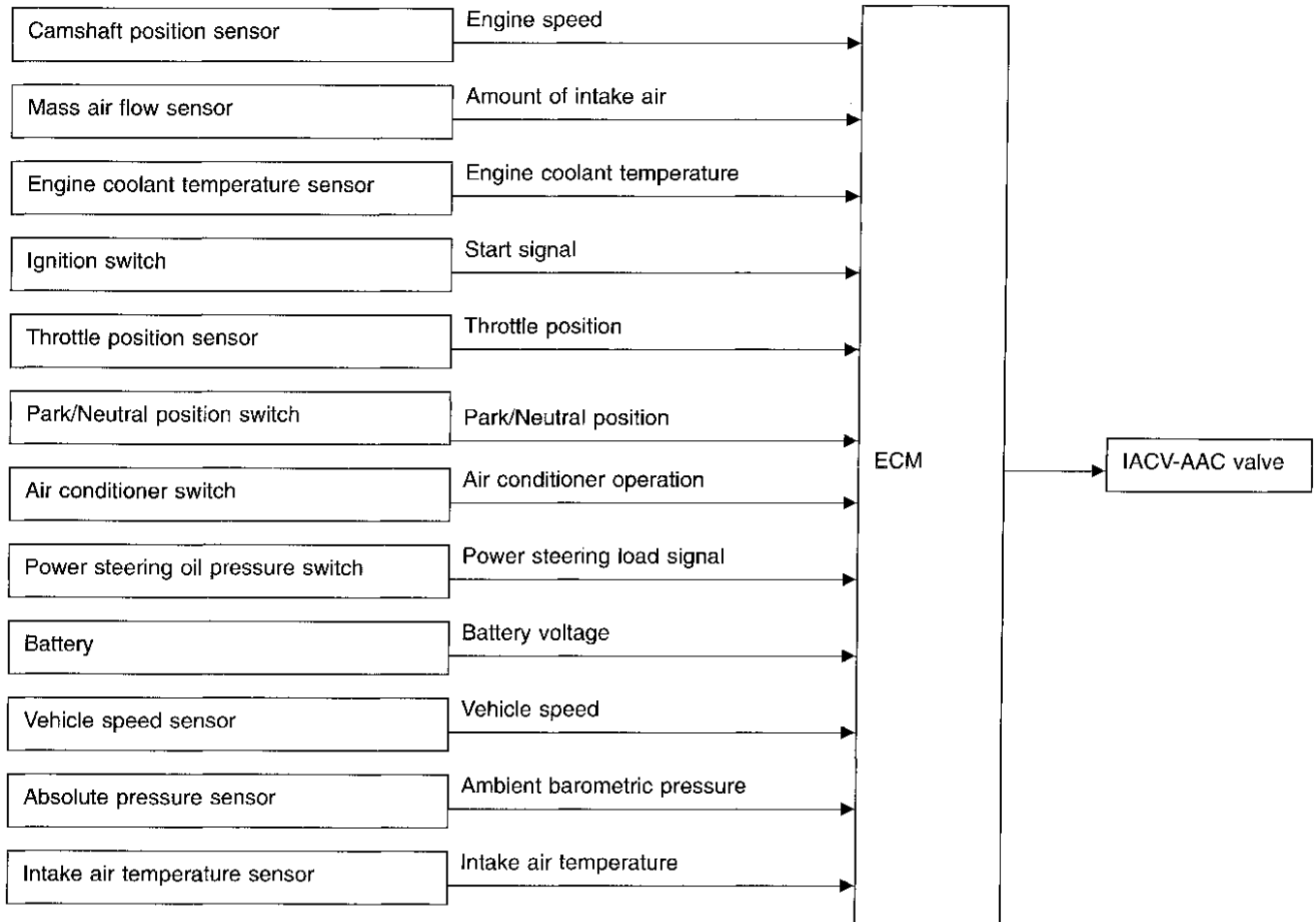
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

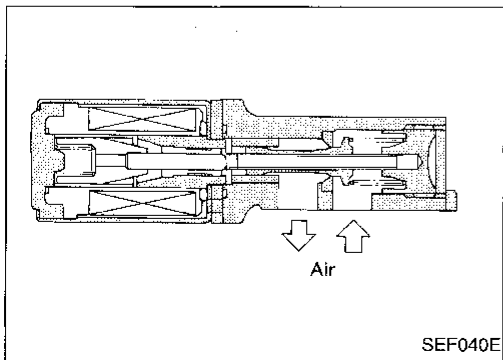
INSPECTION END

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

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 bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner and power steering).



COMPONENT DESCRIPTION

IACV-AAC valve

The IACV-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

TROUBLE DIAGNOSIS FOR DTC P0505

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

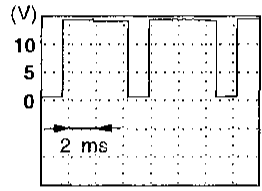
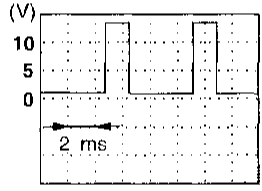
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|--------------|--|-----------|---------------|
| IACV-AAC/V | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle | Approx. 30% |
| | | 2,000 rpm | — |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ⓓ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------|---|---|
| 101 | OR/L | IACV-AAC valve | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) ↳ Idle speed | 10.5 - 11.5V  |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) ↳ Engine speed is 2,000 rpm. | 1 - 13V  |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P0505 0205 | A) The IACV-AAC valve does not operate properly. | <ul style="list-style-type: none"> ● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve |
| | B) The IACV-AAC valve does not operate properly. | <ul style="list-style-type: none"> ● Harness or connectors (The IACV-AAC valve circuit is shorted.) ● IACV-AAC valve |

TROUBLE DIAGNOSIS FOR DTC P0505

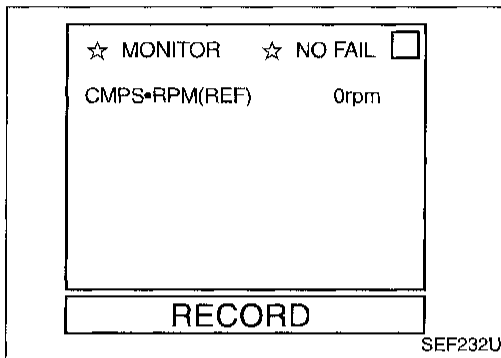
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B".

NOTE:


If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.




Procedure for malfunction A

TESTING CONDITION:


Before performing the following procedure, confirm battery voltage is more than 10.5V at ignition switch "ON".

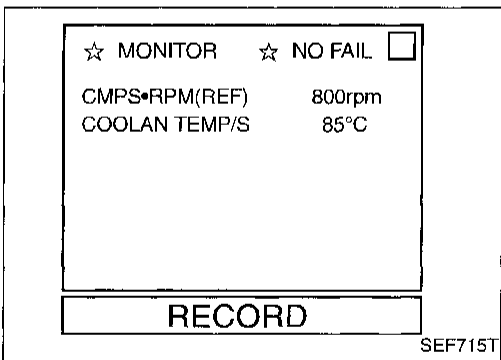
-  1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

OR

-  1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Select "MODE 7" with GST.

OR


-  1) Turn ignition switch "ON" and wait at least 2 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.




Procedure for malfunction B

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

-  1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
4) Start engine and run it for at least 1 minute at idle speed.

OR

-  1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it for at least 1 minute at idle speed.
4) Select "MODE 7" with GST.

TROUBLE DIAGNOSIS FOR DTC P0505

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

OR

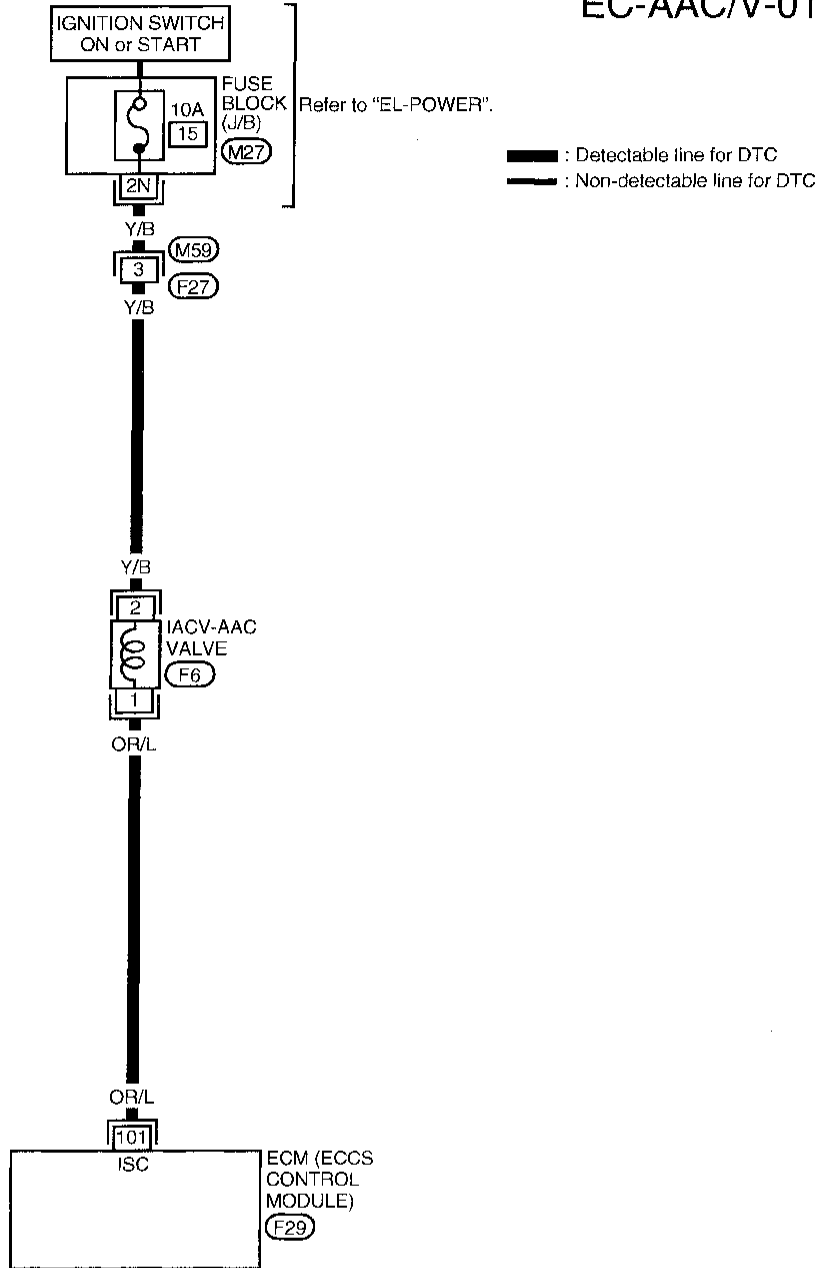


- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine again and run it for at least 1 minute at idle speed.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

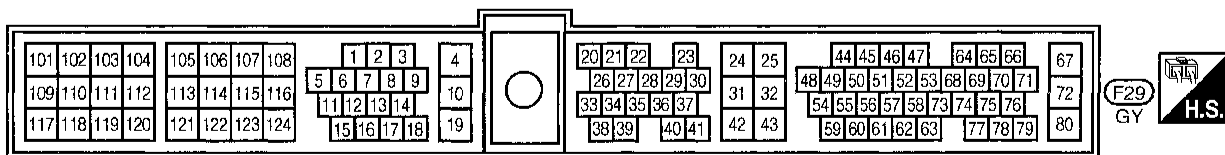
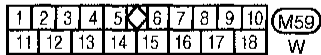
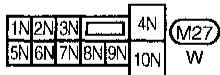
TROUBLE DIAGNOSIS FOR DTC P0505

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

EC-AAC/V-01



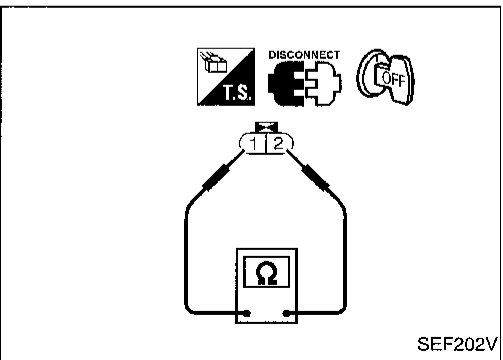
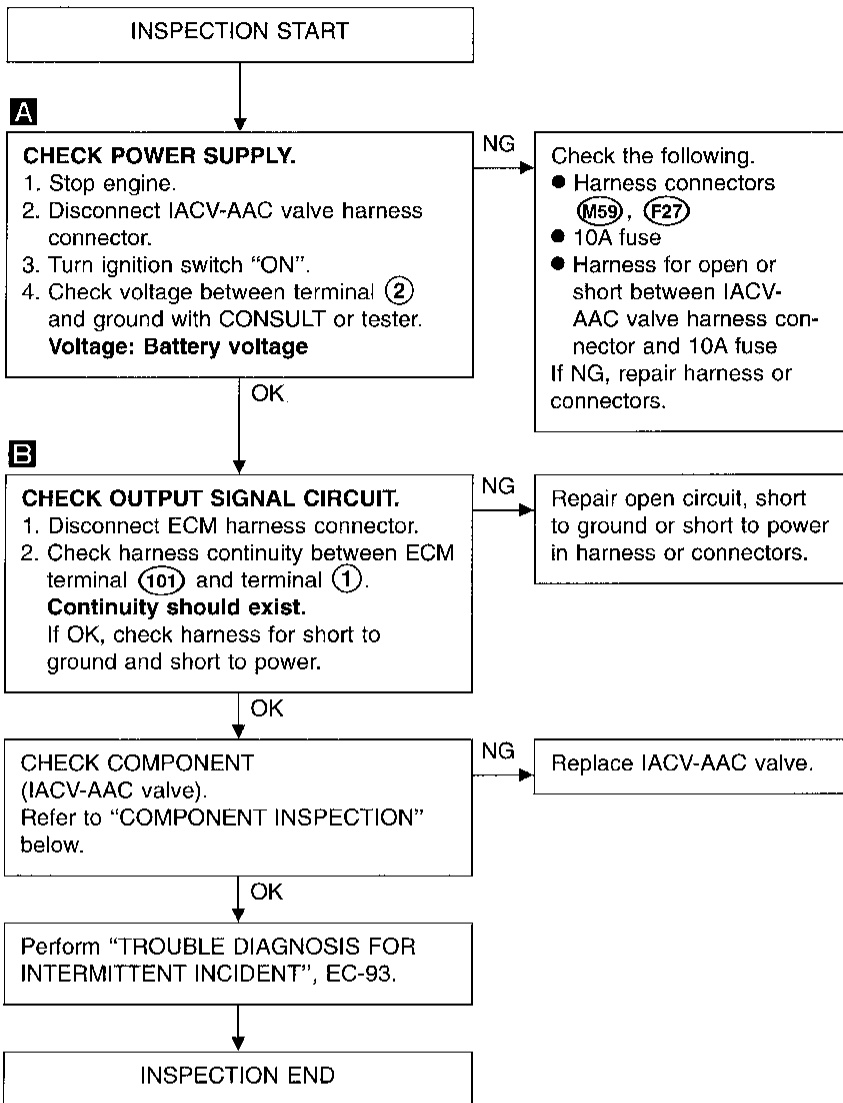
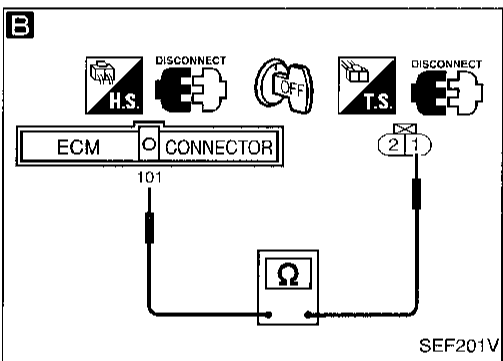
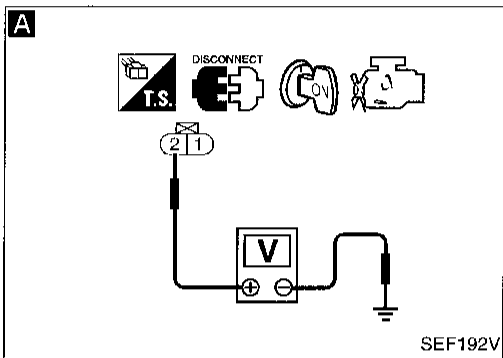
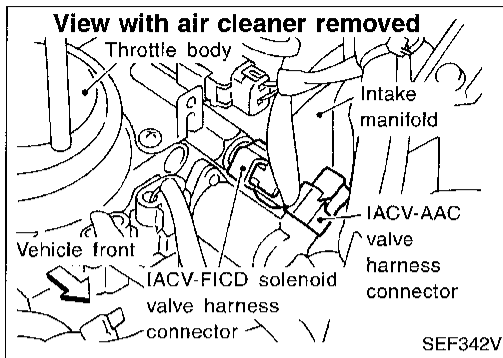
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TROUBLE DIAGNOSIS FOR DTC P0505

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

DIAGNOSTIC PROCEDURE



COMPONENT INSPECTION

IACV-AAC valve

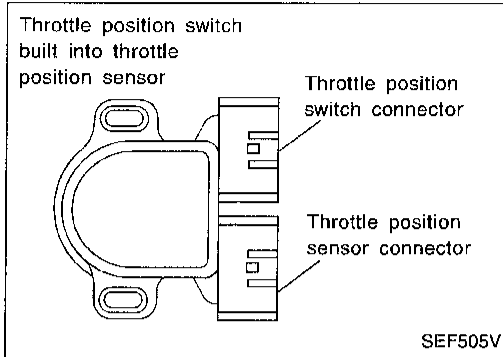
Disconnect IACV-AAC valve harness connector.

- Check IACV-AAC valve resistance.

Resistance:

Approximately 10Ω [at 25°C (77°F)]

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



Closed Throttle Position Switch

COMPONENT DESCRIPTION

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--|--|----------------------------|
| 28 | BR/W | Throttle position switch (Closed position) | Ignition switch "ON" (Warm-up condition) └ Accelerator pedal fully released | BATTERY VOLTAGE (11 - 14V) |
| | | | Ignition switch "ON" └ Accelerator pedal depressed | Approximately 0V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P0510 0203 | <ul style="list-style-type: none"> Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened. | <ul style="list-style-type: none"> Harness or connectors (The closed throttle position switch circuit is shorted.) Closed throttle position switch Throttle position sensor |

TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd)

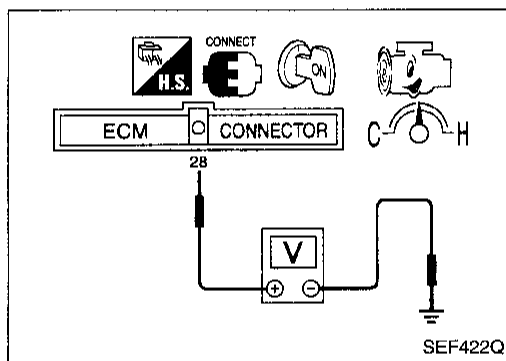
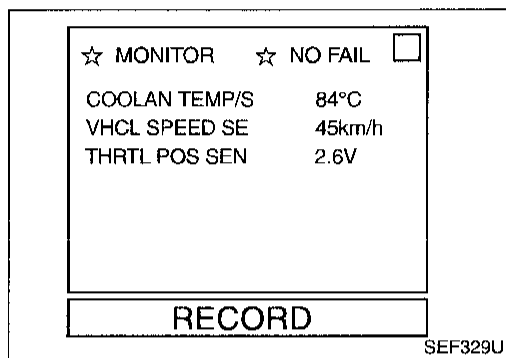
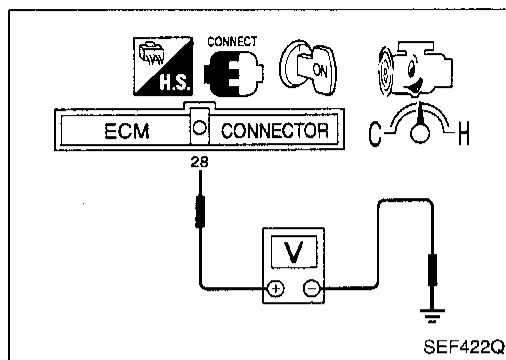
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.

- 2) Check voltage between ECM terminal ⑳ and ground under the following conditions.

At idle: Battery voltage

At 2,000 rpm: 0 - 1V

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-300.

If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN: More than 2.5V

VHCL SPEED SE: More than 4 km/h (2 MPH)

Selector lever: Suitable position

Driving pattern: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.



- 1) Start engine and warm it up to normal operating temperature.

- 2) Check the voltage between ECM terminal ⑳ and ground under the following conditions.

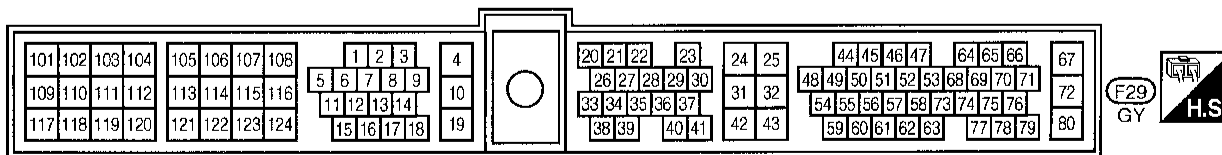
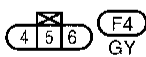
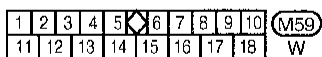
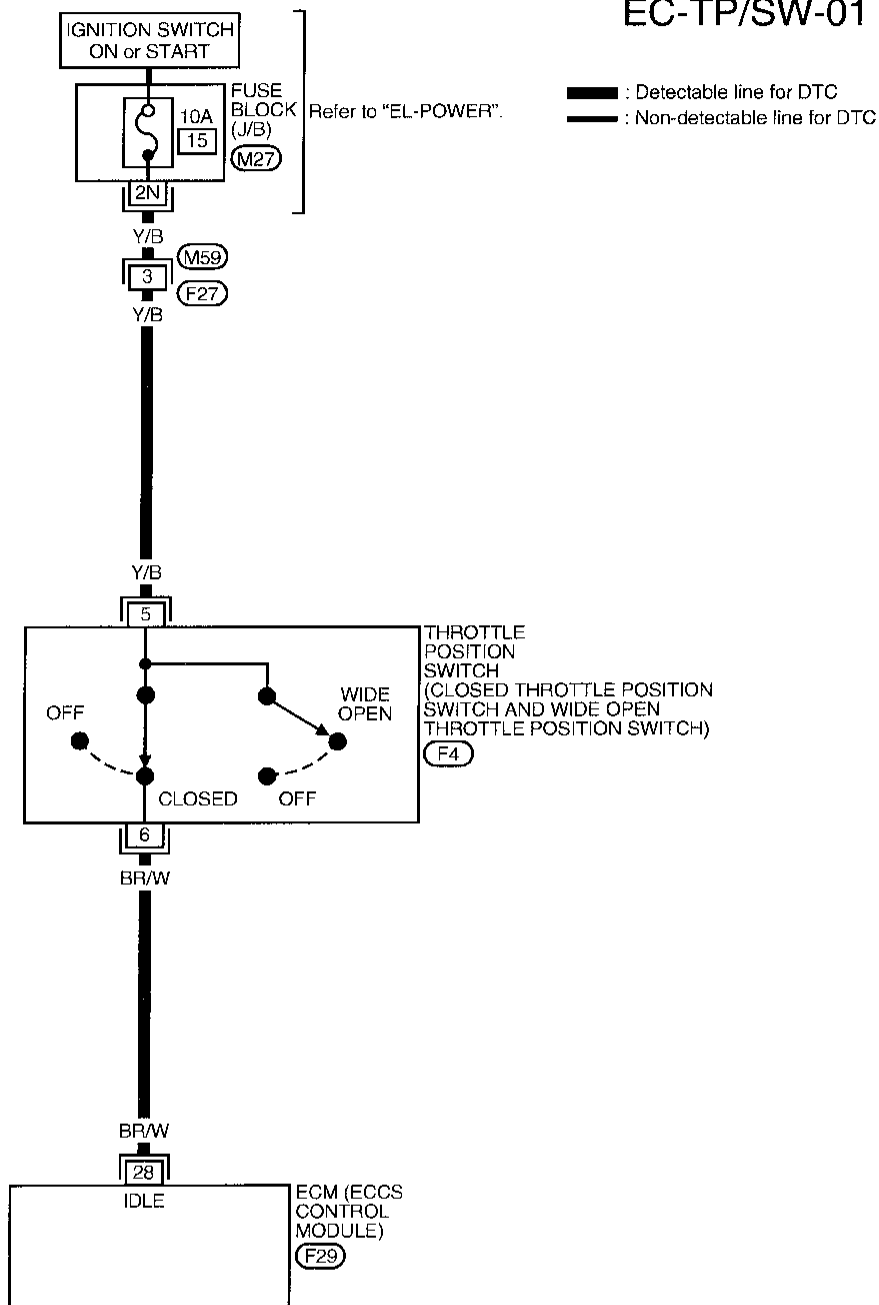
At idle: Battery voltage

At 2,000 rpm: 0 - 1V

TROUBLE DIAGNOSIS FOR DTC P0510

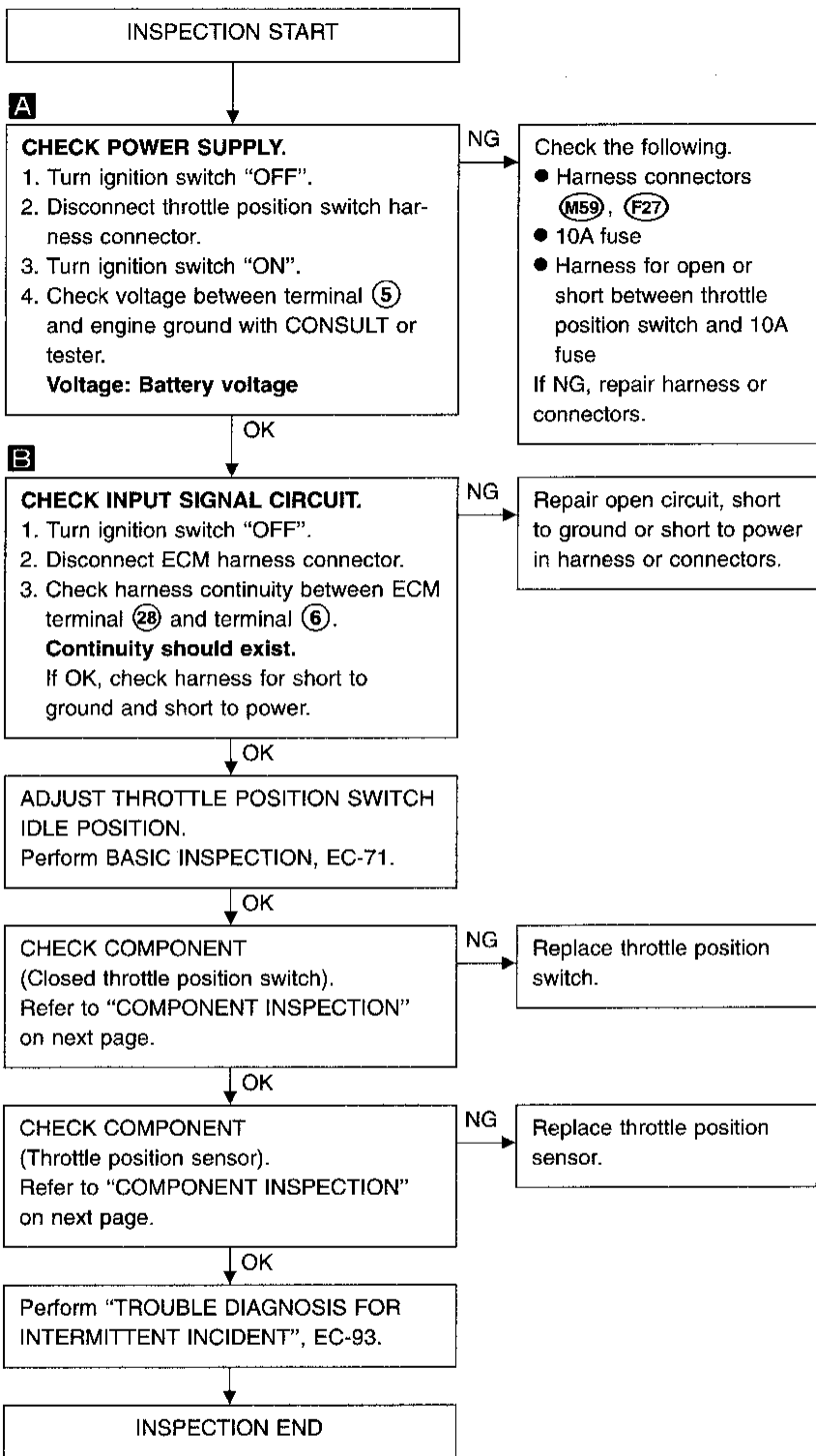
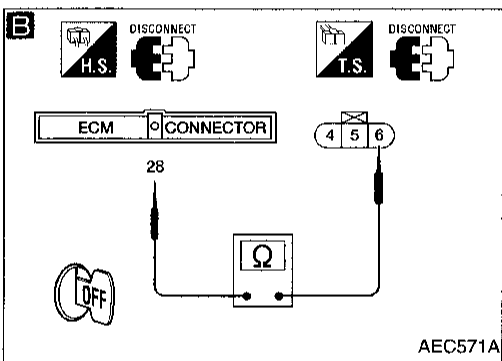
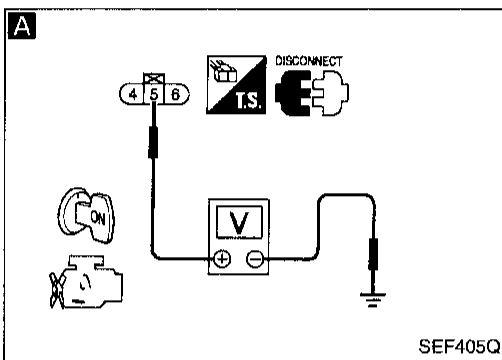
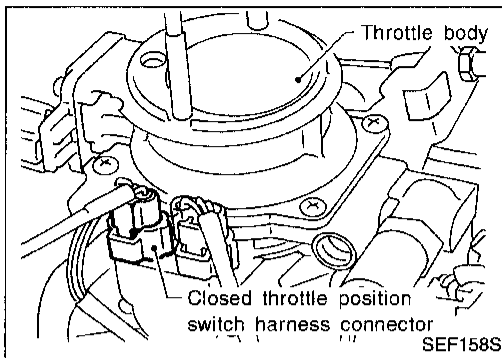
Closed Throttle Position Switch (Cont'd)

EC-TP/SW-01



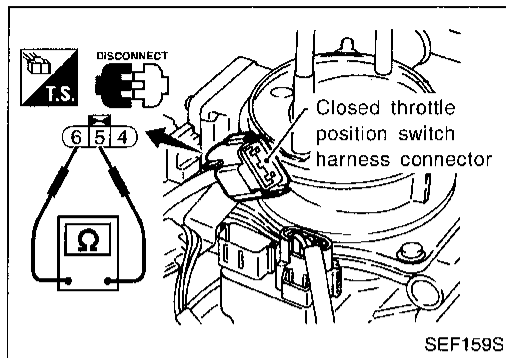
Closed Throttle Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P0510

Closed Throttle Position Switch (Cont'd) COMPONENT INSPECTION

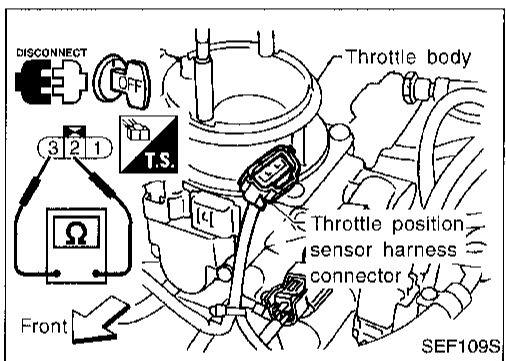


Closed throttle position switch

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect throttle position switch harness connector.
4. Check continuity between terminals ⑤ and ⑥ while opening throttle valve manually.

| Throttle valve conditions | Continuity |
|-----------------------------------|------------|
| Completely closed | Yes |
| Partially open or completely open | No |

If NG, replace throttle position switch.



Throttle position sensor

1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ② and ③ changes when opening throttle valve manually.

| Throttle valve conditions | Resistance [at 25°C (77°F)] |
|---------------------------|-----------------------------|
| Completely closed | Approximately 0.5 kΩ |
| Partially open | 0.5 - 4 kΩ |
| Completely open | Approximately 4 kΩ |

If NG, replace throttle position sensor.
To adjust it, perform "Basic Inspection", EC-71.

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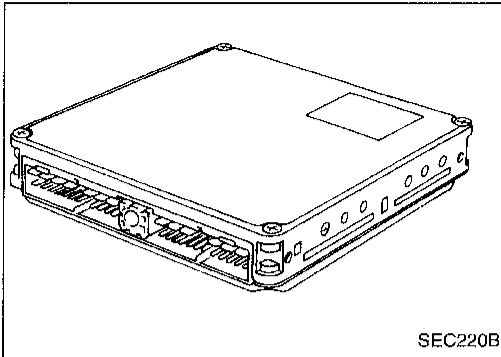
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TROUBLE DIAGNOSIS FOR DTC P0605



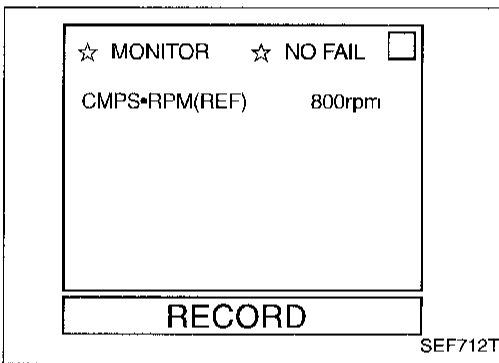
Engine Control Module (ECM)

COMPONENT DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Item (Possible Cause) |
|-----------------------------|---|-----------------------------|
| P0605 0301 | ● ECM calculation function is malfunctioning. | ● ECM |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine.
- 4) Run engine for at least 30 seconds at idle speed.

OR



- 1) Turn ignition switch "ON".
- 2) Start engine.
- 3) Run engine for at least 30 seconds at idle speed.
- 4) Select "Mode 7" with GST.

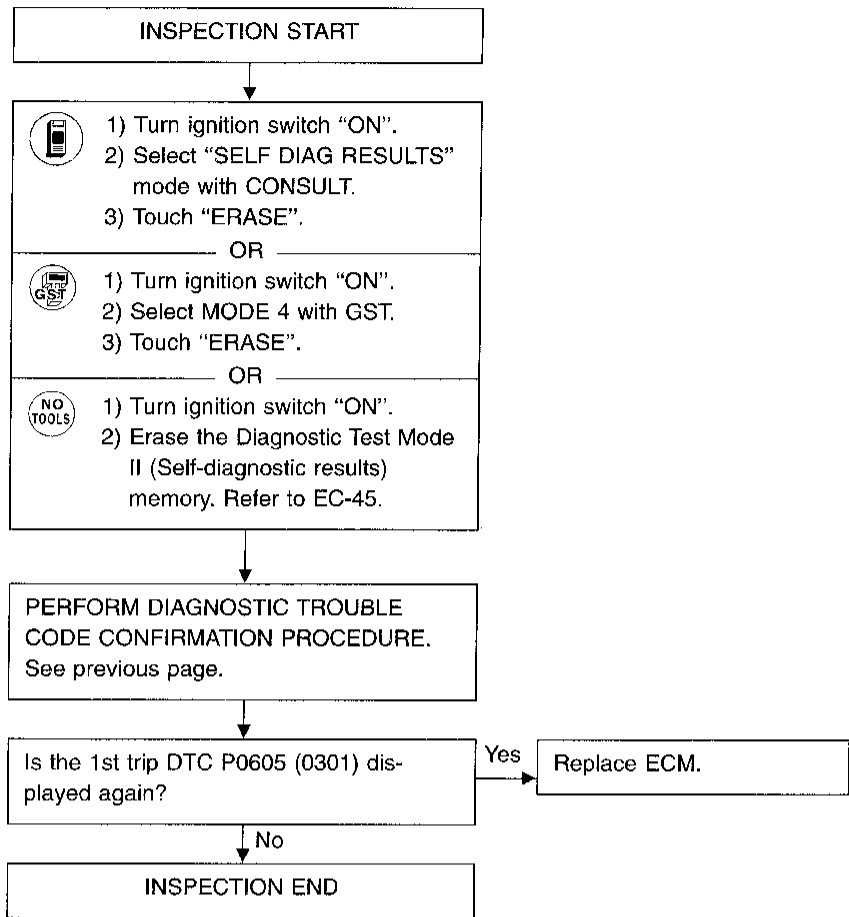
OR



- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 30 seconds.
- 3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

TROUBLE DIAGNOSIS FOR DTC P0605

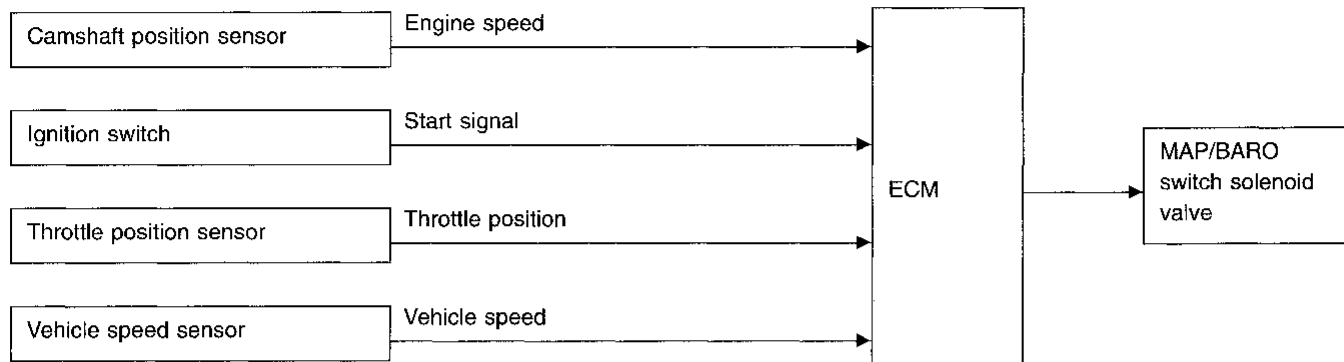
Engine Control Module (ECM) (Cont'd) DIAGNOSTIC PROCEDURE



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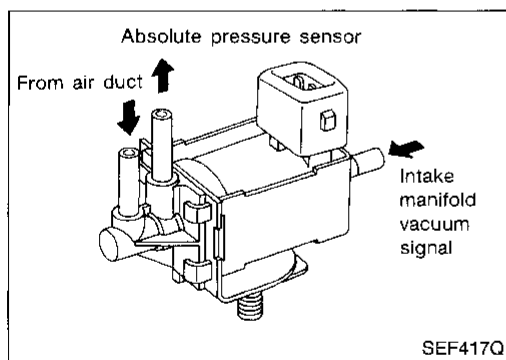
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve

SYSTEM DESCRIPTION



This system allows the absolute pressure sensor to monitor either ambient barometric pressure or intake manifold pressure. The MAP/BARO switch solenoid valve switches between two passages by ON-OFF pulse signals from the ECM. (One passage is from the intake air duct, the other is from the intake manifold.) Either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

| Solenoid | Conditions |
|----------|---|
| ON | <ul style="list-style-type: none"> ● For 5 seconds after turning ignition switch ON (Engine is not running.) <p style="text-align: center;">OR</p> <ul style="list-style-type: none"> ● For 5 seconds after starting engine <p style="text-align: center;">OR</p> |
| | <ul style="list-style-type: none"> ● More than 5 minutes after the solenoid valve shuts OFF. <p style="text-align: center;">and</p> <ul style="list-style-type: none"> ● Throttle valve is shut or almost fully shut for more than 5 seconds <p style="text-align: center;">and</p> <ul style="list-style-type: none"> ● Vehicle speed is less than 100 km/h (62 MPH). |



COMPONENT DESCRIPTION

The MAP/BARO switch solenoid valve switches its air flow passage according to the voltage signal sent from the ECM. When voltage is supplied from the ECM, the MAP/BARO switch solenoid turns "ON". Then, the absolute pressure sensor can monitor the ambient barometric pressure. When voltage is not supplied from the ECM, the MAP/BARO switch solenoid valve turns "OFF". Then, the sensor monitors intake manifold pressure.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---------------|---|---------------|
| MAP/BARO SW/V | ● Engine: For 5 seconds after starting engine | BARO |
| | ● Ignition switch: More than 5 seconds after turning ignition switch "ON" | MAP |
| | ● Engine: More than 5 seconds after starting engine | |

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--------------------------------|---|----------------------------|
| 118 | LG/B | MAP/BARO switch solenoid valve | Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running. └ For 5 seconds after starting engine | 0 - 1V |
| | | | Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON" Engine is running. └ More than 5 seconds after starting engine | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P1105 1302 | A) MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve. | <ul style="list-style-type: none"> ● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● MAP/BARO switch solenoid valve |
| | B) There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and voltage at intake manifold pressure. | <ul style="list-style-type: none"> ● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● Hoses (Hoses are clogged, vent, kinked, disconnected or improper connection.) ● Absolute pressure sensor ● MAP/BARO switch solenoid valve |

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B".

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

Procedure for malfunction A

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch "ON".



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 10 seconds.

OR

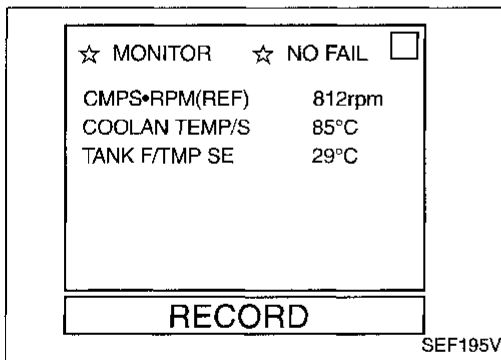
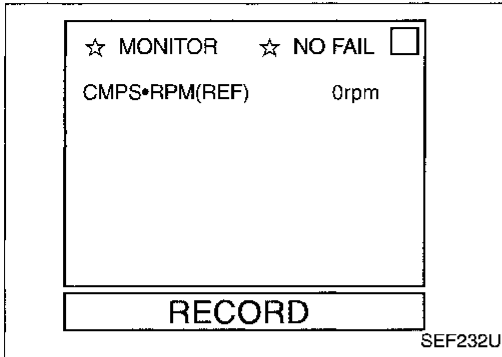


- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- 2) Select "Mode 7" with GST.

OR



- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



Procedure for malfunction B

TESTING CONDITION:

Always perform the test at a temperature of 5°C (41°F) or higher.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that "TANK/F/TEMP SE" is more than 0°C (32°F).
- 5) Start engine and let it idle for at least 10 seconds.

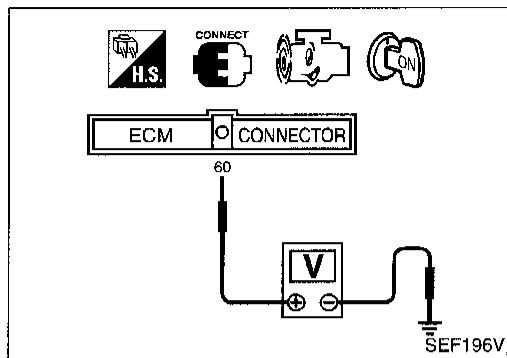
OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- 4) Check that voltage between ECM terminal ⑥ and ground is less than 4.2V.
- 5) Start engine and let it idle for at least 10 seconds.
- 6) Select "MODE 7" with GST.

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



- OR
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Turn ignition switch "OFF" and wait at least 5 seconds.
 - 3) Turn ignition switch "ON".
 - 4) Check that voltage between ECM terminal ⑥0 and ground is less than 4.2V.
 - 5) Start engine and let it idle for at least 10 seconds.
 - 6) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
 - 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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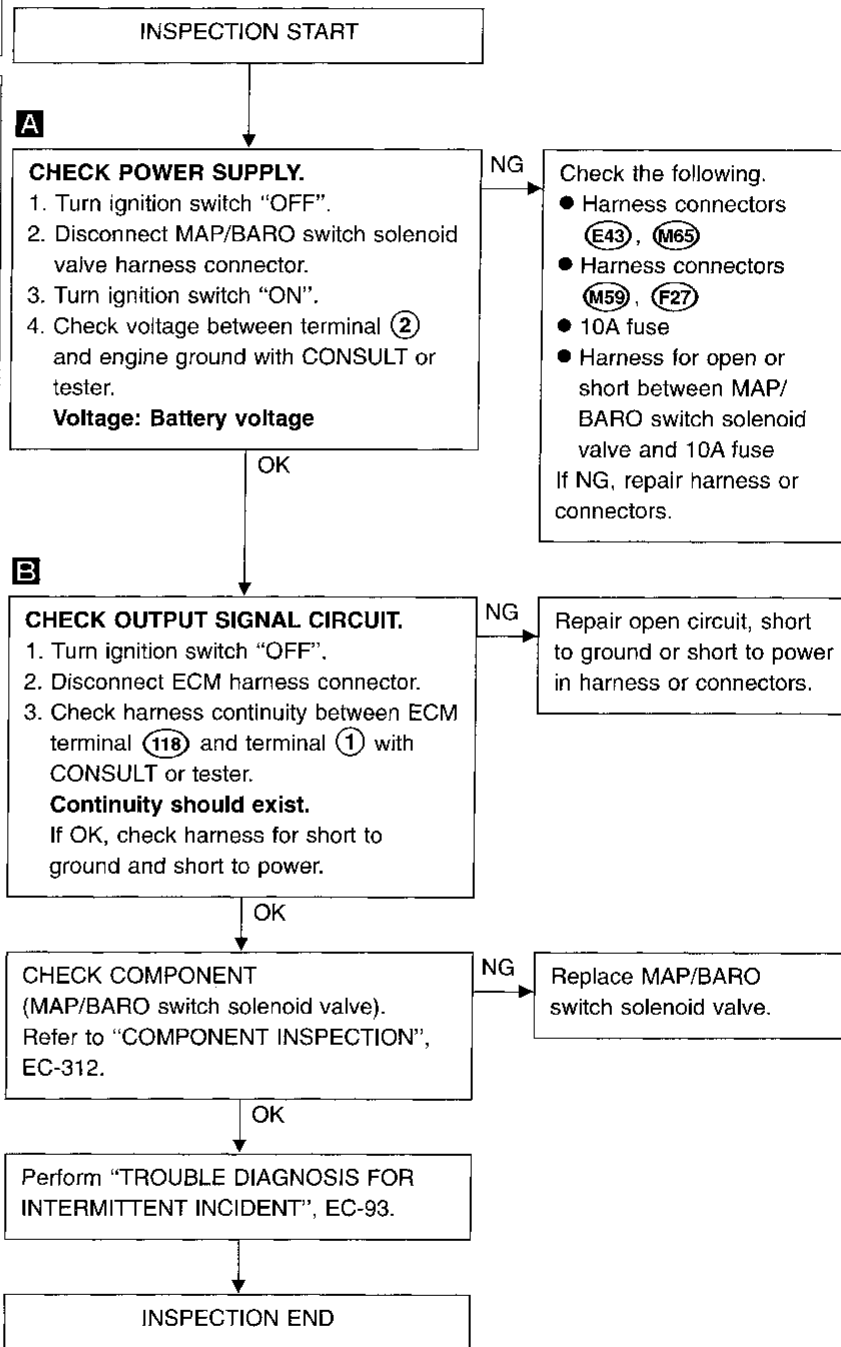
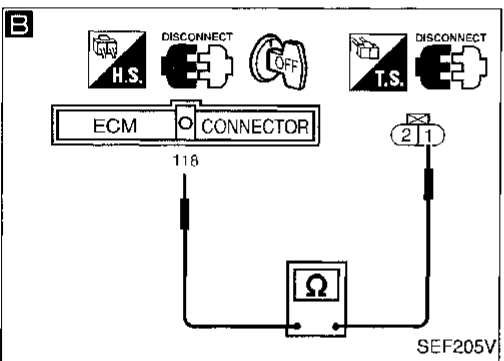
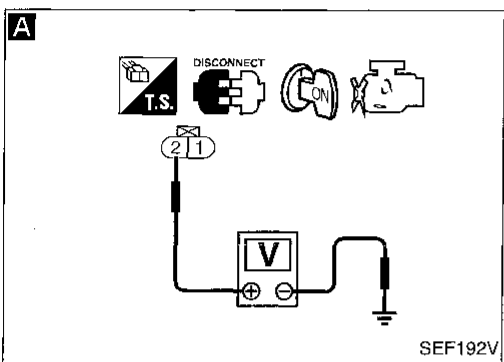
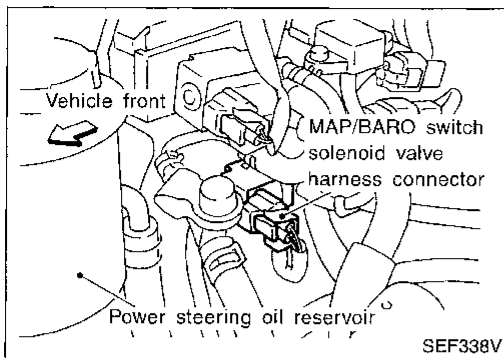
TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE

If the trouble is duplicated after "Procedure for malfunction A", perform "Procedure A" below. If the trouble is duplicated after "Procedure for malfunction B", perform "Procedure B" on next page.

