# ENGINE CONTROL SYSTEM

# SECTION EC



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# Alphabetical & P No. Index for DTC

NBEC0001

## ALPHABETICAL INDEX FOR DTC

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| A/T 1ST GR FNCTN | 1103 | P0731 | AT-106 |
| A/T 2ND GR FNCTN | 1104 | P0732 | AT-112 |
| A/T 3RD GR FNCTN | 1105 | P0733 | AT-118 |
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| A/T COMM LINE | — | P0600 | EC-334 |
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| CAM POS SEN/CIRC | 0101 | P0340 | EC-269 |
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| CLOSED TP SW/CIRC | 0203 | P0510 | EC-329 |
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| CPS/CIRC (OBD) COG | 0905 | P1336 | EC-357 |
| CPS/CIRCUIT (OBD) | 0802 | P0335 | EC-264 |
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| EGR TEMP SEN/CIRC | 0305 | P1401 | EC-367 |
| EGRC SOLENOID/V | 1005 | P1400 | EC-362 |
| EGRC-BPT VALVE | 0306 | P0402 | EC-284 |
| ENGINE SPEED SIG*4 | 1207 | P0725 | AT-102 |
| EVAP PURG FLOW/MON | 0111 | P1447 | EC-399 |
| EVAP SYS PRES SEN | 0704 | P0450 | EC-311 |

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| FR O2 SE HEATER-B2 | 1001 | P0155 | EC-194 |
| FRONT O2 SENSOR-B1 | 0503 | P0130 | EC-158 |
| FRONT O2 SENSOR-B1 | 0415 | P0131 | EC-166 |
| FRONT O2 SENSOR-B1 | 0414 | P0132 | EC-172 |
| FRONT O2 SENSOR-B1 | 0413 | P0133 | EC-178 |
| FRONT O2 SENSOR-B1 | 0509 | P0134 | EC-187 |
| FRONT O2 SENSOR-B2 | 0303 | P0150 | EC-158 |
| FRONT O2 SENSOR-B2 | 0411 | P0151 | EC-166 |
| FRONT O2 SENSOR-B2 | 0410 | P0152 | EC-172 |
| FRONT O2 SENSOR-B2 | 0409 | P0153 | EC-178 |
| FRONT O2 SENSOR-B2 | 0412 | P0154 | EC-187 |
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| IACV/AAC VLV/CIRC | 0205 | P0505 | EC-323 |
| IGN SIGNAL-PRIMARY | 0201 | P1320 | EC-350 |
| INHIBITOR SW/CIRC | 1101 | P0705 | AT-87 |
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| L/PRES SOL/CIRC | 1205 | P0745 | AT-146 |
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| MULTI CYL MISFIRE | 0701 | P0300 | EC-255 |
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| PURG VOLUME CONT/V | 0214 | P1444 | EC-387 |
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| REAR O2 SENSOR-B1 | 0510 | P0138 | EC-208 |

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| REAR O2 SENSOR-B1 | 0512 | P0140 | EC-224 |
| REAR O2 SENSOR-B2 | 0314 | P0157 | EC-200 |
| REAR O2 SENSOR-B2 | 0313 | P0158 | EC-208 |
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| REAR O2 SENSOR-B2 | 0315 | P0160 | EC-224 |
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| TCC SOLENOID/CIRC | 1204 | P0740 | AT-133 |
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| TRTL POS SEN/CIRC*3 | 0403 | P0120 | EC-143 |
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| VC CUT/V BYPASS/V | 0311 | P1491 | EC-415 |
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| VEH SPEED SEN/CIRC | 0104 | P0500 | EC-319 |
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| VENT CONTROL VALVE | 0903 | P0446 | EC-305 |
| VENT CONTROL VALVE | 0215 | P1446 | EC-394 |
| VENT CONTROL VALVE | 0309 | P1448 | EC-404 |

*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: The MIL illuminates after TCM (Transmission control module) enters the fail-safe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.
*5: While engine is running.
*6: 1st trip DTC No. is the same as DTC No.
NOTE:
Regarding R50 models, "-B1" and "BK1" indicate right bank and "-B2" and "BK2" indicate left bank.

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| P0130 | 0503 | FRONT O2 SENSOR-B1 | EC-158 |
| P0131 | 0415 | FRONT O2 SENSOR-B1 | EC-166 |
| P0132 | 0414 | FRONT O2 SENSOR-B1 | EC-172 |
| P0133 | 0413 | FRONT O2 SENSOR-B1 | EC-178 |
| P0134 | 0509 | FRONT O2 SENSOR-B1 | EC-187 |
| P0135 | 0901 | FR O2 SE HEATER-B1 | EC-194 |
| P0137 | 0511 | REAR O2 SENSOR-B1 | EC-200 |
| P0138 | 0510 | REAR O2 SENSOR-B1 | EC-208 |
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| P0150 | 0303 | FRONT O2 SENSOR-B2 | EC-158 |
| P0151 | 0411 | FRONT O2 SENSOR-B2 | EC-166 |
| P0152 | 0410 | FRONT O2 SENSOR-B2 | EC-172 |
| P0153 | 0409 | FRONT O2 SENSOR-B2 | EC-178 |
| P0154 | 0412 | FRONT O2 SENSOR-B2 | EC-187 |
| P0155 | 1001 | FR O2 SE HEATER-B2 | EC-194 |
| P0157 | 0314 | REAR O2 SENSOR-B2 | EC-200 |
| P0158 | 0313 | REAR O2 SENSOR-B2 | EC-208 |
| P0159 | 0708 | REAR O2 SENSOR-B2 | EC-216 |
| P0160 | 0315 | REAR O2 SENSOR-B2 | EC-224 |
| P0161 | 1002 | RR O2 SE HEATER-B2 | EC-231 |
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| P0172 | 0114 | FUEL SYS RICH/BK1 | EC-244 |
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| P0175 | 0209 | FUEL SYS RICH/BK2 | EC-244 |
| P0180 | 0402 | FUEL TEMP SEN/CIRC | EC-251 |
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| P0306 | 0603 | CYL 6 MISFIRE | EC-255 |
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| P0335 | 0802 | CPS/CIRCUIT (OBD) | EC-264 |
| P0340 | 0101 | CAM POS SEN/CIRC | EC-269 |
| P0400 | 0302 | EGR SYSTEM | EC-276 |
| P0402 | 0306 | EGRC-BPT VALVE | EC-284 |
| P0420 | 0702 | TW CATALYST SYS-B1 | EC-288 |
| P0430 | 0703 | TW CATALYST SYS-B2 | EC-288 |
| P0440 | 0705 | EVAP SMALL LEAK | EC-292 |
| P0443 | 1008 | PURG VOLUME CONT/V | EC-299 |
| P0446 | 0903 | VENT CONTROL VALVE | EC-305 |
| P0450 | 0704 | EVAP SYS PRES SEN | EC-311 |
| P0500 | 0104 | VEH SPEED SEN/CIRC | EC-319 |
| P0505 | 0205 | IACV/AAC VLV/CIRC | EC-323 |
| P0510 | 0203 | CLOSED TP SW/CIRC | EC-329 |
| P0600 | — | A/T COMM LINE | EC-334 |
| P0605 | 0301 | ECM | EC-337 |
| P0705 | 1101 | INHIBITOR SW/CIRC | AT-87 |
| P0710 | 1208 | ATF TEMP SEN/CIRC | AT-92 |
| P0720 | 1102 | VEH SPD SEN/CIRC A/T*4 | AT-97 |
| P0725 | 1207 | ENGINE SPEED SIG*4 | AT-102 |
| P0731 | 1103 | A/T 1ST GR FNCTN | AT-106 |
| P0732 | 1104 | A/T 2ND GR FNCTN | AT-112 |
| P0733 | 1105 | A/T 3RD GR FNCTN | AT-118 |
| P0734 | 1106 | A/T 4TH GR FNCTN | AT-124 |
| P0740 | 1204 | TCC SOLENOID/CIRC | AT-133 |
| P0744 | 1107 | A/T TCC S/V FNCTN | AT-138 |
| P0745 | 1205 | L/PRESS SOL/CIRC | AT-146 |
| P0750 | 1108 | SFT SOL A/CIRC*3 | AT-152 |
| P0755 | 1201 | SFT SOL B/CIRC*3 | AT-157 |
| P1105 | 1302 | MAP/BARO SW SOL/CIRC | EC-339 |
| P1148 | 0307 | CLOSED LOOP-B1 | EC-348 |
| P1168 | 0308 | CLOSED LOOP-B2 | EC-348 |
| P1320 | 0201 | IGN SIGNAL-PRIMARY | EC-350 |

| DTC*6 | | Items (CONSULT screen terms) | Reference page |
|---|---|---|---|
| CONSULT GST*2 | ECM*1 | | |
| P1336 | 0905 | CPS/CIRC (OBD) COG | EC-357 |
| P1400 | 1005 | EGRC SOLENOID/V | EC-362 |
| P1401 | 0305 | EGR TEMP SEN/CIRC | EC-367 |
| P1402 | 0514 | EGR SYSTEM | EC-373 |
| P1440 | 0213 | EVAP SMALL LEAK | EC-380 |
| P1444 | 0214 | PURG VOLUME CONT/V | EC-387 |
| P1446 | 0215 | VENT CONTROL VALVE | EC-394 |
| P1447 | 0111 | EVAP PURG FLOW/MON | EC-399 |
| P1448 | 0309 | VENT CONTROL VALVE | EC-404 |
| P1490 | 0801 | VC/V BYPASS/V | EC-410 |
| P1491 | 0311 | VC CUT/V BYPASS/V | EC-415 |
| P1605 | 0804 | A/T DIAG COMM LINE | EC-422 |
| P1705 | 1206 | TP SEN/CIRC A/T*3 | AT-162 |
| P1706 | 1003 | P-N POS SW/CIRCUIT | EC-425 |
| P1760 | 1203 | O/R CLUTCH SOL/CIRC | AT-169 |
| — | 0208 | OVER HEAT | LC section |

*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: The MIL illuminates after TCM (Transmission control module) enters the fail-safe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.
*5: While engine is running.
*6: 1st trip DTC No. is the same as DTC No.
NOTE:
Regarding R50 models, "-B1" and "BK1" indicate right bank and "-B2" and "BK2" indicate left bank.

## Supplemental Restraint System (SRS) "AIR BAG"

NBEC0002

The Supplemental Restraint System "AIR BAG", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and on the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

**WARNING:**

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized INFINITI 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 for the complete harness, for easy identification.**

## Precautions for On Board Diagnostic (OBD) System of Engine and A/T

NBEC0003

The ECM (ECCS control module) 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 and TCM (Transmission control module) before returning the vehicle to the customer.**

## Engine Fuel & Emission Control System

NBEC0004

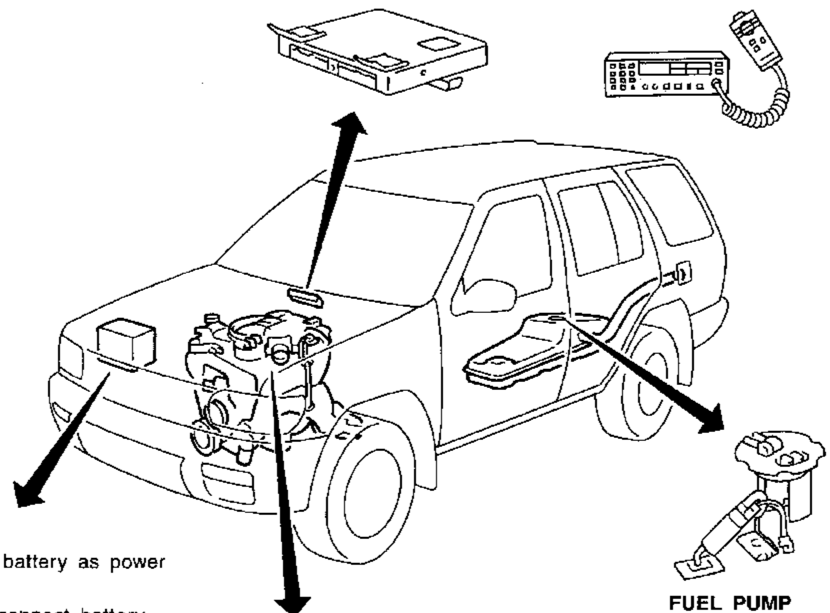
**ECM (ECCS Control Module)**

- Do not disassemble ECM.
- Do not turn diagnosis test mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECM will not 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**

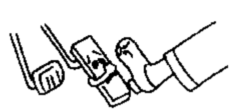
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

**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.)

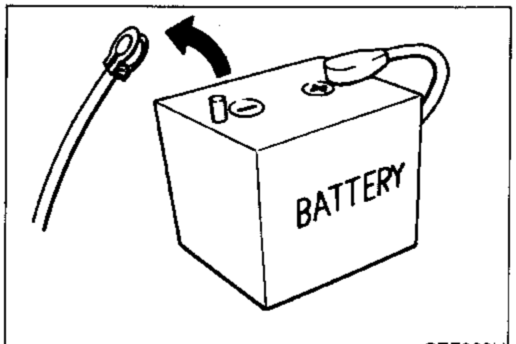
**ECM HARNESS HANDLING**

- 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.

SEF952RC

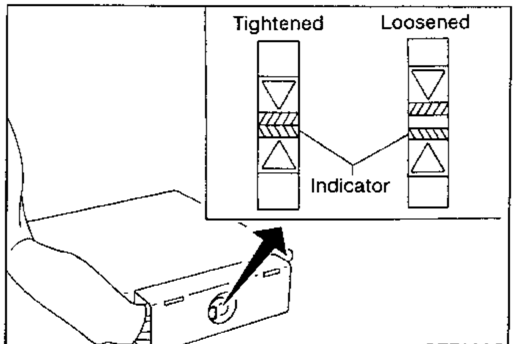
## Precautions

NBEC0005



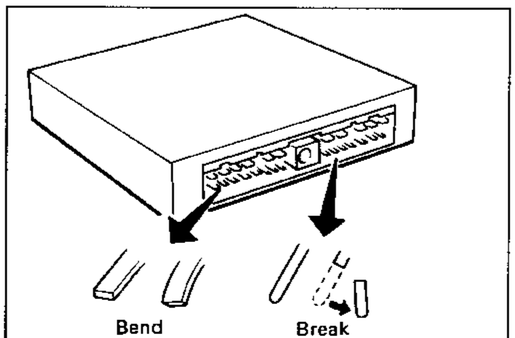

SEF289H

- 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.



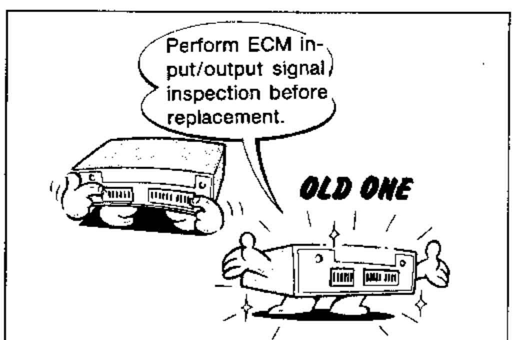

SEF308Q

- 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)



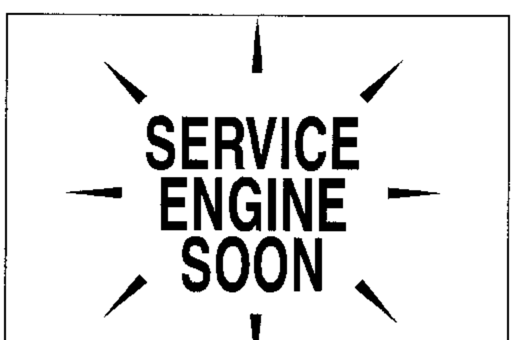

SEF291H

- 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.



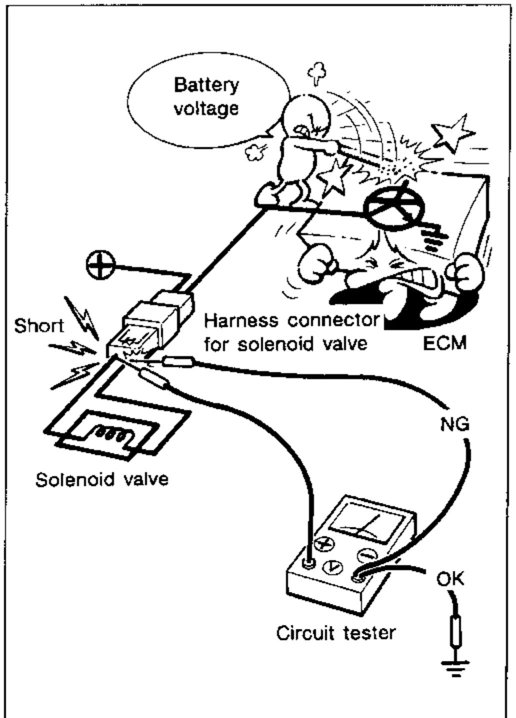

MEF040D

- Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-98.



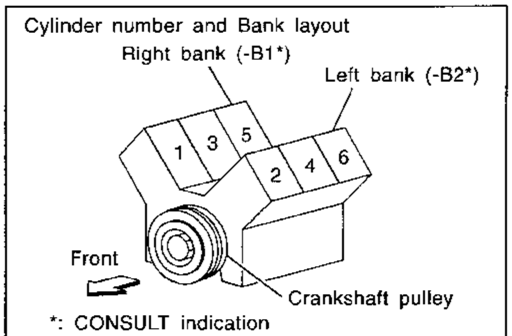

SEF217U

- After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".
  The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.



SEF348N

- **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.**



SEF926U

- **Regarding model R50, "-B1" indicates the right bank and "-B2" indicates the left bank as shown in the figure.**

## Wiring Diagrams and Trouble Diagnosis

NBEC0006

When you read Wiring diagrams, refer to the followings:

- "HOW TO READ WIRING DIAGRAMS" in GI section
- "POWER SUPPLY ROUTING" for power distribution circuit in EL section

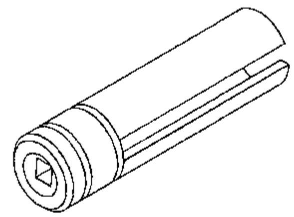
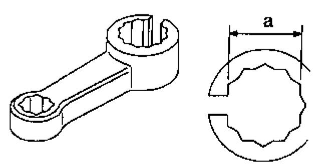
When you perform trouble diagnosis, refer to the followings:

- "HOW TO FOLLOW TEST GROUP IN TROUBLE DIAGNOSIS" in GI section
- "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT" in GI section

## Special Service Tools

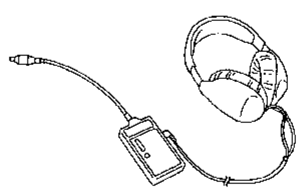
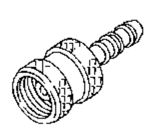
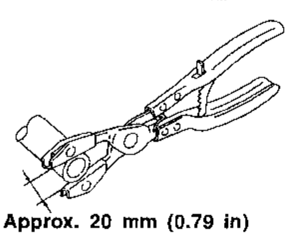
NBEC0007

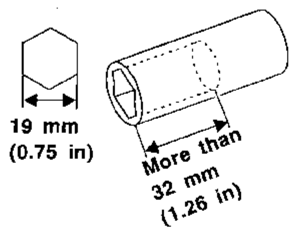
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

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

## Commercial Service Tools

NBEC0008

| Tool name<br>(Kent-Moore No.) | Description | |
|---|---|---|
| Leak detector<br>(J41416) | <br>NT703 | When distinguishing the EVAP leak portion. |
| EVAP service port adapter<br>(J41413-OBD) | <br>NT704 | When applying positive pressure through EVAP service port. |
| Hose clipper | <br>NT720 | This tool is used to clamp the EVAP purge hose between the fuel tank and EVAP canister applied to DTC P1440 (EVAP small leak positive pressure). |

| Tool name (Kent-Moore No.) | Description |
|---|---|
| Fuel filler cap adapter |  NT653 Checking fuel tank vacuum relief valve opening pressure |
| Socket wrench |  NT705 Removing and installing engine coolant temperature sensor |

GI
MA
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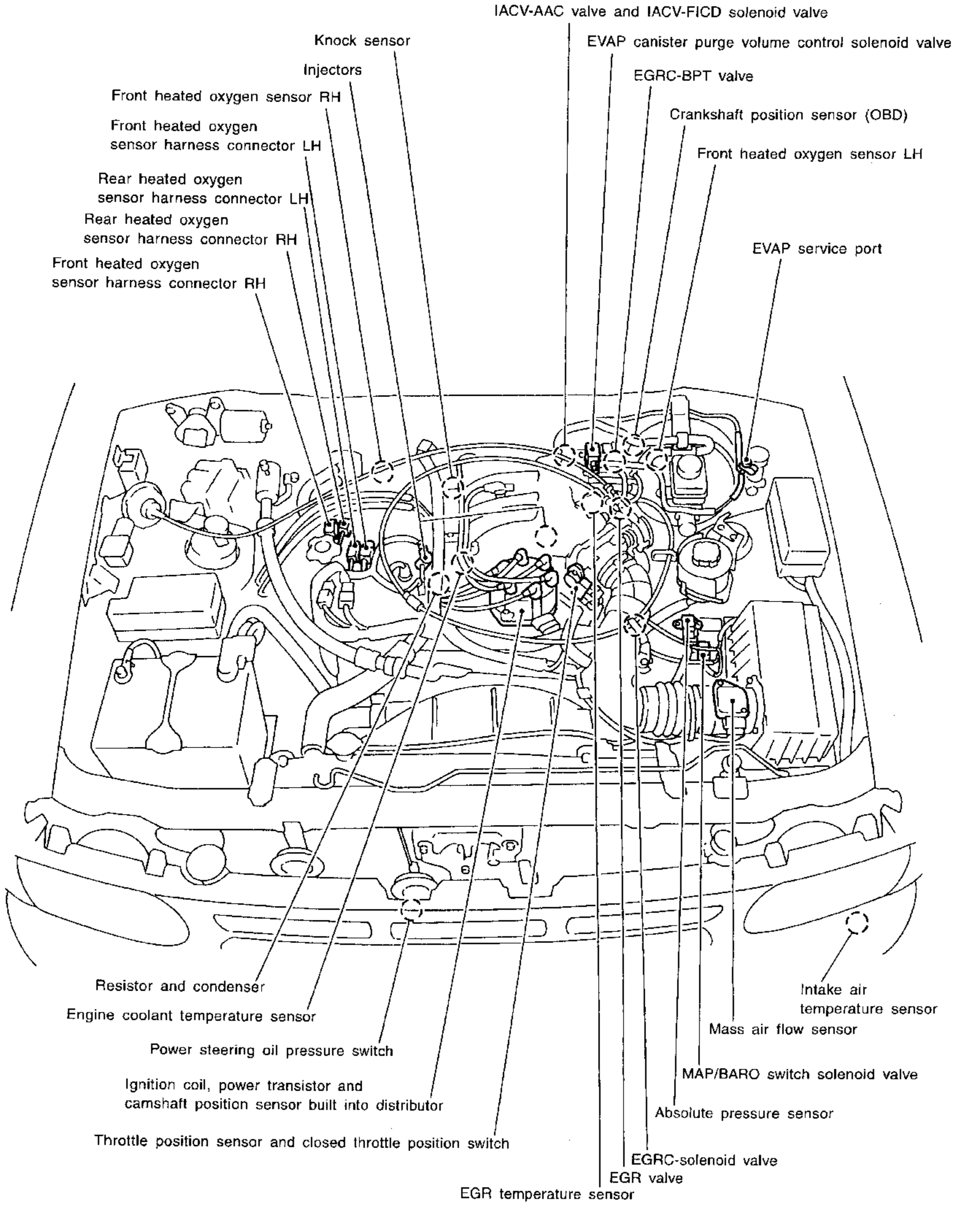
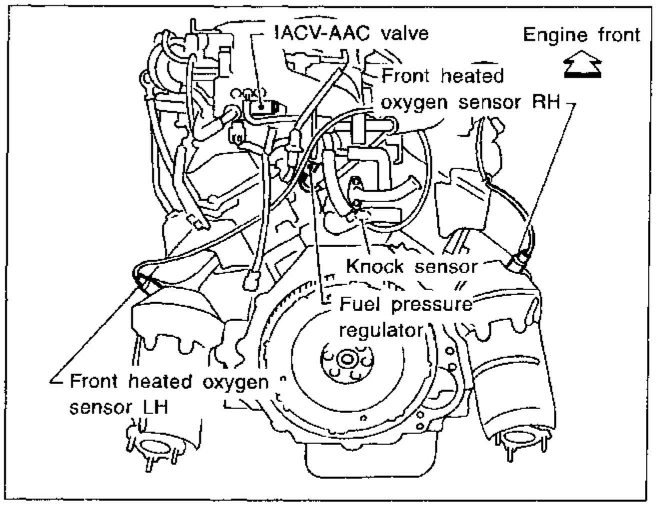
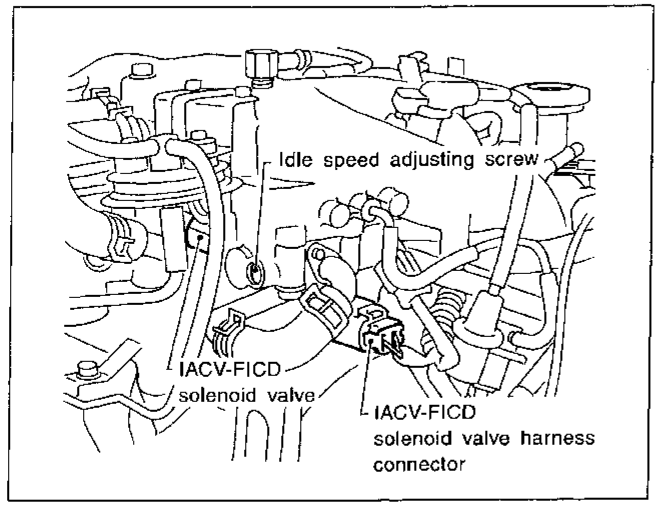
## ECCS Component Parts Location

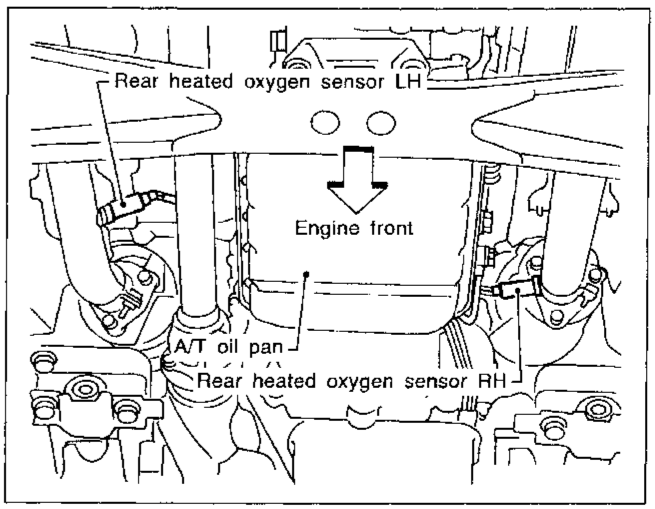
NBEC0009

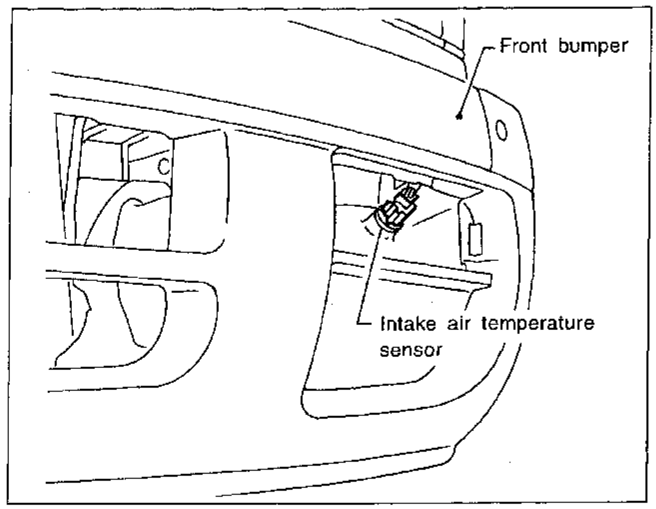


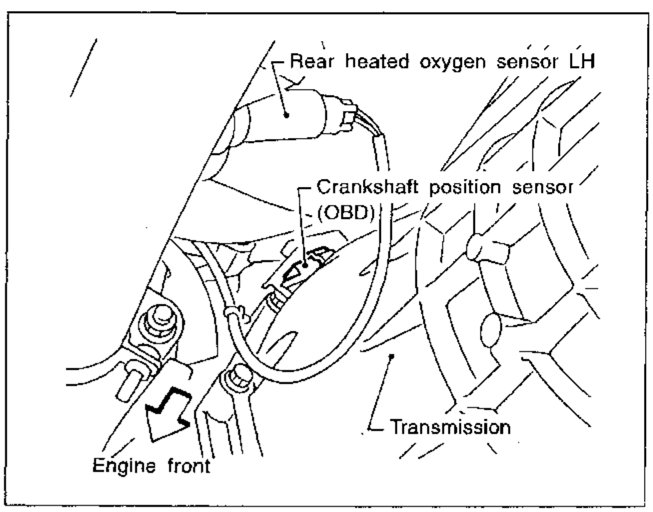

SEF790U

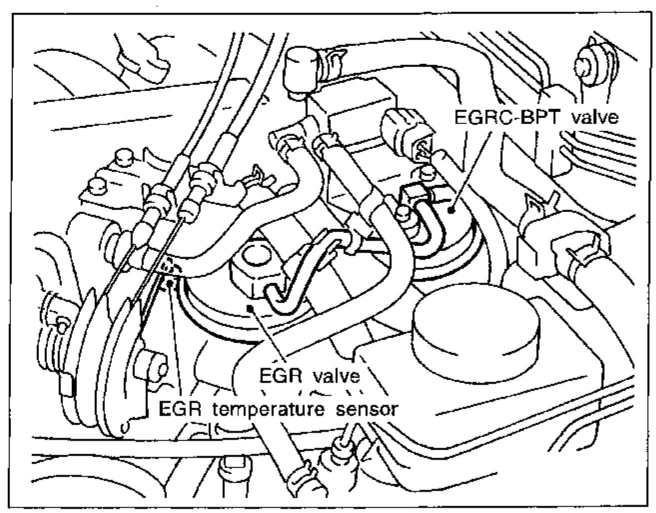

IACV-AAC valve
Engine front
Front heated oxygen sensor RH
Knock sensor
Fuel pressure regulator
Front heated oxygen sensor LH


Idle speed adjusting screw
IACV-FICD solenoid valve
IACV-FICD solenoid valve harness connector


Rear heated oxygen sensor LH
Engine front
A/T oil pan
Rear heated oxygen sensor RH


Front bumper
Intake air temperature sensor

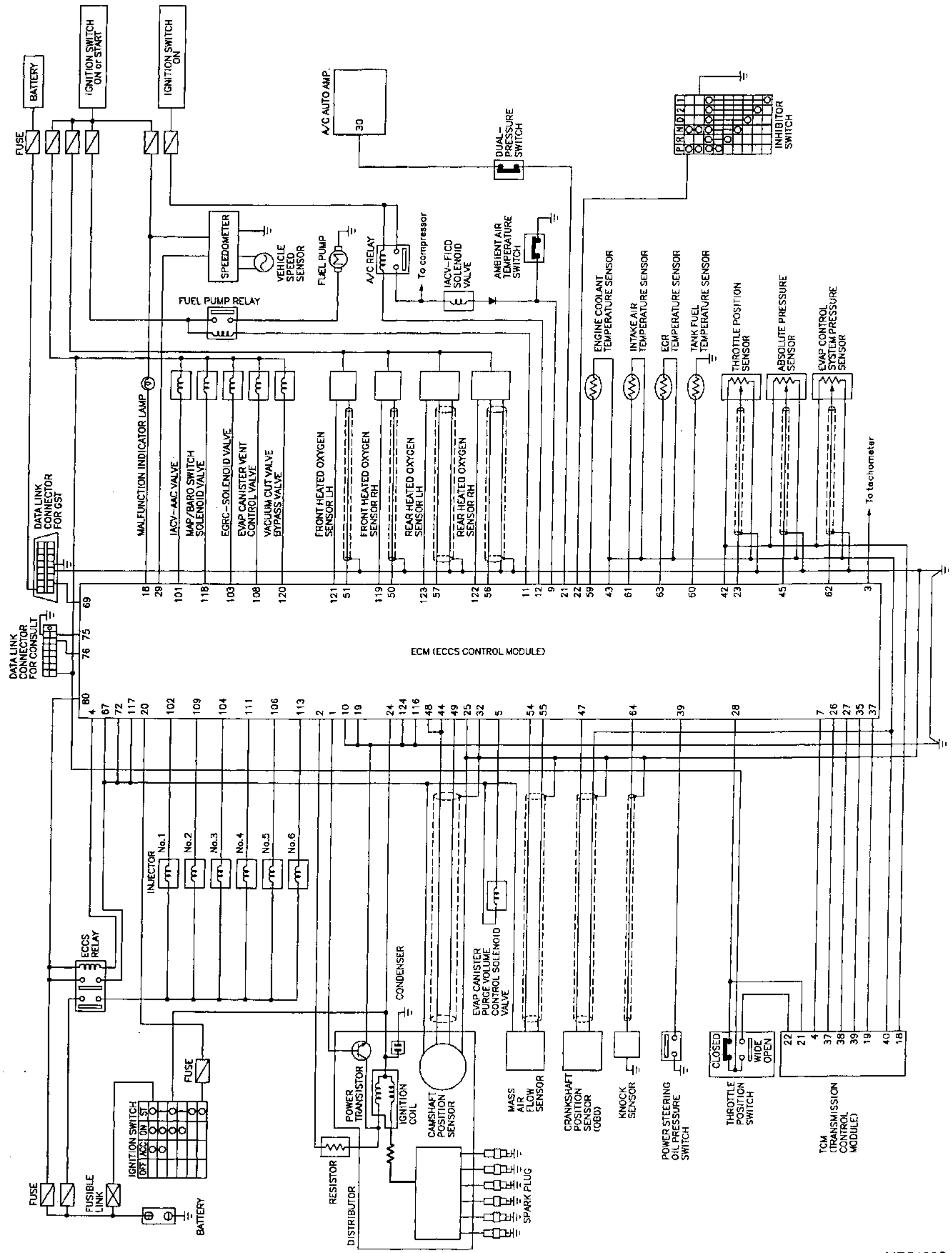

Rear heated oxygen sensor LH
Crankshaft position sensor (OBD)
Transmission
Engine front


EGRC-BPT valve
EGR valve
EGR temperature sensor

SEF791U

# Circuit Diagram

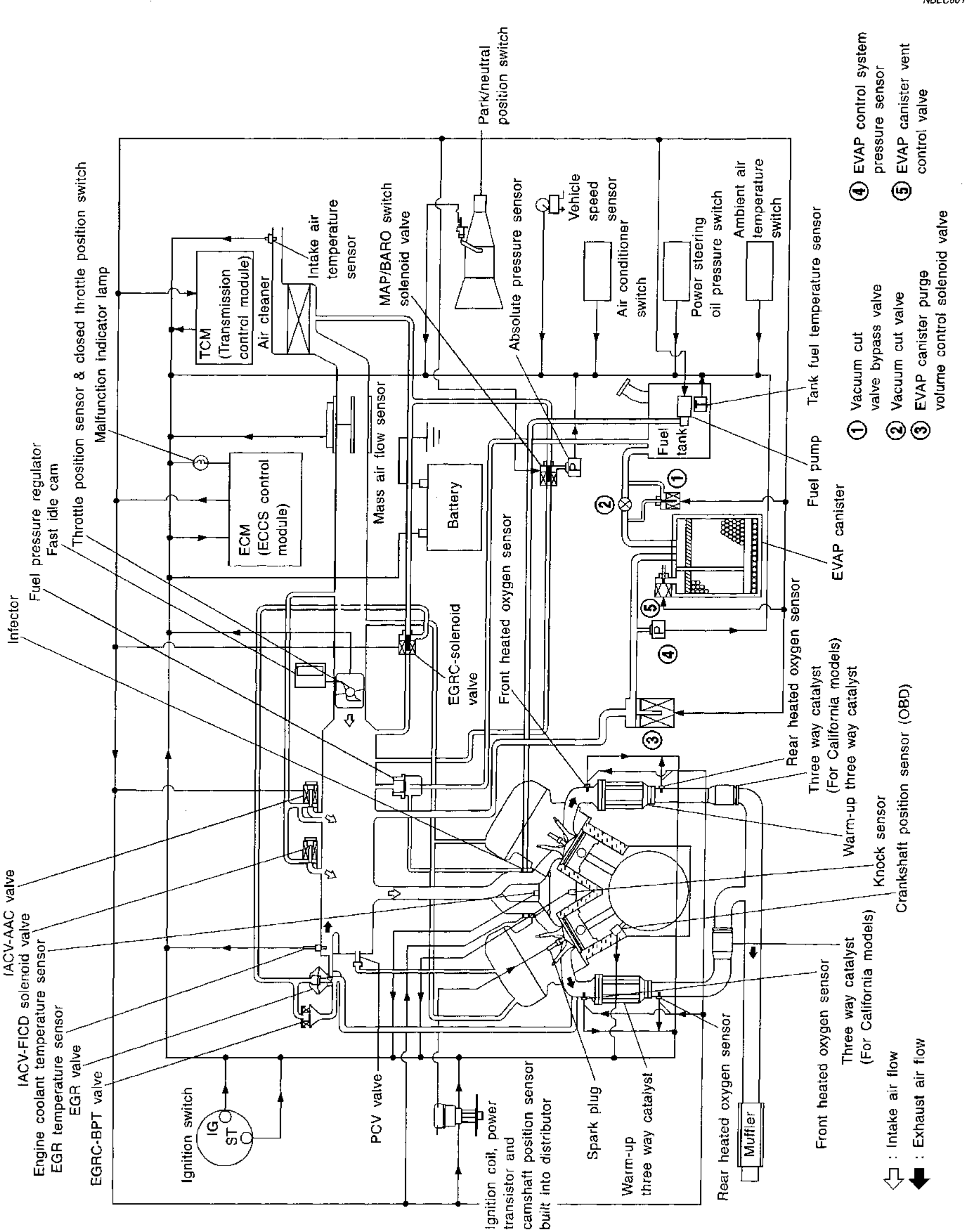
NBEC0010




MEC136C

## System Diagram

NBEC0011



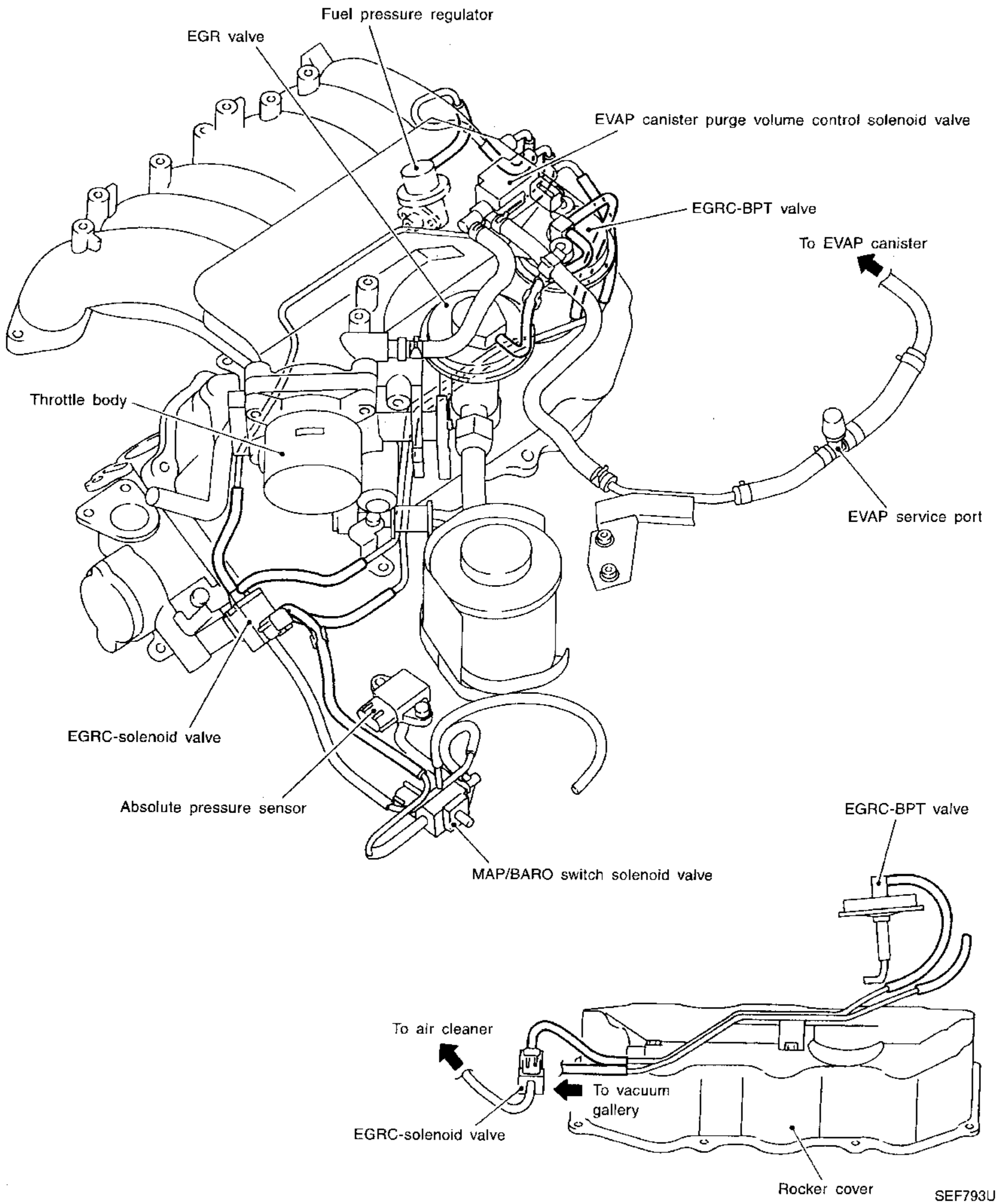

SEF792U

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## Vacuum Hose Drawing

NBEC0012

**Refer to "System Diagram", EC-17 for Vacuum Control System.**




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

## System Chart

NBEC0013

| Input (Sensor) | ECM Function | Output (Actuator) |
|---|---|---|
| • Camshaft position sensor<br>• Mass air flow sensor<br>• Engine coolant temperature sensor<br>• Front heated oxygen sensor<br>• Ignition switch<br>• Throttle position sensor<br>• Closed throttle position switch *4<br>• Park/Neutral position switch<br>• Air conditioner switch<br>• Knock sensor<br>• EGR temperature sensor *1<br>• Intake air temperature sensor<br>• Absolute pressure sensor<br>• EVAP control system pressure sensor *1<br>• Battery voltage<br>• Power steering oil pressure switch<br>• Vehicle speed sensor<br>• Tank fuel temperature sensor *1<br>• Crankshaft position sensor (OBD) *1<br>• Rear heated oxygen sensor *3<br>• TCM (Transmission control module) *2<br>• Electrical load<br>• Ambient air temperature switch | Fuel injection & mixture ratio control | Injectors |
| | Distributor ignition system | Power transistor |
| | Idle air control system | IACV-AAC valve and IACV-FICD solenoid valve |
| | Fuel pump control | Fuel pump relay |
| | Front heated oxygen sensor monitor & on board diagnostic system | Malfunction indicator lamp (On the instrument panel) |
| | EGR control | EGRC-solenoid valve |
| | Front heated oxygen sensor heater control | Front heated oxygen sensor heater |
| | Rear heated oxygen sensor heater control | Rear heated oxygen sensor heater |
| | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| | Air conditioning cut control | Air conditioner relay |
| | ON BOARD DIAGNOSIS for EVAP system | • EVAP canister vent control valve<br>• Vacuum cut valve bypass valve<br>• MAP/BARO switch solenoid valve |

*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: The DTC related to A/T will be sent to ECM.
*3: This sensor is not used to control the engine system under normal conditions.
*4: This switch will operate in place of the throttle position sensor to control EVAP parts if the sensor malfunctions.

# Multiport Fuel Injection (MFI) System

## DESCRIPTION
NBEC0014

### Input/Output Signal Line
NBEC0014S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed and piston position | Fuel injection control | Injector |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Front heated oxygen sensor | Density of oxygen in exhaust gas | | |
| Throttle position sensor | Throttle position<br>Throttle valve idle position | | |
| Park/Neutral position switch | Gear position | | |
| Vehicle speed sensor | Vehicle speed | | |
| Ignition switch | Start signal | | |
| Air conditioner switch | Air conditioner operation | | |
| Knock sensor | Engine knocking condition | | |
| Battery | Battery voltage | | |
| Absolute pressure sensor | Manifold absolute pressure<br>Ambient barometic pressure | | |
| Power steering oil pressure switch | Power steering operation | | |
| Rear heated oxygen sensor* | Density of oxygen in exhaust gas | | |

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

### Basic Multiport Fuel Injection System
NBEC0014S02

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
NBEC0014S03

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

**<Fuel increase>**

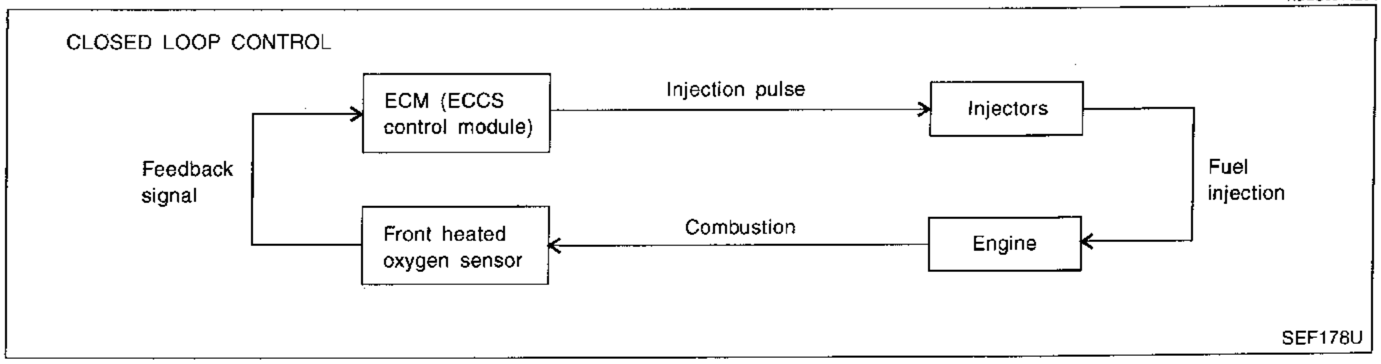
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from "N" to "D"
- High-load, high-speed operation

**<Fuel decrease>**

- During deceleration
- During high engine speed operation

## Mixture Ratio Feedback Control (Closed loop control)

NBEC0014S04




The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The warm-up 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-158. 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 warm-up 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

NBEC0014S05

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

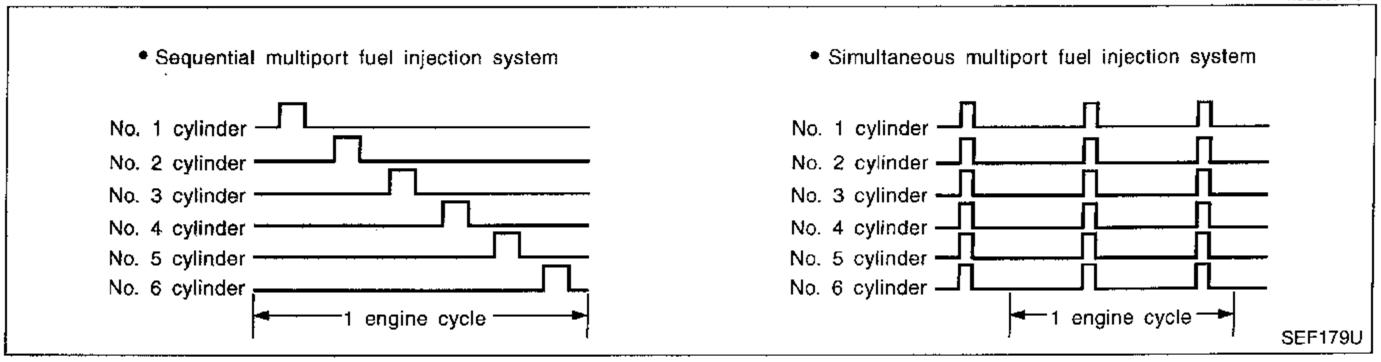
## Mixture Ratio Self-learning Control

NBEC0014S06

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.

## Fuel Injection Timing

NBEC0014S07




SEF179U

Two types of systems are used.

### Sequential Multiport Fuel Injection System

NBEC0014S0701

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

NBEC0014S0702

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

NBEC0014S08

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

# Distributor Ignition (DI) System

## DESCRIPTION

NBEC0015

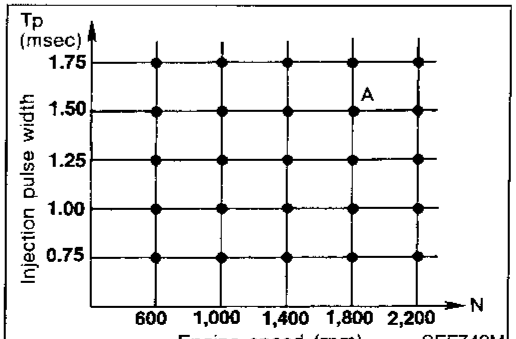
### Input/Output Signal Line

NBEC0015S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed and piston position | Ignition timing control | Power transistor |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position<br>Throttle valve idle position | | |
| Vehicle speed sensor | Vehicle speed | | |
| Ignition switch | Start signal | | |
| Knock sensor | Engine knocking | | |
| Park/Neutral position switch | Gear position | | |
| Battery | Battery voltage | | |

## System Description

NBEC0015S02



SEF742M



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
- At low battery voltage
- 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

## DESCRIPTION

NBEC0016

### Input/Output Signal Line

NBEC0016S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Air conditioner switch | Air conditioner "ON" signal | Air conditioner cut control | Air conditioner relay |
| Throttle position sensor | Throttle valve opening angle | | |
| Camshaft position sensor | Engine speed | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Vehicle speed sensor | Vehicle speed | | |
| Power steering oil pressure switch | Power steering operation | | |

## System Description

NBEC0016S02

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.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.

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

## DESCRIPTION

NBEC0017

### Input/Output Signal Line

NBEC0017S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Vehicle speed sensor | Vehicle speed | Fuel cut control | Injectors |
| Park/Neutral position switch | Neutral position | | |
| Throttle position sensor | Throttle position | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Camshaft position sensor | Engine speed | | |

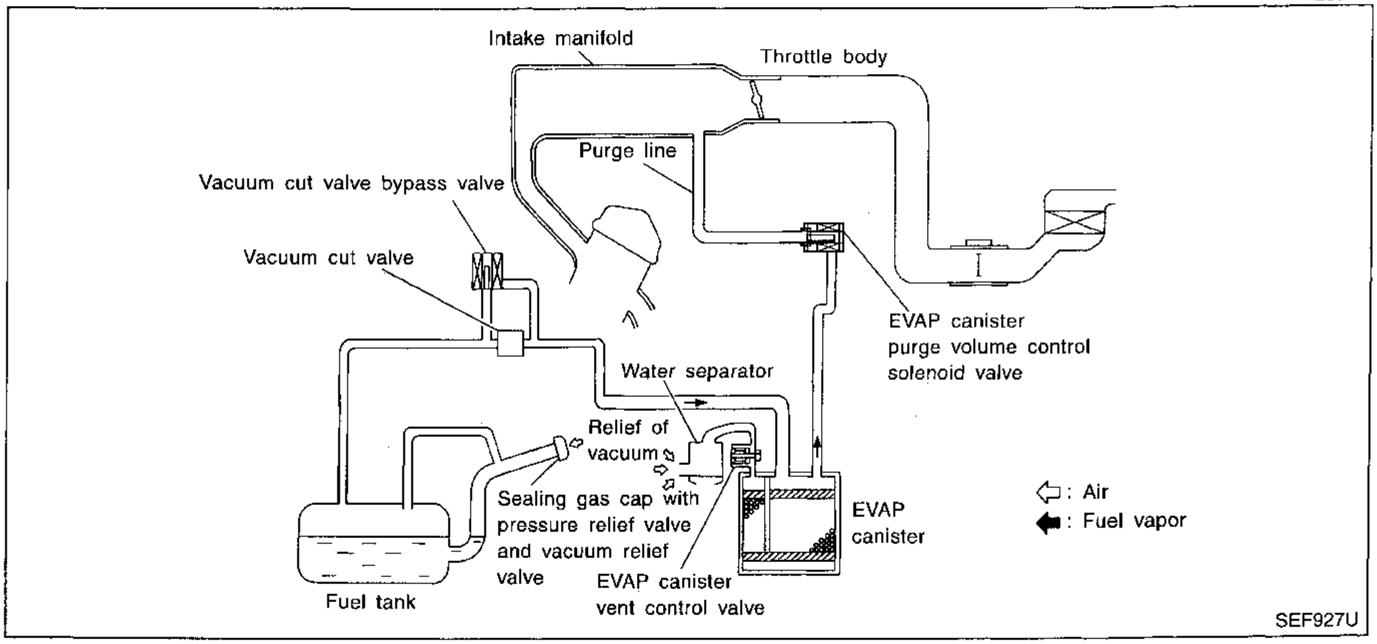
If the engine speed is above 2,500 rpm with no load (for example, in neutral and engine speed over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 2,000 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-20.

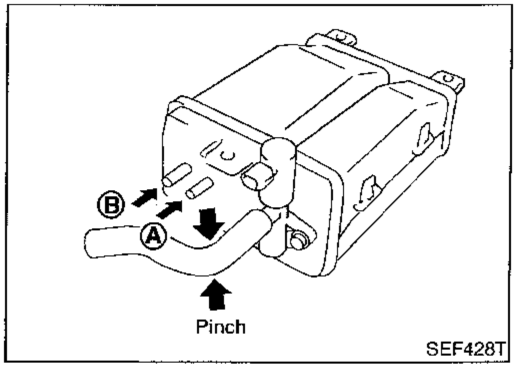
# Evaporative Emission System

## DESCRIPTION

NBEC0018



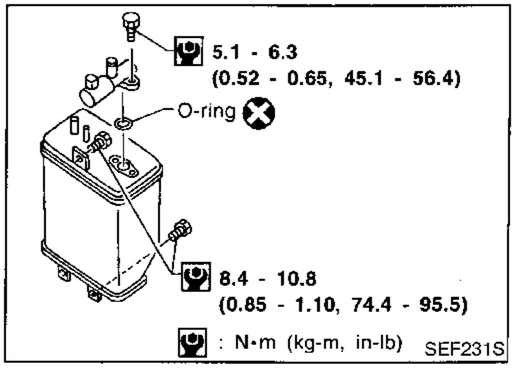

The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
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
NBEC0019

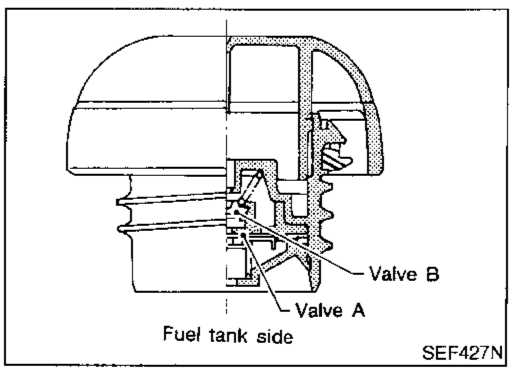
### EVAP Canister
NBEC0019S01

Check EVAP canister as follows:
1. Pinch the fresh air hose.
2. Blow air into port **A** and check that it flows freely out of port **B**.




### Tightening Torque
NBEC0019S02

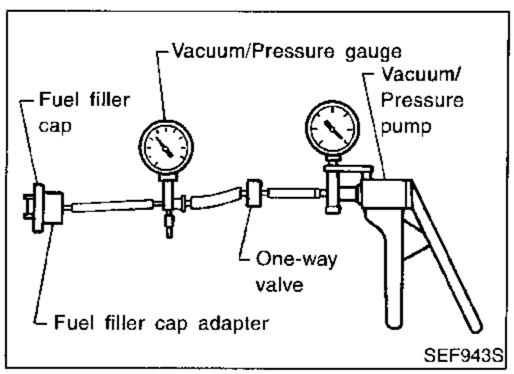
Tighten EVAP canister as shown in the figure.
**Make sure new O-ring is installed properly between EVAP canister and EVAP canister vent control valve.**




### Fuel Tank Vacuum Relief Valve (Built into fuel filler cap)
NBEC0019S03

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.
   **Pressure:**
   **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm$^2$, 2.22 - 2.90 psi)**
   **Vacuum:**
   **−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm$^2$, −0.87 to −0.48 psi)**
3. If out of specification, replace fuel filler cap as an assembly.

**CAUTION:**
**Use only a genuine 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
NBEC0019S05

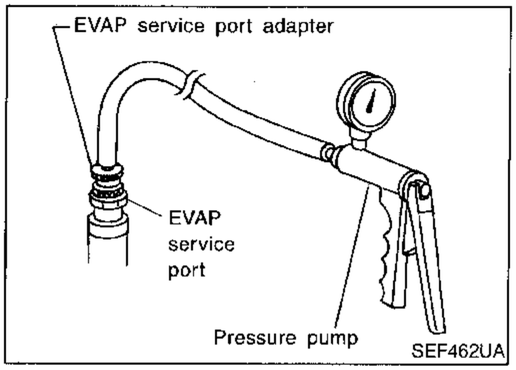
Refer to EC-415.

### Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve
NBEC0019S06

Refer to EC-299.

### Tank Fuel Temperature Sensor
NBEC0019S08

Refer to EC-251.



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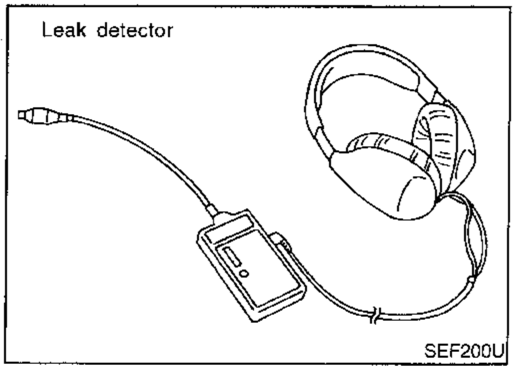
## Evap Service Port

NBEC0019S09

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.