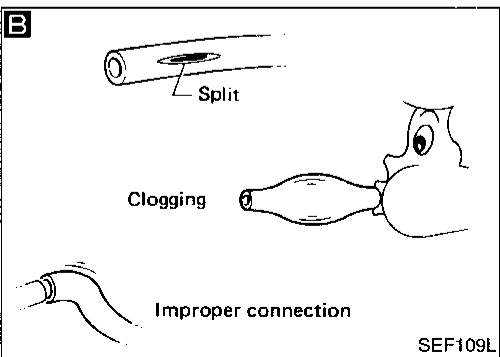
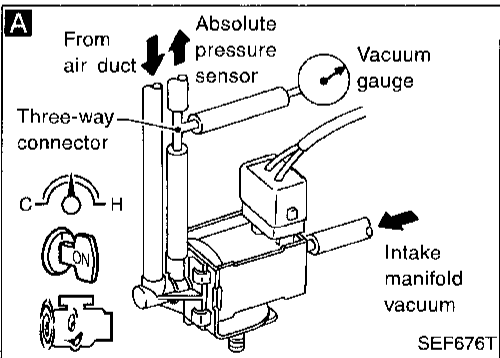
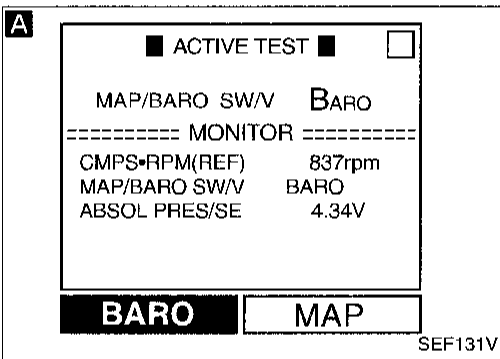
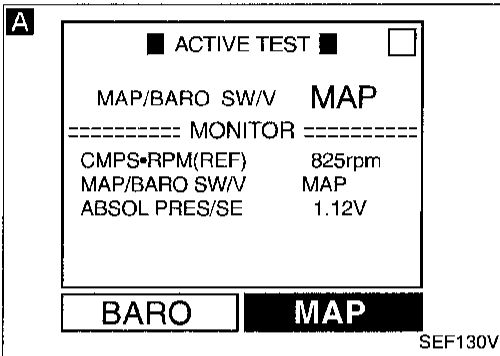
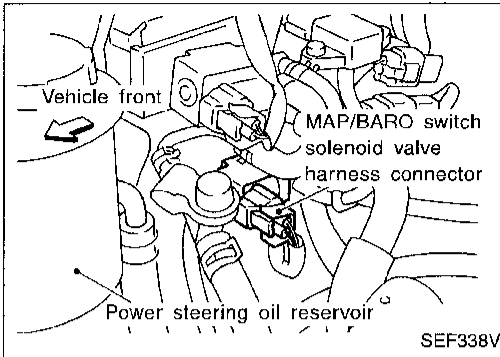
Procedure A



TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

Procedure B



INSPECTION START

A

CHECK VACUUM SOURCE AND CIRCUIT TO MAP/BARO SWITCH SOLENOID VALVE.

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Connect MAP/BARO switch solenoid valve and absolute pressure sensor with a rubber tube that has vacuum gauge.
4. Turn ignition switch "ON".
5. Select "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
6. Start engine and let it idle.
7. Touch "MAP" and "BARO" alternately and check for vacuum.

| MAP/BARO SW/V | Vacuum |
|---------------|-------------------|
| BARO | Should not exist. |
| MAP | Should exist. |

OR

4. Turn ignition switch "ON".
5. Start engine and check for vacuum.
For 5 seconds after starting engine
Vacuum should not exist.
More than 5 seconds after starting engine
Vacuum should exist.

OK

CHECK COMPONENT (Absolute pressure sensor).

1. Check for disconnection of vacuum hose connected to the sensor.
2. Check sensor harness connector for water.
Water should not exist.

Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P0105", EC-114.

OK

NG

Replace absolute pressure sensor.

Go to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

B

CHECK HOSE.

1. Turn ignition switch "OFF".
2. Check hose for clogging, cracks, disconnection or improper connection.

NG

Clean, repair or reconnect the hose.
If NG, check vacuum port for clogging.

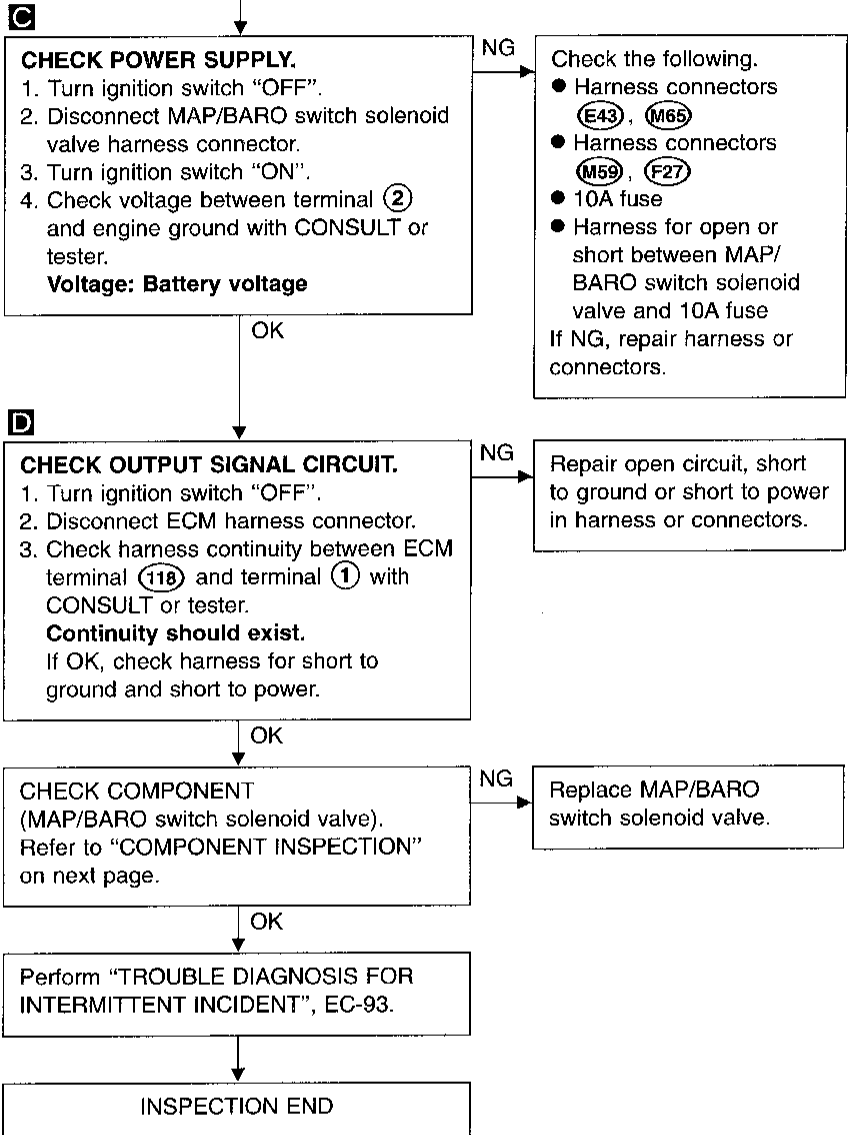
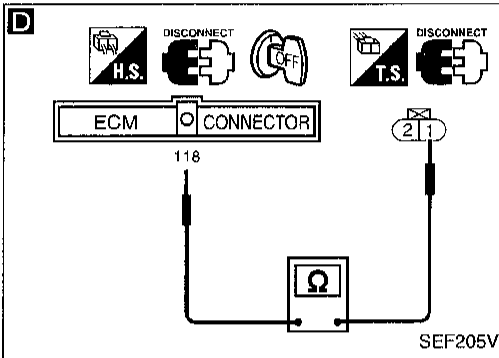
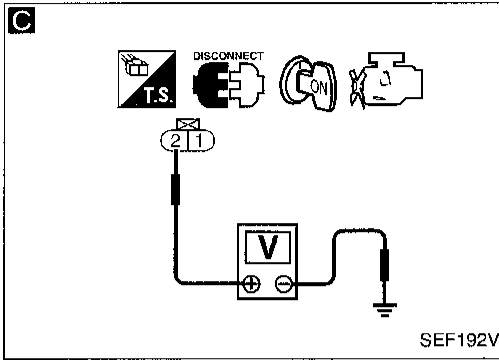
OK

CHECK INTAKE SYSTEM.
Check the intake system for air leaks.

(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



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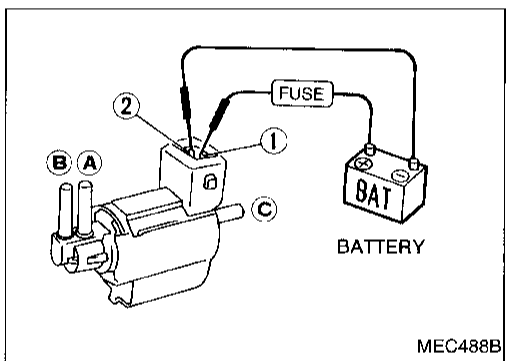
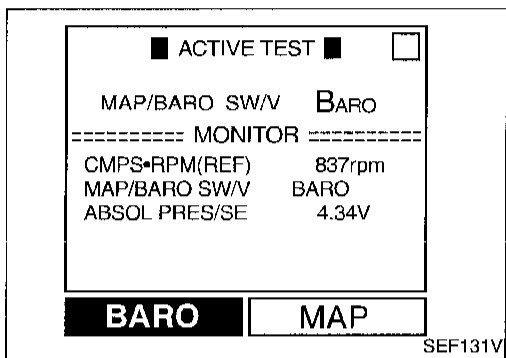
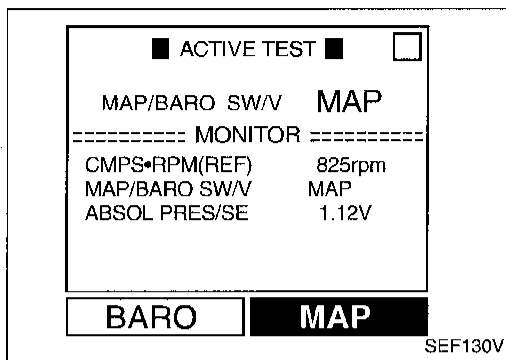
TROUBLE DIAGNOSIS FOR DTC P1105

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

COMPONENT INSPECTION

MAP/BARO switch solenoid valve

1. Start engine and warm it up to normal operating temperature.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
 - Condition: At idle under no-load
 - CONSULT display



| MAP/BARO | ABSOL PRES/SE (Voltage) |
|------------------------------|-------------------------------|
| BARO | More than 2.6V |
| MAP | Less than the voltage at BARO |
| • Time for voltage to change | |
| MAP/BARO SW/V | Required time to switch |
| BARO to MAP | Less than 1 second |
| MAP to BARO | |

4. If NG, check solenoid valve as shown below.

OR

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

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

3. If NG or operation takes more than 1 second, replace solenoid valve.

Closed Loop Control

ON BOARD DIAGNOSIS LOGIC

★ The closed loop control has the one trip detection logic.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P1148 0307 | <ul style="list-style-type: none"> The closed loop control function does not operate even when vehicle is driving in the specified condition. | <ul style="list-style-type: none"> The front heated oxygen sensor circuit is open or shorted. Front heated oxygen sensor Front heated oxygen sensor heater |

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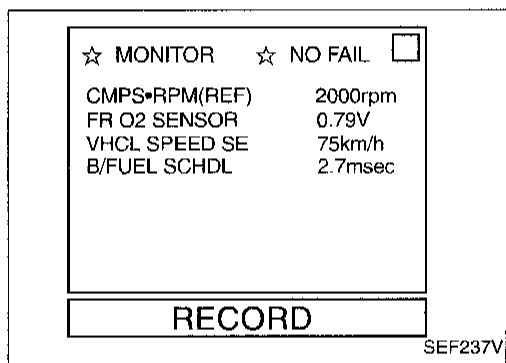
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DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Never raise engine speed above 3,000 rpm during the “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE”. If the engine speed limit is exceeded, retry the procedure from step 5).
- Before performing the following procedure, confirm that battery voltage is in between 11V and 16V at idle.



- Start engine and warm it up to normal operating temperature.
- Select “DATA MONITOR” mode with CONSULT.
- Hold engine speed at 2,000 rpm.
- While holding engine speed at 2,000 rpm, check the following.
 - “FR O2 SENSOR” voltage should go above 0.61V at least once.

OR

 - “FR O2 SENSOR” voltage should go below 0.23V at least once.

If the check result is NG, perform “DIAGNOSIS PROCEDURE”, EC-166.
If the check result is OK, perform the following step.
- Let engine idle at least 3 minutes.
- Maintain the following condition at least 50 consecutive seconds.

TROUBLE DIAGNOSIS FOR DTC P1148

Closed Loop Control (Cont'd)

B/FUEL SCHDL: 1.5 ms or more (A/T)

1.3 ms or more (M/T)

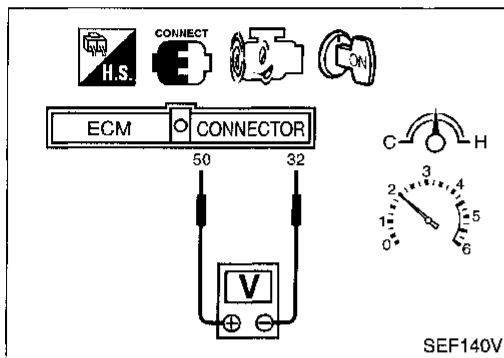
CMPS-RPM (REF): 1,500 - 3,000 rpm (A/T)

1,700 - 3,000 rpm (M/T)

Selector lever: Suitable position

VHCL SPEED SE: More than 70 km/h (43 MPH)

During this test, P0130 may be displayed on CONSULT screen.



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the closed loop control. During this check, a 1st trip DTC might not be confirmed.



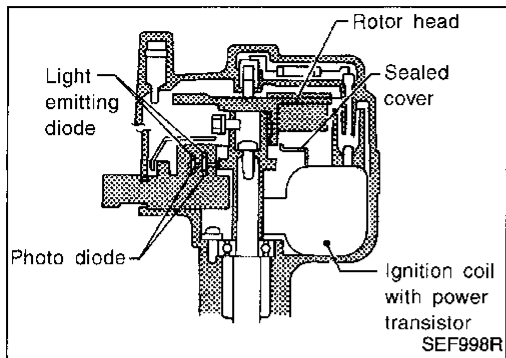
- 1) Start engine and warm it up to normal operating temperature.
 - 2) Set voltmeter probes between ECM terminal ⑤⑩ (sensor signal) and ③② (ECM ground).
 - 3) Check the following with engine speed held at 2,000 rpm constant under no load.
- The voltage should go above 0.7V at least once.

OR

- The voltage should go below 0.21V at least once.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0133, EC-166.



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor

The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|--|--------------------|
| IGNITION SW | ● Ignition switch: ON → OFF → ON | ON → OFF → ON |
| IGN TIMING | ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load | Idle |
| | | 2,000 rpm |
| | | Approx. 20° BTDC |
| | | More than 25° BTDC |

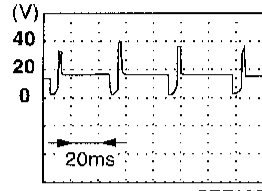
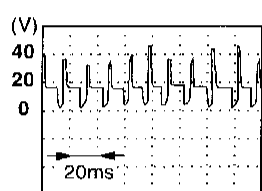
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------|--|--------------------|
| 1 | PU/W | Ignition signal | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) └ Idle speed | 0 - 0.5V |
| | | | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> └ Engine speed is 2,000 rpm. | 0.2 - 1.0V |

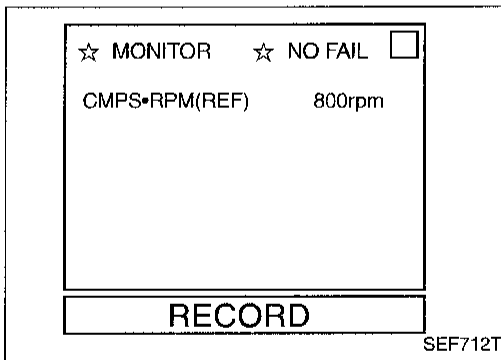
TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------|---|---|
| 2 | B | Ignition check | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> (Warm-up condition) └ Idle speed | 12 - 14V  |
| | | | <div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> └ Engine speed is 2,000 rpm. | 12 - 13V  |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P1320 0201 | <ul style="list-style-type: none"> ● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running. | <ul style="list-style-type: none"> ● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit. ● Resistor ● Camshaft position sensor ● Camshaft position sensor circuit |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.
- If both DTC P0340 (0101) and P1320 (0201) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340 first. Refer to EC-236.



- 1) Turn ignition switch “ON”.
- 2) Select “DATA MONITOR” mode with CONSULT.
- 3) Start engine. (If engine does not run, turn ignition switch to “START” for at least 5 seconds.)

OR



- 1) Turn ignition switch “ON”.
- 2) Start engine. (If engine does not run, turn ignition switch to “START” for at least 5 seconds.)
- 3) Select MODE 7 with GST.

TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)



- OR
- 1) Turn ignition switch "ON".
 - 2) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
 - 3) Turn ignition switch "OFF" and wait at least 5 seconds, then turn "ON".
 - 4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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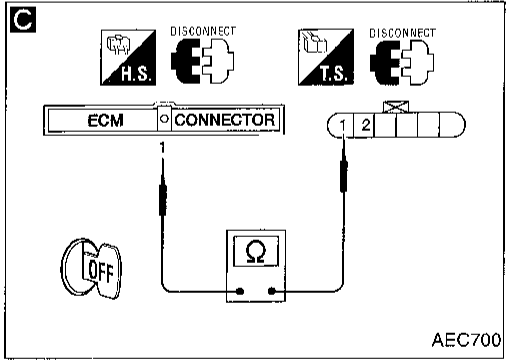
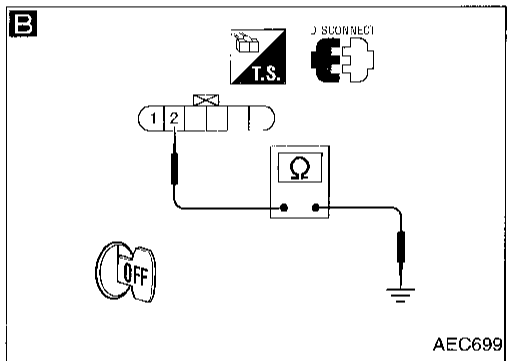
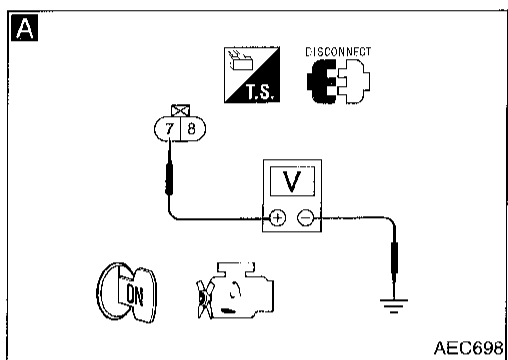
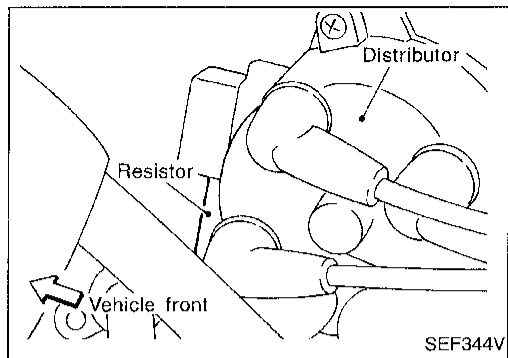
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Ignition Signal (Cont'd)
DIAGNOSTIC PROCEDURE



INSPECTION START

Turn ignition switch "OFF", and restart engine.
Is engine running?

Yes → **A** (Go to next page.)

No

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect ignition coil harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ⑦ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.

- Harness connectors **E43**, **M65**
- Harness connectors **M59**, **F27**
- Harness for open or short between ignition coil and ignition switch

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect power transistor harness connector.
3. Check harness continuity between terminal ② and engine ground.
Continuity should exist.

If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

C

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ① and power transistor terminal ①.
Continuity should exist.

If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-320.

NG → Replace malfunctioning component(s).

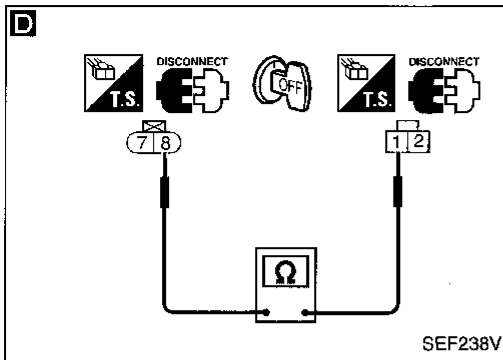
OK

A
(Go to next page.)

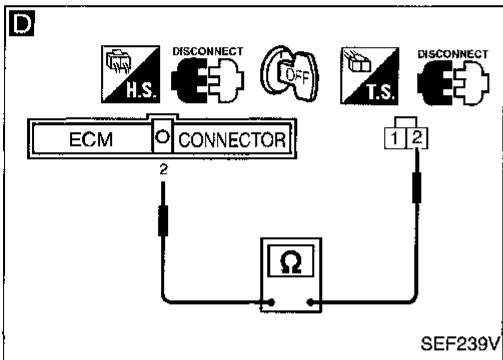
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TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont'd)



SEF238V



SEF239V

D

CHECK INPUT SIGNAL CIRCUIT.

1. Stop engine.
2. Disconnect ignition coil harness connector.
3. Strip tape covering resistor and condenser.
4. Disconnect resistor harness connector.
5. Disconnect ECM harness connector.
6. Check harness continuity between ignition coil terminal ⑧ and resistor terminal ①, resistor terminal ② and ECM terminal ②.

Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

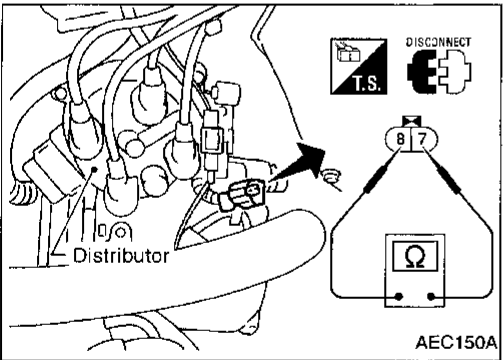
CHECK COMPONENTS (Resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace resistor.

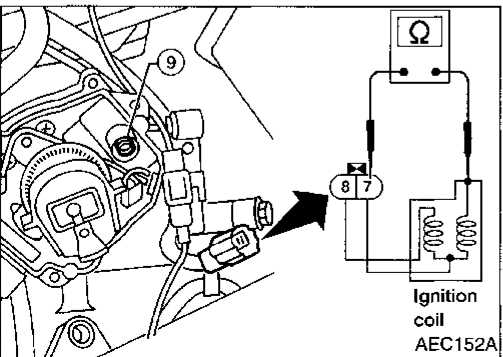
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END



AEC150A



AEC152A

COMPONENT INSPECTION

Ignition coil

1. Disconnect ignition coil harness connector.
2. Remove distributor cap.
3. Check resistance as shown in the figure.

| Terminal | Resistance [at 25°C (77°F)] |
|----------|-----------------------------|
| ⑦ - ⑧ | Less than 1Ω |
| ⑦ - ⑨ | 7 - 13 kΩ |

If NG, replace distributor assembly as a unit.

TROUBLE DIAGNOSIS FOR DTC P1320

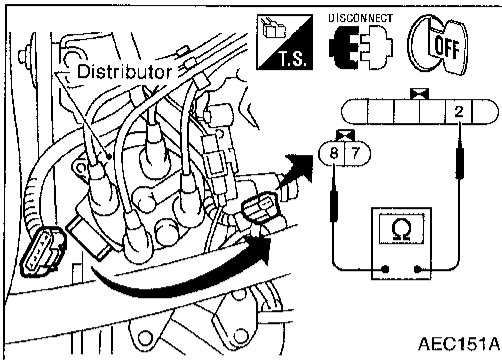
Ignition Signal (Cont'd)

Power transistor

1. Disconnect camshaft position sensor & power transistor harness connector and ignition coil harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

| Terminals | Resistance | Result |
|-----------|------------|--------|
| ② and ⑧ | Except 0Ω | OK |
| | 0Ω | NG |

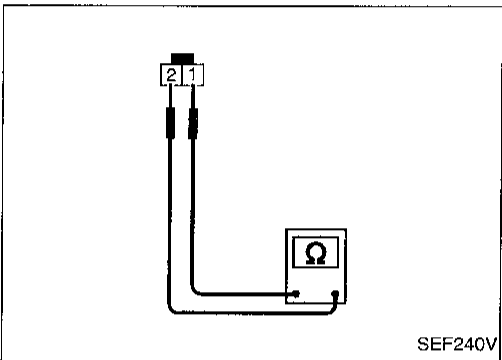
If NG, replace distributor assembly.



AEC151A

Resistor

1. Disconnect resistor harness connector.
2. Check resistance between terminals ① and ②.
Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]
 If NG, replace resistor.



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Crankshaft Position Sensor (CKPS) (OBD) (COG)

COMPONENT DESCRIPTION

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet, core and coil.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

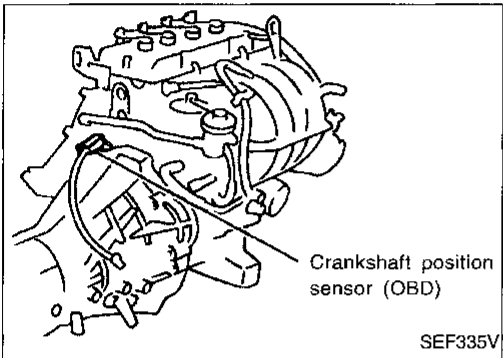
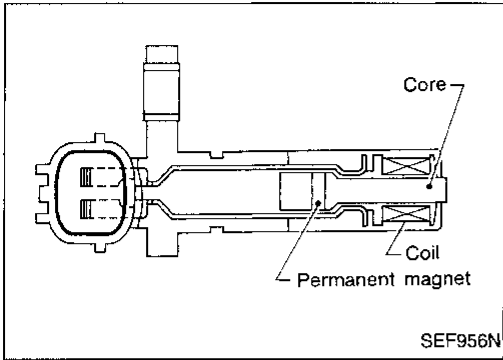
The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

This sensor is not directly used to control the engine system.

It is used only for the on board diagnosis.



ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓢ (ECM ground).

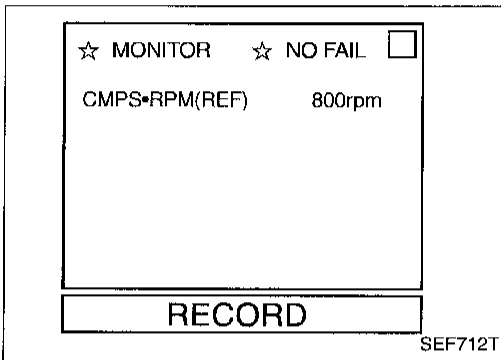
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------------|--|----------------------|
| 43 | B/W | Sensors' ground | Engine is running. └ Idle speed | Approximately 0V |
| 47 | L | Crankshaft position sensor (OBD) | Engine is running. (Warm-up condition) └ Idle speed | Approximately 0V |
| | | | Engine is running. └ Engine speed is 2,000 rpm. | Approximately 0V |

TROUBLE DIAGNOSIS FOR DTC P1336

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P1336 0905 | <ul style="list-style-type: none"> ● A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM. | <ul style="list-style-type: none"> ● Harness or connectors ● Crankshaft position sensor (OBD) ● Drive plate/Flywheel |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for at least 2 minutes at idle speed.

OR



- 1) Start engine and run it for at least 2 minutes at idle speed.
- 2) Select "MODE 7" with GST.

OR



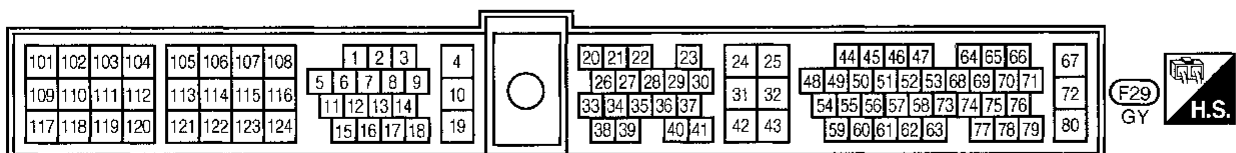
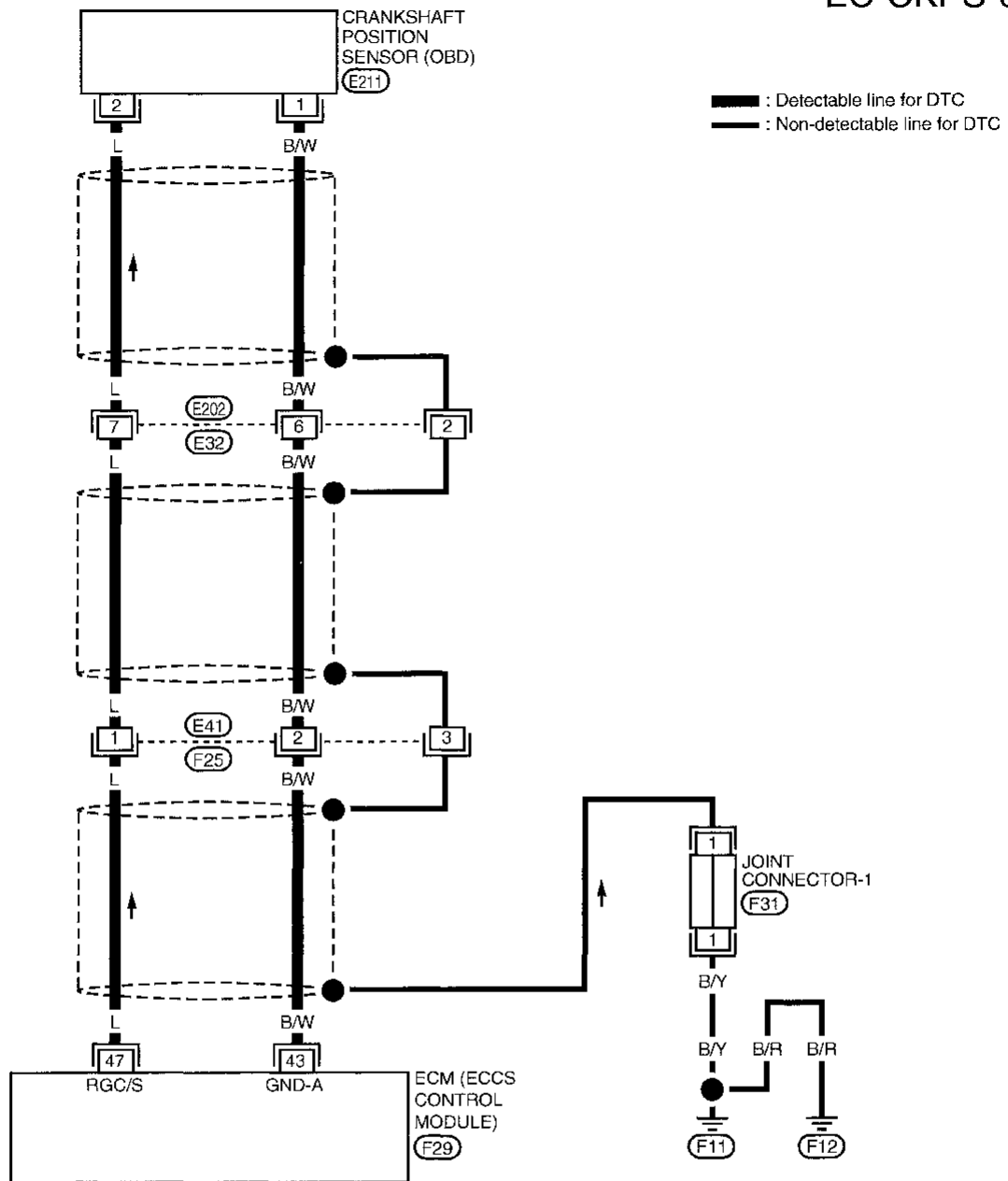
- 1) Start engine and run it for at least 2 minutes at idle speed.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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TROUBLE DIAGNOSIS FOR DTC P1336

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

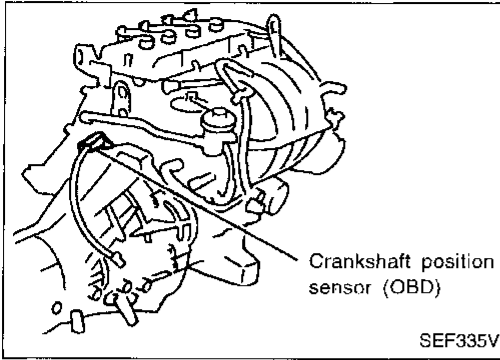
EC-CKPS-01



TROUBLE DIAGNOSIS FOR DTC P1336

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.

A

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.
2. Check continuity between ECM terminal (47) and terminal (2).

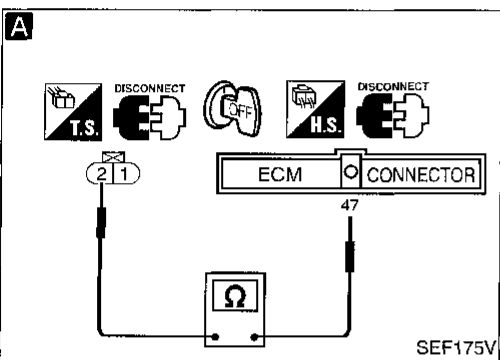
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (E202), (E32)
- Harness connectors (E41), (F25)
- Harness for open or short between ECM and crankshaft position sensor (OBD)

If NG, repair open circuit or short to ground or short to power in harness or connectors.



OK

B

CHECK GROUND CIRCUIT.

1. Reconnect ECM harness connector.
2. Check harness continuity between terminal (1) and engine ground.

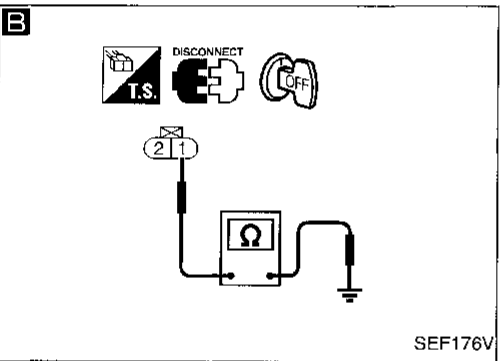
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (E202), (E32)
- Harness connectors (E41), (F25)
- Harness for open or short between crankshaft position sensor (OBD) and ECM

If NG, repair open circuit or short to ground or short to power in harness or connectors.



OK

Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.

Trouble is not fixed.

CHECK COMPONENT
[Crankshaft position sensor (OBD)]. Refer to "COMPONENT INSPECTION" on next page.

NG

Replace crankshaft position sensor (OBD).

OK

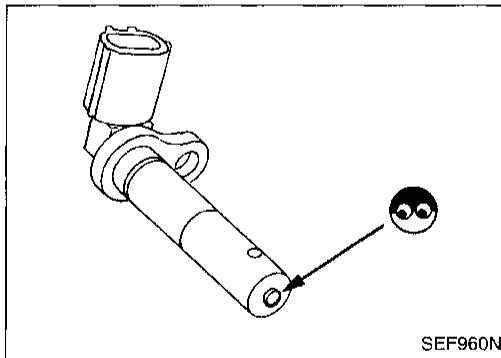
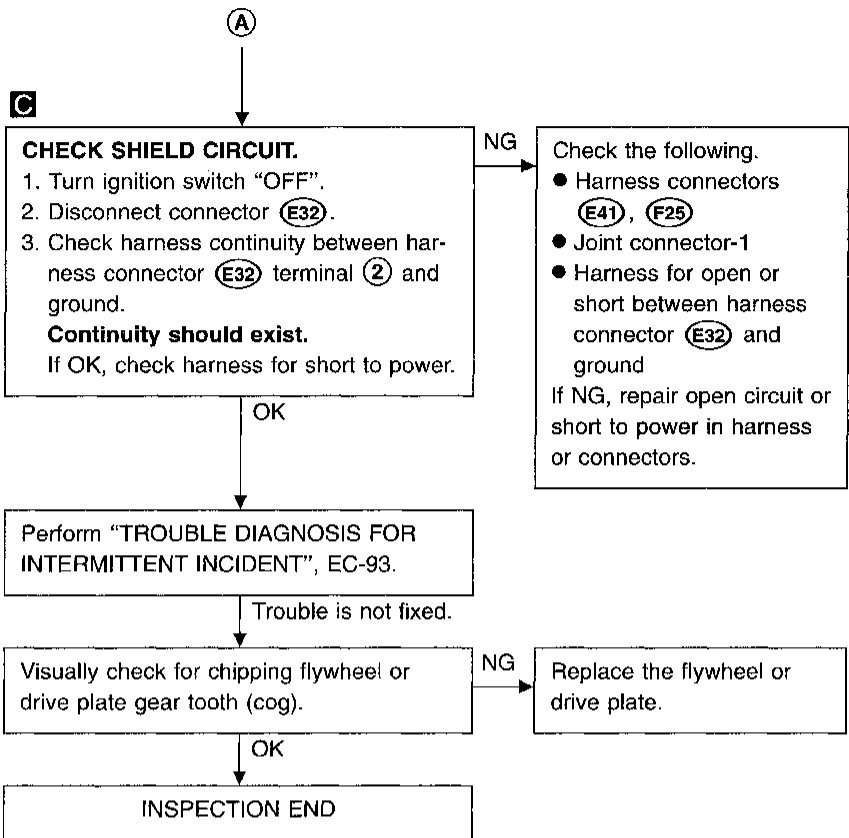
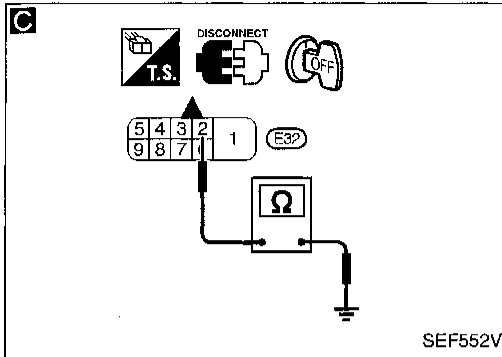
A

(Go to next page.)

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TROUBLE DIAGNOSIS FOR DTC P1336

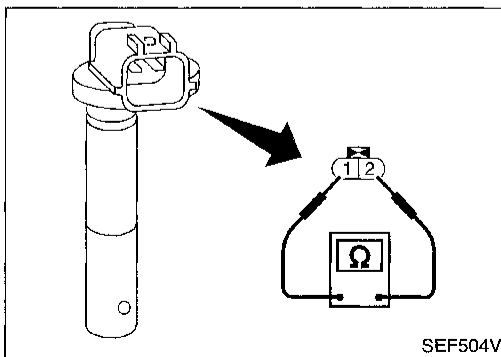
Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)



COMPONENT INSPECTION

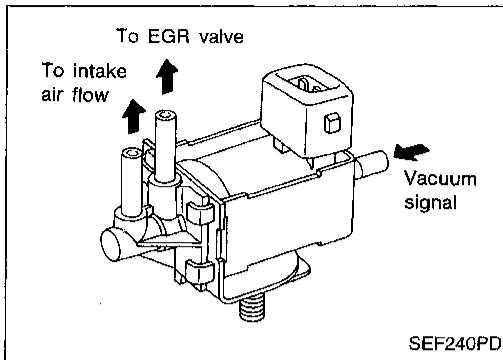
Crankshaft position sensor (OBD)

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.
Resistance: Approximately 166.5 - 203.5Ω
[at 20°C (68°F)]

TROUBLE DIAGNOSIS FOR DTC P1400



EGRC-Solenoid Valve

COMPONENT DESCRIPTION

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve. When the ECM sends an ON signal, a plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|---|---------------|
| EGRC SOL/V | <ul style="list-style-type: none"> ● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load Idle | ON |
| | Engine speed: Revving engine from idle to 3,000 rpm quickly | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------|---|----------------------------|
| 103 | G/W | EGRC-solenoid valve | Engine is running. (Warm-up condition) └ Idle speed | 0 - 1V |
| | | | Engine is running. (Warm-up condition) └ Revving engine from idle to 3,000 rpm quickly | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P1400 1005 | <ul style="list-style-type: none"> ● The improper voltage signal is sent to ECM through EGRC-solenoid valve. | <ul style="list-style-type: none"> ● Harness or connectors (The EGRC-solenoid valve circuit is open or shorted.) ● EGRC-solenoid valve |

TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-Solenoid Valve (Cont'd)

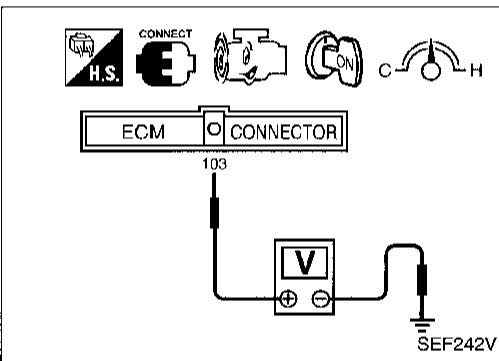
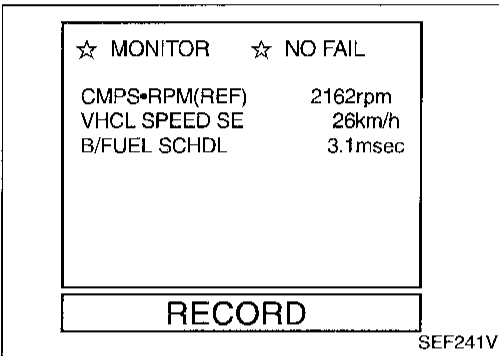
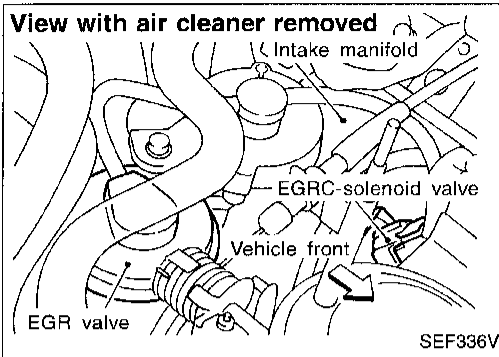
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Maintain the following conditions for at least 5 consecutive seconds.

CMPS-RPM (REF): 1,000 - 3,400 rpm

B/FUEL SCHDL: 2 ms or more

VHCL SPEED SE: Suitable speed

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGR temperature sensor. During this check, a 1st trip DTC might not be confirmed.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Check the voltage between ECM terminal (103) and ground at idle.

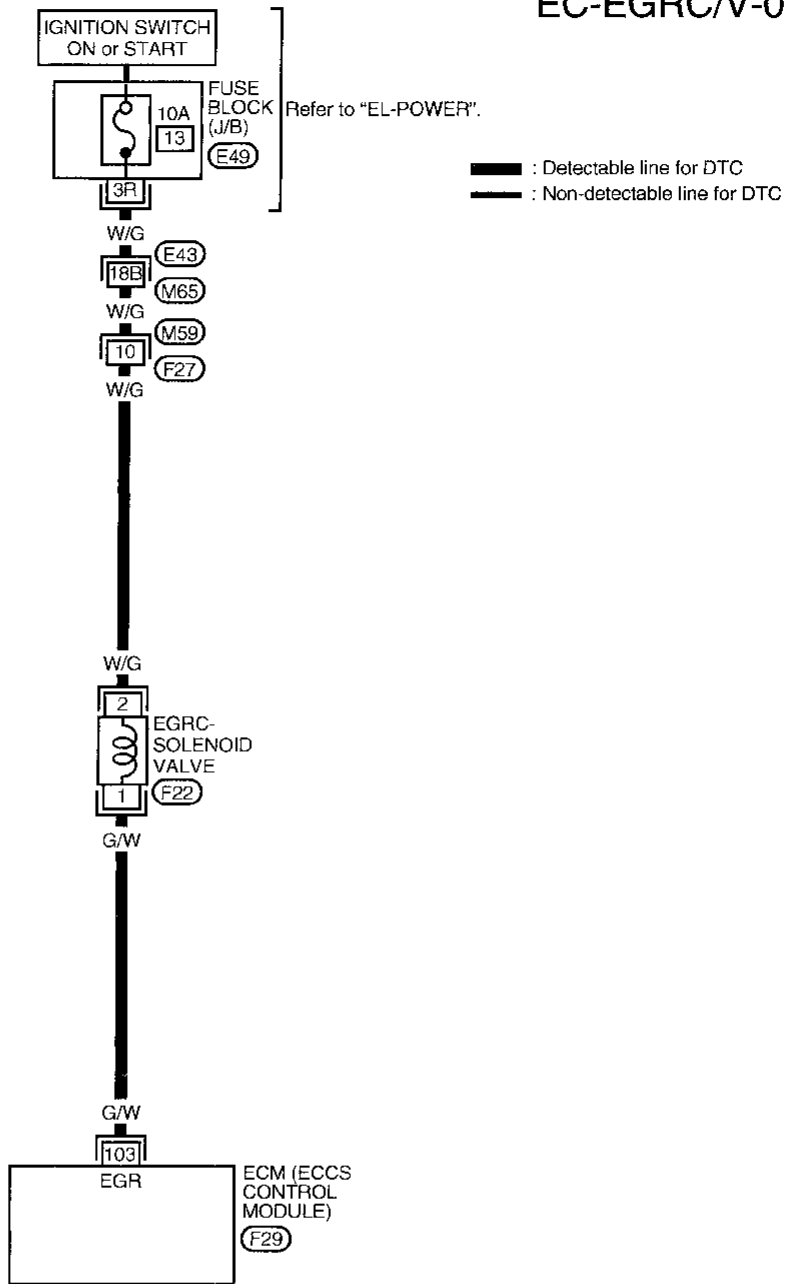
Voltage: 0 - 1V

- 3) Check that the voltage changes to battery voltage and returns to 0 - 1V when revving the engine from idle to 3,000 rpm quickly.