SEF200U

## How to Detect Fuel Vapor Leakage

NBEC0019S10

**CAUTION:**

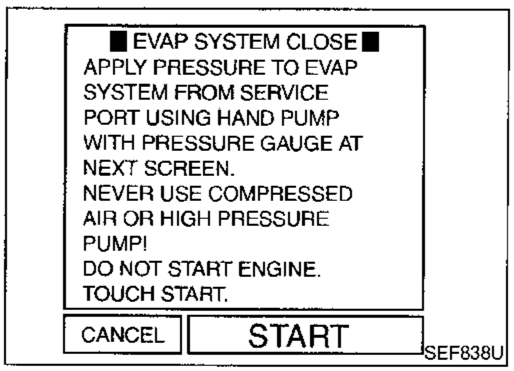
- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm$^2$, 0.6 psi) of pressure in EVAP system.**

NOTE:

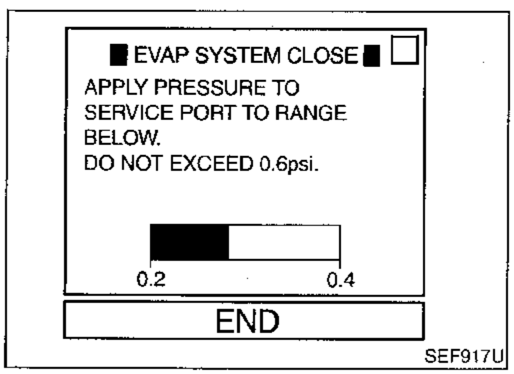
- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

**With CONSULT**

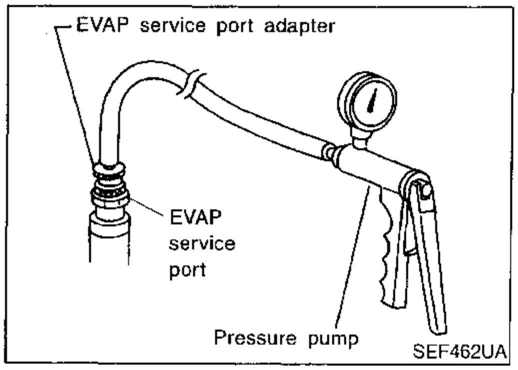
1) Attach the EVAP service port adapter securely to the EVAP service port.
2) Also attach the pressure pump and hose to the EVAP service port adapter.
3) Turn ignition switch "ON".
4) Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
5) Touch "START". A bar graph (Pressure indicating 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 EVAP service port adapter and hose with pressure pump.
8) Locate the leak using a leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-28.

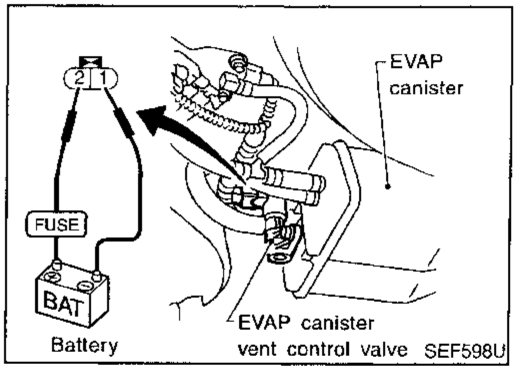


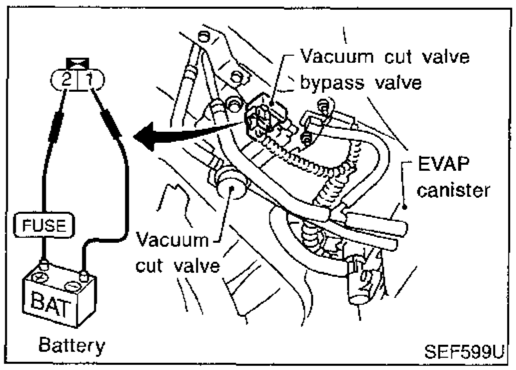
SEF838U



SEF917U



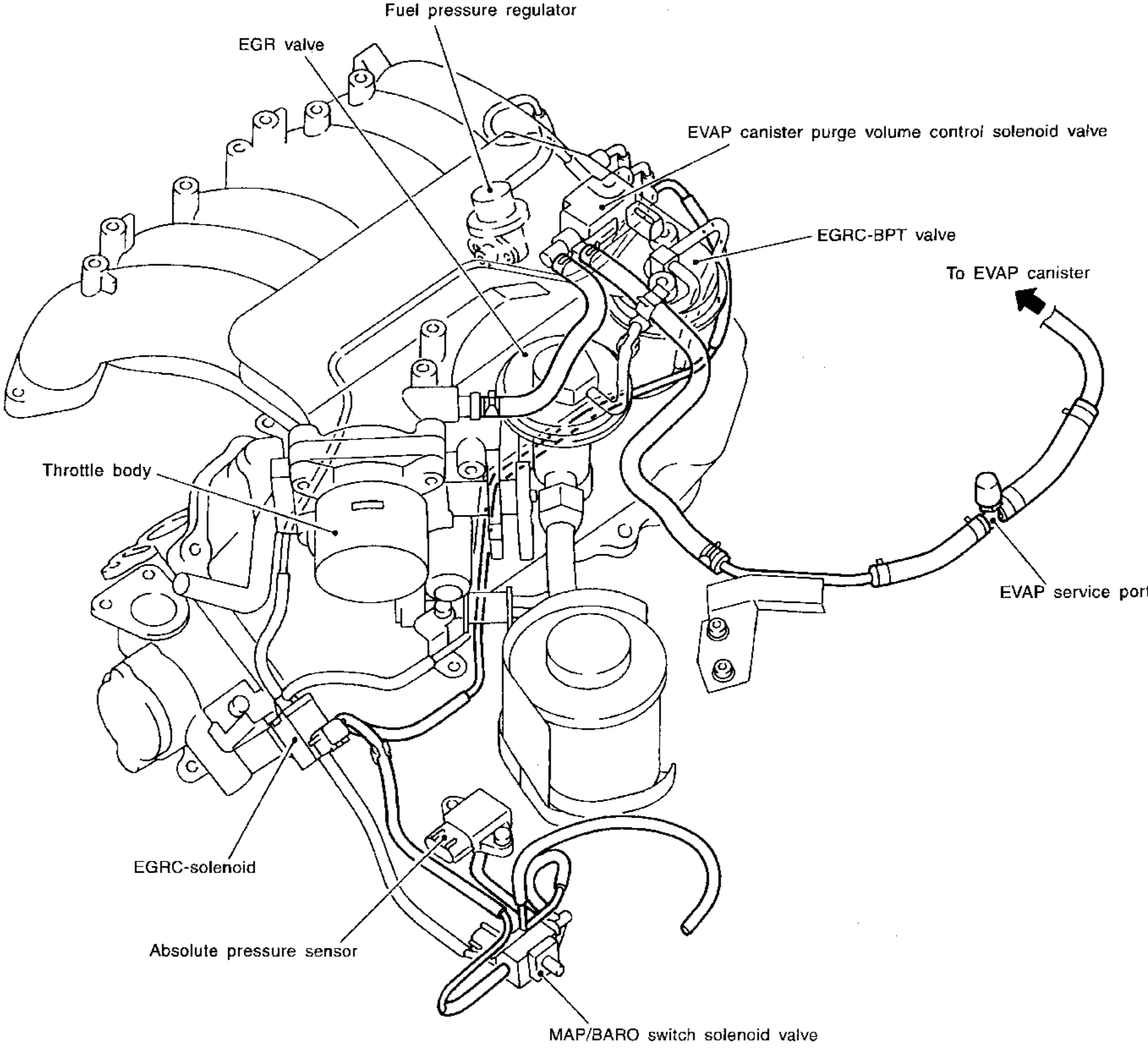




**Without CONSULT**

1) Attach the EVAP service port adapter securely to the EVAP service port.
2) Also attach the pressure pump with pressure gauge to the EVAP service port adapter.
3) 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.
4) To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 - 2.76 kPa (0.014 - 0.028 kg/cm$^2$, 0.2 - 0.4 psi).
5) Remove EVAP service port adapter and hose with pressure pump.
6) Locate the leak using a leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-28.

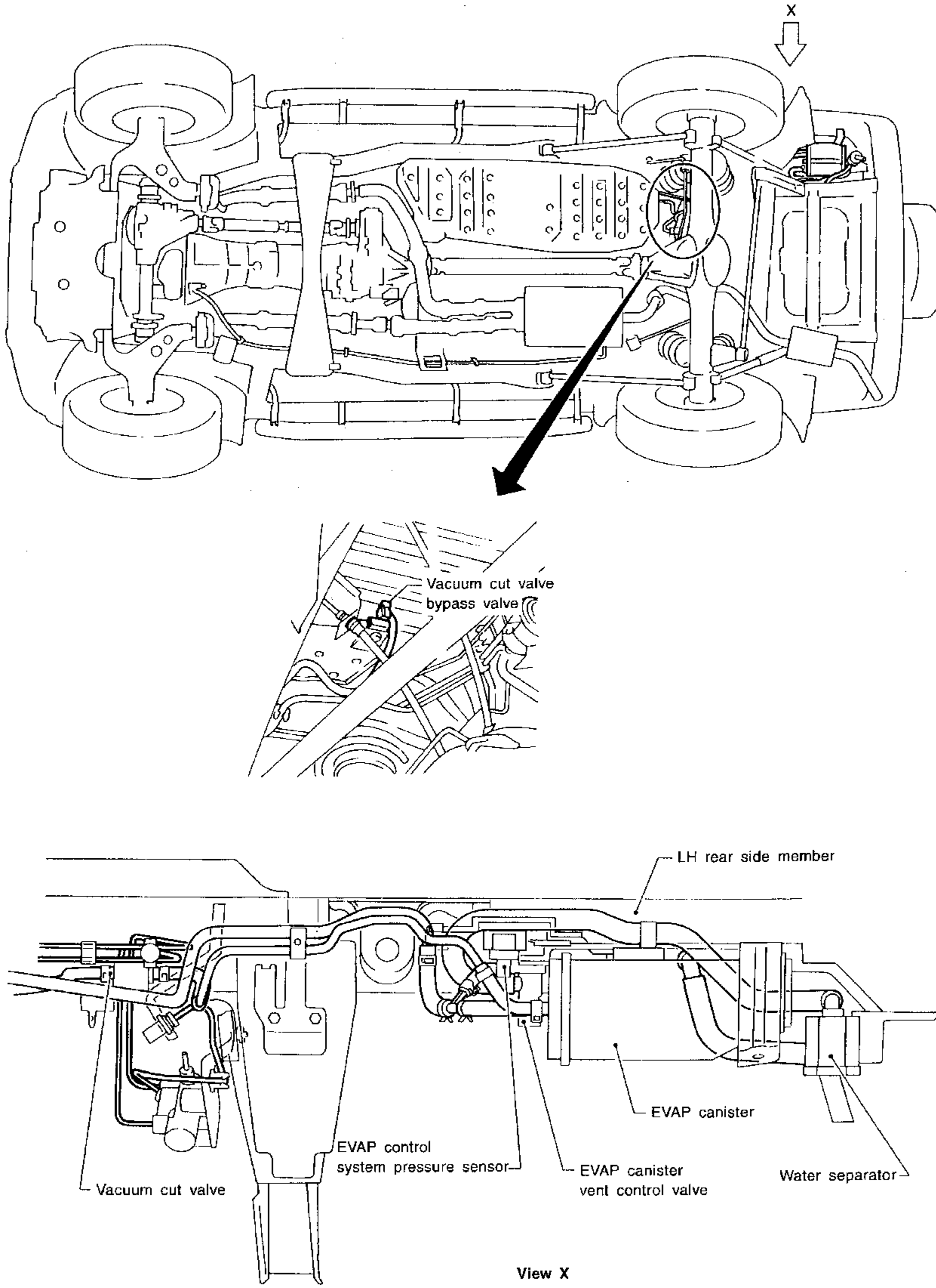
## EVAPORATIVE EMISSION LINE DRAWING

NBEC0020



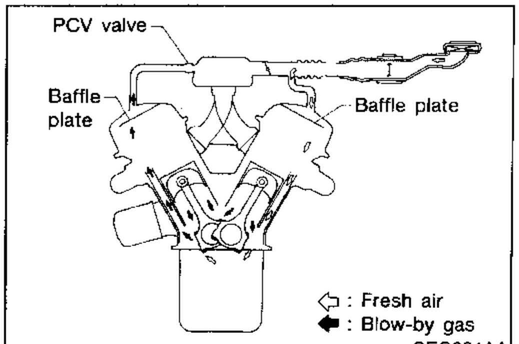

SEF794U

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


X
Vacuum cut valve bypass valve
LH rear side member
EVAP canister
EVAP control system pressure sensor
Vacuum cut valve
EVAP canister vent control valve
Water separator
View X

SEF870T

## Positive Crankcase Ventilation

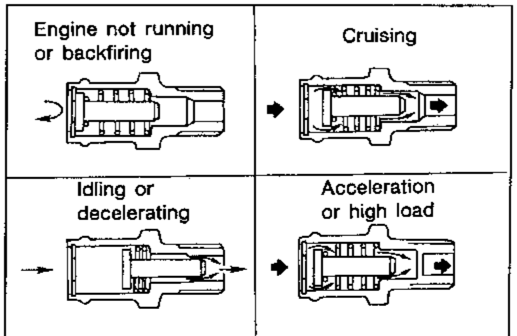


SEC631AA

### DESCRIPTION

NBEC0021

This system returns blow-by gas to the intake manifold.
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 inlet tubes 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 air inlet tubes under all conditions.



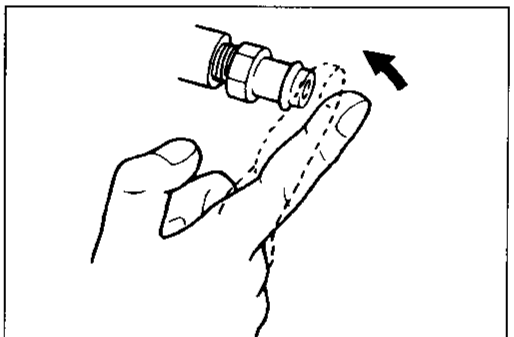
SEF559A

### INSPECTION

NBEC0022

#### PCV (Positive Crankcase Ventilation) Valve

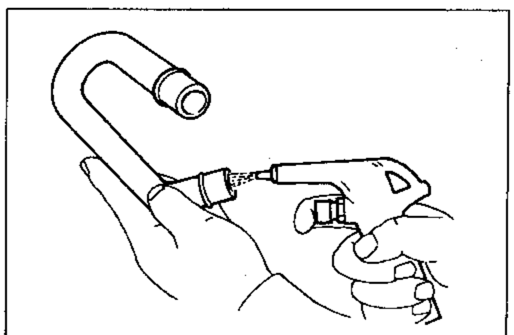
NBEC0022S01


SEC137A

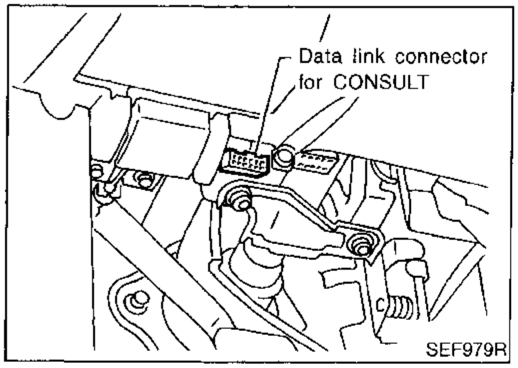
With engine running at idle, remove PCV valve ventilation hose from PCV valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

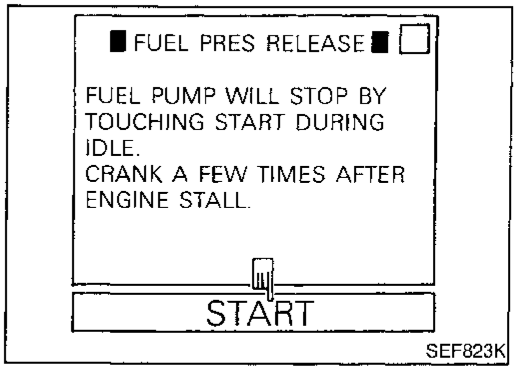
#### PCV Valve Ventilation Hose

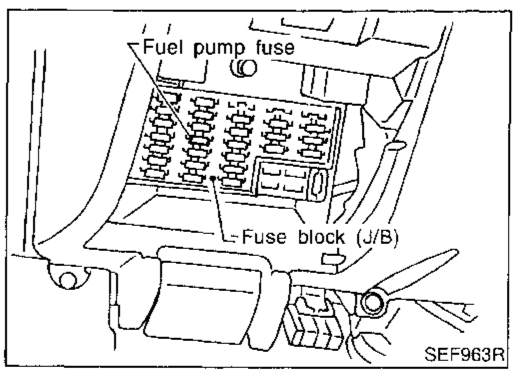
NBEC0022S02


ET277

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

NBEC0023

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

### WITH CONSULT

NBEC0023S01

1. Turn ignition switch "ON".
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch "OFF".

### WITHOUT CONSULT

NBEC0023S02

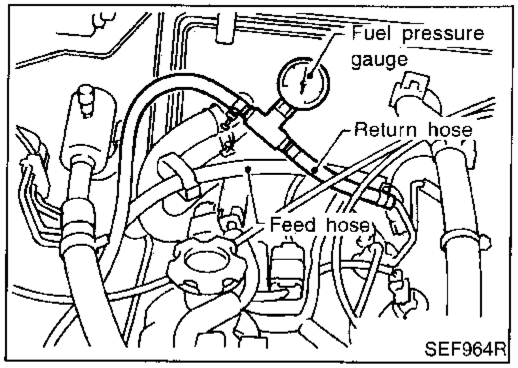
1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch "OFF".
5. Reinstall fuel pump fuse after servicing fuel system.

## Fuel Pressure Check

NBEC0024

- **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).



SEF964R

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/cm$^2$, 34 psi)**

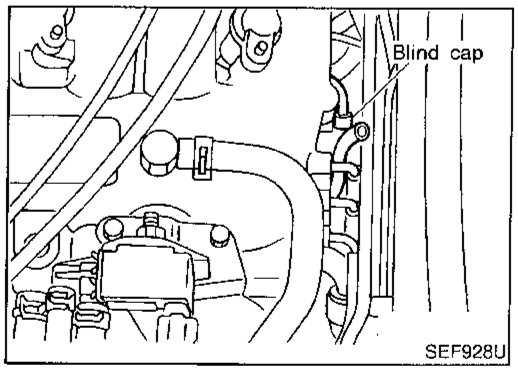
**With vacuum hose disconnected**

**Approximately 294 kPa (3.0 kg/cm$^2$, 43 psi)**

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

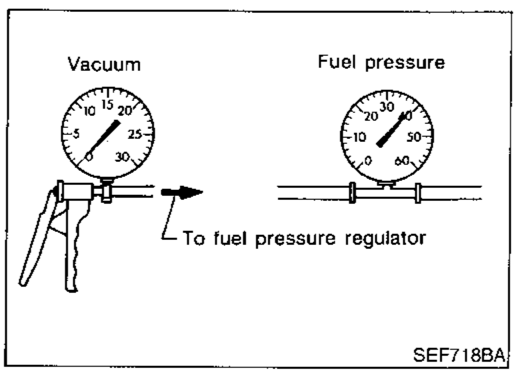
## Fuel Pressure Regulator Check

NBEC0387



SEF928U

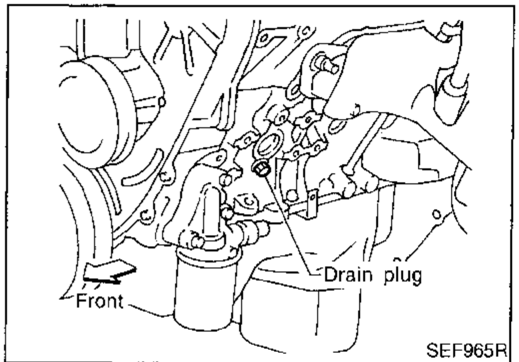
1. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
2. Plug intake manifold with a blind cap.
3. Connect variable vacuum source to fuel pressure regulator.



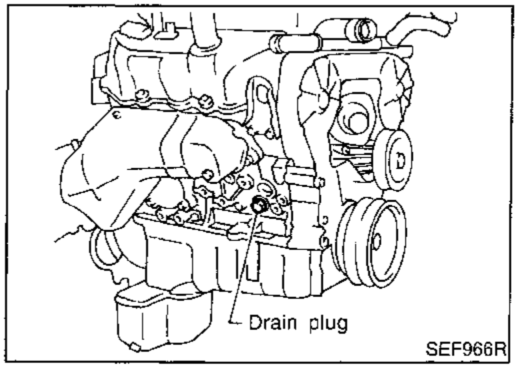
SEF718BA

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

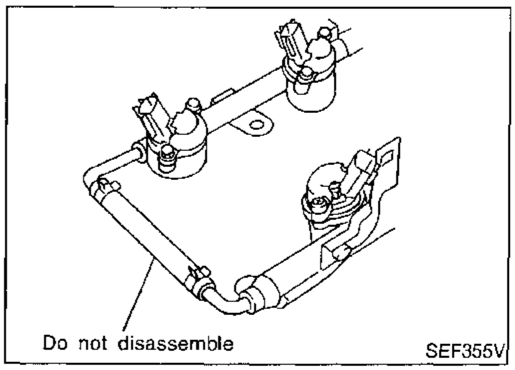
**Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.**



SEF965R



SEF966R



SEF355V

# Injector

## REMOVAL AND INSTALLATION

NBEC0025

1. Release fuel pressure to zero. Refer to EC-31.
2. Drain coolant by removing drain plugs from both sides of cylinder block.
3. Separate ASCD and accelerator control wire from intake manifold collector.
4. Remove intake manifold collector from engine.
   The following parts should be disconnected or removed.

a. Harness connectors for
- IACV-AAC valve
- IACV-FICD solenoid valve
- Throttle position sensor and closed throttle position switch assembly
- EGRC-solenoid valve
- EGR temperature sensor
- Ground harness

b. PCV valve ventilation hoses

c. Vacuum hoses for
- Brake booster
- EGRC-solenoid valve
- Fuel pressure regulator
- EVAP canister
- EGRC-BPT valve

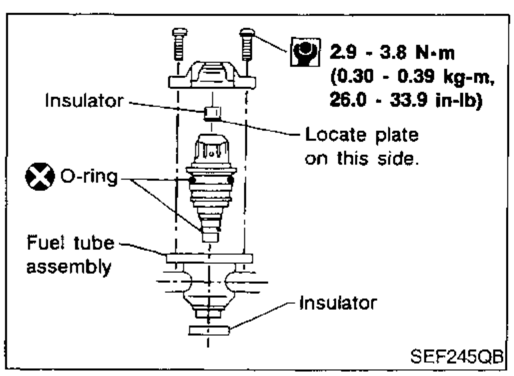
d. Air hoses from
- Air duct
- IACV-AAC valve

e. Water hoses for
- Throttle body
- Air relief plug

f. EVAP canister purge hose

g. EGR flare tube

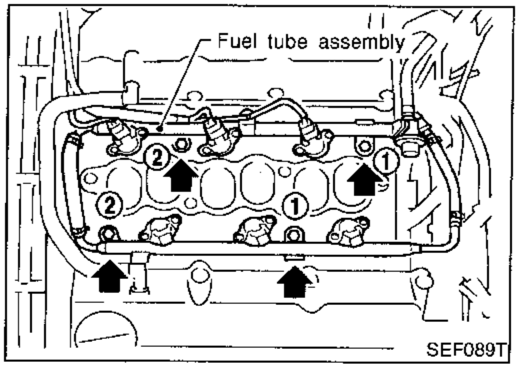
5. Remove injector fuel tube assembly.
   The following parts should be disconnected or removed.
- Vacuum hose for fuel pressure regulator
- Fuel feed and return hose
- All injectors harness connectors
- **Push injector tail piece.**
- **Do not pull on connector.**
- **Do not extract injector by pinching.**



SEF245QB

6. Push out any malfunctioning injector from injector fuel tube.
7. Replace or clean injector as necessary.
- **Always replace O-rings with new ones.**
- **Lubricate O-rings with engine oil.**

8. Install injector to injector fuel tube assembly.

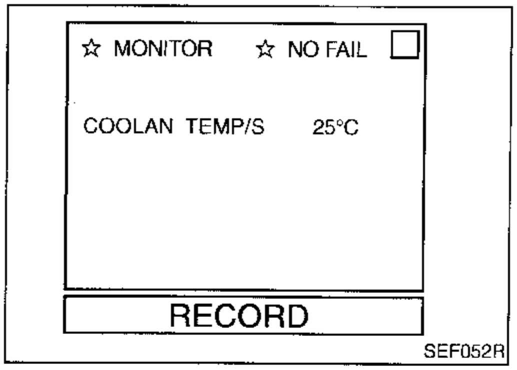


SEF089T

9. Install injectors with fuel tube assembly to intake manifold.
   **Tighten in numerical order shown in the figure.**
   a. First, tighten all bolts to 6 to 7 N·m (0.6 to 0.7 kg-m, 4.3 to 5.1 ft-lb).
   b. Then, tighten all bolts to 10.8 to 14.7 N·m (1.1 to 1.5 kg-m, 8 to 11 ft-lb).
10. Reinstall any part removed in reverse order of removal.

**CAUTION:**

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



SEF052R

## Fast Idle Cam (FIC)

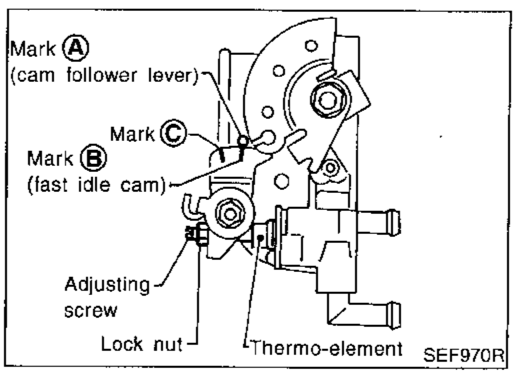
### INSPECTION AND ADJUSTMENT

NBEC0026

### With CONSULT

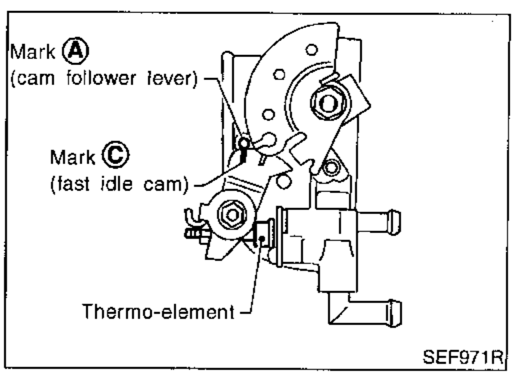
NBEC0026S01

1. Turn ignition switch “ON”.
2. See “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT.
3. When engine coolant temperature is 25±5°C (77±9°F), make sure that the center of mark **A** is aligned with mark **B** as shown in the figure.



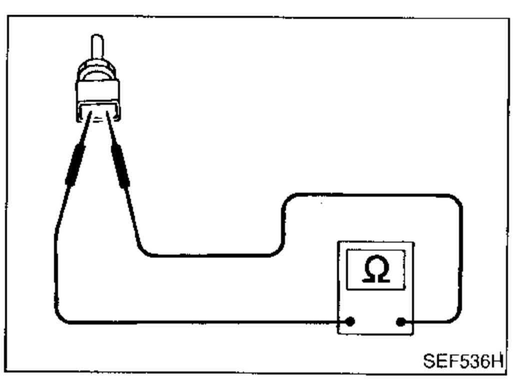
SEF970R

- If NG, adjust by turning adjusting screw.
  **Lock nut:**
  **: 0.98 - 1.96 N·m (10 - 20 kg-cm, 8.7 - 17.4 in-lb)**



SEF971R

4. Start engine and warm it up.
5. When engine coolant temperature is 80±5°C (176±9°F), check the following.
- The center of mark **A** is aligned with mark **C**.
- The cam follower lever's roller is not touching the fast idle cam.
- If NG, replace thermo-element and perform the above inspection and adjustment again.

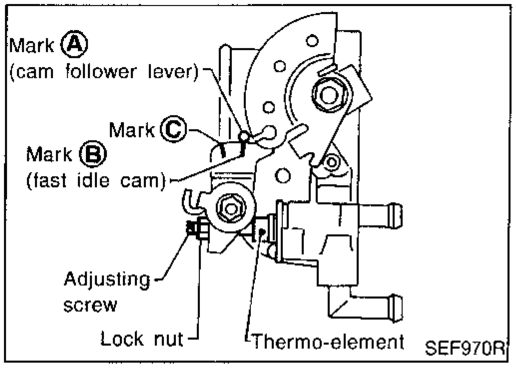


SEF536H

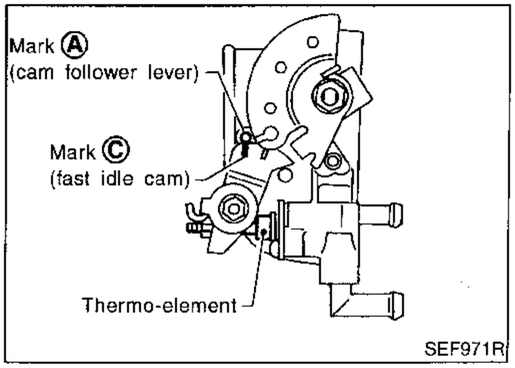
### Without CONSULT

NBEC0026S02

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 1.65 to 2.4 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.
  **Lock nut:**
  **: 0.98 - 1.96 N·m (10 - 20 kg-cm, 8.7 - 17.4 in-lb)**




4. Start engine and warm it up.
5. When the resistance of engine coolant temperature sensor is 0.26 to 0.39 kΩ, check the following.

- The center of mark **A** is aligned with mark **C**.
- The cam follower lever's roller is not touching the fast idle cam.
- If NG, replace thermo-element and perform the above inspection and adjustment again.

## Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

NBEC0027

### PREPARATION

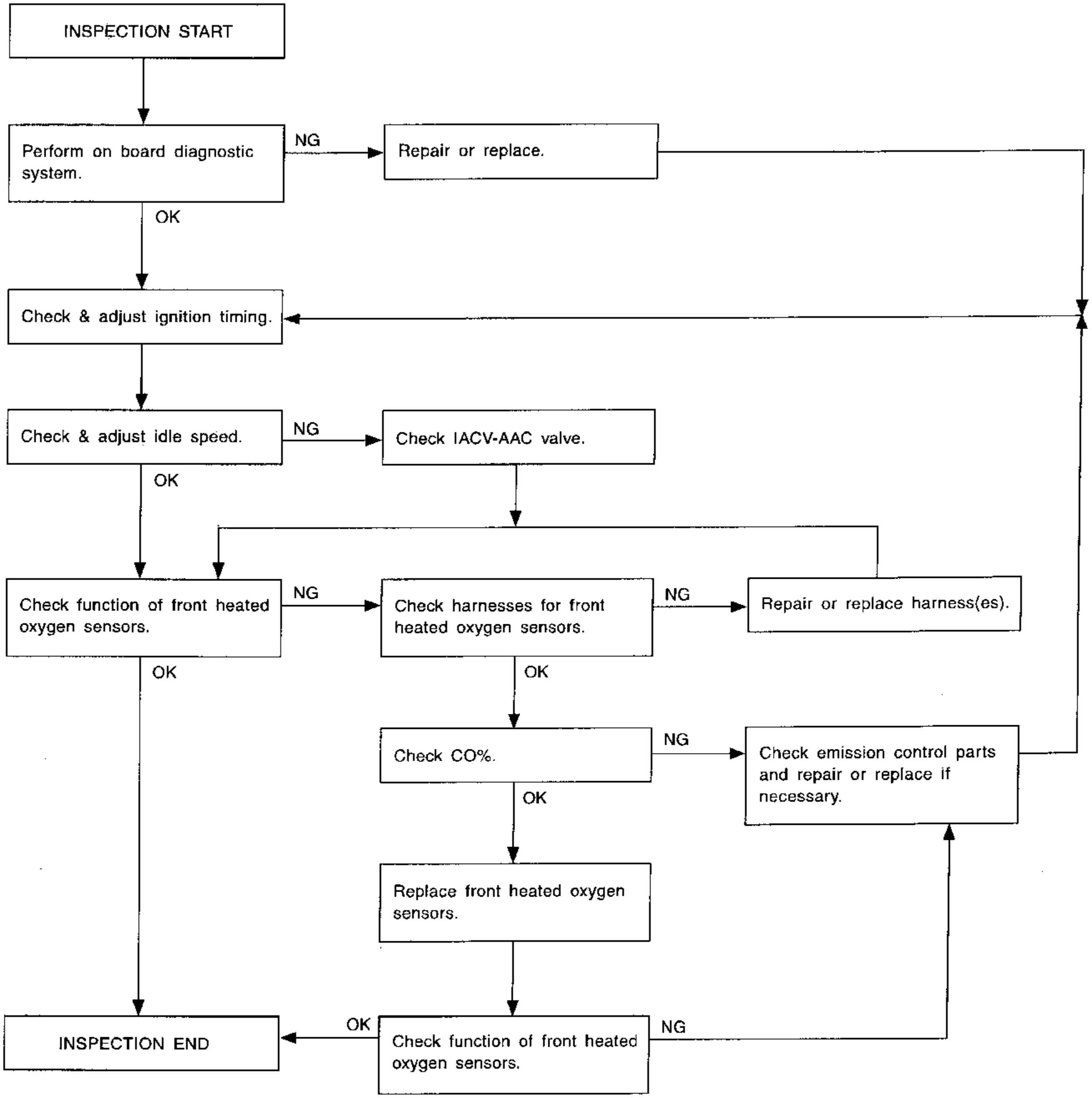
NBEC0027S01

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

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

## Overall Inspection Sequence

NBEC0027S0101

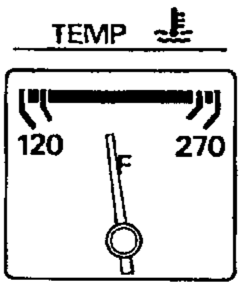



MEC003C

| 1 | INSPECTION START |
|---|---|

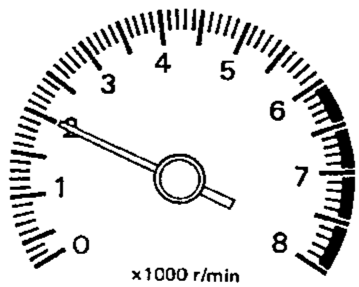
1. Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- EGR valve operation
- Electrical connectors
- Gasket
- Throttle valve and throttle position sensor operation

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




SEF976U

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




SEF977U

4. Perform diagnostic test mode II (Self-diagnostic results). Refer to EC-59.

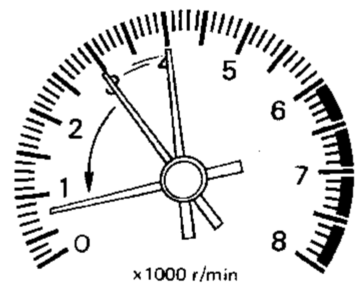

SEF217U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | 1. Repair or replace components as necessary.<br>2. GO TO 2. |

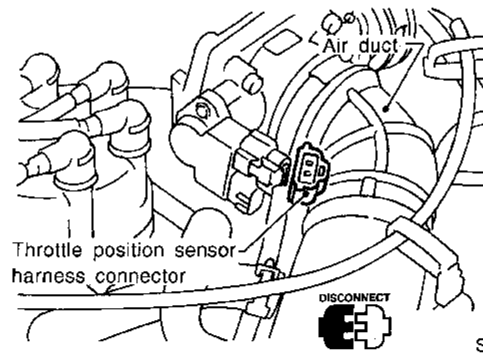
| 2 | CHECK IGNITION TIMING |
|---|---|

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 - 3,000 rpm) two or three times under no-load, then run engine at idle speed.



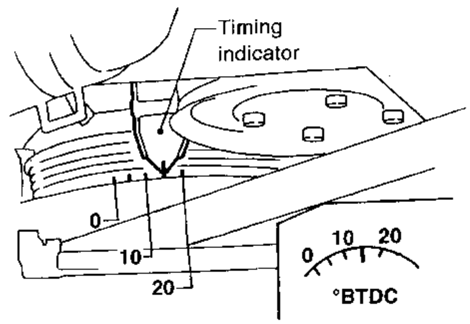

SEF978U

3. Turn off engine and disconnect throttle position sensor harness connector.




SEF975R

4. Start and rev engine (2,000 - 3,000 rpm) two or three times under no-load, then run at idle speed.
5. Check ignition timing with a timing light.
   **15°±2° BTDC (in "N" position)**




SEF371S

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |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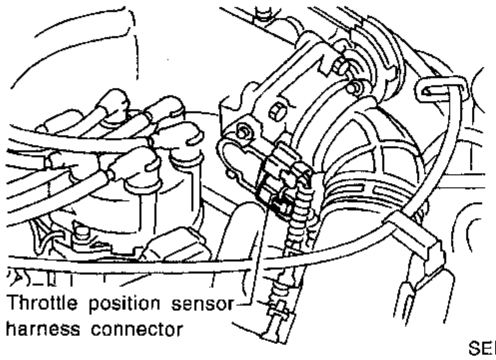
| 3 | ADJUST IGNITION TIMING |
|---|---|

1. Adjust ignition timing by turning distributor after loosening securing bolts.
2. Turn off engine and connect throttle position sensor harness connector to throttle position sensor.




SEF972R

| | |
|---|---|
| ▶ | GO TO 2. |

| 4 | CHECK BASE IDLE SPEED |
|---|---|

**With CONSULT**

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

**700±50 rpm (in "N" position)**

| ☆ MONITOR | ☆ NO FAIL □ |
|---|---|
| CMPS•RPM(REF) | 700 rpm |
| RECORD | |

SEF356V

**Without CONSULT**

1. Check idle speed.

**700±50 rpm (in "N" position)**

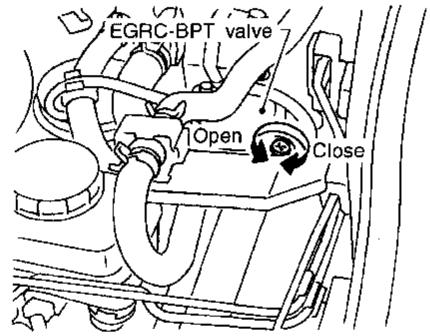
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

| 5 | ADJUST BASE IDLE SPEED |
|---|---|

1. Rev engine (2,000 - 3,000 rpm) 2 or 3 times under no-load then run engine at idle speed.
2. Adjust idle speed by turning idle speed adjusting screw.

**700±50 rpm (in "N" position)**




SEF973R

| | |
|---|---|
| ▶ | GO TO 6. |

| 6 | CHECK TARGET IDLE SPEED |
|---|---|

**With CONSULT**

1. Turn off engine and connect throttle position sensor harness connector.
2. Start and rev engine (2,000 - 3,000 rpm) 2 or 3 times under no-load then run at idle speed.
3. Read idle speed in "DATA MONITOR" mode with CONSULT.

**750±50 rpm (in "N" position)**

| ☆ MONITOR | ☆ NO FAIL □ |
|---|---|
| CMPS•RPM(REF) | 750 rpm |
| RECORD | |

SEF357V

**Without CONSULT**

1. Turn off engine and connect throttle position sensor harness connector.
2. Start and rev engine (2,000 - 3,000 rpm) 2 or 3 times under no-load then run at idle speed.
3. Check idle speed.

**750±50 rpm (in "N" position)**

**OK or NG**

| | | |
|---|---|---|
| OK (With CONSULT) | ▶ | GO TO 8. |
| OK (Without CONSULT) | ▶ | GO TO 9. |
| NG | ▶ | GO TO 7. |

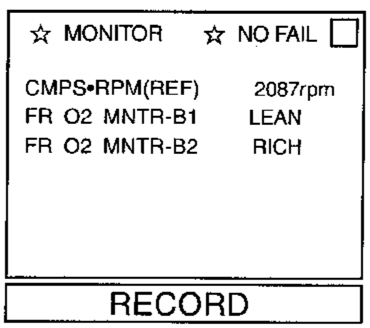
## 7 DETECT MALFUNCTIONING PART

Check the following.
1. Check IACV-AAC valve and replace if necessary. Refer to EC-323.
2. Check IACV-AAC valve harness and repair if necessary. Refer to EC-323.
3. Check ECM function by substituting another known good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

| | |
|---|---|
| With CONSULT ▶ | GO TO 8. |
| Without CONSULT ▶ | GO TO 9. |

## 8 CHECK FRONT HEATED OXYGEN SENSOR LH SIGNAL

**With CONSULT**
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. See "FR O2 MNTR-B2" in "DATA MONITOR" mode.
3. Running 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 time: RICH → LEAN → RICH**
   **2 times: RICH → LEAN → RICH → LEAN → RICH**



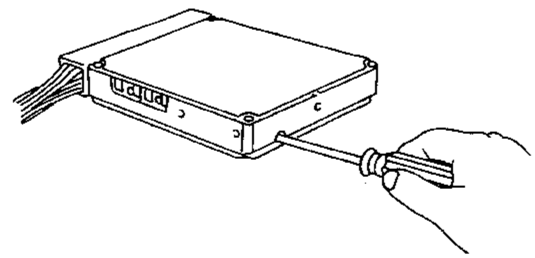

SEF358V

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 12. |
| NG (Monitor does not fluctuate.) ▶ | GO TO 17. |
| NG (Monitor fluctuates less than 5 times.) ▶ | 1. Replace front heated oxygen sensor LH.<br>2. GO TO 10. |

## 9 CHECK FRONT HEATED OXYGEN SENSOR LH SIGNAL

**Without CONSULT**
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Set "Left bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-59.



SEF979U

3. Make sure that MIL goes on more than 5 times during 10 seconds at 2,000 rpm.


SEF217U

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 12. |
| NG (MIL does not blink.) ▶ | GO TO 17. |
| NG (MIL blinks less than 5 times.) ▶ | 1. Replace front heated oxygen sensor LH.<br>2. GO TO 10. |

### 10 CHECK FRONT HEATED OXYGEN SENSOR LH SIGNAL

**With CONSULT**

1. See "FR O2 MNTR-B2" in "DATA MONITOR" mode.
2. Running 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 time: RICH → LEAN → RICH**
   **2 times: RICH → LEAN → RICH → LEAN → RICH**

**Without CONSULT**

1. Set "Left bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-59.
2. Make sure that MIL goes on more than 5 times during 10 seconds at 2,000 rpm.

**OK or NG**

| | | |
|---|---|---|
| OK (With CONSULT) | ▶ | GO TO 12. |
| OK (Without CONSULT) | ▶ | GO TO 13. |
| NG | ▶ | GO TO 11. |

### 11 DETECT MALFUNCTIONING PART

Check the following.

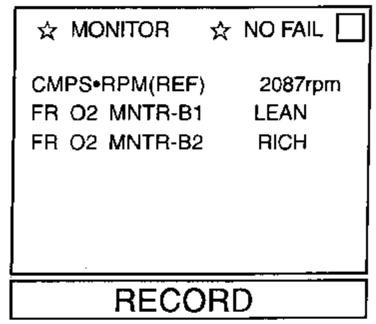
1. Check fuel pressure regulator. Refer to EC-32.
2. Check mass air flow sensor and its circuit. Refer to EC-115.
3. Check injector and its circuit. Refer to EC-429. Clean or replace if necessary.
4. Check engine coolant temperature sensor and its circuit. Refer to EC-153.
5. Check ECM function by substituting another known good ECM. (ECM may be the cause of a problem, but this is rarely the case.)

| | | |
|---|---|---|
| | ▶ | GO TO 2. |

### 12 CHECK FRONT HEATED OXYGEN SENSOR RH SIGNAL

**With CONSULT**

1. See "FR O2 MNTR-B1" 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 time: RICH → LEAN → RICH**
   **2 times: RICH → LEAN → RICH → LEAN → RICH**



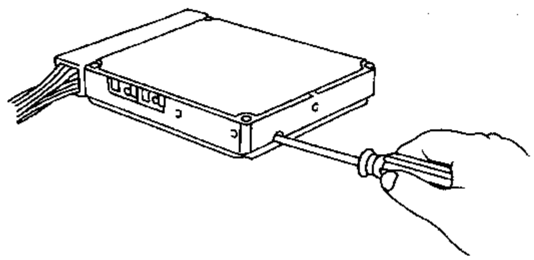

SEF358V

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | END |
| NG (Monitor does not fluctuate.) | ▶ | GO TO 16. |
| NG (Monitor fluctuates less than 5 times.) | ▶ | 1. Replace front heated oxygen sensor RH.<br>2. GO TO 14. |

| 13 | CHECK FRONT HEATED OXYGEN SENSOR RH SIGNAL |
|---|---|

**Without CONSULT**
1. Set "Right bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-59.



SEF979U

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


SEF217U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | END |
| NG (MIL does not blink.) | ▶ | GO TO 16. |
| NG (MIL blinks less than 5 times.) | ▶ | 1. Replace front heated oxygen sensor RH.<br>2. GO TO 14. |

| 14 | CHECK FRONT HEATED OXYGEN SENSOR RH SIGNAL |
|---|---|

**With CONSULT**
1. See "FR O2 MNTR-B1" 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 time: RICH → LEAN → RICH**
   **2 times: RICH → LEAN → RICH → LEAN → RICH**

**Without CONSULT**
1. Set "Right bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-59.
2. Make sure that MIL goes on more than 5 times during 10 seconds at 2,000 rpm.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | END |
| NG | ▶ | GO TO 15. |

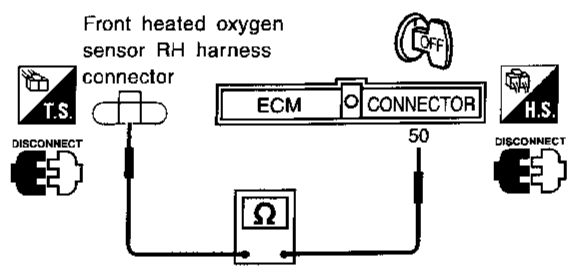
| 15 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
1. Check fuel pressure regulator. Refer to EC-32.
2. Check mass air flow sensor and its circuit. Refer to EC-115.
3. Check injector and its circuit. Refer to EC-429.
   Clean or replace if necessary.
4. Check engine coolant temperature sensor and its circuit. Refer to EC-153.
5. Check ECM function by substituting another known good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

| | | |
|---|---|---|
| | ▶ | GO TO 2. |

| 16 | CHECK FRONT HEATED OXYGEN SENSOR RH HARNESS |
|---|---|

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect front heated oxygen sensor RH harness connector.
4. Check harness continuity between ECM terminal 50 and front heated oxygen sensor RH harness connector.
   **Continuity should exist.**




SEF980U

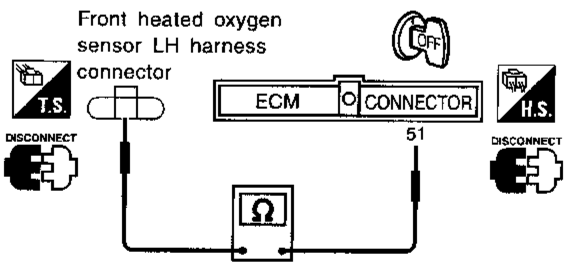
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | 1. Connect ECM harness connector.<br>2. GO TO 18. |
| NG | ▶ | 1. Repair or replace harness.<br>2. GO TO 8. (With CONSULT)<br>GO TO 9. (Without CONSULT) |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## 17 CHECK FRONT HEATED OXYGEN SENSOR LH HARNESS

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect front heated oxygen sensor LH harness connector.
4. Check harness continuity between ECM terminal 51 and front heated oxygen sensor LH harness connector.
   **Continuity should exists.**



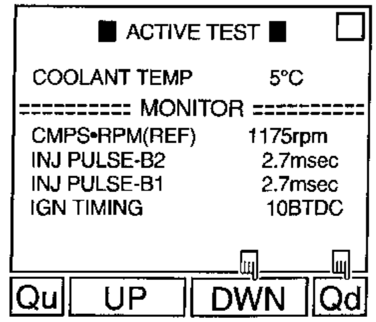

SEF981U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | 1. Connect ECM harness connector.<br>2. GO TO 18. |
| NG | ▶ | 1. Repair or replace harness.<br>2. GO TO 8. (With CONSULT)<br>GO TO 9. (Without CONSULT) |

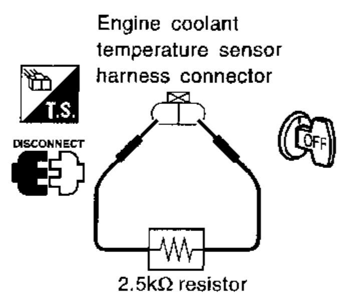
## 18 PREPARATION FOR "CO" % CHECK

**With CONSULT**
1. Select "COOLANT TEMP" in "ACTIVE TEST" mode.
2. Set "COOLANT TEMP" to 5°C (41°F) by touching "DWN" and "Qd".




SEF359V

**Without CONSULT**
1. Disconnect engine coolant temperature sensor harness connector.
2. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.

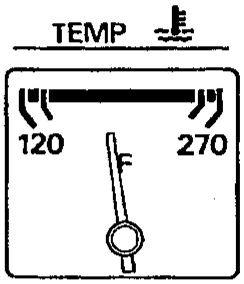



SEF982U

| | |
|---|---|
| ▶ | GO TO 19. |

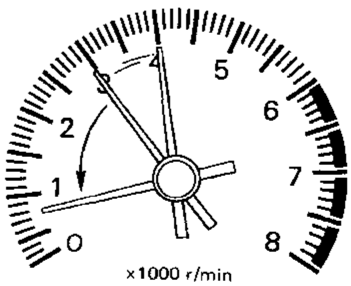
## 19 CHECK "CO" %

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




SEF976U

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




SEF978U

3. Check "CO" %.
   **Idle CO: 0.2 - 8%**
4. **Without CONSULT**
   After checking CO%,
a. Disconnect the resistor from terminals of engine coolant temperature sensor.
b. Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | 1. Replace front heated oxygen sensor LH.<br>2. GO TO 10. |
| NG | ▶ | GO TO 20. |

## 20 DETECT MALFUNCTIONING PART

Check the following.
1. Connect front heated oxygen sensor harness connectors to front heated oxygen sensor.
2. Check fuel pressure regulator. Refer to EC-32.
3. Check mass air flow sensor and its circuit. Refer to EC-115.
4. Check injector and its circuit. Refer to EC-429.
   Clean or replace if necessary.
5. Check engine coolant temperature sensor and its circuit. Refer to EC-153.
6. Check ECM function by substituting another known good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

| | | |
|---|---|---|
| | ▶ | GO TO 2. |

## Introduction

NBEC0028

The ECM (ECCS control module) 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:

| Emission-related diagnostic information | SAE Mode |
|---|---|
| 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-88.)

## Two Trip Detection Logic

NBEC0029

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 - P0306 (0701, 0603 - 0608) is being detected | X | | | X | | X | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 - 0608) has been detected | | X | | X | | X | |
| Closed loop control — DTC: P1148 (0307), P1168 (0308) | | X | | X | | X | |
| Fail-safe items (Refer to EC-88.) | | X | | X*1 | | X*1 | |
| Except above | | | X | | X | X | X |

*1: Except "ECM"

## Emission-related Diagnostic Information

NBEC0030

### DTC AND 1ST TRIP DTC

NBEC0030S01

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-55.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-53. 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 EC-83. Then perform "DTC 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

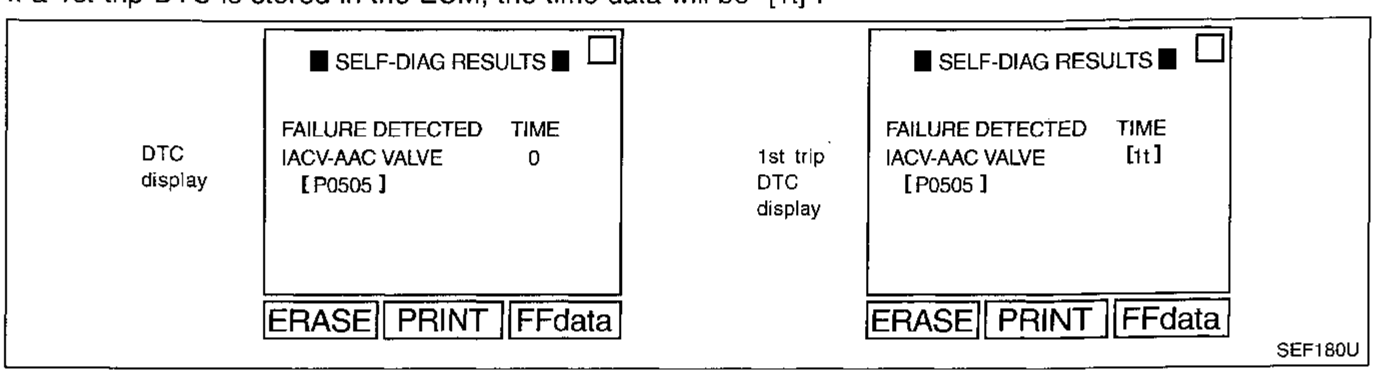
NBEC0030S0101

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

1) **No Tools**
   The number of blinks of the MIL in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc.
   These DTCs are controlled by NISSAN.
2) **With CONSULT**
   **With GST**
   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 and 1st trip DTC is shown below. 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".
If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".




SEF180U

## FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

NBEC0030S02

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 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-70.
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 - P0306 (0701, 0603 - 0608)<br>Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114), P0174 (0210), P0175 (0209) |
| 2 | | Except the above items (Includes A/T related 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, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st 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-55.

## SYSTEM READINESS TEST (SRT) CODE

NBEC0030S03

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 5 SRT items (30 test items) for the ECCS used in R50 models.

| SRT items | Self-diagnostic test items |
|---|---|
| Catalyst monitoring | • Three way catalyst function (right bank) P0420 (0702)<br>• Three way catalyst function (left bank) P0430 (0703) |
| EVAP system monitoring | • EVAP control system (Small leak — negative pressure) P0440 (0705)<br>• EVAP control system (Small leak — positive pressure) P1440 (0213)<br>• EVAP control system purge flow monitoring P1447 (0111) |

| SRT items | Self-diagnostic test items | |
|---|---|---|
| Oxygen sensor monitoring | Right bank | • Front heated oxygen sensor (Circuit) P0130 (0503)<br>• Front heated oxygen sensor (Lean shift monitoring) P0131 (0415)<br>• Front heated oxygen sensor (Rich shift monitoring) P0132 (0414)<br>• Front heated oxygen sensor (Response monitoring) P0133 (0413)<br>• Front heated oxygen sensor (High voltage) P0134 (0509) |
| | Left bank | • Front heated oxygen sensor (Circuit) P0150 (0303)<br>• Front heated oxygen sensor (Lean shift monitoring) P0151 (0411)<br>• Front heated oxygen sensor (Rich shift monitoring) P0152 (0410)<br>• Front heated oxygen sensor (Response monitoring) P0153 (0409)<br>• Front heated oxygen sensor (High voltage) P0154 (0412) |
| | Right bank | • Rear heated oxygen sensor (Min. voltage monitoring) P0137 (0511)<br>• Rear heated oxygen sensor (Max. voltage monitoring) P0138 (0510)<br>• Rear heated oxygen sensor (Response monitoring) P0139 (0707)<br>• Rear heated oxygen sensor (High voltage) P0140 (0512) |
| | Left bank | • Rear heated oxygen sensor (Min. voltage monitoring) P0157 (0314)<br>• Rear heated oxygen sensor (Max. voltage monitoring) P0158 (0313)<br>• Rear heated oxygen sensor (Response monitoring) P0159 (0708)<br>• Rear heated oxygen sensor (High voltage) P0160 (0315) |
| Oxygen sensor heater monitoring | • Front heated oxygen sensor heater (right bank) P0135 (0901)<br>• Rear heated oxygen sensor heater (right bank) P0141 (0902)<br>• Front heated oxygen sensor heater (left bank) P0155 (1001)<br>• Rear heated oxygen sensor heater (left bank) P0161 (1002) | |
| EGR system monitoring | • EGR function (close) P0400 (0302)<br>• EGR function (open) P1402 (0514)<br>• EGRC-BPT valve function P0402 (0306) | |

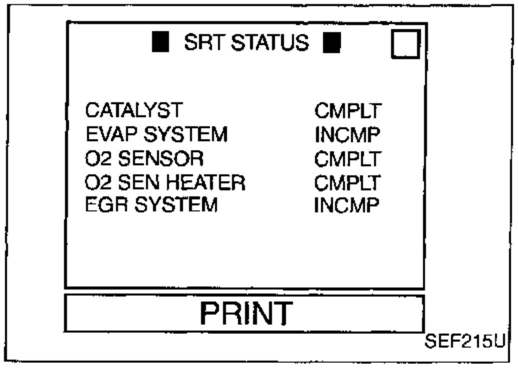
Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-55). In addition, after ECCS components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

## How to Display SRT Code

NBEC0030S0301

1. **With CONSULT**
   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. **With GST**
   Selecting Mode 1 with GST (Generic Scan Tool)

A sample of CONSULT display for SRT code is shown below.
"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

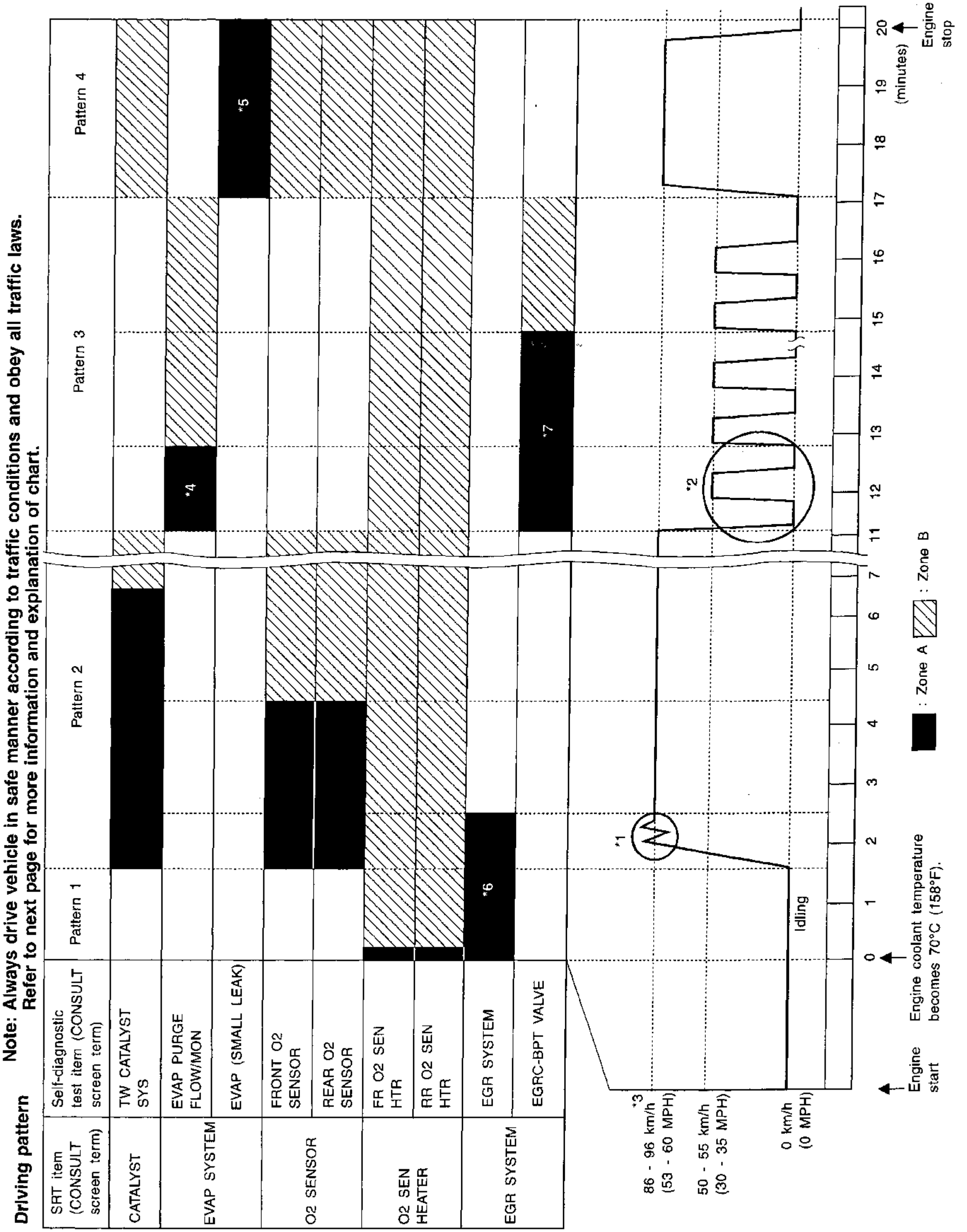
NBEC0030S0302

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.

## Driving Pattern

NBEC0030S0303

**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.**




SEF224U

- 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 terminal 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.

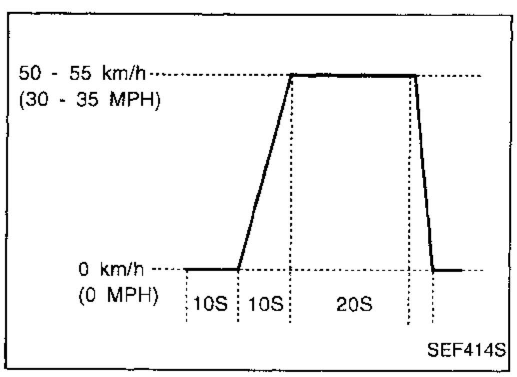
Pattern 4:

- 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.




*3: Checking the vehicle speed with CONSULT or GST is advised.

*4: The driving pattern may be omitted when "PURG 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 "EGRC-BPT/VLV P0402" is performed using the "DTC WORK SUPPORT" mode with CONSULT.

### Suggested Transmission Gear Position for A/T Models

NBEC0030S0304

Set the selector lever in the "D" position with the overdrive switch turned ON.

## TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT)

NBEC0030S04

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 (30 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 | Self-diagnostic test item | Test value (GST display) | | Test limit | Application |
|---|---|---|---|---|---|
| | | TID | CID | | |
| CATALYST | Three way catalyst function (Right bank) | 01H | 01H | Max. | X |
| | Three way catalyst function (Left bank) | 03H | 02H | Max. | X |
| EVAP SYSTEM | EVAP control system (Small leak) | 05H | 03H | Max. | X |
| | EVAP control system purge flow monitoring | 06H | 83H | Min. | X |

| SRT item | Self-diagnostic test item | Test value (GST display) | | Test limit | Application |
|---|---|---|---|---|---|
| | | TID | CID | | |
| O2 SENSOR | Front heated oxygen sensor (Right bank) | 09H | 04H | Max. | X |
| | | 0AH | 84H | Min. | X |
| | | 0BH | 04H | Max. | X |
| | | 0CH | 04H | Max. | X |
| | | 0DH | 04H | Max. | X |
| | Front heated oxygen sensor (Left bank) | 11H | 05H | Max. | X |
| | | 12H | 85H | Min. | X |
| | | 13H | 05H | Max. | X |
| | | 14H | 05H | Max. | X |
| | | 15H | 05H | Max. | X |
| | Rear heated oxygen sensor (Right bank) | 19H | 86H | Min. | X |
| | | 1AH | 86H | Min. | X |
| | | 1BH | 06H | Max. | X |
| | | 1CH | 06H | Max. | X |
| | Rear heated oxygen sensor (Left bank) | 21H | 87H | Min. | X |
| | | 22H | 87H | Min. | X |
| | | 23H | 07H | Max. | X |
| | | 24H | 07H | Max. | X |
| O2 SENSOR HEATER | Front heated oxygen sensor heater (Right bank) | 29H | 08H | Max. | X |
| | | 2AH | 88H | Min. | X |
| | Front heated oxygen sensor heater (Left bank) | 2BH | 09H | Max. | X |
| | | 2CH | 89H | Min. | X |
| | Rear heated oxygen sensor heater (Right bank) | 2DH | 0AH | Max. | X |
| | | 2EH | 8AH | Min. | X |
| | Rear heated oxygen sensor heater (Left bank) | 2FH | 0BH | Max. | X |
| | | 30H | 8BH | 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 |

## EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

NBEC0030S05

X: Applicable —: Not applicable

| Items (CONSULT screen terms) | DTC*4 | | | | | Reference page |
|---|---|---|---|---|---|---|
| | CONSULT GST*2 | ECM*1 | SRT code | Test value/ Test limit | 1st trip DTC | |
| **NO SELF DIAGNOSTIC FAILURE INDICATED** | **P0000** | **0505** | — | — | — | — |
| MAF SEN/CIRCUIT | P0100 | 0102 | — | — | X | EC-115 |
| ABSL PRES SEN/CIRC | P0105 | 0803 | — | — | X | EC-123 |
| AIR TEMP SEN/CIRC | P0110 | 0401 | — | — | X | EC-132 |
| COOLANT T SEN/CIRC | P0115 | 0103 | — | — | X | EC-138 |
| THRTL POS SEN/CIRC | P0120 | 0403 | — | — | X | EC-143 |
| *COOLAN T SEN/CIRC | P0125 | 0908 | — | — | X | EC-153 |
| FRONT O2 SENSOR-B1 | P0130 | 0503 | X | X | X*3 | EC-158 |
| FRONT O2 SENSOR-B1 | P0131 | 0415 | X | X | X*3 | EC-166 |
| FRONT O2 SENSOR-B1 | P0132 | 0414 | X | X | X*3 | EC-172 |
| FRONT O2 SENSOR-B1 | P0133 | 0413 | X | X | X*3 | EC-178 |
| FRONT O2 SENSOR-B1 | P0134 | 0509 | X | X | X*3 | EC-187 |
| FR O2 SE HEATER-B1 | P0135 | 0901 | X | X | X*3 | EC-194 |
| REAR O2 SENSOR-B1 | P0137 | 0511 | X | X | X*3 | EC-200 |
| REAR O2 SENSOR-B1 | P0138 | 0510 | X | X | X*3 | EC-208 |
| REAR O2 SENSOR-B1 | P0139 | 0707 | X | X | X*3 | EC-216 |
| REAR O2 SENSOR-B1 | P0140 | 0512 | X | X | X*3 | EC-224 |
| RR O2 SE HEATER-B1 | P0141 | 0902 | X | X | X*3 | EC-231 |
| FRONT O2 SENSOR-B2 | P0150 | 0303 | X | X | X*3 | EC-158 |
| FRONT O2 SENSOR-B2 | P0151 | 0411 | X | X | X*3 | EC-166 |
| FRONT O2 SENSOR-B2 | P0152 | 0410 | X | X | X*3 | EC-172 |
| FRONT O2 SENSOR-B2 | P0153 | 0409 | X | X | X*3 | EC-178 |
| FRONT O2 SENSOR-B2 | P0154 | 0412 | X | X | X*3 | EC-187 |
| FR O2 SE HEATER-B2 | P0155 | 1001 | X | X | X*3 | EC-194 |
| REAR O2 SENSOR-B2 | P0157 | 0314 | X | X | X*3 | EC-200 |
| REAR O2 SENSOR-B2 | P0158 | 0313 | X | X | X*3 | EC-208 |
| REAR O2 SENSOR-B2 | P0159 | 0708 | X | X | X*3 | EC-216 |
| REAR O2 SENSOR-B2 | P0160 | 0315 | X | X | X*3 | EC-224 |
| RR O2 SE HEATER-B2 | P0161 | 1002 | X | X | X*3 | EC-231 |
| FUEL SYS LEAN/BK1 | P0171 | 0115 | — | — | X | EC-237 |
| FUEL SYS RICH/BK1 | P0172 | 0114 | — | — | X | EC-244 |
| FUEL SYS LEAN/BK2 | P0174 | 0210 | — | — | X | EC-237 |
| FUEL SYS RICH/BK2 | P0175 | 0209 | — | — | X | EC-244 |
| FUEL TEMP SEN/CIRC | P0180 | 0402 | — | — | X | EC-251 |

| Items (CONSULT screen terms) | DTC*4 | | | | | Reference page |
|---|---|---|---|---|---|---|
| | CONSULT GST*2 | ECM*1 | SRT code | Test value/ Test limit | 1st trip DTC | |
| MULTI CYL MISFIRE | P0300 | 0701 | — | — | X | EC-255 |
| CYL 1 MISFIRE | P0301 | 0608 | — | — | X | EC-255 |
| CYL 2 MISFIRE | P0302 | 0607 | — | — | X | EC-255 |
| CYL 3 MISFIRE | P0303 | 0606 | — | — | X | EC-255 |
| CYL 4 MISFIRE | P0304 | 0605 | — | — | X | EC-255 |
| CYL 5 MISFIRE | P0305 | 0604 | — | — | X | EC-255 |
| CYL 6 MISFIRE | P0306 | 0603 | — | — | X | EC-255 |
| KNOCK SEN/CIRC | P0325 | 0304 | — | — | — | EC-260 |
| CPS/CIRCUIT (OBD) | P0335 | 0802 | — | — | X | EC-264 |
| CAM POS SEN/CIRC | P0340 | 0101 | — | — | X | EC-269 |
| EGR SYSTEM | P0400 | 0302 | X | X | X*3 | EC-276 |
| EGRC-BPT VALVE | P0402 | 0306 | X | X | X*3 | EC-284 |
| TW CATALYST SYS-B1 | P0420 | 0702 | X | X | X*3 | EC-288 |
| TW CATALYST SYS-B2 | P0430 | 0703 | X | X | X*3 | EC-288 |
| EVAP SMALL LEAK | P0440 | 0705 | X | X | X*3 | EC-292 |
| PURG VOLUME CONT/V | P0443 | 1008 | — | — | X | EC-299 |
| VENT CONTROL VALVE | P0446 | 0903 | — | — | X | EC-305 |
| EVAPO SYS PRES SEN | P0450 | 0704 | — | — | X | EC-311 |
| VEH SPEED SEN/CIRC | P0500 | 0104 | — | — | X | EC-319 |
| IACV/AAC VLV/CIRC | P0505 | 0205 | — | — | X | EC-323 |
| CLOSED TP SW/CIRC | P0510 | 0203 | — | — | X | EC-329 |
| A/T COMM LINE | P0600 | — | — | — | — | EC-334 |
| ECM | P0605 | 0301 | — | — | X | EC-337 |
| INHIBITOR SW/CIRC | P0705 | 1101 | — | — | X | AT-87 |
| ATF TEMP SEN/CIRC | P0710 | 1208 | — | — | X | AT-92 |
| VEH SPD SEN/CIR AT | P0720 | 1102 | — | — | X | AT-97 |
| ENGINE SPEED SIG | P0725 | 1207 | — | — | X | AT-102 |
| A/T 1ST GR FNCTN | P0731 | 1103 | — | — | X | AT-106 |
| A/T 2ND GR FNCTN | P0732 | 1104 | — | — | X | AT-112 |
| A/T 3RD GR FNCTN | P0733 | 1105 | — | — | X | AT-118 |
| A/T 4TH GR FNCTN | P0734 | 1106 | — | — | X | AT-124 |
| TCC SOLENOID/CIRC | P0740 | 1204 | — | — | X | AT-133 |
| A/T TCC S/V FNCTN | P0744 | 1107 | — | — | X | AT-138 |
| L/PRESS SOL/CIRC | P0745 | 1205 | — | — | X | AT-146 |
| SFT SOL A/CIRC | P0750 | 1108 | — | — | X | AT-152 |
| SFT SOL B/CIRC | P0755 | 1201 | — | — | X | AT-157 |

| Items (CONSULT screen terms) | DTC*4 | | | | | Reference page |
|---|---|---|---|---|---|---|
| | CONSULT GST*2 | ECM*1 | SRT code | Test value/ Test limit | 1st trip DTC | |
| MAP/BARO SW SOL/CIR | P1105 | 1302 | — | — | X | EC-339 |
| CLOSED LOOP-B1 | P1148 | 0307 | — | — | X | EC-348 |
| CLOSED LOOP-B2 | P1168 | 0308 | — | — | X | EC-348 |
| IGN SIGNAL-PRIMARY | P1320 | 0201 | — | — | X | EC-350 |
| CPS/CIRC (OBD) COG | P1336 | 0905 | — | — | X | EC-357 |
| EGRC SOLENOID/V | P1400 | 1005 | — | — | X | EC-362 |
| EGR TEMP SEN/CIRC | P1401 | 0305 | — | — | X | EC-367 |
| EGR SYSTEM | P1402 | 0514 | X | X | X*3 | EC-373 |
| EVAP SMALL LEAK | P1440 | 0213 | X | X | X*3 | EC-380 |
| PURG VOLUME CONT/V | P1444 | 0214 | — | — | X | EC-387 |
| VENT CONTROL VALVE | P1446 | 0215 | — | — | X | EC-394 |
| EVAP PURG FLOW/MON | P1447 | 0111 | X | X | X*3 | EC-399 |
| VENT CONTROL VALVE | P1448 | 0309 | — | — | X | EC-404 |
| VC/V BYPASS/V | P1490 | 0801 | — | — | X | EC-410 |
| VC CUT/V BYPASS/V | P1491 | 0311 | — | — | X | EC-415 |
| A/T DIAG COMM LINE | P1605 | 0804 | — | — | X | EC-422 |
| TP SEN/CIRC A/T | P1705 | 1206 | — | — | X | AT-162 |
| P-N POS SW/CIRCUIT | P1706 | 1003 | — | — | X | EC-425 |
| O/R CLTCH SOL/CIRC | P1760 | 1203 | — | — | X | AT-169 |

*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.
NOTE:
Regarding R50 models, "-B1" and "BK1" indicate right bank and "-B2" and "BK2" indicate left bank.

## HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

NBEC0030S06

### How to Erase DTC (Ⓒ With CONSULT)

NBEC0030S0601

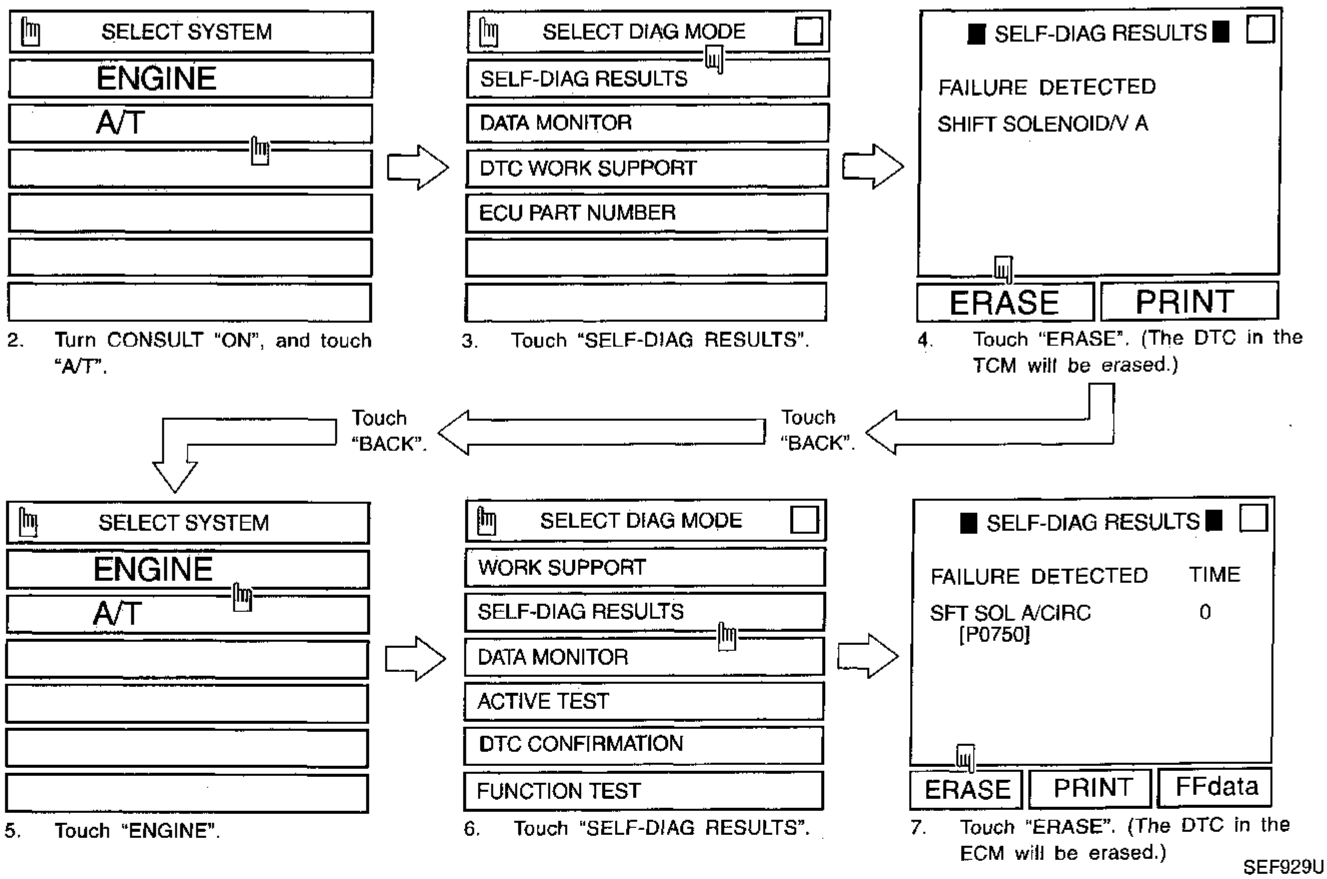
NOTE:
**If the DTC is not for A/T related items (see EC-2), skip steps 2 through 4.**

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 "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". [The DTC in the TCM (Transmission control module) will be erased.] Then touch "BACK" twice.
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)

- If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

**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.



SEF929U

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)

NBEC0030S0602

NOTE:

**If the DTC is not for A/T related items (see EC-2), skip step 2.**

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. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. 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.

## How to Erase DTC (No Tools)

NBEC0030S0603

NOTE:

**If the DTC is not for A/T related items (see EC-2), skip step 2.**

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. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis".
   (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-59.)

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.

- **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.**

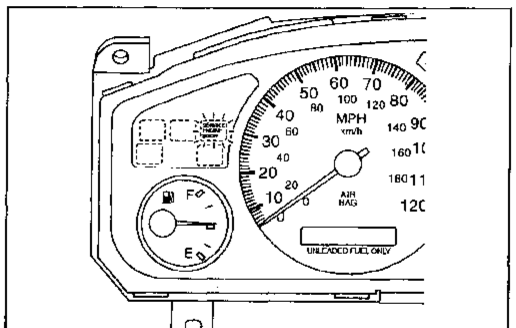
1) Diagnostic trouble codes
2) 1st trip diagnostic trouble codes
3) Freeze frame data
4) 1st trip freeze frame data
5) System readiness test (SRT) codes
6) Test values
7) Others

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.

## Malfunction Indicator Lamp (MIL)

### DESCRIPTION

NBEC0031



SEF930U

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the MIL does not light up, refer to EL section ("WARNING LAMPS AND CHIME") or see EC-454.
2. When the engine is started, the MIL should go off.
If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.

## On Board Diagnostic System Function

=NBEC0031S01

The on board diagnostic system has the following four functions.

| Diagnostic Test Mode | KEY and ENG. Status | Function | Explanation of Function |
|---|---|---|---|
| Mode I | Ignition switch in "ON" position<br>Engine stopped | BULB CHECK | This function checks the MIL bulb for damage (blown, open circuit, etc.).<br>If the MIL does not come on, check MIL circuit and ECM test mode selector. (See EC-59.) |
| | Engine running | 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.<br>The following malfunctions will light up or blink the MIL in the 1st trip.<br>• "Misfire (Possible three way catalyst damage)"<br>• "Closed loop control"<br>• Fail-safe mode |
| Mode II | Ignition switch in "ON" position<br>Engine stopped | SELF-DIAGNOSTIC RESULTS | This function allows DTCs and 1st trip DTCs to be read. |
| | Engine running | 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

NBEC0031S0101

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", EC-59.

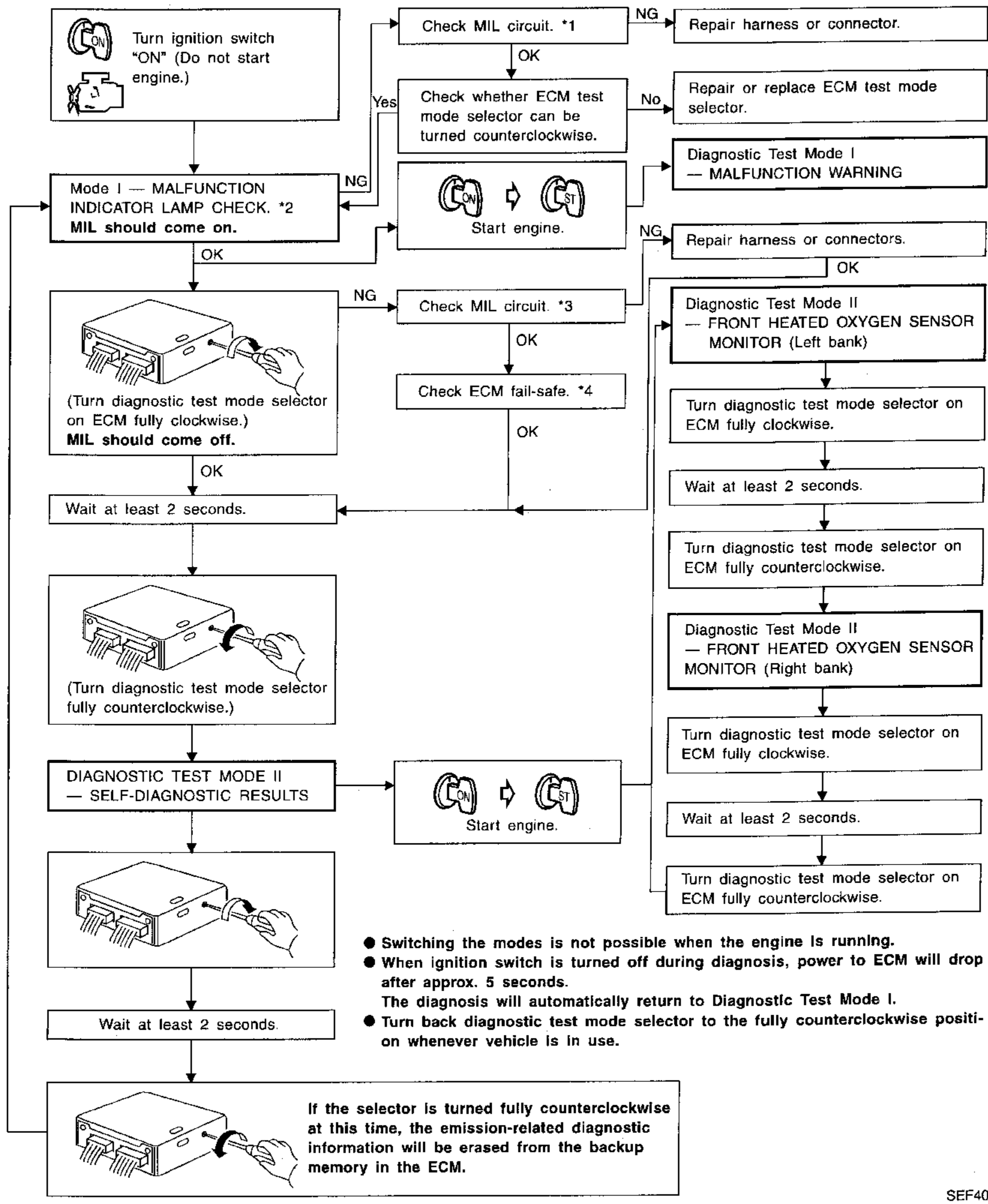
How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-59.)

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

## How to Switch Diagnostic Test Modes

NBEC0031S02




SEF404V

*1 EC-454 *3 EC-454 *4 EC-88
*2 EC-57

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

### Diagnostic Test Mode I — Bulb Check

NBEC0031S03

In this mode, the MIL 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-454.

### Diagnostic Test Mode I — Malfunction Warning

NBEC0031S04

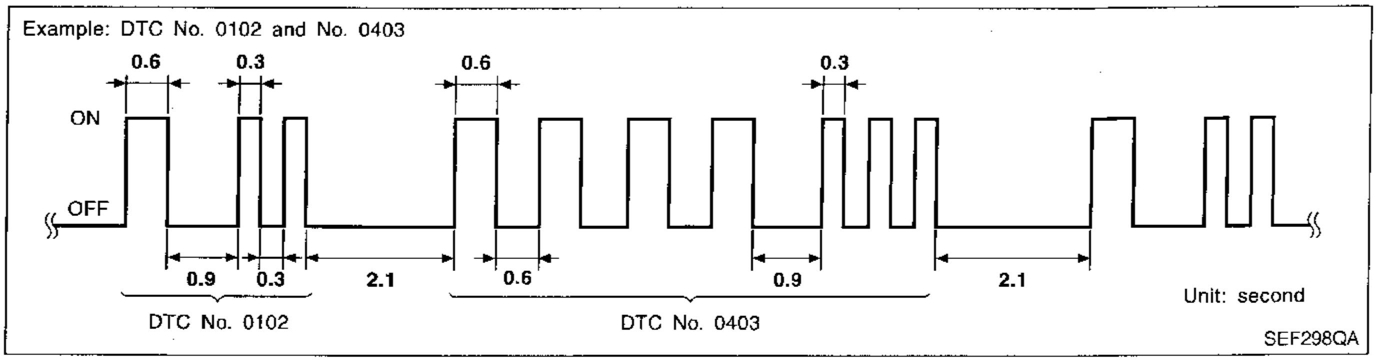
| MIL | Condition |
|---|---|
| ON | When the malfunction is detected or the ECM's CPU is malfunctioning. |
| OFF | No malfunction. |

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

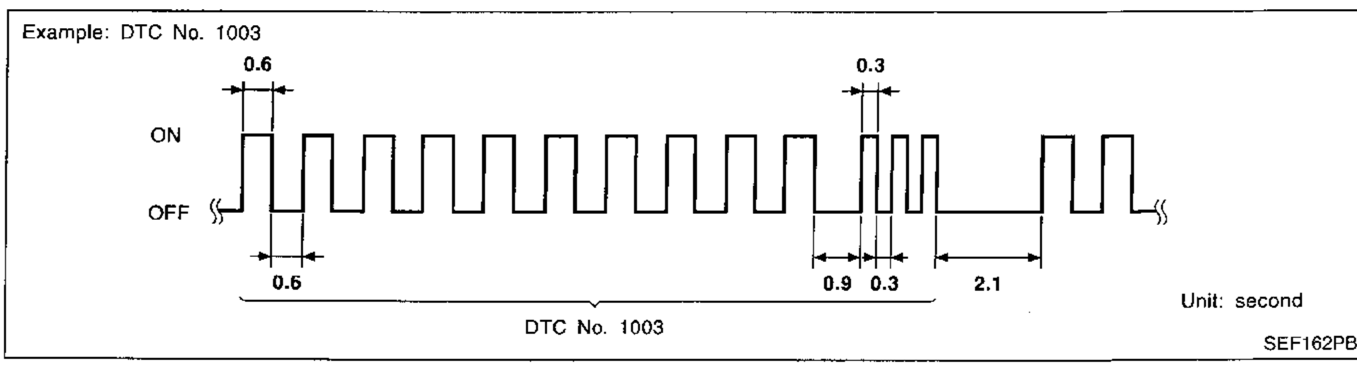
### Diagnostic Test Mode II — Self-diagnostic Results

NBEC0031S05

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the MIL.
The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (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.




SEF298QA




SEF162PB

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 MIL 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 park/neutral position switch.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0505" refers to no malfunction. (See TROUBLE DIAGNOSIS — INDEX, EC-2.)

#### How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

NBEC0031S0501

The DTC 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", EC-59.)

- **If the battery is disconnected, the DTC 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

NBEC0031S06

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

| MIL | 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 MIL comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

## OBD System Operation Chart

NBEC0032

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

NBEC0032S01

- 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-44.
- 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

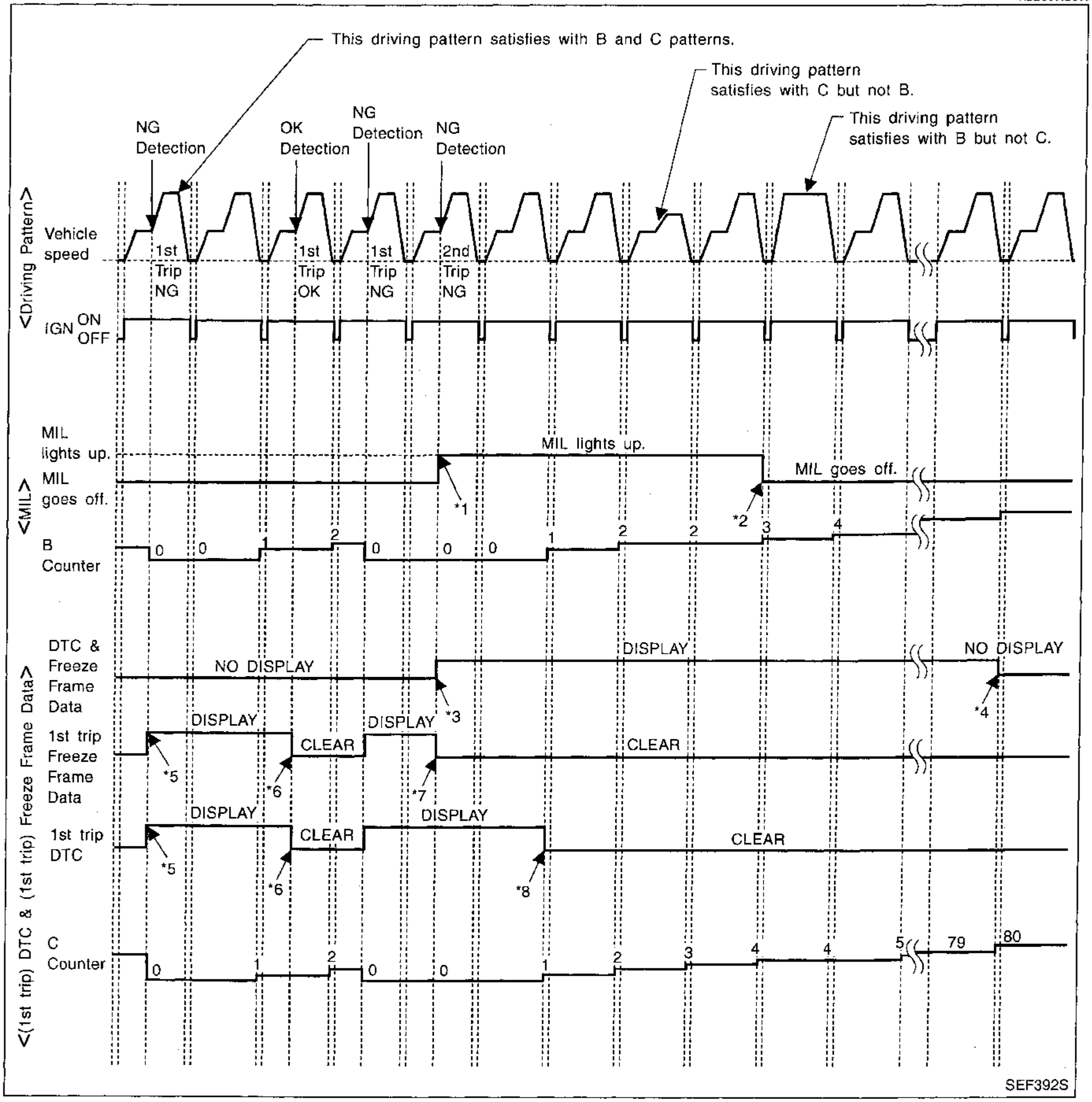
NBEC0032S02

| Items | Fuel Injection System | Misfire | Except the lefts |
|---|---|---|---|
| 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) |

Details about patterns "A", "B", and "C" are on EC-63, EC-65.
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

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

NBEC0032S03




*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.

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

NBEC0032S04

### <Driving Pattern B>

NBEC0032S0401

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>

NBEC0032S0402

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) x (1±0.1) [%]
   Engine coolant temperature (T) condition:

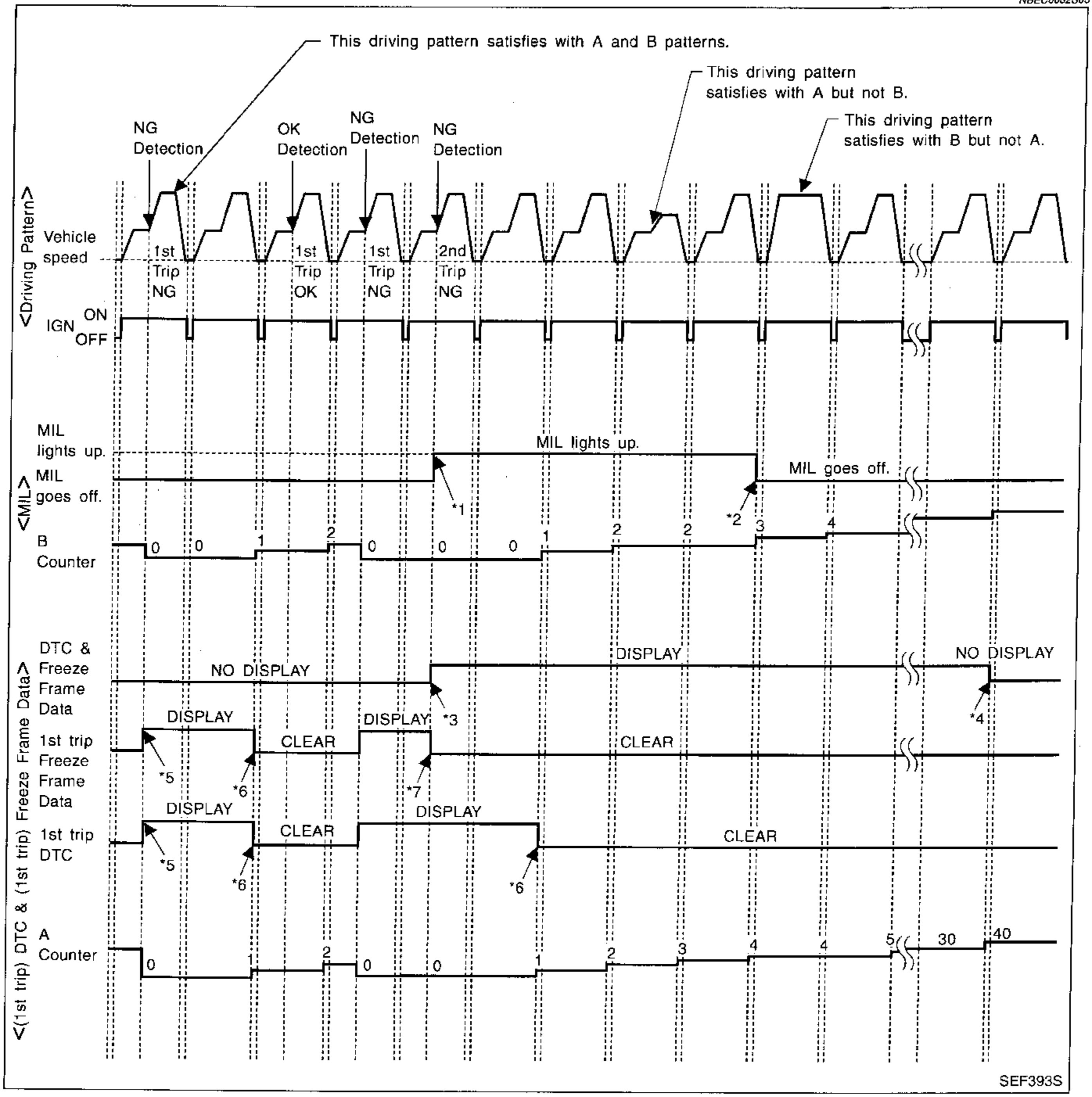
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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.

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

NBEC0032S05




*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.

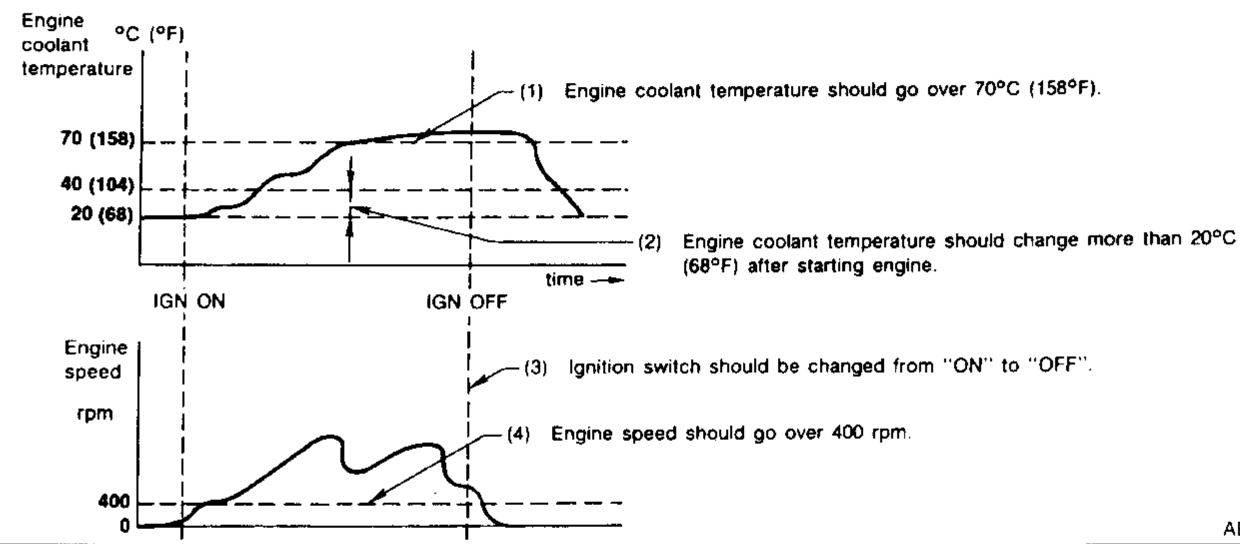
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

## EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

NBEC0032S06

### <Driving Pattern A>

NBEC0032S0601




AEC574

- 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>

NBEC0032S0602

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”).

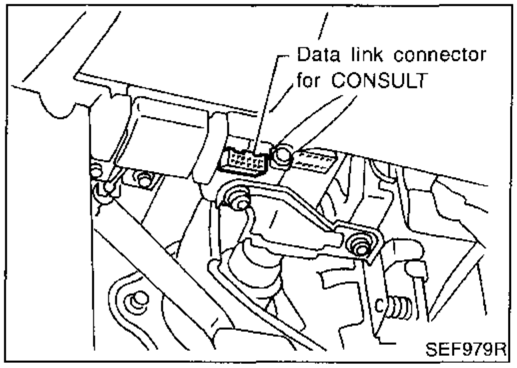
# CONSULT

=NBEC0033

## CONSULT INSPECTION PROCEDURE

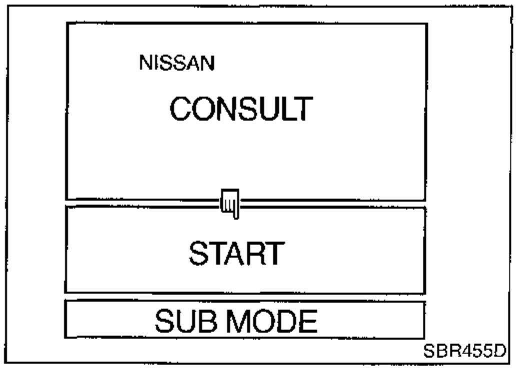
NBEC0033S01

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



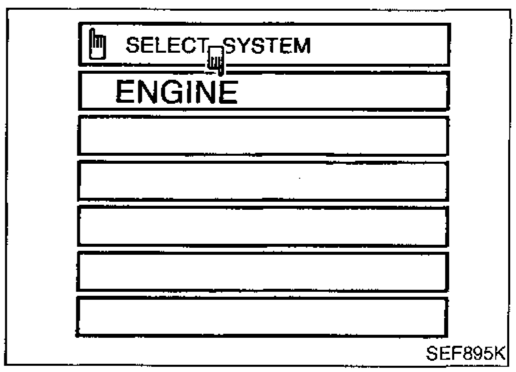
SEF979R

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



SBR455D

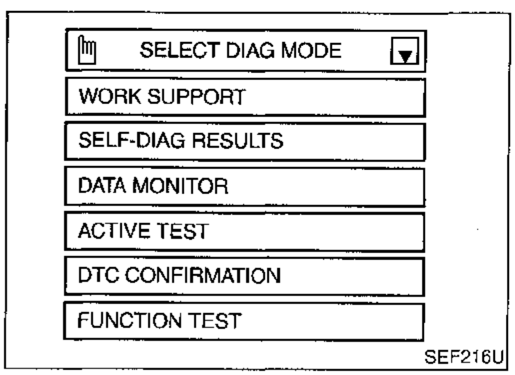
5. Touch "ENGINE".



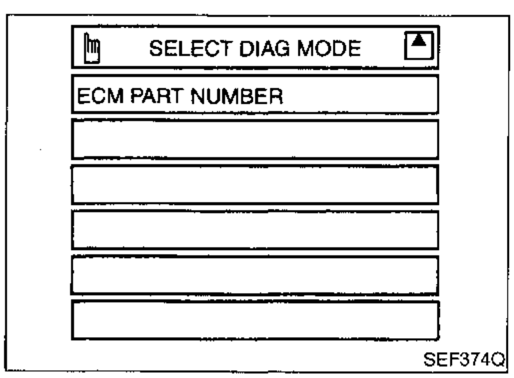
SEF895K

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.**



SEF216U



SEF374Q

## ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

*NBEC0033S02*

| Item | | | DIAGNOSTIC TEST MODE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | WORK SUPPORT | SELF-DIAGNOSTIC RESULTS | | DATA MONITOR | ACTIVE TEST | DTC CONFIRMATION | | FUNCTION TEST |
| | | | | DTC*1 | FREEZE FRAME DATA*2 | | | SRT STATUS | DTC WORK SUPPORT | |
| 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 | 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 | | | | |
| | | 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 switch | | | | X | | | | |
| | | Battery voltage | | | | X | | | | |
| | | Ambient air temperature switch | | | | X | | | | |

| | | | DIAGNOSTIC TEST MODE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | SELF-DIAGNOSTIC RESULTS | | | | DTC CONFIRMATION | | |
| Item | | | WORK SUPPORT | DTC*1 | FREEZE FRAME DATA*2 | DATA MONITOR | ACTIVE TEST | SRT STATUS | DTC WORK SUPPORT | FUNCTION TEST |
| ECCS COMPONENT PARTS | 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*3 |
| | | Front heated oxygen sensor heater | | X | | X | | X | | |
| | | Rear heated oxygen sensor heater | | X | | X | | X | | |
| | | EVAP canister vent control valve | | X | | X | | | | |
| | | Vacuum cut valve bypass valve | | 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-46.

*3: If this function test mode is not available, use the ACTIVE TEST mode.

## FUNCTION

=NBEC0033S03

| 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 number | ECM part number 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

NBEC0033S04

| 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.<br>• IGN SW "ON"<br>• ENG NOT RUNNING<br>• ACC PEDAL NOT PRESSED | When adjusting throttle position sensor initial position |
| IACV-AAC VALVE ADJ | SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS.<br>• ENGINE WARMED UP<br>• NO-LOAD | When adjusting idle speed |
| FUEL PRESSURE RELEASE | • FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |
| 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.<br>• IGN SW "ON"<br>• ENGINE NOT RUNNING<br>• AMBIENT TEMPERATURE IS ABOVE 0°C (32°F).<br>• NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM<br>• TANK FUEL TEMP. IS MORE THAN 0°C (32°F).<br>• WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" | When detecting EVAP vapor leak point of EVAP system |

## SELF-DIAGNOSTIC MODE

NBEC0033S05

### DTC and 1st Trip DTC

NBEC0033S0501

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

### Freeze Frame Data and 1st Trip Freeze Frame Data

NBEC0033S0502

| Freeze frame data item*1 | Description |
|---|---|
| DIAG TROUBLE CODE [PXXXX] | • ECCS component part/control system has a trouble code, it is displayed as "PXXXX". (Refer to "TROUBLE DIAGNOSIS — INDEX", EC-2.) |
| FUEL SYS-B1*2<br>FUEL SYS-B2*2 | • "Fuel injection system status" at the moment a malfunction is detected is displayed.<br>• One mode in the following is displayed.<br>"MODE 2": Open loop due to detected system malfunction<br>"MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment)<br>"MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control<br>"MODE 5": Open loop - has not yet satisfied condition to go to closed loop |
| CAL/LD VALUE [%] | • The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | • The engine coolant temperature at the moment a malfunction is detected is displayed. |
| S-FUEL TRIM-B1 [%]<br>S-FUEL TRIM-B2 [%] | • "Short-term fuel trim" at the moment a malfunction is detected is displayed.<br>• The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. |
| L-FUEL TRIM-B1 [%]<br>L-FUEL TRIM-B2 [%] | • "Long-term fuel trim" at the moment a malfunction is detected is displayed.<br>• The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| ENGINE SPEED [rpm] | • The engine speed at the moment a malfunction is detected is displayed. |
| VHCL SPEED [km/h] or [mph] | • The vehicle speed at the moment a malfunction is detected is displayed. |
| ABSOL PRESS [kPa] or [kg/cm$^2$] or [psi] | • The absolute pressure at the moment a malfunction is detected is displayed. |

*1: The items are the same as those of 1st trip freeze frame data.
*2: Regarding R50 model, "-B1" indicates right bank and "-B2" indicates left bank.

## DATA MONITOR MODE

=NBEC0033S06

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| CMPS·RPM (REF) [rpm] | ○ | ○ | • Indicates the engine speed computed from the REF signal (120° signal) of the camshaft position sensor. | |
| MAS AIR/FL SE [V] | ○ | ○ | • The signal voltage of the mass air flow sensor is displayed. | • When the engine is stopped, a certain value is indicated. |
| COOLAN TEMP/S [°C] or [°F] | ○ | ○ | • The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | • 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 SEN-B2 [V] | ○ | ○ | • The signal voltage of the front heated oxygen sensor is displayed. | |
| FR O2 SEN-B1 [V] | ○ | | | |
| RR O2 SEN-B1 [V] | ○ | ○ | • The signal voltage of the rear heated oxygen sensor is displayed. | |
| RR O2 SEN-B2 [V] | ○ | | | |
| FR O2 MNTR-B2 [RICH/LEAN] | ○ | ○ | • Display of front heated oxygen sensor signal during air-fuel ratio feedback control:<br>RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture.<br>LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture. | • After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins.<br>• When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously. |
| FR O2 MNTR-B1 [RICH/LEAN] | ○ | ○ | | |
| RR O2 MNTR-B1 [RICH/LEAN] | ○ | | • Display of rear heated oxygen sensor signal:<br>RICH ... means the amount of oxygen after three way catalyst is relatively small.<br>LEAN ... means the amount of oxygen after three way catalyst is relatively large. | • When the engine is stopped, a certain value is indicated. |
| RR O2 MNTR-B2 [RICH/LEAN] | ○ | ○ | | |
| VHCL SPEED SE [km/h] or [mph] | ○ | ○ | • The vehicle speed computed from the vehicle speed sensor signal is displayed. | |
| BATTERY VOLT [V] | ○ | ○ | • The power supply voltage of ECM is displayed. | |
| THRTL POS SEN [V] | ○ | ○ | • The throttle position sensor signal voltage is displayed. | |
| TANK F/TMP SE [°C] or [°F] | ○ | | • The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed. | |
| EGR TEMP SEN [V] | ○ | | • The signal voltage of the EGR temperature sensor is displayed. | |
| INT/A TEMP SE [°C] or [°F] | ○ | | • The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated. | |
| START SIGNAL [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the starter signal. | • After starting the engine, [OFF] is displayed regardless of the starter signal. |

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| CLSD THL/P SW [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the throttle position sensor signal. | |
| AIR COND SIG [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| P/N POSI SW [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the park/neutral position switch signal. | |
| PW/ST SIGNAL [ON/OFF] | ○ | ○ | • [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated. | |
| AMB TEMP SW [ON/OFF] | ○ | ○ | • Indicates [ON/OFF] condition from the ambient air temperature switch signal. | |
| IGNITION SW [ON/OFF] | ○ | | • Indicates [ON/OFF] condition from ignition switch. | |
| INJ PULSE-B2 [msec] | | ○ | • Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | • When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-B1 [msec] | | | | |
| B/FUEL SCHDL [msec] | | ○ | • "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | |
| IGN TIMING [BTDC] | | ○ | • Indicates the ignition timing computed by ECM according to the input signals. | • When the engine is stopped, a certain value is indicated. |
| IACV-AAC/V [%] | | ○ | • Indicates the IACV-AAC valve control value computed by ECM according to the input signals. | |
| PURG VOL C/V [%] | | | • Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.<br>• The opening becomes larger as the value increases. | |
| A/F ALPHA-B2 [%] | | | • The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | • When the engine is stopped, a certain value is indicated.<br>• This data also includes the data for the air-fuel ratio learning control. |
| A/F ALPHA-B1 [%] | | | | |
| EVAP SYS PRES [V] | | | • The signal voltage of EVAP control system pressure sensor is displayed. | |
| AIR COND RLY [ON/OFF] | | | • The air conditioner relay control condition (determined by ECM according to the input signal) is indicated. | |
| FUEL PUMP RLY [ON/OFF] | | | • Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| EGRC SOL/V [ON/OFF] | | | • The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated.<br>• ON ... EGR is operational<br>OFF ... EGR operation is cut-off | |
| VENT CONT/V [ON/OFF] | | | • The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated.<br>• ON ... Closed<br>OFF ... Open | |
| FR O2 HTR-B1 [ON/OFF] | | | • Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals. | |
| FR O2 HTR-B2 [ON/OFF] | | | | |
| RR O2 HTR-B1 [ON/OFF] | | | • Indicates [ON/OFF] condition of rear heated oxygen sensor heater determined by ECM according to the input signals. | |
| RR O2 HTR-B2 [ON/OFF] | | | | |
| VC/V BYPASS/V [ON/OFF] | | | • The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated.<br>• ON ... Open<br>OFF ... Closed | |
| CAL/LD VALUE [%] | | | • "Calculated load value" indicates the value of the current airflow divided by peak airflow. | |
| ABSOL TH·P/S [%] | | | • "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] | | | • Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor. | |
| MAP/BARO SW/V [MAP/BARO] | | | • The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated.<br>MAP ... Intake manifold absolute pressure<br>BARO ... Ambient barometric pressure | |
| ABSOL PRES/SE [V] | | | • The signal voltage of the absolute pressure sensor is displayed. | |
| VOLTAGE [V] | | | • Voltage measured by the voltage probe. | |
| PULSE [msec] or [Hz] or [%] | | | • Pulse width, frequency or duty cycle measured by the pulse probe. | • Only "#" is displayed if item is unable to be measured.<br>• Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured. |

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding R50 model, "-B1" indicates right bank and "-B2" indicates left bank.

## ACTIVE TEST MODE

NBEC0033S07

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| FUEL INJECTION | • Engine: Return to the original trouble condition<br>• Change the amount of fuel injection using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Harness and connector<br>• Fuel injectors<br>• Front heated oxygen sensor |
| IACV-AAC/V OPENING | • Engine: After warming up, idle the engine.<br>• Change the IACV-AAC valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | • Harness and connector<br>• IACV-AAC valve |
| ENG COOLANT TEMP | • Engine: Return to the original trouble condition<br>• Change the engine coolant temperature using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Harness and connector<br>• Engine coolant temperature sensor<br>• Fuel injectors |
| IGNITION TIMING | • Engine: Return to the original trouble condition<br>• Timing light: Set<br>• Retard the ignition timing using CONSULT. | If trouble symptom disappears, see CHECK ITEM. | • Adjust initial ignition timing |
| POWER BALANCE | • Engine: After warming up, idle the engine.<br>• A/C switch "OFF"<br>• Shift lever "N"<br>• Cut off each injector signal one at a time using CONSULT. | Engine runs rough or dies. | • Harness and connector<br>• Compression<br>• Injectors<br>• Power transistor<br>• Spark plugs<br>• Ignition coils |
| FUEL PUMP RELAY | • Ignition switch: ON (Engine stopped)<br>• Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound. | Fuel pump relay makes the operating sound. | • Harness and connector<br>• Fuel pump relay |
| EGRC SOLENOID VALVE | • Ignition switch: ON (Engine stopped)<br>• Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | • Harness and connector<br>• Solenoid valve |
| SELF-LEARNING CONT | • In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen. | | |
| PURG VOL CONT/V | • Engine: After warming up, run engine at 1,500 rpm.<br>• Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT. | Engine speed changes according to the opening percent. | • Harness and connector<br>• Solenoid valve |
| TANK F/TEMP SEN | • Change the tank fuel temperature using CONSULT. | | |
| VENT CONTROL/V | • Ignition switch: ON (Engine stopped)<br>• Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | • Harness and connector<br>• Solenoid valve |

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| VC/V BYPASS/V | • Ignition switch: ON (Engine stopped)<br>• Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | • Harness and connector<br>• Solenoid valve |
| MAP/BARO SW/V | • Ignition switch: ON (Engine stopped)<br>• Turn the MAP/BARO switch solenoid valve between "MAP" and "BARO" using CONSULT and listen to operating sound. | Solenoid valve makes an operating sound. | • Harness and connector<br>• Solenoid valve |

## DTC CONFIRMATION MODE
NBEC0033S10

### SRT STATUS Mode
NBEC0033S1001

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-46.

### DTC Work Support Mode
NBEC0033S1002

| Test mode | Test item | Condition | Reference page |
|---|---|---|---|
| EVAPORATIVE SYSTEM | PURGE FLOW P1447 | Refer to corresponding trouble diagnosis for DTC. | EC-399 |
| | VC CUT/V BP/V P1491 | | EC-415 |
| | PURG VOL CN/V P1444 | | EC-387 |
| | EVAP SML LEAK P0440 | | EC-292 |
| | EVAP SML LEAK P1440 | | EC-380 |
| FR O2 SENSOR | FR O2 SEN-B1 P0131 | | EC-166 |
| | FR O2 SEN-B1 P0132 | | EC-172 |
| | FR O2 SEN-B1 P0133 | | EC-178 |
| | FR O2 SEN-B1 P0130 | | EC-158 |
| | FR O2 SEN-B2 P0151 | | EC-166 |
| | FR O2 SEN-B2 P0152 | | EC-172 |
| | FR O2 SEN-B2 P0153 | | EC-178 |
| | FR O2 SEN-B2 P0150 | | EC-158 |
| RR O2 SENSOR | RR O2 SEN-B1 P0137 | | EC-200 |
| | RR O2 SEN-B1 P0138 | | EC-208 |
| | RR O2 SEN-B1 P0139 | | EC-216 |
| | RR O2 SEN-B2 P0157 | | EC-200 |
| | RR O2 SEN-B2 P0158 | | EC-208 |
| | RR O2 SEN-B2 P0159 | | EC-216 |
| EGR SYSTEM | EGR SYSTEM P0400 | | EC-276 |
| | EGRC-BPT/VLV P0402 | | EC-284 |
| | EGR SYSTEM P1402 | | EC-373 |

## FUNCTION TEST MODE

NBEC0033S08

| FUNCTION TEST ITEM | CONDITION | JUDGEMENT | | CHECK ITEM (REMEDY) |
|---|---|---|---|---|
| SELF-DIAG RESULTS | • Ignition switch: ON (Engine stopped)<br>• Displays the results of on board diagnostic system. | — | | Objective system |
| CLOSED THROTTLE POSI | • Ignition switch: ON (Engine stopped)<br>• 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 | • Harness and connector<br>• Throttle position sensor (Closed throttle position)<br>• Throttle position sensor (Closed throttle position) adjustment<br>• Throttle linkage<br>• Verify operation in DATA MONITOR mode. |
| | | Throttle valve: closed | ON | |
| THROTTLE POSI SEN CKT | • Ignition switch: ON (Engine stopped)<br>• Throttle position sensor circuit is tested when throttle is opened and closed fully. | Range (Throttle valve fully opened — Throttle valve fully closed) | More than 3.0V | • Harness and connector<br>• Throttle position sensor<br>• Throttle position sensor adjustment<br>• Throttle linkage<br>• Verify operation in DATA MONITOR mode. |
| PARK/NEUT POSI SW CKT | • Ignition switch: ON (Engine stopped)<br>• Inhibitor switch circuit is tested when shift lever is manipulated. | Out of N/P positions | OFF | • Harness and connector<br>• Inhibitor switch<br>• Linkage or Inhibitor switch adjustment |
| | | In N/P positions | ON | |
| FUEL PUMP CIRCUIT | • Ignition switch: ON (Engine stopped)<br>• Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched. | There is pressure pulsation on the fuel feed hose. | | • Harness and connector<br>• Fuel pump<br>• Fuel pump relay<br>• Fuel filter clogging<br>• Fuel level |
| EGRC SOL/V CIRCUIT* | • Ignition switch: ON (Engine stopped)<br>• EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise. | The solenoid valve makes an operating sound every 3 seconds. | | • Harness and connector<br>• EGRC-solenoid valve |
| START SIGNAL CIRCUIT | • Ignition switch: ON → START<br>• 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 | | • Harness and connector<br>• Ignition switch |
| PW/ST SIGNAL CIRCUIT | • Ignition switch: ON (Engine running)<br>• Power steering oil pressure switch circuit is tested when steering wheel is rotated fully and then set to a straight line running position. | Locked position | ON | • Harness and connector<br>• Power steering oil pressure switch<br>• Power steering oil pump |
| | | Neutral position | OFF | |
| VEHICLE SPEED SEN CKT | • Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher. | Vehicle speed sensor input signal is greater than 4 km/h (2 MPH) | | • Harness and connector<br>• Vehicle speed sensor<br>• Speedometer |

| FUNCTION TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| IGN TIMING ADJ | • After warming up, idle the engine.<br>• 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. | • Adjust ignition timing (by moving camshaft position sensor or distributor)<br>• Camshaft position sensor drive mechanism |
| MIXTURE RATIO TEST | • Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the 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 | • INJECTION SYSTEM (Injector, fuel pressure regulator, harness or connector)<br>• IGNITION SYSTEM (Spark plug, power transistor, ignition coil, harness or connector)<br>• VACUUM SYSTEM (Intake air leaks)<br>• Front heated oxygen sensor circuit<br>• Front heated oxygen sensor operation<br>• Fuel pressure high or low<br>• Mass air flow sensor |
| POWER BALANCE | • After warming up, idle the engine.<br>• Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.) | Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder. | • Injector circuit (Injector, harness or connector)<br>• Ignition circuit (Spark plug, ignition coil with power transistor harness or connector)<br>• Compression<br>• Valve timing |
| IACV-AAC/V SYSTEM | • After warming up, idle the engine.<br>• 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%. | • Harness and connector<br>• IACV-AAC valve<br>• Air passage restriction between air inlet and IACV-AAC valve<br>• IAS (Idle adjusting screw) adjustment |

*: If this function test mode is not available, use the ACTIVE TEST mode.