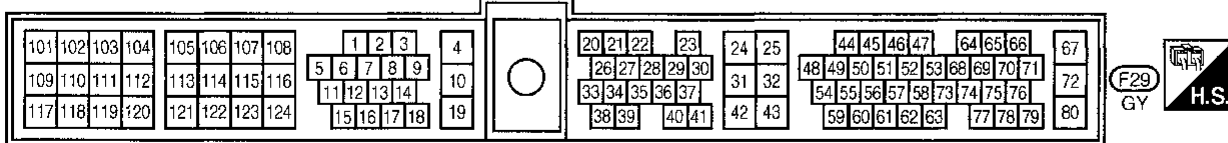
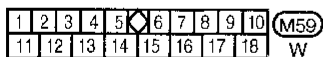
TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-Solenoid Valve (Cont'd)

EC-EGRC/V-01



Refer to last page (Foldout page).

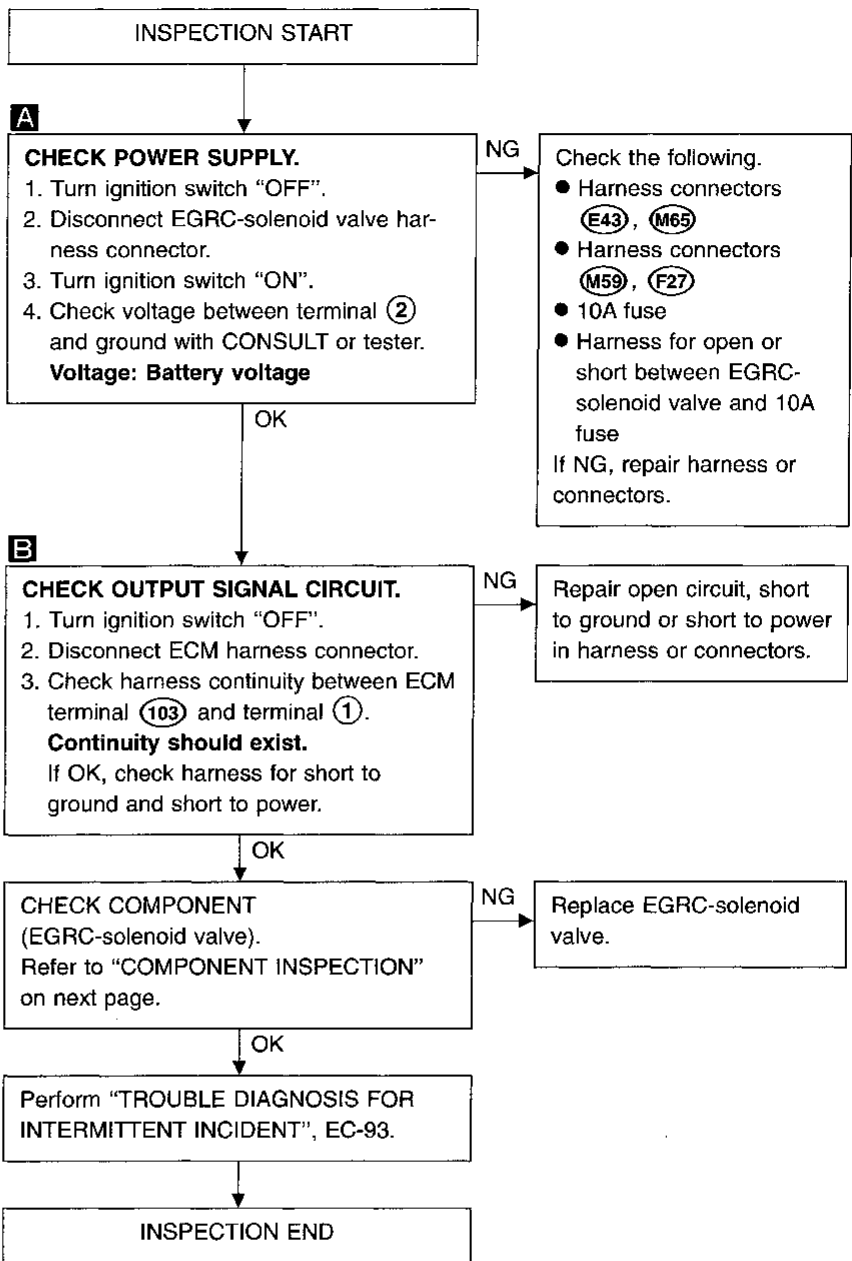
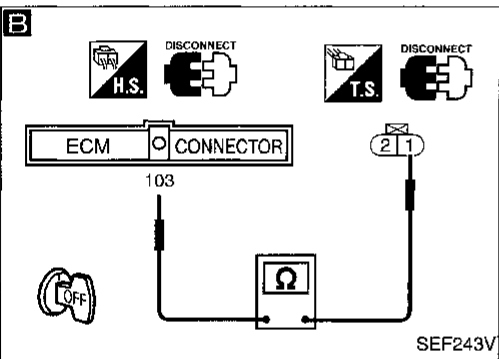
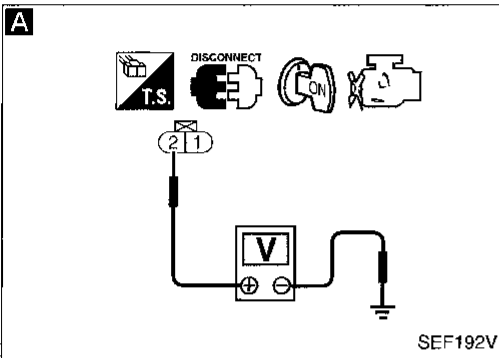
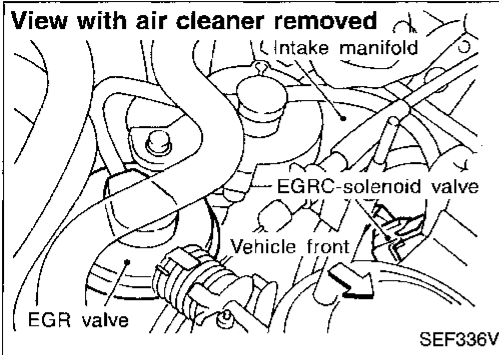


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TROUBLE DIAGNOSIS FOR DTC P1400

EGRC-Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P1400

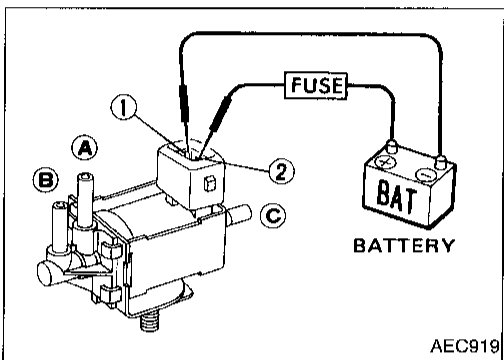
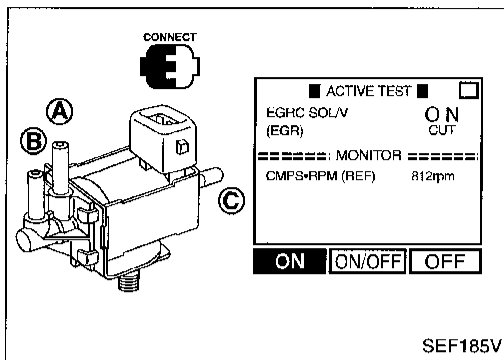
EGRC-Solenoid Valve (Cont'd)

COMPONENT INSPECTION

EGRC-solenoid valve

Check air passage continuity.

 Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.



| Condition EGRC SOLENOID VALVE | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|----------------------------------|---|---|
| ON | Yes | No |
| OFF | No | Yes |

OR



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

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.

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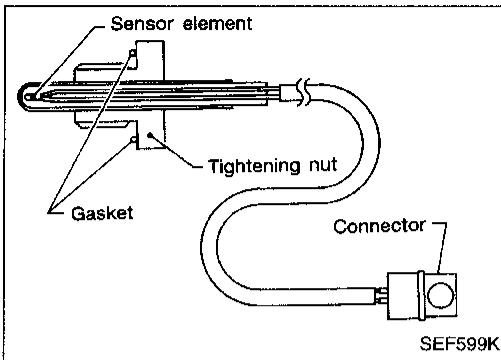
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EGR Temperature Sensor

COMPONENT DESCRIPTION

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.

It is used only for the on board diagnosis.

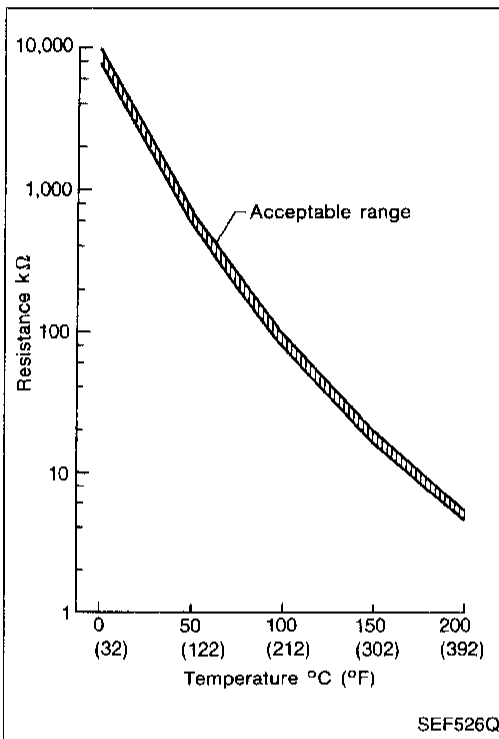
<Reference data>

| EGR temperature °C (°F) | Voltage* V | Resistance MΩ |
|----------------------------|---------------|------------------|
| 0 (32) | 4.81 | 7.9 - 9.7 |
| 50 (122) | 2.82 | 0.57 - 0.70 |
| 100 (212) | 0.8 | 0.08 - 0.10 |

*: These data are reference values and are measured between ECM terminal ⑥③ (EGR temperature sensor) and ECM terminal ③② (ECM ground).

When EGR system is operating.

Voltage: 0 - 1.5V



ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P1401 0305 | A) An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low. | <ul style="list-style-type: none"> ● Harness or connectors (The EGR temperature sensor circuit is shorted.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve |
| | B) An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high. | <ul style="list-style-type: none"> ● Harness or connectors (The EGR temperature sensor circuit is open.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve |

TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If DTC cannot be confirmed, perform "Procedure for malfunction B".

Procedure for malfunction A

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Verify that engine coolant temperature is less than 40°C (104°F).

If the engine coolant temperature is above the range, cool the engine down.

- 4) Start engine and let it idle for at least 8 seconds.

OR

- 1) Turn ignition switch "ON".
- 2) Select "MODE 1" with GST.
- 3) Verify that engine coolant temperature is less than 40°C (104°F).

If the engine coolant temperature is above the range, cool the engine down.

- 4) Start engine and let it idle for at least 8 seconds.

- 5) Select "MODE 7" with GST.

OR

- 1) Turn ignition switch "ON".
- 2) Verify that voltage between ECM terminal 59 (engine coolant temperature) and ground is more 1.5V.

If the voltage is below the range, cool the engine down.

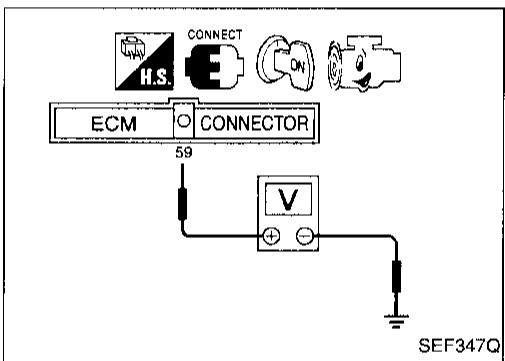
- 3) Start engine and let it idle for at least 8 seconds.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



NO TOOLS

| | | |
|---------------|-----------|--------------------------|
| ★ MONITOR | ★ NO FAIL | <input type="checkbox"/> |
| CMPS•RPM(REF) | 812rpm | |
| COOLAN TEMP/S | 20°C | |

SEF244V



Procedure for malfunction B

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Always perform the test at a temperature of 5°C (41°F) or higher.

- 1) Start engine and warm it up to normal operating temperature.
- 2) Run engine at idle for at least 2 minutes.
- 3) Confirm that EGR valve is not lifting.
If the check result is NG, go to "TROUBLE DIAGNOSES FOR DTC P1402". (See page EC-338.)
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Read "EGR TEMP SEN" at about 1,500 rpm while holding the EGR valve in full open position by hand.
Voltage should decrease to less than 1.0V.

| | | |
|----------------|-----------|--------------------------|
| ★ MONITOR | ★ NO FAIL | <input type="checkbox"/> |
| CMPS•RPM(REF) | 1500rpm | |
| COOLAN TEMP/S | 85°C | |
| VHCL SPEED SEN | 0km/h | |
| THRTL POS SEN | 1.68V | |
| B/FUEL SCHDL | 1.0msec | |

SEF336U

EGR Temperature Sensor (Cont'd)

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-336.

If the check result is OK, go to following step.

- 6) Turn ignition switch "OFF" and wait at least 5 seconds.
- 7) Turn ignition switch "ON".
- 8) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
- 9) Start engine.
- 10) Maintain the following conditions for at least 5 consecutive seconds.

CMPS-RPM (REF): 2,000 - 2,600 rpm

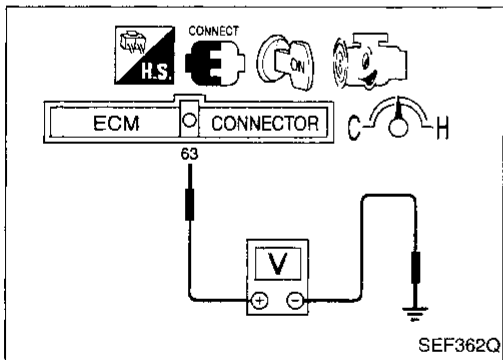
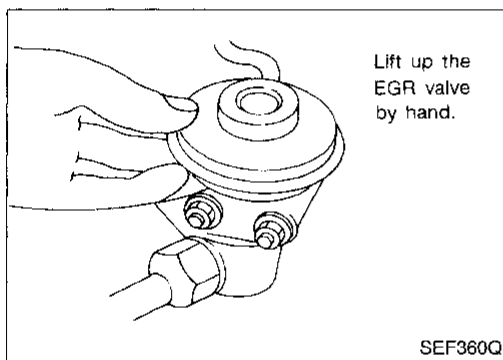
VHCL SPEED SE: Suitable speed

B/FUEL SCHDL: 2.5 - 3.5 ms

THRTL POS SEN: $(X + 0.10) - (X + 0.52)$ V

X = Voltage value measured at step 8)

Selector lever: Suitable position



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGR temperature sensor. During this check, a 1st trip DTC might not be confirmed.

Procedure for malfunction B

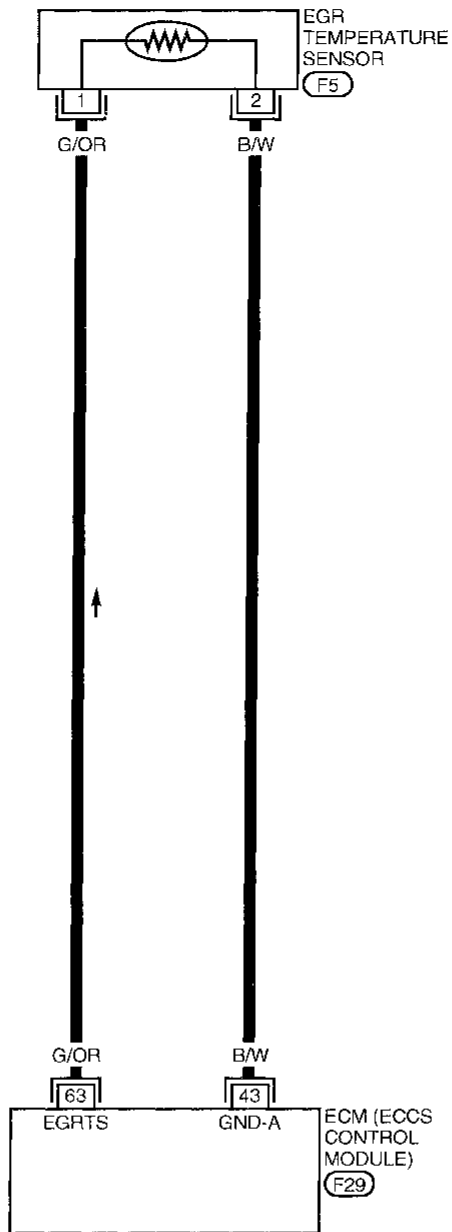


- 1) Start engine and warm it up to normal operating temperature.
- 2) Run engine at idle for at least 2 minutes.
- 3) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P1402 (See page EC-338).
- 4) Check voltage between ECM terminal 63 (EGR temperature sensor) and ground at about 1,500 rpm with EGR valve lifted up to the full position by hand.
Voltage should decrease to less than 1.0V.
- 5) If step 4 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400 and P1400 (See pages EC-242 and 327).

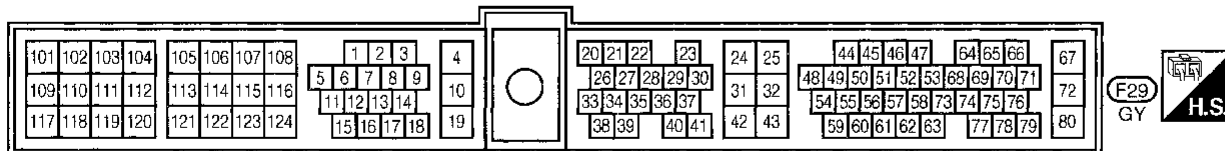
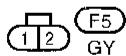
TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01



: Detectable line for DTC
 : Non-detectable line for DTC



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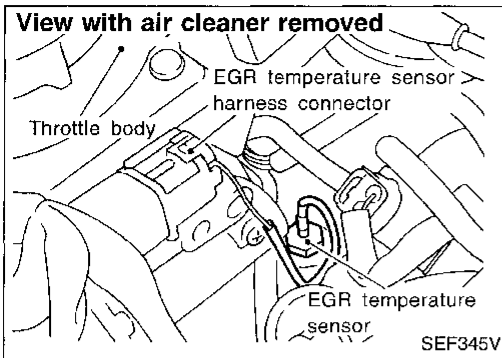
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TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Disconnect EGR temperature sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ② and engine ground.

Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

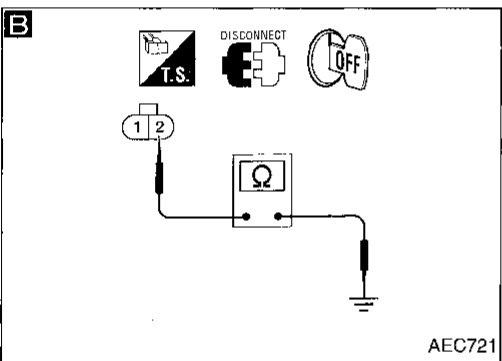
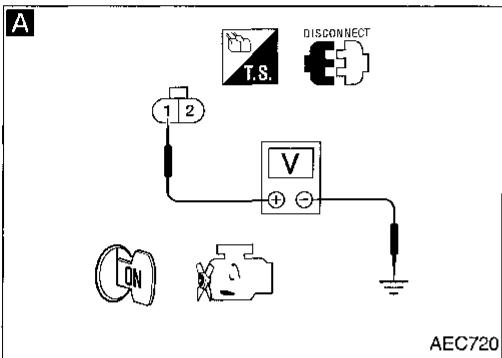
CHECK COMPONENT
(EGR temperature sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR temperature sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END



TROUBLE DIAGNOSIS FOR DTC P1401

EGR Temperature Sensor (Cont'd)

COMPONENT INSPECTION

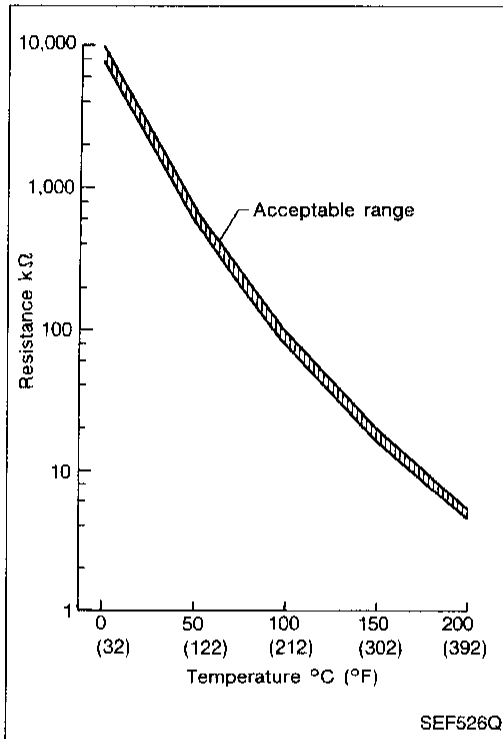
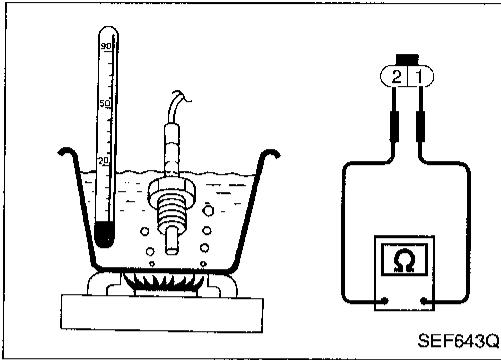
EGR temperature sensor

Check resistance change and resistance value.

<Reference data>

| EGR temperature °C (°F) | Voltage V | Resistance MΩ |
|----------------------------|--------------|------------------|
| 0 (32) | 4.81 | 7.9 - 9.7 |
| 50 (122) | 2.82 | 0.57 - 0.70 |
| 100 (212) | 0.8 | 0.08 - 0.10 |

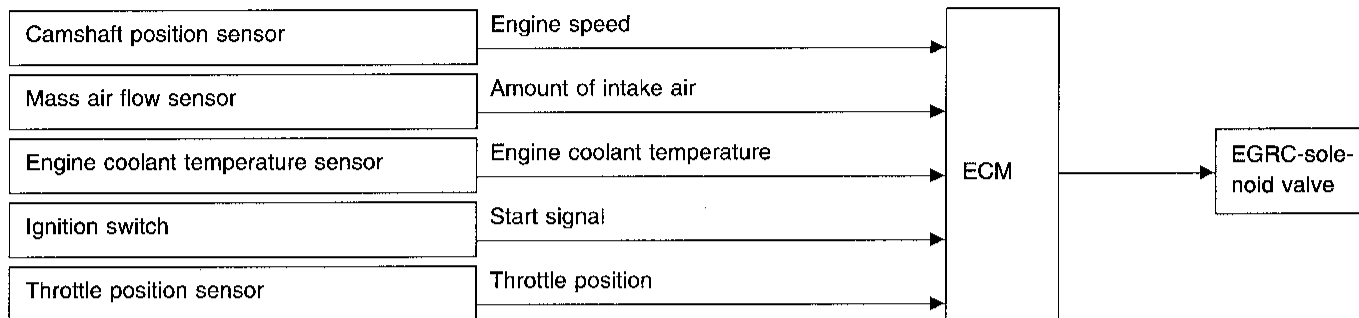
If NG, replace EGR temperature sensor.



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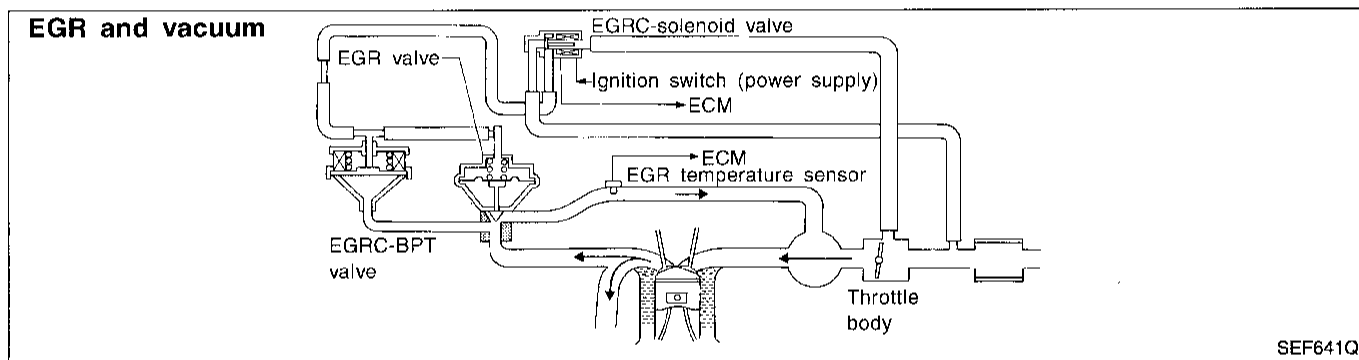
EGR Function (Open)

SYSTEM DESCRIPTION

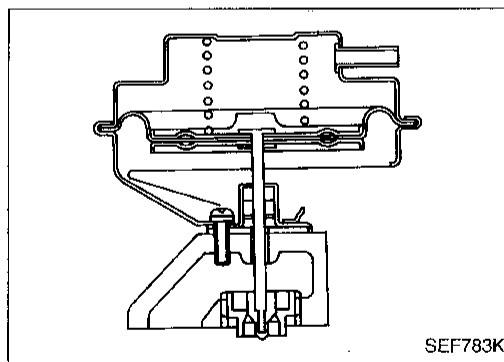


This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-solenoid valve. When the ECM detects any of the following conditions, current flows through the solenoid valve. This causes the port vacuum to be cut. The EGR valve remains closed.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction



SEF641Q

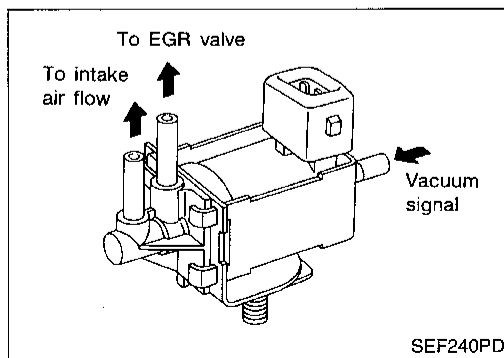


SEF783K

COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.



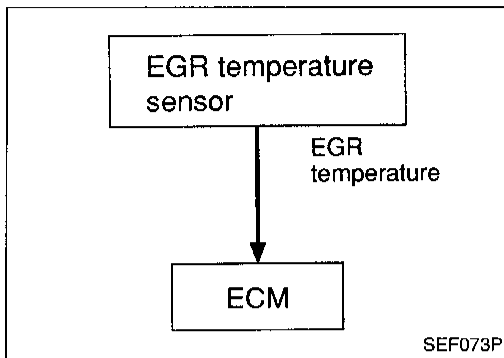
SEF240PD

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal passes through the solenoid valve. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve). When the ECM sends an OFF signal, a plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd) ON BOARD DIAGNOSIS LOGIC



If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

| Diagnostic Trouble Code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P1402 0514 | <ul style="list-style-type: none"> The exhaust gas recirculation (EGR) flow is excessively high during the specified driving condition. | <ul style="list-style-type: none"> EGRC-solenoid valve EGR valve leaking or stuck open EGR temperature sensor EGRC-BPT valve |

☆ MONITOR ☆ NO FAIL

COOLAN TEMP/S 30°C
EGR TEMP SEN 4.2V

RECORD

SEF347U

■ EGR SYSTEM P1402 ■

OUT OF CONDITION

===== MONITOR =====

CMPS-RPM(REF) 0rpm
THRTL POS SEN 0.56V
B/FUEL SCHDL 0.0msec

SEF245V

■ EGR SYSTEM P1402 ■

TESTING

===== MONITOR =====

CMPS-RPM(REF) 987rpm
THRTL POS SEN 0.56V
B/FUEL SCHDL 1.1msec

SEF246V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Always perform the test at a temperature of -10°C (14°F) or higher.
- Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.
COOLAN TEMP/S: -10 to 40°C (14 to 104°F)
EGR TEMP SEN: Less than 4.8V

If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant temperature or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

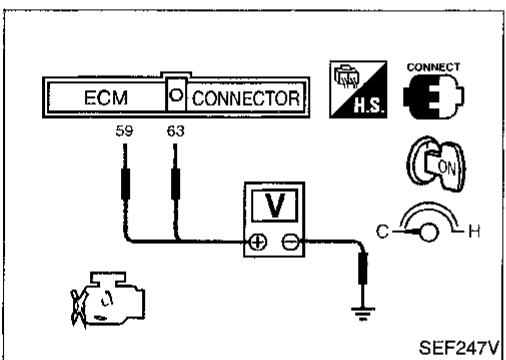
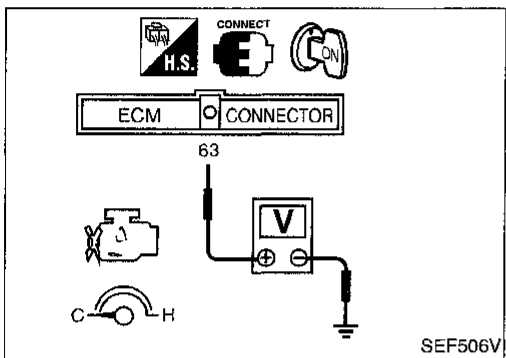
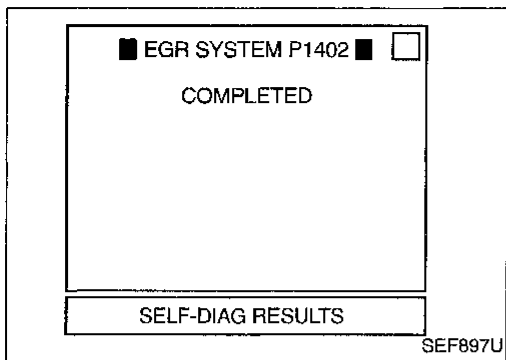


- Turn ignition switch "ON".
- Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- Start engine and let it idle until "TESTING" on CONSULT screen is turned to "COMPLETED". (It will take 60 seconds or more.)

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TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)



If "TESTING" is not displayed after 5 minutes, turn ignition "OFF" and cool the engine coolant temperature to the range of -10 to 40°C (14 to 104°F). Retry from step 1).

5) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-342.

OR



- 1) Turn ignition switch "ON" and select "MODE 1" with GST.
- 2) Check that engine coolant temperature is within the range of -10 to 40°C (14 to 104°F).
- 3) Check that voltage between ECM terminal 63 (EGR temperature) and ground is less than 4.8V.
- 4) Start engine and let it idle for at least 60 seconds.
- 5) Stop engine.
- 6) Perform from step 1) to 4).
- 7) Select "MODE 3" with GST.

OR



- 1) Turn ignition switch "ON".
- 2) Check the following voltages.
ECM terminal 59 (engine coolant temperature) and ground:

1.5 - 4.4V

ECM terminal 63 (EGR temperature) and ground:
Less than 4.8V

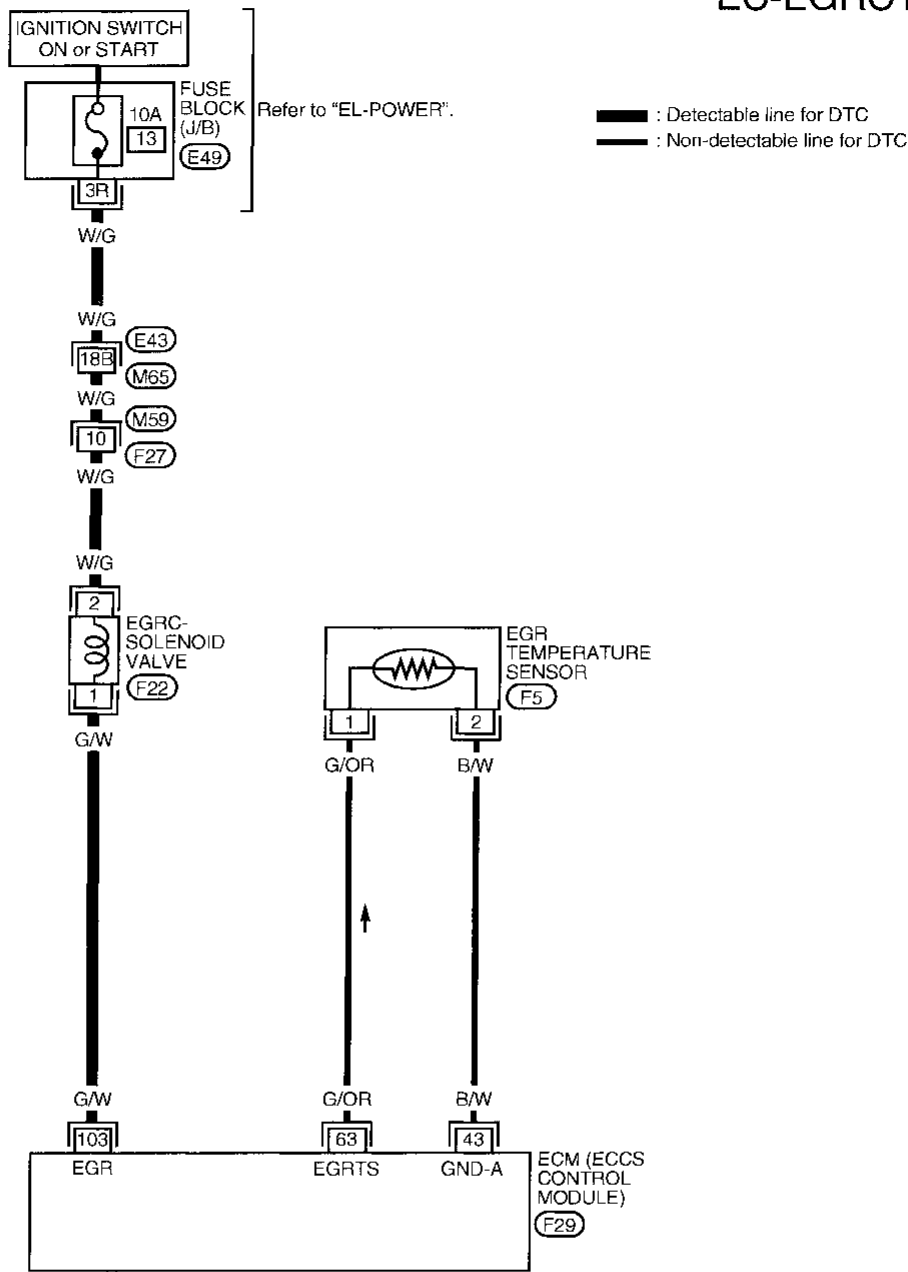
- 3) Start engine and let it idle for at least 60 seconds.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

- When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.

TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

EC-EGRC1-01



Refer to last page (Foldout page).

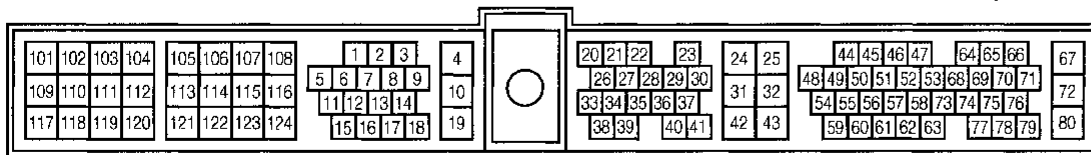
| | | | | | | | | | | |
|----|----|----|----|----|----|----|----|---|----|-------|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | (M59) |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | | | W |

| | | | | | | | |
|----|----|----|----|-----|-------|-----|---|
| 1R | 2R | 3R | 4R | 5R | (E49) | | |
| 6R | 7R | 8R | 9R | 10R | 11R | 12R | W |

| | | |
|---|---|------|
| 1 | 2 | (F5) |
| | | GY |

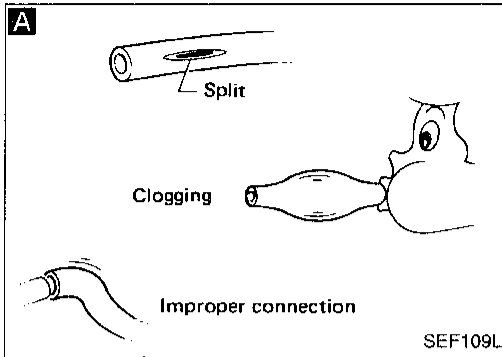
| | | |
|---|---|-------|
| 2 | 1 | (F22) |
| | | G |

(M65), (E43)

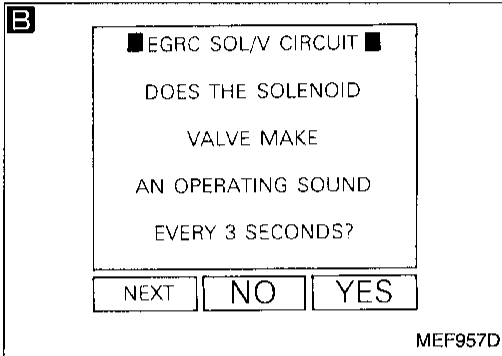


EGR Function (Open) (Cont'd)

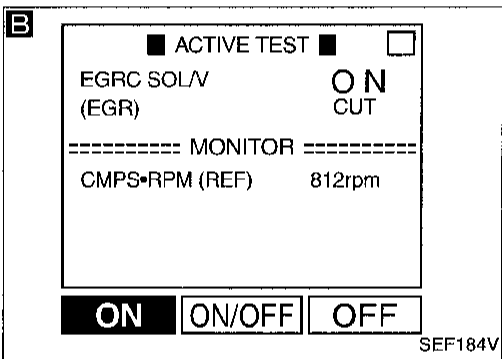
DIAGNOSTIC PROCEDURE



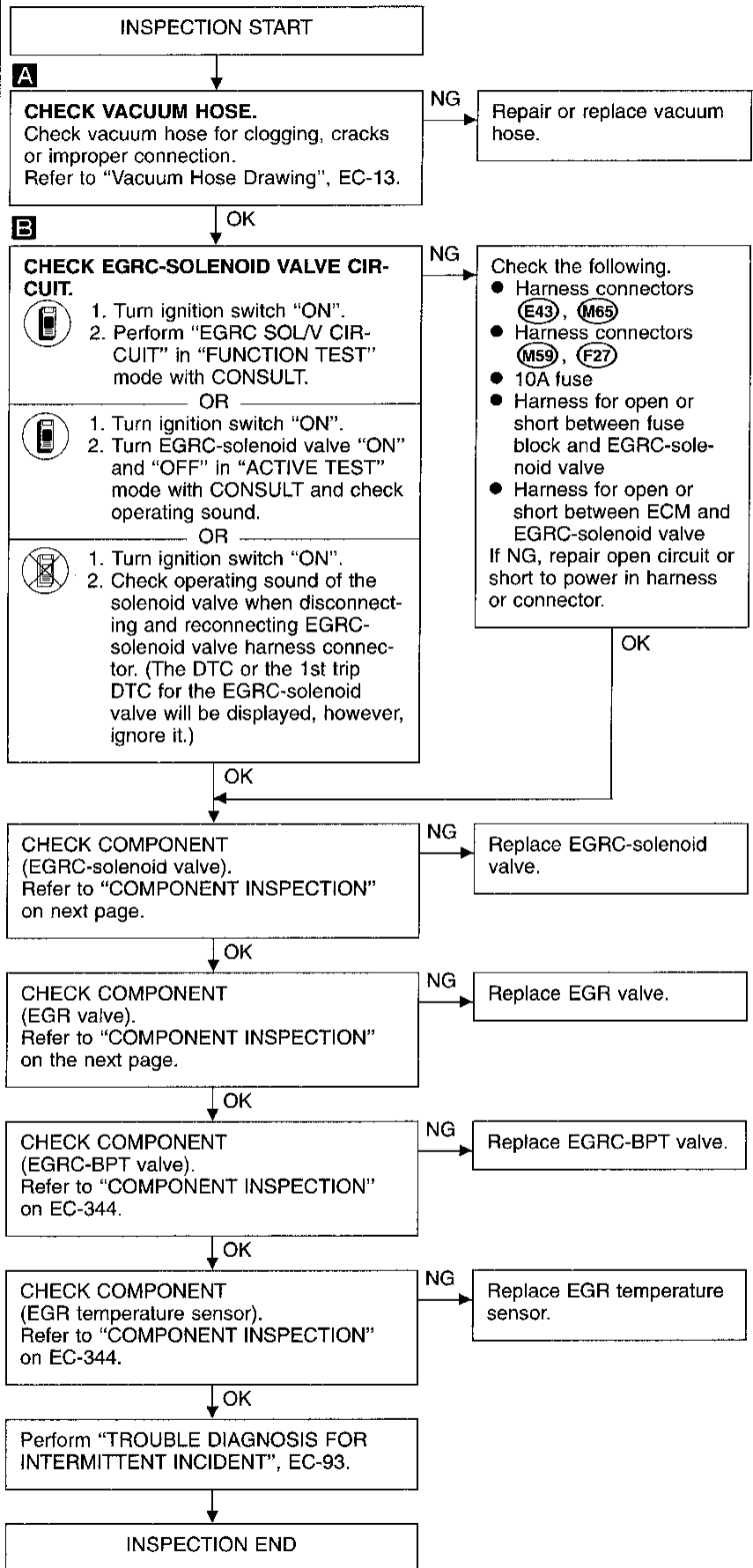
SEF109L



MEF957D



SEF184V



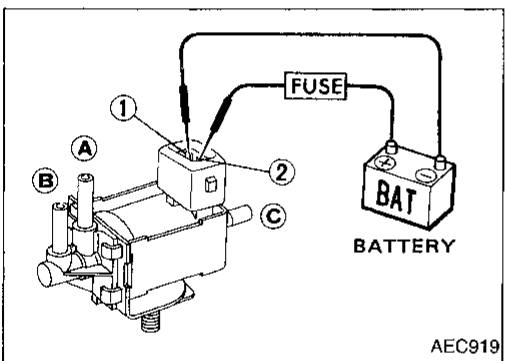
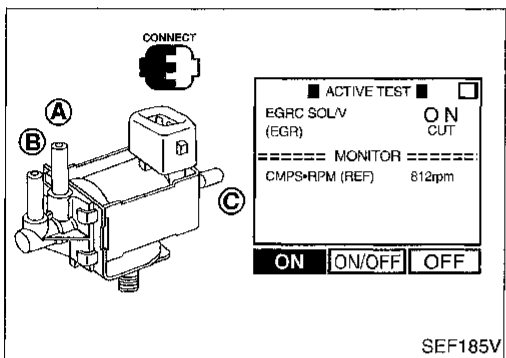
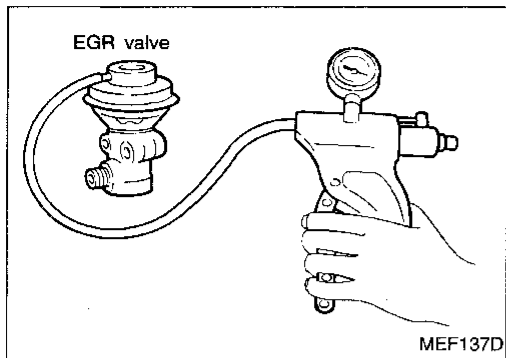
TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

COMPONENT INSPECTION

EGR valve

- Apply vacuum to EGR vacuum port with a hand vacuum pump. **EGR valve spring should lift.**
 - Check for sticking
- If NG, repair or replace EGR valve.



EGRC-solenoid valve

Check air passage continuity.

- Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

| Condition EGRC SOLENOID VALVE | Air passage continuity between (A) and (B) | Air passage continuity between (A) and (C) |
|----------------------------------|---|---|
| ON | Yes | No |
| OFF | No | Yes |

OR

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

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.

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TROUBLE DIAGNOSIS FOR DTC P1402

EGR Function (Open) (Cont'd)

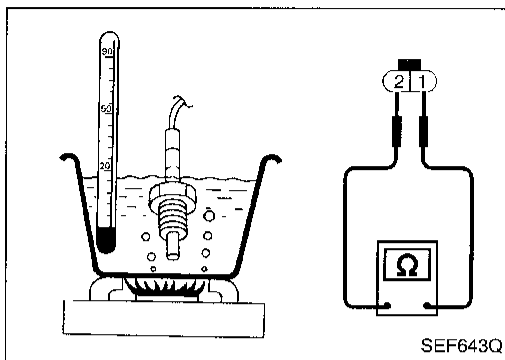
EGR temperature sensor

Check resistance change and resistance value.

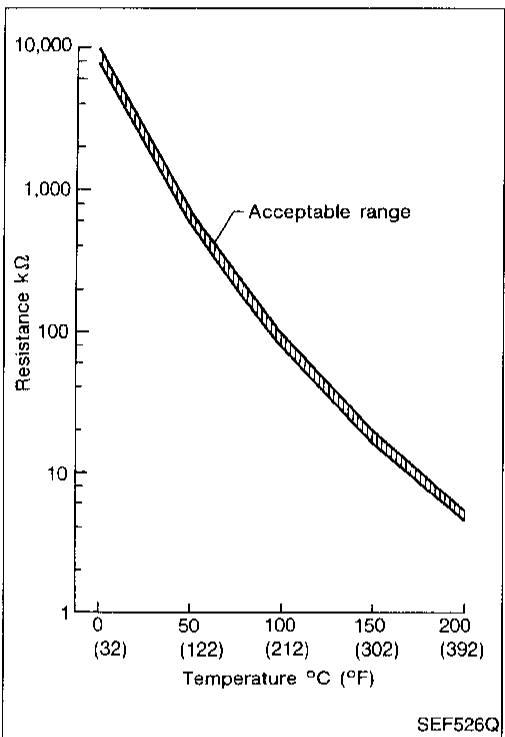
<Reference data>

| EGR temperature °C (°F) | Voltage V | Resistance MΩ |
|----------------------------|--------------|------------------|
| 0 (32) | 4.81 | 7.9 - 9.7 |
| 50 (122) | 2.82 | 0.57 - 0.70 |
| 100 (212) | 0.8 | 0.08 - 0.10 |

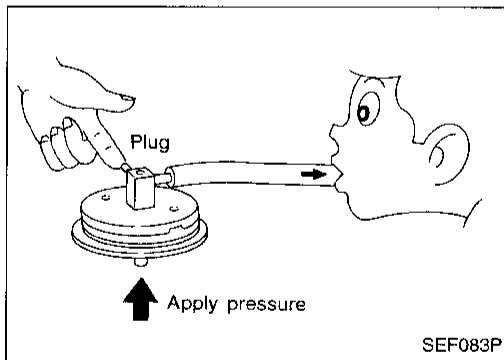
If NG, replace EGR temperature sensor.



SEF643Q



SEF526Q



SEF083P

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH₂O, 3.94 inH₂O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

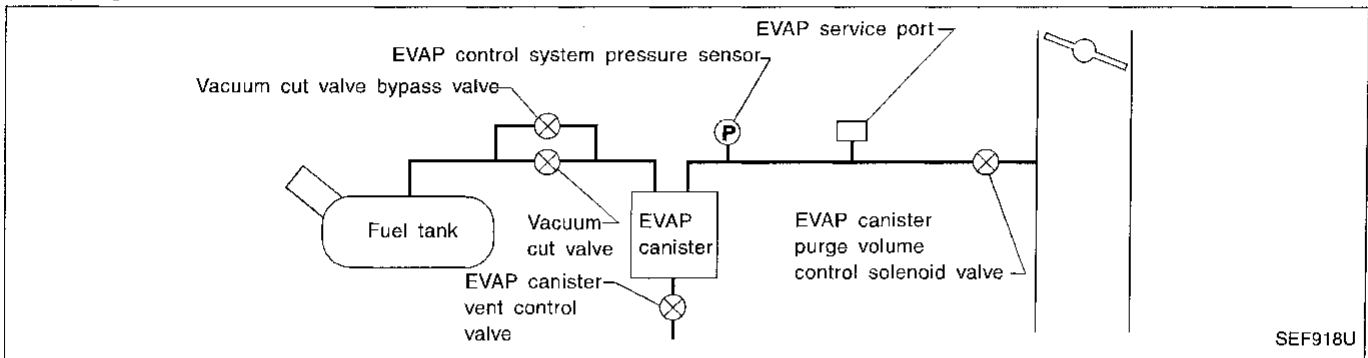
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure)

Note: If both DTC P1440 and P1448 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-373.)