## REAL TIME DIAGNOSIS IN DATA MONITOR MODE (RECORDING VEHICLE DATA)

NBEC0033S09

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.

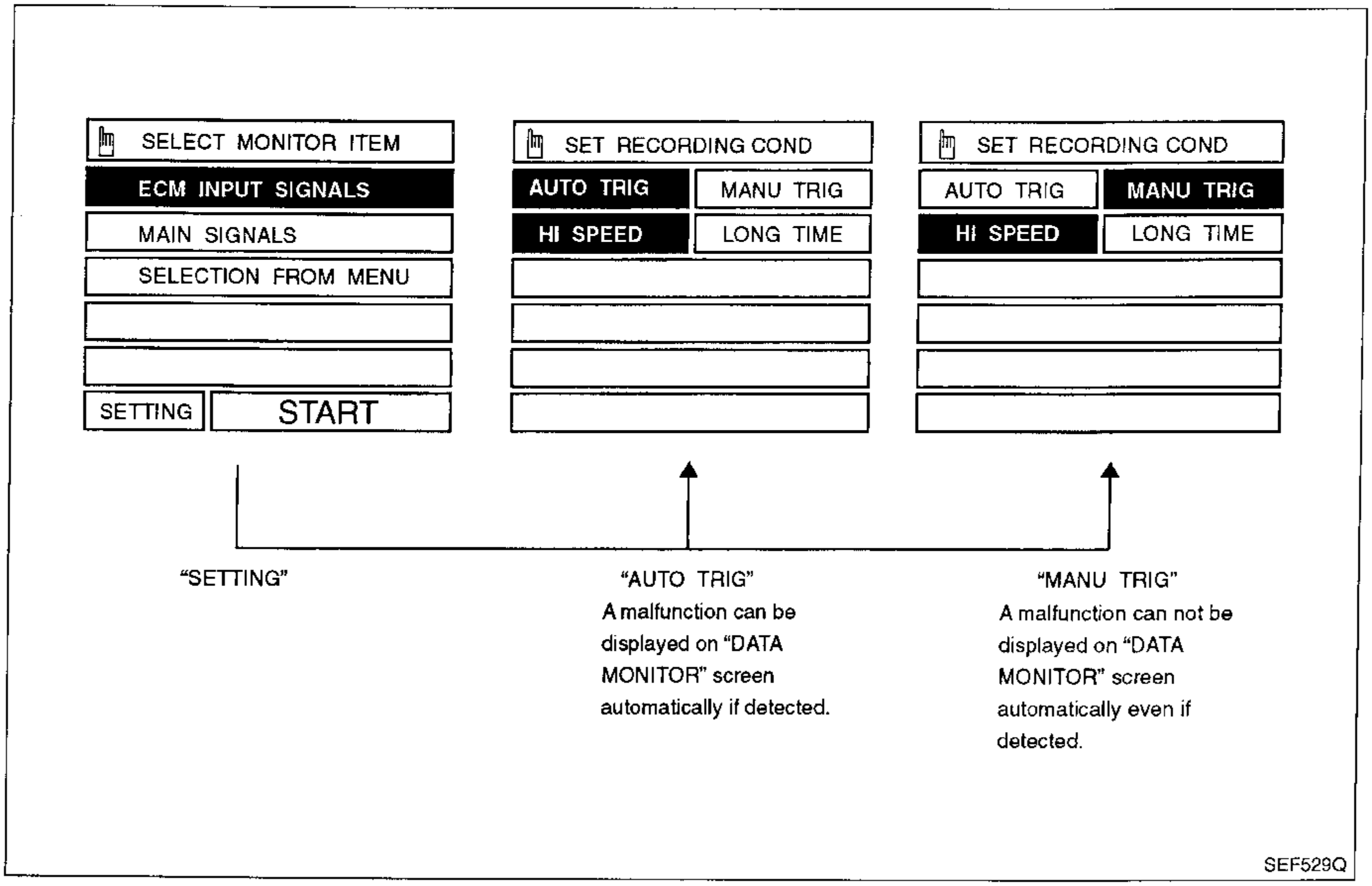
Use these triggers as follows:

1) "AUTO TRIG"

- While trying to detect the DTC/1st trip DTC by performing the "DTC 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 "DTC 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.

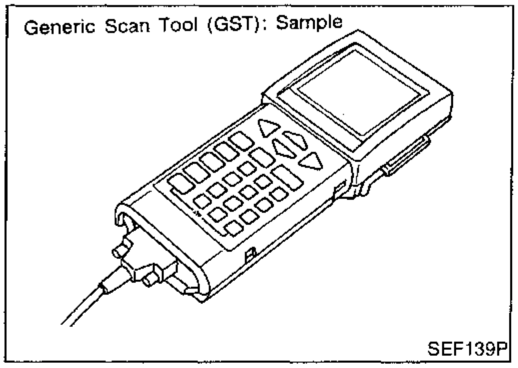


## Generic Scan Tool (GST)

NBEC0034

### DESCRIPTION

NBEC0034S01

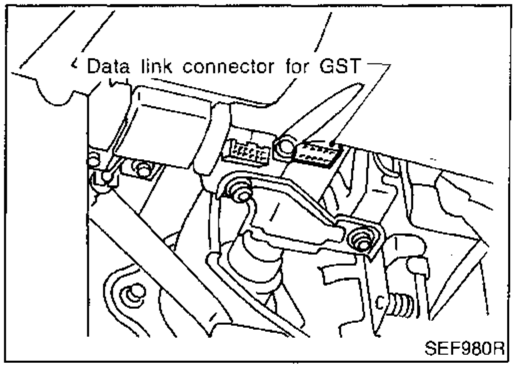


SEF139P

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.

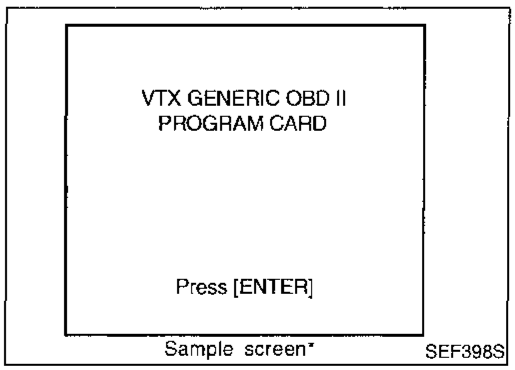
### GST INSPECTION PROCEDURE

NBEC0034S02



SEF980R

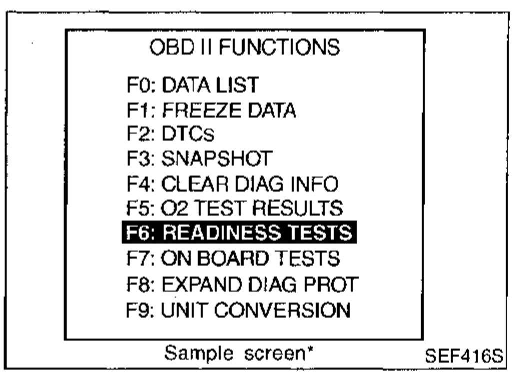
1. Turn off ignition switch.
2. Connect "GST" to data link connector for GST. (Data link connector for GST is located under LH dash panel near the fuse box cover.)



Sample screen*
SEF398S

3. Turn on ignition switch.
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.)



Sample screen*
SEF416S

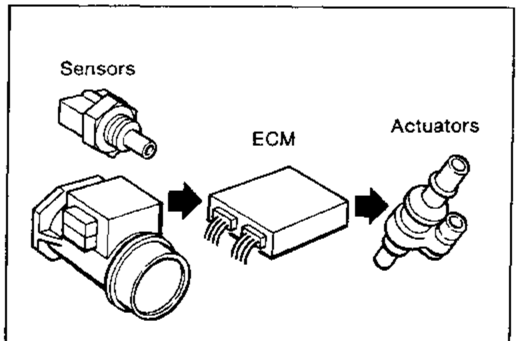
5. Perform each diagnostic mode according to each service procedure.

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

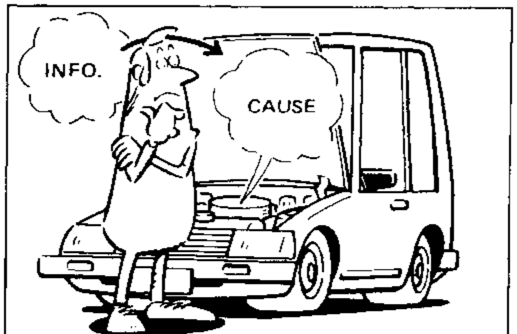
## FUNCTION

NBEC0034S03

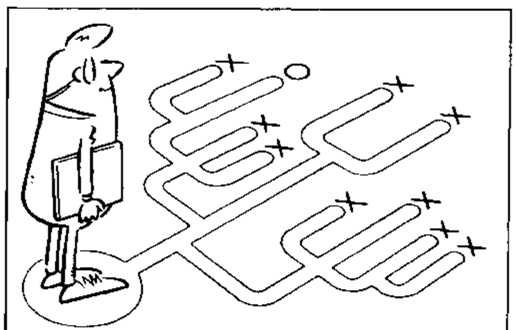
| Diagnostic test mode | | Function |
|---|---|---|
| MODE 1 | READINESS TESTS | This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information. |
| MODE 2 | (FREEZE DATA) | This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to "Freeze Frame Data" (EC-70).] |
| 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:<br>● Clear number of diagnostic trouble codes (MODE 1)<br>● Clear diagnostic trouble codes (MODE 3)<br>● Clear trouble code for freeze frame data (MODE 1)<br>● Clear freeze frame data (MODE 2)<br>● Reset status of system monitoring test (MODE 1)<br>● 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, the following parts can be opened or closed.<br>● EVAP canister vent control valve open<br>● Vacuum cut valve bypass valve closed<br>In the following conditions, this mode cannot function.<br>● Low ambient temperature<br>● Low battery voltage<br>● Engine running<br>● Ignition switch "OFF"<br>● Low fuel temperature<br>● Too much pressure is applied to EVAP system |



MEF036D



SEF233G


SEF234G

## Introduction

NBEC0035

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-83.
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.

**KEY POINTS**

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

SEF907L

### DIAGNOSTIC WORKSHEET

NBEC0035S01

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 MIL 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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## Worksheet Sample

NBEC0035S0101

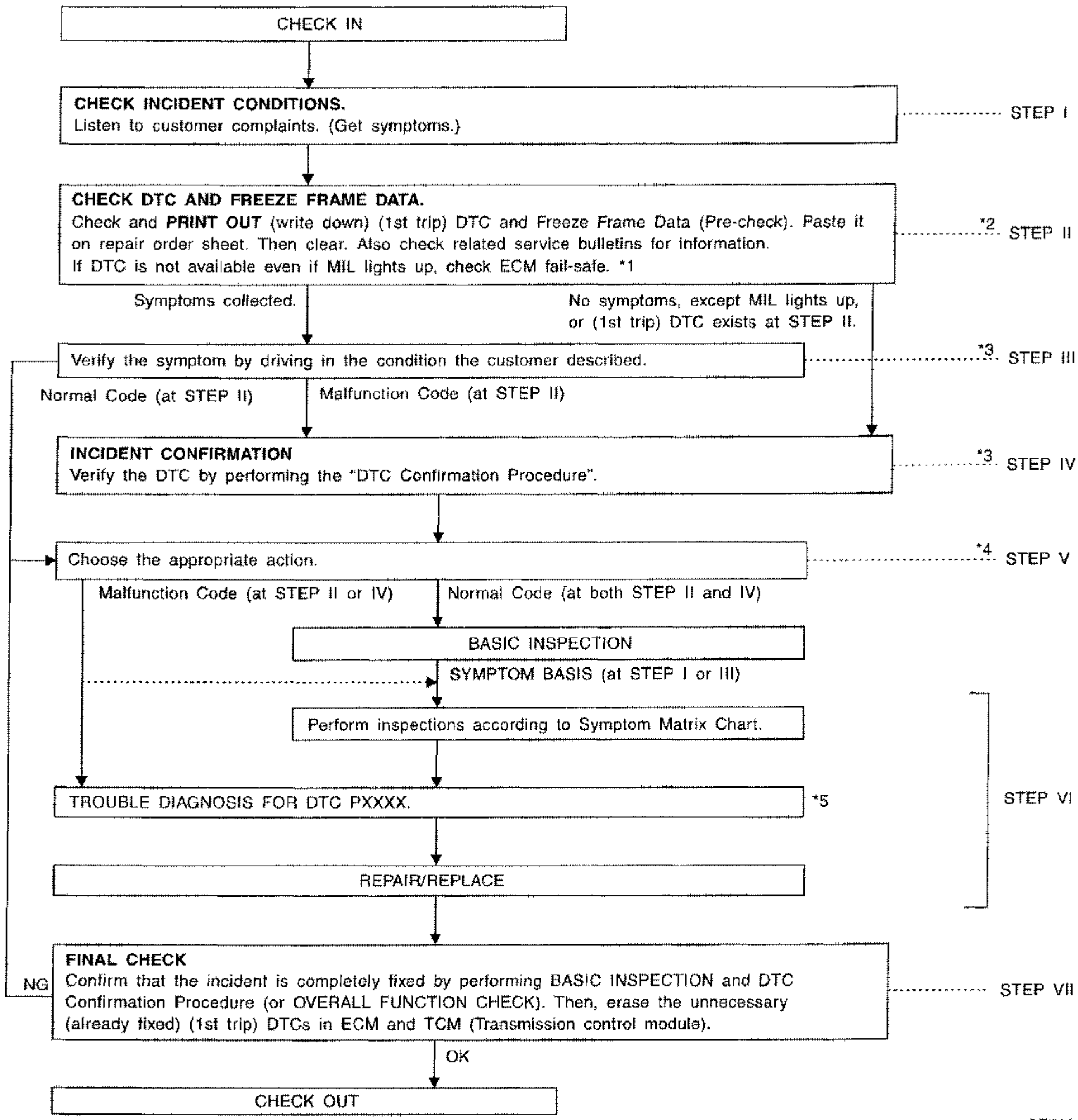
| | | |
|---|---|---|
| Customer name MR/MS | Model & Year | VIN |
| Engine # | Trans. | Mileage |
| Incident Date | Manuf. Date | In Service Date |

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

MTBL0017

## Work Flow

NBEC0036




SEF931U

*1 EC-88

*2 If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

*3 If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

*4 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-108.

*5 If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

## DESCRIPTION FOR WORK FLOW

NBEC0036S01

| STEP | DESCRIPTION |
|---|---|
| STEP I | Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-82. |
| STEP II | Before confirming the concern, check and write down (print out using CONSULT or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-55.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV.<br>If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.<br>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-89.)<br>Also check related service bulletins for information. |
| STEP III | Try to confirm the symptom and under what conditions the incident occurs.<br>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.<br>If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.<br>If the malfunction code is detected, skip STEP IV and perform STEP V. |
| STEP IV | Try to detect the (1st trip) DTC by driving in (or performing) the "DTC Confirmation Procedure". Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT or GST.<br>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.<br>If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.<br>In case the "DTC 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.<br>The "NG" result of the "Overall Function Check" is the same as the (1st trip) DTC detection. |
| STEP V | Take the appropriate action based on the results of STEP I through IV.<br>If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX.<br>If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-85.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-89.) |
| STEP VI | 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".<br>Gently shake the related connectors, components or wiring harness with CONSULT set in "DATA MONITOR (AUTO TRIG)" mode.<br>Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT. Refer to EC-93, EC-98.<br>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").<br>Repair or replace the malfunction parts.<br>If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. |
| STEP VII | 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.<br>Perform the "DTC Confirmation Procedure" and confirm the normal code [DTC 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.<br>Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-55.) |

## Basic Inspection

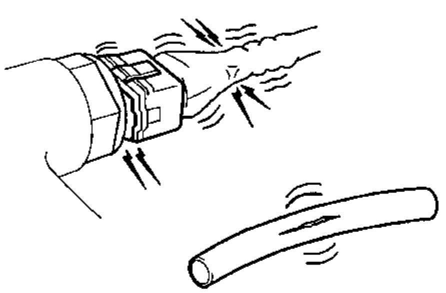
NBEC0037

**Precaution:**
**Perform Basic Inspection without electrical or mechanical loads applied;**

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

| 1 | INSPECTION START |
|---|---|

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

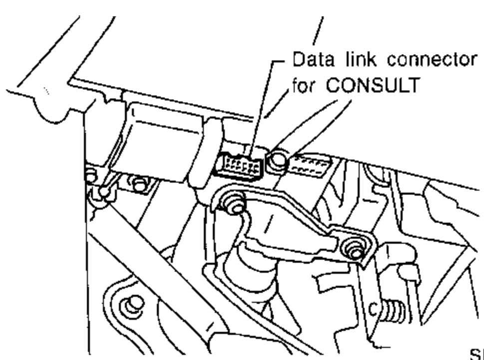


SEF983U

| | | |
|---|---|---|
| with CONSULT | ▶ | GO TO 2. |
| without CONSULT | ▶ | GO TO 3. |

| 2 | CONNECT CONSULT TO THE VEHICLE |
|---|---|

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-66.

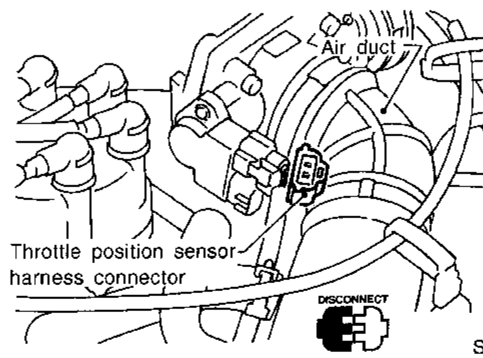



SEF979R

| | | |
|---|---|---|
| | ▶ | GO TO 3. |

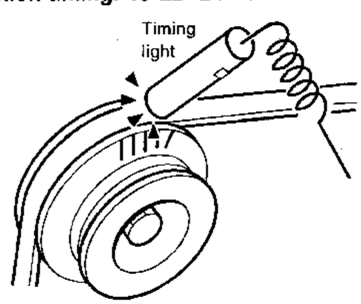
| 3 | CHECK IGNITION TIMING |
|---|---|

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and disconnect throttle position sensor harness connector.




SEF975R

3. Start engine.
4. Check ignition timing at idle using a timing light.
   **Ignition timing: 15°±2° BTDC**




SEF984U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | 1. Adjust ignition timing by turning distributor.<br>2. GO TO 4. |

| 4 | CHECK BASE IDLE SPEED |
|---|---|

Does engine speed fall to the following speed?
**700±50 rpm (in "N" position)**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | 1. Adjust engine speed by turning idle speed adjusting screw.<br>2. GO TO 5. |

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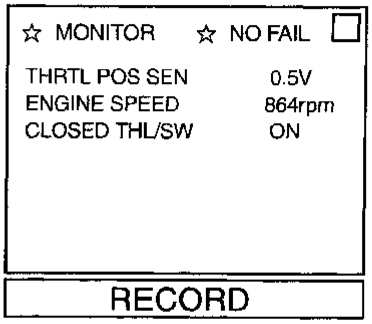
| 5 | CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION |
|---|---|

**With CONSULT**

1. Select "A/T", then "DATA MONITOR".
2. Select "ENGINE SPEED" and "CLOSED THL/SW".
3. Read "CLOSED THL/SW" signal under the following condition:

- Raise engine speed to 2,000 rpm.
- Gradually lower engine speed.




SEF985U

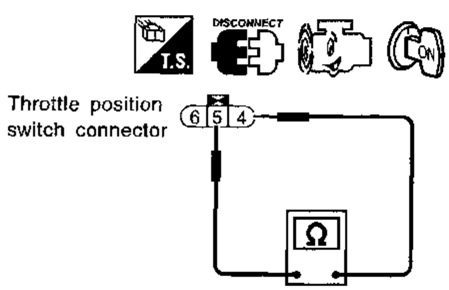
**"CLOSED THL/SW" should turn "ON" at 950±150 rpm with transmission in N position.**

**Without CONSULT**

1. Disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
2. Check continuity between closed throttle position switch terminals 4 and 5 under the following condition.

- Raise engine speed to 2,000 rpm.
- Gradually lower engine speed.

**Continuity should exist (Closed throttle position switch closed) at 950±150 rpm with transmission in N position.**




SEF986U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | 1. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.<br>2. GO TO 7. |
| NG | ▶ | 1. Adjust continuity signal by rotating throttle position sensor body.<br>2. GO TO 6. |

| 6 | RESET IDLE POSITION MEMORY |
|---|---|

**With CONSULT**

1. Warm up engine to normal operating temperature.
2. Select "CLSD THL/P SW" in "DATA MONITOR (manual trigger)" mode with CONSULT.
3. Stop engine.
4. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.
5. Turn ignition switch "ON".
6. Turn ignition switch "OFF" and wait at least 5 seconds.
7. Repeat steps 5. and 6. until "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT changes to "ON".

**Without CONSULT**

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

| | |
|---|---|
| ▶ | GO TO 7. |

| 7 | CHECK TARGET IDLE SPEED |
|---|---|

**With CONSULT**

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

**750±50 rpm (in "N" position)**

**Without CONSULT**

Check idle speed.

**750±50 rpm (in "N" position)**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Adjust idle speed. Refer to EC-35. |

| 8 | ERASE UNNECESSARY DTC |
|---|---|

After this inspection, unnecessary DTC No. might be displayed.
Erase the stored memory in ECM and TCM (Transmission control module).
Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-55 and "HOW TO ERASE DTC" in AT section.

| | |
|---|---|
| ▶ | **INSPECTION END** |

## DTC Inspection Priority Chart

NBEC0038

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 | • P0100 Mass air flow sensor (0102)<br>• P0110 Intake air temperature sensor (0401)<br>• P0115 P0125 Engine coolant temperature sensor (0103) (0908)<br>• P0120 Throttle position sensor (0403)<br>• P0180 Tank fuel temperature sensor (0402)<br>• P0325 Knock sensor (0304)<br>• P0335 P1336 Crankshaft position sensor (OBD) (0802) (0905)<br>• P0340 Camshaft position sensor (0101)<br>• P0500 Vehicle speed sensor (0104)<br>• P0600 A/T communication line<br>• P0605 ECM (0301)<br>• P1320 Ignition signal (0201)<br>• P1400 EGRC-solenoid valve (1005)<br>• P1605 A/T diagnosis communication line (0804)<br>• P1706 Park/Neutral position switch (1003) |
| 2 | • P0105 Absolute pressure sensor (0803)<br>• P0130-P0134, P0150-P0154 Front heated oxygen sensor (0413-0415) (0503) (0509), (0303) (0409-0412)<br>• P0135 P0155 Front heated oxygen sensor heater (0901) (1001)<br>• P0137-P0140, P0157-P0160 Rear heated oxygen sensor (0510-0512) (0707), (0313-0315) (0708)<br>• P0141 P0161 Rear heated oxygen sensor heater (0902) (1002)<br>• P0443 P1444 EVAP canister purge volume control solenoid valve (1008) (0214)<br>• P0446 P1446 P1448 EVAP canister vent control valve (0903) (0215) (0309)<br>• P0450 EVAP control system pressure sensor (0704)<br>• P0510 Closed throttle position switch (0203)<br>• P0705-P0755 P1705 P1760 A/T related sensors, solenoid valves and switches (1101-1208)<br>• P1105 MAP/BARO switch solenoid valve (1302)<br>• P1401 EGR temperature sensor (0305)<br>• P1490 P1491 Vacuum cut valve bypass valve (0801) (0311)<br>• P1447 EVAP control system purge flow monitoring (0111) |
| 3 | • P0172 P0171 P0175 P0174 Fuel injection system function (0114) (0115) (0209) (0210)<br>• P0306 - P0300 Misfire (0603 - 0701)<br>• P0400 P1402 EGR function (0302) (0514)<br>• P0402 EGRC-BPT valve function (0306)<br>• P0420 P0430 Three way catalyst function (0702) (0703)<br>• P0440 P1440 EVAP control system (SMALL LEAK) (0705) (0213)<br>• P0505 IACV-AAC valve (0205)<br>• P0731-P0734 P0744 A/T function (1103 - 1106) (1107)<br>• P1148 P1168 Closed loop control (0307) (0308) |

## Fail-safe Chart

=NBEC0039

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.

<table>
<tr><th colspan="2">DTC No.</th><th rowspan="2">Detected items</th><th colspan="2" rowspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><th>CONSULT<br>GST</th><th>ECM*1</th></tr>
<tr><td>P0100</td><td>0102</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="5">P0115</td><td rowspan="5">0103</td><td rowspan="5">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".<br>CONSULT displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT display)</td></tr>
<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)<br>(Depends on the time)</td></tr>
<tr><td rowspan="4">P0120</td><td rowspan="4">0403</td><td rowspan="4">Throttle position sensor circuit</td><td colspan="2">Throttle position will be determined based on the injected fuel amount and the engine speed.<br>Therefore, acceleration will be poor.</td></tr>
<tr><td>Condition</td><td>Driving condition</td></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
<tr><td rowspan="8">Unable to access ECCS</td><td rowspan="8">Unable to access Diagnostic Test Mode II</td><td rowspan="8">ECM</td><td colspan="2">ECM fail-safe activating condition<br>The computing function of the ECM was judged to be malfunctioning.<br>When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MIL on the instrument panel lights to warn the driver.<br>However it is not possible to access ECCS and DTC cannot be confirmed.<br>Engine control with fail-safe<br>When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, and IACV-AAC valve operation are controlled under certain limitations.</td></tr>
<tr><td></td><td>ECM fail-safe operation</td></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td colspan="2">Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

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

## Symptom Matrix Chart

NBEC0040

### SYSTEM — BASIC ENGINE CONTROL SYSTEM

NBEC0040S01

| | | 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) | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | | 3 | 2 | | | 3 | | 1 | EC-439 |
| | Injector circuit | | | | | | | 2 | | | | | | | EC-429 |
| | Fuel pressure regulator system | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | | 4 | | | EC-32 |
| | Evaporative emission system | | | | | | | | | | | | | | EC-24 |
| Air | Positive crankcase ventilation system | | | | | | | | | | | | 1 | | EC-30 |
| | Incorrect idle speed adjustment | 3 | 3 | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-35 |
| | IACV-AAC valve circuit | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | | 3 | | 1 | EC-323 |
| | IACV-FICD solenoid valve circuit | | 2 | | | | 3 | 3 | | | | | | | EC-449 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-35 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-350 |
| EGR | EGRC-solenoid valve circuit | | 2 | | 3 | 3 | | | | | | 3 | | | EC-362 |
| | EGR system | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 3 | | 4 | | | EC-276, 373 |
| Main power supply and ground circuit | | 1 | 2 | 3 | 3 | 3 | | 3 | 2 | | 1 | 3 | | 1 | EC-108 |
| Air conditioner circuit | | 2 | | | | | 3 | | | 2 | | | | | HA section |

1 - 6: The numbers refer to the checking order.
(continued on next page)

## SYSTEM — ECCS SYSTEM

NBEC0040S02

| | | 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 | 1 | | | 2 | | | | 2 | | | | | | EC-269 |
| | Mass air flow sensor circuit | | 1 | 2 | | 2 | | | | | | 2 | | | EC-115 |
| | Front heated oxygen sensor circuit | | | | 3 | | | 2 | | | | | | | EC-158 |
| | Engine coolant temperature sensor circuit | 1 | 2 | 3 | | 3 | 3 | | | 2 | | 3 | | | EC-138, 153 |
| | Throttle position sensor circuit | | 1 | 2 | | 2 | 2 | | | | | 2 | | | EC-143 |
| | Incorrect throttle position sensor adjustment | | 3 | 1 | | 1 | 1 | 1 | 1 | 1 | | 1 | | | EC-85 |
| | Vehicle speed sensor circuit | | 2 | | | | | | | | | | | | EC-319 |
| | Knock sensor circuit | | | 3 | 3 | 3 | | | | | | 3 | | | EC-260 |
| | ECM | 2 | 2 | | | | 3 | 3 | 2 | 2 | 1 | | | | EC-337, 88 |
| | Start signal circuit | 1 | | | | | | | | | | | | | EC-435 |
| | Park/Neutral position switch circuit | | | 3 | | 3 | | | | | | 3 | | | EC-425 |
| | Power steering oil pressure switch circuit | | 2 | | | | | 3 | 2 | | | | | | EC-445 |

1 - 6: The numbers refer to the checking order.
(continued on next page)

## SYSTEM— ENGINE MECHANICAL & OTHER

NBEC0040S03

| | | 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) | Reference section |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 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 | 4 | | | 5 | | | |
| | Vapor lock | | 5 | | | | | | | | | | | | |
| | Valve deposit | | | | | | | | | | | | | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | 5 | 5 | 5 | | 5 | 4 | | | 5 | | | — |
| Air | Air duct | | | | | | | | | | | | | | |
| | Air cleaner | | | | | | | | | | | | | | |
| | Air leakage from air duct (Mass air flow sensor — throttle body) | | 5 | 5 | 5 | 5 | | 5 | 4 | | | 5 | | | |
| | Throttle body, Throttle wire | 5 | | | | | 5 | | | 4 | | | | | FE section |
| | Air leakage from intake manifold/Collector/Gasket | | | | 5 | | | | | | | | | | — |
| Cranking | Battery | | 1 | 1 | | 1 | | 1 | 1 | | | 1 | | 1 | |
| | Alternator circuit | 1 | | | | | | | | | | | | | EL section |
| | Starter circuit | | | | | | | | | | | | | | |
| | Inhibitor switch | | | | | | | | | | | | | | AT section |
| | Drive plate | 6 | | | | | | | | | | | | | EM section |

1 - 6: The numbers refer to the checking order.

(continued on next page)

| | | SYMPTOM | | | | | | | | | | | | | Reference section |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 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 | |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM section |
| | Cylinder head gasket | | | | | | | | | | 2 | | 2 | | |
| | Cylinder block | | | | | | | | | | | | | | |
| | Piston | | | | | | | | | | | | 3 | | |
| | Piston ring | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | | |
| | Connecting rod | | | | | | | | | | | | | | |
| | Bearing | | | | | | | | | | | | | | |
| | Crankshaft | | | | | | | | | | | | | | |
| Valve mechanism | Timing belt | | | | | | | | | | | | | | |
| | Camshaft | 6 | | | | | | | | | | | | | |
| | Intake valve | | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | 2 | | |
| | Exhaust valve | | | | | | | | | | | | | | |
| | Hydraulic lash adjuster | | | | | | | | | | | | | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | | FE section |
| | Three way catalyst | | | | | | | | | | | | | | |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | 2 | | MA, EM, LC section |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | MA section |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | LC section |
| | Thermostat | | | | | | 5 | | | 5 | | | | | |
| | Water pump | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | 2 | 6 | | | |
| | Water gallery | | | | | | | | | | | | | | |
| | Cooling fan | | | | | | 5 | | | 5 | | | | | |
| | Coolant level (low)/Contaminated coolant | | | | | | | | | | | | | | MA section |

1 - 6: The numbers refer to the checking order.

## CONSULT Reference Value in Data Monitor Mode

NBEC0041

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) | • Tachometer: Connect<br>• Run engine and compare tachometer indication with the CONSULT value. | | Almost the same speed as the CONSULT value. |
| MAS AIR/FL SE | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | 1.0 - 1.7V |
| | | 2,500 rpm | 1.7 - 2.3V |
| COOLAN TEMP/S | • Engine: After warming up | | More than 70°C (158°F) |
| FR O2 SEN-B2<br>FR O2 SEN-B1 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| FR O2 MNTR-B2<br>FR O2 MNTR-B1 | | | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |
| RR O2 SEN-B1<br>RR O2 SEN-B2 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| RR O2 MNTR-B1<br>RR O2 MNTR-B2 | | | LEAN ←→ RICH |
| VHCL SPEED SE | • Turn drive wheels and compare speedometer indication with the CONSULT value | | Almost the same speed as the CONSULT value |
| BATTERY VOLT | • Ignition switch: ON (Engine stopped) | | 11 - 14V |
| THRTL POS SEN | • Engine: After warming up<br>• Ignition switch: ON (Engine stopped) | Throttle valve: fully closed | 0.3 - 0.7V |
| | | Throttle valve: fully opened | Approx. 4.0V |
| EGR TEMP SEN | • Engine: After warming up | | Less than 4.5V |
| START SIGNAL | • Ignition switch: ON → START → ON | | OFF → ON → OFF |
| CLSD THL/P SW | • Engine: After warming up<br>• Ignition switch: ON (Engine stopped) | Throttle valve: Idle position | ON |
| | | Throttle valve: Slightly open | OFF |
| AIR COND SIG | • Engine: After warming up, idle the engine | Air conditioner switch: "OFF" | OFF |
| | | Air conditioner switch: "ON" (Compressor operates.) | ON |
| P/N POSI SW | • Ignition switch: ON | Shift lever: "P" or "N" | ON |
| | | Except above | OFF |
| PW/ST SIGNAL | • Engine: After warming up, idle the engine | Steering wheel in neutral position (forward direction) | OFF |
| | | The steering wheel is turned | ON |

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| AMB TEMP SW | • Ignition switch: ON<br>• Compare ambient temperature with the following: | Below 23.5°C (74°F) | OFF |
| | | Above 23.5°C (74°F) | ON |
| IGNITION SW | • Ignition switch: ON → OFF → ON | | ON → OFF → ON |
| INJ PULSE-B2<br>INJ PULSE-B1 | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | 2.4 - 3.2 msec |
| | | 2,000 rpm | 1.9 - 2.8 msec |
| B/FUEL SCHDL | ditto | Idle | 1.0 - 1.6 msec |
| | | 2,000 rpm | 0.7 - 1.3 msec |
| IGN TIMING | ditto | Idle | 10° BTDC |
| | | 2,000 rpm | More than 25° BTDC |
| IACV-AAC/V | ditto | Idle | 10 - 20% |
| | | 2,000 rpm | — |
| PURG VOL C/V | ditto | Idle | 0 % |
| | | 2,000 rpm | — |
| A/F ALPHA-B2<br>A/F ALPHA-B1 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 54 - 155% |
| 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)<br>• Engine running and cranking | | ON |
| | Except as shown above | | OFF |
| EGRC SOL/V | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | OFF |
| | | Engine speed: Revving from idle up to 3,000 rpm quickly | ON |
| VENT CONT/V | • Ignition switch: ON | | OFF |
| FR O2 HTR-B1<br>FR O2 HTR-B2 | • Engine speed: Idle | | ON |
| | • Engine speed: Above 3,200 rpm | | OFF |
| RR O2 HTR-B1<br>RR O2 HTR-B2 | • Engine speed: Idle | | ON |
| | • Engine speed: Above 3,200 rpm | | OFF |
| VC/V BYPASS/V | Ignition switch: ON | | OFF |
| CAL/LD VALUE | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | 18.5 - 26.0% |
| | | 2,500 rpm | 18.0 - 21.0% |
| ABSOL TH·P/S | • Engine: After warming up<br>• Ignition switch: ON (Engine stopped) | Throttle valve: fully closed | 0.0% |
| | | Throttle valve: fully opened | Approx. 80% |
| MASS AIRFLOW | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | 3.3 - 4.8 g·m/s |
| | | 2,500 rpm | 12.0 - 14.9 g·m/s |

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| MAP/BARO SW/V | • Ignition switch: ON (Engine stopped) | | MAP |
| | • Engine speed: Idle | For 5 seconds after starting engine | BARO |
| | | More than 5 seconds after starting engine | MAP |
| ABSOL PRES/SE | • Ignition switch: ON (Engine stopped) | | Approx. 1.3V |
| | • Engine speed: Idle | For 5 seconds after starting engine | Approx. 4.4V |
| | | More than 5 seconds after starting engine | Approx. 1.3V |

## Major Sensor Reference Graph in Data Monitor Mode

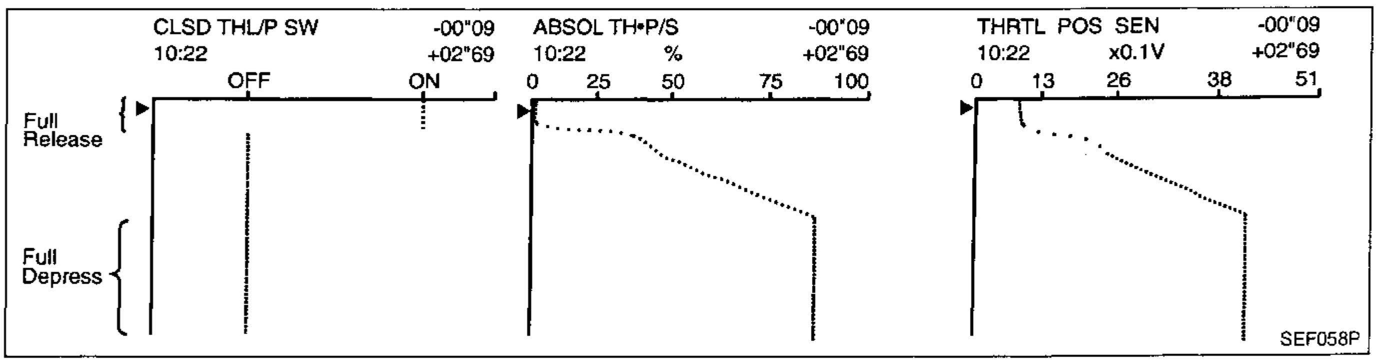
NBEC0042

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

NBEC0042S01

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".



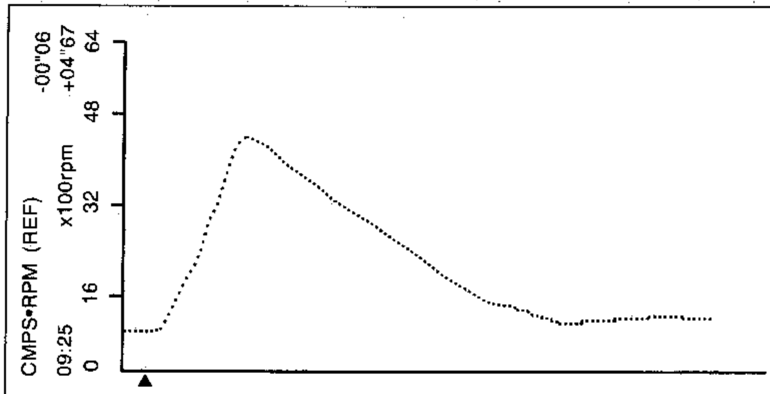

SEF058P

### CMPS·RPM (REF), MAS AIR/FL SE, THRTL POS SEN, RR O2 SEN-B1, FR O2 SEN-B1, INJ PULSE-B1

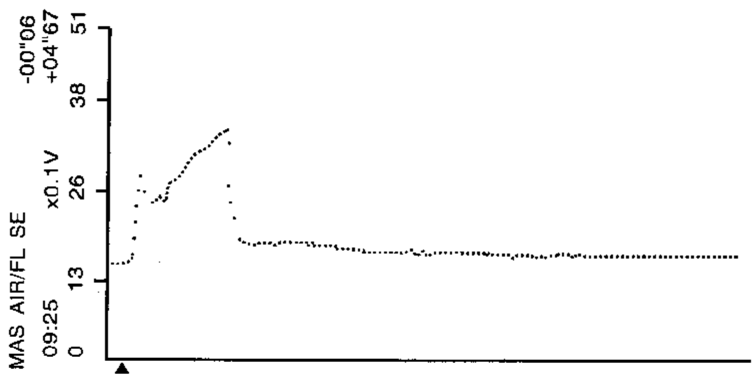
NBEC0042S02

Below is the data for "CMPS·RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SEN-B1", "FR O2 SEN-B1" and "INJ PULSE-B1" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

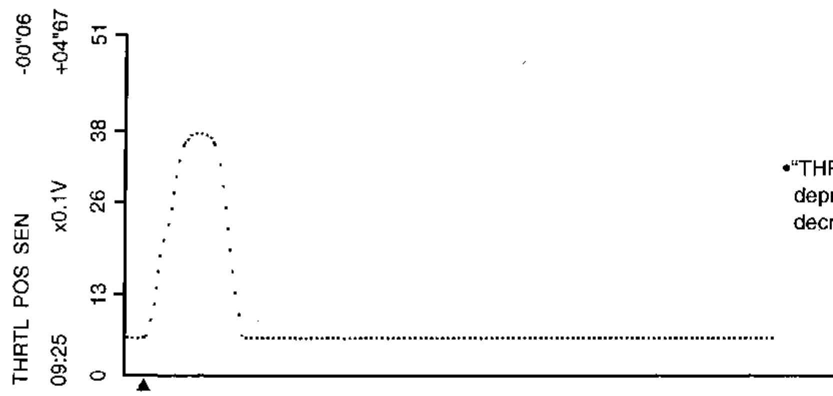



• "CMPS•RPM (REF)" should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.

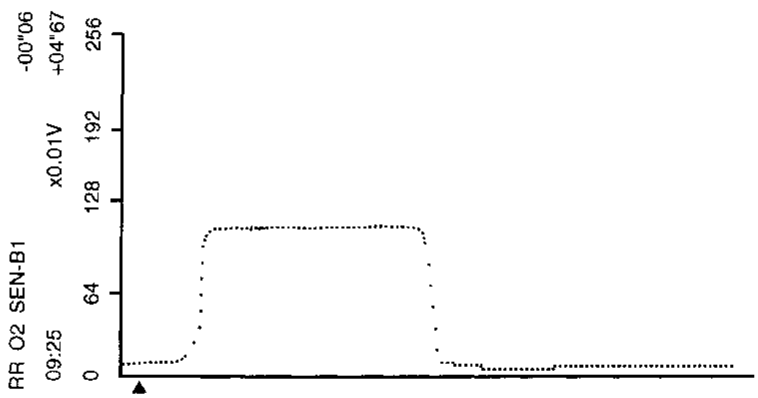



• "MAS AIR/FL SE" should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

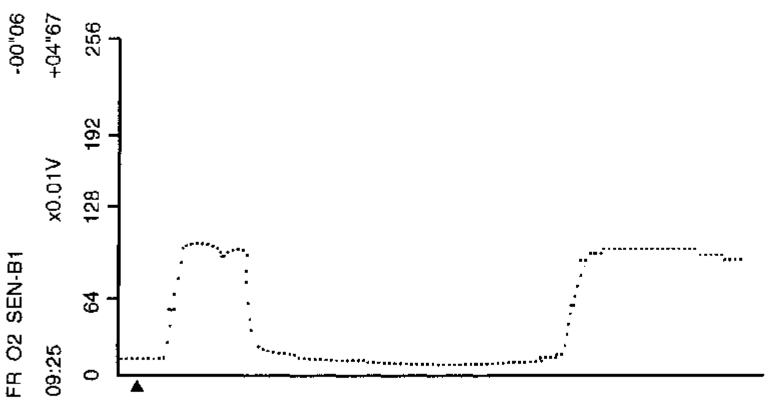
SEF935QA



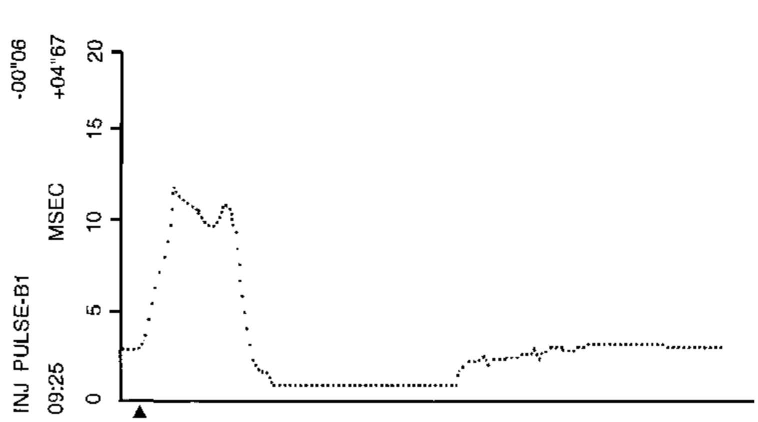

•"THRTL POS SEN" should increase while depressing the accelerator pedel and should decrease while releasing it.




•"RR O2 SEN-B1" may increase immediately after depressing the accelerator pedel and may decrease after releasing the pedal.




•"FR O2 SEN-B1" may increase immediately after depressing the accelerator pedel and may decrease after releasing the pedal.




•"INJ PULSE-B1" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

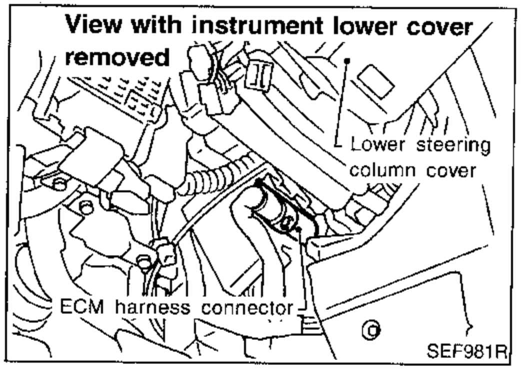
SEF936Q

## ECM Terminals and Reference Value

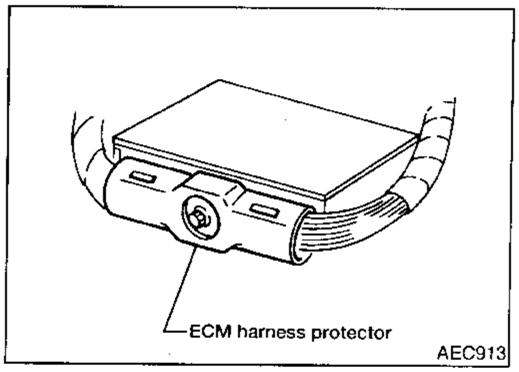
NBEC0043

### PREPARATION

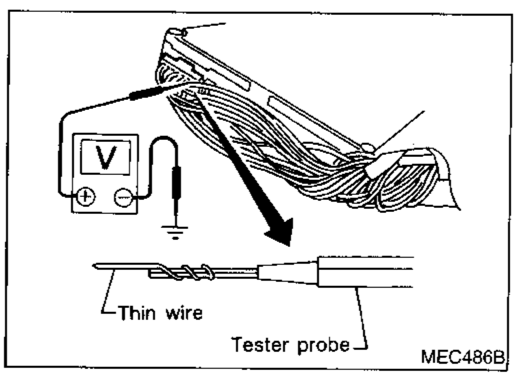
NBEC0043S01




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



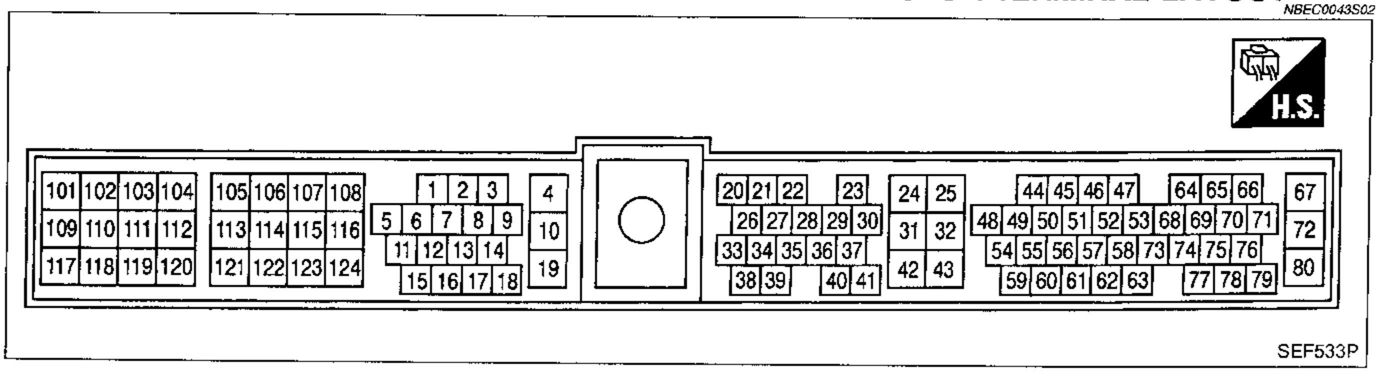

2. Remove ECM harness protector.




3. 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

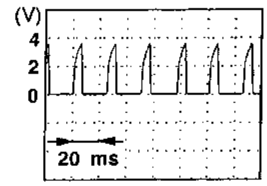
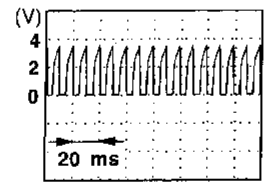
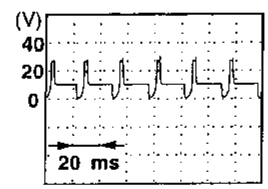
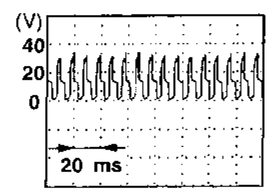
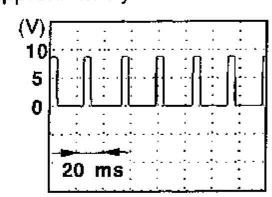
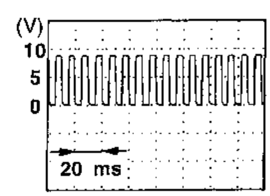
NBEC0043S02

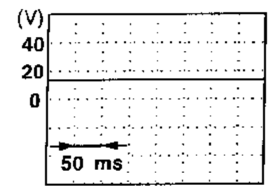
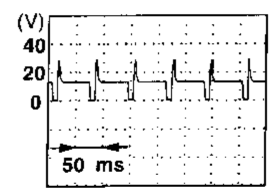


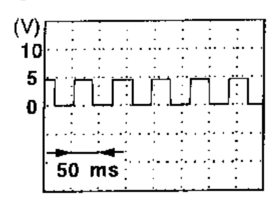

### ECM INSPECTION TABLE

NBEC0043S03

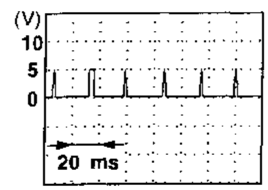
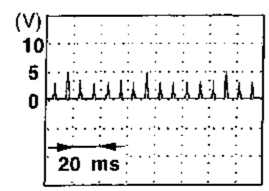
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

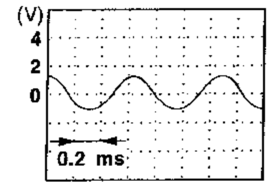
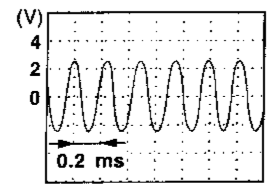
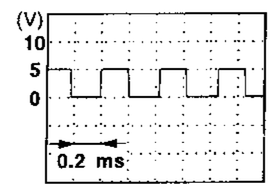
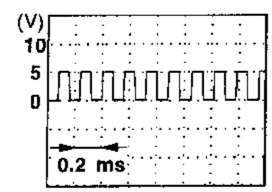
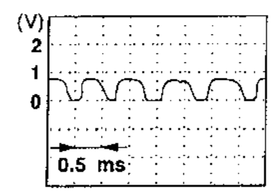
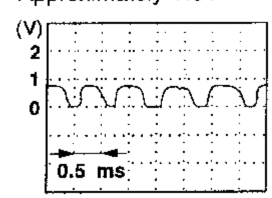
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 1 | W/B | Ignition signal | **[Engine is running]**<br>● Idle speed | 0.7V<br><br>SEF988U |
| | | | **[Engine is running]**<br>● Engine speed is 2,000 rpm | 1.1 - 1.5V<br><br>SEF989U |
| 2 | W/G | Ignition check | **[Engine is running]**<br>● **Warm-up condition**<br>● Idle speed | Approximately 12V<br><br>SEF990U |
| | | | **[Engine is running]**<br>● Engine speed is 2,000 rpm | Approximately 11V<br><br>SEF991U |
| 3 | W | Tachometer | **[Engine is running]**<br>● **Warm-up condition**<br>● Idle speed | Approximately 2V<br><br>SEF992U |
| | | | **[Engine is running]**<br>● Engine speed is 2,000 rpm | 4 - 5V<br><br>SEF993U |

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 4 | L/B | ECCS relay (Self-shut-off) | **[Engine is running]** **[Ignition switch "OFF"]** • For a few seconds after turning ignition switch "OFF" | 0 - 1.5V |
| | | | **[Ignition switch "OFF"]** • A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 5 | LG/B | EVAP canister purge volume control solenoid valve | **[Engine is running]** • Idle speed | BATTERY VOLTAGE (11 - 14V)   SEF994U |
| | | | **[Engine is running]** • Engine speed is 2,000 rpm | BATTERY VOLTAGE (11 - 14V)   SEF995U |
| 7 | Y/G | A/T check signal | **[Ignition switch "ON"]** **[Engine is running]** | 0 - 3.0V |
| 9 | G/OR | Ambient air temperature switch | **[Engine is running]** • Idle speed • Ambient air temperature is above 23.5°C (74°F) • Air conditioner is operating | 0V |
| | | | **[Engine is running]** • Idle speed • Ambient air temperature is below 23.5°C (74°F) • Air conditioner is operating | BATTERY VOLTAGE (11 - 14V) |
| | | | **[Engine is running]** • Idle speed • Ambient air temperature is below 23.5°C (74°F) • Air conditioner is not operating | Approximately 5V |
| 10 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground |
| 11 | R/L | Fuel pump relay | **[Ignition switch "ON"]** • For 5 seconds after turning ignition switch "ON" **[Engine is running]** | 0 - 1V |
| | | | **[Ignition switch "ON"]** • More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 12 | G/R | Air conditioner relay | **[Engine is running]** • Both A/C switch and blower switch are "ON"* | 0 - 1V |
| | | | **[Engine is running]** • A/C switch is "OFF" | BATTERY VOLTAGE (11 - 14V) |

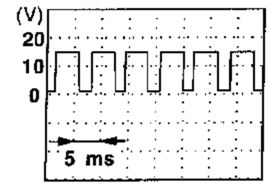
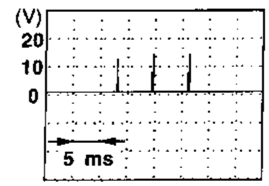
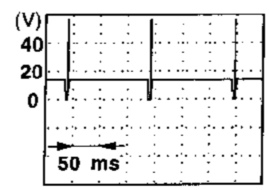
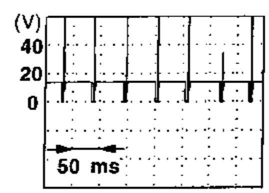
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 18 | OR | Malfunction indicator lamp | **[Ignition switch "ON"]** | 0 - 1V |
| | | | **[Engine is running]**<br>● Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |
| 19 | B | ECCS ground | **[Engine is running]**<br>● Idle speed | Engine ground |
| 20 | B/Y | Start signal | **[Ignition switch "ON"]** | Approximately 0V |
| | | | **[Ignition switch "START"]** | BATTERY VOLTAGE<br>(11 - 14V) |
| 21 | B/W | Air conditioner switch | **[Engine is running]**<br>● Both A/C switch and blower switch are "ON" (Compressor operates)* | Approximately 0V |
| | | | **[Engine is running]**<br>● A/C switch is "OFF" | Approximately 5V |
| 22 | L/B | Inhibitor switch | **[Ignition switch "ON"]**<br>● Gear position is "N" or "P" | Approximately 0V |
| | | | **[Ignition switch "ON"]**<br>● Except the above gear position | Approximately 5V |
| 23 | W | Throttle position sensor | **[Ignition switch "ON"]**<br>● **Warm-up condition**<br>● Accelerator pedal fully released | 0.3 - 0.7V |
| | | | **[Ignition switch "ON"]**<br>● Accelerator pedal fully depressed | Approximately 4V |
| 24 | B/W | Ignition switch | **[Ignition switch "OFF"]** | 0V |
| | | | **[Ignition switch "ON"]** | BATTERY VOLTAGE<br>(11 - 14V) |
| 25 | B | ECCS ground | **[Engine is running]**<br>● Idle speed | Engine ground |
| 26 | PU/W | A/T signal No. 1 | **[Ignition switch "ON"]**<br>**[Engine is running]**<br>● Idle speed | 6 - 8V |
| 27 | P/B | A/T signal No. 2 | **[Ignition switch "ON"]**<br>**[Engine is running]**<br>● Idle speed | 6 - 8V |
| 28 | OR/W | Throttle position switch (Closed position) | **[Ignition switch "ON"]**<br>● **Warm-up condition**<br>● Accelerator pedal fully released | BATTERY VOLTAGE<br>(11 - 14V) |
| | | | **[Ignition switch "ON"]**<br>● Accelerator pedal depressed | Approximately 0V |
| 29 | W/L | Vehicle speed sensor | **[Engine is running]**<br>● Lift up the vehicle.<br>● In 1st gear position<br>● Vehicle speed is 40 km/h | 2 - 3V<br><br>SEF996U |

*ECM Terminals and Reference Value (Cont'd)*

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 32 | B | ECCS ground | **[Engine is running]**<br>• Idle speed | Engine ground<br>(Probe this terminal with (–) tester probe when measuring) |
| 35 | P | A/T signal No. 3 | **[Ignition switch "ON"]** | 0V |
| 37 | P | Throttle position sensor signal to TCM (Transmission control module) | **[Ignition switch "ON"]**<br>• **Warm-up condition**<br>• Accelerator pedal fully released | Approximately 0.4V |
| | | | **[Ignition switch "ON"]**<br>• Accelerator pedal fully depressed | Approximately 3V |
| 39 | R/B | Power steering oil pressure switch | **[Engine is running]**<br>• Steering wheel is being turned | Approximately 0V |
| | | | **[Engine is running]**<br>• Steering wheel is not being turned | Approximately 5V |
| 42 | P/B | Sensors' power supply | **[Ignition switch "ON"]** | Approximately 5V |
| 43 | B | Sensors' ground | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | Approximately 0V |
| 44<br>48 | L<br>L | Camshaft position sensor (Reference signal) | **[Engine is running]**<br>• Idle speed | 0.3 - 0.5V<br><br>SEF997U |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | 0.3 - 0.5V<br><br>SEF998U |
| 45 | W | Absolute pressure sensor | **[Ignition switch "ON"]**<br>• Engine is not running<br>• For 5 seconds after ignition switch is turned "ON"<br>**[Engine is running]**<br>• Idle (for 5 seconds after engine start) | Approximately 4.4V |
| | | | **[Ignition switch "ON"]**<br>• Engine is not running<br>• More than 5 seconds after ignition switch is turned "ON"<br>**[Engine is running]**<br>• Idle (More than 5 seconds after engine start) | Approximately 1.3V |

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 47 | L | Crankshaft position sensor (OBD) | **[Engine is running]**<br>**• Warm-up condition**<br>• Idle speed | Approximately 1V<br>(AC range)<br><br>SEF003V |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | Approximately 2V<br>(AC range)<br><br>SEF004V |
| 49 | B/W | Camshaft position sensor (Position signal) | **[Engine is running]**<br>**• Warm-up condition**<br>• Idle speed | Approximately 2.5V<br><br>SEF999U |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | Approximately 2.5V<br><br>SEF001V |
| 50 | W | Front heated oxygen sensor RH | **[Engine is running]**<br>**• Warm-up condition**<br>• Engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br>SEF002V |
| 51 | W | Front heated oxygen sensor LH | **[Engine is running]**<br>**• Warm-up condition**<br>• Engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br>SEF002V |

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 54 | W | Mass air flow sensor | **[Engine is running]**<br>● **Warm-up condition**<br>● Idle speed | 1.0 - 1.7V |
| | | | **[Engine is running]**<br>● **Warm-up condition**<br>● Engine speed is 2,500 rpm | 1.7 - 2.3V |
| 55 | B | Mass air flow sensor ground | **[Engine is running]**<br>● **Warm-up condition**<br>● Idle speed | Approximately 0V |
| 56 | L/W | Rear heated oxygen sensor RH | **[Engine is running]**<br>● **Warm-up condition**<br>● Engine speed is 2,000 rpm | 0 - Approximately 1.0V |
| 57 | W | Rear heated oxygen sensor LH | **[Engine is running]**<br>● **Warm-up condition**<br>● Engine speed is 2,000 rpm | 0 - Approximately 1.0V |
| 59 | LG/R | Engine coolant temperature sensor | **[Engine is running]** | Approximately 0 - 4.8V<br>Output voltage varies with engine coolant temperature |
| 60 | LG/B | Tank fuel temperature sensor | **[Engine is running]** | Approximately 0 - 4.8V<br>Output voltage varies with fuel temperature |
| 61 | Y/L | Intake air temperature sensor | **[Engine is running]** | Approximately 0 - 4.8V<br>Output voltage varies with intake air temperature. |
| 62 | G/B | EVAP control system pressure sensor | **[Ignition switch "ON"]** | Approximately 3.4V |
| 63 | P/G | EGR temperature sensor | **[Ignition switch "ON"]** | Less than 4.5V |
| | | | **[Engine is running]**<br>● **Warm-up condition**<br>● EGR system is operating | 0 - 1.5V |
| 64 | W | Knock sensor | **[Engine is running]**<br>● Idle speed | Approximately 2.5V |
| 67 | B/W | Power supply for ECM | **[Ignition switch "ON"]** | BATTERY VOLTAGE<br>(11 - 14V) |
| 69 | LG/R | Data link connector for GST | **[Engine is running]**<br>● Idle speed (GST is disconnected) | 6 - 10V |
| 72 | B/W | Power supply for ECM | **[Ignition switch "ON"]** | BATTERY VOLTAGE<br>(11 - 14V) |
| 75 | W | Data link connector for CONSULT | **[Engine is running]**<br>● Idle speed (Connect CONSULT and turned on.) | 0 - 4V |
| 76 | L | | | 3 - 9V |
| 80 | W/R | Power supply (Back-up) | **[Ignition switch "OFF"]** | BATTERY VOLTAGE<br>(11 - 14V) |

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 101 | OR | IACV-AAC valve | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | 8 - 11V<br><br>SEF005V |
| | | | **[Engine is running]**<br>• **Warm-up condition**<br>• Engine speed is 3,000 rpm | 1 - 2V<br><br>SEF006V |
| 102<br>104<br>106<br>109<br>111<br>113 | W<br>Y/R<br>W/G<br>Y<br>W/L<br>W/B | Injector No. 1<br>Injector No. 3<br>Injector No. 5<br>Injector No. 2<br>Injector No. 4<br>Injector No. 6 | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | BATTERY VOLTAGE<br>(11 - 14V)<br><br>SEF007V |
| | | | **[Engine is running]**<br>• **Warm-up condition**<br>• Engine speed is 2,000 rpm | BATTERY VOLTAGE<br>(11 - 14V)<br><br>SEF008V |
| 103 | L/W | EGRC-solenoid valve | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |
| | | | **[Engine is running]**<br>• **Warm-up condition**<br>• Engine speed is revving from idle up to 3,000 rpm quickly | 0 - 1.5V |
| 108 | G/R | EVAP canister vent control valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE<br>(11 - 14V) |
| 116 | B | ECCS ground | **[Engine is running]**<br>• Idle speed | Engine ground |
| 117 | B/W | Current return | **[Engine is running]**<br>• Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |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| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 118 | G/OR | MAP/BARO switch solenoid valve | **[Ignition switch "ON"]**<br>• Engine is not running<br>• For 5 seconds after ignition switch is turned "ON"<br>**[Engine is running]**<br>• Idle (for 5 seconds after engine start) | 0 - 1V |
| | | | **[Ignition switch "ON"]**<br>• Engine is not running<br>• More than 5 seconds after ignition switch is turned "ON"<br>**[Engine is running]**<br>• Idle (More than 5 seconds after engine start) | BATTERY VOLTAGE (11 - 14V) |
| 119 | PU | Front heated oxygen sensor heater RH | **[Engine is running]**<br>• Engine speed is below 3,200 rpm | Approximately 0.4V |
| | | | **[Engine is running]**<br>• Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |
| 120 | G/W | Vacuum cut valve bypass valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |
| 121 | PU/W | Front heated oxygen sensor heater LH | **[Engine is running]**<br>• Engine speed is below 3,200 rpm | Approximately 0.4V |
| | | | **[Engine is running]**<br>• Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |
| 122 | PU/G | Rear heated oxygen sensor heater RH | **[Engine is running]**<br>• Engine speed is below 3,200 rpm | Approximately 0.4V |
| | | | **[Engine is running]**<br>• Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |
| 123 | PU/R | Rear heated oxygen sensor heater LH | **[Engine is running]**<br>• Engine speed is below 3,200 rpm | Approximately 0.4V |
| | | | **[Engine is running]**<br>• Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |
| 124 | B | ECCS ground | **[Engine is running]**<br>• Idle speed | Engine ground |

*: Any mode except "OFF", ambient air temperature is above 23.5°C (74°F).

## Description

NBEC0388

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 (1st trip) DTC 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

NBEC0388S01

| 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 does not appear during the DTC Confirmation Procedure. |
| VI | The Diagnostic Procedure for PXXXX does not indicate the problem area. |

## Diagnostic Procedure

NBEC0389

| 1 | INSPECTION START | |
|---|---|---|
| Erase (1st trip) DTCs. Refer to "HOW TO ERASE EMISSION — RELATED INFORMATION", EC-55. | | |
| | ▶ | GO TO 2. |

| 2 | CHECK GROUND TERMINALS | |
|---|---|---|
| Check ground terminals for corroding or loose connection. Refer to "Circuit Inspection", "GROUND INSPECTION" in GI section. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace. |

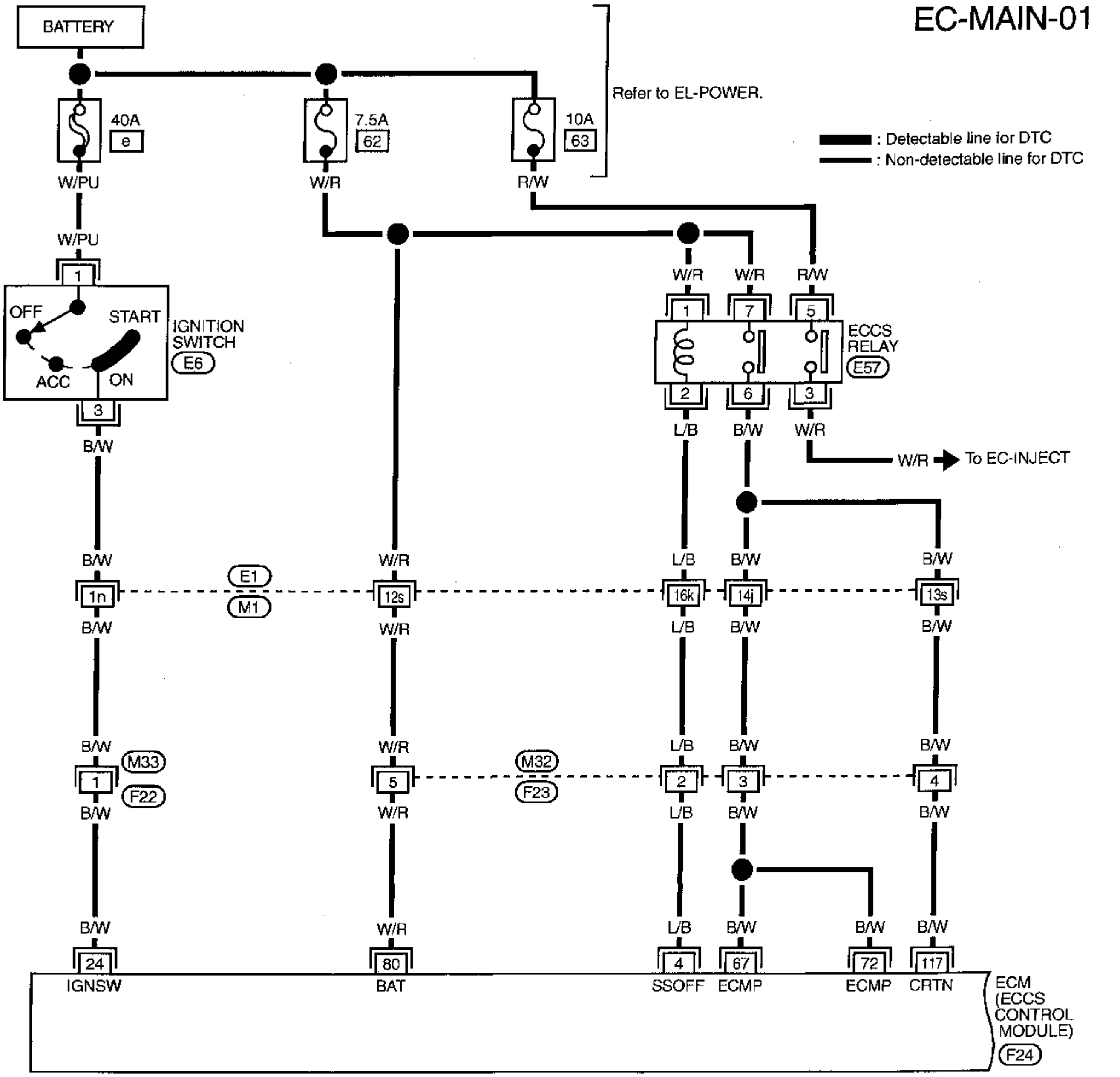
| 3 | SEARCH FOR ELECTRICAL INCIDENT | |
|---|---|---|
| Perform "Incident Simulation Tests" in GI section. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair or replace. |

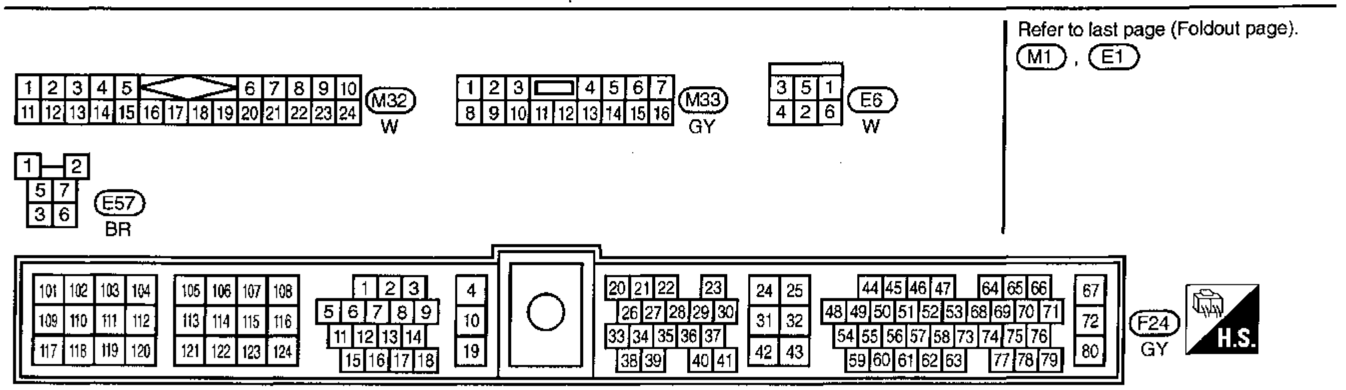
| 4 | CHECK CONNECTOR TERMINALS | |
|---|---|---|
| Refer to "How to Check Enlarged Contact Spring of Terminal" in GI section. | | |
| **OK or NG** | | |
| OK | ▶ | **INSPECTION END** |
| NG | ▶ | Repair or replace connector. |

## Main Power Supply and Ground Circuit

### WIRING DIAGRAM

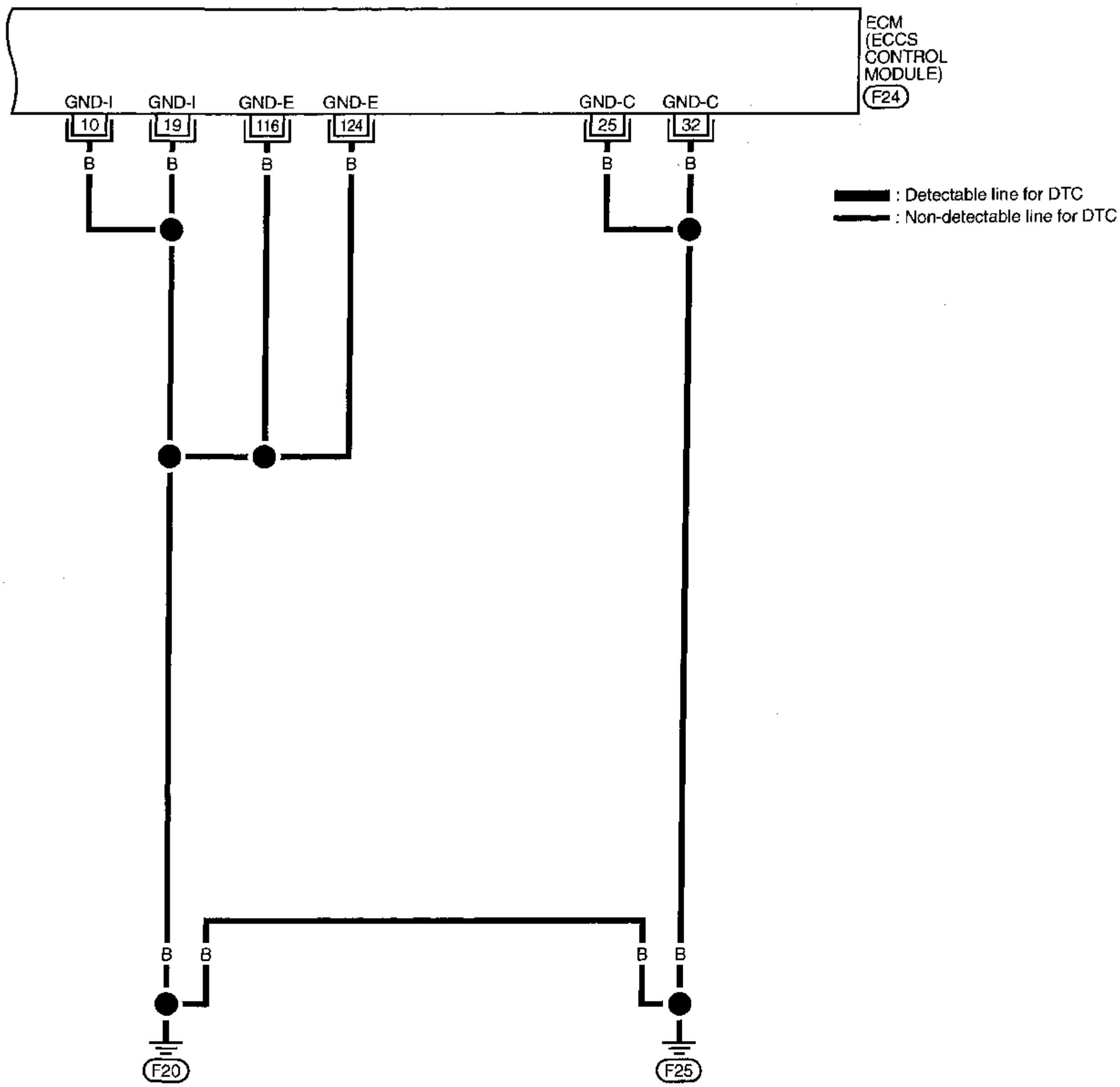
NBEC0044

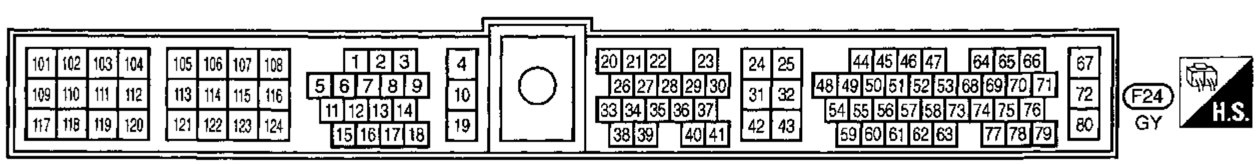



MEC137C

EC-MAIN-02




MEC138C

## ECM TERMINALS AND REFERENCE VALUE

NBEC0045

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 4 | L/B | ECCS relay (Self-shutoff) | **[Engine is running]** **[Ignition switch "OFF"]** • For a few seconds after turning ignition switch "OFF" | 0 - 1.5V |
| | | | **[Ignition switch "OFF"]** • A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 10 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground |
| 19 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground |
| 24 | B/W | Ignition switch | **[Ignition switch "OFF"]** | 0V |
| | | | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |
| 25 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground |
| 32 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground (Probe this terminal with (–) tester probe when measuring) |
| 67 | B/W | Power supply for ECM | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/W | | | |
| 80 | W/R | Power supply (Back-up) | **[Ignition switch "OFF"]** | BATTERY VOLTAGE (11 - 14V) |
| 116 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground |
| 117 | B/W | Current return | **[Engine is running]** • Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 124 | B | ECCS ground | **[Engine is running]** • Idle speed | Engine ground |

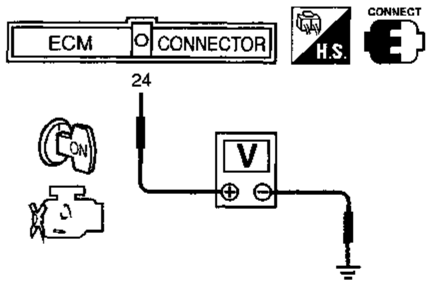
## DIAGNOSTIC PROCEDURE

NBEC0046

| 1 | INSPECTION START | |
|---|---|---|
| Start engine.<br>**Is engine running?**<br>**Yes or No** | | |
| Yes | ▶ | GO TO 9. |
| No | ▶ | GO TO 2. |

## 2 CHECK POWER SUPPLY-I

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 24 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF674U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

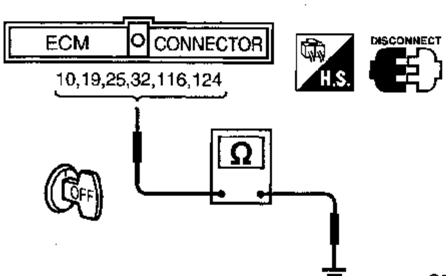
## 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1
- Harness connectors M33, F22
- Harness for open or short between ECM and ignition switch

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

## 4 CHECK GROUND CIRCUIT-I

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 10, 19, 25, 32, 116, 124 and engine ground.
   **Continuity should exist.**




SEF675U

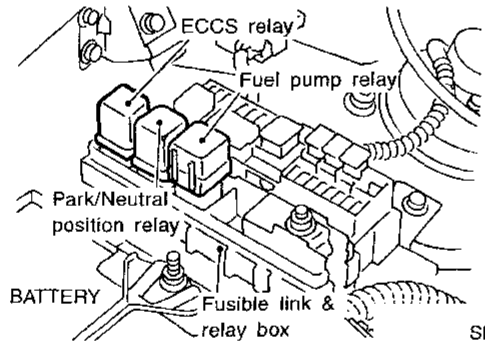
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

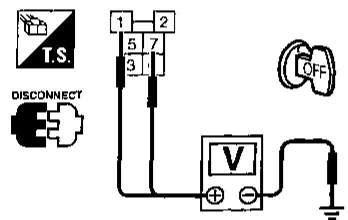
## 5 CHECK POWER SUPPLY-II

1. Disconnect ECCS relay.




SEF681U

2. Check voltage between terminals 1, 7 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF676U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

## 6 DETECT MALFUNCTIONING PART

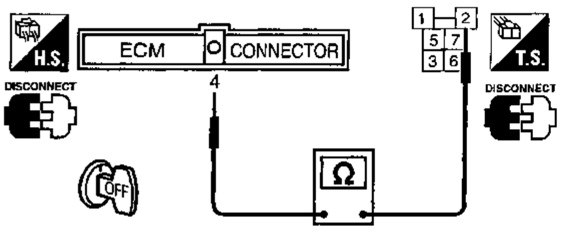
Check the following.
- 7.5A fuse
- Harness for open or short between ECCS relay and battery

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 7 CHECK OUTPUT SIGNAL CIRCUIT

Check harness continuity between ECM terminal 4 and relay terminal 2.

**Continuity should exist.**




SEF677U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | Go to "INJECTOR", EC-429. |
| NG | ▶ | GO TO 8. |

## 8 DETECT MALFUNCTIONING PART

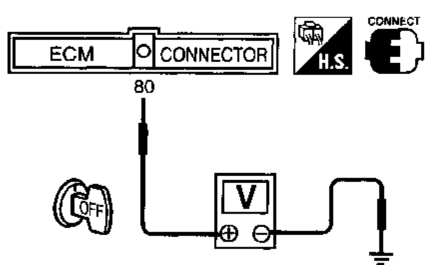
Check the following.

1. Harness connectors E1, M1
2. Harness connectors M32, F23
3. Harness for open or short between ECCS relay and ECM

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 9 CHECK POWER SUPPLY-III

1. Stop engine.
2. Check voltage between ECM terminal 80 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF678U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | GO TO 10. |

## 10 DETECT MALFUNCTIONING PART

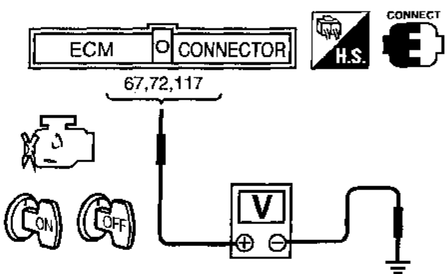
Check the following.

- Harness connectors F23, M32
- Harness connectors M1, E1
- Harness for open or short between ECM and fuse

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

## 11 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.**



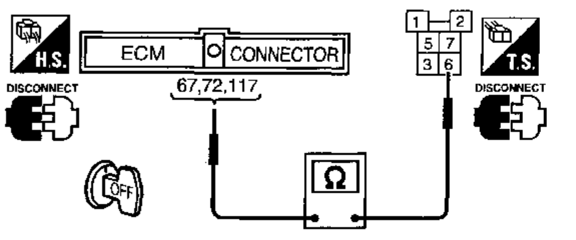

SEF679U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 19. |
| NG (Battery voltage does not exist.) | ▶ | GO TO 12. |
| NG (Battery voltage exists for more than a few seconds.) | ▶ | GO TO 18. |

### 12 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 6.
   **Continuity should exist.**




SEF680U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 14. |
| NG | ▶ | GO TO 13. |

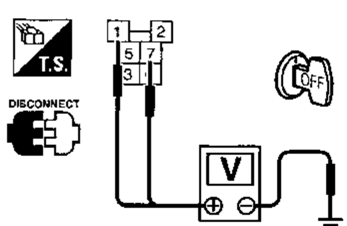
### 13 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F23, M32
- Harness connectors E1, M1
- Harness for open or short between ECCS relay and ECM

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

### 14 CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND

Check voltage between relay terminals 1, 7 and ground with CONSULT or tester.
**Voltage: Battery voltage**




SEF676U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 16. |
| NG | ▶ | GO TO 15. |

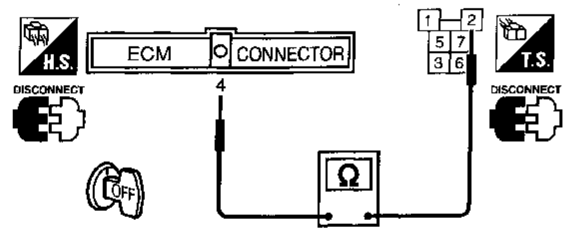
### 15 DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECCS relay and 7.5A fuse

▶ Repair harness or connectors.

### 16 CHECK OUTPUT SIGNAL CIRCUIT

Check harness continuity between ECM terminal 4 and relay terminal 2.
**Continuity should exist.**




SEF677U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 18. |
| NG | ▶ | GO TO 17. |

### 17 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1
- Harness connectors M32, F23
- Harness for open or short between ECM and ECCS relay

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

GI
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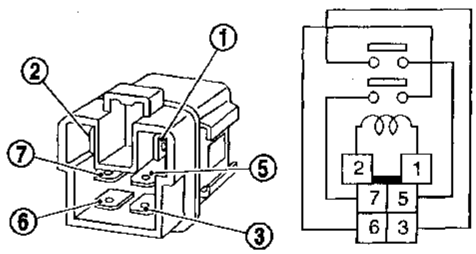
EL
IDX

| 18 | CHECK ECCS 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 exists.**
   **No voltage applied: No continuity**



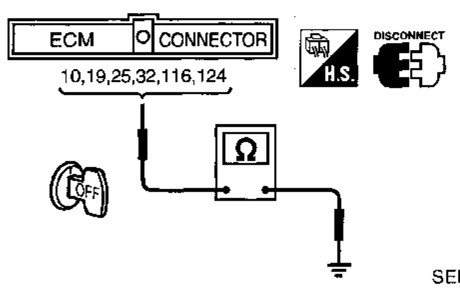
SEF745U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 19. |
| NG | ▶ | Replace ECCS relay. |

| 19 | CHECK GROUND CIRCUIT-II |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 10, 19, 25, 32, 116, 124 and engine ground.
   **Continuity should exist.**



SEF675U

If OK, check harness for short.

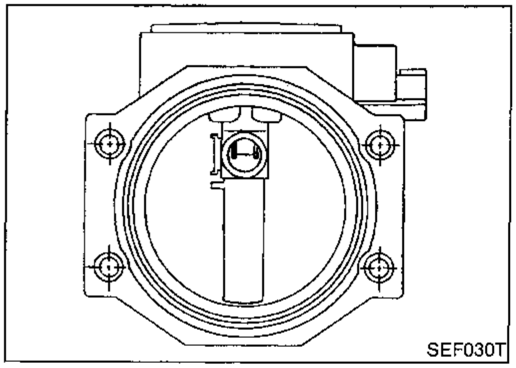
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 20. |
| NG | ▶ | Repair harness or connectors. |

| 20 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | **INSPECTION END** |



SEF030T

## Component Description

NBEC0047

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

NBEC0048

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| MAS AIR/FL SE | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | 1.0 - 1.7V |
| | | 2,500 rpm | 1.7 - 2.3V |
| CAL/LD VALUE | ditto | Idle | 18.5 - 26.0% |
| | | 2,500 rpm | 18.0 - 21.0% |
| MASS AIRFLOW | ditto | Idle | 3.3 - 4.8 g·m/s |
| | | 2,500 rpm | 12.0 - 14.9 g·m/s |

## ECM Terminals and Reference Value

NBEC0049

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 54 | W | Mass air flow sensor | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | 1.0 - 1.7V |
| | | | **[Engine is running]**<br>• **Warm-up condition**<br>• Engine speed is 2,500 rpm | 1.7 - 2.3V |
| 55 | B | Mass air flow sensor ground | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | Approximately 0V |

## On Board Diagnosis Logic

NBEC0050

| DTC No. | Malfunction is detected when ... | | Check Items (Possible Cause) |
|---|---|---|---|
| P0100<br>0102 | A) | An excessively high voltage from the sensor is sent to ECM when engine is not running. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• 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.* | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Intake air leaks<br>• 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.

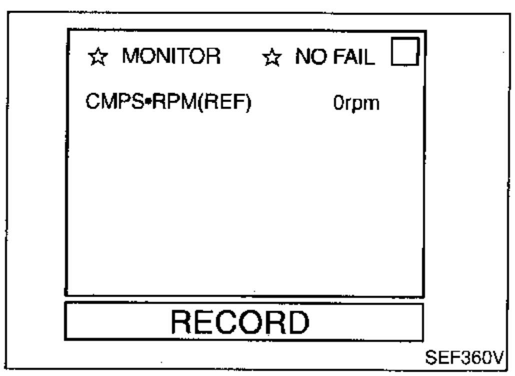
| Detected items | Engine operating condition in fail-safe mode |
|---|---|
| Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. |

## DTC Confirmation Procedure

NBEC0051

**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".**

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



SEF360V

### PROCEDURE FOR MALFUNCTION A

NBEC0051S01

**With CONSULT**

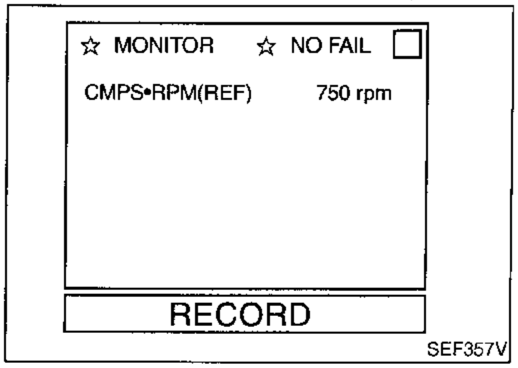
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 6 seconds.

**With GST**

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

**No Tools**

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.



SEF357V

## PROCEDURE FOR MALFUNCTION B

NBEC0051S02

**With CONSULT**

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

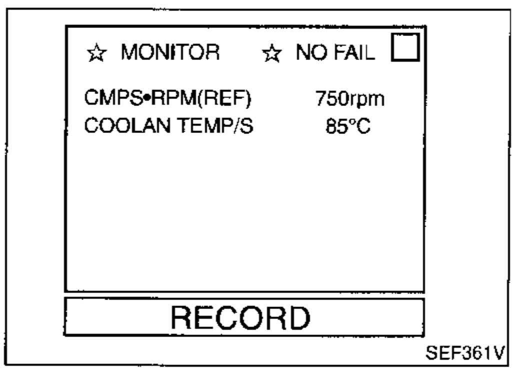
**With GST**

1) Start engine and wait 5 seconds at most.
2) Select "MODE 7" with GST.

**No Tools**

1) Start engine and wait 5 seconds at most.
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.

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



SEF361V

## PROCEDURE FOR MALFUNCTION C

NBEC0051S03

**With CONSULT**

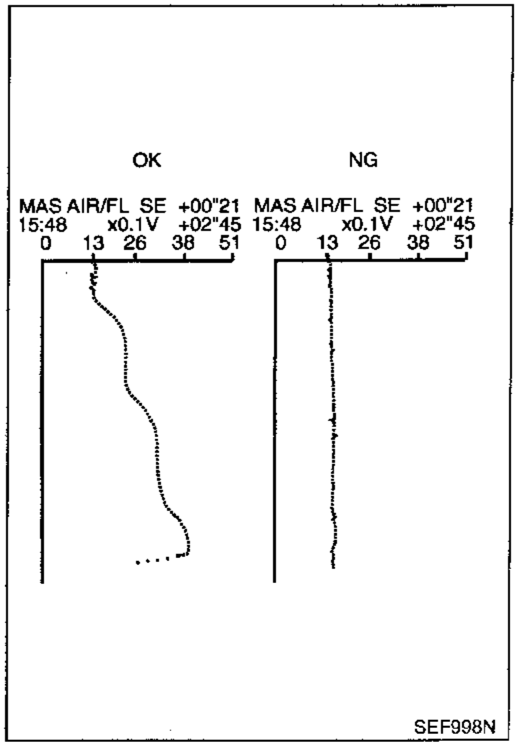
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and warm it up to normal operating temperature.
4) Run engine for at least 10 seconds at idle speed.

**With GST**

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.

**No Tools**

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.



SEF998N

### PROCEDURE FOR MALFUNCTION D

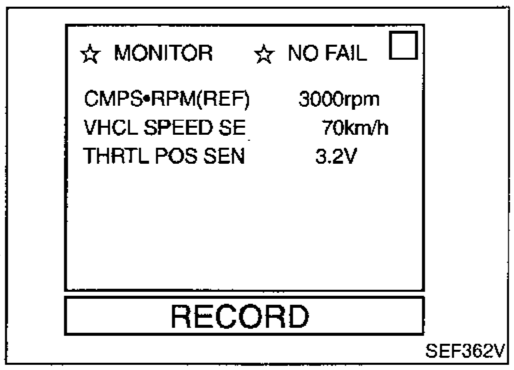
NBEC0051S04

**CAUTION:**

**Always drive vehicle at a safe speed.**

**With CONSULT**

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-120.**
3) Select "DATA MONITOR" mode with CONSULT.
4) Check the voltage of MAS AIR/FL SE with "DATA MONITOR".
5) Increases engine speed to about 4,000 rpm.
6) Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to "Diagnostic Procedure", EC-120.
   If OK, go to following step.
7) 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.**



SEF362V

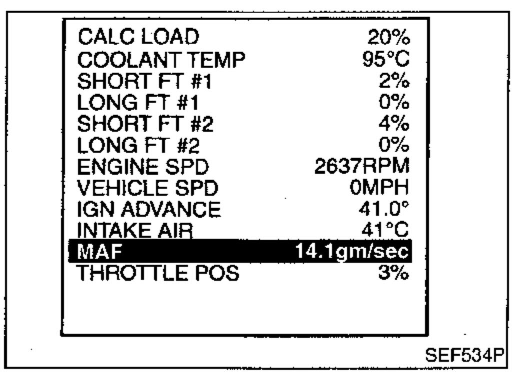
### Overall Function Check

NBEC0051S0401

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.

**With GST**

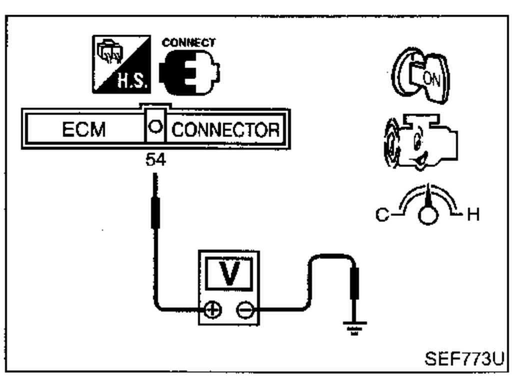
1) Start engine and warm it up to normal operating temperature.
2) Select "MODE 1" with GST.
3) Check the mass air flow sensor signal with "MODE 1".
4) Check for linear mass air flow sensor signal value rise in response to increases to about 4,000 rpm in engine speed.



SEF534P

**No Tools**

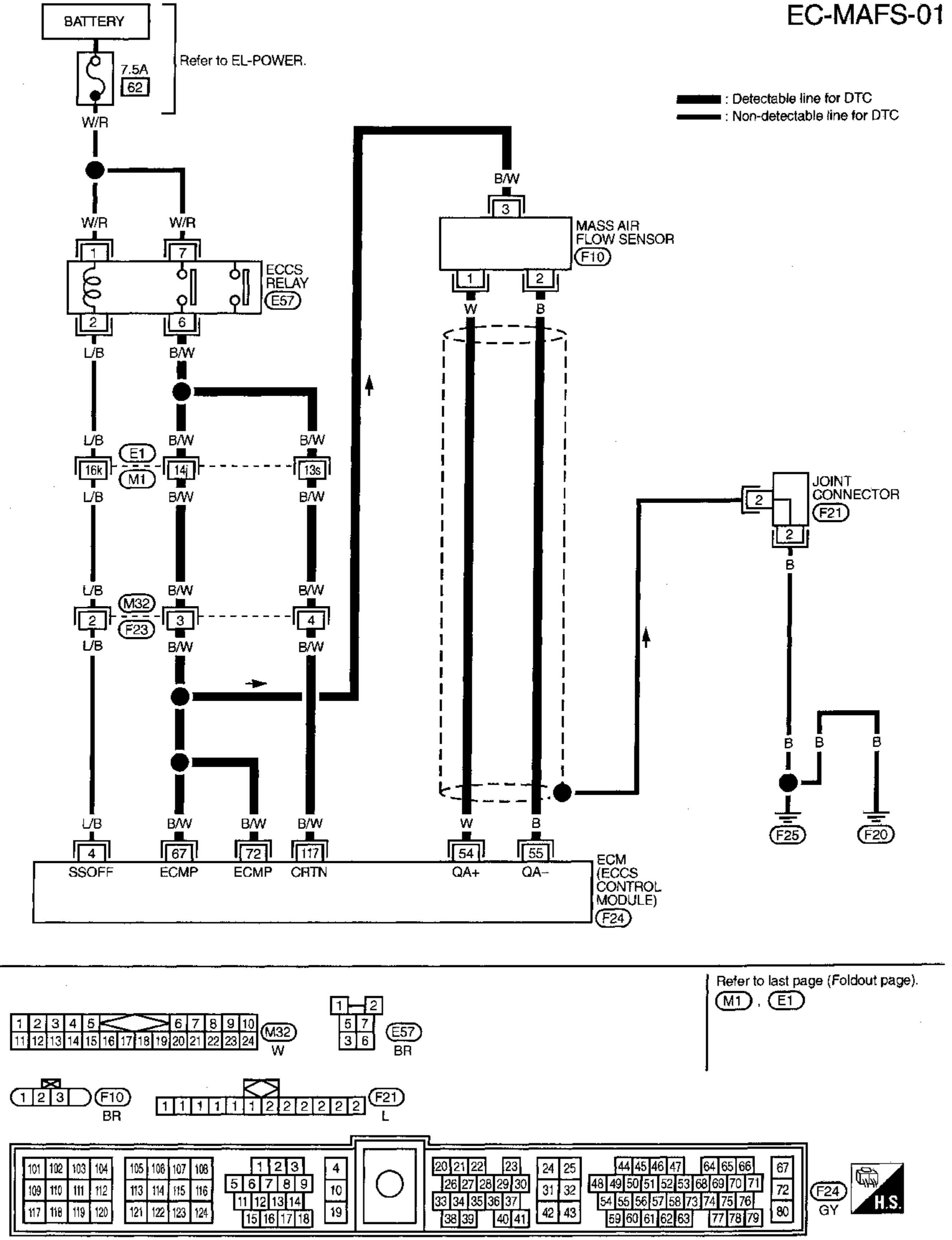
1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal 54 (Mass air flow sensor signal) and ground.
3) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.



SEF773U

## Wiring Diagram

NBEC0052




MEC139C

## Diagnostic Procedure

NBEC0053

| 1 | INSPECTION START |
|---|---|
| Which malfunction (A, B, C or D) is duplicated? | |

| MALFUNCTION | Type |
|---|---|
| A and/or C | I |
| B and/or D | II |

MTBL0063

**Type I or Type II**

| | | |
|---|---|---|
| Type I | ▶ | GO TO 3. |
| Type II | ▶ | GO TO 2. |

| 2 | CHECK INTAKE SYSTEM |
|---|---|

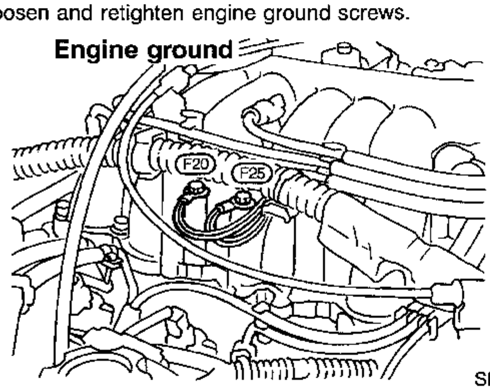
Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold collector

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Reconnect the parts. |

| 3 | RETIGHTEN GROUND SCREWS |
|---|---|

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

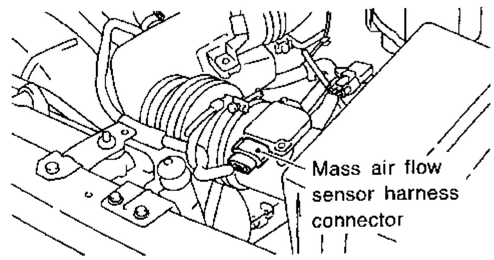


SEF031S

| | | |
|---|---|---|
| | ▶ | GO TO 4. |

| 4 | CHECK POWER SUPPLY |
|---|---|

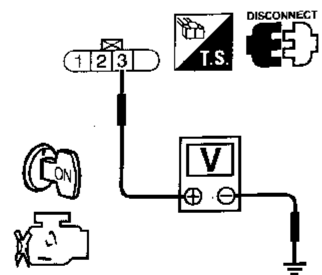
1. Disconnect mass air flow sensor harness connector.



SEF746U

2. Turn ignition switch "ON".
3. Check voltage between terminal 3 and ground with CONSULT or tester.

**Voltage: Battery voltage**



SEF682U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

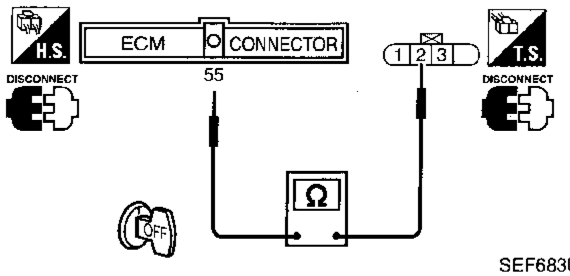
| 5 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F23, M32
- Harness connectors M1, E1
- 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

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

### 6 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal 2 and ECM terminal 55.
   **Continuity should exist.**




SEF683U

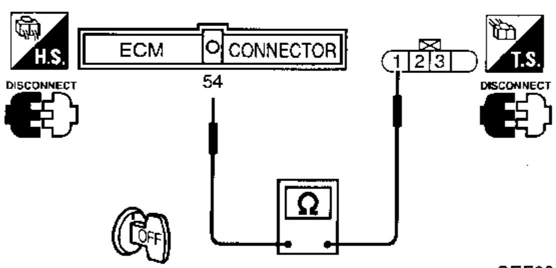
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 7 CHECK INPUT SIGNAL CIRCUIT

Check harness continuity between terminal 1 and ECM terminal 54.
**Continuity should exist.**




SEF684U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 8 CHECK COMPONENT

(Mass air flow sensor)
Refer to "Component Inspection", EC-122.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace mass air flow sensor. |

### 9 CHECK SHIELD CIRCUIT

1. Remove joint connector F21.
2. Check the following.
   - Continuity between joint connector terminal and ground
   - Joint connector
     (Refer to "HARNESS LAYOUT" in EL section.)
     **Continuity should exist.**
     If OK, check harness for short to ground and short to power. Then reconnect joint connector.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 10 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | **INSPECTION END** |

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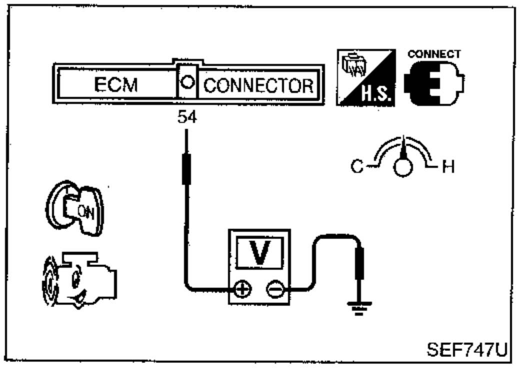
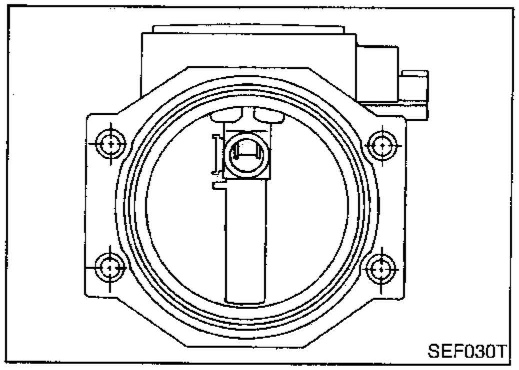


SEF747U


SEF030T

## Component Inspection

NBEC0054

### MASS AIR FLOW SENSOR

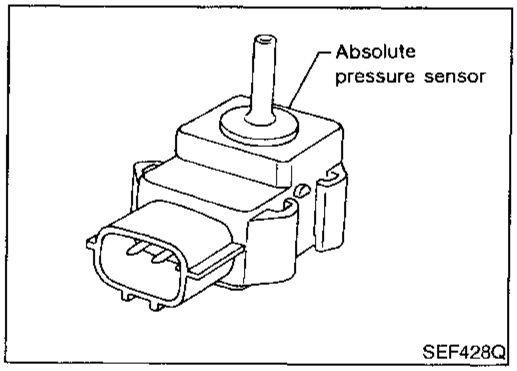
NBEC0054S01

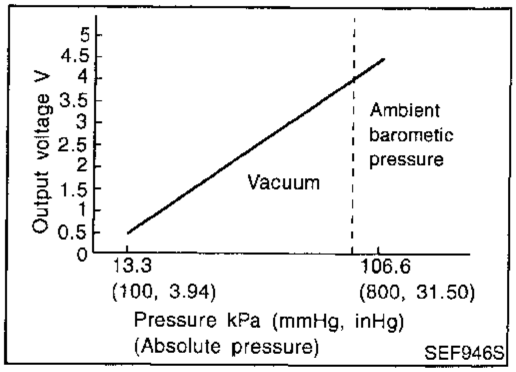
1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 54 (Mass air flow sensor signal) and ground.

| Conditions | Voltage V |
|---|---|
| Ignition switch "ON" (Engine stopped.) | Less than 1.0 |
| Idle (Engine is warmed-up to normal operating temperature.) | 1.0 - 1.7 |
| 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 - 2.3 |
| Idle to about 4,000 rpm* | 1.0 - 1.7 to Approx. 4.0 |

*: 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.
   Then repeat above check.
5. If NG, remove mass air flow sensor from air duct. Check hot wire for damage or dust.




## Component Description

NBEC0055

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 absolute pressure and sends the voltage signal to the ECM. As the pressure increases, the voltage rises.

## On Board Diagnosis Logic

NBEC0056

| DTC No. | | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|---|
| P0105<br>0803 | A) | An excessively low or high voltage from the sensor is sent to ECM. | • Harness or connectors<br>(Absolute pressure sensor circuit is open or shorted.)<br>• Absolute pressure sensor |
| | B) | A high voltage from the sensor is sent to ECM under light load driving conditions. | • Hoses<br>(Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.)<br>• Intake air leaks<br>• MAP/BARO switch solenoid valve<br>• Absolute pressure sensor |
| | C) | A low voltage from the sensor is sent to ECM under heavy load driving conditions. | • Absolute pressure sensor |

## DTC Confirmation Procedure

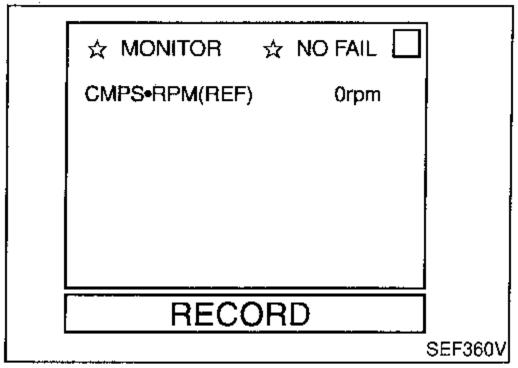
NBEC0057

**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".**

NOTE:

If "DTC 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

NBEC0057S01

**With CONSULT**

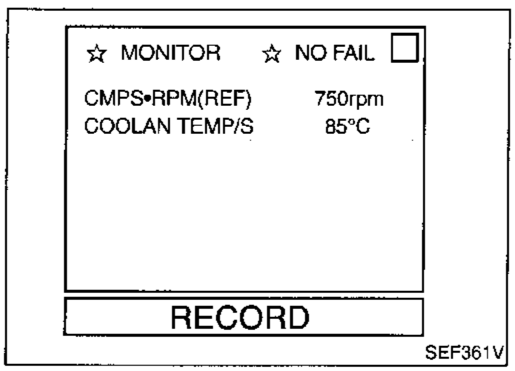
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 6 seconds.

**With GST**

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

**No Tools**

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

NBEC0057S02

**With CONSULT**

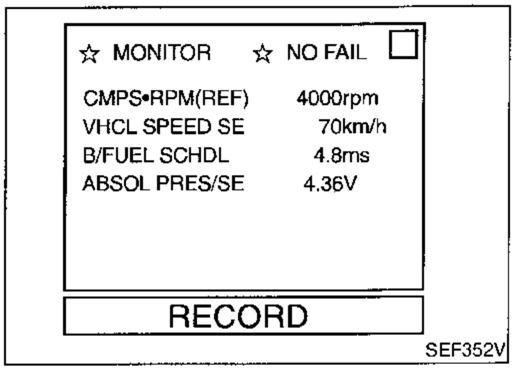
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
4) Start engine and let it idle.
5) Wait at least 15 seconds.

**With GST**

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 15 seconds.
5) Select "MODE 7" with GST.

**No Tools**

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 15 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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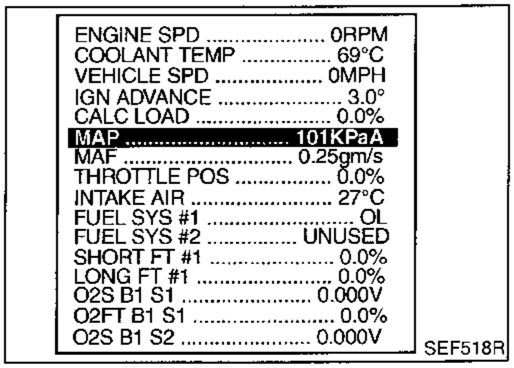
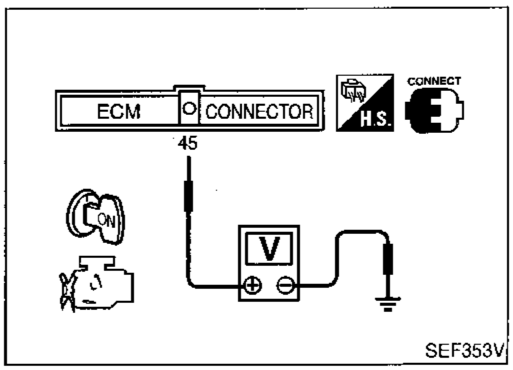


SEF518R



SEF353V

## PROCEDURE FOR MALFUNCTION C

NBEC0057S03

**CAUTION:**

**Always drive vehicle at a safe speed.**

**With CONSULT**

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-127.**
   **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 13 seconds.
6) Select "DATA MONITOR" mode with CONSULT.
7) Drive the vehicle at least 3 consecutive seconds under the following conditions,
   **CMPS·RPM (REF): 3,000 - 4,800 rpm**
   **B/FUEL SCHDL: More than 4.6 ms**
   **Selector lever: Suitable position**
   **Driving pattern:**
   **Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.**

## Overall Function Check

NBEC0057S0301

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

**With GST**

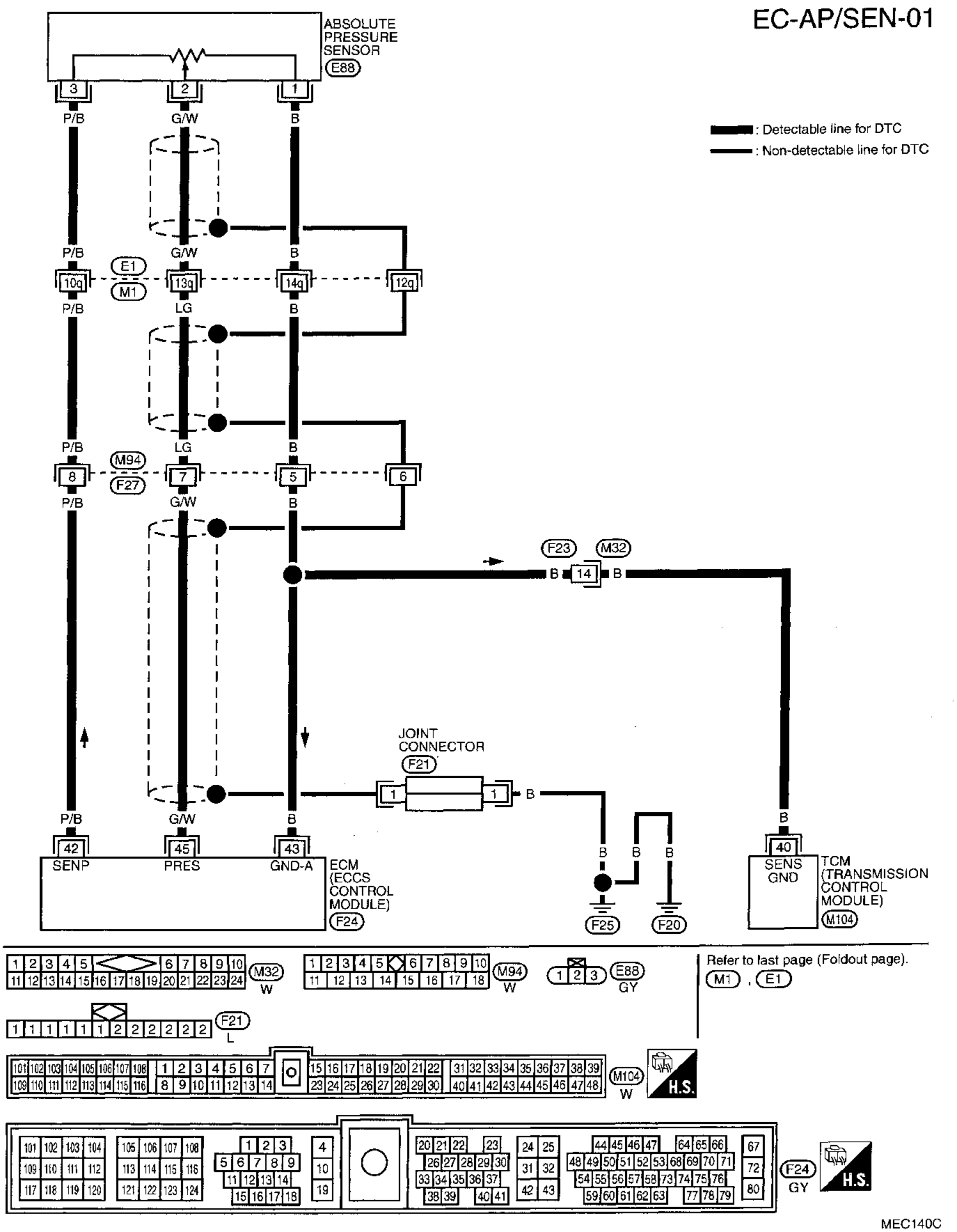
1) Turn ignition switch "ON".
2) Select absolute pressure sensor signal in "MODE 1" with GST.
3) Make sure that the signal is more than 46 kPa (0.47 kg/cm$^2$, 6.7 psi).

**No Tools**

1) Turn ignition switch "ON".
2) Make sure that the voltage between ECM terminal 45 (Absolute pressure sensor signal) and ground is more than 1.74 [V].

## Wiring Diagram

NBEC0058



## Diagnostic Procedure

NBEC0059

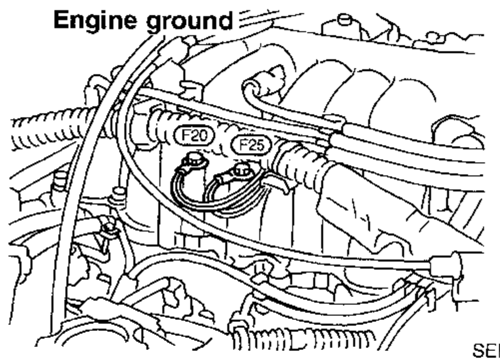
**If the trouble is duplicated after "PROCEDURE FOR MALFUNCTION A or C", perform "PROCEDURE A" below. If the trouble is duplicated after "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE B", EC-129.**

### PROCEDURE A

NBEC0059S01

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|

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

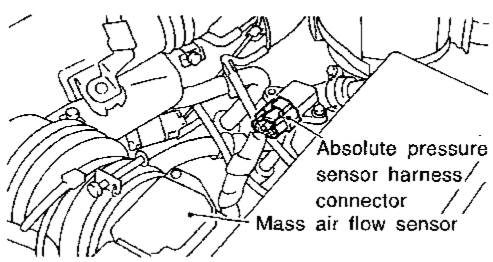



SEF031S

| | |
|---|---|
| ▶ | GO TO 2. |

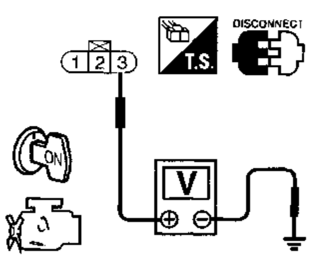
| 2 | CHECK POWER SUPPLY |
|---|---|

1. Disconnect absolute pressure sensor harness connector.




SEF748U

2. Turn ignition switch "ON".
3. Check voltage between terminal 3 and engine ground with CONSULT or tester.
   **Voltage: Approximately 5V**




SEF685U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

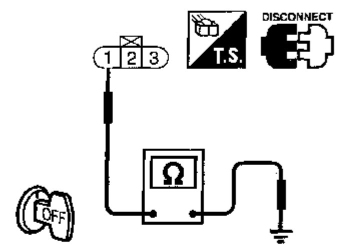
| 3 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F27, M94
- Harness connectors M1, E1
- Harness for open or short between ECM and absolute pressure sensor

| | |
|---|---|
| ▶ | Repair harness or connectors. |

| 4 | CHECK GROUND CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF686U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

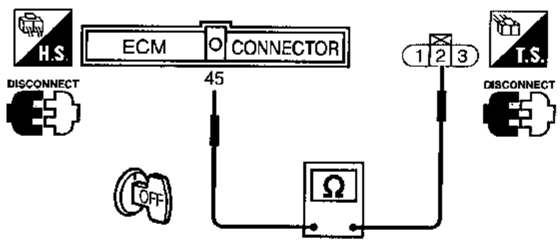
| 5 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F27, M94
- Harness connectors M1, E1
- Harness for open or short between ECM and absolute pressure sensor
- Harness connectors F23, M32
- Harness for open or short between TCM (Transmission control module) and absolute pressure sensor

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 45 and terminal 2.
   **Continuity should exist.**




SEF687U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

| 7 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F27, M94
- Harness connectors M1, E1
- Harness for open or short between ECM and absolute pressure sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK COMPONENT |
|---|---|

(Absolute pressure sensor)
Refer to "Component Inspection", EC-131.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace absolute pressure sensor. |

| 9 | CHECK SHIELD CIRCUIT |
|---|---|

1. Remove joint connector.
2. Check the following.
- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

**Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 10 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

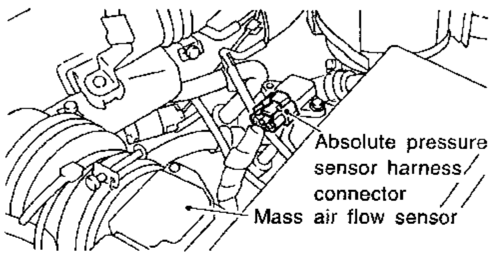
| | | |
|---|---|---|
| | ▶ | **INSPECTION END** |

## PROCEDURE B

=NBEC0059S02

### 1 INSPECTION START

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Attach the vacuum gauge between the absolute pressure sensor and the rubber tube connected to the MAP/BARO switch solenoid valve.