ON BOARD DIAGNOSIS LOGIC

This diagnosis detects leaks in the EVAP purge line using vapor pressure in the fuel tank. The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank.

If pressure increases, the ECM will check for leaks in the line between the vacuum cut valve and EVAP canister purge volume control solenoid valve.



ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P1440 0213 | <ul style="list-style-type: none"> ● EVAP control system has a leak. ● EVAP control system does not operate properly. | <ul style="list-style-type: none"> ● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve ● Absolute pressure sensor ● Tank fuel temperature sensor ● MAP/BARO switch solenoid valve ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● O-ring of EVAP canister vent control valve is missing or damaged. ● Water separator ● EVAP canister is saturated with water. |

CAUTION:

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine rubber tube as a replacement.

TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

- Never use compressed air or high pressure pump. Otherwise, EVAP system may be damaged.
- Do not start engine.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.

NOTE:

- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- Always remove service port adapter from service port when applying air up to 0.69 to 1.38 kPa (5.14 to 10.34 mmHg, 0.202 to 0.407 inHg).
- During the test, clamp the EVAP hose tightly as shown at left.
- If both DTC P1440 and P1448 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-373.)



- 1) Turn ignition switch "ON".
- 2) Select "EVAP SML LEAK P1440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.
- 3) Make sure that "OK" is displayed. If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-348.

OR

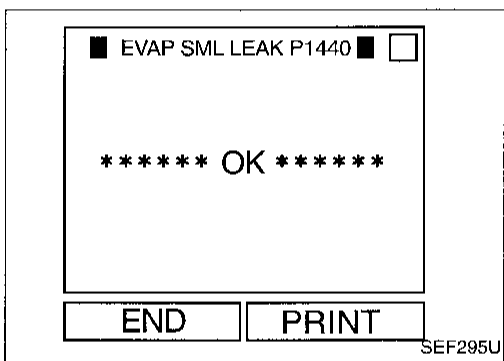
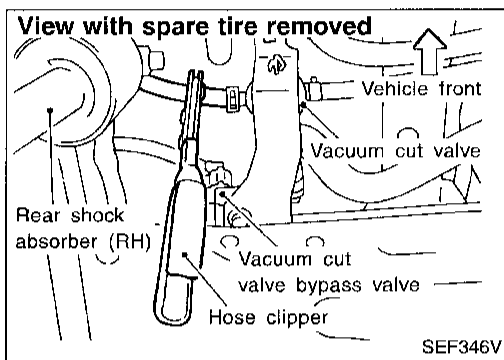
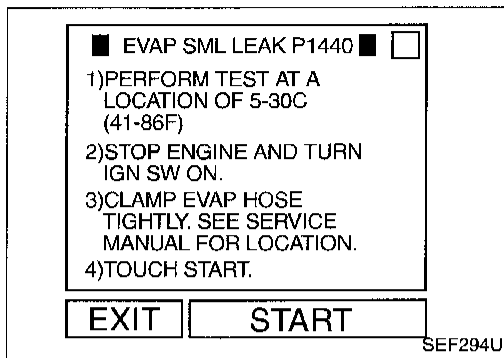
NOTE:

Be sure to read the explanation of "Driving pattern" on EC-39 before driving vehicle.



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-39.
- 3) Stop vehicle.
- 4) Select "MODE 1" with GST.
 - If SRT of EVAP system is not set yet, go to the following step.
 - If SRT of EVAP system is set, the result will be OK.
- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Start engine.

It is not necessary to cool engine down before driving.
- 7) Drive vehicle again according to the "Driving pattern", EC-39.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.
 - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-367.
 - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE", EC-263.
 - If P1440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC P1440", EC-348.
 - If P0440, P1440 and P1447 are not displayed on the screen, go to the following step.
- 10) Select "MODE 1" with GST.
 - If SRT of EVAP system is set, the result will be OK.
 - If SRT of EVAP system is not set, go to step 5).



TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

GI

OR

NOTE:

MA

- Be sure to read the explanation of "Driving pattern" on EC-39 before driving vehicle.
- It is better that the fuel level is low.

EM



- 1) Start engine.
- 2) Drive vehicle according to "Driving pattern", EC-39.
- 3) Stop vehicle.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Perform the step 1) to 4) again.
- 6) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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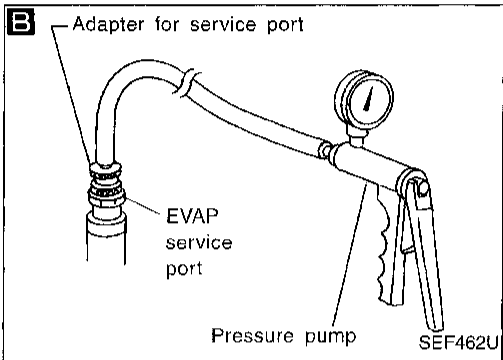
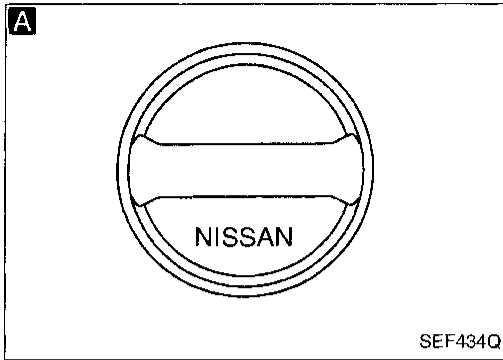
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Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

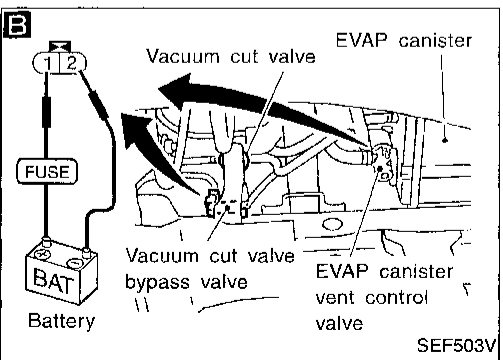
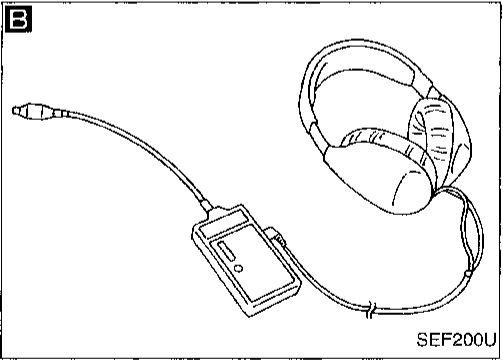
DIAGNOSTIC PROCEDURE



■ EVAP SYSTEM CLOSE ■
 APPLY PRESSURE TO EVAP SYSTEM FROM SERVICE PORT USING HAND PUMP WITH PRESSURE GAUGE AT NEXT SCREEN. NEVER USE COMPRESSED AIR OR HIGH PRESSURE PUMP!
 DO NOT START ENGINE. TOUCH START.

CANCEL
START

SEF658U



INSPECTION START

A

CHECK FUEL FILLER CAP.

1. Check for genuine NISSAN fuel filler cap design.
2. Check for air releasing sound while opening the fuel filler cap. If the air releasing sound is heard, go to **B**.

If the air releasing sound is not heard, check the following.
Was the cap tightened properly?
 If Yes, check fuel filler cap vacuum relief valve. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-21.
 If No, open fuel filler cap, then clean cap and filler neck thread using air blower. Retighten until ratcheting sound is heard.

NG → If genuine NISSAN filler cap is not used, replace with genuine NISSAN fuel filler cap.

OK

B

CHECK FOR EVAP LEAK.

- Never use compressed air or high pressure pump.
- Improper installation of service port may cause leaking.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.

To locate EVAP leak portion, proceed with the following steps.

1. Install the EVAP service port adapter and the pressure pump securely.
2. Turn ignition switch "ON". Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply vacuum into the EVAP line until the pressure indicator reaches the middle of bar graph.
4. Using EVAP leak detector, locate the leak portion. For the leak detector, refer to instruction manual for more details. Refer to "EVAPORATIVE EMISSION SYSTEM", EC-23.

OR

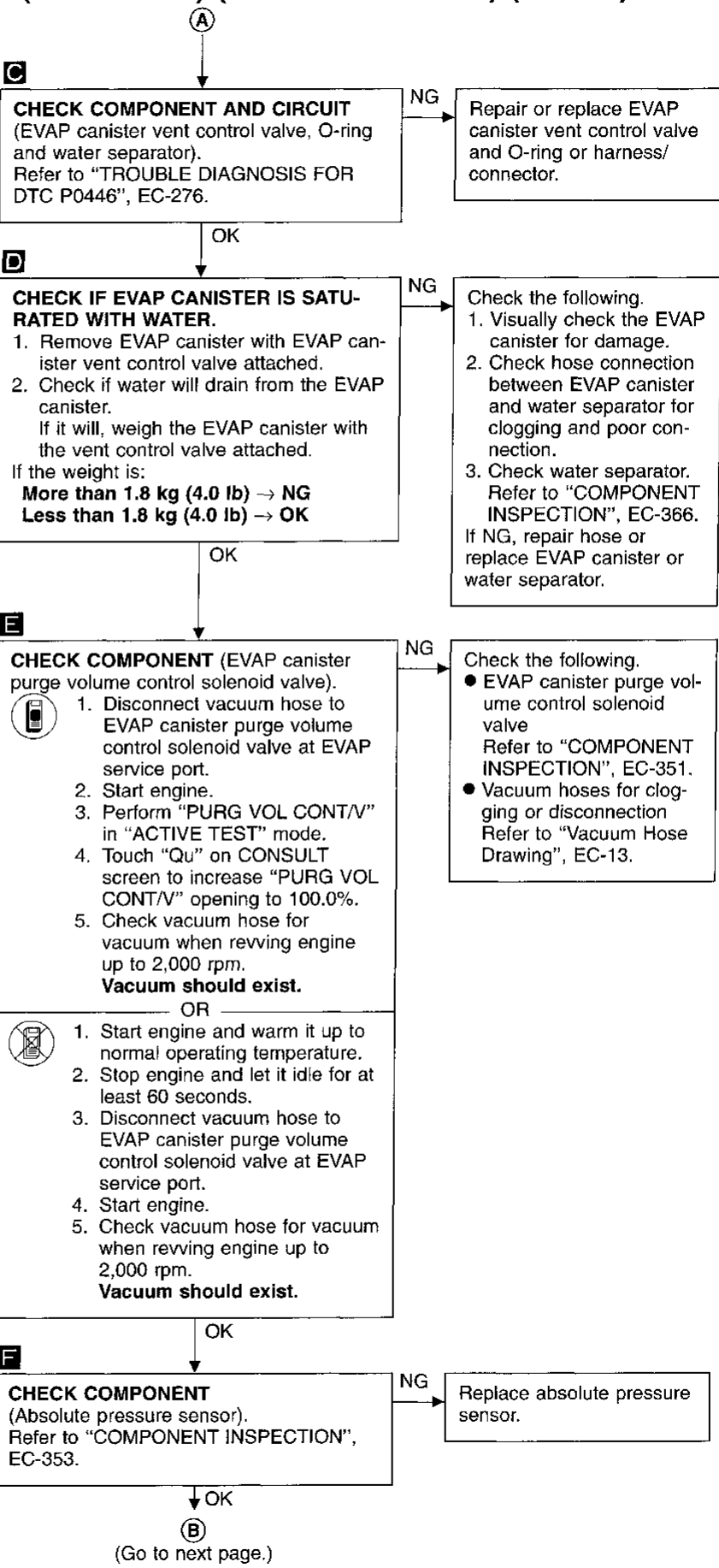
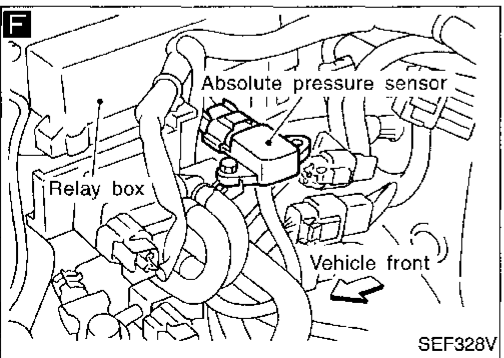
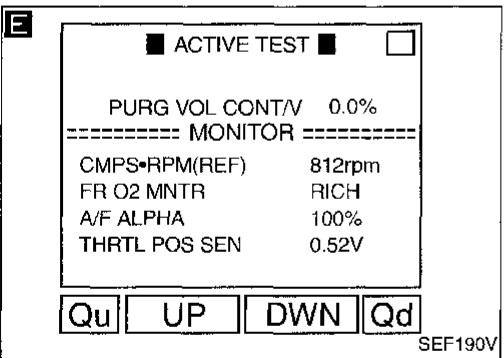
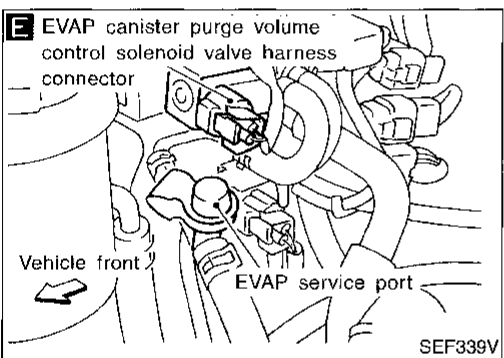
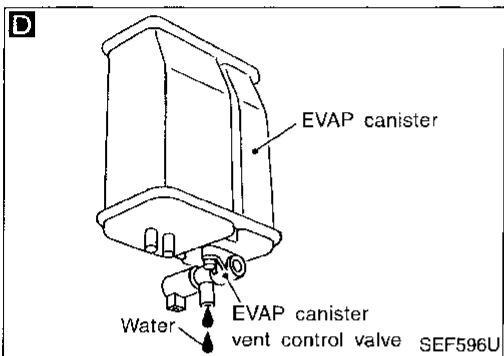
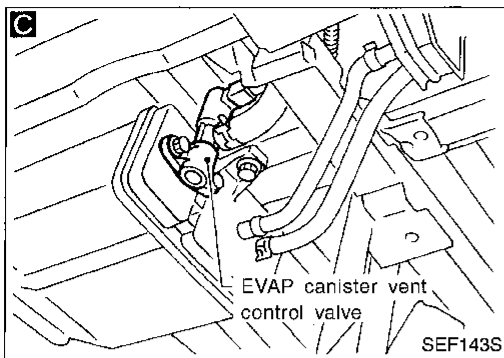
2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12 volts until the end of test.)
5. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg).
6. Locate the leak using a leak detector. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-23.

NG → Repair or replace.

↓ OK
A
 (Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P1440

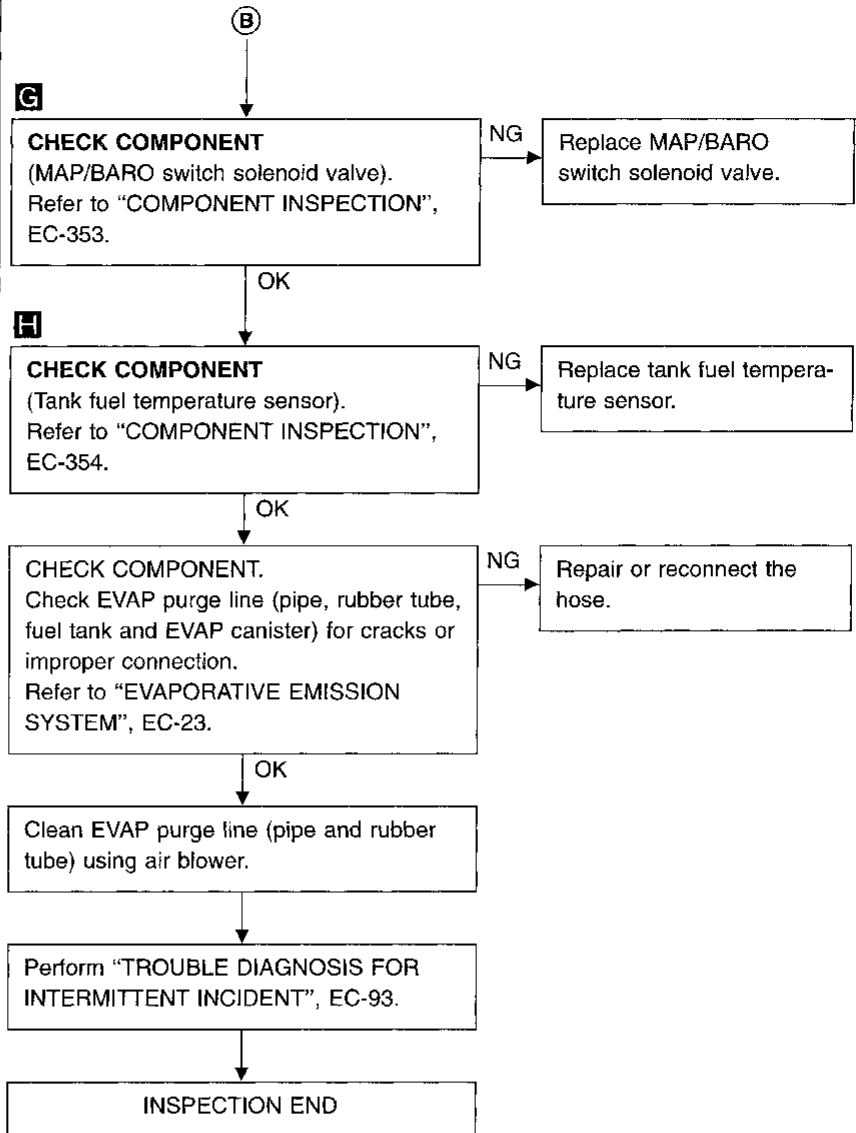
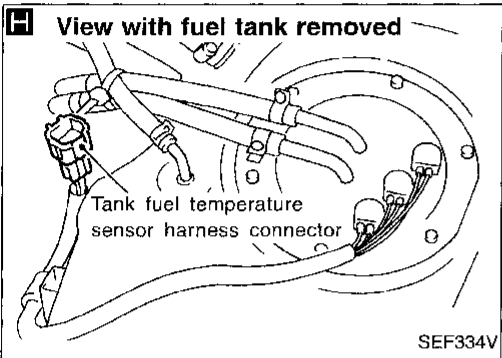
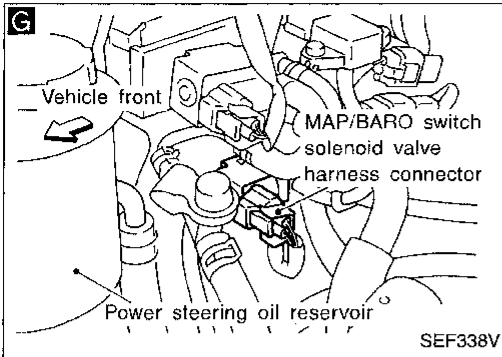
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



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TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



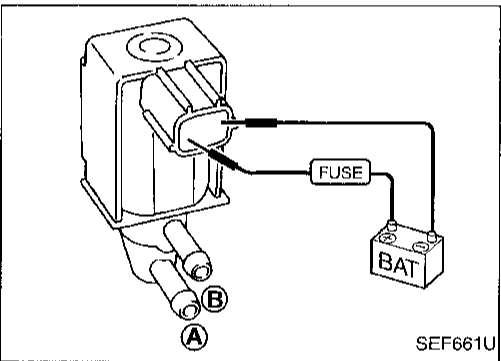
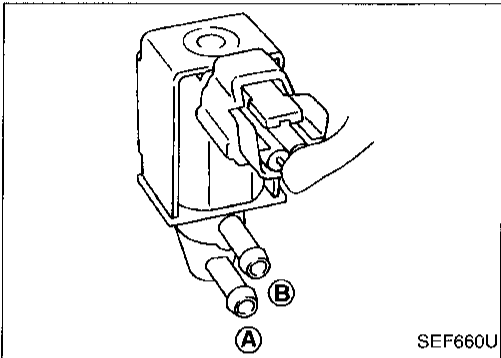
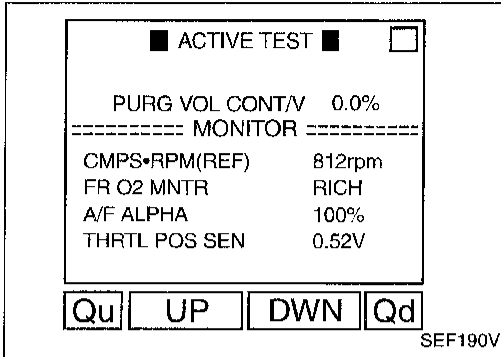
TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening. If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



| Condition PURG VOL CONT/V value | Air passage continuity between (A) and (B) |
|------------------------------------|---|
| 100.0% | Yes |
| 0.0% | No |

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

- Check air passage continuity.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG or operation takes more than 1 second, replace solenoid valve.

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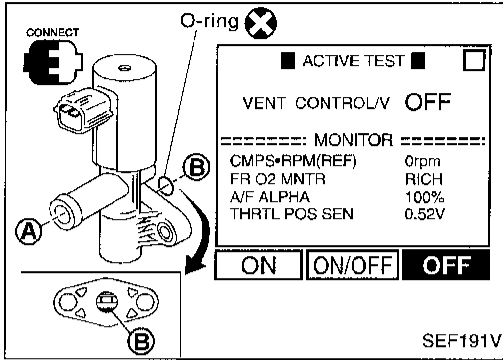
TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

EVAP canister vent control valve

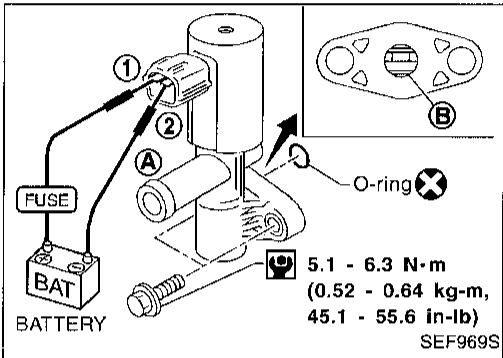
Check air passage continuity.


 Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



| Condition | Air passage continuity between (A) and (B) |
|--------------------|--|
| VENT CONTROL/V ON | No |
| VENT CONTROL/V OFF | Yes |

OR



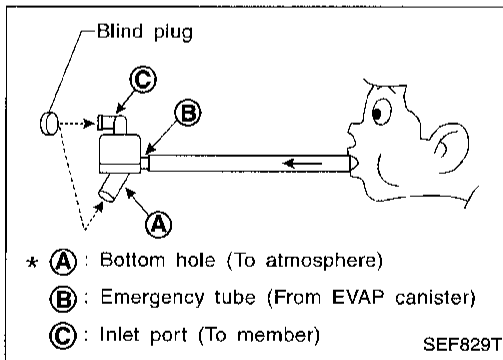


| Condition | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals ① and ② | No |
| No supply | Yes |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



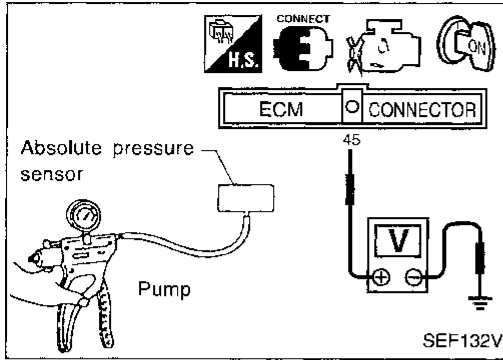
Water separator

1. Check visually for insect nests in the water separator air inlet.
 2. Check visually for cracks or flaws in the appearance.
 3. Check visually for cracks or flaws in the hose.
 4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
 5. In case of NG in items 2 - 4, replace the parts.
- **Do not disassemble water separator.**

TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

Absolute pressure sensor



1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between ECM terminal 45 and engine ground.

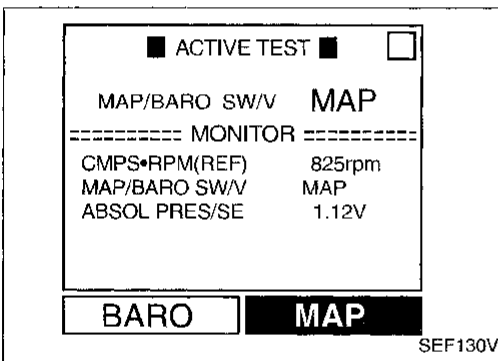
The voltage should be 3.2 to 4.8 V.

4. Use pump to apply vacuum of -26.7 kPa (-200 mmHg , -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.

The voltage should be 1.0 to 1.4 V lower than the value measured in step 3.

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -93.3 kPa (-700 mmHg , -27.56 inHg) or pressure over 101.3 kPa (760 mmHg , 29.92 inHg).
5. If NG, replace absolute pressure sensor.



MAP/BARO switch solenoid valve

1. Start engine and warm it up to normal operating temperature.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
 - Condition: At idle under no-load
 - CONSULT display

| MAP/BARO | ABSOL PRES/SE (Voltage) |
|----------|-------------------------------|
| BARO | More than 2.6V |
| MAP | Less than the voltage at BARO |

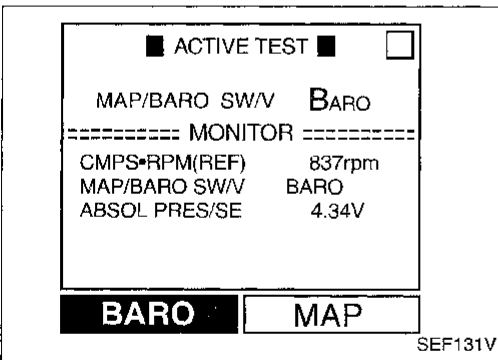
- Time for voltage to change

| MAP/BARO SW/V | Required time to switch |
|---------------|-------------------------|
| BARO to MAP | Less than 1 second |
| MAP to BARO | |

4. If NG, check solenoid valve as shown below.

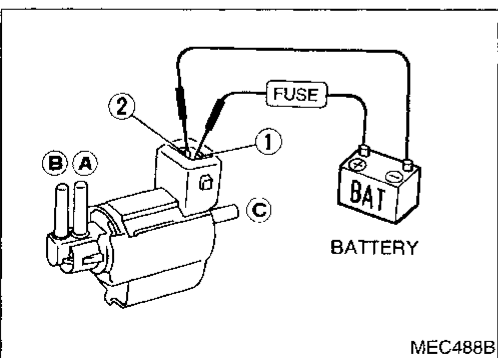
OR

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.



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

3. If NG or operation takes more than 1 second, replace solenoid valve.

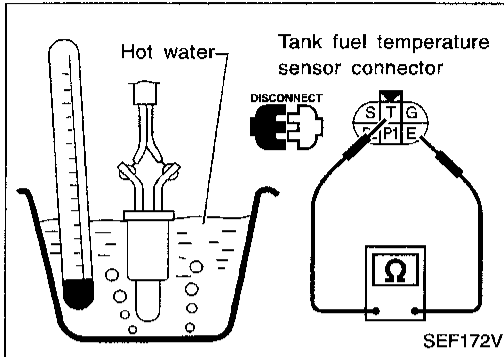


TROUBLE DIAGNOSIS FOR DTC P1440

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

Tank fuel temperature sensor

Check resistance by heating with hot water as shown in the figure or heat gun.

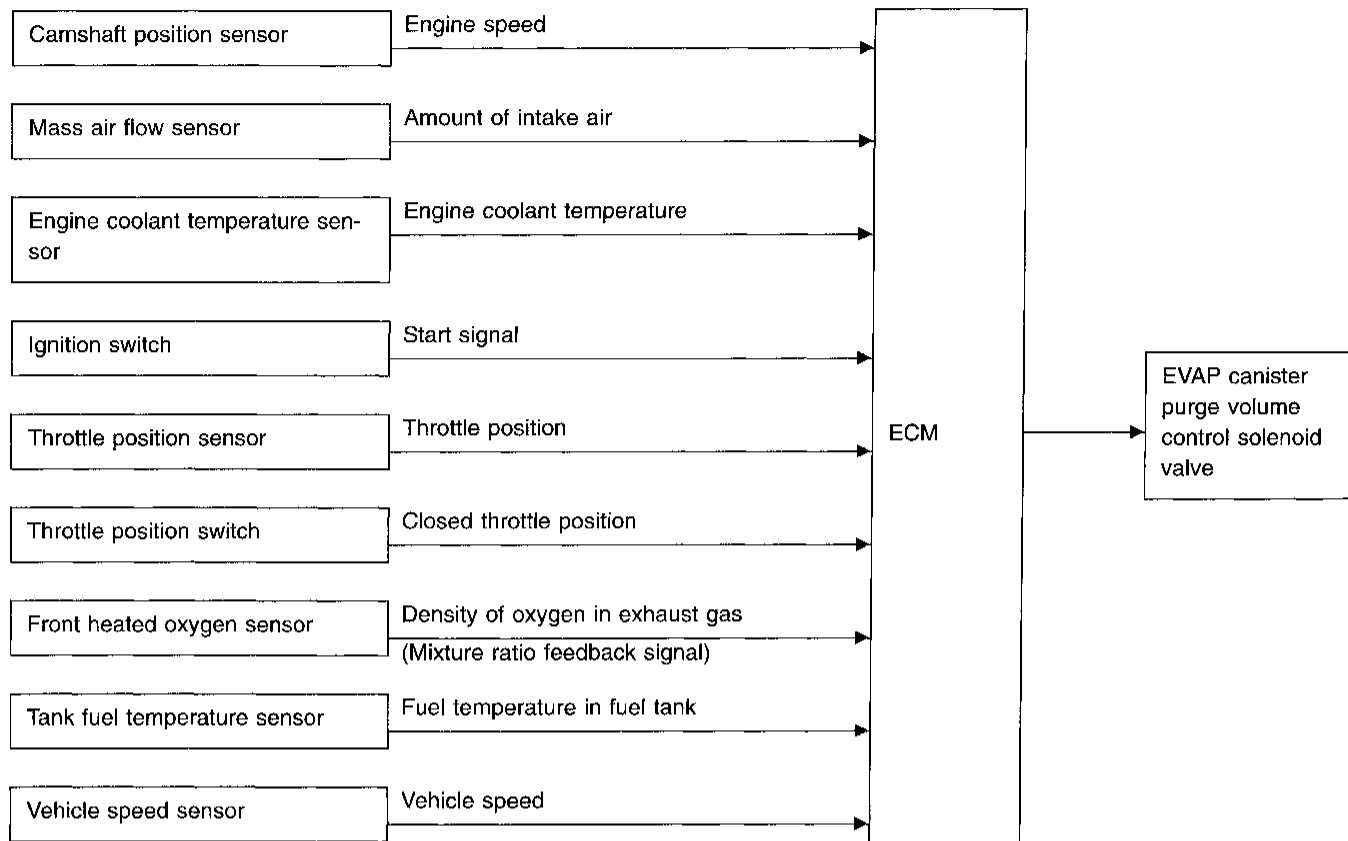


| Temperature °C (°F) | Resistance k Ω |
|---------------------|-----------------------|
| 20 (68) | 2.3 - 2.7 |
| 50 (122) | 0.79 - 0.90 |

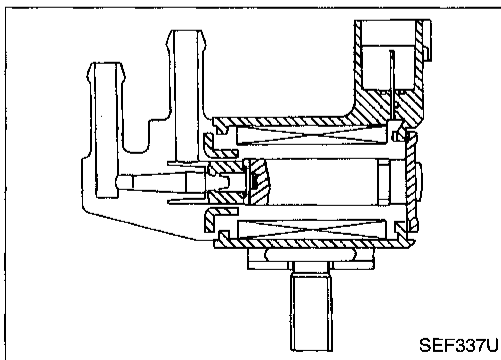
If NG, replace tank fuel temperature sensor.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

SYSTEM DESCRIPTION



This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

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TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

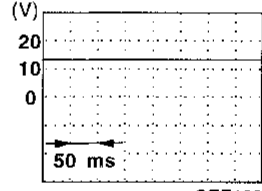
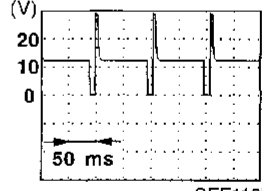
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|---|---|
| PURG VOL C/V | ● Engine: After warming up ● Air conditioner switch "OFF" ● No-load | Idle |
| | | 2,000 rpm (200 seconds after starting engine) |
| | | 0% |
| | | — |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

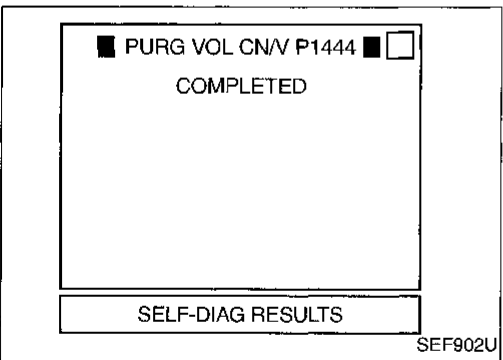
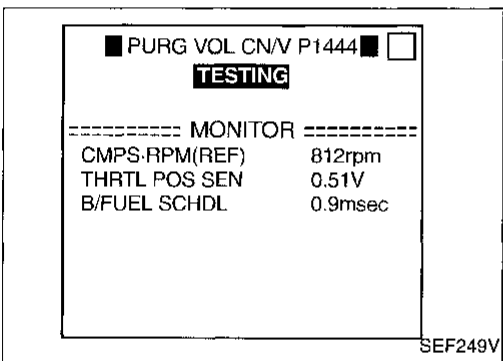
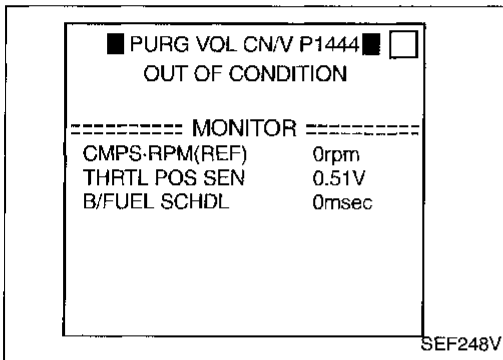
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|--|--|
| 4 | LG/R | ECCS relay (Self-shutoff) | Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF" | 0 - 1V |
| | | | Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 5 | R/Y | EVAP canister purge volume control solenoid valve | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V)  12 - 13V  |
| 67 | B/P | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/P | | | |
| 117 | B/P | Current return | Engine is running. └ Idle speed | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P1444 0214 | <ul style="list-style-type: none"> ● The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | <ul style="list-style-type: none"> ● EVAP control system pressure sensor ● EVAP canister purge volume control solenoid valve (The valve is stuck open.) ● EVAP canister vent control valve ● EVAP canister ● Hoses (Hoses are connected incorrectly or clogged.) |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

- 1) Start engine and warm it up to normal operating temperature.
 - 2) Turn ignition switch "OFF" and wait at least 5 seconds.
 - 3) Turn ignition switch "ON".
 - 4) Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
 - 5) Touch "START".
 - 6) Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take at least 10 seconds.)
- If "TESTING" is not displayed after 5 minutes, retry from step 2).
- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)

OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and let it idle for at least 20 seconds.
- 4) Select "MODE 7" with GST.

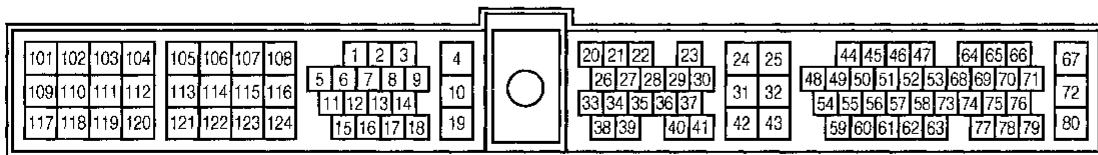
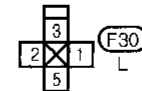
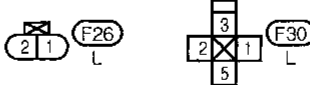
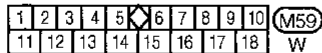
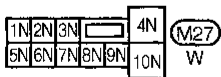
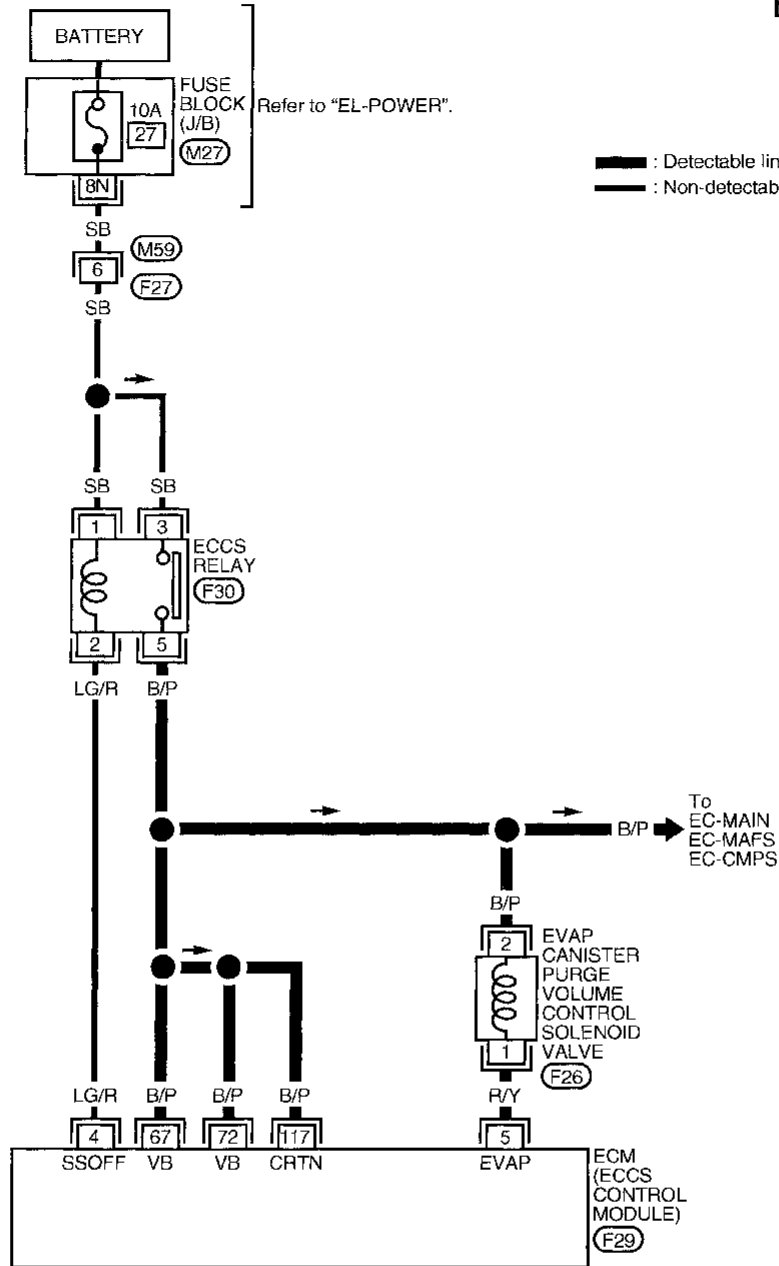
OR

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and let it idle for at least 20 seconds.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

TROUBLE DIAGNOSIS FOR DTC P1444

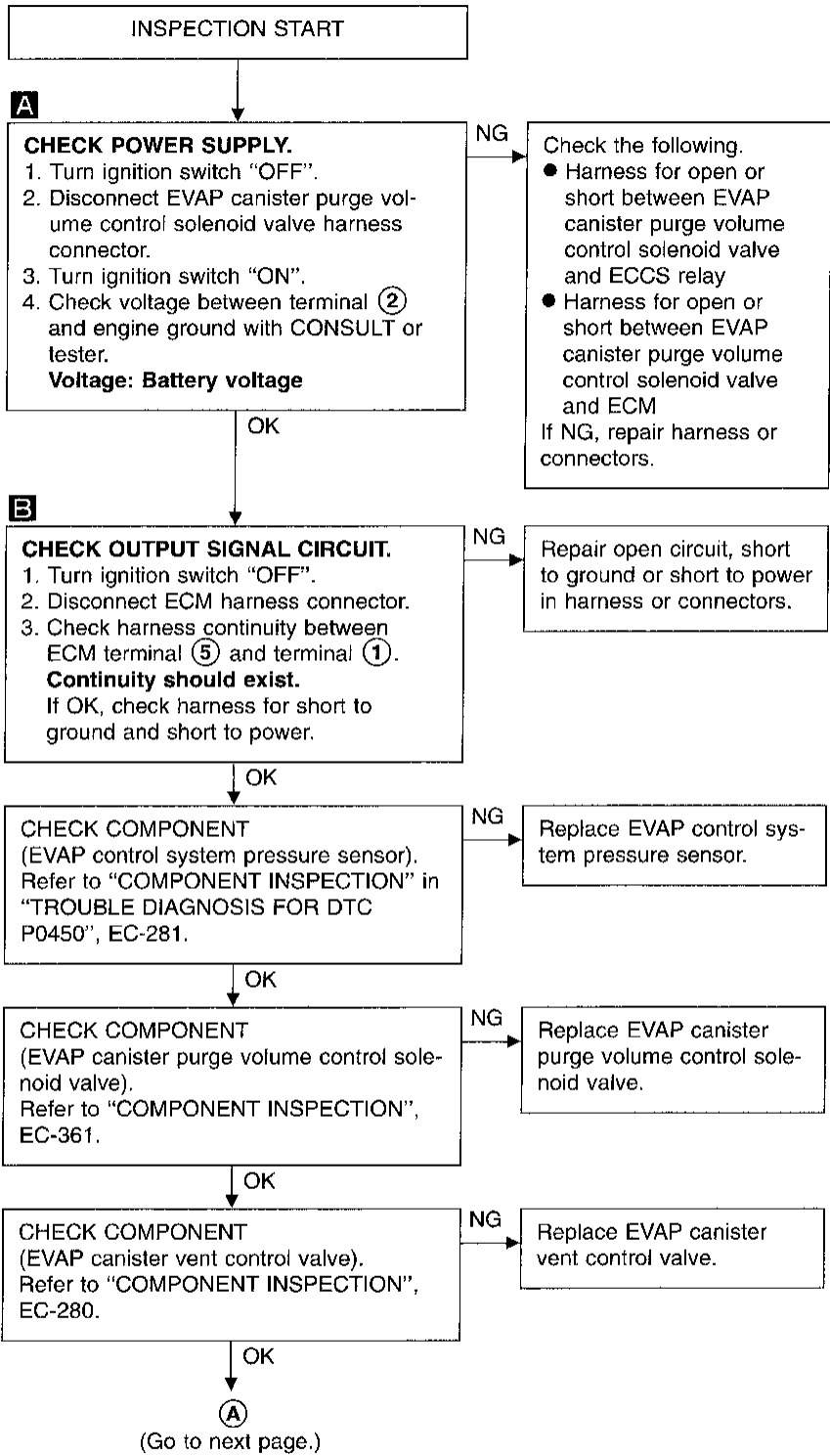
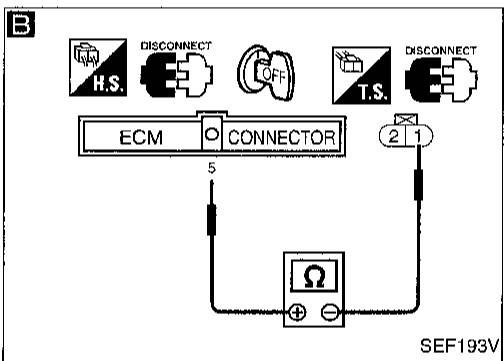
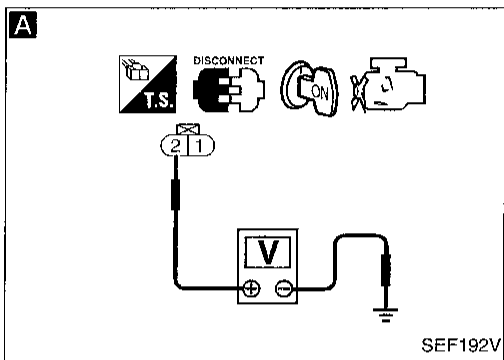
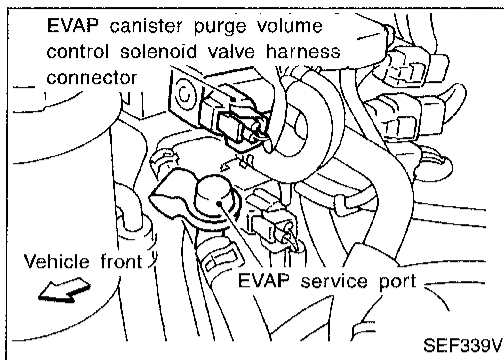
Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

EC-PGC/V-01



Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

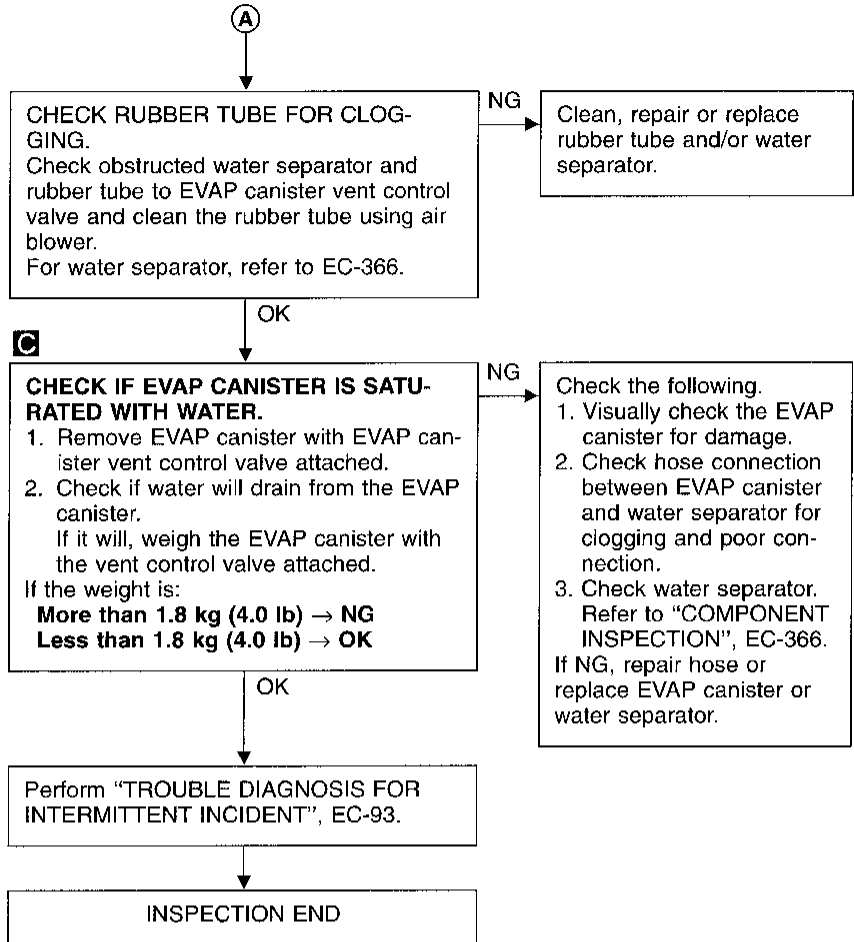
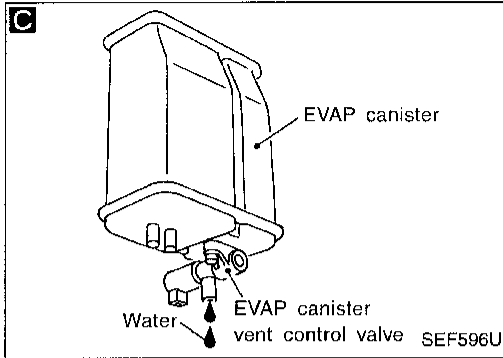
DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)



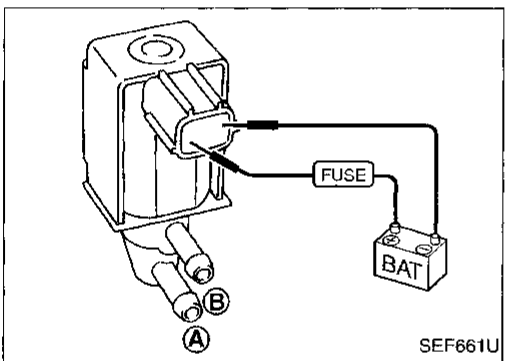
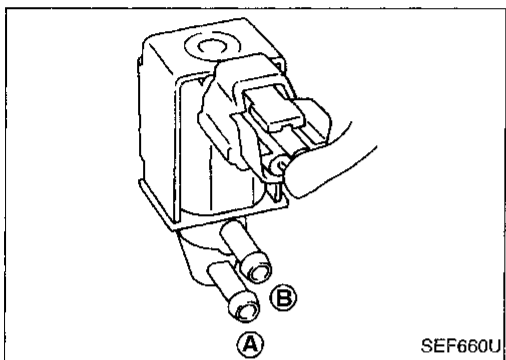
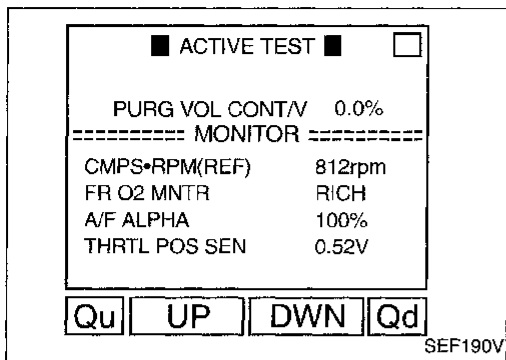
TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



| Condition PURG VOL CONT/V value | Air passage continuity between (A) and (B) |
|------------------------------------|---|
| 100.0% | Yes |
| 0.0% | No |

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

⊗ Check air passage continuity.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG or operation takes more than 1 second, replace solenoid valve.