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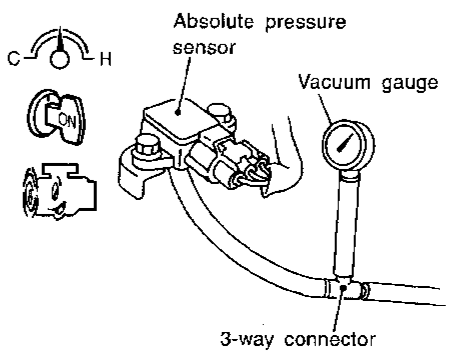



SEF385U

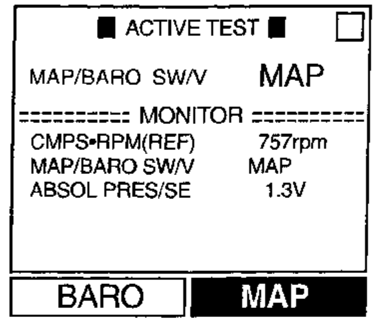
| | | |
|---|---|---|
| Models with CONSULT | ▶ | GO TO 2. |
| Models without CONSULT | ▶ | GO TO 3. |

### 2 CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR

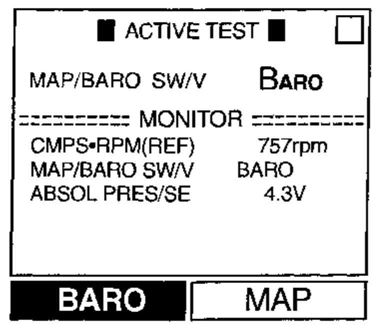
**(With CONSULT)**
1. Start engine and let it idle.
2. Select "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "MAP" and "BARO" alternately and check for vacuum.

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

MTBL0079




SEF396V




SEF397V

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 4. |

### 3 CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR

**(Without CONSULT)**
1. Start engine and let it idle.
2. Check for vacuum under the following condition.

| Condition | Vacuum |
|---|---|
| For 5 seconds after starting engine | Should not exist |
| More than 5 seconds after starting engine | Should exist |

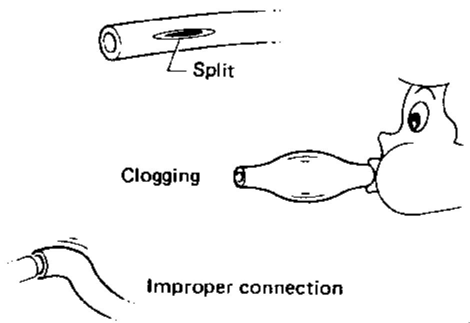
MTBL0080

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 4. |

## 4 CHECK VACUUM HOSE

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



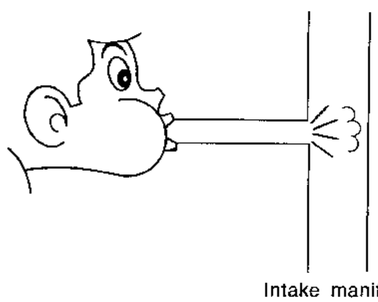

SEF109L

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Clean, repair or replace the hose. |

## 5 CHECK VACUUM PORT

Check vacuum port for clogging.




SEF368U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Clean or repair the vacuum port. |

## 6 CHECK COMPONENT

(MAP/BARO switch solenoid valve)
Refer to "Component Inspection", EC-347.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace MAP/BARO switch solenoid valve. |

## 7 CHECK INTAKE SYSTEM

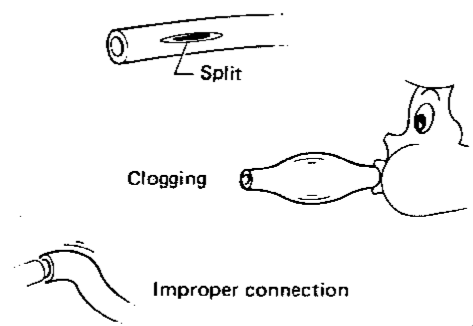
Check intake system for air leaks.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | Repair it. |

## 8 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.




SEF109L

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Repair or reconnect hose. |

## 9 CHECK HARNESS CONNECTOR

1. Disconnect absolute pressure sensor harness connector.
2. Check sensor harness connector for water.
   **Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Repair or replace harness connector. |

## 10 CHECK COMPONENT

(Absolute pressure sensor)
Refer to "Component Inspection", EC-131.

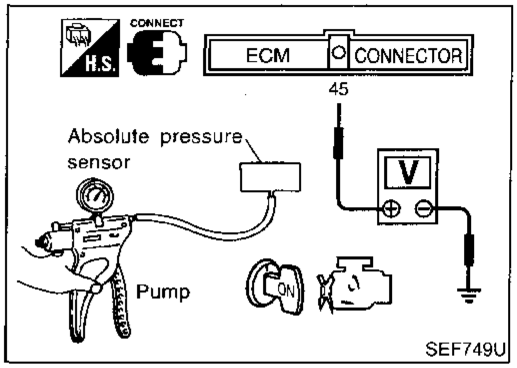
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace absolute pressure sensor. |

## 11 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | **INSPECTION END** |




## Component Inspection

NBEC0060

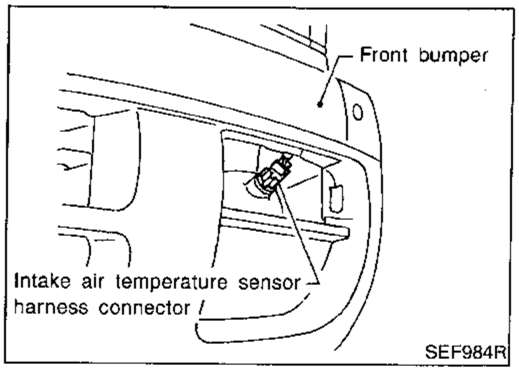
### ABSOLUTE PRESSURE SENSOR

NBEC0060S01

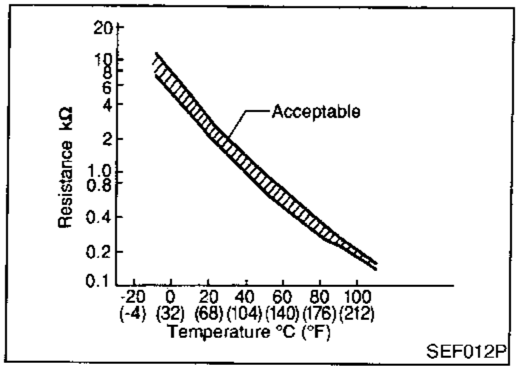
1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between ECM terminal 45 and engine ground.
   **The voltage should be 3.2 to 4.8V.**
4. Use pump to apply vacuum of −26.7 kPa (−200 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 below −93.3 kPa (−700 mmHg, −27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

5. If NG, replace absolute pressure sensor.



SEF984R



SEF012P

## Component Description

NBEC0061

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 (ECCS ground).

## On Board Diagnosis Logic

NBEC0062

| DTC No. | Malfunction is detected when ... | | Check Items (Possible Cause) |
|---|---|---|---|
| P0110<br>0401 | A) | An excessively low or high voltage from the sensor is sent to ECM. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Intake air temperature sensor |
| | B) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor. | |

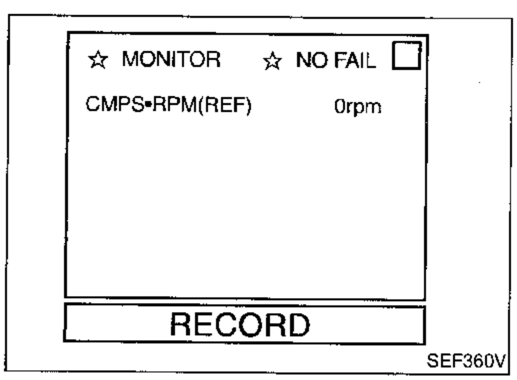
## DTC Confirmation Procedure

NBEC0063

**Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".**

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



SEF360V

### PROCEDURE FOR MALFUNCTION A

NBEC0063S01

**With CONSULT**

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

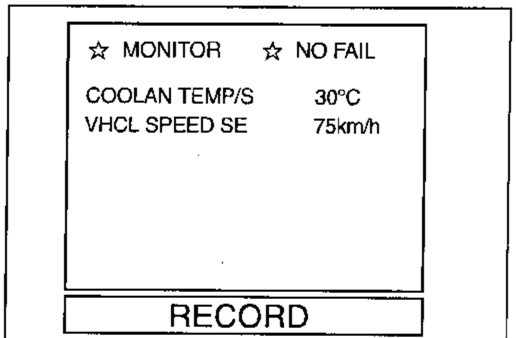
**With GST**

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

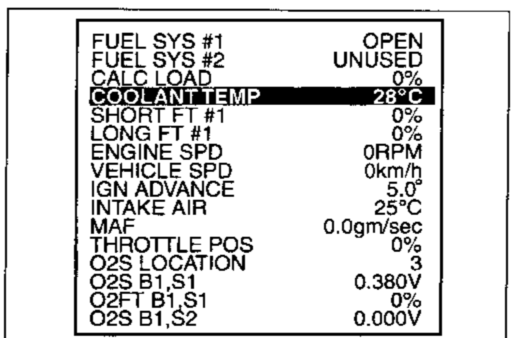
**No Tools**

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.



SEF233U



SEF950N

## PROCEDURE FOR MALFUNCTION B

NBEC0063S02

**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.**

**With CONSULT**

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 not less than 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 at 70 km/h (43 MPH) for 100 consecutive seconds.

**With GST**

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 not less than 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 at 70 km/h (43 MPH) for 100 consecutive seconds.
4) Select MODE 7 with GST.

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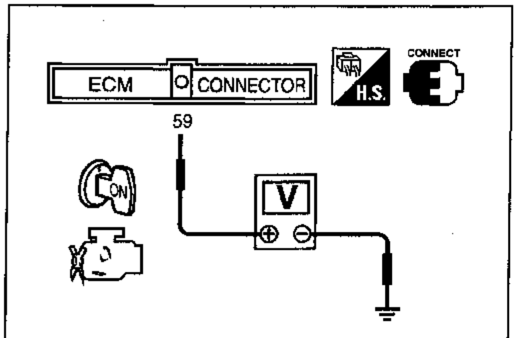


SEF774U

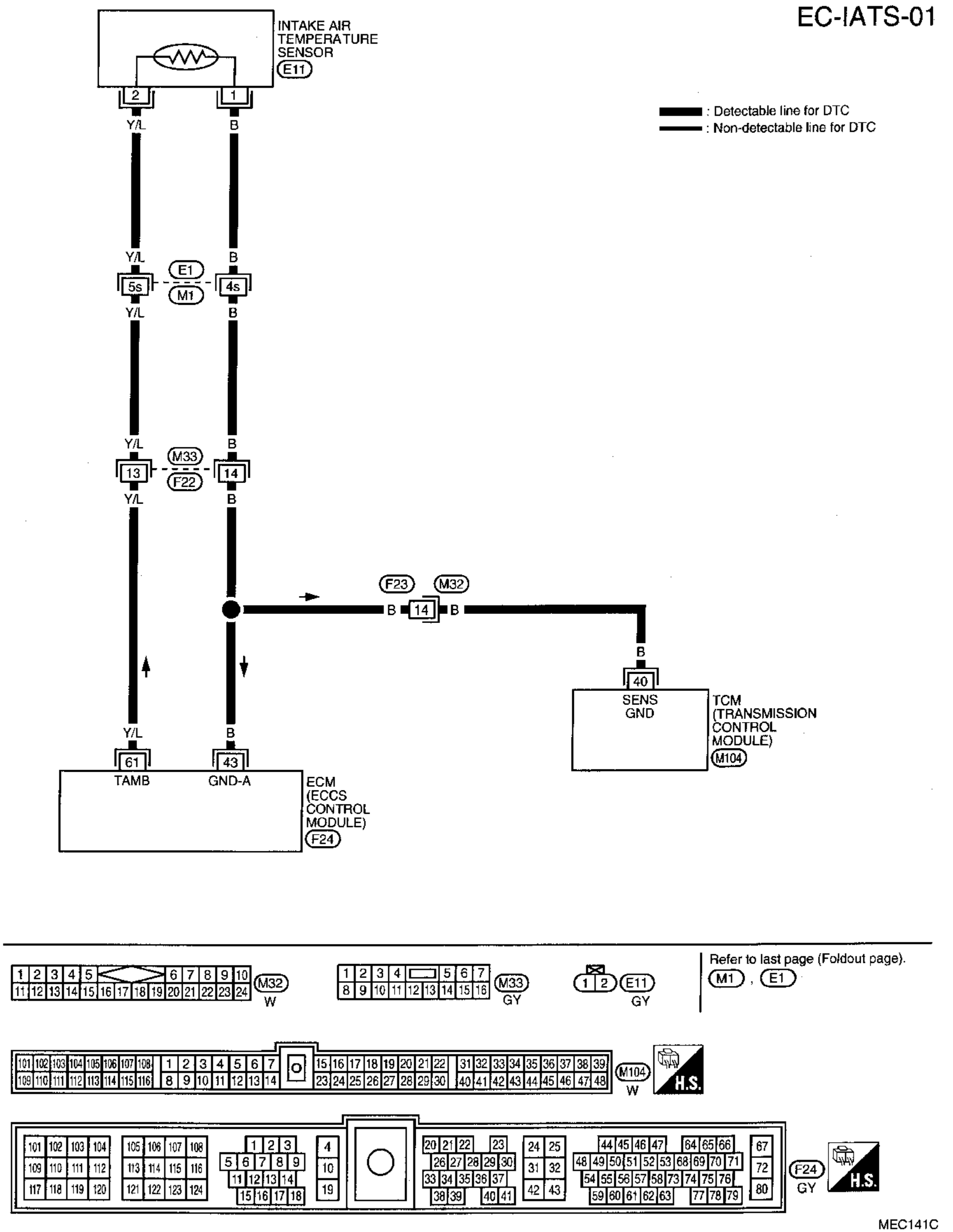
**No Tools**

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 (Engine coolant temperature sensor signal) and ground.
   **Voltage: More than 1.0 (V)**
c) If the voltage is not more than 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 at 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.

## Wiring Diagram

NBEC0064

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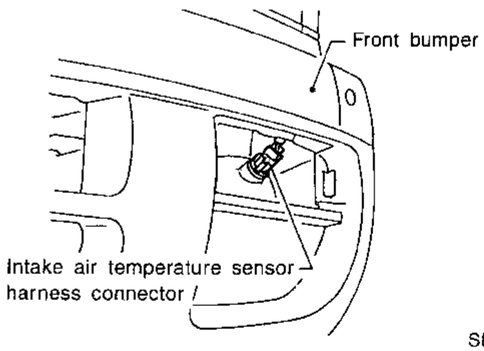
## Diagnostic Procedure

NBEC0065

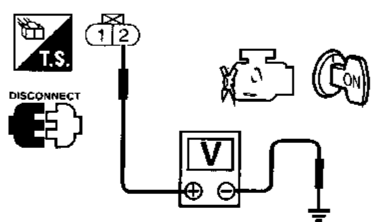
### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect intake air temperature sensor harness connector.




SEF984R

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground.
   **Voltage: Approximately 5V**




SEF688U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

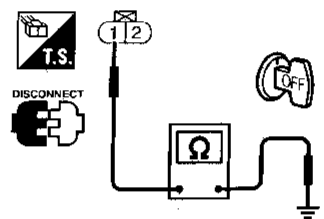
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F22, M33
- Harness connectors M1, E1
- Harness for open or short between ECM and intake air temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

### 3 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF689U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F22, M33
- Harness connectors F23, M32
- Harness connectors M1, E1
- Harness for open or short between ECM and intake air temperature sensor
- Harness for open or short between TCM (Transmission control module) and intake air temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 5 CHECK COMPONENT

(Intake air temperature sensor)
Refer to "Component Inspection", EC-137.

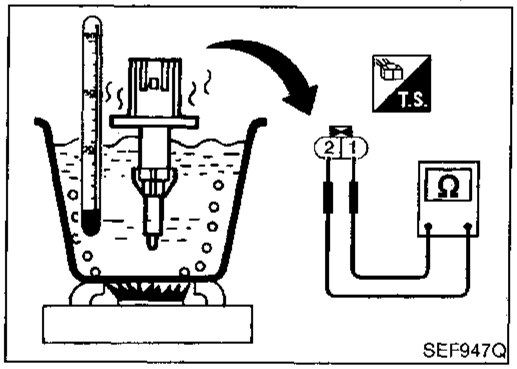
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace intake air temperature sensor. |

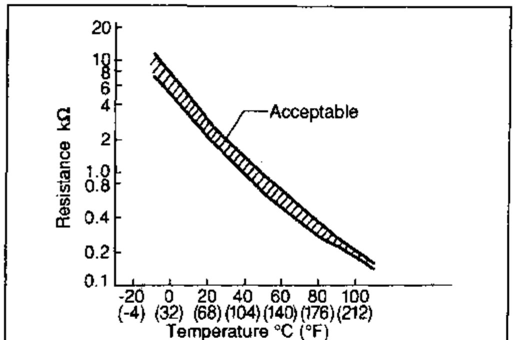
### 6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | **INSPECTION END** |




SEF947Q




SEF012P

## Component Inspection

NBEC0066

### INTAKE AIR TEMPERATURE SENSOR

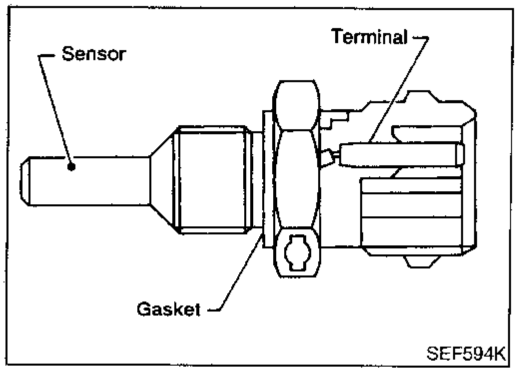
NBEC0066S01

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 |

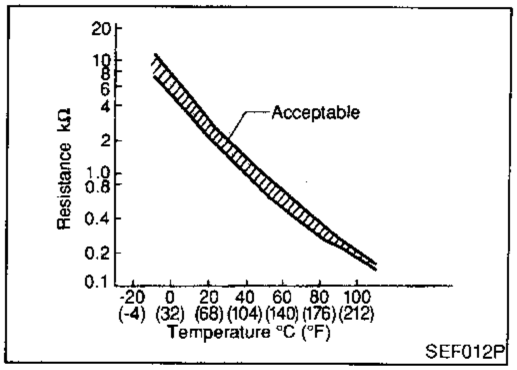
If NG, replace intake air temperature sensor.




## Component Description

NBEC0067

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 (ECCS ground).

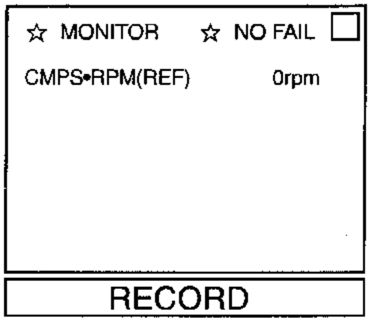
## On Board Diagnosis Logic

NBEC0068

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0115<br>0103 | • An excessively high or low voltage from the sensor is sent to ECM.* | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• 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 | Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".<br>CONSULT displays the engine coolant temperature decided by ECM. | |
| | 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)<br>(Depends on the time) |



SEF360V

## DTC Confirmation Procedure

=NBEC0069

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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

**With GST**

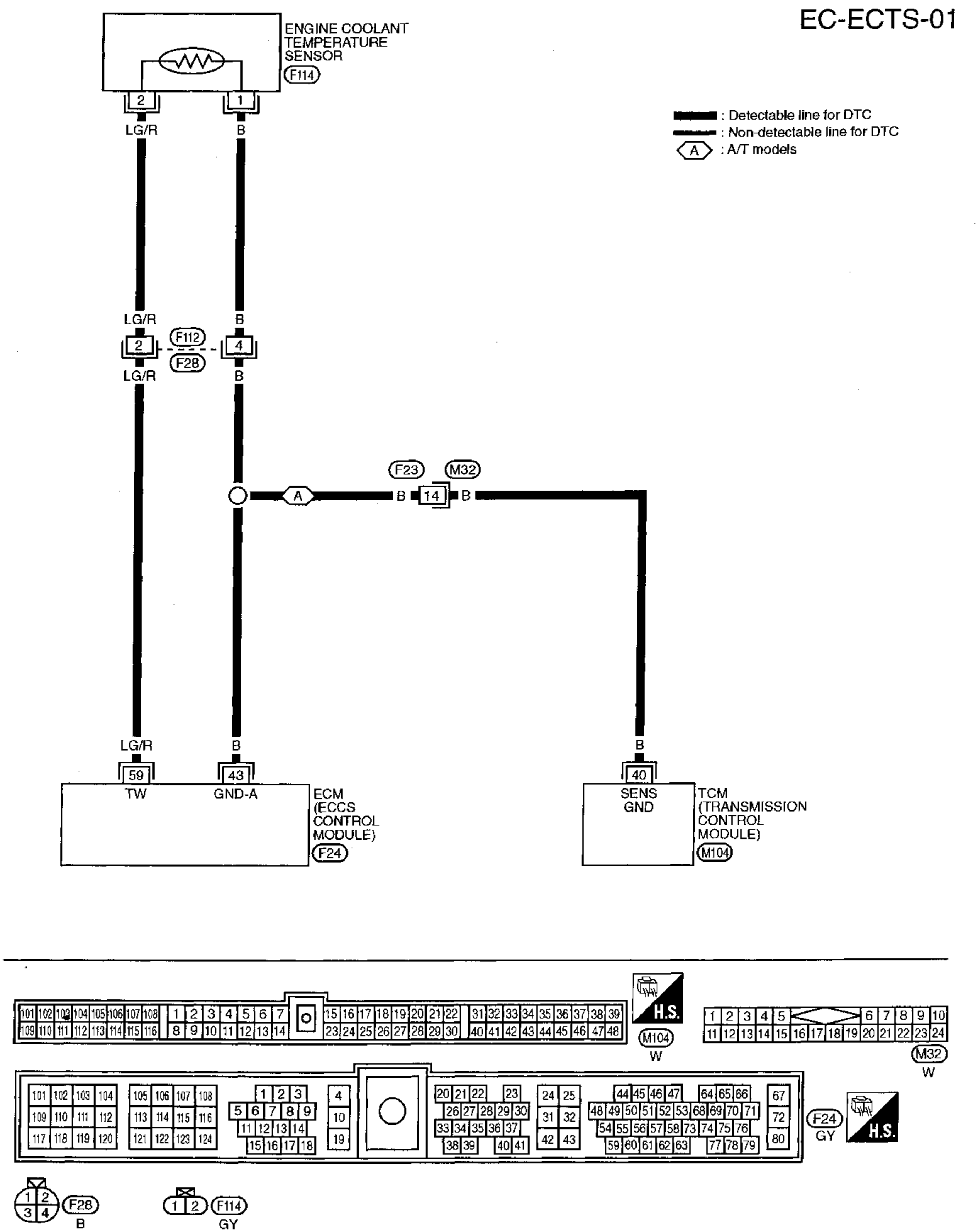
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 7" with GST.

**No Tools**

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.

## Wiring Diagram

NBEC0070



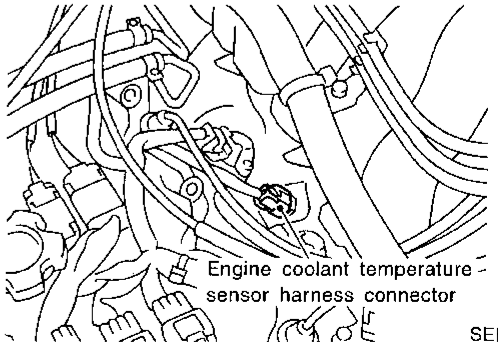

MEC340C

## Diagnostic Procedure

NBEC0071

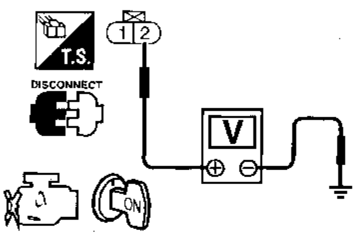
### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect engine coolant temperature sensor harness connector.




SEF750U

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage: Approximately 5V**




SEF690U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

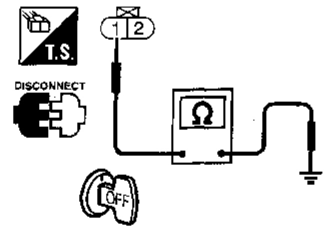
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F28, F112
- Harness for open or short between ECM and engine coolant temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 3 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF691U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F28, F112
- Harness connectors F23, M32
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between TCM (Transmission control module) and engine coolant temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 5 CHECK COMPONENT

(Engine coolant temperature sensor)
Refer to "Component Inspection", EC-142.

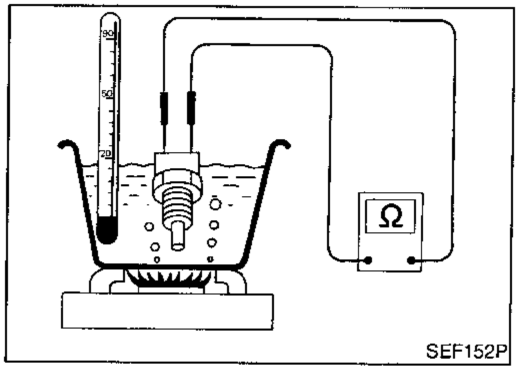
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace engine coolant temperature sensor. |

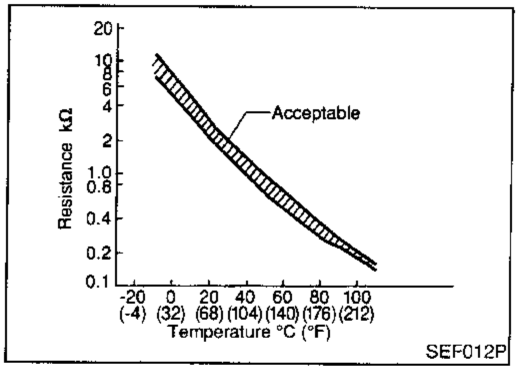
### 6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | **INSPECTION END** |



SEF152P



SEF012P

## Component Inspection

NBEC0072

### ENGINE COOLANT TEMPERATURE SENSOR

NBEC0072S01

Check resistance as shown in the figure.

**<Reference data>**

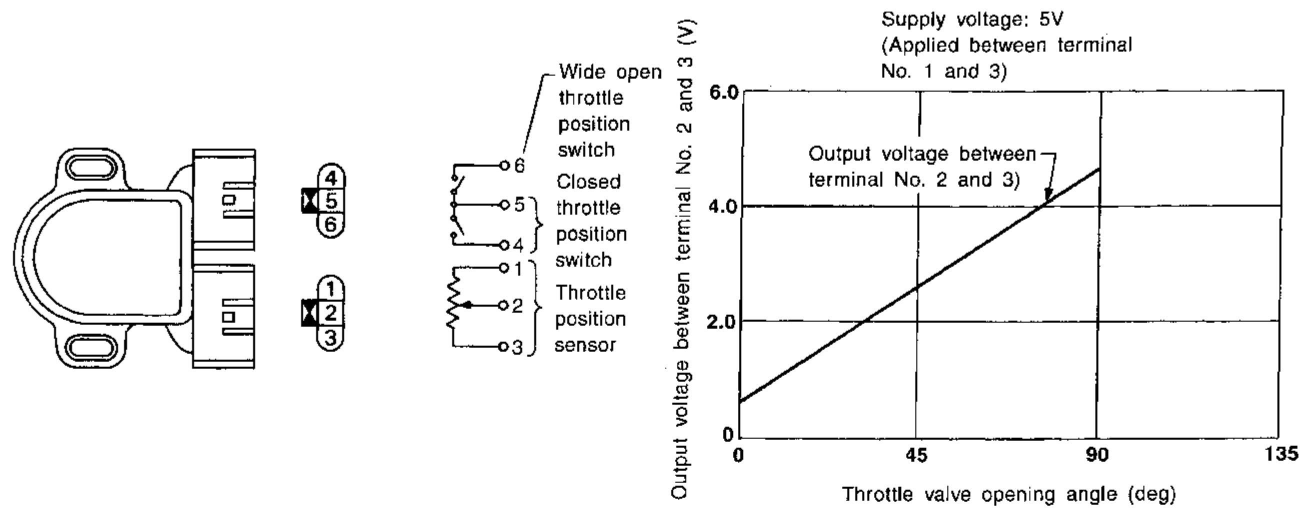
| Temperature °C (°F) | Resistance kΩ |
|---|---|
| 20 (68) | 2.1 - 2.9 |
| 50 (122) | 0.68 - 1.00 |
| 90 (194) | 0.236 - 0.260 |

If NG, replace engine coolant temperature sensor.

## Component Description

NBEC0073

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.



SEF579R

## CONSULT Reference Value in Data Monitor Mode

NBEC0074

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| THRTL POS SEN | • Engine: After warming up<br>• Ignition switch: ON<br>(Engine stopped) | Throttle valve: fully closed | 0.3 - 0.7V |
| | | Throttle valve: fully opened | Approx. 4.0V |
| ABSOL TH·P/S | • Engine: After warming up<br>• Ignition switch: ON<br>(Engine stopped) | Throttle valve: fully closed | 0.0% |
| | | Throttle valve: fully opened | Approx. 80% |

## ECM Terminals and Reference Value

NBEC0075

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 23 | W | Throttle position sensor | **[Ignition switch "ON"]**<br>• **Warm-up condition**<br>• Accelerator pedal fully released | 0.3 - 0.7V |
| | | | **[Ignition switch "ON"]**<br>• Accelerator pedal fully depressed | Approximately 4V |

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 37 | P | Throttle position sensor signal to TCM | **[Ignition switch "ON"]**<br>● **Warm-up condition**<br>● Accelerator pedal fully released | Approximately 0.4V |
| | | | **[Ignition switch "ON"]**<br>● Accelerator pedal fully depressed | Approximately 3V |
| 42 | P/B | Sensors' power supply | **[Ignition switch "ON"]** | Approximately 5V |
| 43 | B | Sensors' ground | **[Engine is running]**<br>● **Warm-up condition**<br>● Idle speed | Approximately 0V |

## On Board Diagnosis Logic

NBEC0076

| DTC No. | | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|---|
| P0120<br>0403 | A) | An excessively low or high voltage from the sensor is sent to ECM*. | ● Harness or connectors<br>(The throttle position sensor circuit is open or shorted.)<br>● Throttle position sensor |
| | B) | A high voltage from the sensor is sent to ECM under light load driving conditions. | ● Harness or connectors<br>(The throttle position sensor circuit is open or shorted.)<br>● Throttle position sensor<br>● Fuel injector<br>● Camshaft position sensor<br>● Mass air flow sensor |
| | C) | A low voltage from the sensor is sent to ECM under heavy load driving conditions. | ● Harness or connectors<br>(The throttle position sensor circuit is open or shorted.)<br>● Intake air leaks<br>● 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. | |
| | Condition | Driving condition |
| | When engine is idling | Normal |
| | When accelerating | Poor acceleration |

## DTC Confirmation Procedure

NBEC0077

NOTE:
- **If both DTC P0120 (0403) and DTC P0510 (0203) are displayed, first perform "DTC P0510 CLOSED THROTTLE POSITION SWITCH", EC-329.**
- **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 "DTC Confirmation Procedure" has been previously

conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

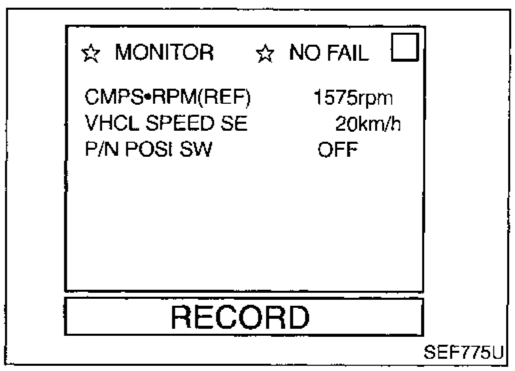
### PROCEDURE FOR MALFUNCTION A
NBEC0077S01

**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.**



SEF775U

**With CONSULT**

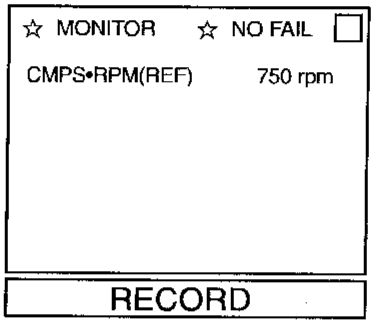
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and maintain the following conditions for at least 5 consecutive seconds.
   **Vehicle speed: More than 4 km/h (2 MPH)**
   **Selector lever:**
   **Suitable position except "P" or "N" position**

**With GST**

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.

**No Tools**

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.



SEF357V

### PROCEDURE FOR MALFUNCTION B

NBEC0077S02

**With CONSULT**

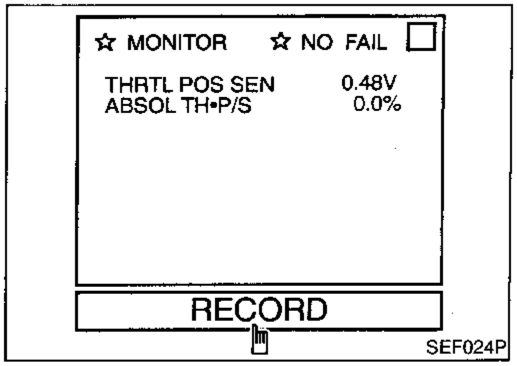
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle for at least 10 seconds.

**With GST**

1) Start engine and let it idle for at least 10 seconds.
2) Select "MODE 7" with GST.

**No Tools**

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



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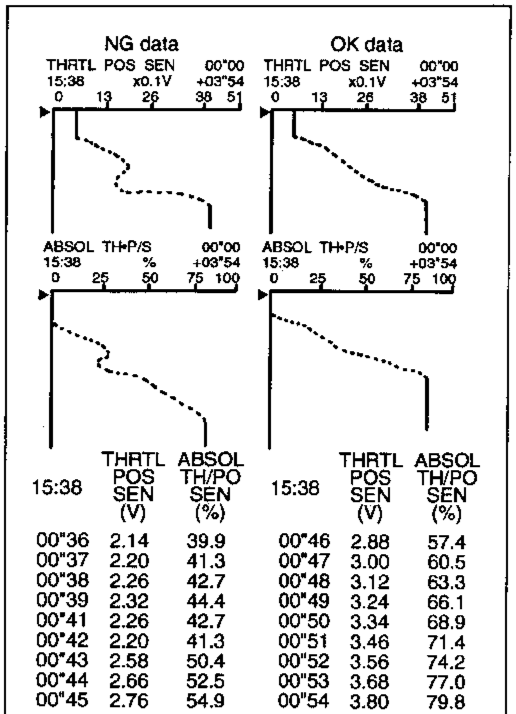

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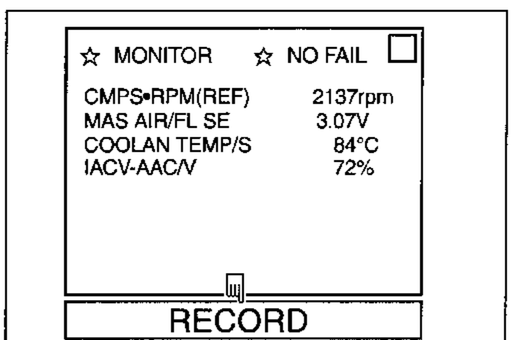


SEF776U

## PROCEDURE FOR MALFUNCTION C

NBEC0077S03

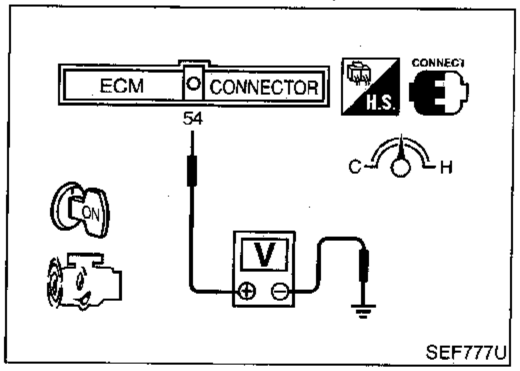
**CAUTION:**

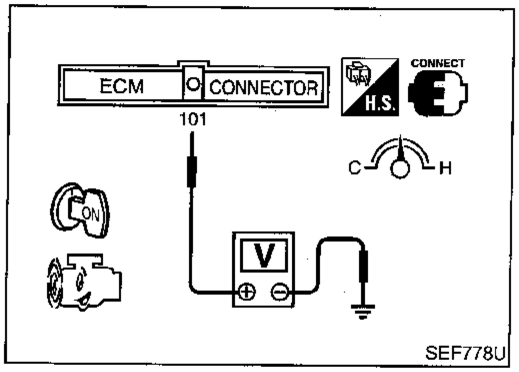
**Always drive vehicle at a safe speed.**

**With CONSULT**

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.
  If NG, go to "Diagnostic Procedure", EC-150.
  If OK, go to following step.
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)**
   **IACV-AAC/V: Less than 80%**
   **Selector lever: Suitable position**
   **Driving location:**
   **Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.**




**With GST**

1) Start engine and warm it up to normal operating temperature.
2) 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 (Mass air flow sensor signal) and ground:**
   **More than 3V**
   **Voltage between ECM terminal 101 (IACV-AAC valve signal) and ground:**
   **More than 4V**
3) Select "MODE 7" with GST.

**No Tools**

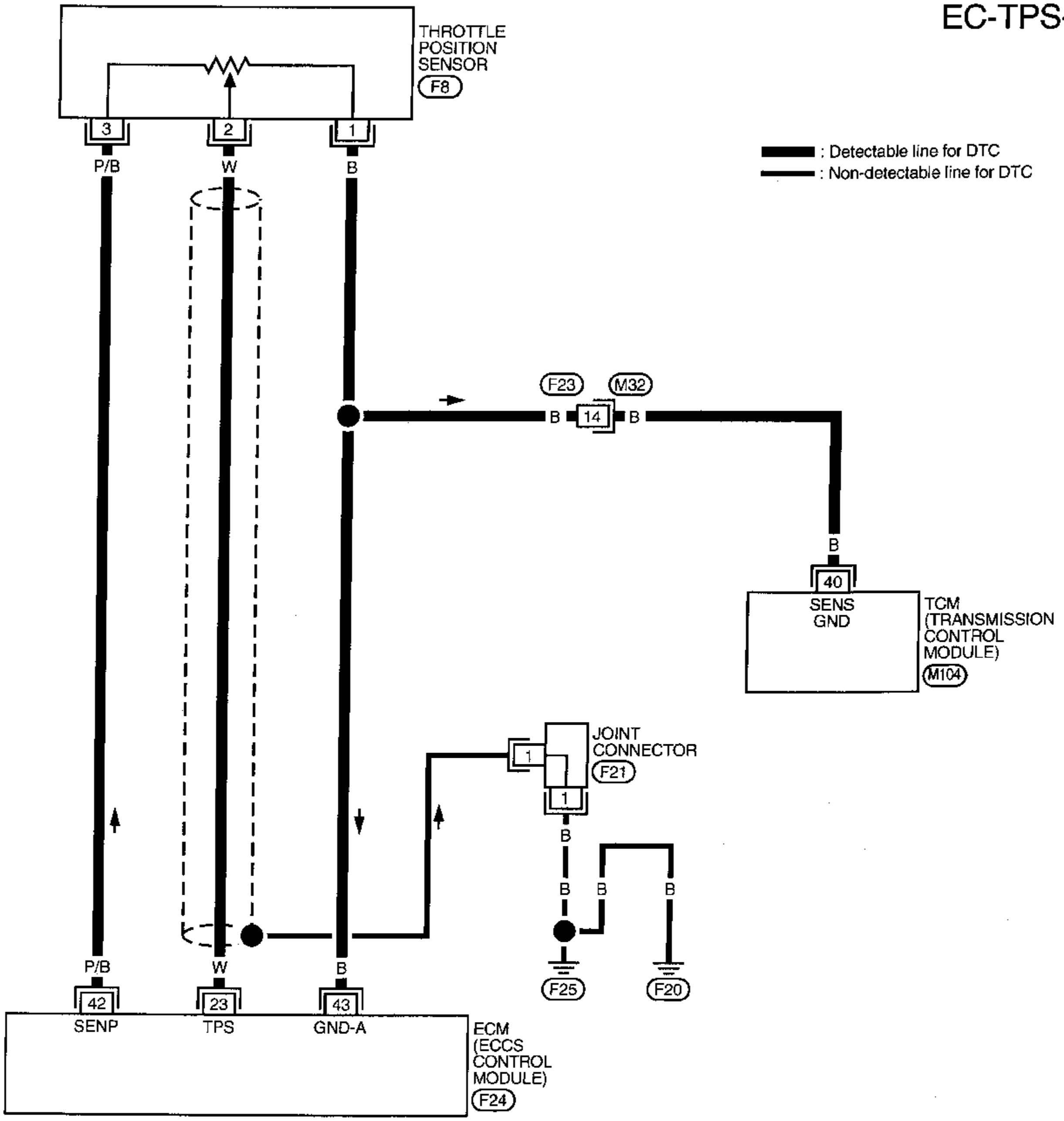
1) Start engine and warm it up to normal operating temperature.
2) Maintain the following conditions for at least 10 consecutive seconds.
   **Gear position: Suitable position**
   **Engine speed: More than 2,000 rpm**
   **Voltage between ECM terminal 54 (Mass air flow sensor signal) and ground:**
   **More than 3V**
   **Voltage between ECM terminal 101 (IACV-AAC valve signal) and ground:**
   **More than 4V**
3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

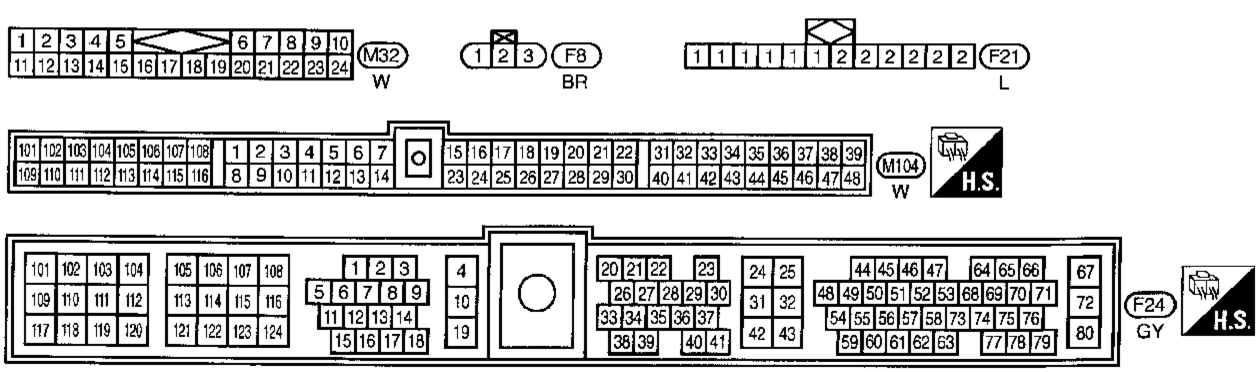
## Wiring Diagram

NBEC0078

EC-TPS-01






MEC142C

# Diagnostic Procedure

NBEC0079

| 1 | INSPECTION START |
|---|---|

Which malfunction A, B or C is duplicated?

| MALFUNCTION | Type |
|---|---|
| A | A |
| B | B |
| C | C |

MTBL0066

**Type A, B or C**

| | |
|---|---|
| Type A or B ▶ | GO TO 4. |
| Type C ▶ | GO TO 2. |

| 2 | ADJUST THROTTLE POSITION SENSOR |
|---|---|

Perform "Basic Inspection", EC-85.

| | |
|---|---|
| ▶ | GO TO 3. |

| 3 | CHECK INTAKE SYSTEM. |
|---|---|

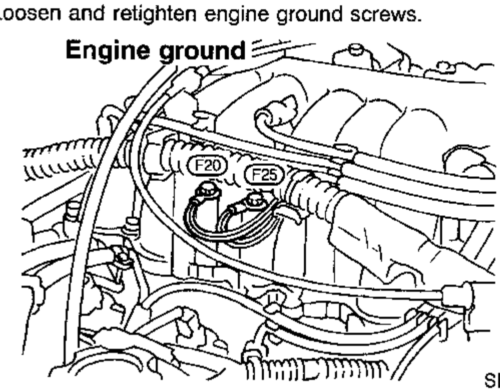
1. Turn ignition switch "OFF".
2. Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold collector

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 4. |
| NG ▶ | Reconnect the parts. |

| 4 | RETIGHTEN GROUND SCREWS |
|---|---|

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

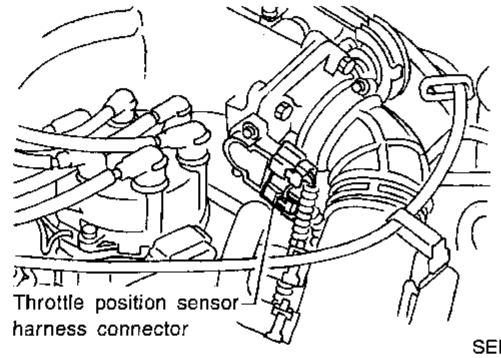



SEF031S

| | |
|---|---|
| ▶ | GO TO 5. |

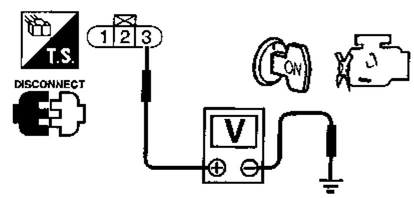
| 5 | CHECK POWER SUPPLY |
|---|---|

1. Disconnect throttle position sensor harness connector.




SEF972R

2. Turn ignition switch "ON".
3. Check voltage between terminal 3 and ground with CONSULT or tester.
   **Voltage: Approximately 5V**



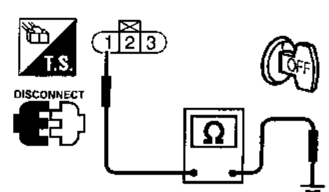

SEF692U

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 6. |
| NG ▶ | Repair harness or connectors. |

| 6 | CHECK GROUND CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF693U

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

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 8. |
| NG ▶ | GO TO 7. |

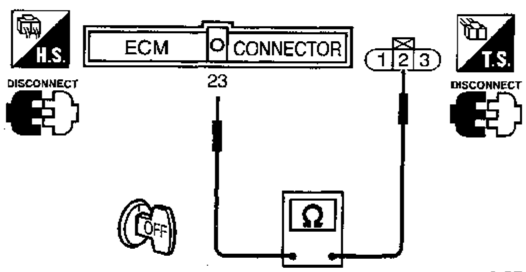
| 7 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F23, M32
- Harness for open or short between ECM and throttle position sensor
- Harness for open or short between TCM (Transmission control module) and throttle position sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 23 and terminal 2.
   **Continuity should exist.**




SEF694U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 9 | CHECK COMPONENT |
|---|---|

(Throttle position sensor)
Refer to "Component Inspection" EC-152.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-85. |

| 10 | CHECK COMPONENT |
|---|---|

(Mass air flow sensor)
Refer to "Component Inspection", EC-122.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace mass air flow sensor. |

| 11 | CHECK COMPONENT |
|---|---|

(Camshaft position sensor)
Refer to "Component Inspection", EC-274.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | Replace camshaft position sensor. |

| 12 | CHECK COMPONENT |
|---|---|

(Fuel injector)
Refer to "Component Inspection", EC-434.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 13. |
| NG | ▶ | Replace fuel injector. |

| 13 | CHECK SHIELD CIRCUIT |
|---|---|

1. Remove joint connector.
2. Check the following.
- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

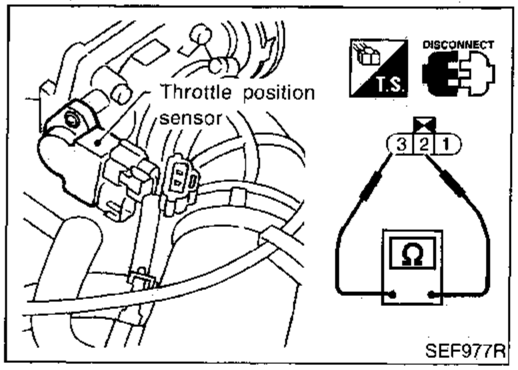
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 14. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 14 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | **INSPECTION END** |



SEF977R

## Component Inspection

NBEC0080

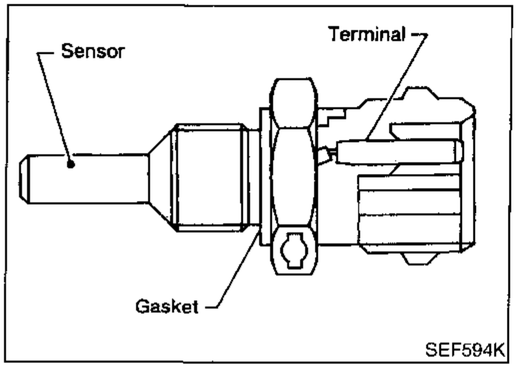
### THROTTLE POSITION SENSOR

NBEC0080S01

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-85.

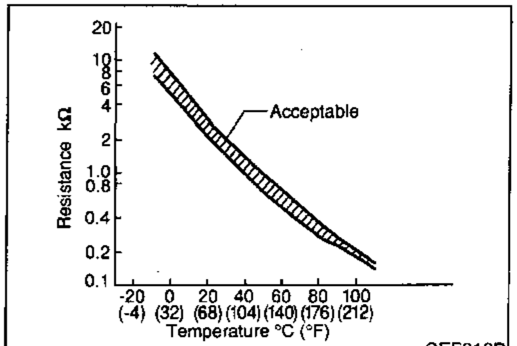


SEF594K

## Component Description

NBEC0081

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.



SEF012P

**<Reference data>**

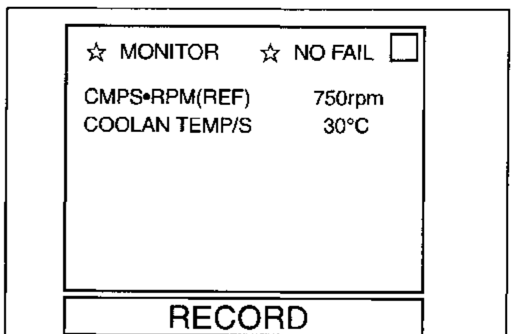
| Engine coolant temperature °C (°F) | Voltage* (V) | Resistance (kΩ) |
|---|---|---|
| −10 (14) | 4.4 | 9.2 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

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

## On Board Diagnosis Logic

NBEC0082

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0125<br>0908 | • Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine.<br>• Engine coolant temperature is insufficient for closed loop fuel control. | • Harness or connectors<br>(High resistance in the circuit)<br>• Engine coolant temperature sensor<br>• Thermostat |



SEF779U

## DTC Confirmation Procedure

NBEC0083

**CAUTION:**

**Be careful not to overheat engine.**

NOTE:

- **If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform “DTC P0115 ENGINE COOLANT TEMPERATURE (ECT) SENSOR”, EC-138.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

**With CONSULT**

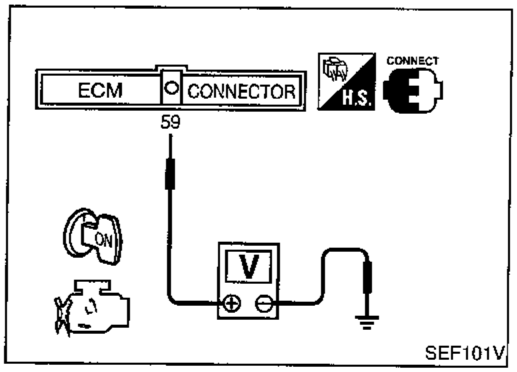
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT.
3) Check that “COOLAN TEMP/S” is above 10°C (50°F).
**If it is above 10°C (50°F), the test result will be OK.**
**If it is below 10°C (50°F), go to following step.**
4) Start engine and run it for 65 minutes at idle speed.

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

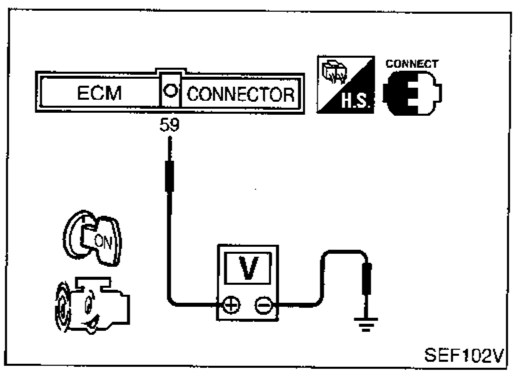
**With GST**

1) Turn ignition switch “ON”.

2) Select "MODE 1" with GST.
3) Check that engine coolant temperature is above 10°C (50°F).
   **If it is above 10°C (50°F), the test result will be OK.**
   **If it is below 10°C (50°F), go to following step.**
4) Start engine and run it for 65 minutes at idle speed.
   **If engine coolant temperature increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.**
5) Select "MODE 7" with GST.



SEF101V



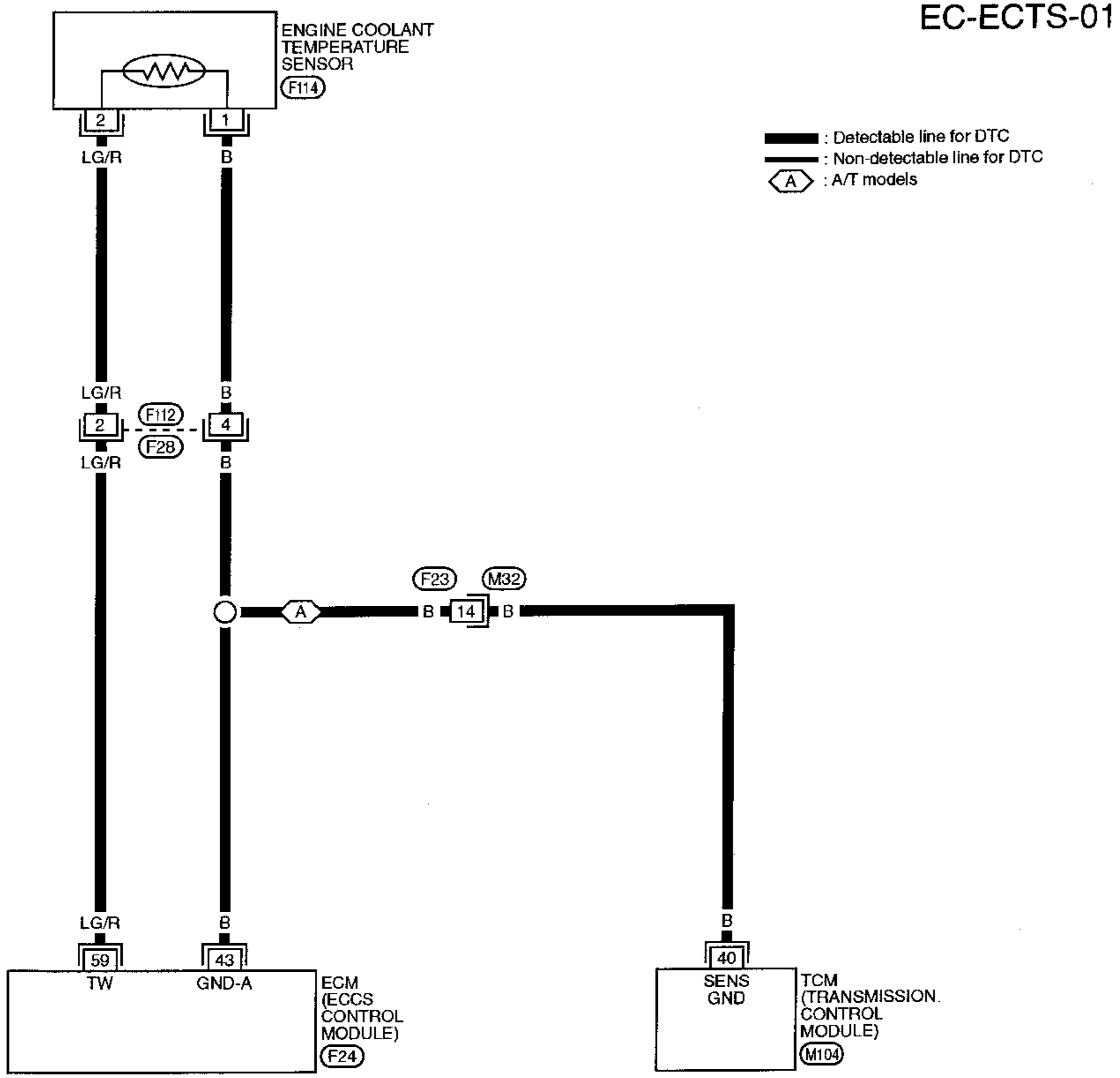
SEF102V

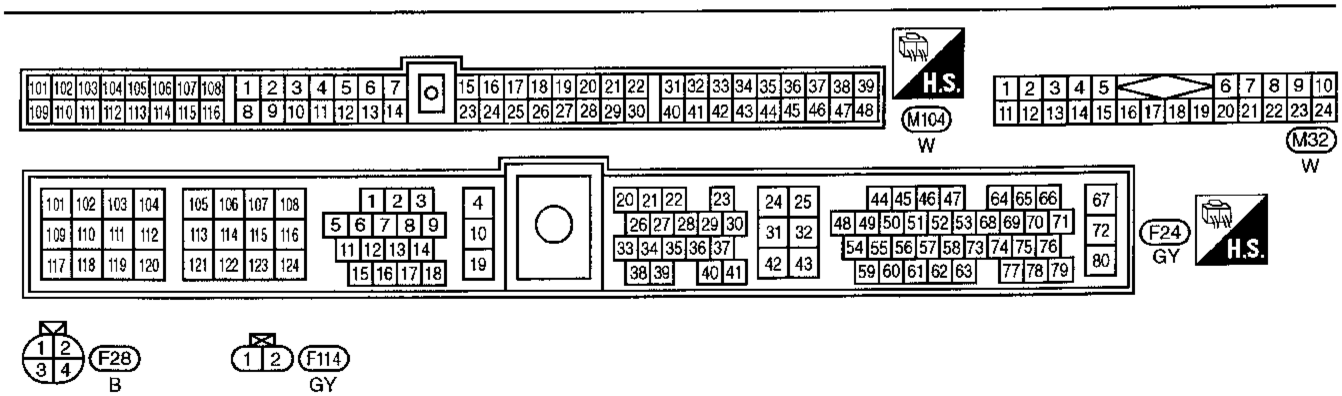
**No Tools**

1) Turn ignition switch "ON".
2) Check that voltage between ECN terminal 59 (Engine coolant temperature sensor signal) and ground is less than 3.8V.
   **If it is less than 3.8V, the test result will be OK.**
   **If it is over 3.8V, go to following step.**
3) Start engine and run it for 65 minutes at idle speed measuring voltage between ECM terminal 59 and ground.
   **If the voltage decreases to less than 3.8V within 65 minutes, stop engine because the test result will be OK.**
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.