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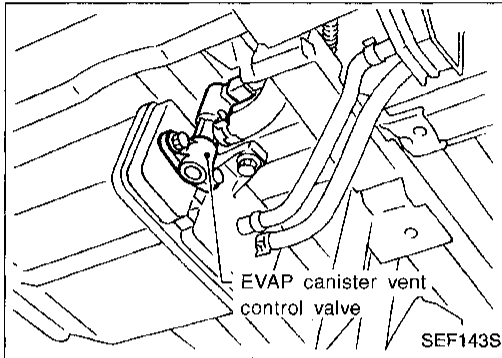
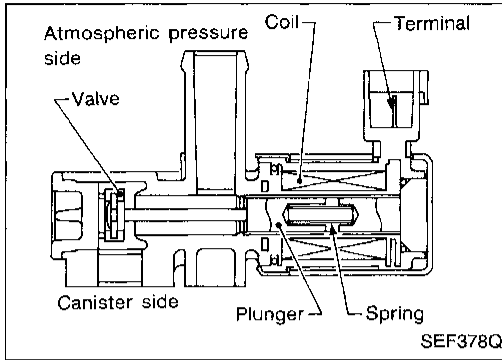
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TROUBLE DIAGNOSIS FOR DTC P1446



Evaporative Emission (EVAP) Canister Vent Control Valve (Close)

COMPONENT DESCRIPTION

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|-----------------------|---------------|
| VENT CONT/V | ● Ignition switch: ON | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓜ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------------|----------------------|----------------------------|
| 108 | R/G | EVAP canister vent control valve | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P1446 0215 | ● EVAP canister vent control valve remains closed under specified driving conditions. | <ul style="list-style-type: none"> ● EVAP canister vent control valve ● EVAP control system pressure sensor and the circuit ● Blocked rubber tube to EVAP canister vent control valve ● Water separator ● EVAP canister is saturated with water. |

TROUBLE DIAGNOSIS FOR DTC P1446

Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine.
- 4) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.

NOTE:

If a malfunction exists, NG result may be displayed quicker.

OR



- 1) Start engine.
- 2) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
- 3) Select "MODE 7" with GST.

OR



- 1) Start engine.
- 2) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

| | | |
|----------------|-----------|--------------------------|
| ★ MONITOR | ★ NO FAIL | <input type="checkbox"/> |
| CMPS•RPM(REF) | 1500rpm | |
| COOLAN TEMP/S | 85°C | |
| VHCL SPEED SEN | 0km/h | |
| THRTL POS SEN | 1.68V | |
| B/FUEL SCHDL | 1.0msec | |

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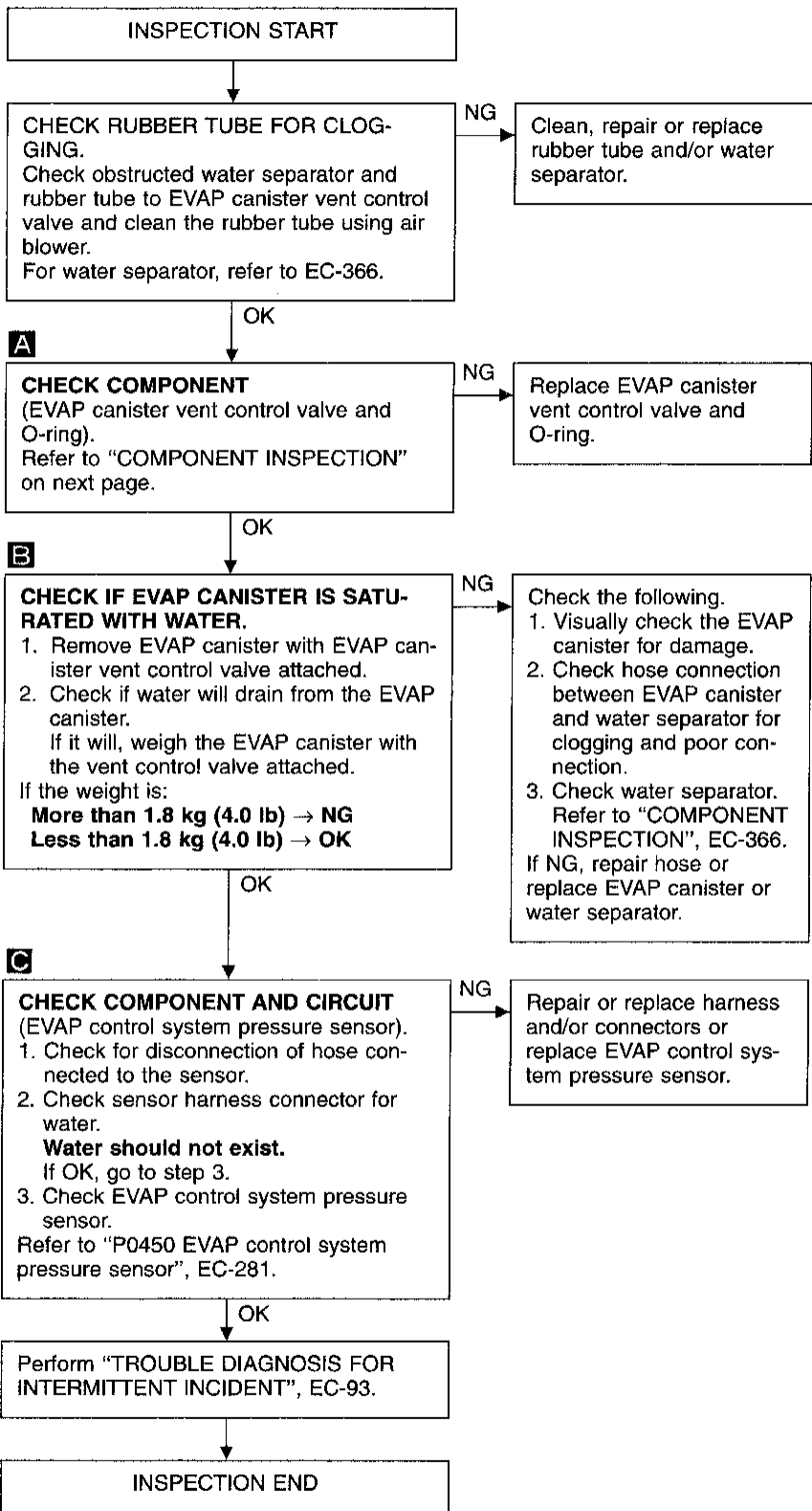
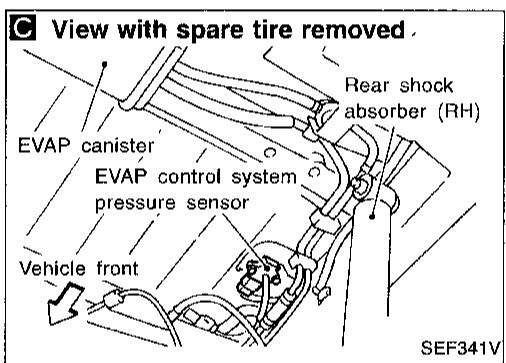
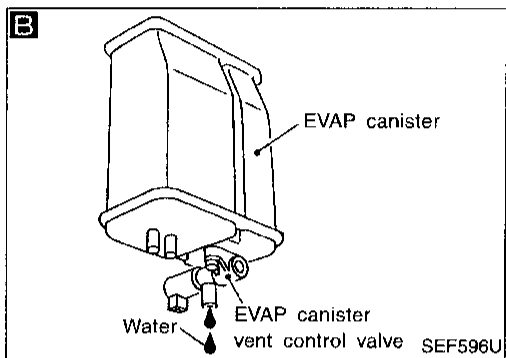
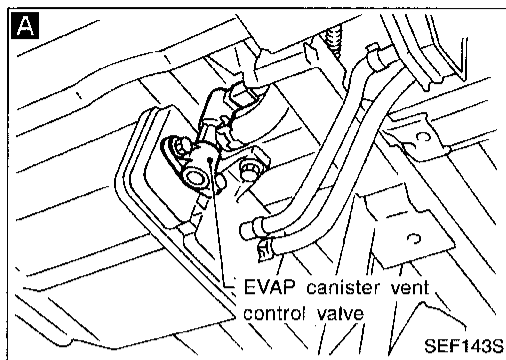
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TROUBLE DIAGNOSIS FOR DTC P1446

Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

DIAGNOSTIC PROCEDURE



TROUBLE DIAGNOSIS FOR DTC P1446

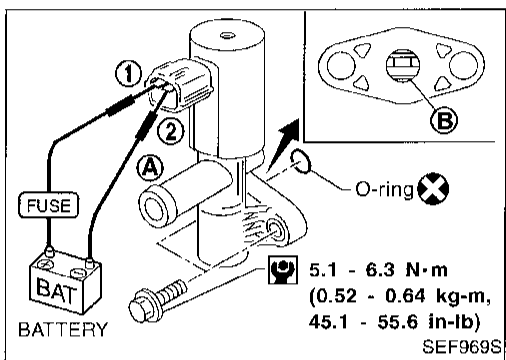
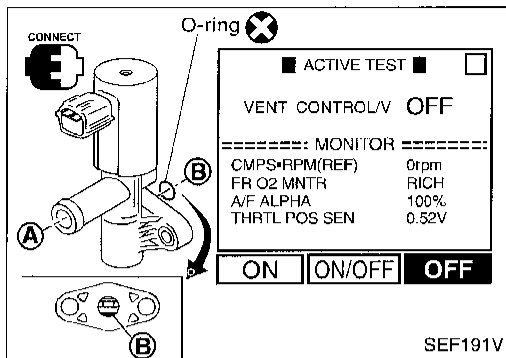
Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



| Condition | Air passage continuity between (A) and (B) |
|--------------------|--|
| VENT CONTROL/V ON | No |
| VENT CONTROL/V OFF | Yes |

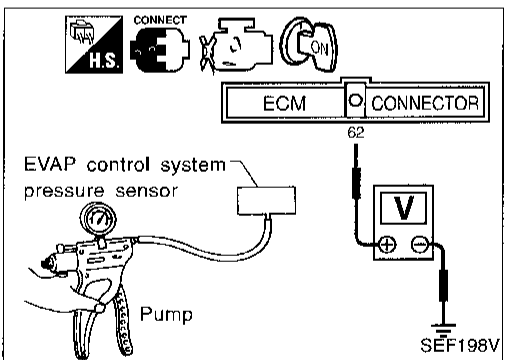
OR

| Condition | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals (1) and (2) | No |
| No supply | Yes |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminals (62) and engine ground.

| Pressure (Relative to atmospheric pressure) | Voltage (V) |
|---|-------------|
| 0 kPa (0 mmHg, 0 inHg) | 3.0 - 3.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg) | 0.4 - 0.6 |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.

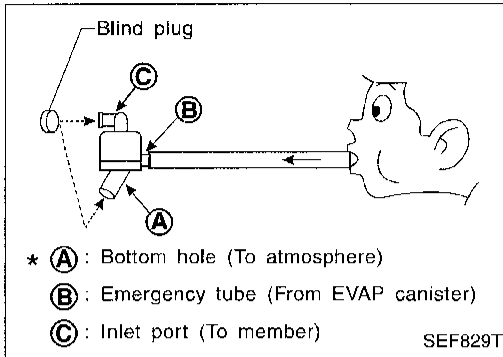
TROUBLE DIAGNOSIS FOR DTC P1446

Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

Water separator

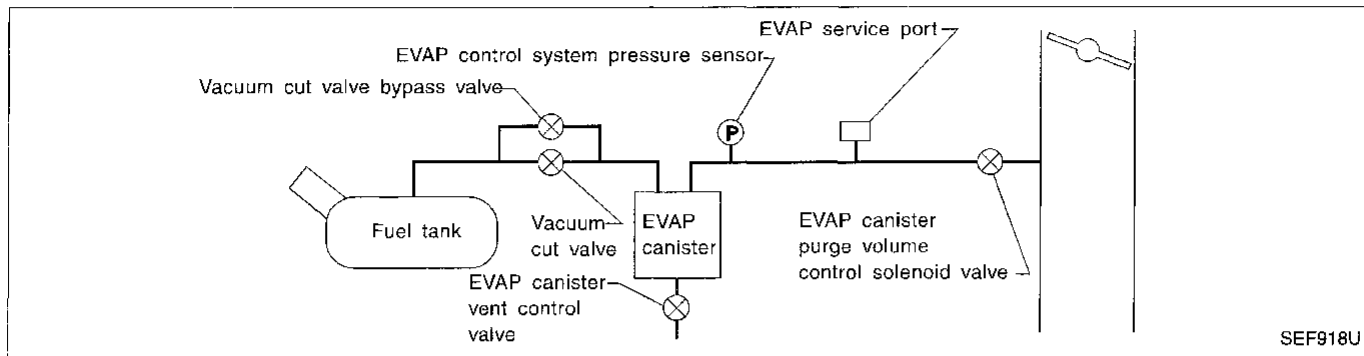
1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
5. In case of NG in items 2 - 4, replace the parts.

- **Do not disassemble water separator.**



Evaporative Emission (EVAP) Control System
Purge Flow Monitoring

Note: If both DTC P0510 and P1447 are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0510 first.
(See EC-297.)



SYSTEM DESCRIPTION

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

ON BOARD DIAGNOSIS LOGIC

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|---|
| P1447 0111 | <ul style="list-style-type: none"> ● EVAP control system does not operate properly. ● EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. | <ul style="list-style-type: none"> ● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor and the circuit ● Loose, disconnected or improper connection of rubber tube ● Blocked rubber tube ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve circuit ● Closed throttle position switch ● Blocked purge port ● EVAP canister vent control valve |

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine and let it idle for at least 1 minute.
- 4) Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CONSULT.
- 5) Touch "START".
- 6) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

Selector lever: Suitable position

Vehicle speed: 32 - 100 km/h (20 - 62 MPH)

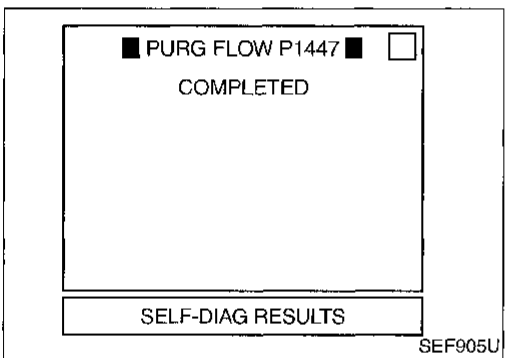
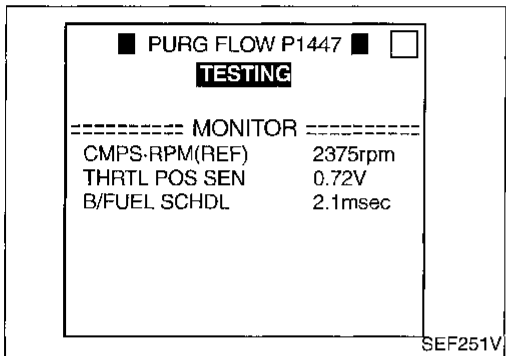
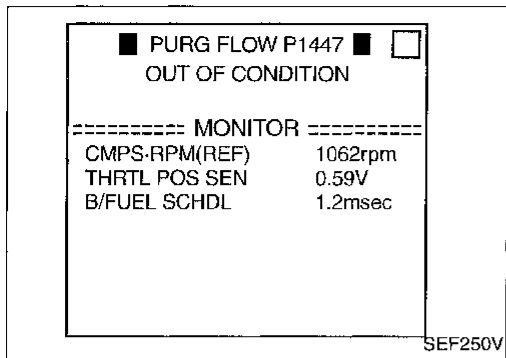
CMPS-RPM (REF): 500 - 3,100 rpm

B/FUEL SCHDL: 1.6 - 3.5 ms

Engine coolant temperature: 70 - 100°C (158 - 212°F)

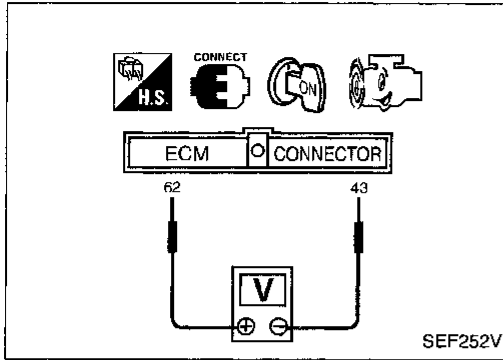
If "TESTING" is not changed for a long time, retry from step 2).

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-370.



TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



OR OVERALL FUNCTION CHECK

Use this procedure to check the overall monitoring function of the EVAP control system purge flow. During this check, a 1st trip DTC might not be confirmed.

- 1) Lift up drive wheels.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF", wait at least 5 seconds.
- 4) Start engine and wait at least 60 seconds.
- 5) Set voltmeter probes to ECM terminals ⑥② (EVAP control system pressure sensor signal) and ④③ (ground).
- 6) Check EVAP control system pressure sensor value at idle speed.
- 7) Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch: ON

Steering wheel: Fully turned

Headlamp switch: ON

Engine speed: Approx. 3,000 rpm

Gear position:

M/T models

Any position other than "Neutral" or "Reverse"

A/T models

Any position other than "P", "N" or "R"

Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed for at least 1 second.

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TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

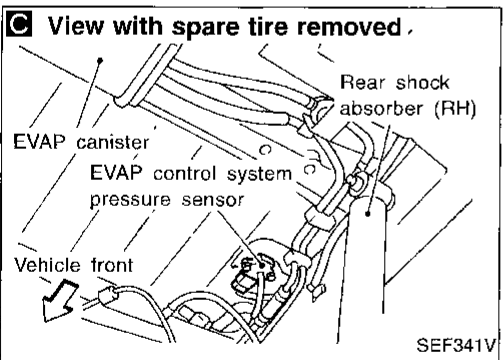
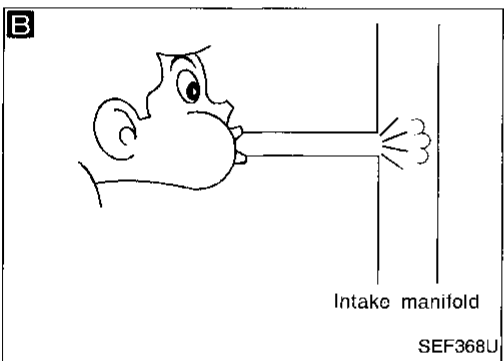
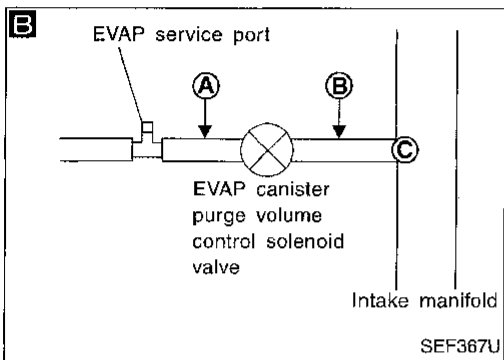
DIAGNOSTIC PROCEDURE

A

| | |
|---------------------|--------|
| ■ ACTIVE TEST ■ | |
| PURG VOL CONT/V | 0.0% |
| ----- MONITOR ----- | |
| CMPS•RPM(REF) | 812rpm |
| FR O2 MNTR | RICH |
| A/F ALPHA | 100% |
| THRTL POS SEN | 0.52V |

Qu UP DWN Qd

SEF190V



INSPECTION START

CHECK EVAP CANISTER.
Check EVAP canister for cracks.

NG → Replace EVAP canister.

OK ↓

A

CHECK PURGE FLOW.

1. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
2. Start engine and let it idle.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL CONT/V" opening.
100.0%: Vacuum should exist.
0.0%: Vacuum should not exist.

OR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
4. Start engine and let it idle for at least 60 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
While operating solenoid valve, vacuum should exist.
6. Release the accelerator pedal and let engine idle.
Vacuum should not exist.

NG → **B**

OK ↓

B

CHECK EVAP PURGE LINE.
Check EVAP purge line for improper connection, disconnection and blocked purge port.

1. Turn ignition switch "OFF".
2. Disconnect purge hoses connected to EVAP canister purge volume control solenoid valve (B) and EVAP service port (A).
3. Blow air into each hose and check that air flows freely.
4. Check EVAP purge port (C).

If NG, repair or clean hoses and/or purge port.

OK ↓

CHECK COMPONENT (EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-372.

OK ↓

C

CHECK COMPONENT AND CIRCUIT (EVAP control system pressure sensor).

1. Check disconnection of hose connected to the sensor.
2. Check sensor harness connector for water.
Water should not exist.
If OK, go to step 3.
3. Check EVAP control system pressure sensor.

Refer to "TROUBLE DIAGNOSIS FOR DTC P0450", EC-281.

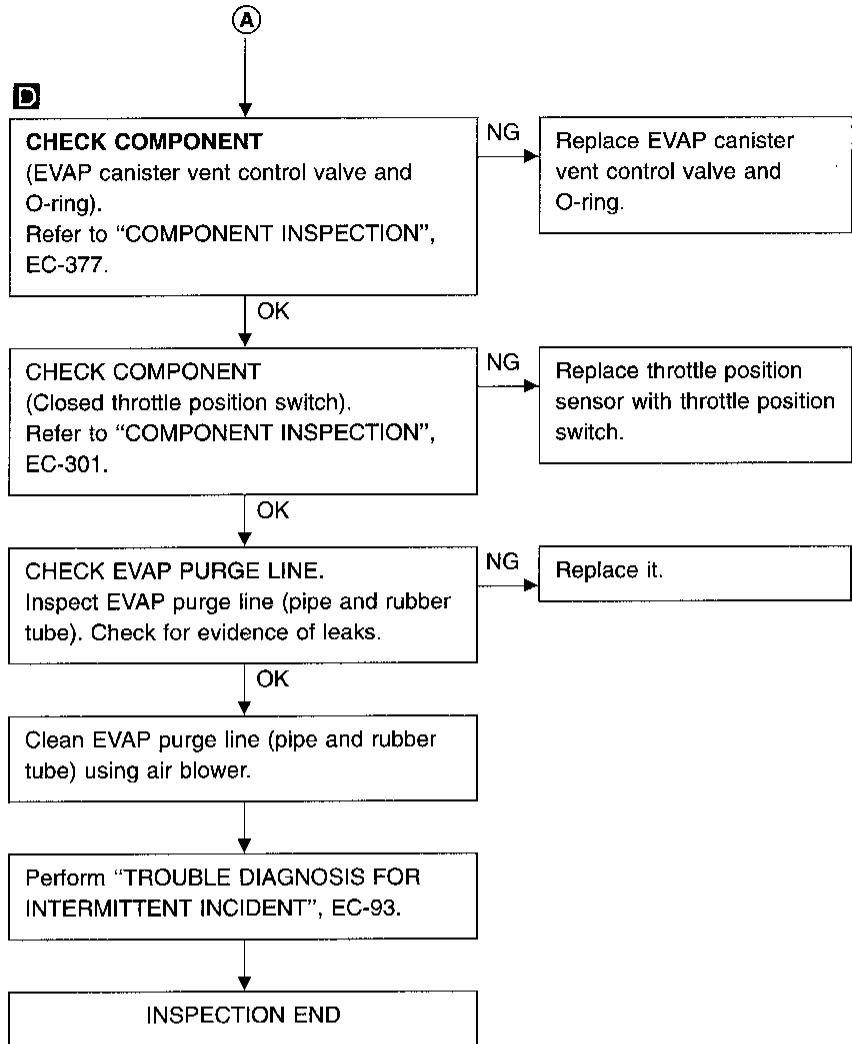
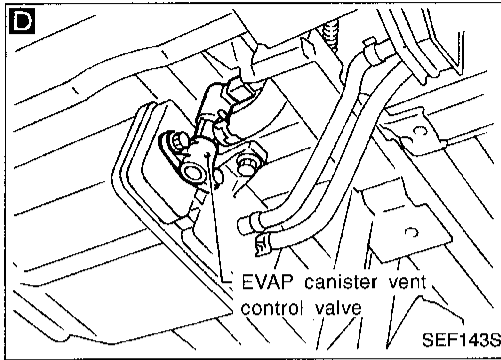
NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.

OK ↓

(Go to next page.)

TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



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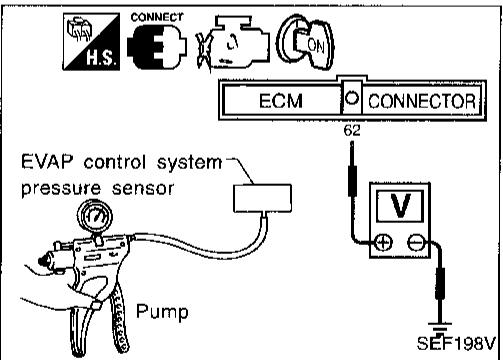
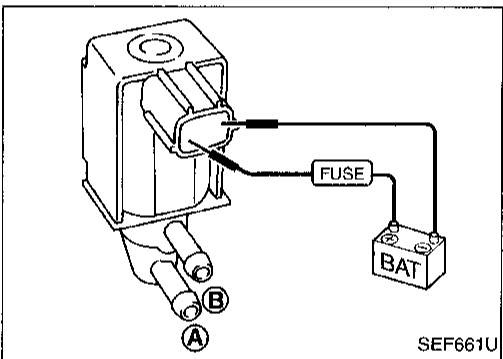
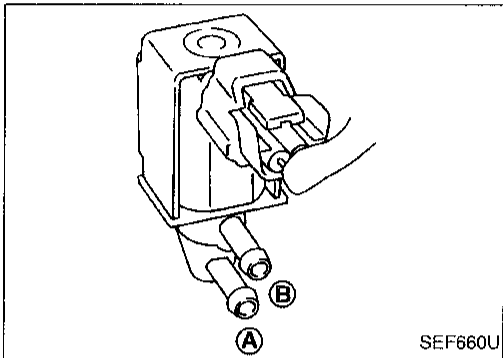
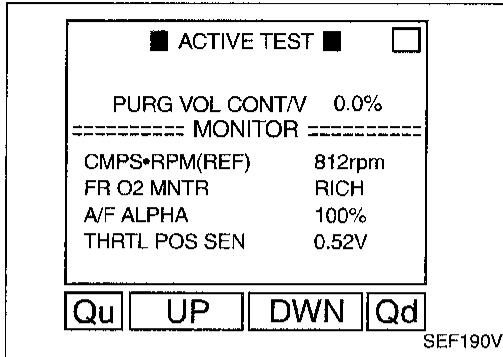
TROUBLE DIAGNOSIS FOR DTC P1447

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



| Condition PURG VOL CONT/V value | Air passage continuity between (A) and (B) |
|------------------------------------|---|
| 100.0% | Yes |
| 0.0% | No |

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

⊗ Check air passage continuity.

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG or operation takes more than 1 second, replace solenoid valve.

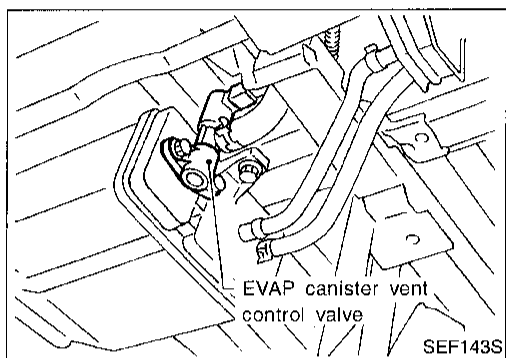
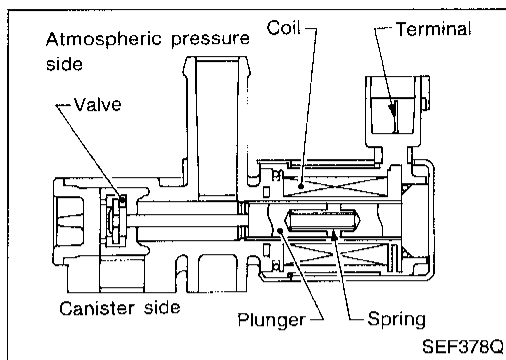
EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal ⑥2 and engine ground.

| Pressure (Relative to atmospheric pressure) | Voltage (V) |
|---|-------------|
| 0 kPa (0 mmHg, 0 inHg) | 3.0 - 3.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg) | 0.4 - 0.6 |

CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.



Evaporative Emission (EVAP) Canister Vent Control Valve (Open)

COMPONENT DESCRIPTION

NOTE:

If DTC P0440 or P1440 is displayed with P1448, perform **TROUBLE DIAGNOSIS FOR DTC P1448** first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|-----------------------|---------------|
| VENT CONT/V | ● Ignition switch: ON | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ⓑ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------------------------|----------------------|----------------------------|
| 108 | R/G | EVAP canister vent control valve | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P1448 0309 | ● EVAP canister vent control valve remains opened under specified driving conditions. | <ul style="list-style-type: none"> ● EVAP canister vent control valve ● EVAP control system pressure sensor ● Blocked rubber tube to EVAP canister vent control valve ● Water separator ● EVAP canister is saturated with water ● Vacuum cut valve |

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TROUBLE DIAGNOSIS FOR DTC P1448

Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- If DTC P0440 or P1440 is displayed with P1448, perform TROUBLE DIAGNOSIS FOR DTC P1448 first.
- If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 30°C (41 to 86°F).
- It is better that the fuel level is low.

- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that the following conditions are met.
COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
INT/A TEMP SE: 5 - 60°C (41 - 140°F)
- 5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.

Follow the instruction displayed.

NOTE:

- If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest. (Use a fan to reduce the stabilization time.)
 - The engine idle portion of this test (See illustration at left.) will take approximately 5 minutes.
- 6) Make sure that "OK" is displayed.
If "NG" is displayed, go to the following step.

NOTE:

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

- 7) Stop engine and wait at least 5 seconds, then turn "ON".
- 8) Disconnect hose from water separator.
- 9) Select "VENT CONTROL/V" of "ACTIVE TEST" mode with CONSULT.
- 10) Touch "ON" and "OFF" alternately.

■ EVAP SML LEAK P0440 ■ □

1)PERFORM TEST AT A LOCATION OF 5-30C (41-86F)
2)OPEN ENGINE HOOD.
3)START ENGINE WITH VEHICLE STOPPED. IF ENG IS ON, STOP FOR 5 SEC. THEN RESTART.
4)TOUCH START.

EXIT START

SEF296U

■ EVAP SML LEAK P0440 ■ □

CAN NOT BE DIAGNOSED

FUEL TEMPERATURE IS TOO HIGH. RETEST AFTER FUEL HAS COOLED.

EXIT PRINT

SEF669U

■ EVAP SML LEAK P0440 ■ □

WAIT. . .

KEEP ENGINE RUNNING AT IDLE SPEED.

SEF551V

■ EVAP SML LEAK P0440 ■ □

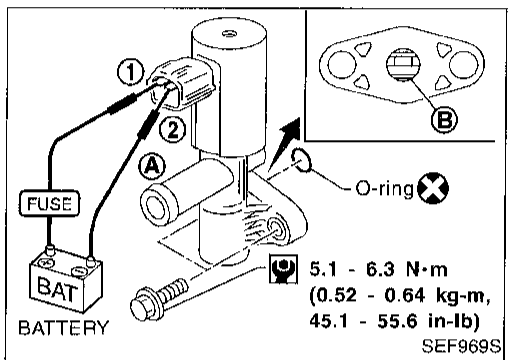
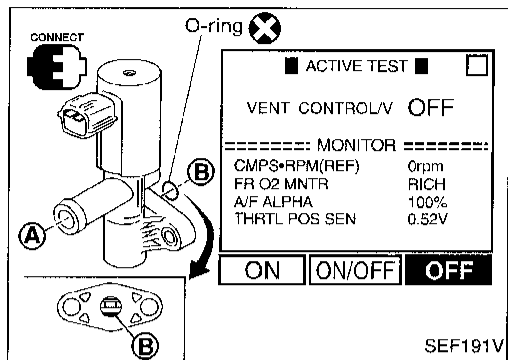
***** OK *****

END PRINT

SEF297U

TROUBLE DIAGNOSIS FOR DTC P1448

Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)



11) Make sure of the following.

| Condition | Air passage continuity between (A) and (B) |
|-----------|--|
| ON | No |
| OFF | Yes |

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-376.

If the result is OK, go to "DIAGNOSTIC PROCEDURE" for "TROUBLE DIAGNOSIS FOR DTC P0440", EC-263.

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

- 1) Disconnect hose from water separator.
- 2) Disconnect EVAP canister vent control valve harness connector.
- 3) Verify the following.

| Condition | Air passage continuity |
|---|------------------------|
| 12V direct current supply between terminals (1) and (2) | No |
| No supply | Yes |

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-376.

If the result is OK, go to "TROUBLE DIAGNOSIS FOR DTC P0440", EC-260.

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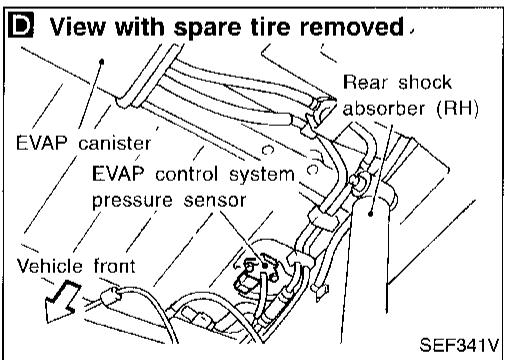
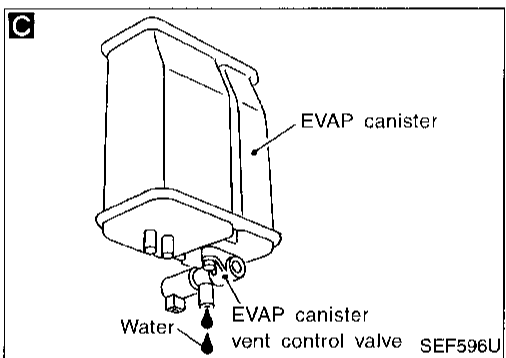
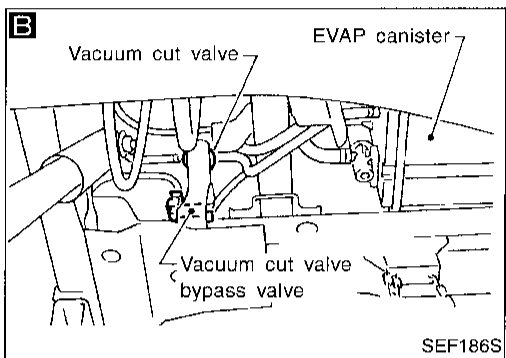
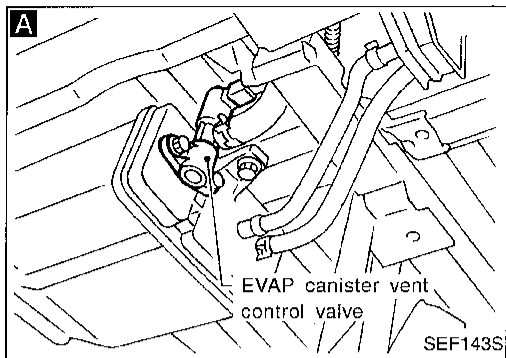
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TROUBLE DIAGNOSIS FOR DTC P1448

Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK RUBBER TUBE FOR DISCONNECTION.
Check disconnection of rubber tube to EVAP canister vent control valve and clean the rubber hose and/or vent control valve then install properly.

A
CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister vent control valve and O-ring.

B
CHECK COMPONENT
(Vacuum cut valve).
Refer to "COMPONENT INSPECTION", EC-387.

NG → Replace vacuum cut valve.

C
CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.
If it will, weigh the EVAP canister with the vent control valve attached.
If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Check the following.
1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator.
Refer to "COMPONENT INSPECTION", EC-366.
If NG, repair hose or replace EVAP canister or water separator.

D
CHECK COMPONENT
(EVAP control system pressure sensor).
1. Check for disconnection of hose connected to the sensor.
2. Check harness connector for water in the sensor connectors.
Water should not exist.
If OK, go to step 3.
3. Check EVAP control system pressure sensor.
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

TROUBLE DIAGNOSIS FOR DTC P1448

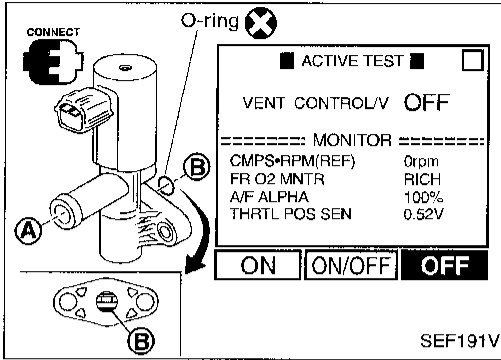
Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

① Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.



| Condition | Air passage continuity between (A) and (B) |
|----------------|--|
| VENT CONTROL/V | |
| ON | No |
| OFF | Yes |

OR



| Condition | Air passage continuity between (A) and (B) |
|---|--|
| 12V direct current supply between terminals ① and ② | No |
| No supply | Yes |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If the portion (B) is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal 62 and engine ground.

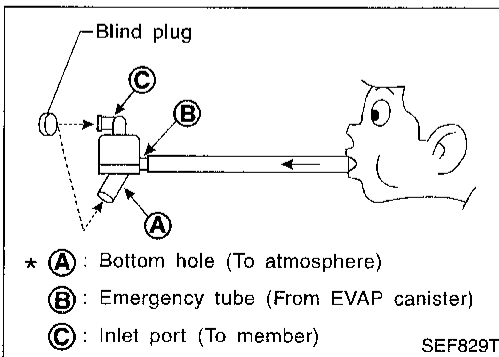
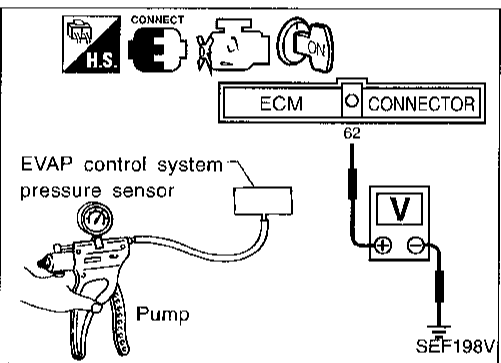
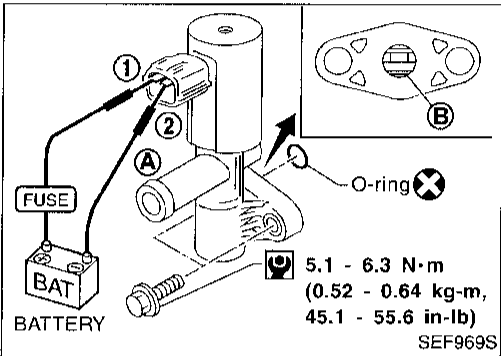
| Pressure (Relative to atmospheric pressure) | Voltage (V) |
|---|-------------|
| 0 kPa (0 mmHg, 0 inHg) | 3.0 - 3.6 |
| -9.3 kPa (-70 mmHg, -2.76 inHg) | 0.4 - 0.6 |

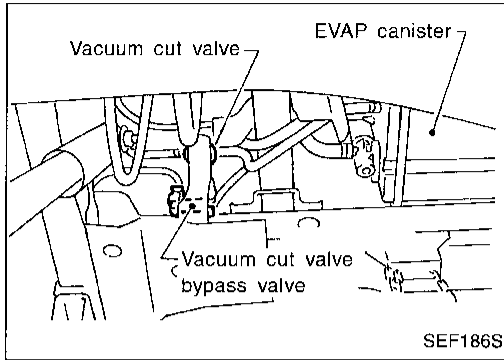
CAUTION:

- Always calibrate the vacuum pump gauge when using it.
 - Do not apply vacuum below -20 kPa (-150 mmHg, -5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).
5. If NG, replace EVAP control system pressure sensor.

Water separator

1. Check visually for insect nests in water separator air inlet.
 2. Check visually for cracks or flaws in the appearance.
 3. Check visually for cracks or flaws in the hose.
 4. Check that (A) and (C) are not clogged by blowing air into (B) with (A), and then (C) plugged.
 5. In case of NG in items 2 - 4, replace the parts.
- Do not disassemble water separator.





Vacuum Cut Valve Bypass Valve (Circuit)

COMPONENT DESCRIPTION

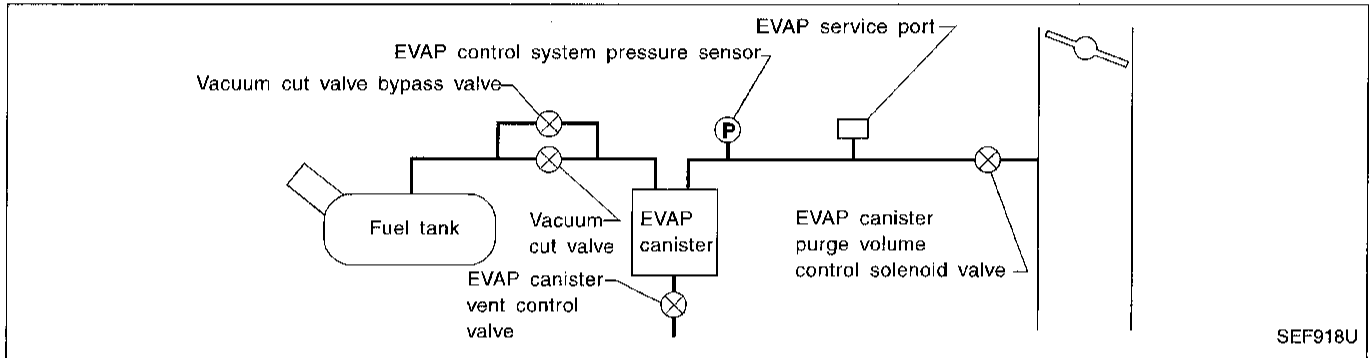
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---------------|-----------------------|---------------|
| V/CV BYPASS/V | ● Ignition switch: ON | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-------------------------------|----------------------|----------------------------|
| 120 | P/B | Vacuum cut valve bypass valve | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P1490 0801 | ● An improper voltage signal is sent to ECM through vacuum cut valve bypass valve. | <ul style="list-style-type: none"> ● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted.) ● Vacuum cut valve bypass valve |

TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

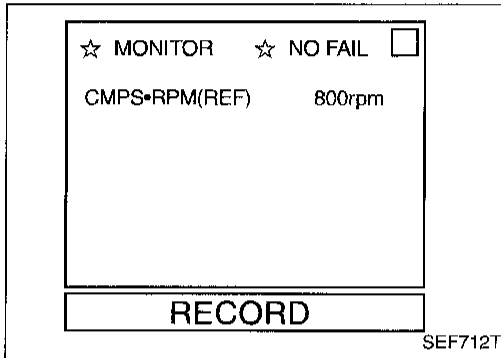
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 5 seconds.

OR



- 1) Start engine and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.

OR



- 1) Start engine and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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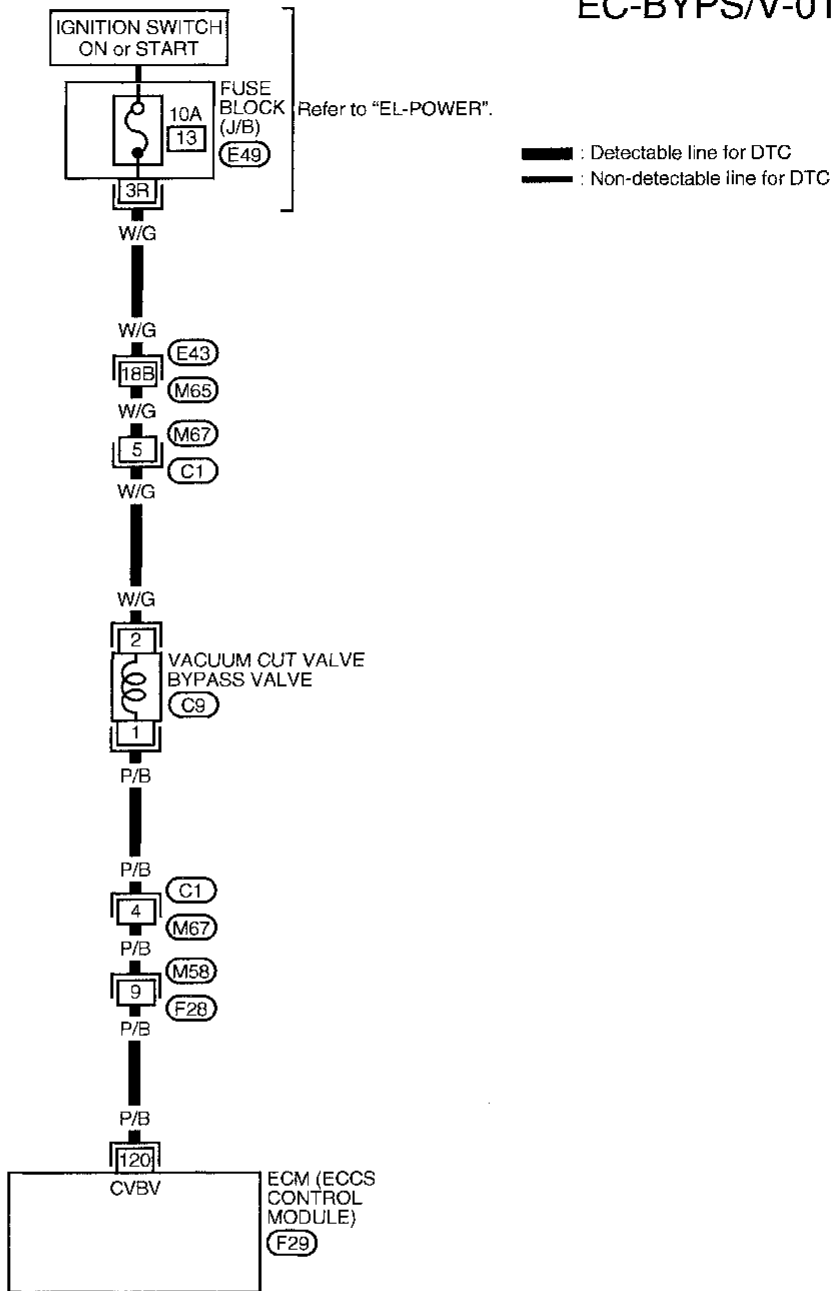
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TROUBLE DIAGNOSIS FOR DTC P1490

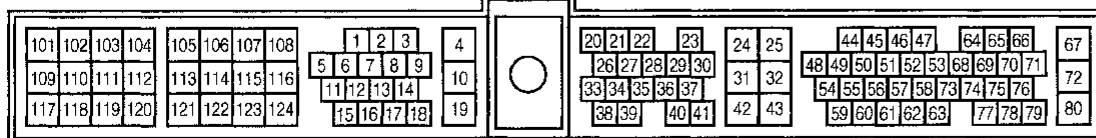
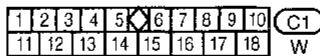
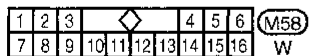
Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

EC-BYPS/V-01



Refer to last page (Foldout page).

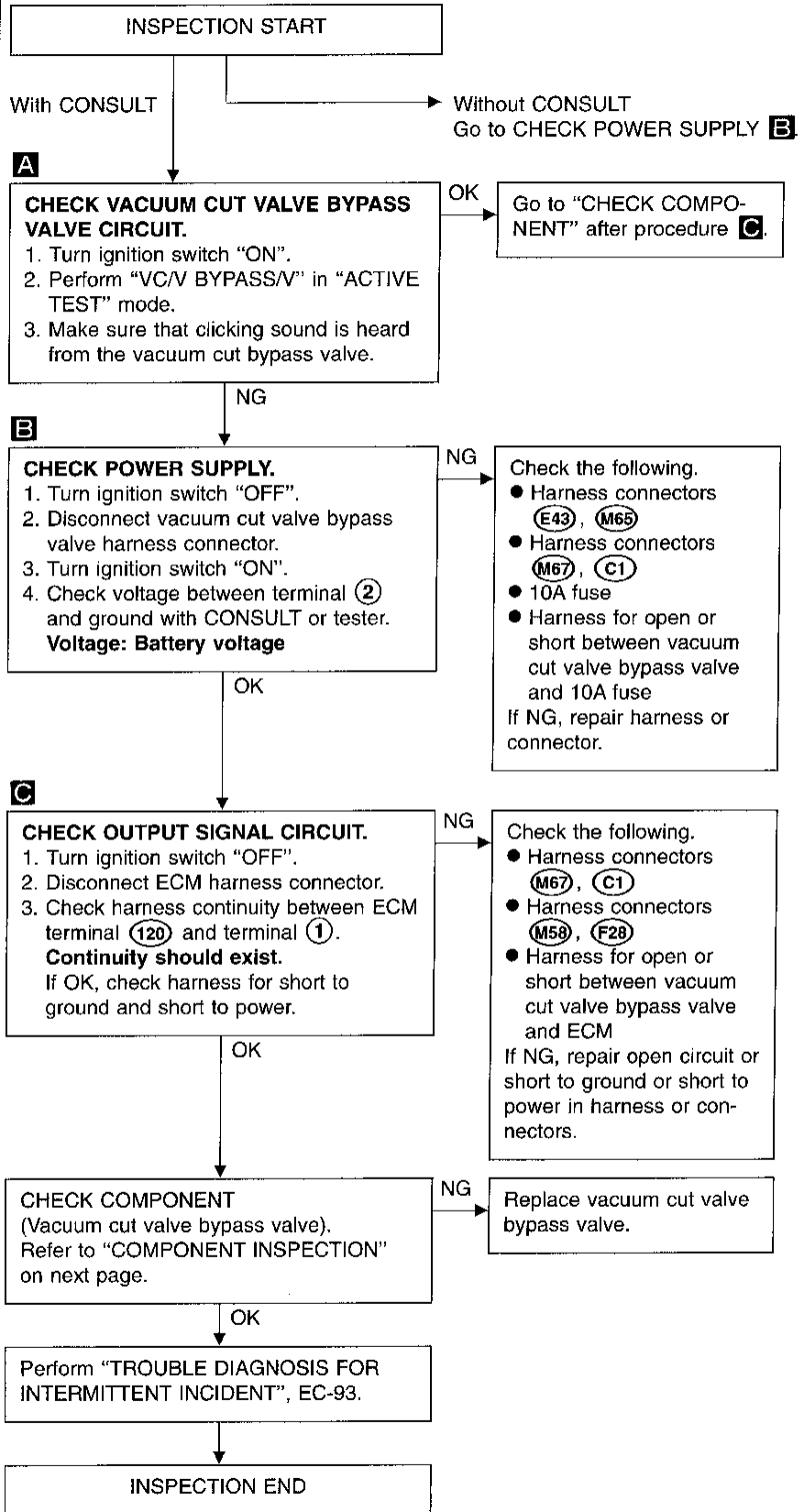
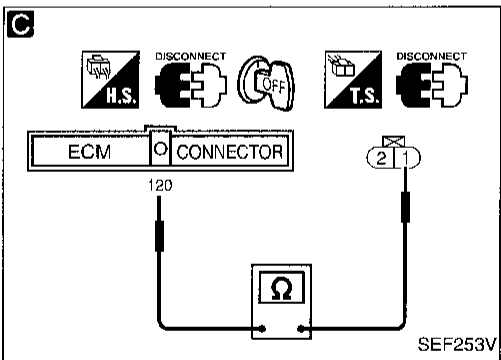
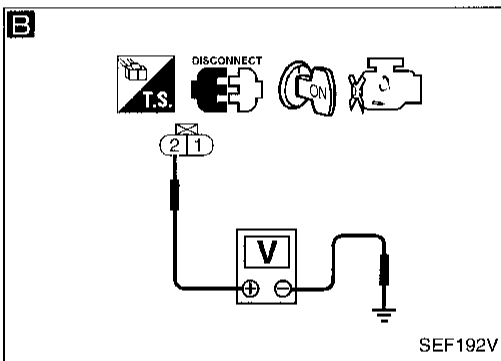
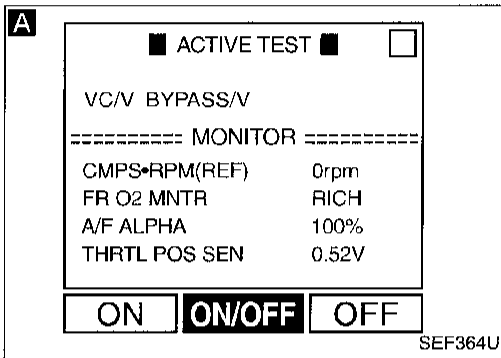
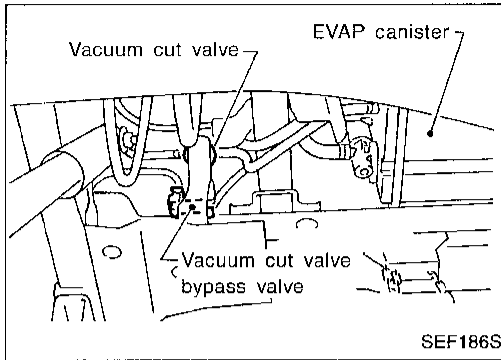
(M65) (E43)



TROUBLE DIAGNOSIS FOR DTC P1490

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

DIAGNOSTIC PROCEDURE



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TROUBLE DIAGNOSIS FOR DTC P1490

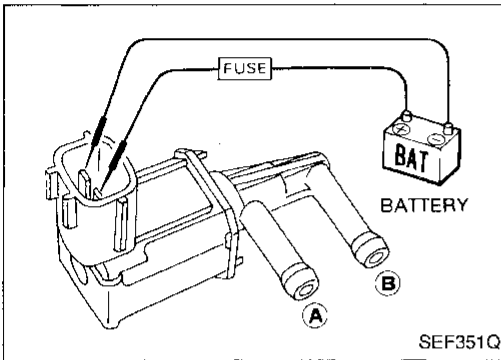
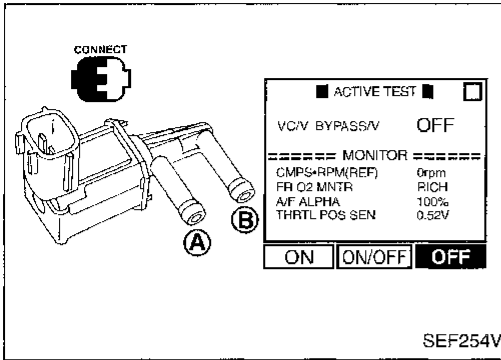
Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

Vacuum cut valve bypass valve

Check air passage continuity.

 Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.



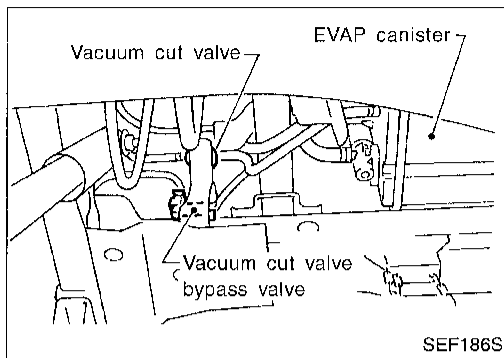
| Condition VC/V BYPASS/V | Air passage continuity between (A) and (B) |
|----------------------------|---|
| ON | Yes |
| OFF | No |

OR



| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG or operation takes more than 1 second, replace vacuum cut valve bypass valve.



Vacuum Cut Valve Bypass Valve

COMPONENT DESCRIPTION

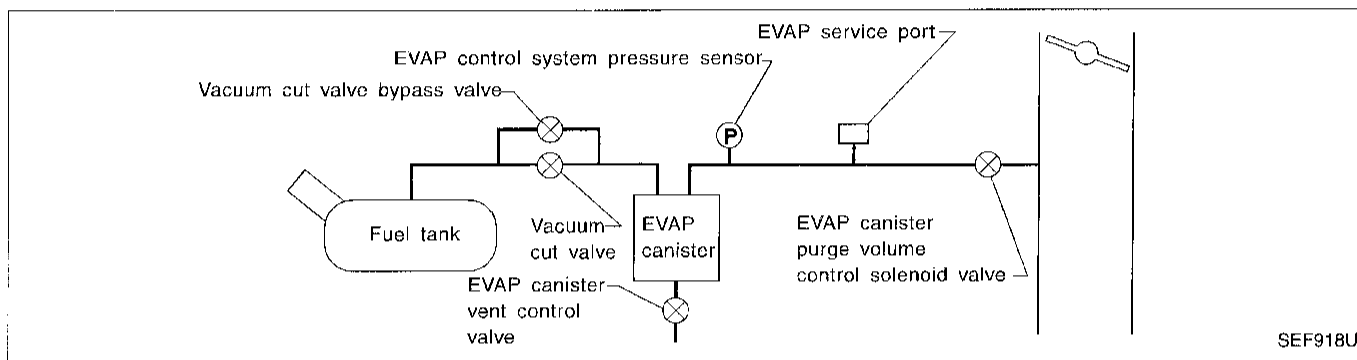
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---------------|-----------------------|---------------|
| VC/V BYPASS/V | ● Ignition switch: ON | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-------------------------------|----------------------|----------------------------|
| 120 | P/B | Vacuum cut valve bypass valve | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P1491 0311 | ● Vacuum cut valve bypass valve does not operate properly. | <ul style="list-style-type: none"> ● Vacuum cut valve bypass valve ● Vacuum cut valve ● Bypass hoses for clogging ● EVAP control system pressure sensor ● EVAP canister vent control valve ● Hose between fuel tank and vacuum cut valve clogged ● Hose between vacuum cut valve and EVAP canister clogged ● EVAP canister |

TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

- Always perform test at a temperature of 5 to 30°C (41 to 86°F).
- This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up to normal operating temperature.
- 3) Turn ignition switch "OFF" and wait at least 5 seconds.
- 4) Start engine and let it idle for at least 1 minute.
- 5) Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- 6) Touch "START".
- 7) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

**CMPS-RPM (REF): 1,000 - 2,700 rpm (A/T)
1,000 - 3,200 rpm (M/T)**

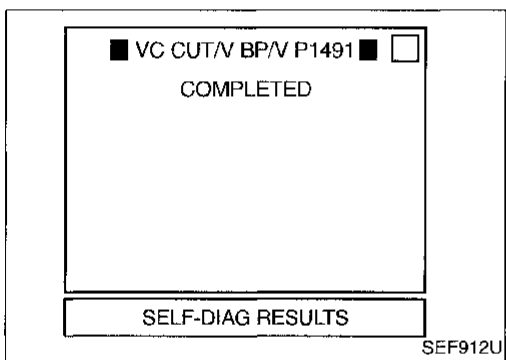
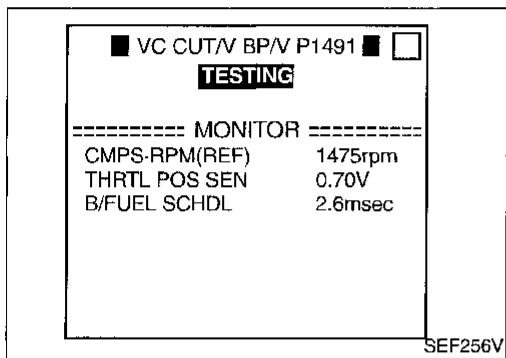
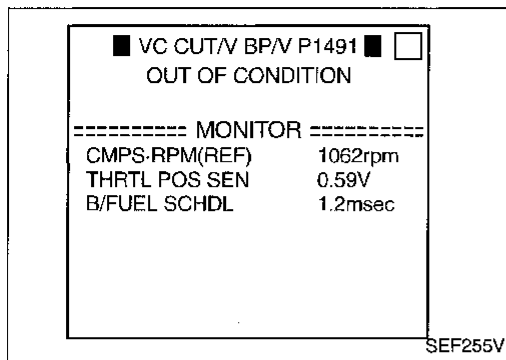
Selector lever: Suitable position

Vehicle speed: 36 - 100 km/h (22 - 62 MPH)

B/FUEL SCHDL: 1.2 - 3.4 ms

If "TESTING" is not displayed after 5 minutes, retry from step 3).

- 8) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-386.



TROUBLE DIAGNOSIS FOR DTC P1491

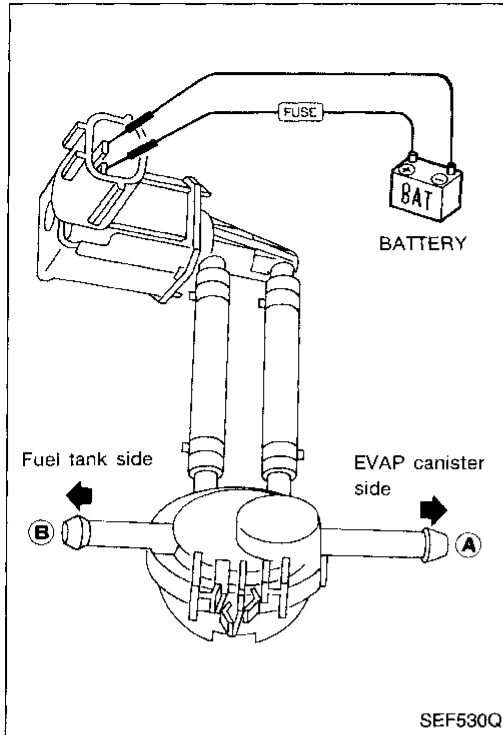
Vacuum Cut Valve Bypass Valve (Cont'd)

OR

OVERALL FUNCTION CHECK



- 1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
- 2) Apply vacuum to port (A) and check that there is no suction from port (B).
- 3) Apply vacuum to port (B) and check that there is suction from port (A).
- 4) Blow air in port (B) and check that there is a resistance to flow out of port (A).
- 5) Supply battery voltage to the terminal.
- 6) Blow air in port (A) and check that air flows freely out of port (B).
- 7) Blow air in port (B) and check that air flows freely out of port (A).



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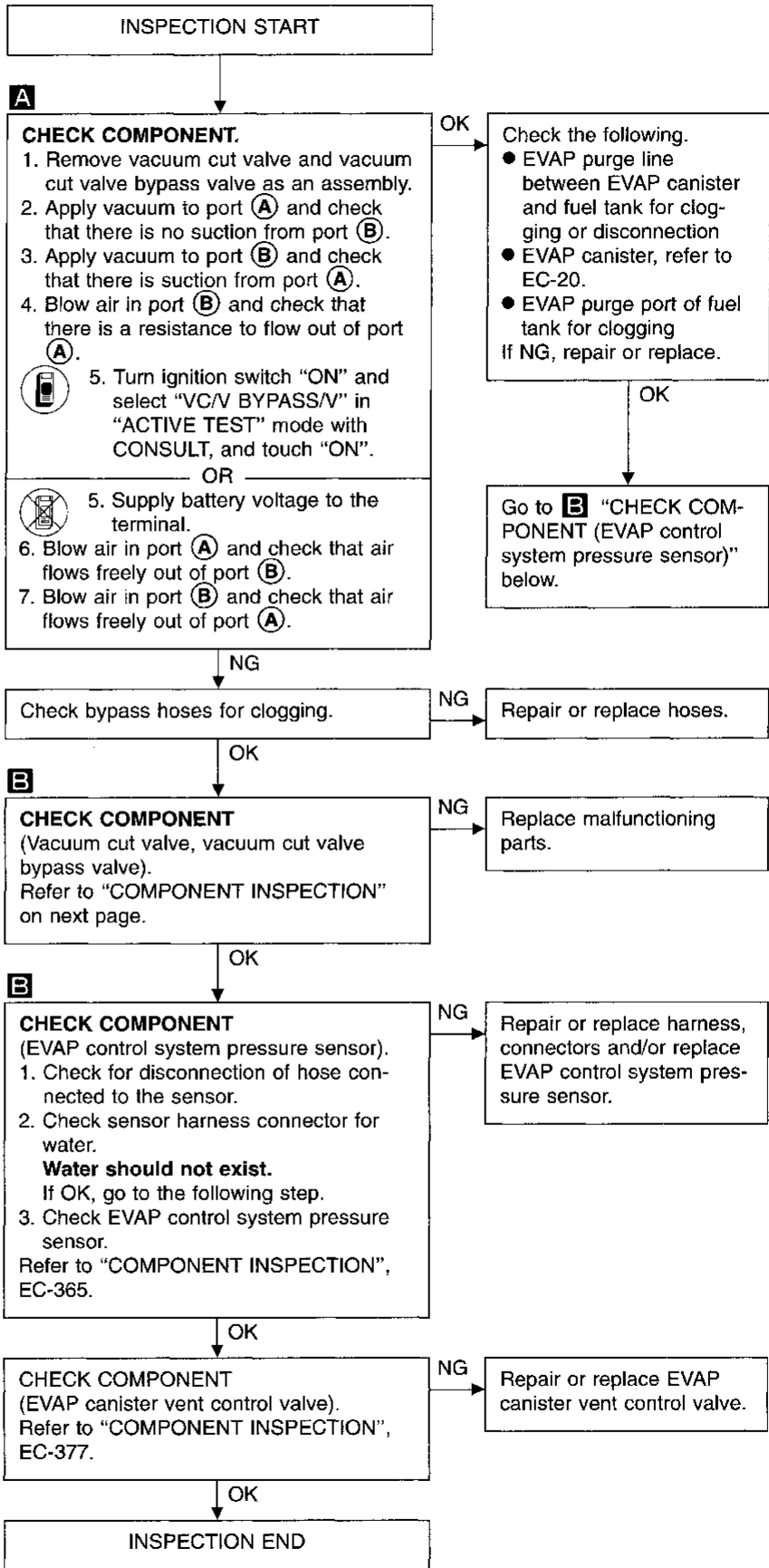
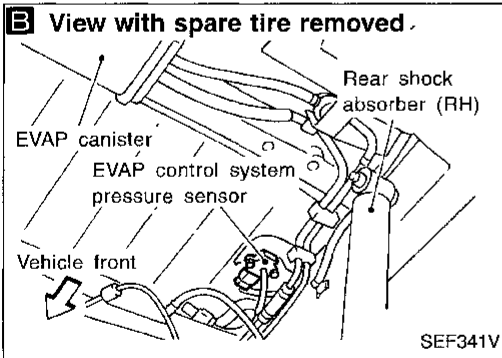
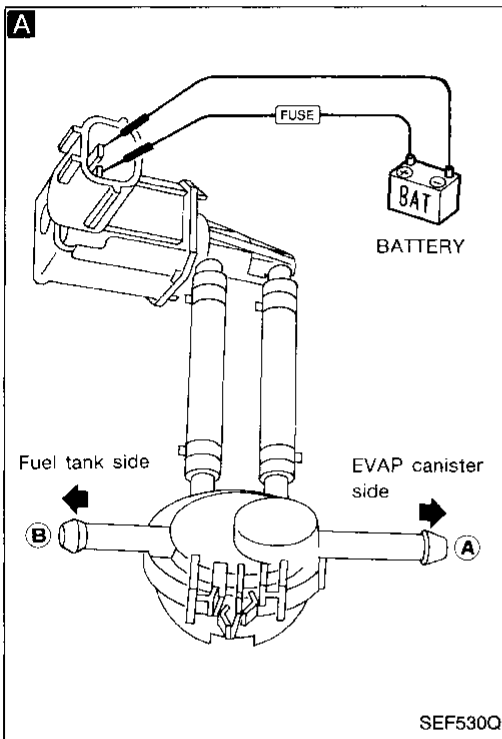
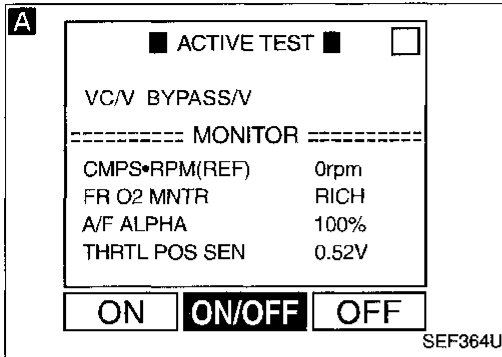
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Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC PROCEDURE



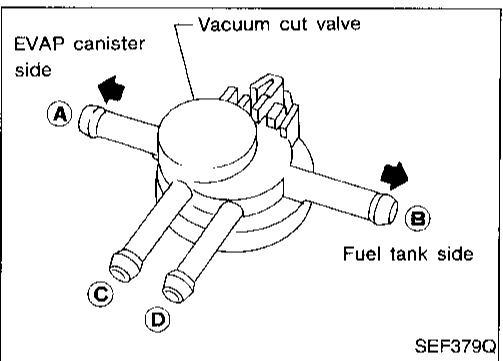
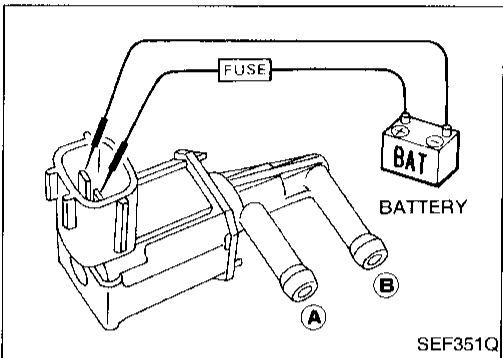
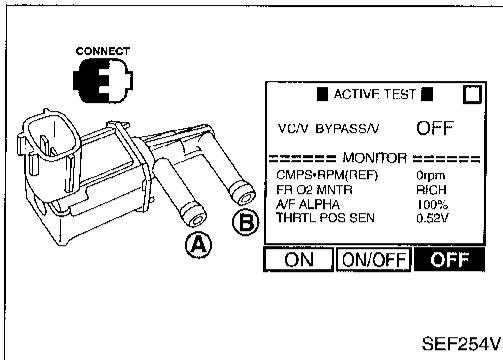
TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd) COMPONENT INSPECTION

Vacuum cut valve bypass valve

Check air passage continuity.

Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.



| Condition VC/V BYPASS/V | Air passage continuity between (A) and (B) |
|----------------------------|---|
| ON | Yes |
| OFF | No |

OR

| Condition | Air passage continuity between (A) and (B) |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG or operation takes more than 1 second, replace vacuum cut valve bypass valve.

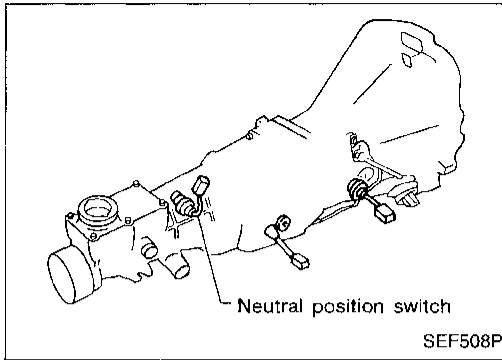
Vacuum cut valve

Check vacuum cut valve as follows:

1. Plug port (C) and (D) with fingers.
2. Apply vacuum to port (A) and check that there is no suction from port (B).
3. Apply vacuum to port (B) and check that there is suction from port (A).
4. Blow air in port (B) and check that there is a resistance to flow out of port (A).
5. Open port (C) and (D).
6. Blow air in port (A) check that air flows freely out of port (C).
7. Blow air in port (B) check that air flows freely out of port (D).

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TROUBLE DIAGNOSIS FOR DTC P1706



Park/Neutral Position Switch

COMPONENT DESCRIPTION

When the gear position is "P" (A/T models only) or "N", park/neutral position switch is "ON".
ECM detects the park/neutral position when continuity with ground exists.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|-----------------------|-------------------------------|
| P/N POSI SW | ● Ignition switch: ON | Shift lever: "P" or "N" ON |
| | | Except above OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---|--|-------------------|
| 22 | L/B | Neutral position switch (M/T models) Inhibitor switch (A/T models) | Ignition switch "ON" └ Gear position is "N" or "P". | Approximately 0V |
| | | | Ignition switch "ON" └ Except the above gear position | Approximately 5V |

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|--|
| P1706 1003 | ● The signal of the park/neutral position switch is not changed in the process of engine starting and driving. | <ul style="list-style-type: none"> ● Harness or connectors (The neutral position switch or inhibitor switch circuit is open or shorted.) ● Inhibitor switch (A/T models) ● Neutral position switch (M/T models) |

TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position Switch (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

1) Turn ignition switch "ON".

2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

| Position (Selector lever) | Known good signal |
|---------------------------------|-------------------|
| "N" and "P" (A/T only) position | ON |
| Except the above position | OFF |

If NG, go to "DIAGNOSTIC PROCEDURE", EC-391.

If OK, go to following step.

3) Select "DATA MONITOR" mode with CONSULT.

4) Start engine and warm it up to normal operating temperature.

5) Maintain the following conditions for at least 60 consecutive seconds.

CMPS•RPM (REF): 1,600 - 2,700 rpm (A/T)

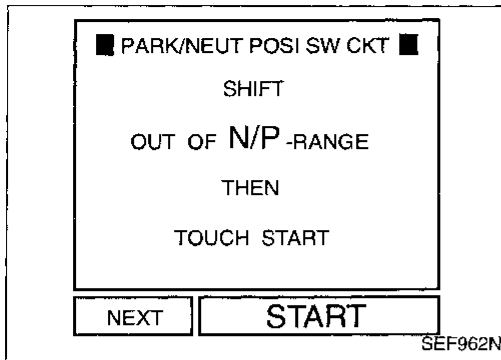
1,800 - 3,200 rpm (M/T)

COOLAN TEMP/S: More than 70°C (158°F)

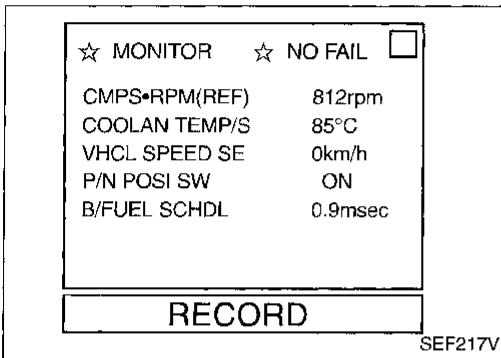
B/FUEL SCHDL: 1 - 4.8 ms

VHCL SPEED SE: 70 - 100 km/h (43 - 62 MPH)

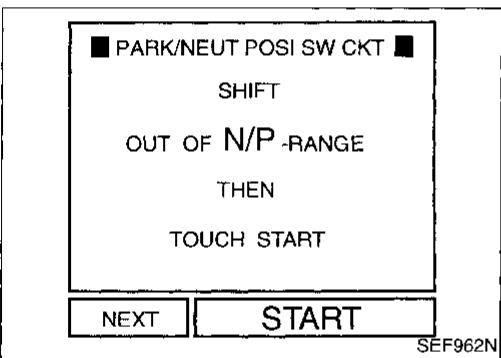
Selector lever: Suitable position



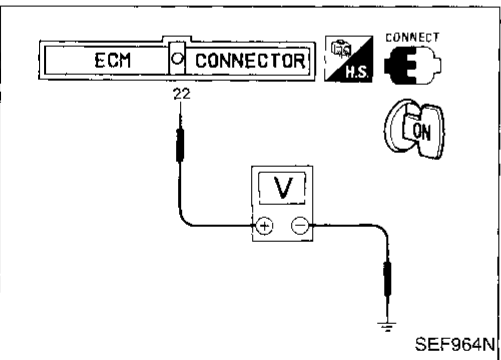
SEF962N



SEF217V



SEF962N



SEF964N

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.



1) Turn ignition switch "ON".

2) Check voltage between ECM terminal ② and body ground under the following conditions.

| Condition (Gear position) | Voltage (V) (Known good data) |
|---------------------------------|-------------------------------|
| "P" (A/T only) and "N" position | Approx. 0 |
| Except the above position | Approx. 5 |

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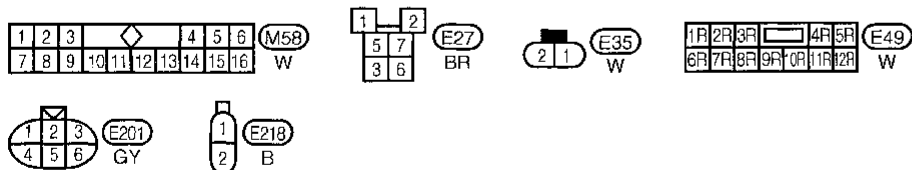
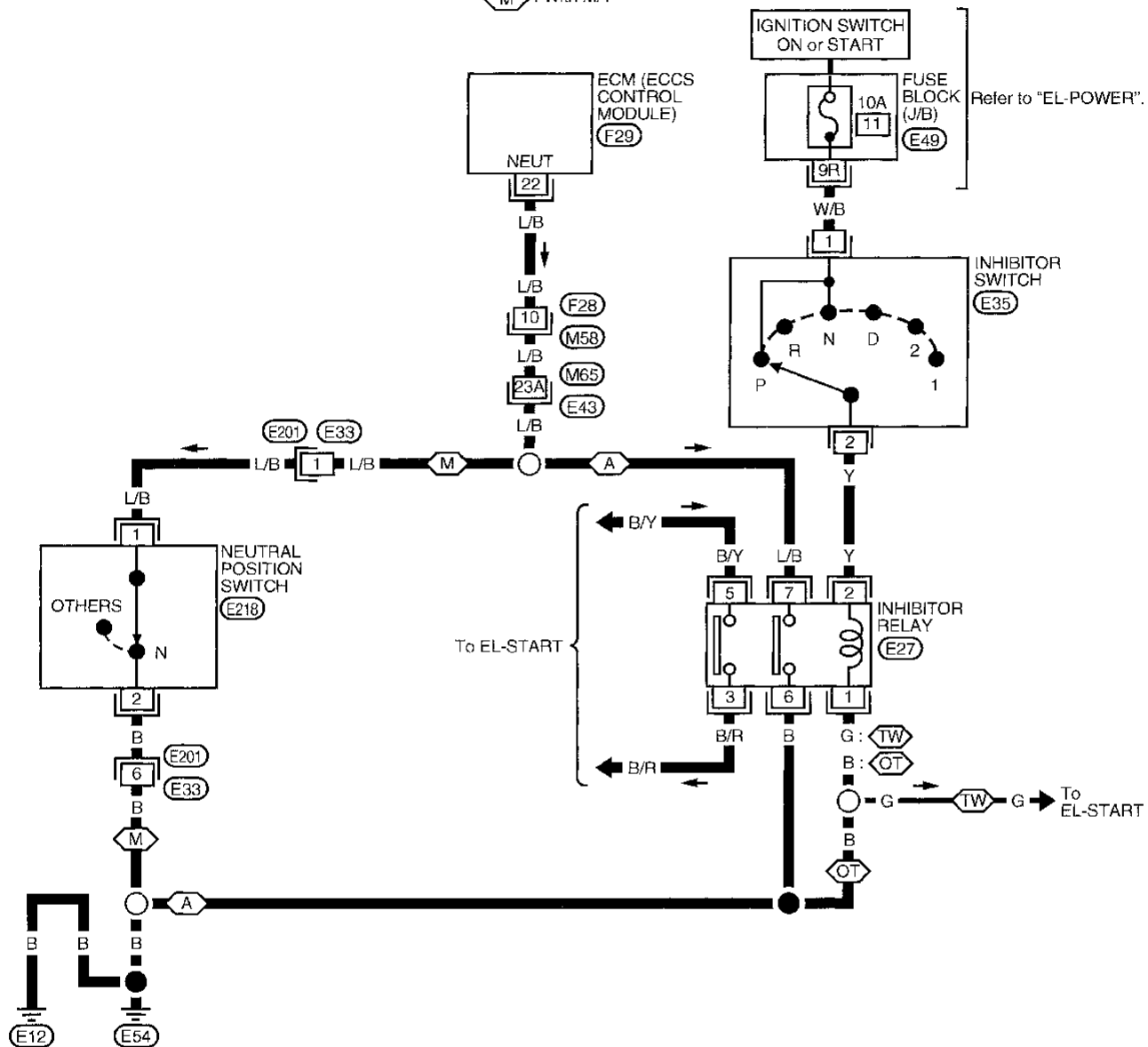
TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position Switch (Cont'd)

EC-PNP/SW-01

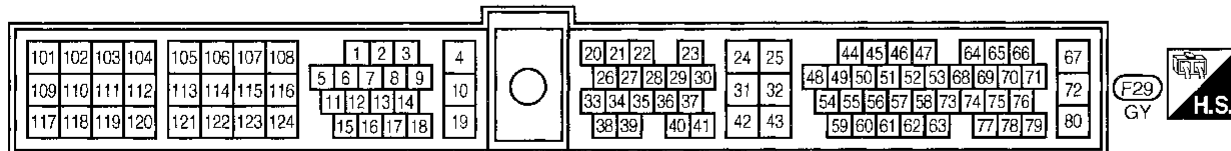
- : With theft warning system
- : Without theft warning system
- : With A/T
- : With M/T

- : Detectable line for DTC
- : Non-detectable line for DTC



Refer to last page (Foldout page).

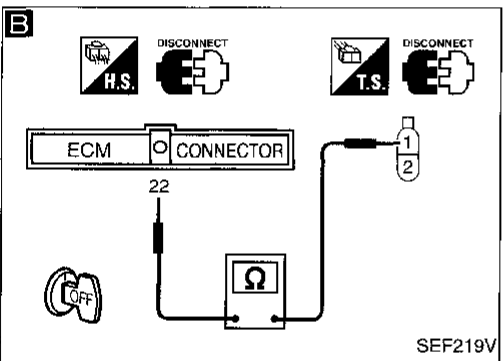
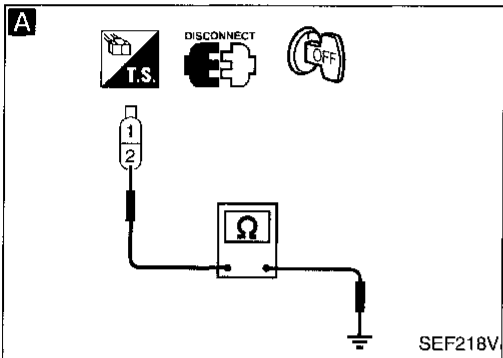
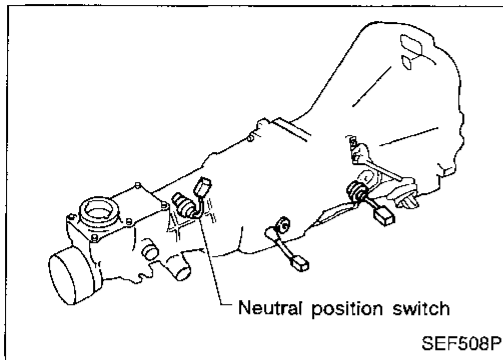
M65, E43



TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE



Neutral position switch (M/T models)

INSPECTION START

A

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect neutral position switch harness connector.
3. Check harness continuity between terminal ② and body ground.
Continuity should exist.
If OK, check harness for short to power.

NG

Check the following.

- Harness connectors (E33, E201)
- Harness for open or short between neutral position switch and body ground

If NG, repair open circuit or short to ground or short to power in harness or connectors.

B

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ② and terminal ①.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (F28, M58)
- Harness connectors (M65, E43)
- Harness connectors (E33, E201)
- Harness for open or short between ECM and neutral position switch

If NG, repair open circuit or short to ground or short to power in harness or connectors.

CHECK COMPONENT
(Neutral position switch).
Refer to MT section

NG

Replace neutral position switch.

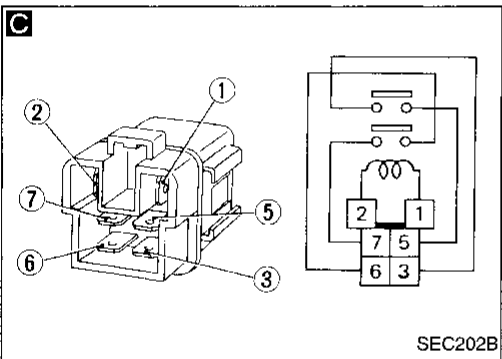
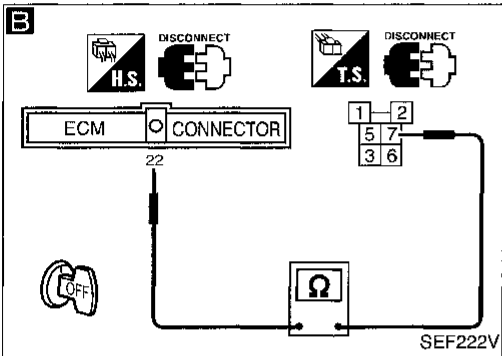
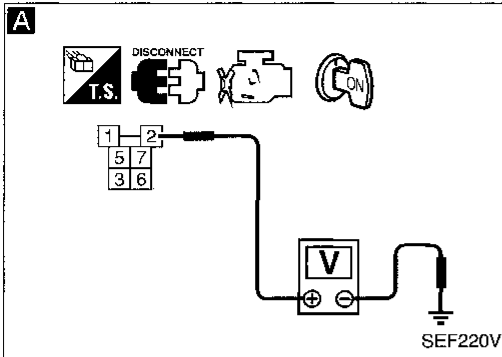
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

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TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position Switch (Cont'd)



Inhibitor switch (A/T models)

INSPECTION START

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect inhibitor switch harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
Voltage: Battery voltage

NG

Check the following.

- 10A fuse
- Harness for open or short between inhibitor switch and 10A fuse
- Harness for open or short between inhibitor relay and inhibitor switch

If NG, repair harness or connectors.

OK

CHECK COMPONENT
(Inhibitor switch).
Refer to AT section.
If NG, replace inhibitor switch.

B

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ②② and inhibitor relay terminal ⑦.

Continuity should exist.
If OK, check harness for short to ground and short to power.

NG

Check the following.

- Harness connectors (F28, M58)
- Harness connectors (M65, E43)
- Harness for open or short between ECM and inhibitor relay

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

C

INHIBITOR RELAY

1. Apply 12V direct current between relay terminals ① and ②.
2. Check continuity between relay terminals ③ and ⑤, ⑥ and ⑦.

12V (① - ②) applied:
Continuity should exist.

No voltage applied:
Continuity should not exist.

NG

Replace inhibitor relay.

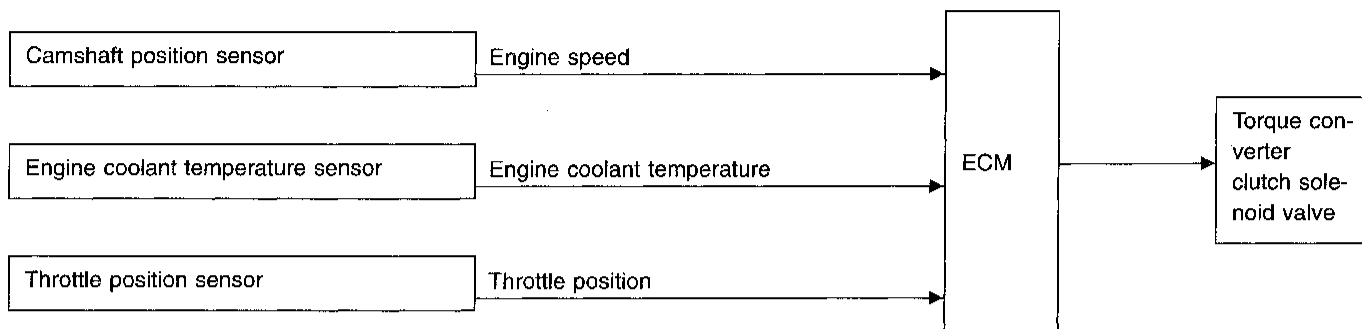
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

Torque Converter Clutch Solenoid Valve

SYSTEM DESCRIPTION



The ECM controls torque converter clutch solenoid valve to cancel the lock-up condition of A/T. When the solenoid valve is **turned on**, lock-up is **cancelled**. When the solenoid valve is turned off, A/T lock-up is operational.

Conditions for lock-up cancel:

Torque converter clutch solenoid valve is turned "ON" when;

- Throttle valve is fully closed (during idling or deceleration)
- Engine coolant temperature is below 40°C (104°F)
- Engine is stopped

Conditions for lock-up operation:

- Under 55 to 63 km/h (34 to 39 MPH) (2/8 throttle on flat road), lock-up does not operate even

when the torque converter clutch solenoid valve is "OFF".

- Over 58 to 66 km/h (36 to 41 MPH) (2/8 throttle on flat road), lock-up should operate because the torque converter clutch solenoid valve is "OFF".

To confirm vehicle lock-up, the torque converter clutch solenoid valve must be in operation ("ON" during idle and deceleration, and "OFF" during acceleration) and engine speed should drop.

When the accelerator pedal is depressed (less than 2/8) in lock-up, the engine speed should not change abruptly. If there is a big jump in engine speed, there will be no lock-up.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|----------------------------|------------------|
| TCC SOLV | • Engine: After warming up | Idle ON |
| | | 2,000 rpm OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓜ (ECM ground).

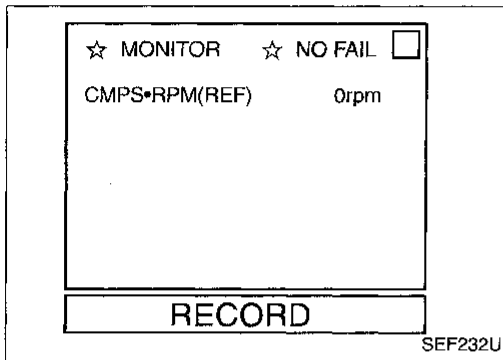
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|--|--|----------------------------|
| 115 | L/Y | Torque converter clutch solenoid valve (A/T models only) | Engine is running. └ Idle speed | Approximately 1V |
| | | | Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSIS FOR DTC P1775

Torque Converter Clutch Solenoid Valve (Cont'd)

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|--|---|
| P1775 0904 | <ul style="list-style-type: none"> ● An excessively low voltage from the solenoid is sent to ECM. | <ul style="list-style-type: none"> ● Harness or connectors (The circuit is open or shorted.) ● Torque converter clutch solenoid valve |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.

OR

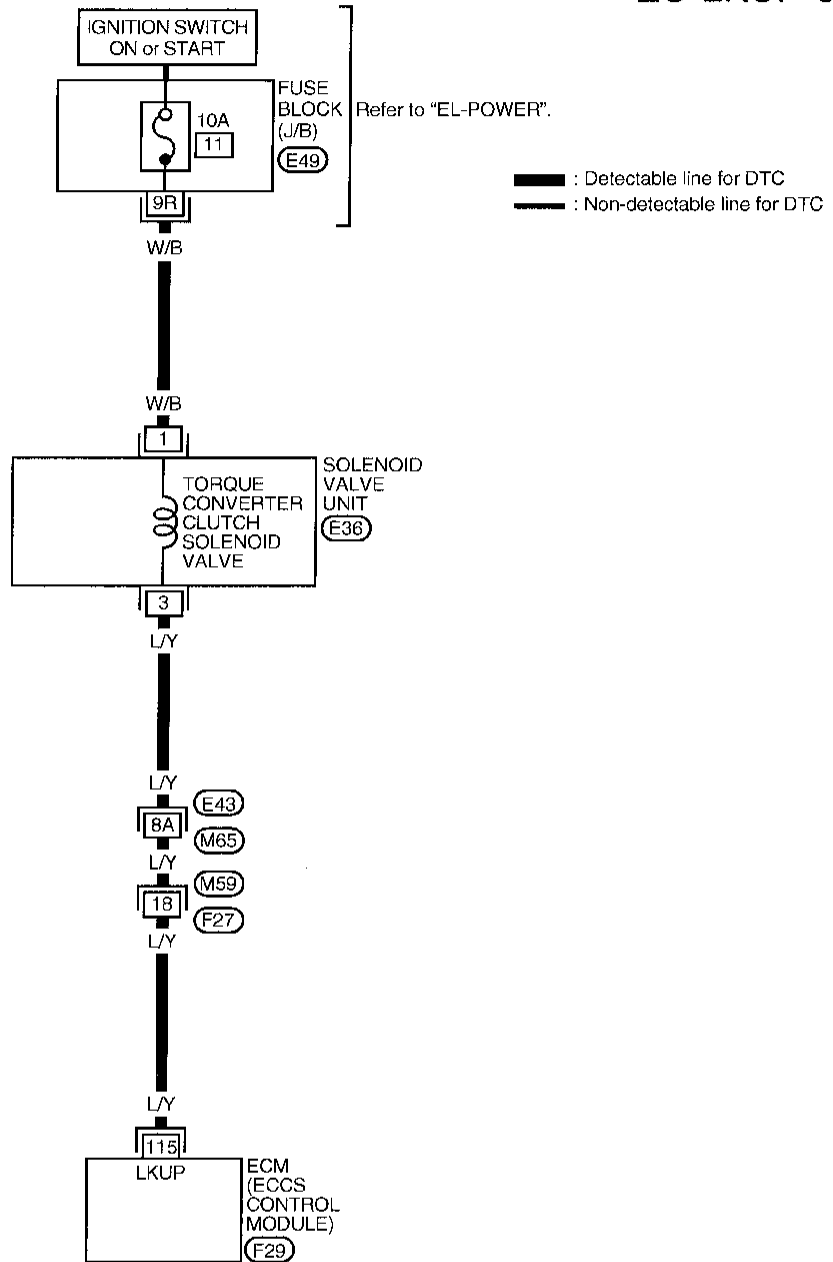


- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

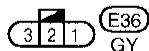
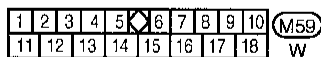
TROUBLE DIAGNOSIS FOR DTC P1775

Torque Converter Clutch Solenoid Valve (Cont'd)

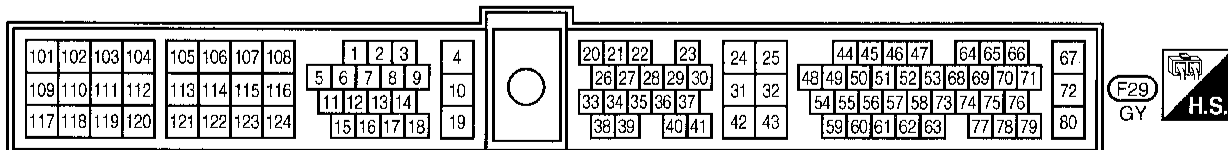
EC-LKUP-01



Refer to last page (Foldout page).