## Wiring Diagram

NBEC0084



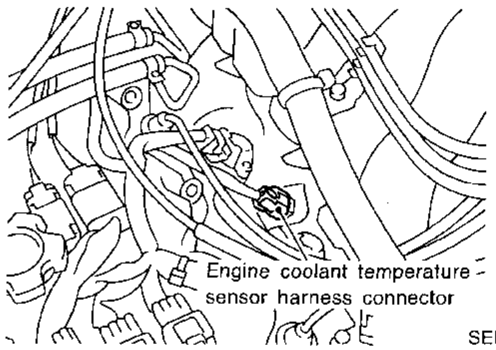

MEC340C

## Diagnostic Procedure

NBEC0085

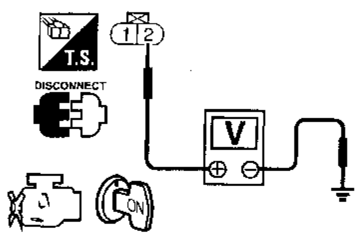
### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect engine coolant temperature sensor harness connector.




SEF750U

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage:**
   **Approximately 5V**




SEF690U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

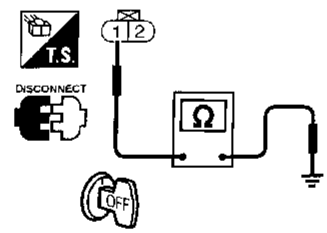
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F28, F112
- Harness for open or short between ECM and engine coolant temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 3 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF691U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F28, F112
- Harness connectors F23, M32
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between TCM (Transmission control module) and engine coolant temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 5 CHECK COMPONENT

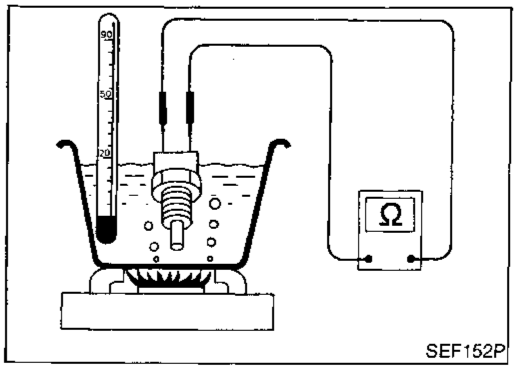
(Engine coolant temperature sensor)
Refer to "Component Inspection", EC-157.

**OK or NG**

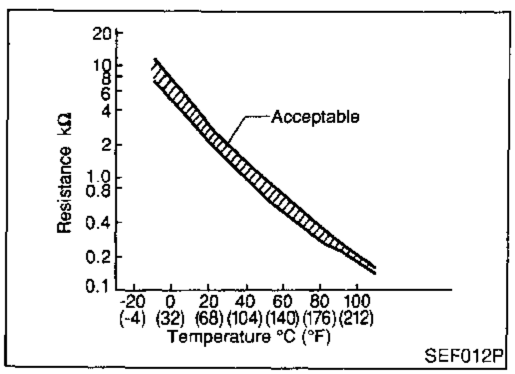
| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace engine coolant temperature sensor. |

| 6 | CHECK THERMOSTAT OPERATION | |
|---|---|---|
| When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant does not flow. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair or replace thermostat. Refer to LC section ("Thermostat", "ENGINE COOLING SYSTEM"). |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | **INSPECTION END** |



SEF152P




SEF012P

## Component Inspection

NBEC0086

### ENGINE COOLANT TEMPERATURE SENSOR

NBEC0086S01

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.

GI
MA
EM
LC
EC
FE
AT
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PD
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BR
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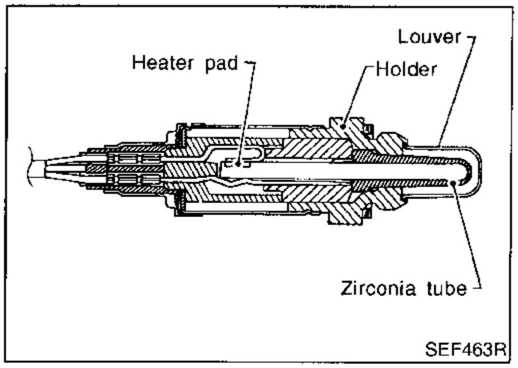
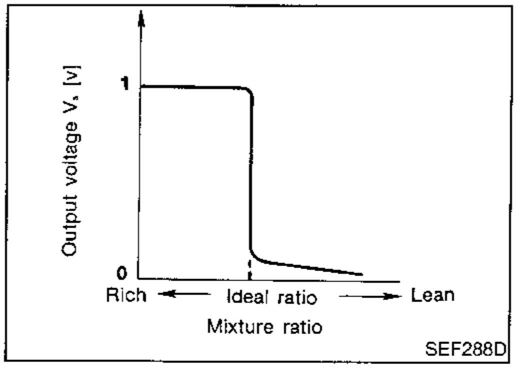
# DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (CIRCUIT)





SEF463R



SEF288D

## Component Description

NBEC0090

The front heated oxygen sensor is placed into the front tube. 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

NBEC0091

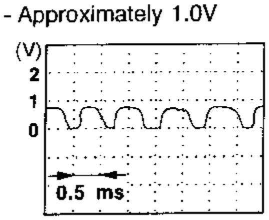
Specification data are reference values.

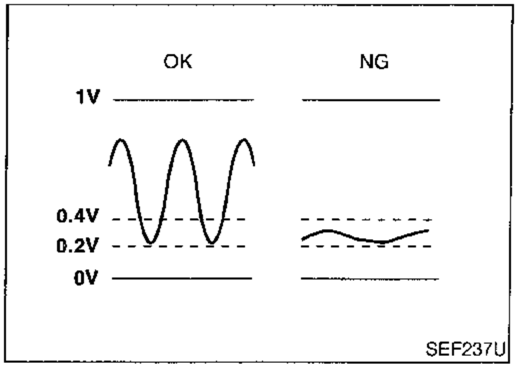
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| FR O2 SEN-B1<br>FR O2 SEN-B2 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| FR O2 MNTR-B1<br>FR O2 MNTR-B2 | | | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |

## ECM Terminals and Reference Value

NBEC0092

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 50 | W | Front heated oxygen sensor RH | **[Engine is running]**<br>• After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br><br>SEF002V |
| 51 | W | Front heated oxygen sensor LH | | |



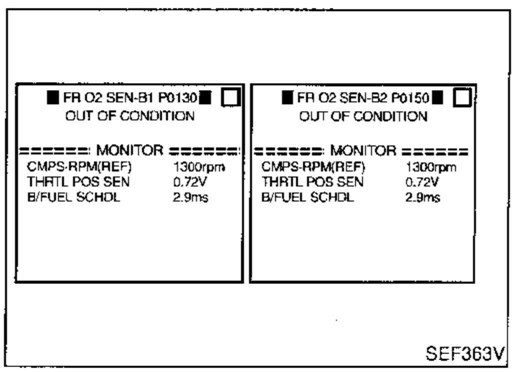
SEF237U

## On Board Diagnosis Logic

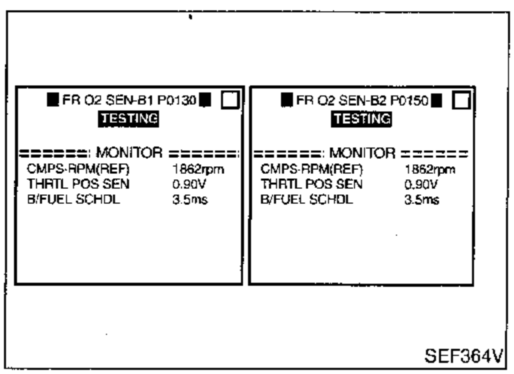
NBEC0093

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.

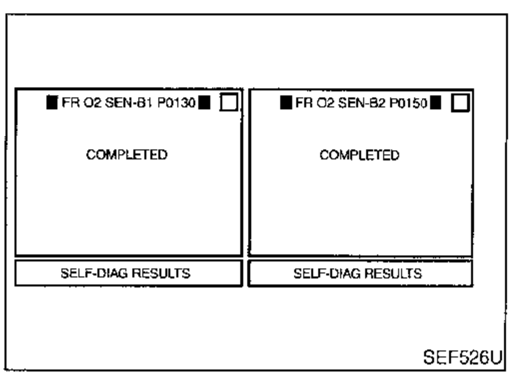
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0130<br>0503<br>(Right bank) | • The voltage from the sensor is constantly approx. 0.3V. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Front heated oxygen sensor |
| P0150<br>0303<br>(Left bank) | | |



SEF363V



SEF364V



SEF526U

## DTC Confirmation Procedure

NBEC0390

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC 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 3,200 rpm during the "DTC Confirmation Procedure". If the engine speed limit is exceeded, retry the procedure from step 2.**
- **Always drive vehicle at a temperature of more than −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

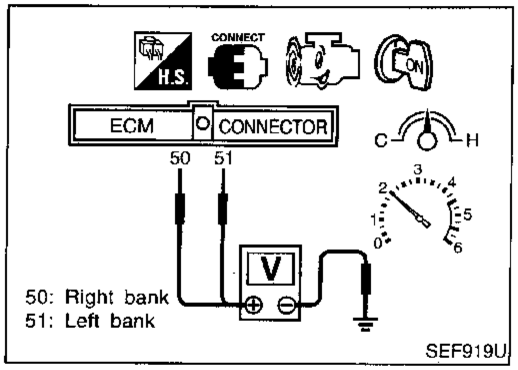
**With CONSULT**

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 "FR O2 SEN-B1 (-B2) P0130 (P0150)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 3.5 minutes.
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 10 to 60 seconds.)

   **CMPS·RPM (REF): 1,800 - 2,600 rpm**
   **Vehicle speed: 70 - 100 km/h (43 - 62 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.5 ms**
   **Selector lever: Suitable position**

**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-163.
   **During this test, P1148 may be stored in ECM.**




## Overall Function Check

NBEC0094

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.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

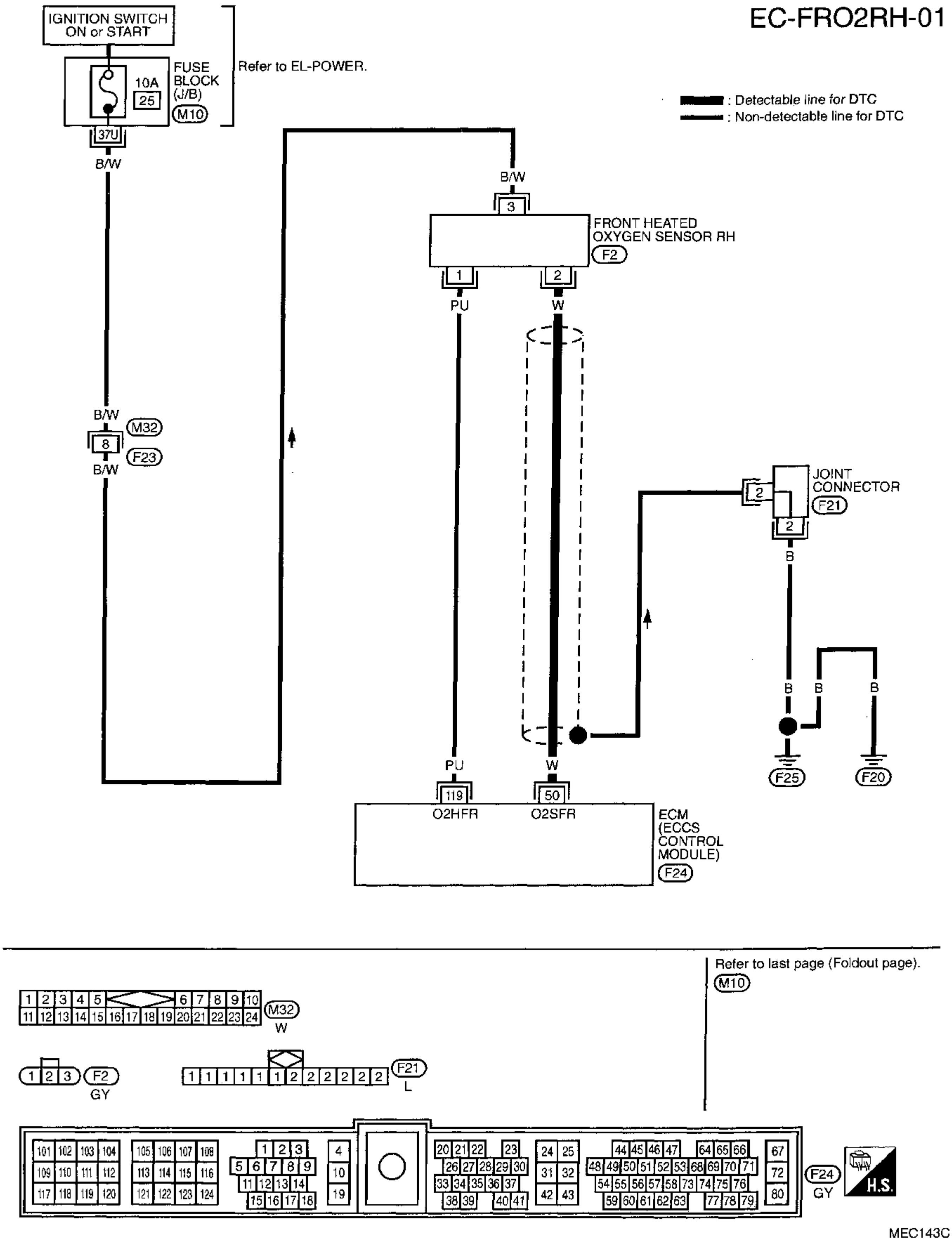
- The voltage does not remain in the range of 0.2 - 0.4V.

## Wiring Diagram

NBEC0095

### RIGHT BANK

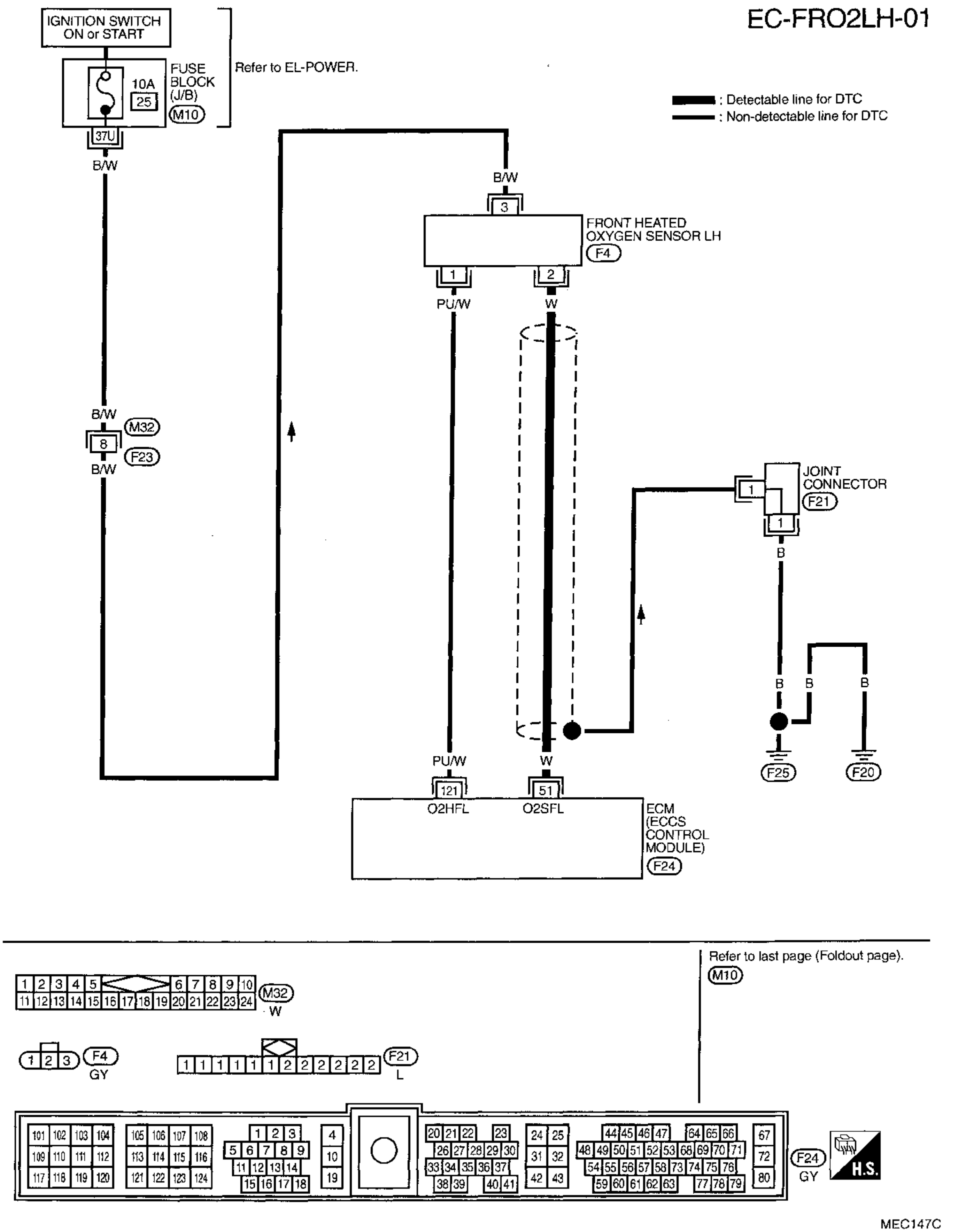
NBEC0095S01



*Wiring Diagram (Cont'd)*

## LEFT BANK

NBEC0095S02



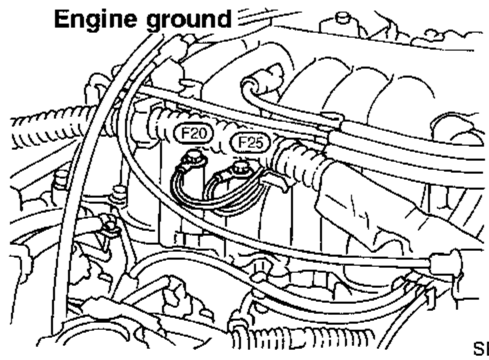

MEC147C

## Diagnostic Procedure

*NBEC0096*

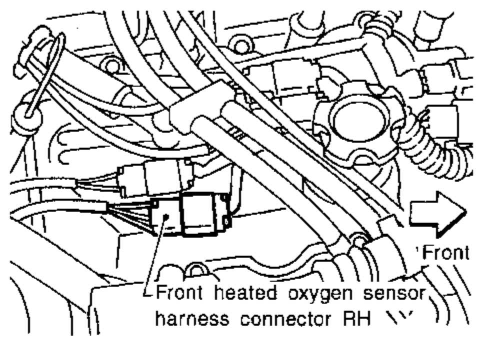
### 1 INSPECTION START

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

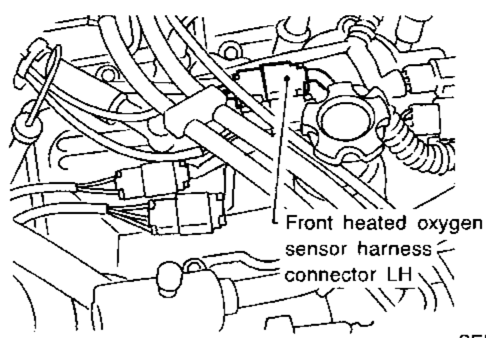



SEF031S

3. Disconnect corresponding front heated oxygen sensor harness connector.




SEF987R

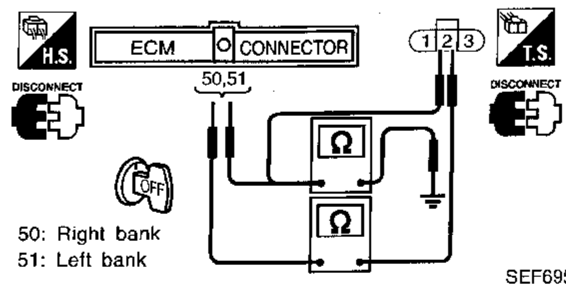



SEF994RB

| | |
|---|---|
| ▶ | GO TO 2. |

### 2 CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 50 or 51 and sensor terminal 2.
   **Continuity should exist.**
3. Check harness continuity between ECM terminal 50 or 51 (or sensor terminal 2) and ground.
   **Continuity should not exist.**




50: Right bank
51: Left bank

SEF695U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 3 CHECK COMPONENT

(Front heated oxygen sensor)
Refer to "Component Inspection", EC-164.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Replace front heated oxygen sensor. |

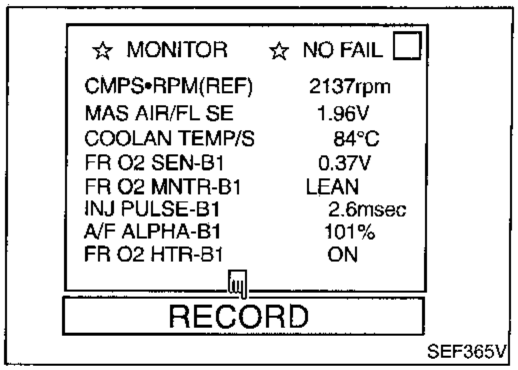
### 4 CHECK SHIELD CIRCUIT

1. Remove joint connector.
2. Check the following.
- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

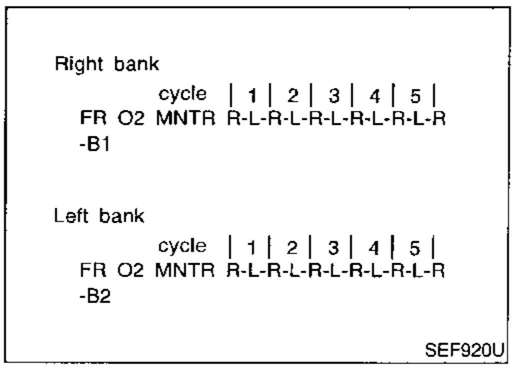
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |




SEF365V




SEF920U

## Component Inspection

NBEC0391

### FRONT HEATED OXYGEN SENSOR

NBEC0391S01

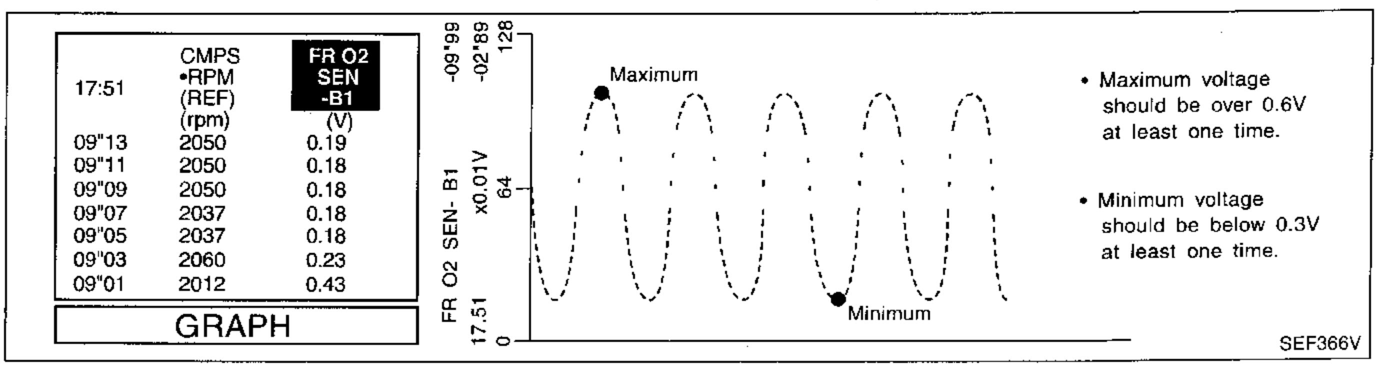
**With CONSULT**

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 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
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.

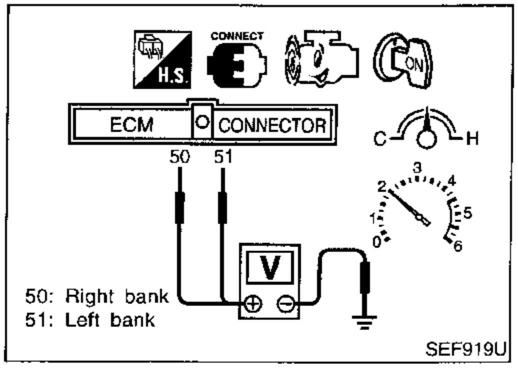
- "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown left:
  R = "FR O2 MNTR-B1 (-B2)", "RICH"
  L = "FR O2 MNTR-B1 (-B2)", "LEAN"
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1 (-B2)" voltage never exceeds 1.0V.

**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.**




SEF366V



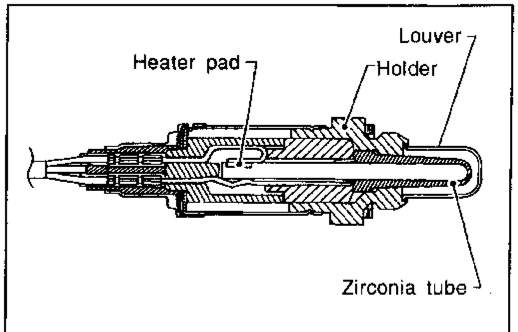

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

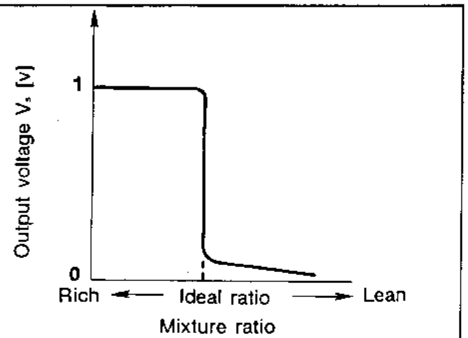
- MIL goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

**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.**



SEF463R



SEF288D

## Component Description

NBEC0392

The front heated oxygen sensor is placed into the front tube. 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

NBEC0393

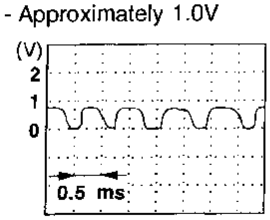
Specification data are reference values.

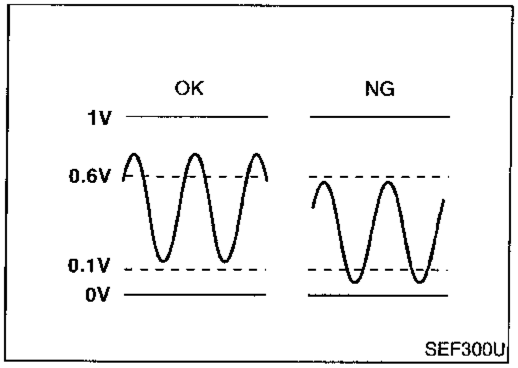
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| FR O2 SEN-B1<br>FR O2 SEN-B2 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| FR O2 MNTR-B1<br>FR O2 MNTR-B2 | | | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |

## ECM Terminals and Reference Value

NBEC0394

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 50 | W | Front heated oxygen sensor RH | **[Engine is running]**<br>• After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br>SEF002V |
| 51 | W | Front heated oxygen sensor LH | | |




## On Board Diagnosis Logic

NBEC0395

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.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0131<br>0415<br>(Right bank) | • The maximum and minimum voltage from the sensor are not reached to the specified voltages. | • Front heated oxygen sensor<br>• Front heated oxygen sensor heater<br>• Fuel pressure<br>• Injectors<br>• Intake air leaks |
| P0151<br>0411<br>(Left bank) | | |

## DTC Confirmation Procedure

NBEC0396

**CAUTION:**

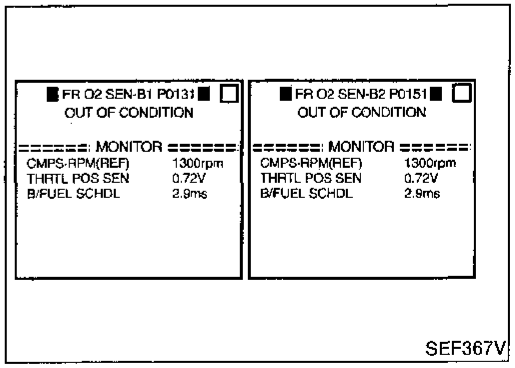
**Always drive vehicle at a safe speed.**

NOTE:

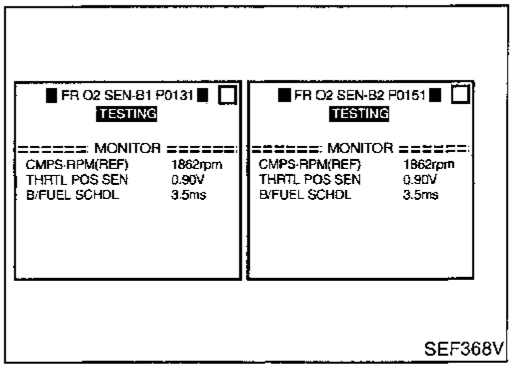
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**TESTING CONDITION:**

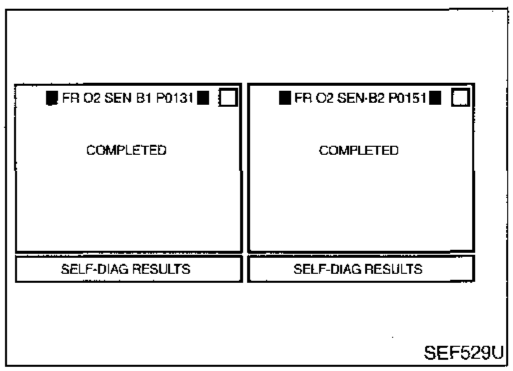
- **Before performing following procedure, confirm that battery voltage is more than 11V at idle.**
- **Never raise engine speed above 3,200 rpm during the "DTC Confirmation Procedure". If the engine speed limit is exceeded, retry the procedure from step 2.**




SEF367V




SEF368V




SEF529U

**With CONSULT**

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 "FR O2 SEN-B1 (-B2) P0131 (P0151)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 3.5 minutes.
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 50 seconds.)

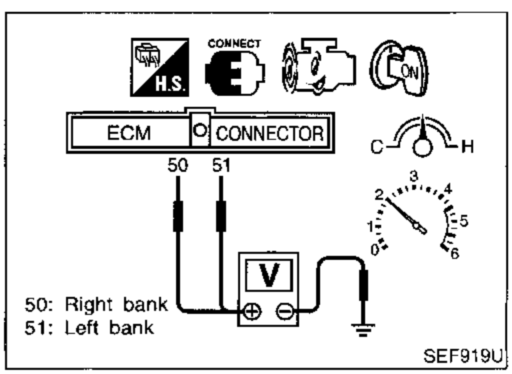
   **CMPS·RPM (REF): 1,800 - 2,800 rpm**

   **Vehicle speed: 80 - 100 km/h (50 - 62 MPH)**

   **B/FUEL SCHDL: 1.7 - 6.5 ms**

   **Selector lever: Suitable position**

   **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-169.




SEF919U

## Overall Function Check

*NBEC0397*

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.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check one of the following with engine speed held at 2,000 rpm constant under no load.

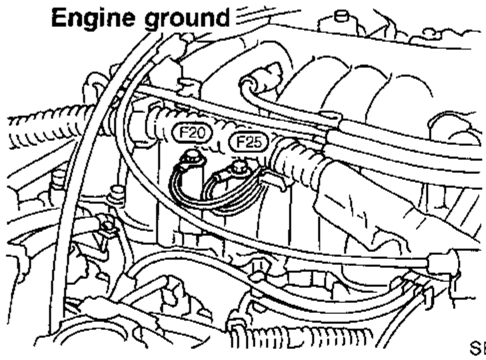
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is over 0.1V at least one time.

## Diagnostic Procedure

NBEC0399

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|

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




SEF031S

| | |
|---|---|
| ▶ | GO TO 2. |

| 2 | RETIGHTEN FRONT HEATED OXYGEN SENSOR |
|---|---|

Loosen and retighten corresponding front heated oxygen sensor.

**Tightening torque:**

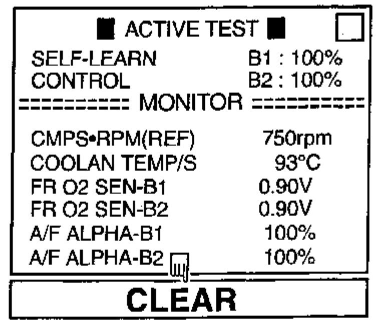
**40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)**

| | |
|---|---|
| ▶ | GO TO 3. |

| 3 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT**

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".




SEF921U

4. Run engine for at least 10 minutes at idle speed.
   **Is the 1st trip DTC P0171 or P0174 detected?**
   **Is it difficult to start engine?**

**Without CONSULT**

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure DTC 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 0210 detected?**
   **Is it difficult to start engine?**

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | Go to Trouble diagnosis for "DTC P0171, P0174", EC-237. |
| No | ▶ | GO TO 4. |

| 4 | CHECK COMPONENT |
|---|---|

(Front heated oxygen sensor heater)
Refer to "Component inspection", EC-199.

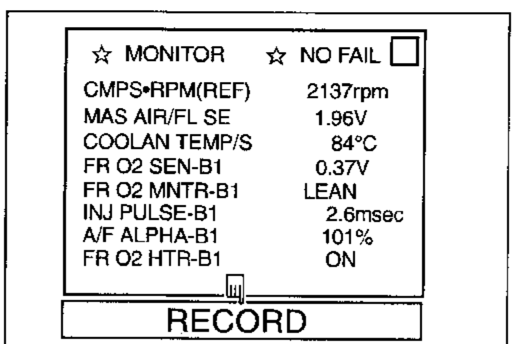
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace corresponding front heated oxygen sensor. |

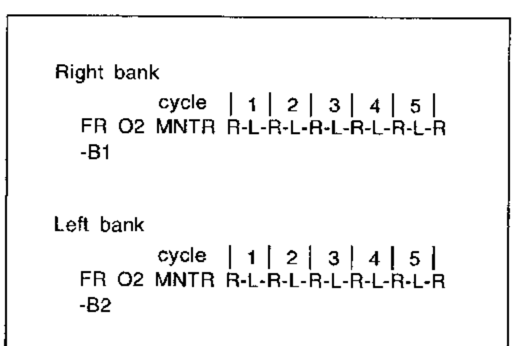
| 5 | CHECK COMPONENT | |
|---|---|---|
| (Front heated oxygen sensor)<br>Refer to "Component Inspection", EC-170. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace corresponding front heated oxygen sensor. |

| 6 | CHECK SHIELD CIRCUIT | |
|---|---|---|
| 1. Remove joint connector.<br>2. For circuit, refer to "DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (CIRCUIT)", EC-158.<br>3. Check the following.<br>• Continuity between joint connector terminal and ground<br>• Joint connector<br>(Refer to "HARNESS LAYOUT" in EL section.)<br>**Continuity should exist.**<br>If OK, check harness for short to ground and short to power. Then reconnect joint connector. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.<br>For circuit, refer to "DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (CIRCUIT)", EC-158. | | |
| | ▶ | INSPECTION END |



SEF365V



SEF920U

# Component Inspection

NBEC0400

## FRONT HEATED OXYGEN SENSOR

NBEC0400S01

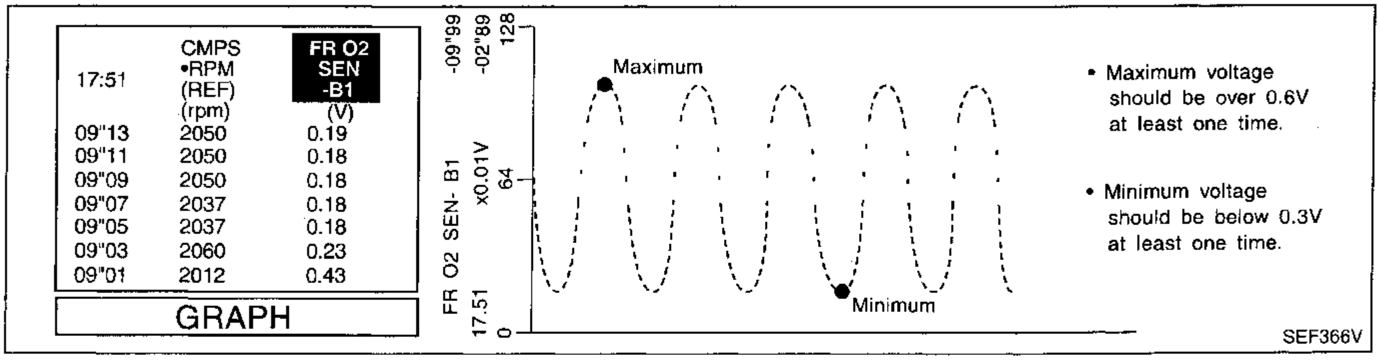
### With CONSULT

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 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
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-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown left:
  R = "FR O2 MNTR-B1 (-B2)", "RICH"
  L = "FR O2 MNTR-B1 (-B2)", "LEAN"
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1 (-B2)" voltage never exceeds 1.0V.

**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.**




SEF366V

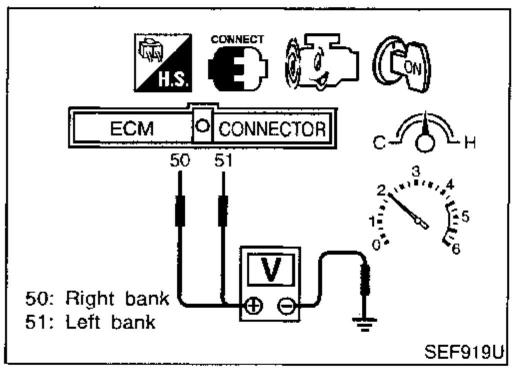
### Without CONSULT

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- MIL 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 0.3V at least one time.
- The voltage never exceeds 1.0V.

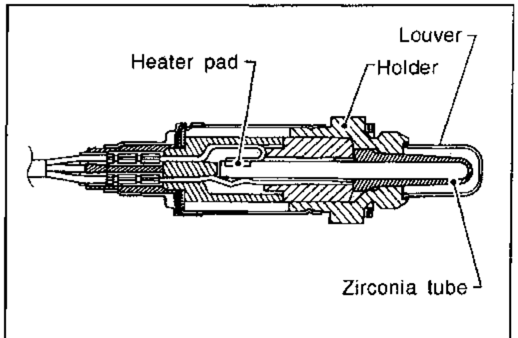
**CAUTION:**

**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.**

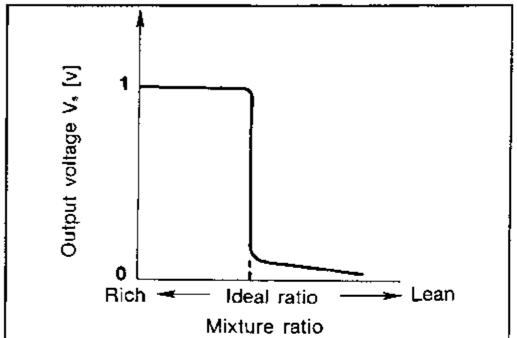



SEF919U

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX



SEF463R



SEF288D

## Component Description

NBEC0401

The front heated oxygen sensor is placed into the front tube. 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

NBEC0402

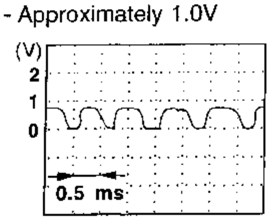
Specification data are reference values.

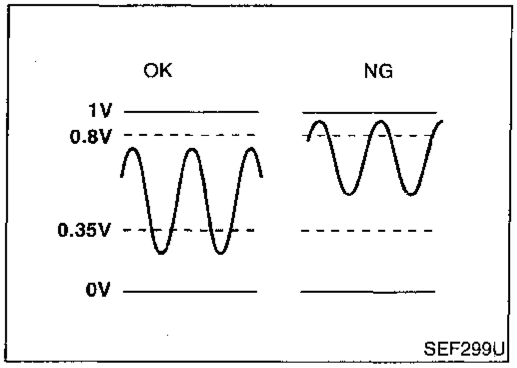
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| FR O2 SEN-B1<br>FR O2 SEN-B2 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| FR O2 MNTR-B1<br>FR O2 MNTR-B2 | | | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |

## ECM Terminals and Reference Value

NBEC0403

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 50 | W | Front heated oxygen sensor RH | **[Engine is running]**<br>• After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br>SEF002V |
| 51 | W | Front heated oxygen sensor LH | | |




## On Board Diagnosis Logic

NBEC0404

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.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0132<br>0414<br>(Right bank) | • The maximum and minimum voltages from the sensor are beyond the specified voltages. | • Front heated oxygen sensor<br>• Fuel pressure<br>• Injectors<br>• Front heated oxygen sensor heater |
| P0152<br>0410<br>(Left bank) | | |

## DTC Confirmation Procedure

NBEC0405

**CAUTION:**

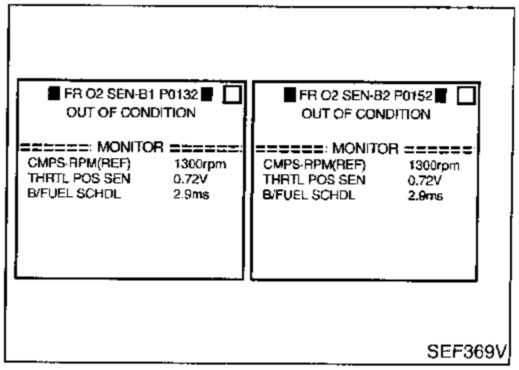
**Always drive vehicle at a safe speed.**

NOTE:

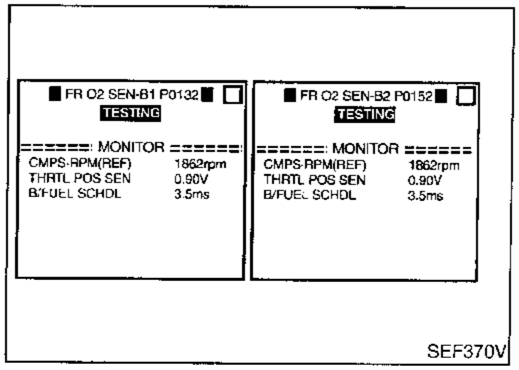
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**TESTING CONDITION:**

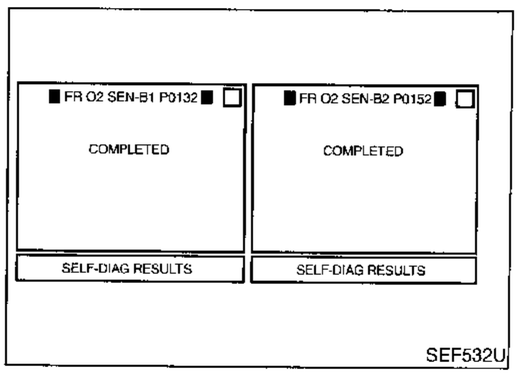
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**
- **Never raise engine speed above 3,200 rpm during the "DTC Confirmation Procedure". If the engine speed limit is exceeded, retry the procedure from step 2.**



SEF369V



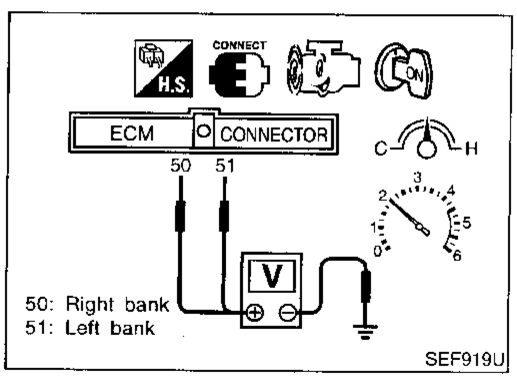
SEF370V



SEF532U

**With CONSULT**

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 "FR O2 SEN-B1 (-B2) P0132 (P0152)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 3.5 minutes.
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 50 seconds.)
   **CMPS·RPM (REF): 1,800 - 2,800 rpm**
   **Vehicle speed: 80 - 100 km/h (50 - 62 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.5 ms**
   **Selector lever: Suitable position**
   **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-175.



SEF919U

## Overall Function Check

NBEC0406

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.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check one of the following with engine speed held at 2,000 rpm constant under no load.

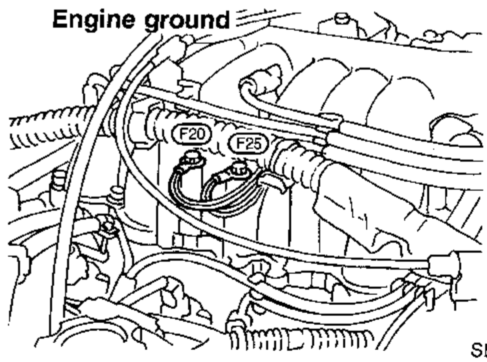
- The maximum voltage is below 0.8V at least one time.
- The minimum voltage is below 0.35V at least one time.

## Diagnostic Procedure

NBEC0408

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|

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



SEF031S

| | |
|---|---|
| ▶ | GO TO 2. |

| 2 | RETIGHTEN FRONT HEATED OXYGEN SENSOR |
|---|---|

Loosen and retighten corresponding front heated oxygen sensor.

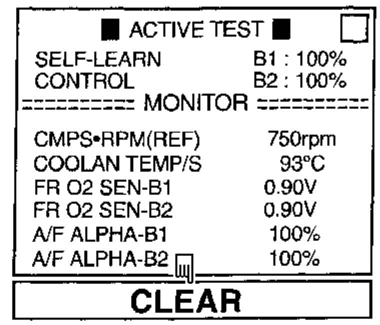
**Tightening torque:**
**40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)**

| | |
|---|---|
| ▶ | GO TO 3. |

| 3 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT**

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".



SEF921U

4. Run engine for at least 10 minutes at idle speed.
   **Is the 1st trip DTC P0172 or P0175 detected?**
   **Is it difficult to start engine?**

**Without CONSULT**

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure DTC 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 or 0209 detected?**
   **Is it difficult to start engine?**

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | Go to Trouble Diagnosis for "DTC P0172, P0175", EC-244. |
| No | ▶ | GO TO 4. |

| 4 | CHECK CONNECTOR FOR WATER |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector.
3. Check connectors for water.
   **Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair or replace harness or connectors. |

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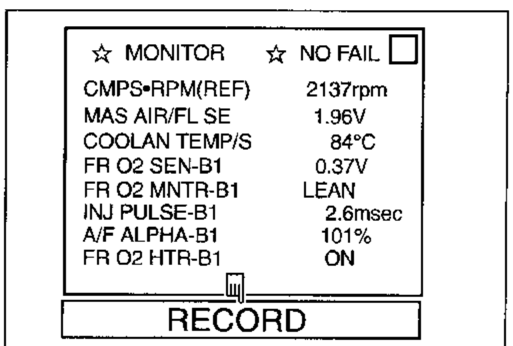
| 5 | CHECK COMPONENT |
|---|---|
| (Front heated oxygen sensor heater)<br>Refer to "Component Inspection", EC-199.<br>**OK or NG** | |
| OK ▶ | GO TO 6. |
| NG ▶ | Replace corresponding front heated oxygen sensor. |

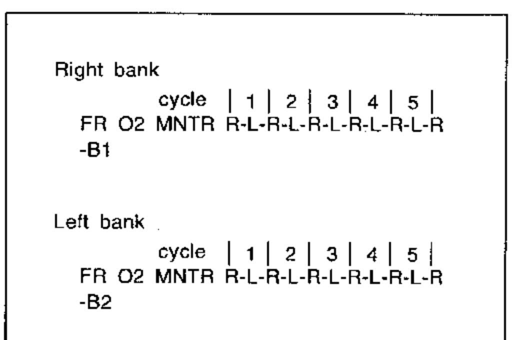
| 6 | CHECK COMPONENT |
|---|---|
| (Front heated oxygen sensor)<br>Refer to "Component Inspection", EC-176.<br>**OK or NG** | |
| OK ▶ | GO TO 7. |
| NG ▶ | Replace corresponding front heated oxygen sensor. |

| 7 | CHECK SHIELD CIRCUIT |
|---|---|
| 1. Remove joint connector.<br>For circuit, refer to "DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (CIRCUIT)", EC-158.<br>2. Check the following.<br>● Continuity between joint connector terminal and ground<br>● Joint connector<br>(Refer to "HARNESS LAYOUT" in EL section.)<br>**Continuity should exist.**<br>If OK, check harness for short to ground and short to power. Then reconnect joint connector.<br>**OK or NG** | |
| OK ▶ | GO TO 8. |
| NG ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.<br>For circuit, refer to "DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (CIRCUIT)", EC-158. | |
| ▶ | **INSPECTION END** |



SEF365V



SEF920U

## Component Inspection

NBEC0409

### FRONT HEATED OXYGEN SENSOR

NBEC0409S01

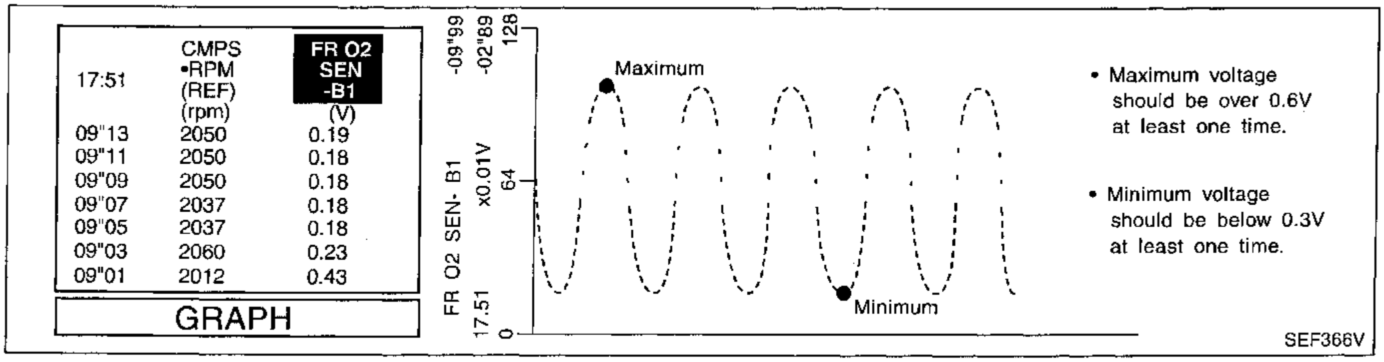
**With CONSULT**

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 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
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.

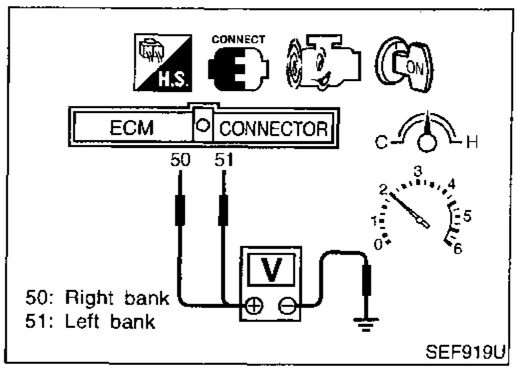
- "FR O2 MNTR-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown left:
  R = "FR O2 MNTR-B1 (-B2)", "RICH"
  L = "FR O2 MNTR-B1 (-B2)", "LEAN"
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1 (-B2)" voltage never exceeds 1.0V.

**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.**




SEF366V




SEF919U

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- MIL 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 0.3V at least one time.
- The voltage never exceeds 1.0V.

**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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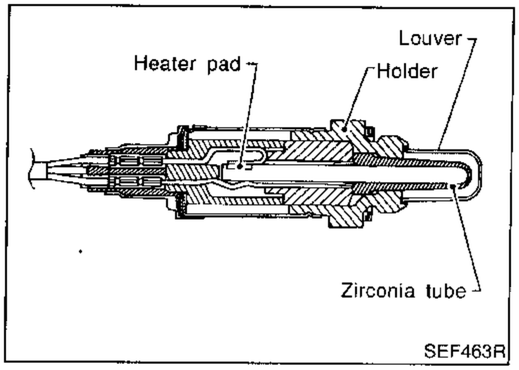

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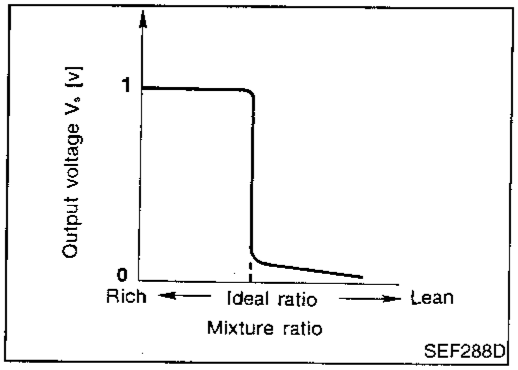


SEF288D

## Component Description

NBEC0410

The front heated oxygen sensor is placed into the front tube. 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

NBEC0411

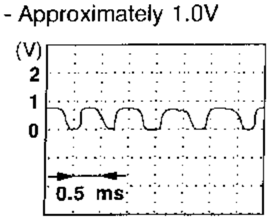
Specification data are reference values.

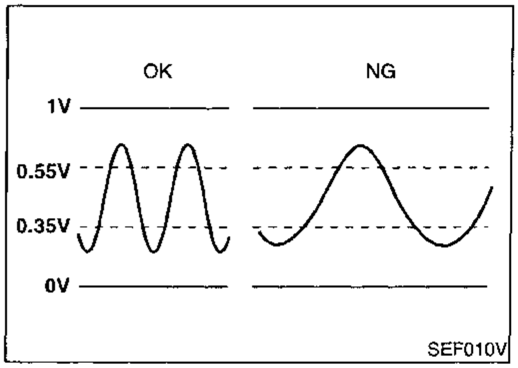
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| FR O2 SEN-B1<br>FR O2 SEN-B2 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| FR O2 MNTR-B1<br>FR O2 MNTR-B2 | | | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |

## ECM Terminals and Reference Value

NBEC0412

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 50 | W | Front heated oxygen sensor RH | **[Engine is running]**<br>• After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br>SEF002V |
| 51 | W | Front heated oxygen sensor LH | | |




## On Board Diagnosis Logic

NBEC0413

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.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0133<br>0413<br>(Right bank) | • The cycle of the voltage signal from the sensor is more than the specified time. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Front heated oxygen sensor<br>• Front heated oxygen sensor heater<br>• Fuel pressure<br>• Injectors<br>• Intake air leaks<br>• Exhaust gas leaks<br>• PCV valve<br>• Mass air flow sensor |
| P0153<br>0409<br>(Left bank) | | |

## DTC Confirmation Procedure

NBEC0414

**CAUTION:**

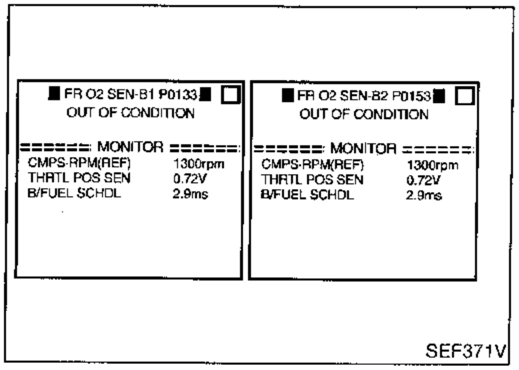
**Always drive vehicle at a safe speed.**

NOTE:

If "DTC 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 11V at idle.**
- **Never raise engine speed above 3,200 rpm during the "DTC Confirmation Procedure". If the engine speed limit is exceeded, retry the procedure from step 2.**



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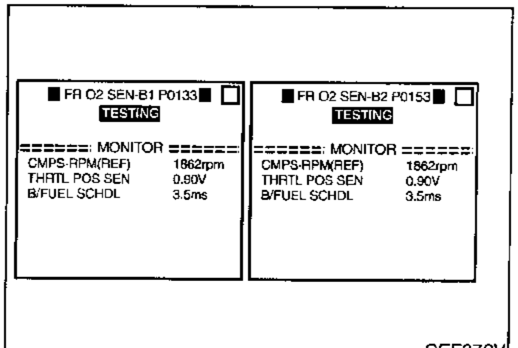
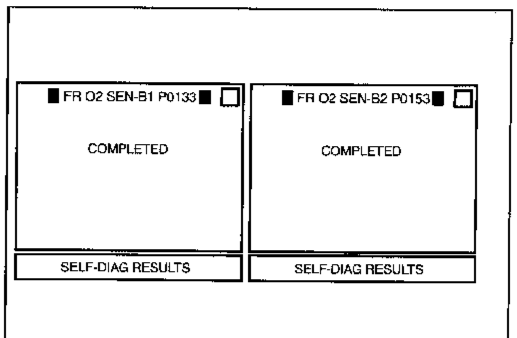


SEF372V



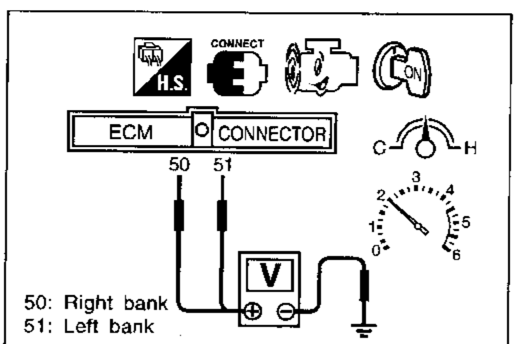
SEF535U

**With CONSULT**

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 "FR O2 SEN-B1 (-B2) P0133 (P0153)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 3.5 minutes.
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 40 to 50 seconds.)

   **CMPS·RPM (REF): 1,800 - 2,800 rpm**
   **Vehicle speed: 80 - 100 km/h (50 - 62 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.5 ms**
   **Selector lever: Suitable position**

   **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-183.



SEF919U

## Overall Function Check

NBEC0415

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.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- MIL goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).