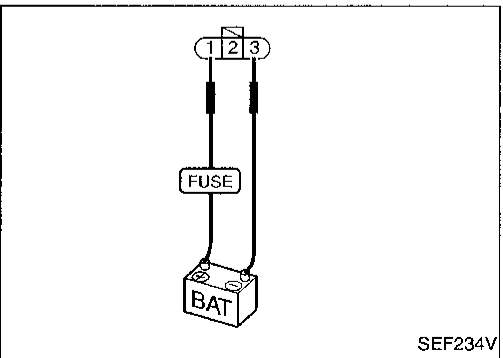
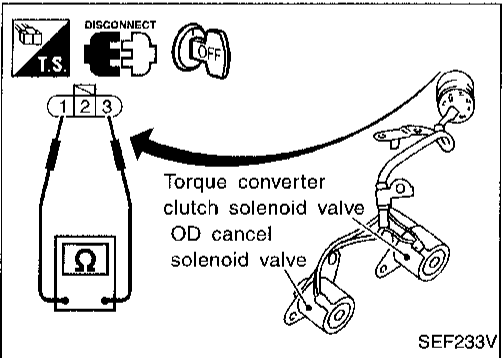
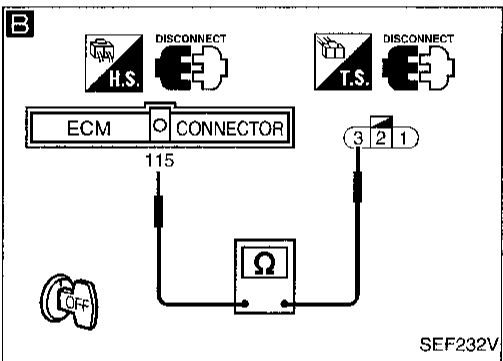
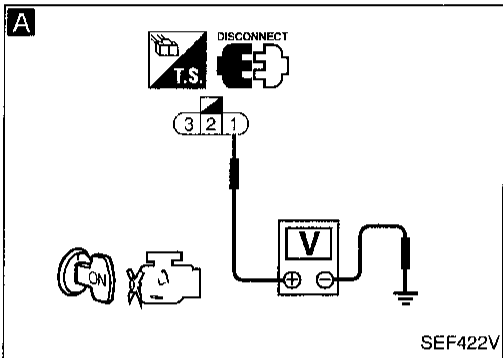
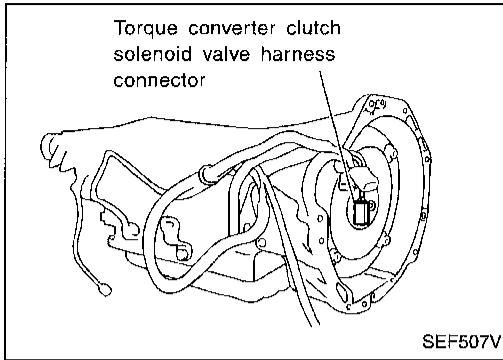


(M65), (E43)



Torque Converter Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK POWER SUPPLY.

1. Disconnect torque converter clutch solenoid valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG

Check the followings.

- 10A fuse
- Harness continuity between torque converter clutch solenoid valve and 10A fuse

If NG, repair harness or connectors.

OK

B

CHECK OUTPUT SIGNAL CIRCUIT.

2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑪⑮ and terminal ③.

Continuity should exist.

If OK, check harness for short.

NG

Check the followings.

- Harness connectors ④③, ④⑤
- Harness connectors ④⑤⑨, ④②⑦
- Harness continuity between torque converter clutch solenoid valve and ECM

If NG, repair open circuit, short to ground or short to power in harness or connectors.

OK

CHECK COMPONENT
(Torque converter clutch solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG

Replace torque converter clutch solenoid valve.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

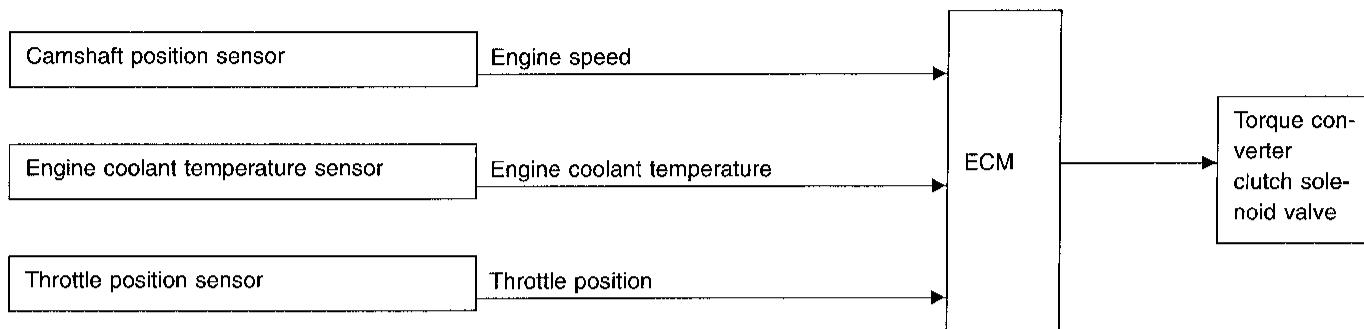
COMPONENT INSPECTION

Torque converter clutch solenoid valve

1. Check resistance between torque converter clutch solenoid valve terminals ① and ③.
Resistance: Approximately 25Ω [at 25°C (77°F)]
2. Remove torque converter clutch solenoid valve. Refer to "ON-VEHICLE SERVICE" in AT section.
3. Supply the solenoid valve terminals ① and ③ with battery voltage and check the solenoid valve operation.
Torque converter clutch solenoid valve should be operated.
4. If NG, replace torque converter clutch solenoid valve.

Torque Converter Clutch Solenoid Valve

SYSTEM DESCRIPTION



The ECM controls torque converter clutch solenoid valve to cancel the lock-up condition of A/T. When the solenoid valve is **turned on**, lock-up is **cancelled**. When the solenoid valve is turned off, A/T lock-up is operational.

Conditions for lock-up cancel:

Torque converter clutch solenoid valve is turned "ON" when;

- Throttle valve is fully closed (during idling or deceleration)
- Engine coolant temperature is below 40°C (104°F)
- Engine is stopped

Conditions for lock-up operation:

- Under 55 to 63 km/h (34 to 39 MPH) (2/8 throttle on flat road), lock-up does not operate even

when the torque converter clutch solenoid valve is "OFF".

- Over 58 to 66 km/h (36 to 41 MPH) (2/8 throttle on flat road), lock-up should operate because the torque converter clutch solenoid valve is "OFF".

To confirm vehicle lock-up, the torque converter clutch solenoid valve must be in operation ("ON" during idle and deceleration, and "OFF" during acceleration) and engine speed should drop.

When the accelerator pedal is depressed (less than 2/8) in lock-up, the engine speed should not change abruptly. If there is a big jump in engine speed, there will be no lock-up.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|----------------------------|---------------|
| TCC SOL/V | • Engine: After warming up | Idle |
| | | 2,000 rpm |
| | | ON |
| | | OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and Ⓣ (ECM ground).

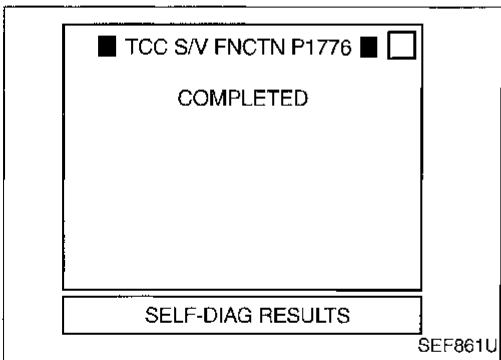
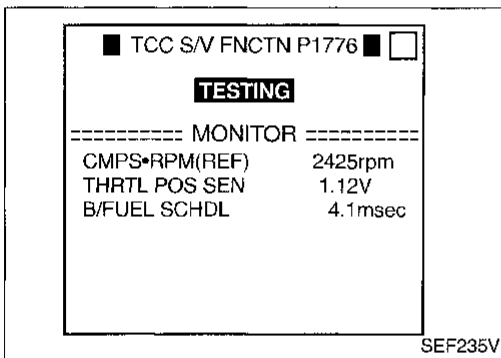
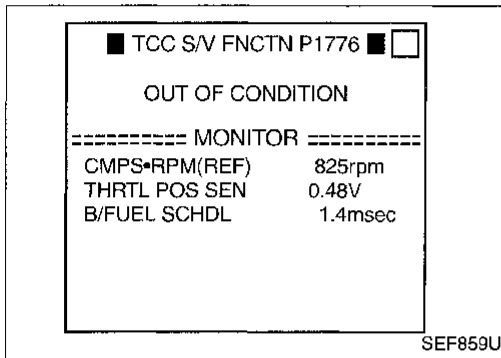
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---------------|------------|--|--|----------------------------|
| 115 | L/Y | Torque converter clutch solenoid valve (A/T models only) | Engine is running. | Approximately 1V |
| | | | └ Idle speed | |
| | | | Engine is running. (Warm-up condition) | BATTERY VOLTAGE (11 - 14V) |
| | | | └ Engine speed is 2,000 rpm. | |

TROUBLE DIAGNOSIS FOR DTC P1776

Torque Converter Clutch Solenoid Valve (Cont'd)

ON BOARD DIAGNOSIS LOGIC

| Diagnostic Trouble Code No. | Malfunction is detected when | Check Items (Possible Cause) |
|-----------------------------|---|--|
| P1776 0513 | <ul style="list-style-type: none"> ● A/T torque converter slip is occurred in lock-up condition. | <ul style="list-style-type: none"> ● Torque converter clutch solenoid valve ● A/T hydraulic control system ● Torque converter |



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

TESTING CONDITION:

Always perform the test at a temperature of -10°C (14°F) or higher.



- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Start engine.
- 4) Select "TCC S/V FNCTN P1776" of "A/T (TCC S/V)" in "DTC WORK SUPPORT" mode with CONSULT.
- 5) Touch "START".
- 6) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 20 seconds.)

Selector lever: D (OD "ON")

Vehicle speed: 76 - 100 km/h (47 - 62 MPH)

**CMPS·RPM (REF): Less than 2,150 rpm (Single cab model)
Less than 2,300 rpm (King cab model)**

B/FUEL SCHDL: 2.5 - 5 ms

THRTL POS SEN: Less than 1.3V

If "TESTING" is not displayed after 5 minutes, retry from step 2).

- 7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".

If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-400.


OR



- 1) Start engine and warm it up to normal operating temperature.
- 2) Perform test drive in "D" position (OD "ON") at least 20 consecutive seconds under the following conditions.

TROUBLE DIAGNOSIS FOR DTC P1776

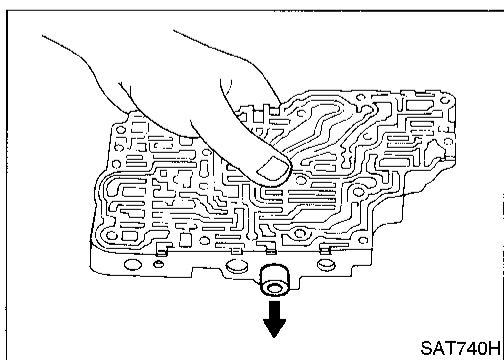
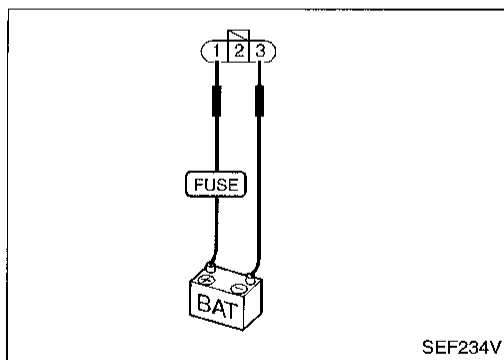
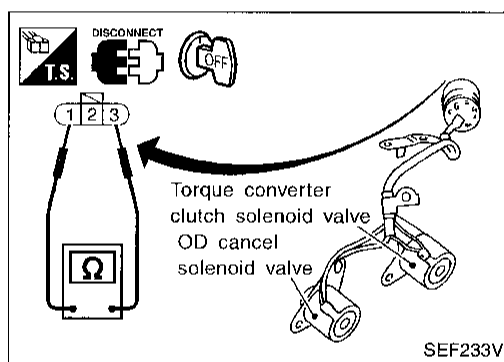
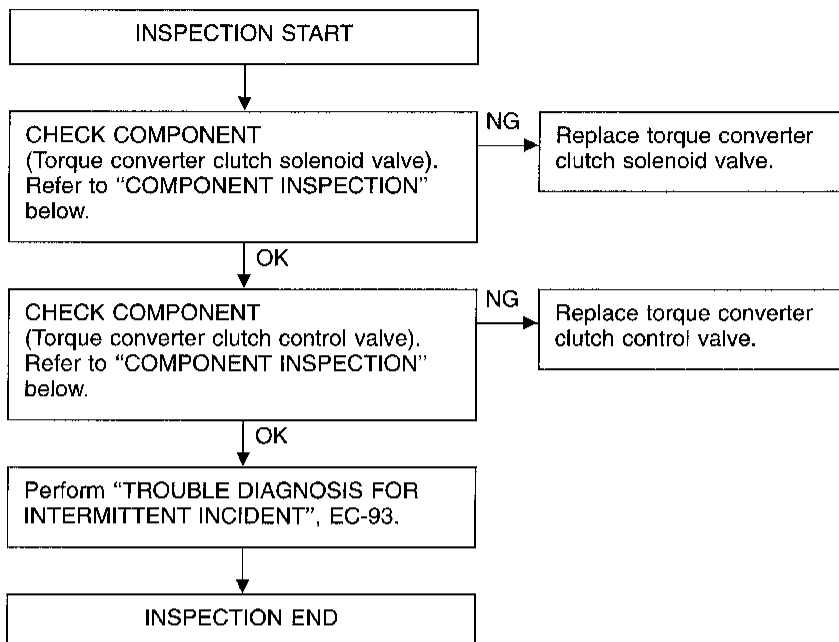
Torque Converter Clutch Solenoid Valve (Cont'd)

| | | |
|---|---|-----|
| | | GI |
| | Engine speed: Less than 2,150 rpm (Single cab model) | MA |
| | Less than 2,300 rpm (King cab model) | |
| | Vehicle speed: 76 - 100 km/h (47 - 62 MPH) | EM |
| | 3) Select MODE 7 with GST. | |
| | OR | |
|  | 1) Start engine and warm it up to normal operating temperature. | LC |
| | 2) Perform test drive in "D" position (OD "ON") at least 20 consecutive seconds under the following conditions. | EC |
| | Engine speed: Less than 2,150 rpm (Single cab model) | |
| | Less than 2,300 rpm (King cab model) | FE |
| | Vehicle speed: 76 - 100 km/h (47 - 62 MPH) | |
| | 3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON". | CL |
| | 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. | MT |
| | | AT |
| | | TF |
| | | PD |
| | | FA |
| | | RA |
| | | BR |
| | | ST |
| | | RS |
| | | BT |
| | | HA |
| | | EL |
| | | IDX |

TROUBLE DIAGNOSIS FOR DTC P1776

Torque Converter Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



COMPONENT INSPECTION

Torque converter clutch solenoid valve

1. Check resistance between torque converter clutch solenoid valve terminals ① and ③.

Resistance: Approximately 25Ω [at 25°C (77°F)]

2. Remove torque converter clutch solenoid valve. Refer to "ON-VEHICLE SERVICE" in AT section.
3. Supply the solenoid valve terminals ① and ③ with battery voltage and check the solenoid valve operation.

Torque converter clutch solenoid valve should be operated.

4. If NG, replace torque converter clutch solenoid valve.

Torque converter clutch control valve

1. Disassemble torque converter clutch control valve assembly. Refer to "REPAIR FOR COMPONENT PARTS" on AT section.
2. Check torque converter clutch control valve.
 - Valve, and sleeve slide along valve bore under their own weight.
 - Valve, and sleeve are free from burrs, dents and scratches.
 - Control valve springs are free from damage, deformation and fatigue.
 - Hydraulic line is free from obstacles.
3. If NG, replace torque converter clutch control valve.

Overheat

ON BOARD DIAGNOSIS LOGIC

If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.

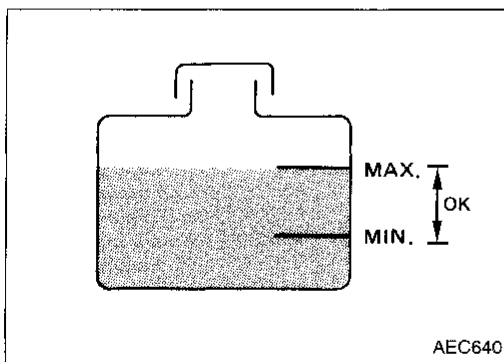
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

| Diagnostic trouble code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|-----------------------------|--|--|
| OVERHEAT 0208 | <ul style="list-style-type: none"> ● Engine coolant temperature reaches an abnormally high temperature. | <ul style="list-style-type: none"> ● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat <p>For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-403.</p> |

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

- a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").
- b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.



OVERALL FUNCTION CHECK

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

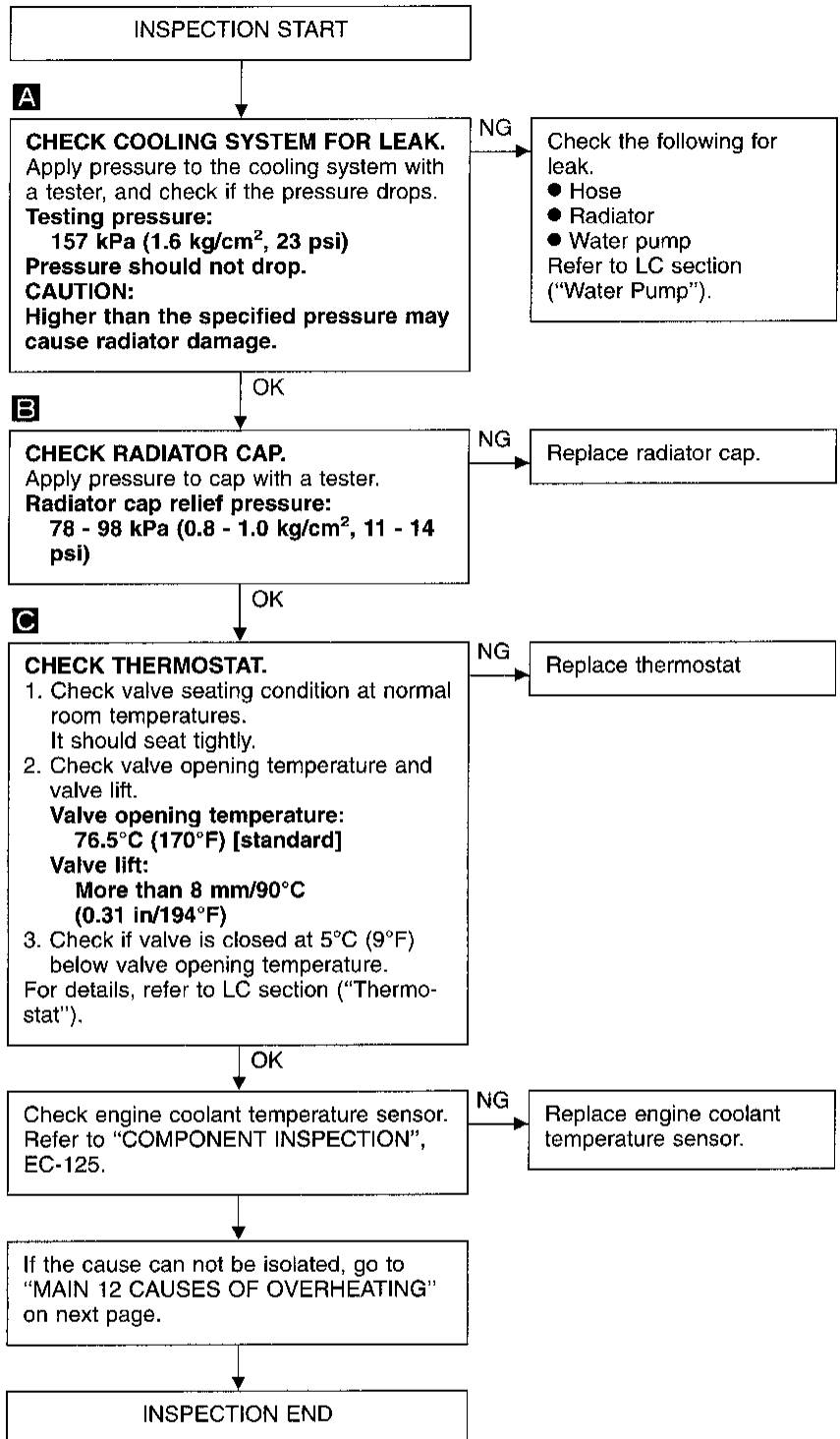
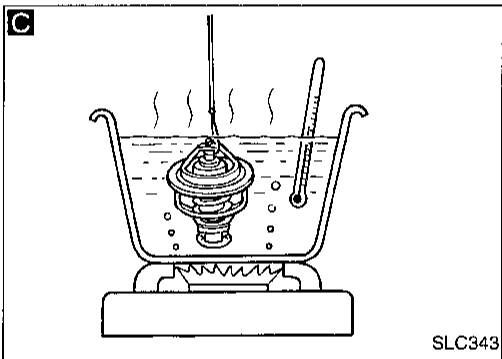
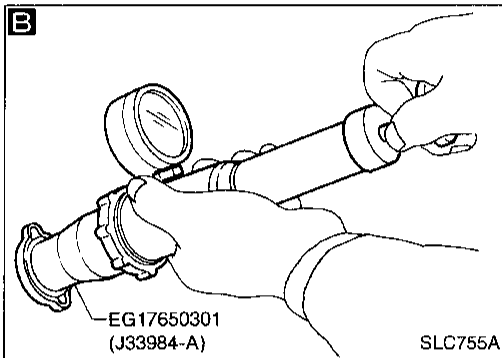
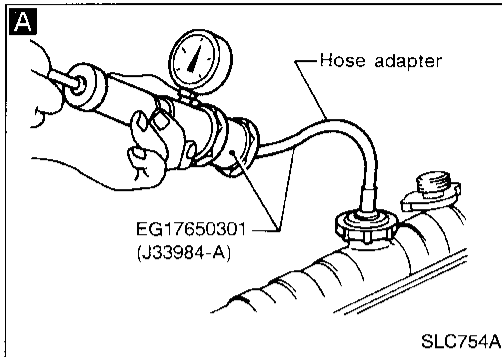
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

- 1) Check the coolant level in the reservoir tank and radiator. **Allow engine to cool before checking coolant level.** If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE" on next page.
- 2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE" on next page.

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

DIAGNOSTIC PROCEDURE



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

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform "OVERALL FUNCTION CHECK".

TROUBLE DIAGNOSIS FOR OVERHEAT

Overheat (Cont'd)

MAIN 12 CAUSES OF OVERHEATING

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|--------|------|--|--|---|---|
| OFF | 1 | <ul style="list-style-type: none"> ● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper | ● Visual | No blocking | — |
| | 2 | ● Coolant mixture | ● Coolant tester | 50 - 50% coolant mixture | See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section. |
| | 3 | ● Coolant level | ● Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section. |
| | 4 | ● Radiator cap | ● Pressure tester | 78 - 98 kPa (0.8 - 1.0 kg/cm ² , 11 - 14 psi) 59 - 98 kPa (0.6 - 1.0 kg/cm ² , 9 - 14 psi) (Limit) | See "System Check", "ENGINE COOLING SYSTEM" in LC section. |
| ON*2 | 5 | ● Coolant leaks | ● Visual | No leaks | See "System Check", "ENGINE COOLING SYSTEM" in LC section. |
| ON*2 | 6 | ● Thermostat | ● Touch the upper and lower radiator hoses | Both hoses should be hot | See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section. |
| ON*1 | 7 | ● Cooling fan | ● CONSULT | Operating | See "Cooling Fan", "ENGINE COOLING SYSTEM" in LC section. |
| OFF | 8 | ● Combustion gas leak | ● Color checker chemical tester 4 Gas analyzer | Negative | — |
| ON*3 | 9 | ● Coolant temperature gauge | ● Visual | Gauge less than 3/4 when driving | — |
| | | ● Coolant overflow to reservoir tank | ● Visual | No overflow during driving and idling | See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section. |
| OFF*4 | 10 | ● Coolant return from reservoir tank to radiator | ● Visual | Should be initial level in reservoir tank | See "ENGINE MAINTENANCE" in MA section. |
| OFF | 11 | ● Cylinder head | ● Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | See "Inspection", "CYLINDER HEAD" in EM section. |
| | 12 | ● Cylinder block and pistons | ● Visual | No scuffing on cylinder walls or piston | See "Inspection", "CYLINDER BLOCK" in EM section. |

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

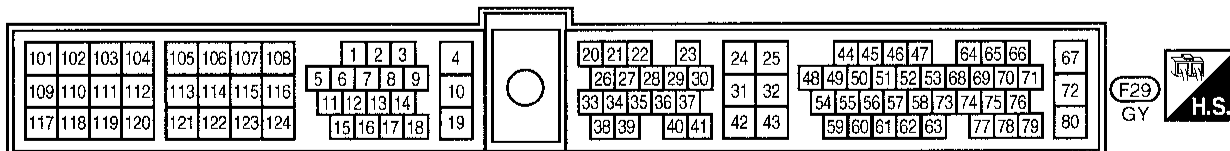
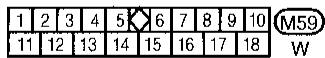
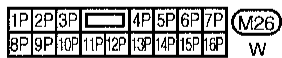
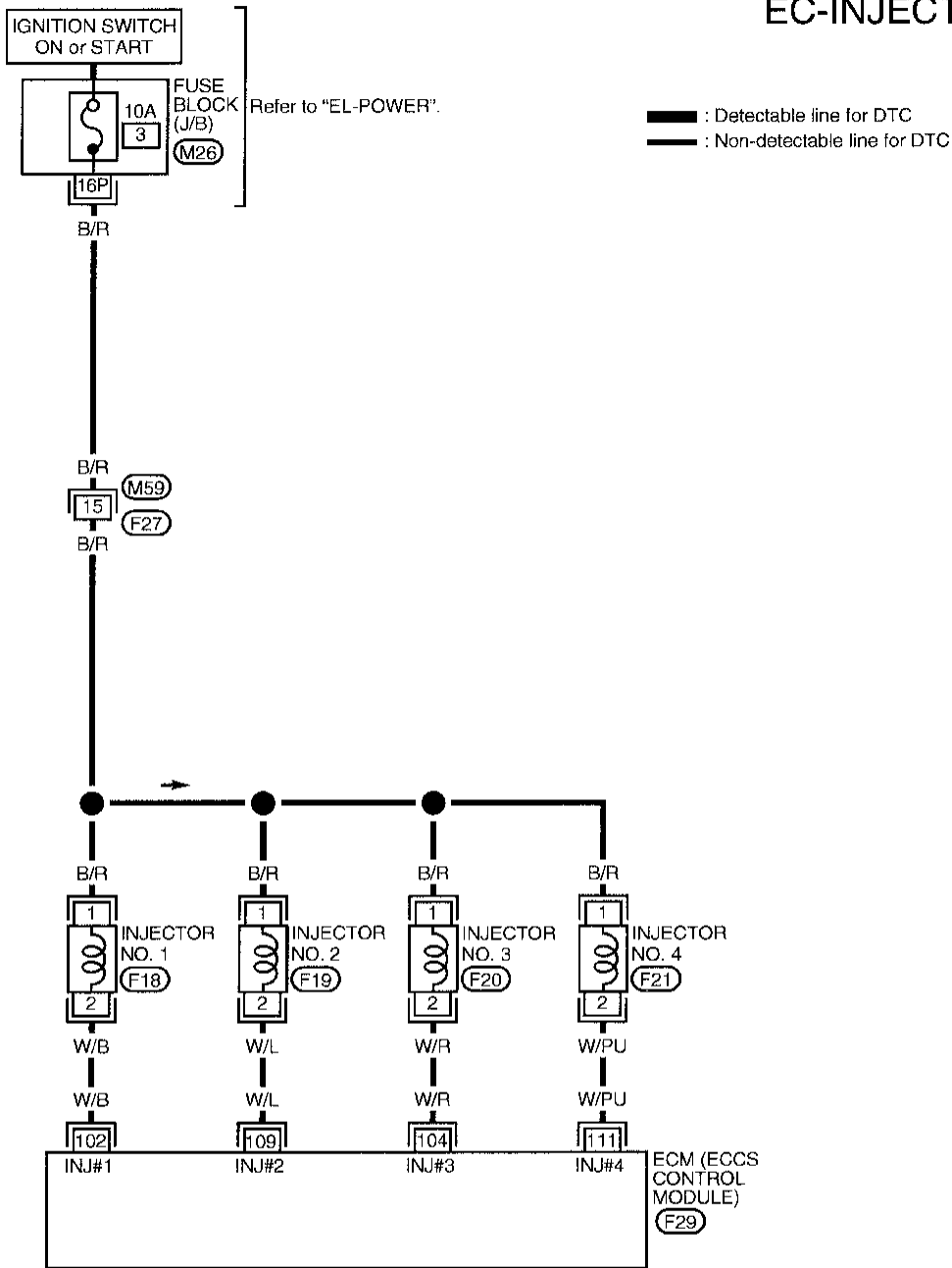
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to "OVERHEATING CAUSE ANALYSIS" in LC section.

Injector

EC-INJECT-01

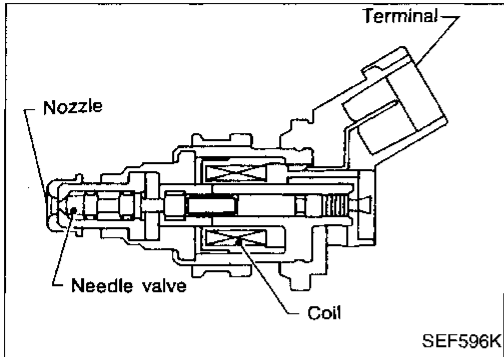


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd)

COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.



ECM TERMINALS AND REFERENCE VALUE

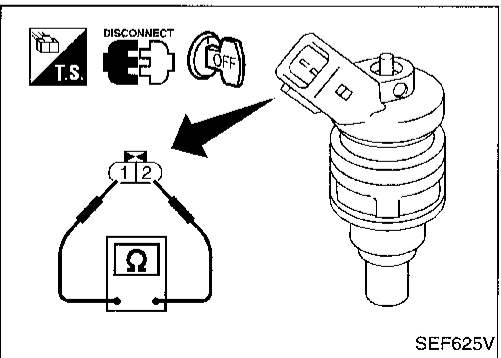
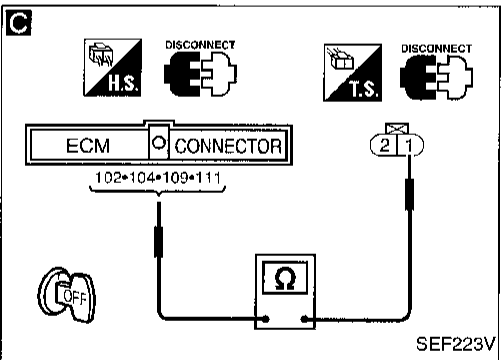
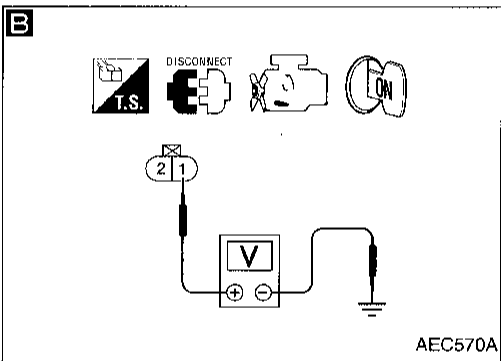
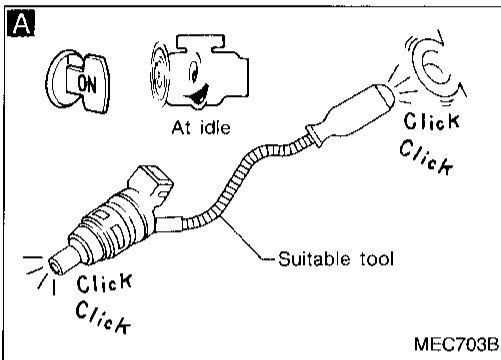
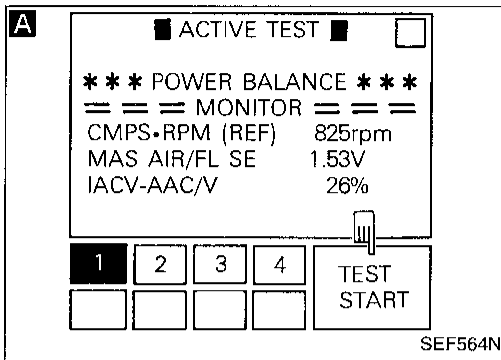
Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|----------------|--|------------------------------------|
| 102 | W/B | Injector No. 1 | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 104 | W/R | Injector No. 3 | | |
| 109 | W/L | Injector No. 2 | <div style="border: 1px solid black; padding: 2px;">Engine is running.</div> (Warm-up condition) Engine speed is 2,000 rpm. | BATTERY VOLTAGE (11 - 14V) |
| 111 | W/PU | Injector No. 4 | | |

GI
MA
EM
LC
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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Injector (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

A **CHECK OVERALL FUNCTION.** **OK** → INSPECTION END

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

- OR
1. Start engine.
 2. Listen to each injector operating sound.
Clicking noise should be heard.

B **CHECK POWER SUPPLY.** **NG** → Check the following.

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
Voltage: Battery voltage

- Harness connectors (F27, M59)
 - 10A fuse
 - Harness for open or short between injector and fuse
- If NG, repair harness or connectors.

C **CHECK OUTPUT SIGNAL CIRCUIT.** **NG** → Repair open circuit, short to ground or short to power in harness or connectors.

1. Turn ignition switch "OFF".
 2. Disconnect ECM harness connector.
 3. Check harness continuity between injector harness connector terminal ① and ECM terminals ⑩②, ⑩④, ⑩⑨, ⑩⑪.
- Continuity should exist.**
If OK, check harness for short to ground and short to power.

CHECK COMPONENT (Injector). **NG** → Replace injector.

Refer to "COMPONENT INSPECTION" below.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-93.

INSPECTION END

COMPONENT INSPECTION

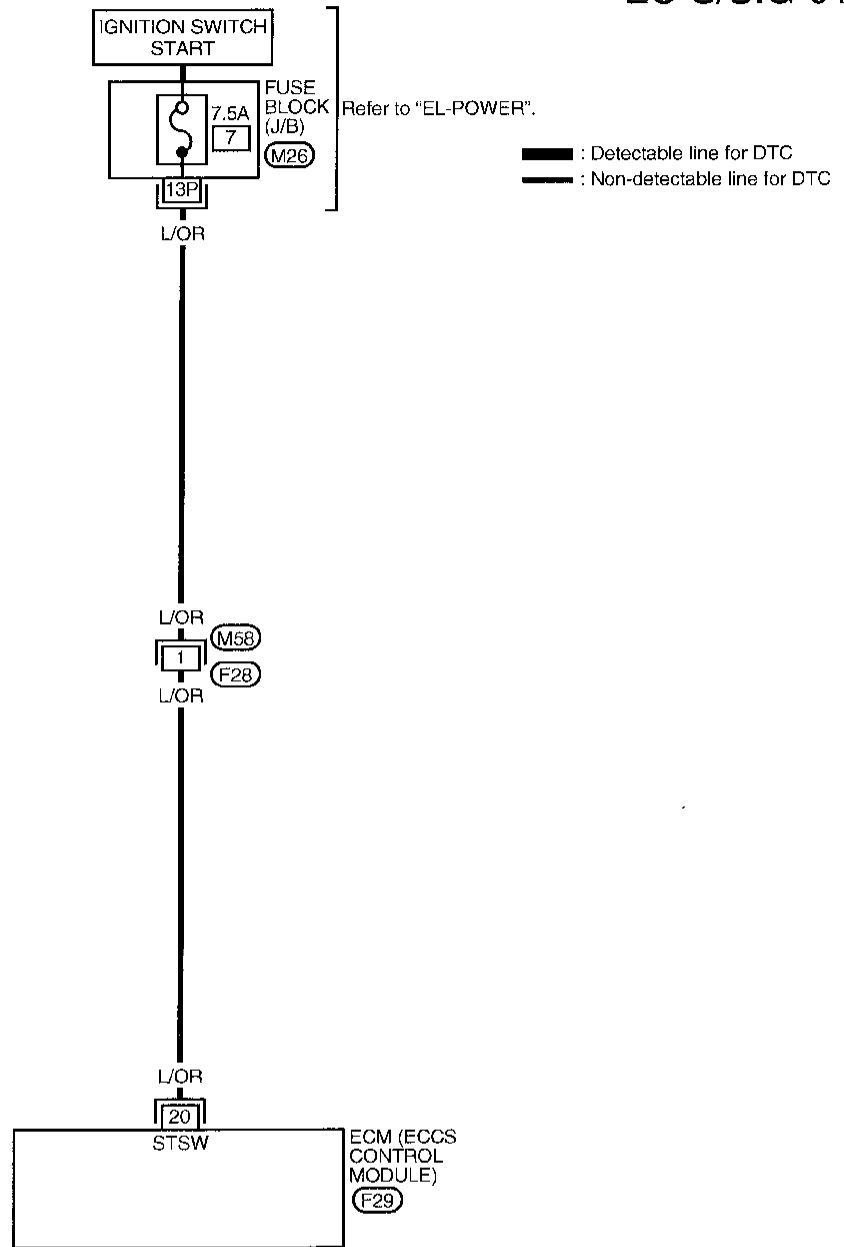
Injector

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
Resistance: 10 - 14Ω [at 25°C (77°F)]
If NG, replace injector.

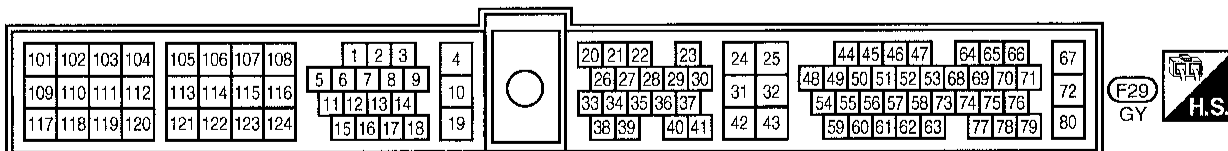
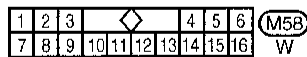
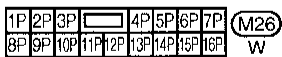
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal

EC-S/SIG-01



- GI
- MA
- EM
- LC
- EC**
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- AT
- TF
- PD
- FA
- RA
- BR
- ST
- RS
- BT
- HA
- EL
- IDX



TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|------------------------------------|----------------|
| START SIGNAL | ● Ignition switch: ON → START → ON | OFF → ON → OFF |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③₂ (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|--------------|-------------------------|----------------------------|
| 20 | L/OR | Start signal | Ignition switch "ON" | Approximately 0V |
| | | | Ignition switch "START" | BATTERY VOLTAGE (11 - 14V) |

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Start Signal (Cont'd) DIAGNOSTIC PROCEDURE

A

■ START SIGNAL CKT ■

1. CLOSE THROTTLE, SHIFT TO P OR N RANGE.
2. TOUCH START AND START ENGINE IMMEDIATELY.

NEXT START

SEF191L

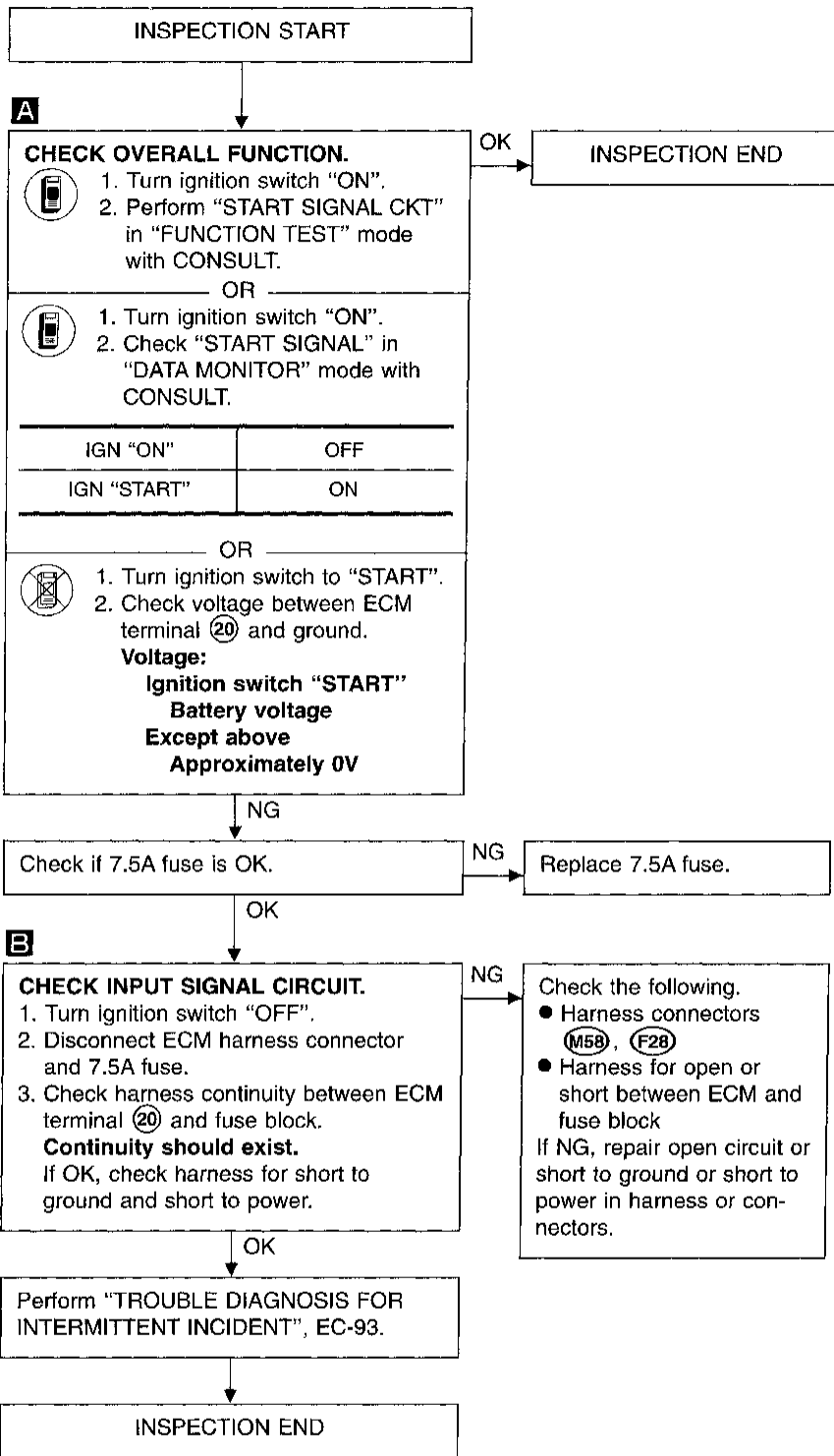
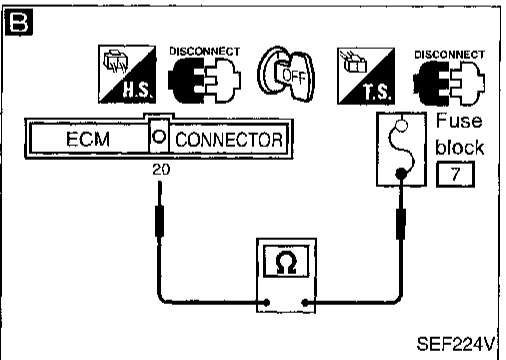
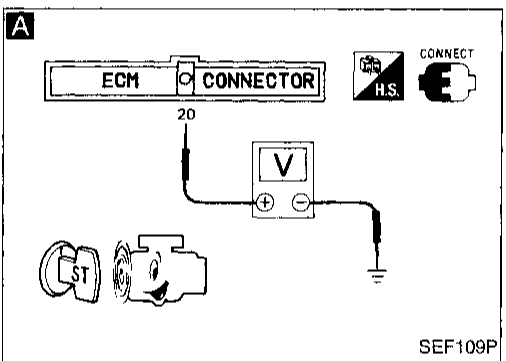
A

☆ MONITOR ☆ NO FAIL

| | |
|--------------|-----|
| START SIGNAL | OFF |
| CLSD TH/P SW | ON |
| AIR COND SIG | OFF |
| P/N POSI SW | ON |

RECORD

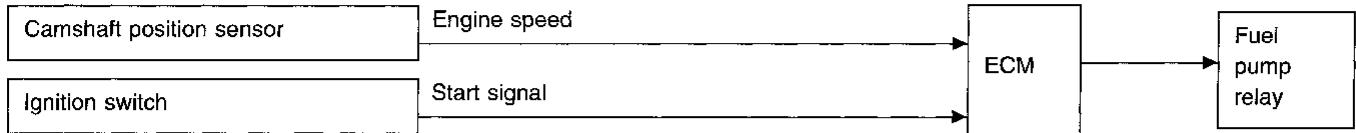
SEF111P



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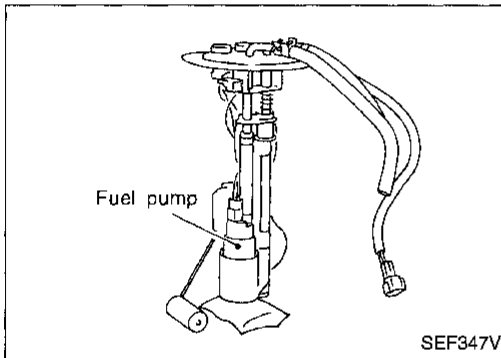
Fuel Pump

SYSTEM DESCRIPTION



The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation |
|----------------------------------|------------------------|
| Ignition switch is turned to ON. | Operates for 5 seconds |
| Engine running and cranking | Operates |
| Except as shown above | Stops |



COMPONENT DESCRIPTION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---------------|---|---------------|
| FUEL PUMP RLY | <ul style="list-style-type: none"> ● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking | ON |
| | Except as shown above | OFF |

ECM TERMINALS AND REFERENCE VALUE

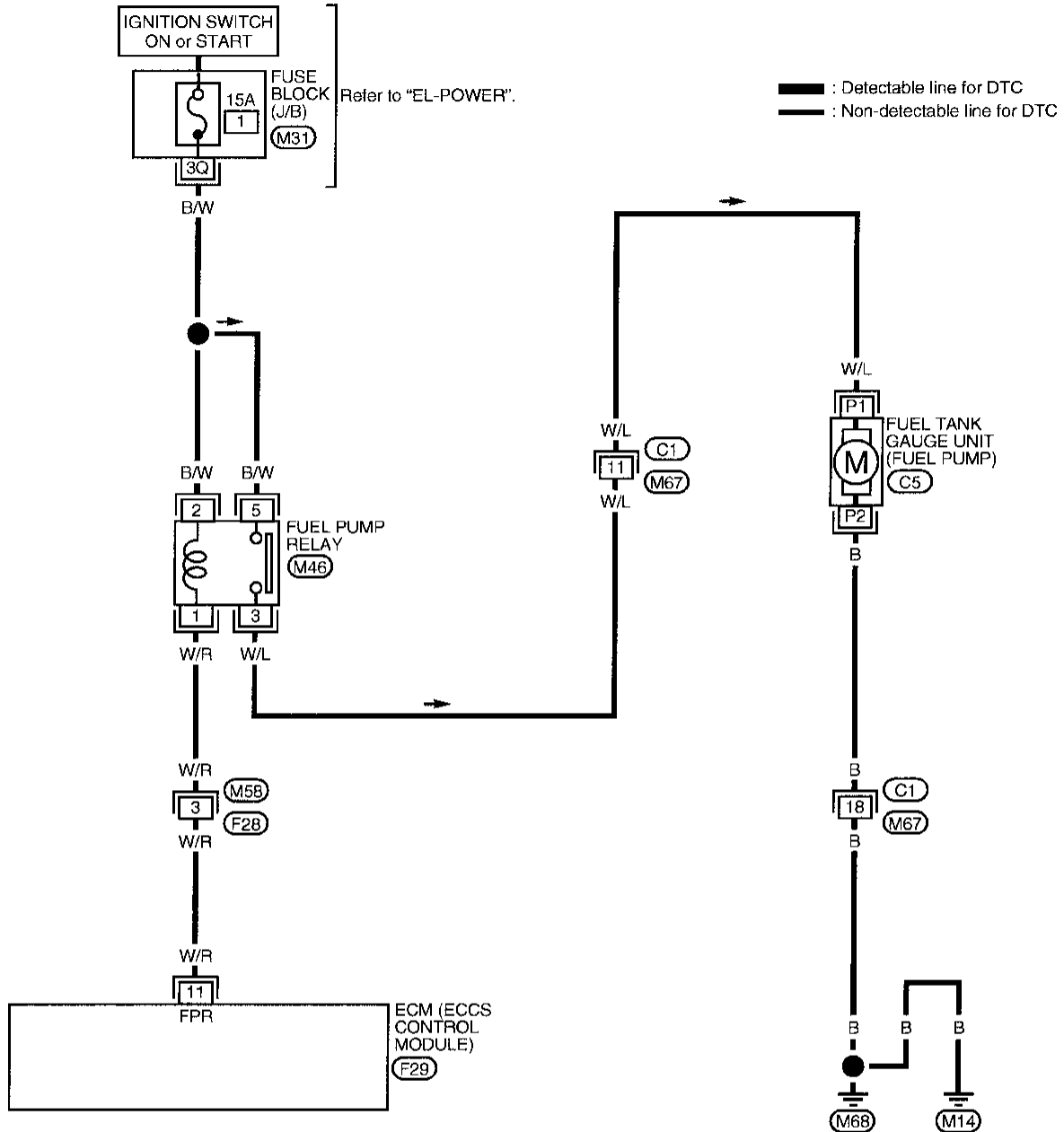
Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|-----------------|--|----------------------------|
| 11 | W/R | Fuel pump relay | Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" | 0 - 1V |
| | | | Engine is running. Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

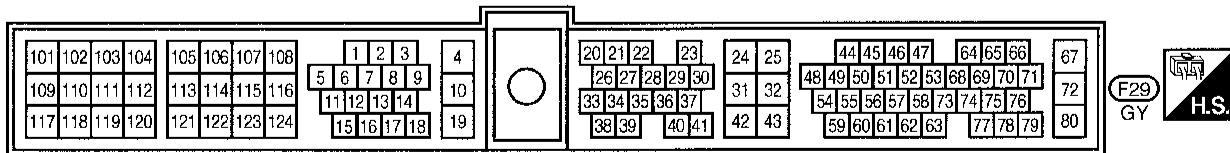
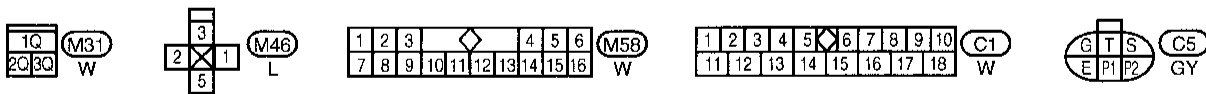
TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump (Cont'd)

EC-F/PUMP-01

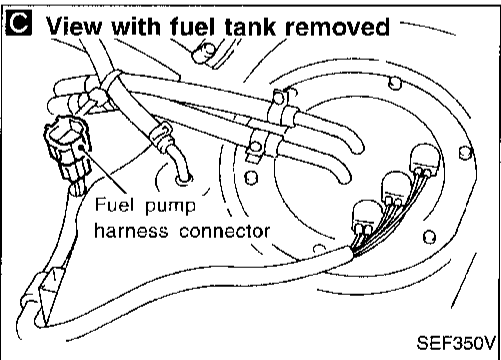
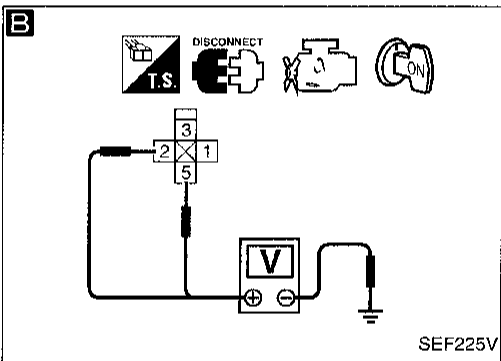
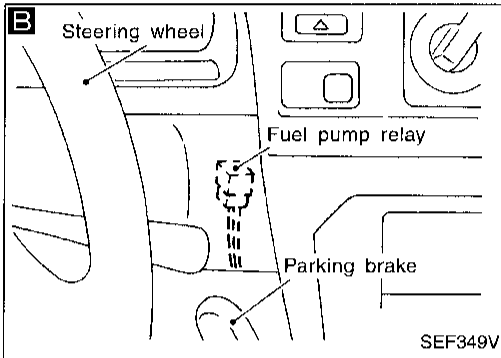
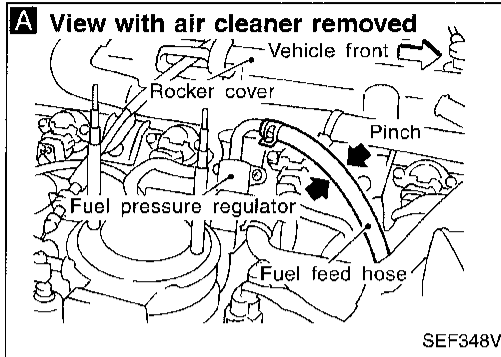


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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".
4. Check voltage between terminals (2), (5) and ground with CONSULT or tester.

Voltage: Battery voltage

NG →

Check the following.

- 15A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK

C

CHECK POWER AND GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal (P2) and body ground, terminal (P1) and fuel pump relay terminal (3).

Continuity should exist.

If OK, check harness for short to ground and short to power.

NG →

Check the following.

- Harness connectors (C1), (M67)
- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (I1) and fuel pump relay terminal (1).

Continuity should exist.

If OK, check harness for short to ground and short to power.

NG →

Check the following.

- Harness connectors (F28), (M58)
- Harness for open or short between ECM and fuel pump relay

If NG, repair open circuit or short to ground or short to power in harness or connectors.

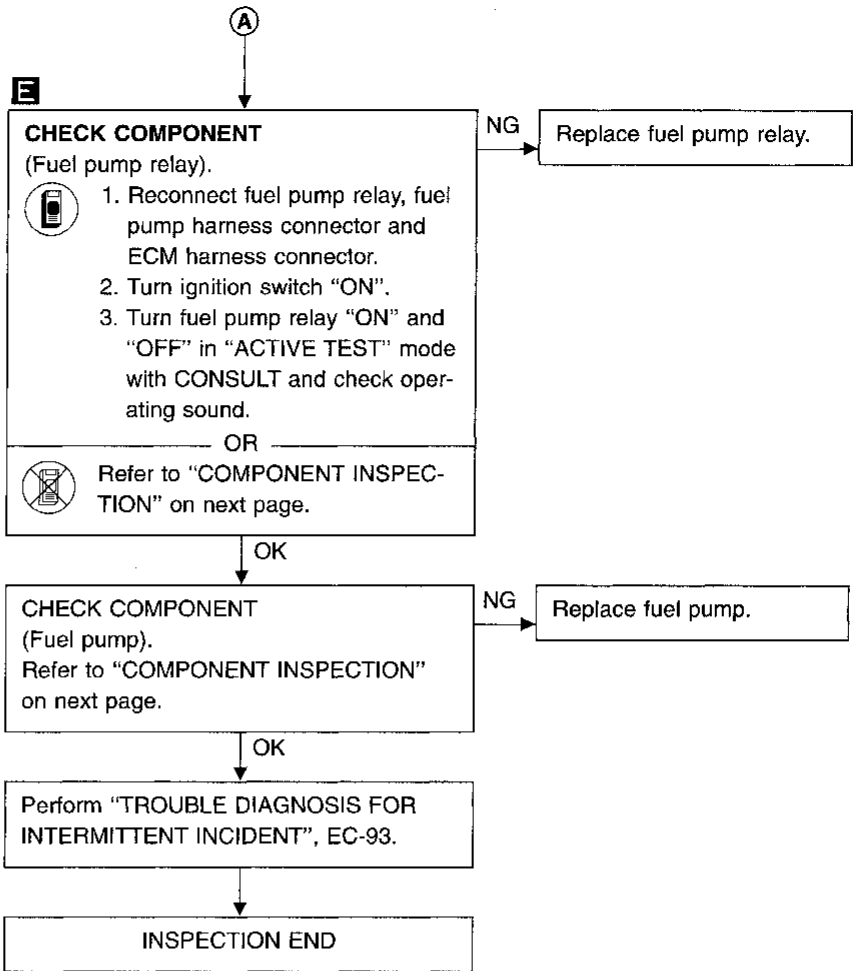
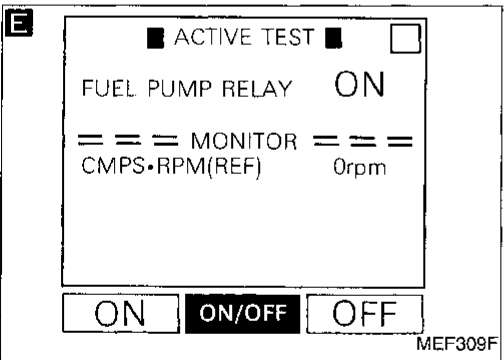
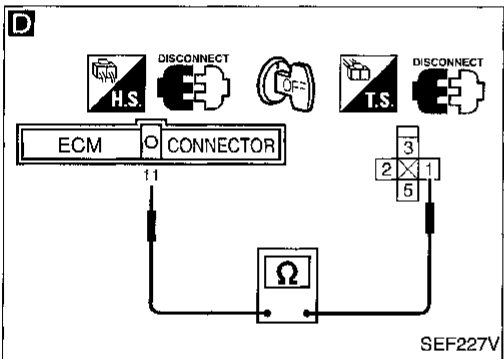
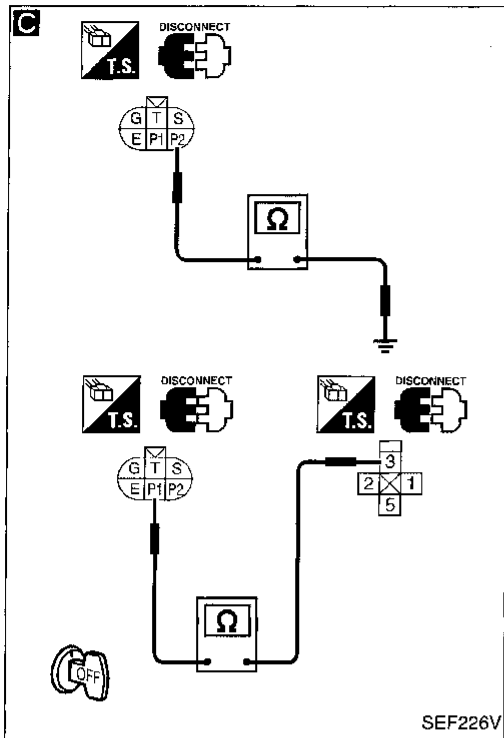
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(Go to next page.)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump (Cont'd)



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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Fuel Pump (Cont'd)

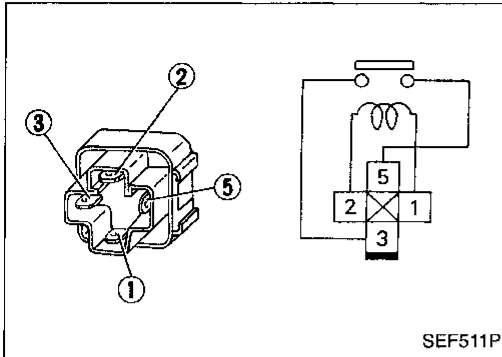
COMPONENT INSPECTION

Fuel pump relay

Check continuity between terminals ③ and ⑤.

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

If NG, replace relay.

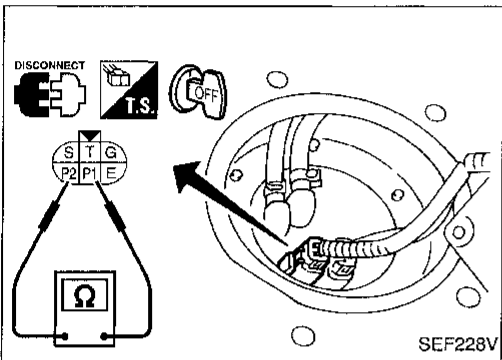


Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ②.

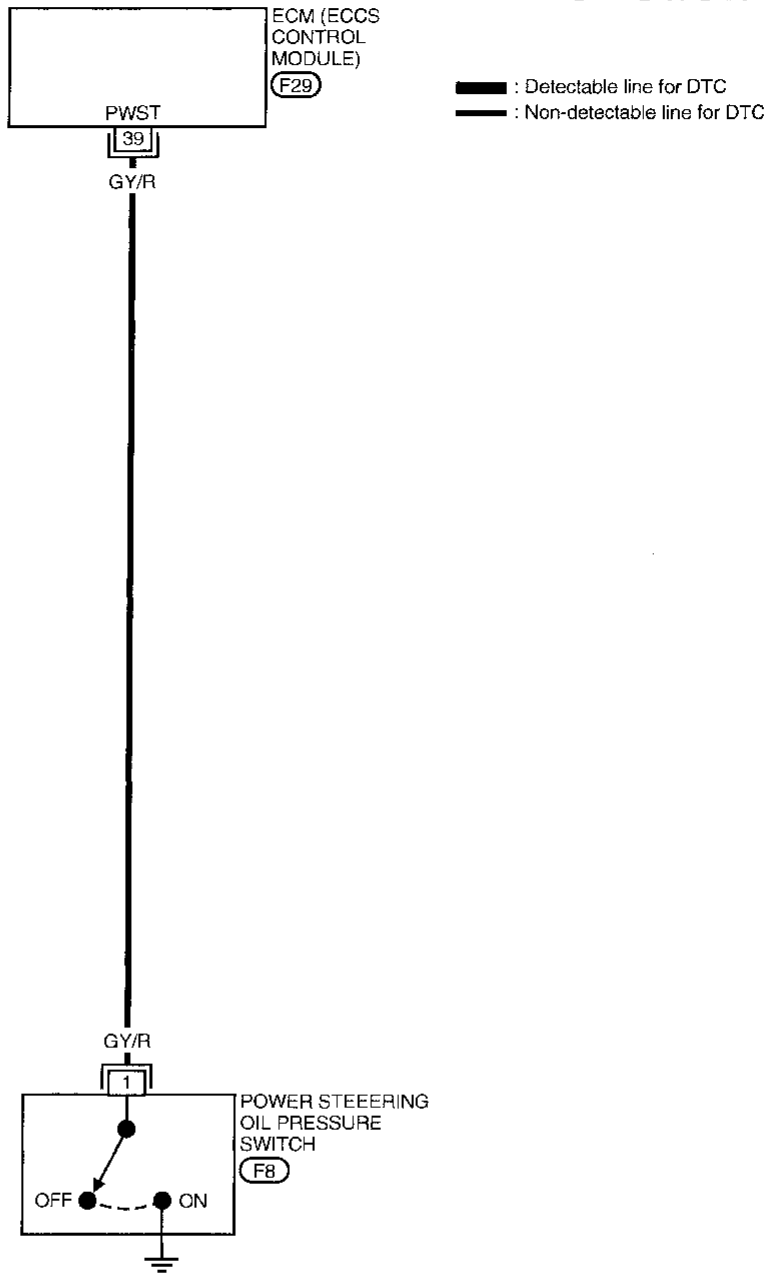
Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]

If NG, replace fuel pump.

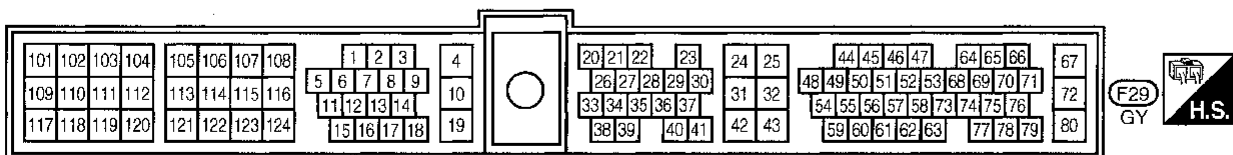


Power Steering Oil Pressure Switch

EC-PST/SW-01



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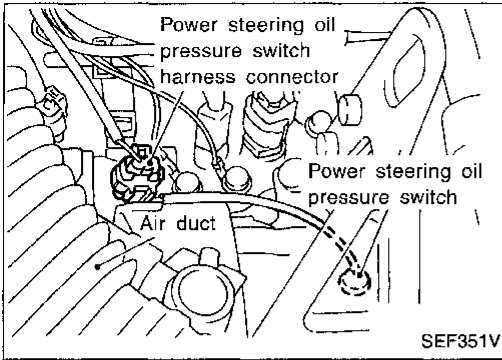


TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd)

COMPONENT DESCRIPTION

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|--------------|---|--|
| PW/ST SIGNAL | ● Engine: After warming up, idle the engine | Steering wheel is in neutral position (forward direction) OFF |
| | | The steering wheel is fully turned ON |

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|------------------------------------|---|-------------------|
| 39 | GY/R | Power steering oil pressure switch | Engine is running. └ Steering wheel is fully turned. | Approximately 0V |
| | | | Engine is running. └ Steering wheel is not turned. | Approximately 5V |

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

Power Steering Oil Pressure Switch (Cont'd) DIAGNOSTIC PROCEDURE

A

■ PW/ST SIGNAL CIRCUIT ■

HOLD STEERING WHEEL
IN A FULL
LOCKED POSITION
THEN
TOUCH START

NEXT START

MEF023E

A

☆ MONITOR ☆ NO FAIL

PW/ST SIGNAL OFF

RECORD

SEF591I

A

CONNECT

H.S.

ECM CONNECTOR

39

V

SEF662P

B

DISCONNECT

H.S.

DISCONNECT

T.S.

ECM CONNECTOR

39

Ω

SEF229V

B

DISCONNECT

T.S.

DISCONNECT

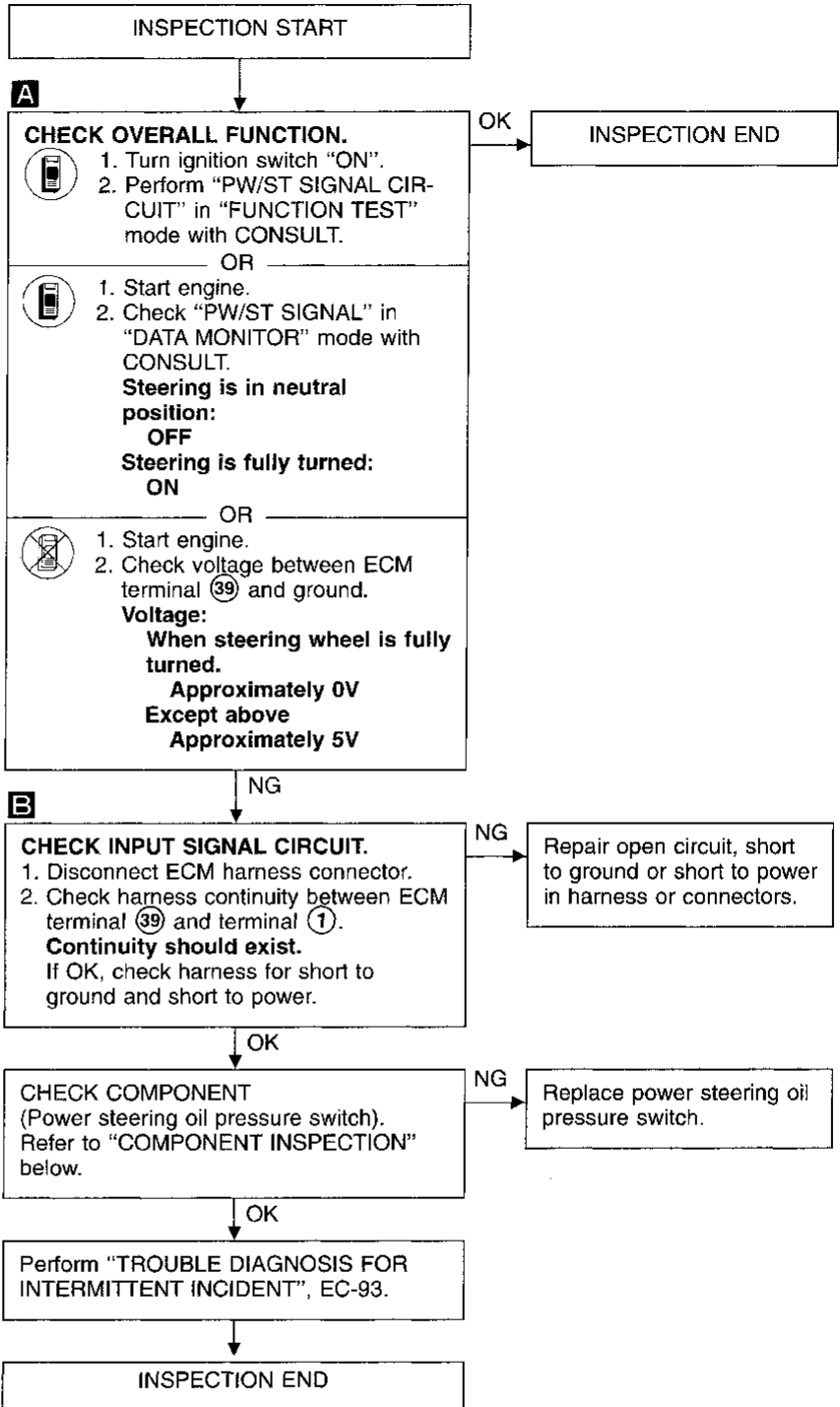
T.S.

ECM CONNECTOR

1

Ω

SEF230V



COMPONENT INSPECTION

Power steering oil pressure switch

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminal (1) and ground.

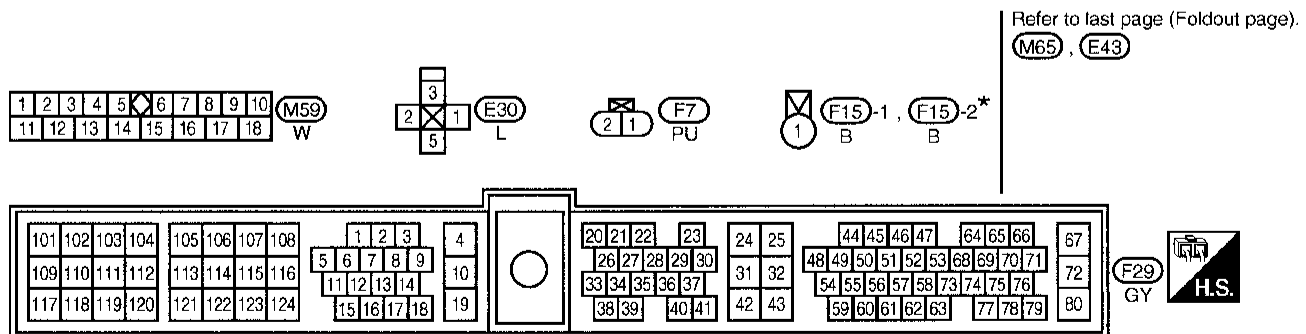
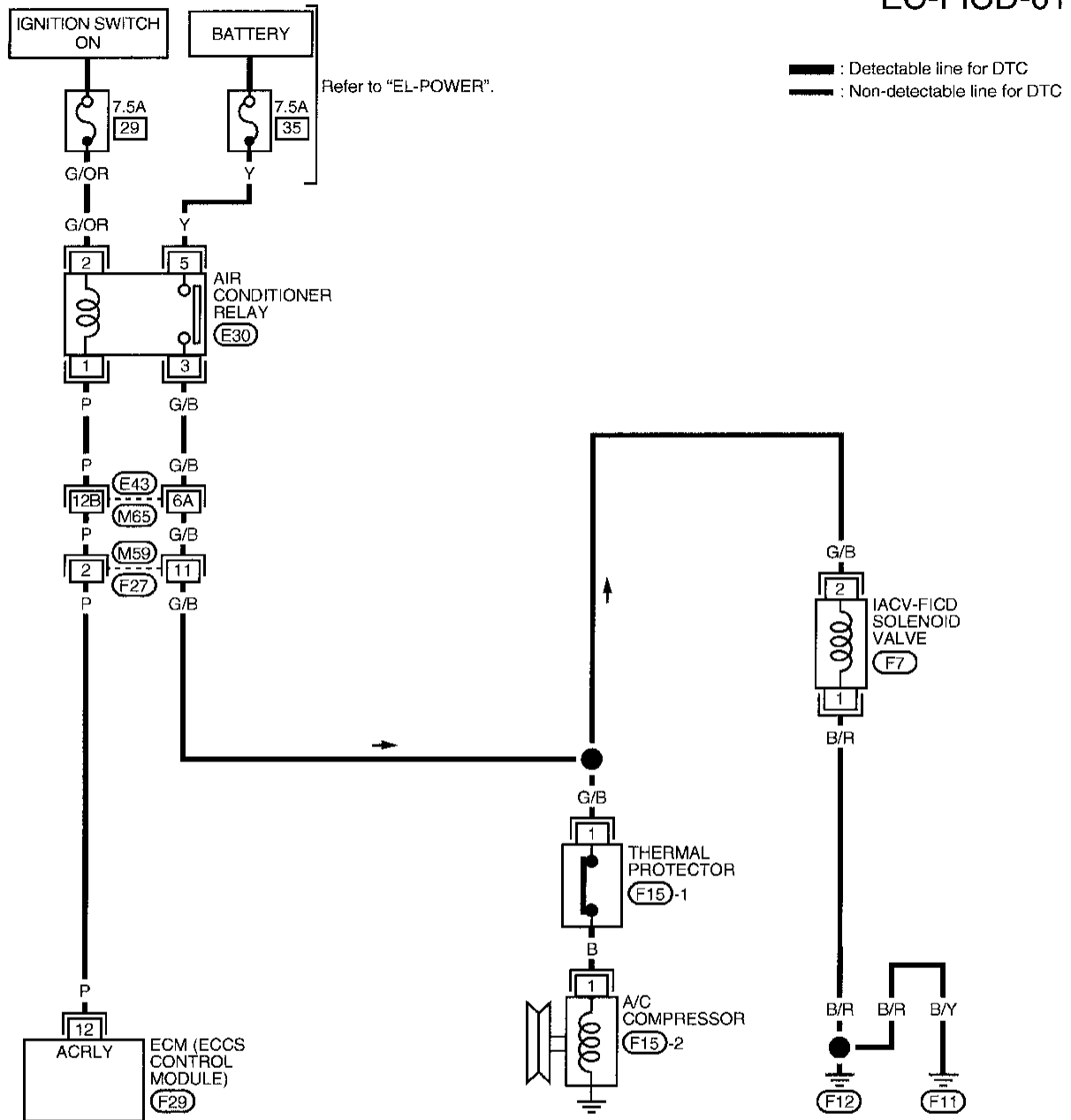
| Conditions | Continuity |
|--------------------------------------|------------|
| Steering wheel is fully being turned | Yes |
| Steering wheel is not being turned | No |

If NG, replace power steering oil pressure switch.

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IACV-FICD Solenoid Valve

EC-FICD-01



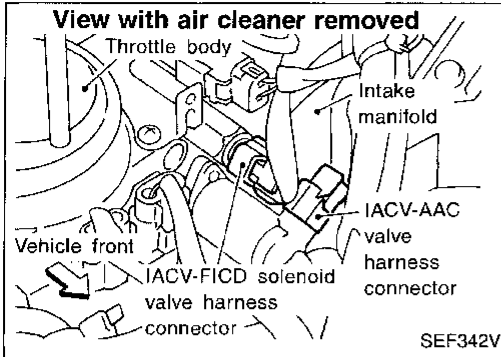
* : This connector is not shown in "HARNES LAYOUT" of EL section.

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

IACV-FICD Solenoid Valve (Cont'd)

COMPONENT DESCRIPTION

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.



ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ③② (ECM ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---------------|------------|---------------------------------------|---|----------------------------|
| 12 | P | Air conditioner relay | Engine is running. └ Both A/C switch and blower switch are "ON"*. | Approximately 0V |
| | | | Engine is running. └ A/C switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |
| 21 | G/R | Air conditioner dual-pres-sure switch | Engine is running. └ Both air conditioner switch and blower switch are "ON". (Compressor operates) | Approximately 0V |
| | | | Engine is running. └ Air conditioner switch is "OFF". | BATTERY VOLTAGE (11 - 14V) |

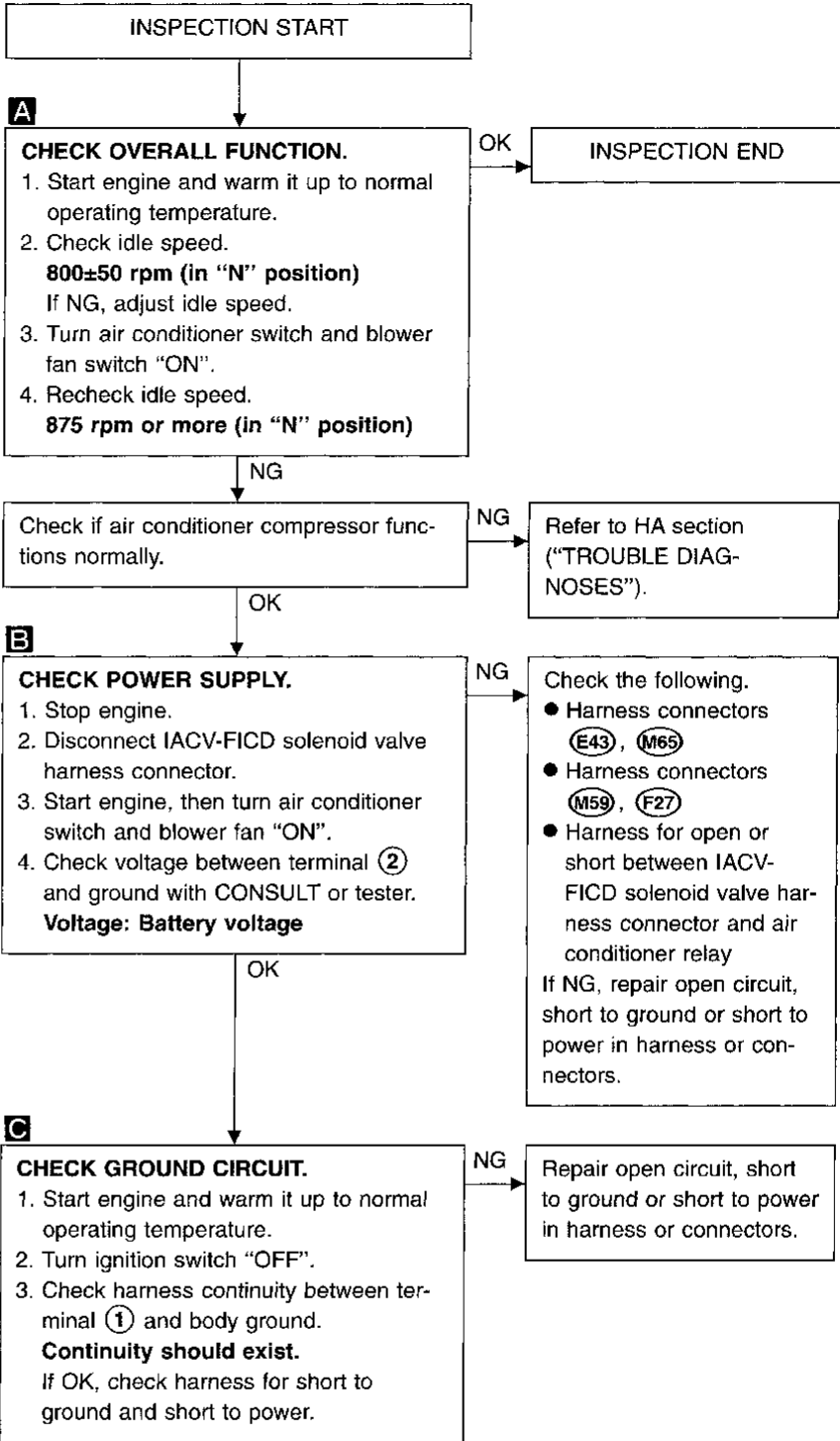
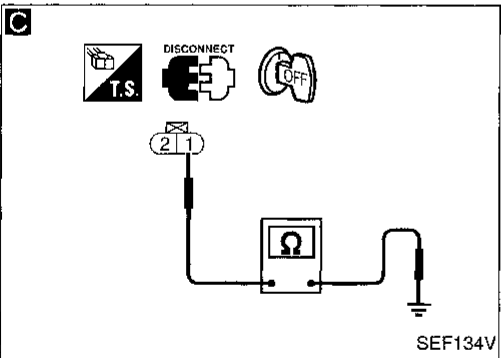
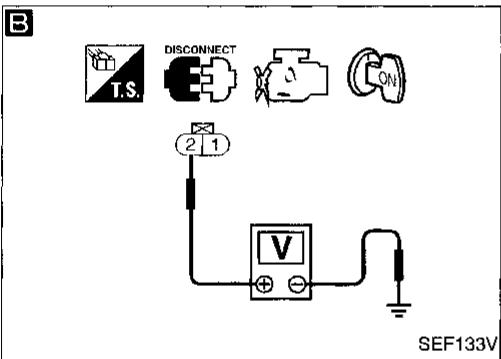
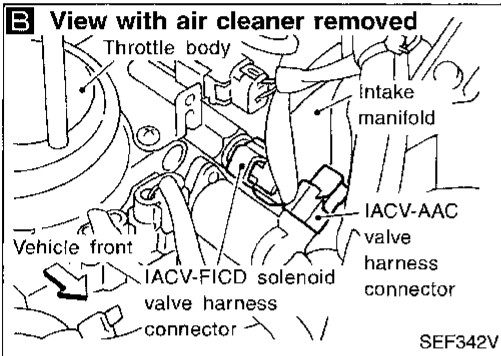
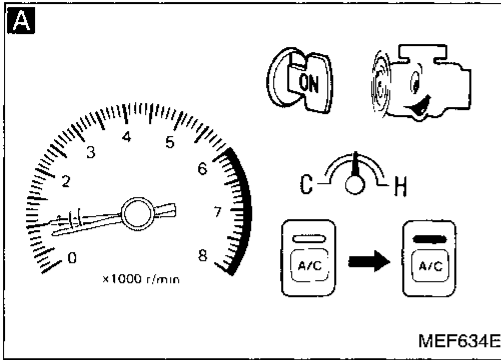
*: Ambient air temperature above 10°C (50°F) and in any mode except "OFF".

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TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

IACV-FICD Solenoid Valve (Cont'd)

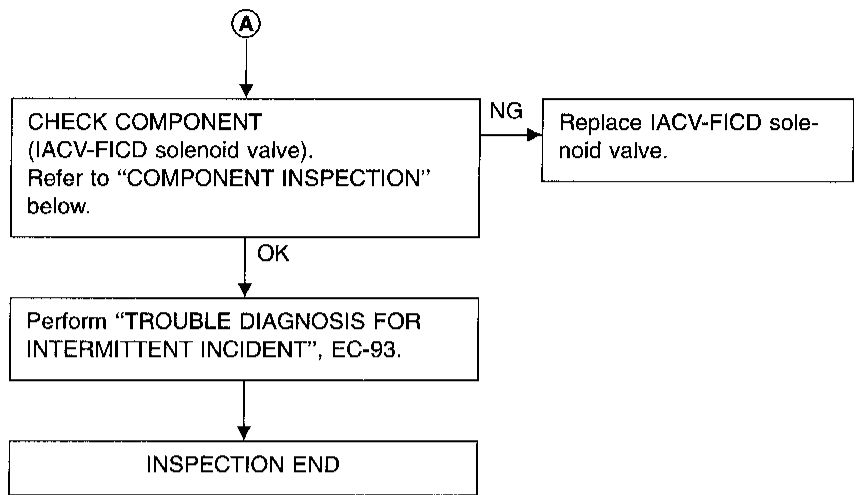
DIAGNOSTIC PROCEDURE



(Go to next page.)

TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

IACV-FICD Solenoid Valve (Cont'd)



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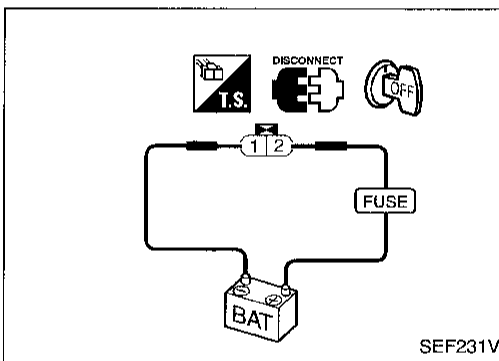
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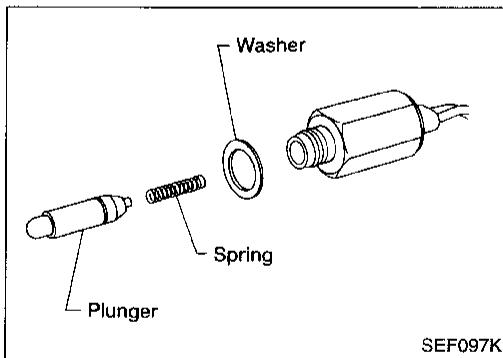


COMPONENT INSPECTION

IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

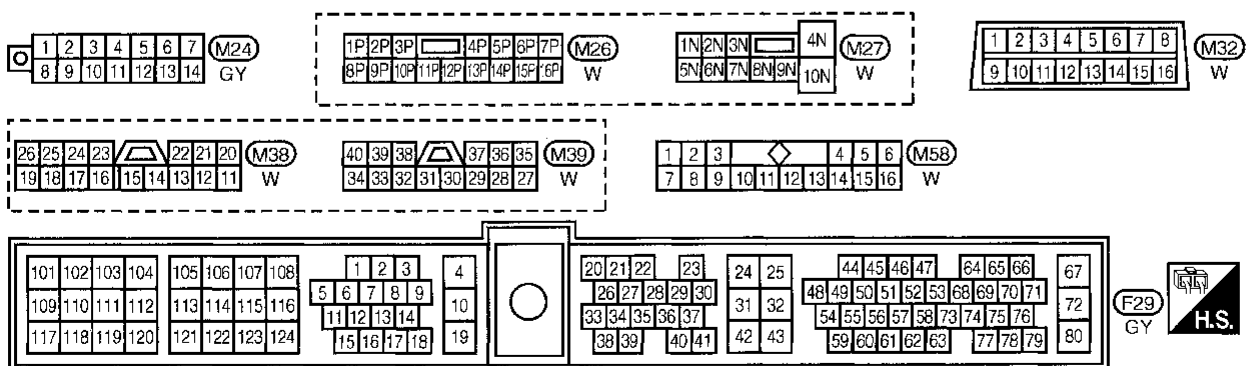
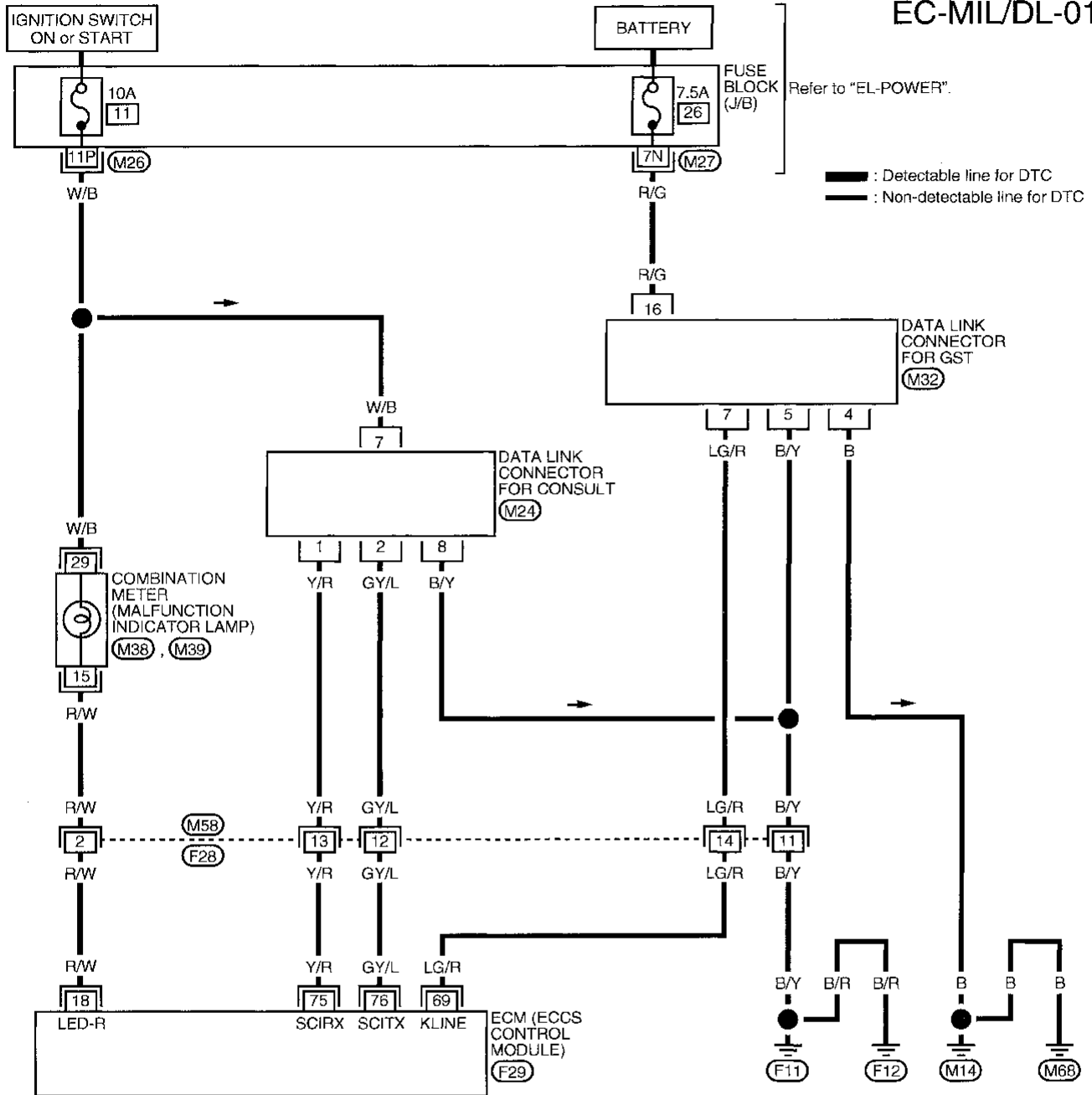
- Check for clicking sound when applying 12V direct current to terminals.



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

MIL & Data Link Connectors

EC-MIL/DL-01



General Specifications

FUEL PRESSURE REGULATOR

| | |
|---|--------------------------------|
| Fuel pressure at idling kPa (kg/cm ² , psi) | |
| Vacuum hose is connected | Approximately 235 (2.4, 34) |
| Vacuum hose is disconnected | Approximately 294 (3.0, 43) |

Inspection and Adjustment

| | |
|--|-------------------|
| Idle speed*1 rpm | |
| No-load*2 (in "N" position) | 800±50 (750±50*3) |
| Air conditioner: ON (In "N" position) | 875 or more |
| Ignition timing | 20°±2° BTDC*3 |
| Closed throttle position switch touch speed ("OFF" to "ON") (in "N" position) rpm | 950±150*3 |

*1: Feedback controlled and needs no adjustments

*2: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights & heater fan)
- Steering wheel: Kept in straight-ahead position

*3: Disconnect throttle position sensor

IGNITION COIL

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

MASS AIR FLOW SENSOR

| | |
|--|--|
| Supply voltage V | Battery voltage (11 - 14) |
| Output voltage at idle V | 0.9 - 1.8* |
| Mass air flow (Using CONSULT or GST) g·m/sec | 0.9 - 5.8 at idle* 7.5 - 13.2 at 2,500 rpm* |

*: Engine is warmed up to normal operating temperature and running under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

| | |
|---------------------|---------------|
| Temperature °C (°F) | Resistance kΩ |
| 20 (68) | 2.1 - 2.9 |
| 50 (122) | 0.68 - 1.00 |
| 90 (194) | 0.236 - 0.260 |

EGR TEMPERATURE SENSOR

| | | |
|----------------------------|--------------|------------------|
| EGR temperature °C (°F) | Voltage V | Resistance MΩ |
| 0 (32) | 4.81 | 7.9 - 9.7 |
| 50 (122) | 2.81 | 0.57 - 0.70 |
| 100 (212) | 0.8 | 0.08 - 0.10 |

FRONT HEATED OXYGEN SENSOR HEATER

| | |
|----------------------------------|-----------|
| Resistance [at 25°C (77°F)] Ω | 2.3 - 4.3 |
|----------------------------------|-----------|

FUEL PUMP

| | |
|----------------------------------|-----------|
| Resistance [at 25°C (77°F)] Ω | 0.2 - 5.0 |
|----------------------------------|-----------|

IACV-AAC VALVE

| | |
|----------------------------------|------------------|
| Resistance [at 25°C (77°F)] Ω | Approximately 10 |
|----------------------------------|------------------|

INJECTOR

| | |
|----------------------------------|---------|
| Resistance [at 25°C (77°F)] Ω | 10 - 14 |
|----------------------------------|---------|

RESISTOR

| | |
|-----------------------------------|-------------------|
| Resistance [at 25°C (77°F)] kΩ | Approximately 2.2 |
|-----------------------------------|-------------------|

THROTTLE POSITION SENSOR

| | |
|---------------------------|-----------------------------------|
| Throttle valve conditions | Resistance kΩ [at 25°C (77°F)] |
| Completely closed | Approximately 0.5 |
| Partially open | 0.5 - 4.0 |
| Completely open | Approximately 4.0 |

SERVICE DATA AND SPECIFICATIONS (SDS)

Inspection and Adjustment (Cont'd)

CALCULATED LOAD VALUE

| | Calculated load value % (Using CONSULT or GST) |
|--------------|---|
| At idle | 9.5 - 34.0% |
| At 2,500 rpm | 13.9 - 24.9% |

INTAKE AIR TEMPERATURE SENSOR

| Temperature °C (°F) | Resistance k Ω |
|---------------------|-----------------------|
| 20 (68) | 2.1 - 2.9 |
| 80 (176) | 0.27 - 0.38 |

REAR HEATED OXYGEN SENSOR HEATER

| | | |
|-----------------------------|----------|-----------|
| Resistance [at 25°C (77°F)] | Ω | 2.3 - 4.3 |
|-----------------------------|----------|-----------|

CRANKSHAFT POSITION SENSOR (OBD)

| | | |
|-----------------------------|----------|---------------|
| Resistance [at 20°C (68°F)] | Ω | 166.5 - 203.5 |
|-----------------------------|----------|---------------|