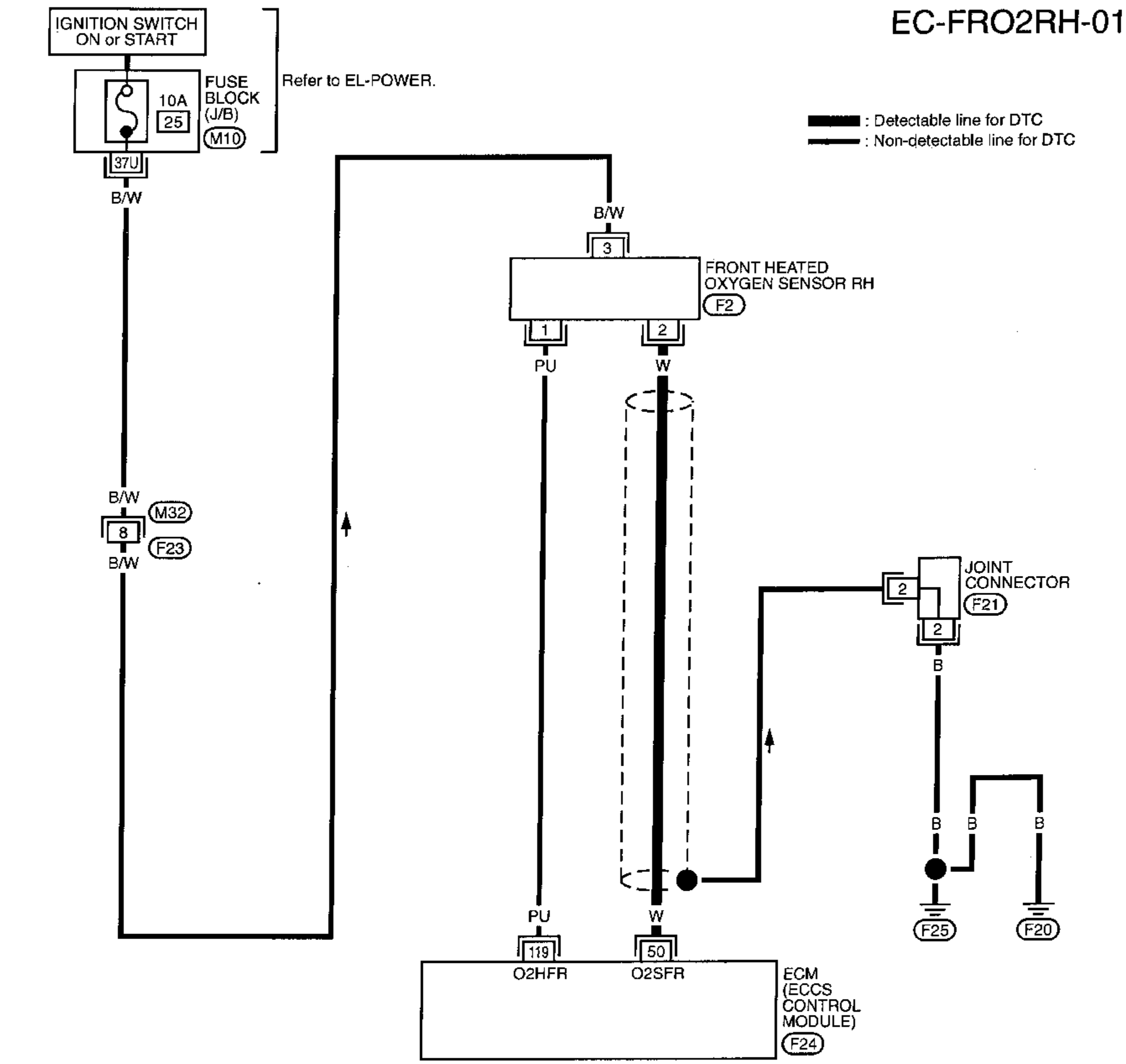
## Wiring Diagram

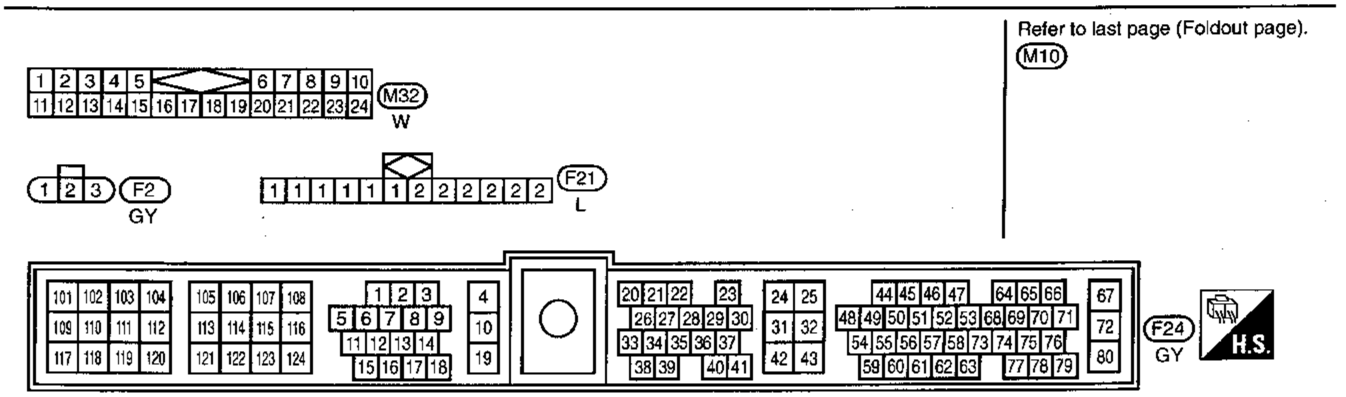
NBEC0416

### RIGHT BANK

NBEC0416S01



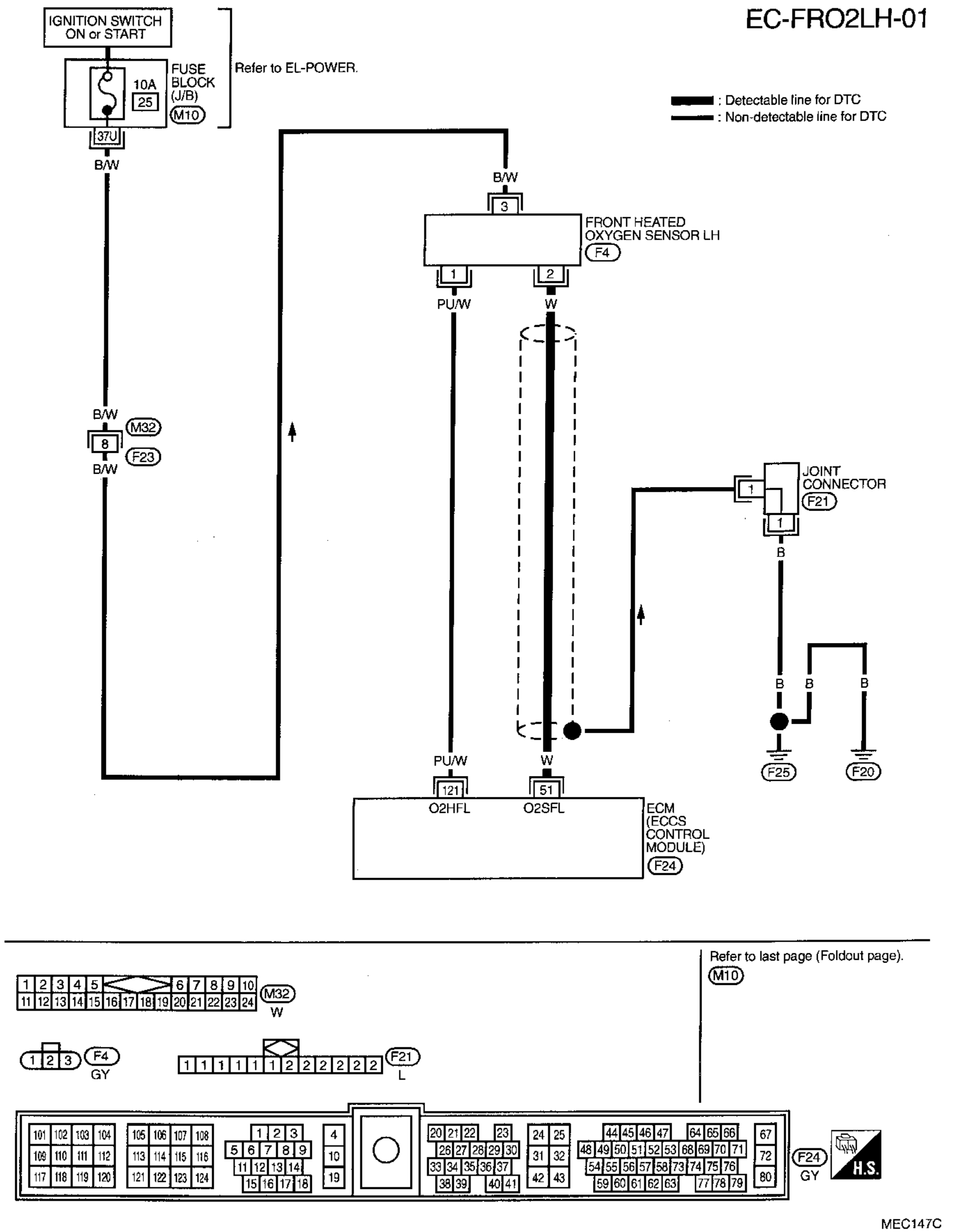



MEC143C

## LEFT BANK

NBEC0416S02



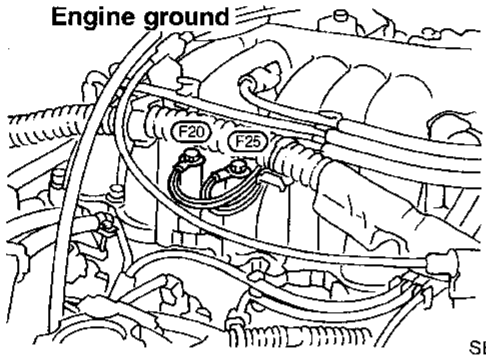

MEC147C

## Diagnostic Procedure

NBEC0417

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|

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

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| | |
|---|---|
| ▶ | GO TO 2. |

| 2 | RETIGHTEN FRONT HEATED OXYGEN SENSOR |
|---|---|

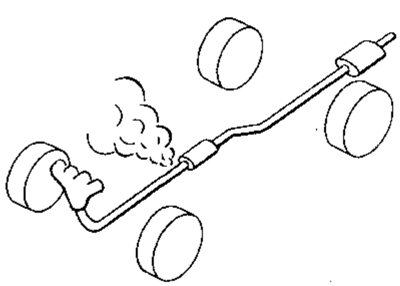
Loosen and retighten corresponding front heated oxygen sensor.

**Tightening torque:**
**40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)**

| | |
|---|---|
| ▶ | GO TO 3. |

| 3 | CHECK FOR EXHAUST AIR LEAK |
|---|---|

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.



SEF099P

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair or replace. |

| 4 | CHECK FOR INTAKE AIR LEAK |
|---|---|

Listen for an intake air leak after the mass air flow sensor.

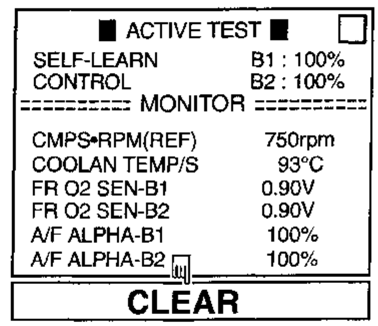
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair or replace. |

| 5 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT**

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".




SEF921U

4. Run engine for at least 10 minutes at idle speed.
   **Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?**
   **Is it difficult to start engine?**

**Without CONSULT**

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure DTC 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, 0115, 0209 or 0210 detected?**
   **Is it difficult to start engine?**

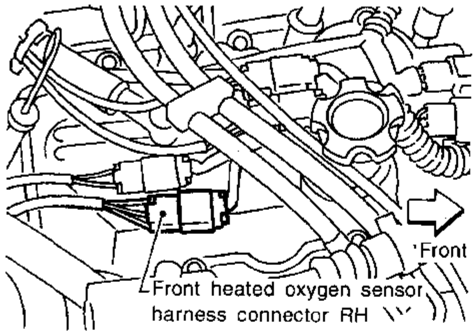
**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | Go to Trouble Diagnosis for "DTC P0171, P0174" or "P0172, P0175", EC-237, 244. |
| No | ▶ | GO TO 6. |

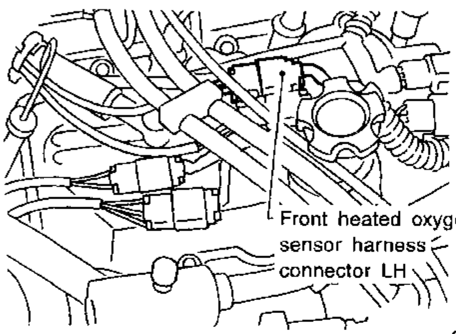
GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

| 6 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector.

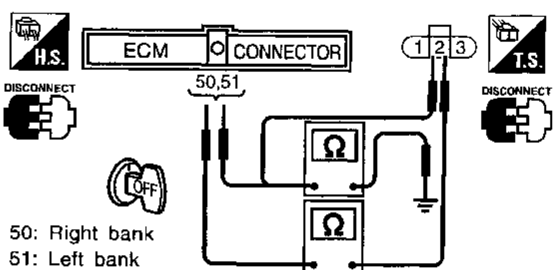



SEF987R




SEF994RB

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 50 or 51 and sensor terminal 2.
   **Continuity should exist.**
5. Check harness continuity between ECM terminal 50 or 51 (or sensor terminal 2) and ground.
   **Continuity should not exist.**




SEF695U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK COMPONENT |
|---|---|

(Front heated oxygen sensor heater)
Refer to "Component Inspection", EC-199.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace corresponding front heated oxygen sensor. |

| 8 | CHECK COMPONENT |
|---|---|

(Mass air flow sensor)
Refer to "Component Inspection", EC-122.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace mass air flow sensor. |

| 9 | CHECK COMPONENT |
|---|---|

(PCV valve)
Refer to "Positive Crankcase Ventilation", EC-30.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace PCV valve. |

| 10 | CHECK COMPONENT |
|---|---|

(Front heated oxygen sensor)
Refer to "Component Inspection", EC-185.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace corresponding front heated oxygen sensor. |

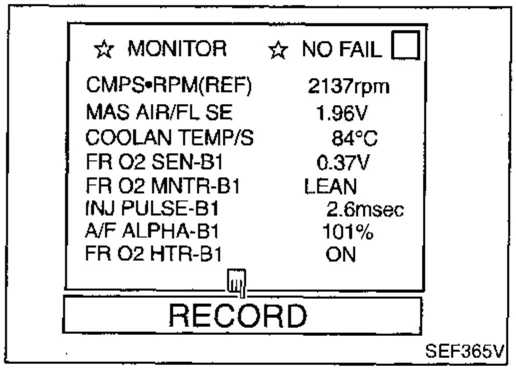
| 11 | CHECK SHIELD CIRCUIT |
|---|---|

1. Remove joint connector.
2. Check the following.
- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 12 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |



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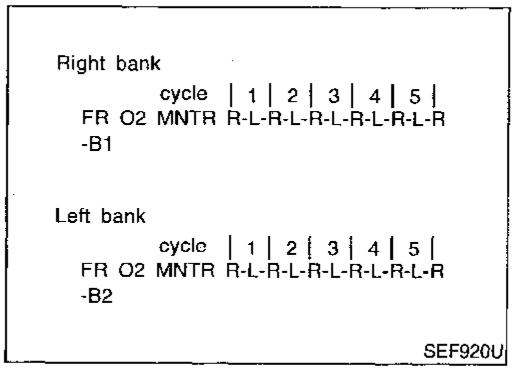


SEF920U

## Component Inspection

NBEC0418

### FRONT HEATED OXYGEN SENSOR

NBEC0418S01

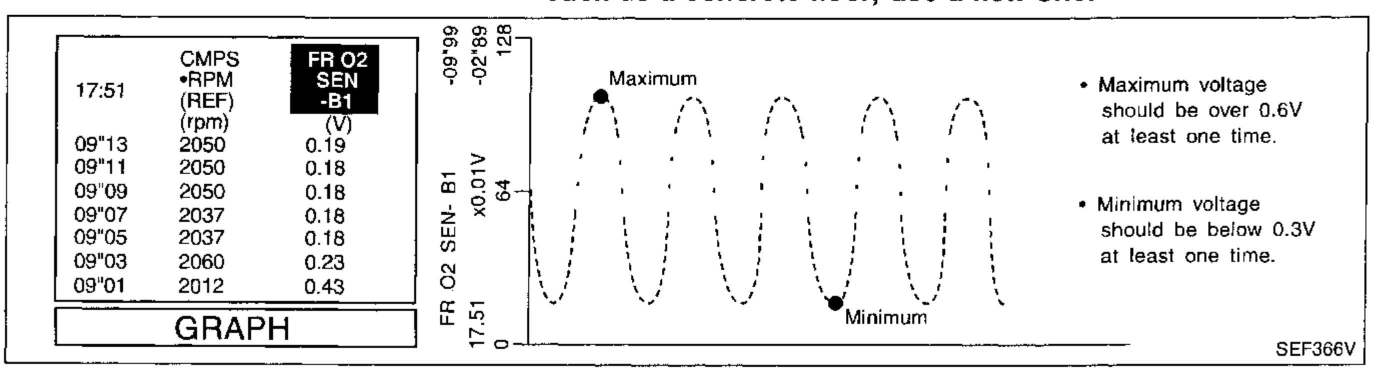
**With CONSULT**

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 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
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-B1 (-B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown left:
  R = "FR O2 MNTR-B1 (-B2)", "RICH"
  L = "FR O2 MNTR-B1 (-B2)", "LEAN"
- "FR O2 SEN-B1 (-B2)" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1 (-B2)" voltage goes below 0.3V at least once.
- "FR O2 SEN-B1 (-B2)" voltage never exceeds 1.0V.

**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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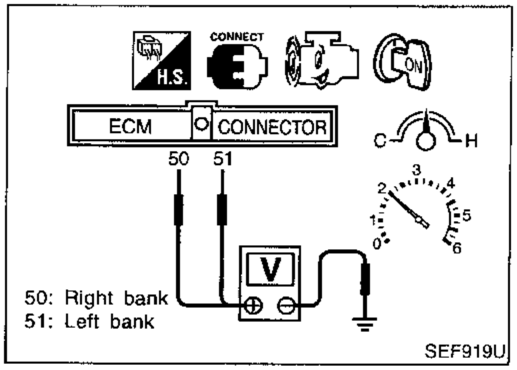


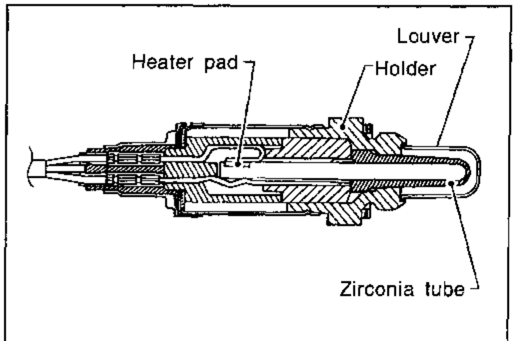

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

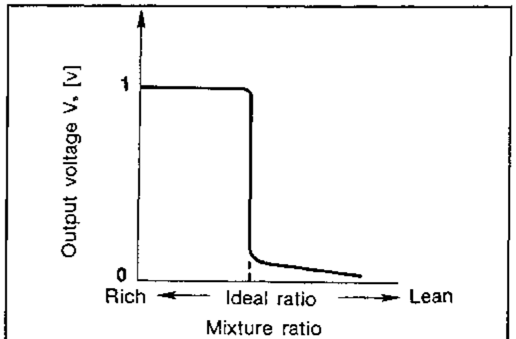
- MIL goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.
- The voltage never exceeds 1.0V.

**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.**



SEF463R



SEF288D

## Component Description

NBEC0419

The front heated oxygen sensor is placed into the front tube. 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

NBEC0420

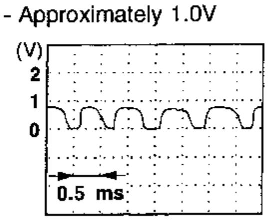
Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| FR O2 SEN-B1<br>FR O2 SEN-B2 | • Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| FR O2 MNTR-B1<br>FR O2 MNTR-B2 | | | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |

## ECM Terminals and Reference Value

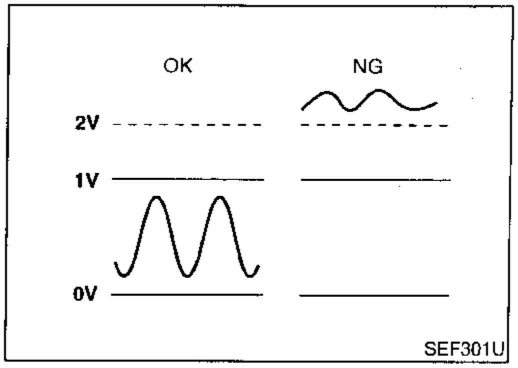
NBEC0421

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 50 | W | Front heated oxygen sensor RH | **[Engine is running]**<br>• After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V<br><br><br>SEF002V |
| 51 | W | Front heated oxygen sensor LH | | |

# DTC P0134 (RIGHT BANK, -B1), P0154 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (HIGH VOLTAGE)





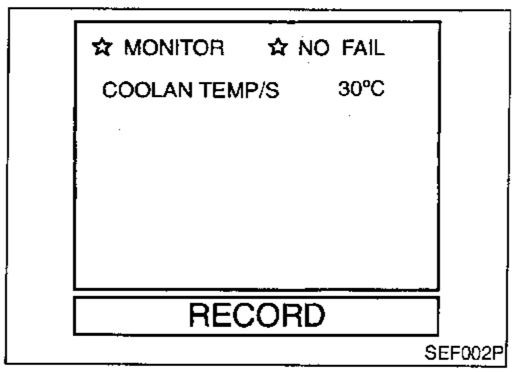
SEF301U

## On Board Diagnosis Logic

NBEC0422

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

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0134<br>0509<br>(Right bank) | • An excessively high voltage from the sensor is sent to ECM. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Front heated oxygen sensor |
| P0154<br>0412<br>(Left bank) | | |



SEF002P

## DTC Confirmation Procedure

NBEC0423

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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

**With GST**

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

**No Tools**

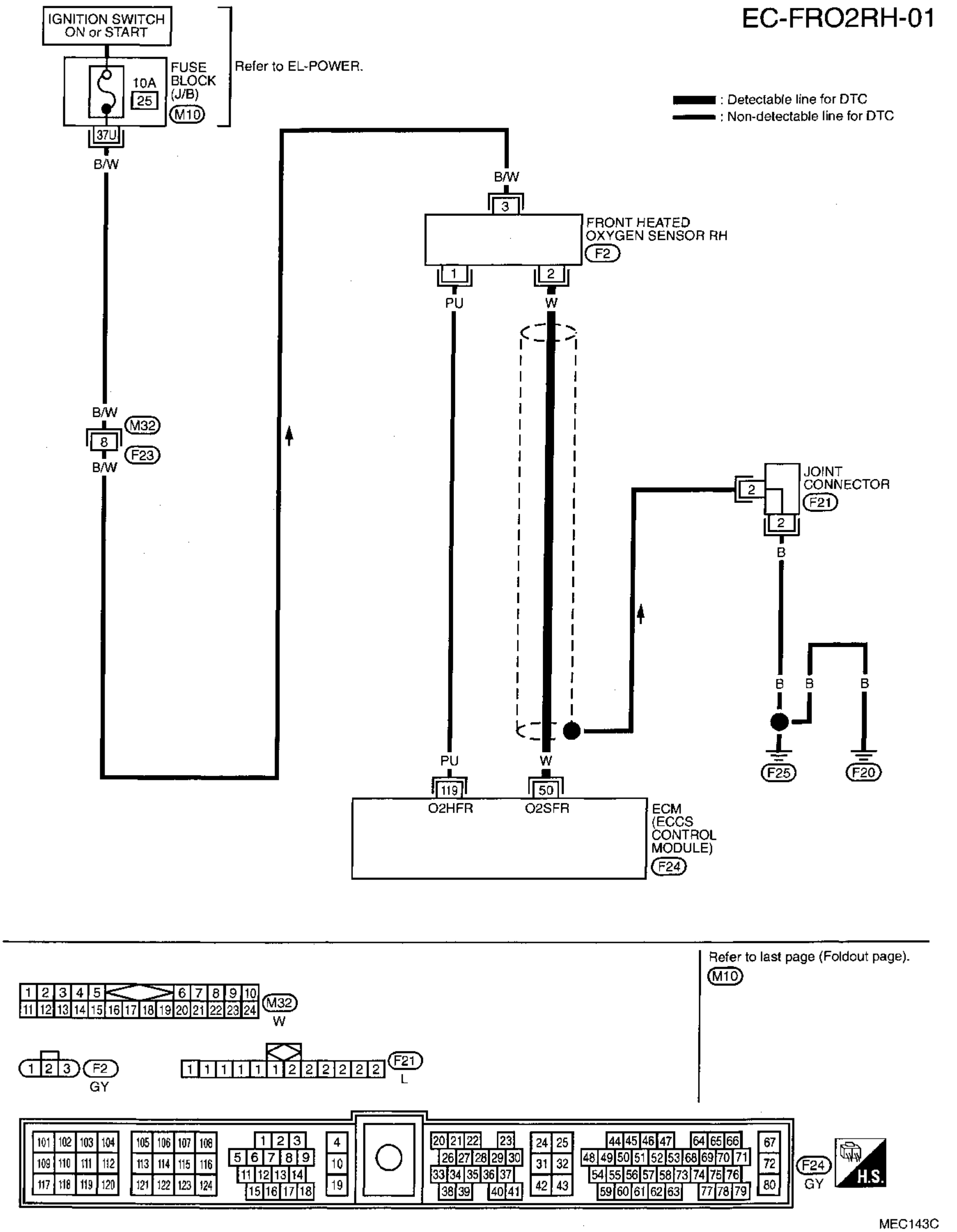
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF" and wait at least 5 seconds
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

## Wiring Diagram

NBEC0424

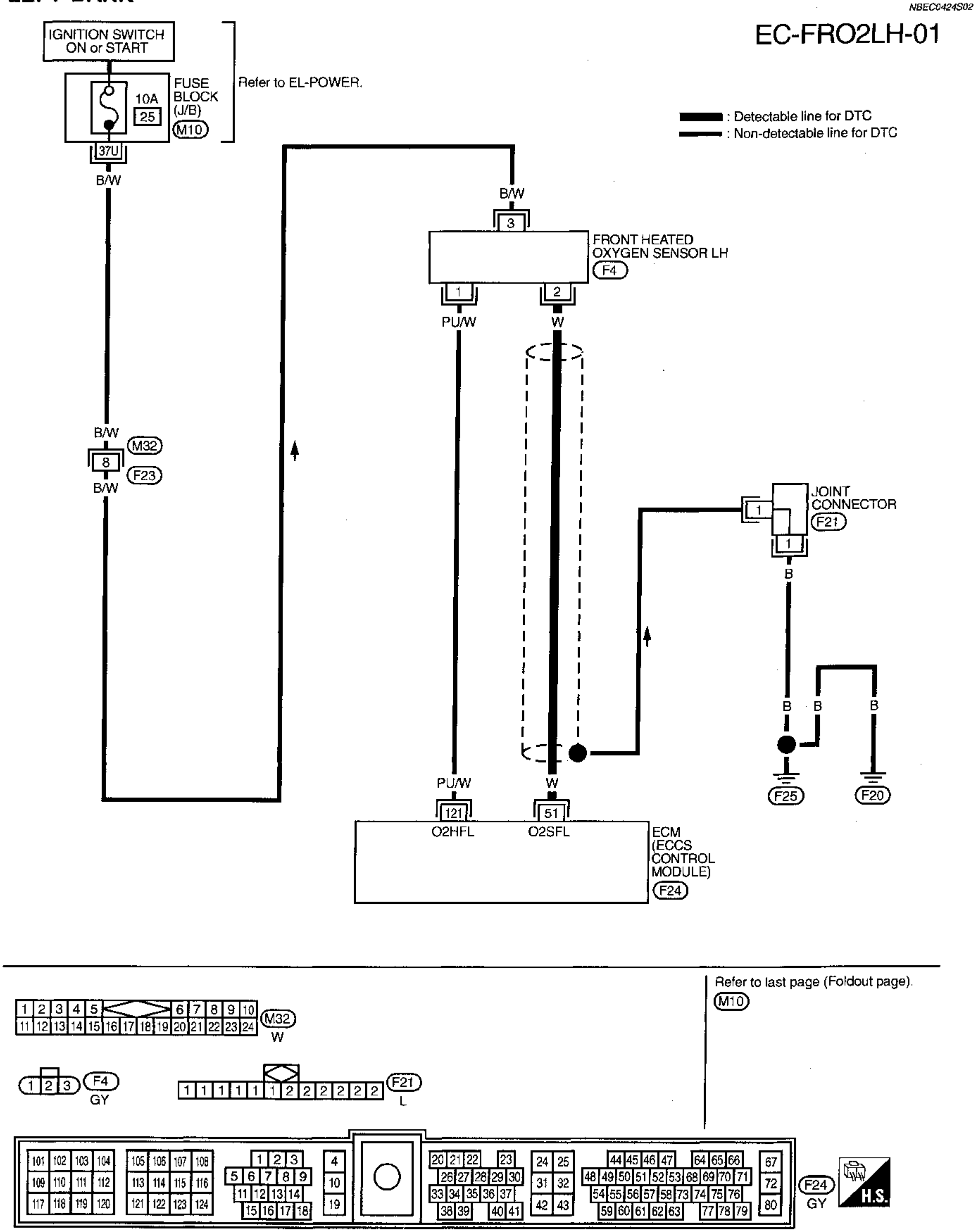
### RIGHT BANK

NBEC0424S01



## LEFT BANK

NBEC0424S02

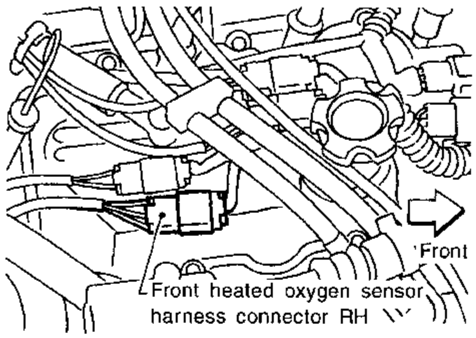



MEC147C

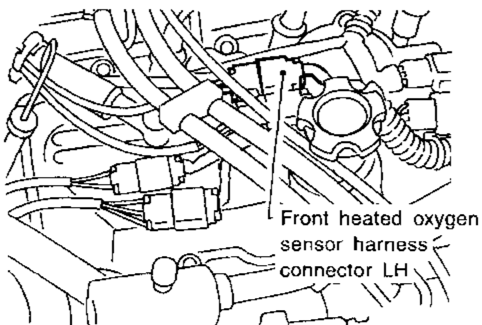
## Diagnostic Procedure

NBEC0425

| 1 | INSPECTION START |
|---|---|
| | 1. Turn ignition switch "OFF".<br>2. Disconnect corresponding front heated oxygen sensor harness connector. |



SEF987R

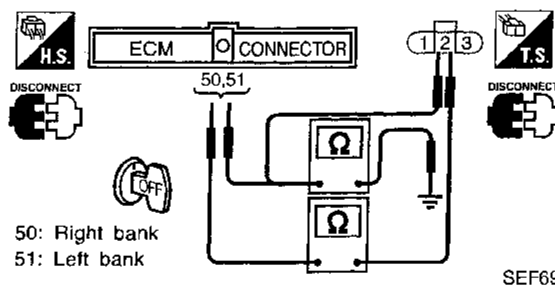


SEF994RB

| | |
|---|---|
| ▶ | GO TO 2. |

| 2 | RETIGHTEN FRONT HEATED OXYGEN SENSOR |
|---|---|
| | 1. Loosen and retighten corresponding front heated oxygen sensor.<br>**Tightening torque:**<br>**40 - 50 N·m (4.1 - 5.1 kg-m, 30 - 37 ft-lb)** |
| ▶ | GO TO 3. |

| 3 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|
| | 1. Disconnect ECM harness connector.<br>2. Check harness continuity between ECM terminal 50 or 51 and sensor terminal 2.<br>**Continuity should exist.**<br>3. Check harness continuity between ECM terminal 50 or 51 (or sensor terminal 2) and ground.<br>**Continuity should not exist.** |



SEF695U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK CONNECTOR FOR WATER |
|---|---|
| | 1. Disconnect front heated oxygen sensor harness connector.<br>2. Check connectors for water.<br>**Water should not exist.** |

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair or replace harness or connectors. |

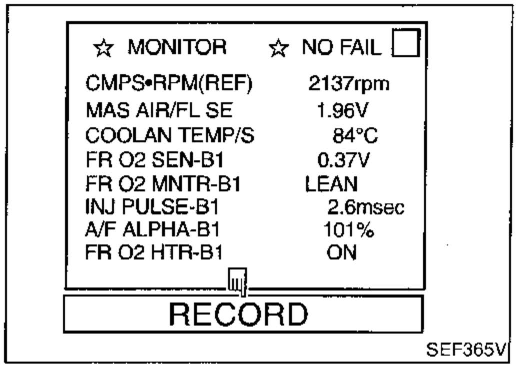
| 5 | CHECK COMPONENT |
|---|---|
| | (Front heated oxygen sensor)<br>Refer to "Component Inspection", EC-192. |

**OK or NG**

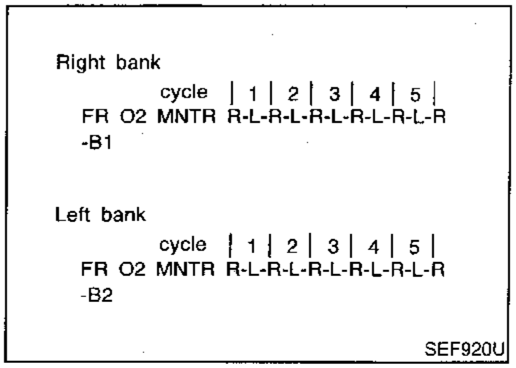
| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace corresponding front heated oxygen sensor. |

| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|
| | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. |
| ▶ | **INSPECTION END** |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX



SEF365V



SEF920U

## Component Inspection

NBEC0426

### FRONT HEATED OXYGEN SENSOR

NBEC0426S01

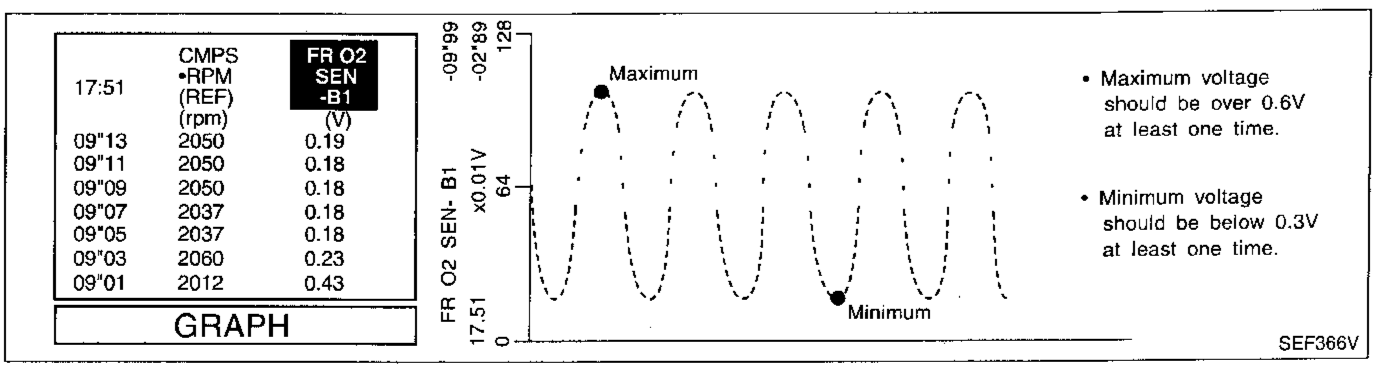
**With CONSULT**

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 SEN-B1 (-B2)” and “FR O2 MNTR-B1 (-B2)”.
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.

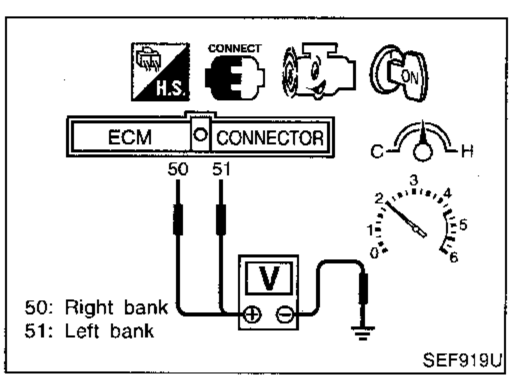
- “FR O2 MNTR-B1 (-B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
  5 times (cycles) are counted as shown left:
  R = “FR O2 MNTR-B1 (-B2)”, “RICH”
  L = “FR O2 MNTR-B1 (-B2)”, “LEAN”
- “FR O2 SEN-B1 (-B2)” voltage goes above 0.6V at least once.
- “FR O2 SEN-B1 (-B2)” voltage goes below 0.3V at least once.
- “FR O2 SEN-B1 (-B2)” voltage never exceeds 1.0V.

**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.**



SEF366V



SEF919U

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- MIL 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 0.3V at least one time.
- The voltage never exceeds 1.0V.

**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.**

# Description

NBEC0427

## SYSTEM DESCRIPTION

NBEC0427S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Front heated oxygen sensor heater control | Front heated oxygen sensor heaters |

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

## OPERATION

NBEC0427S02

| Engine speed rpm | Front heated oxygen sensor heaters |
|---|---|
| Above 3,200 | OFF |
| Below 3,200 | ON |

# CONSULT Reference Value in Data Monitor Mode

NBEC0428

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| FR O2 HTR-B1<br>FR O2 HTR-B2 | • Engine speed: Idle | ON |
| | • Engine speed: Above 3,200 rpm | OFF |

# ECM Terminals and Reference Value

NBEC0429

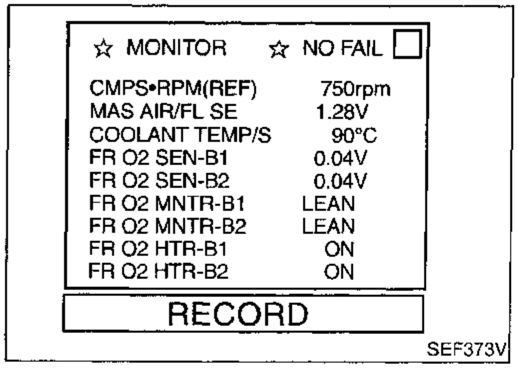
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 119 (Right bank) | PU | Front heated oxygen sensor heater | **[Engine is running]**<br>• Engine speed is below 3,200 rpm | Approximately 0.4V |
| 121 (Left bank) | PU/W | | **[Engine is running]**<br>• Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |

# On Board Diagnosis Logic

NBEC0430

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0135<br>0901<br>(Right bank) | • The current amperage in the front heated oxygen sensor heater circuit is out of the normal range.<br>(An improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.) | • Harness or connectors<br>(The front heated oxygen sensor heater circuit is open or shorted.)<br>• Front heated oxygen sensor heater |
| P0155<br>1001<br>(Left bank) | | |



SEF373V

## DTC Confirmation Procedure

*NBEC0431*

NOTE:
If "DTC 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.**

**With CONSULT**

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.

**With GST**

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 6 seconds at idle speed.
4) Select "MODE 3" with GST.

**No Tools**

1) Start engine and run it for at least 6 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.

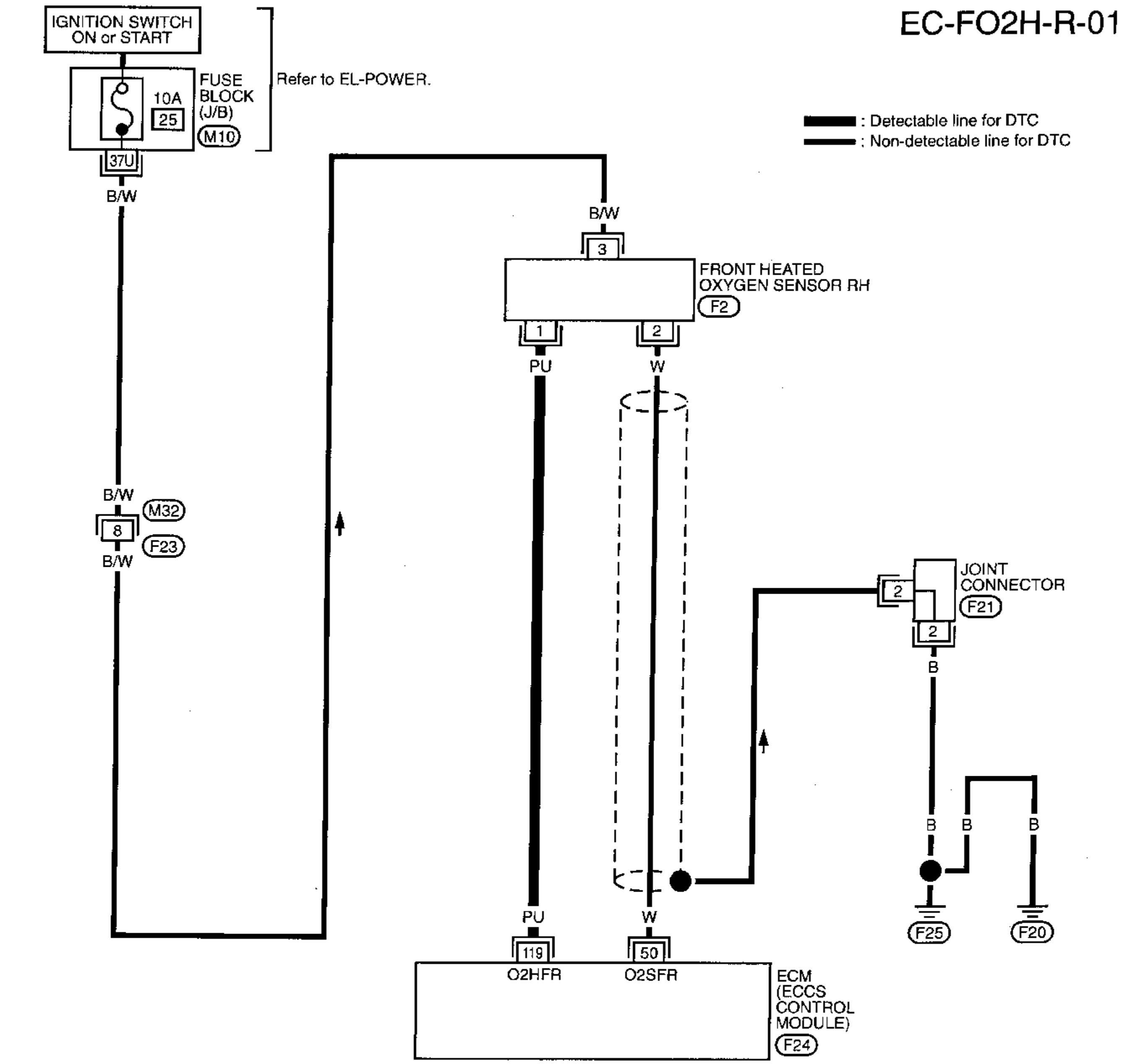
- **When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.**

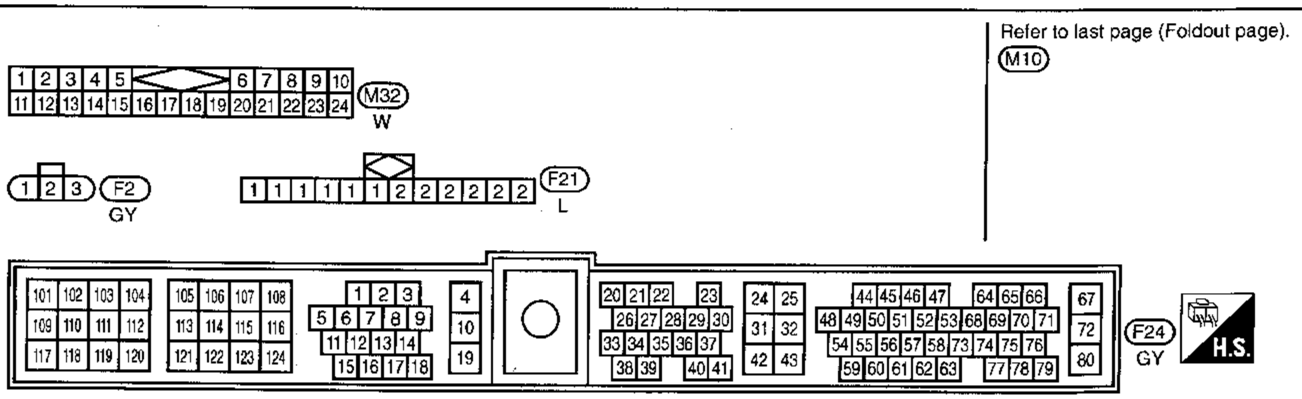
## Wiring Diagram

NBEC0432

### RIGHT BANK

NBEC0432S01

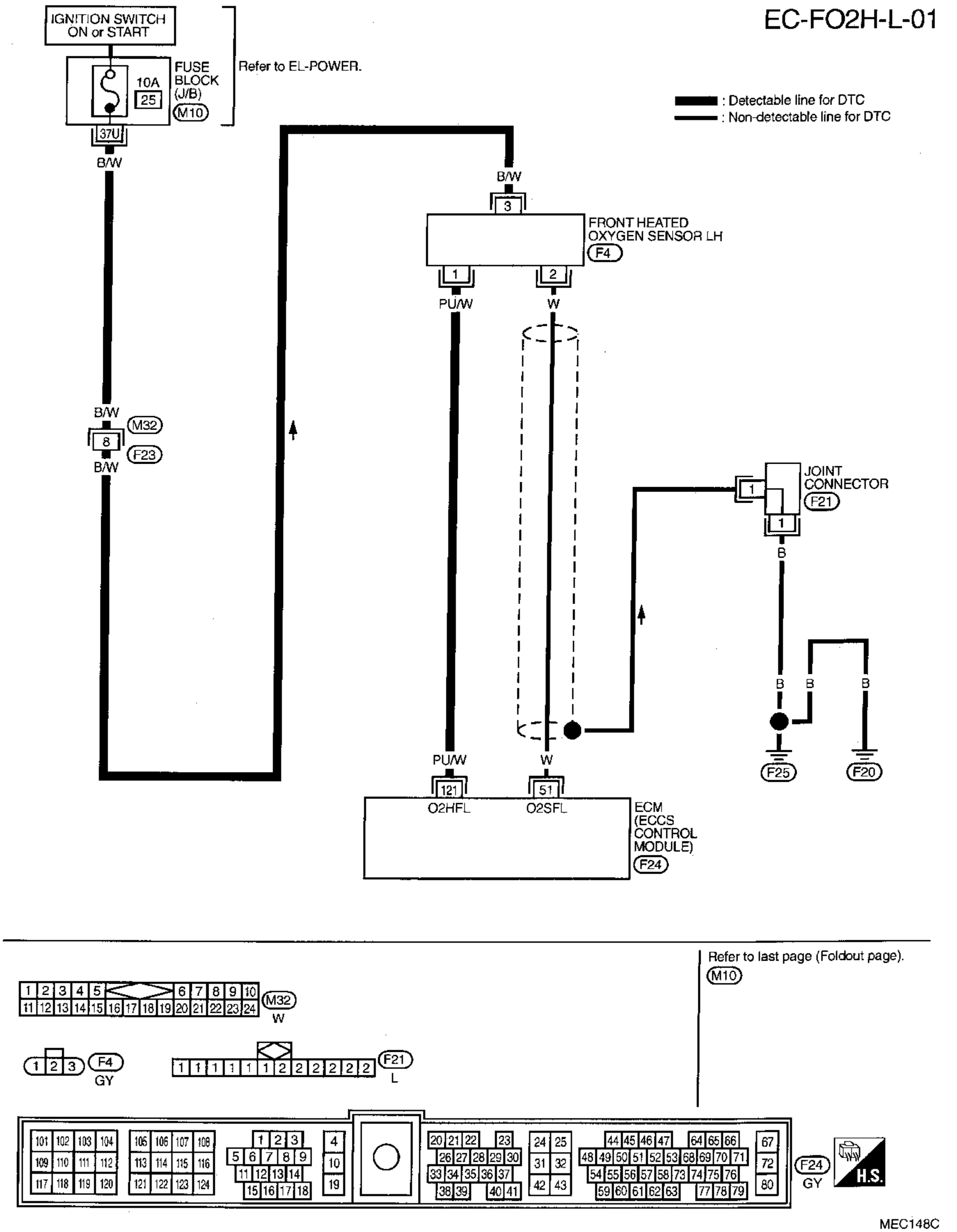



MEC144C

## LEFT BANK

NBEC0432S02

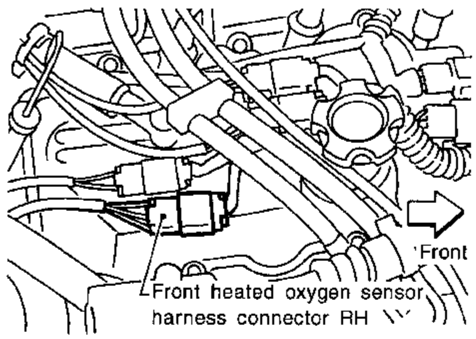


## Diagnostic Procedure

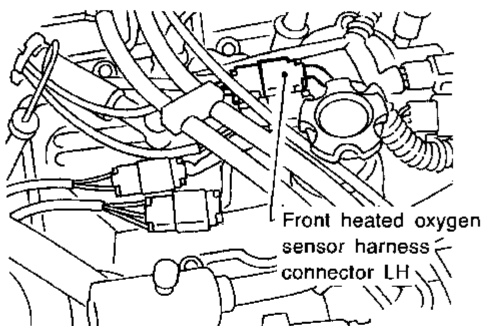
NBEC0433

### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector.

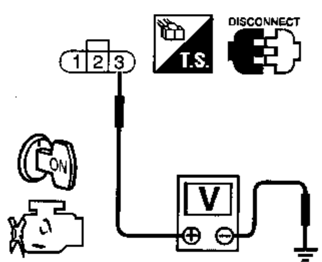



SEF987R




SEF994RB

3. Turn ignition switch "ON".
4. Check voltage between terminal 3 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF696U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

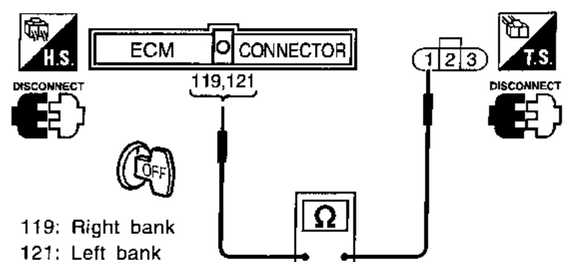
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F23, M32
- Harness connector M10
- 10A fuse
- Harness for open or short between front heated oxygen sensor and fuse

| | |
|---|---|
| ▶ | Repair harness or connectors. |

### 3 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal 1 and ECM terminal 119 or 121.
   **Continuity should exist.**




SEF697U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 CHECK COMPONENT

(Front heated oxygen sensor heater)
Refer to "Component Inspection", EC-199.

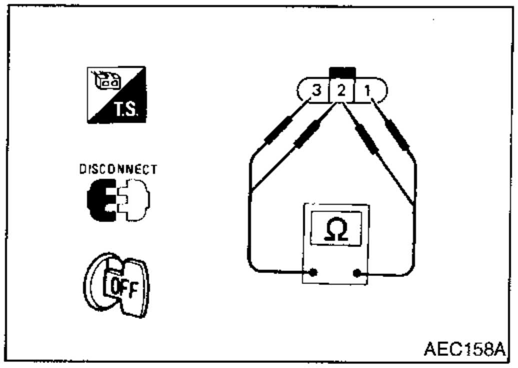
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace corresponding front heated oxygen sensor. |

### 5 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | **INSPECTION END** |



AEC158A

## Component Inspection

NBEC0434

### FRONT HEATED OXYGEN SENSOR HEATER

NBEC0434S01

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.**

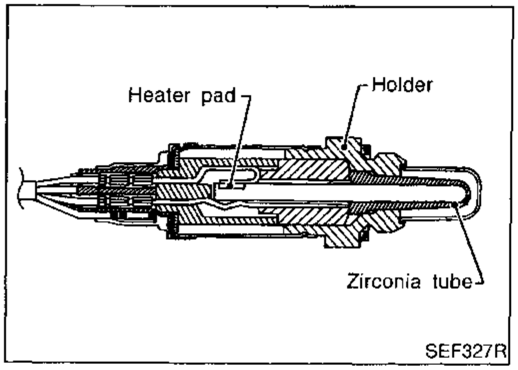
If NG, replace the front heated oxygen sensor.

**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.**

# DTC P0137 (RIGHT BANK, -B1), P0157 (LEFT BANK, -B2) REAR HEATED OXYGEN SENSOR (REAR HO2S) (MIN. VOLTAGE MONITORING)





SEF327R

## Component Description

NBEC0105

The rear heated oxygen sensor, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
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

NBEC0106

Specification data are reference values.

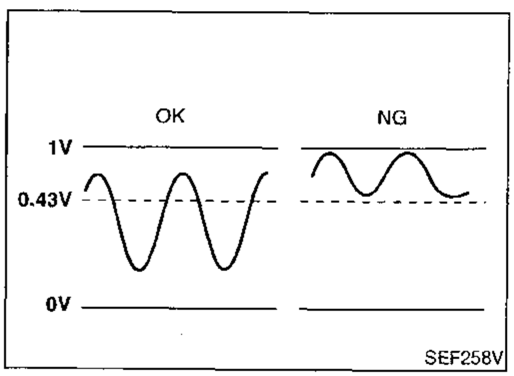
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| RR O2 SEN-B1<br>RR O2 SEN-B2 | • Engine: After warming up | Revving engine from idle up to 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| RR O2 MNTR-B1<br>RR O2 MNTR-B2 | | | LEAN ←→ RICH |

## ECM Terminals and Reference Value

NBEC0107

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 56 (Right bank) | L/W | Rear heated oxygen sensor | **[Engine is running]**<br>• **Warm-up condition**<br>• Revving engine from idle up to 2,000 rpm | 0 - Approximately 1.0V |
| 57 (Left bank) | W | | | |



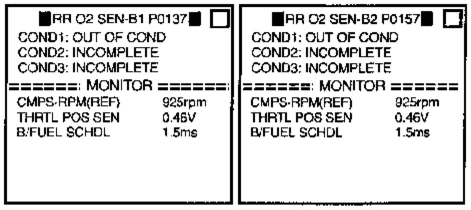
SEF258V

## On Board Diagnosis Logic

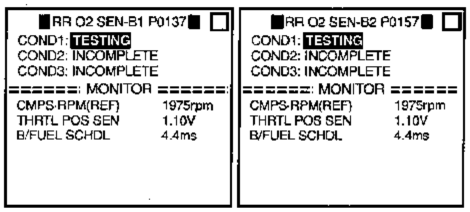
NBEC0108

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 the malfunctions of rear heated oxygen sensor, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.

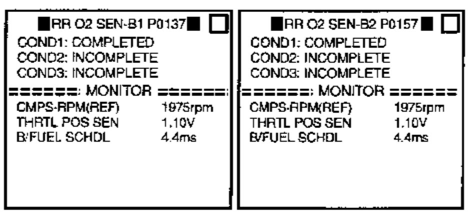
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0137<br>0511<br>(Right bank) | • The minimum voltage from the sensor is not reached to the specified voltage. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Rear heated oxygen sensor<br>• Fuel pressure<br>• Injectors |
| P0157<br>0314<br>(Left bank) | | |



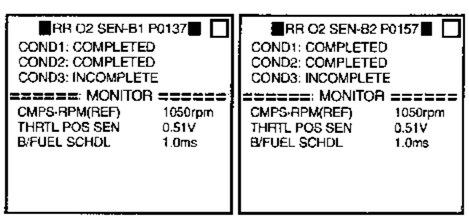
SEF374V



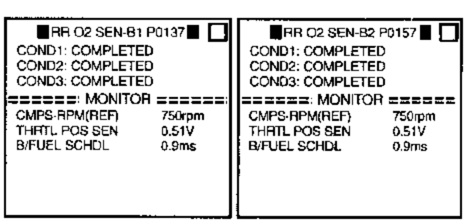
SEF375V



SEF376V



SEF377V



SEF378V

## DTC Confirmation Procedure

NBEC0435

**CAUTION:**

**Always drive vehicle at a safe speed.**

**TESTING CONDITION:**

- **Never stop engine during this test. If the engine is stopped, reperform this test from step 2 in "Procedure for COND1".**
- **Always perform at a temperature of more than −10°C (14°F).**

NOTE:

- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- **"COMPLETED" will appear on CONSULT screen when all tests "COND1", "COND2" and "COND3" are completed.**

**With CONSULT**

**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 SEN-B1 (-B2) P0137 (P0157)" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 30 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 2 in "Procedure for COND 3".
   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 60 seconds.)
   **CMPS·RPM (REF): 1,300 - 2,800 rpm**
   **Vehicle speed: 64 - 120 km/h (40 - 75 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.4 ms**
   **Selector lever: Suitable position**

NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND 1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct "Procedure for COND2".**

**Procedure for COND2**

1) While driving, release accelerator pedal completely with "OD" OFF from the above condition (step 7) until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:

**If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**

GI
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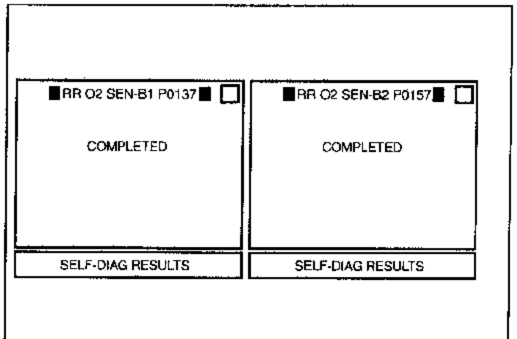



SEF553U

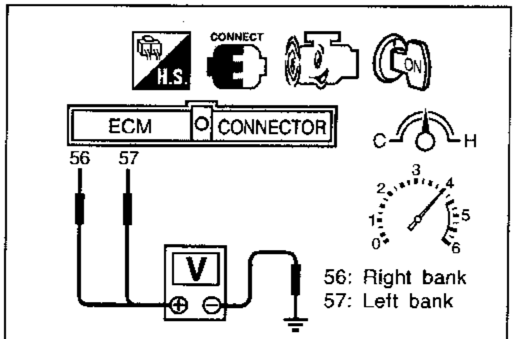
**Procedure for COND3**

1) 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 in "Procedure for COND1".**

2) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-205.




SEF922U

## Overall Function Check

NBEC0109

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.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine 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 below 0.43V 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.
   **The voltage should be below 0.43V at least once during this procedure.**

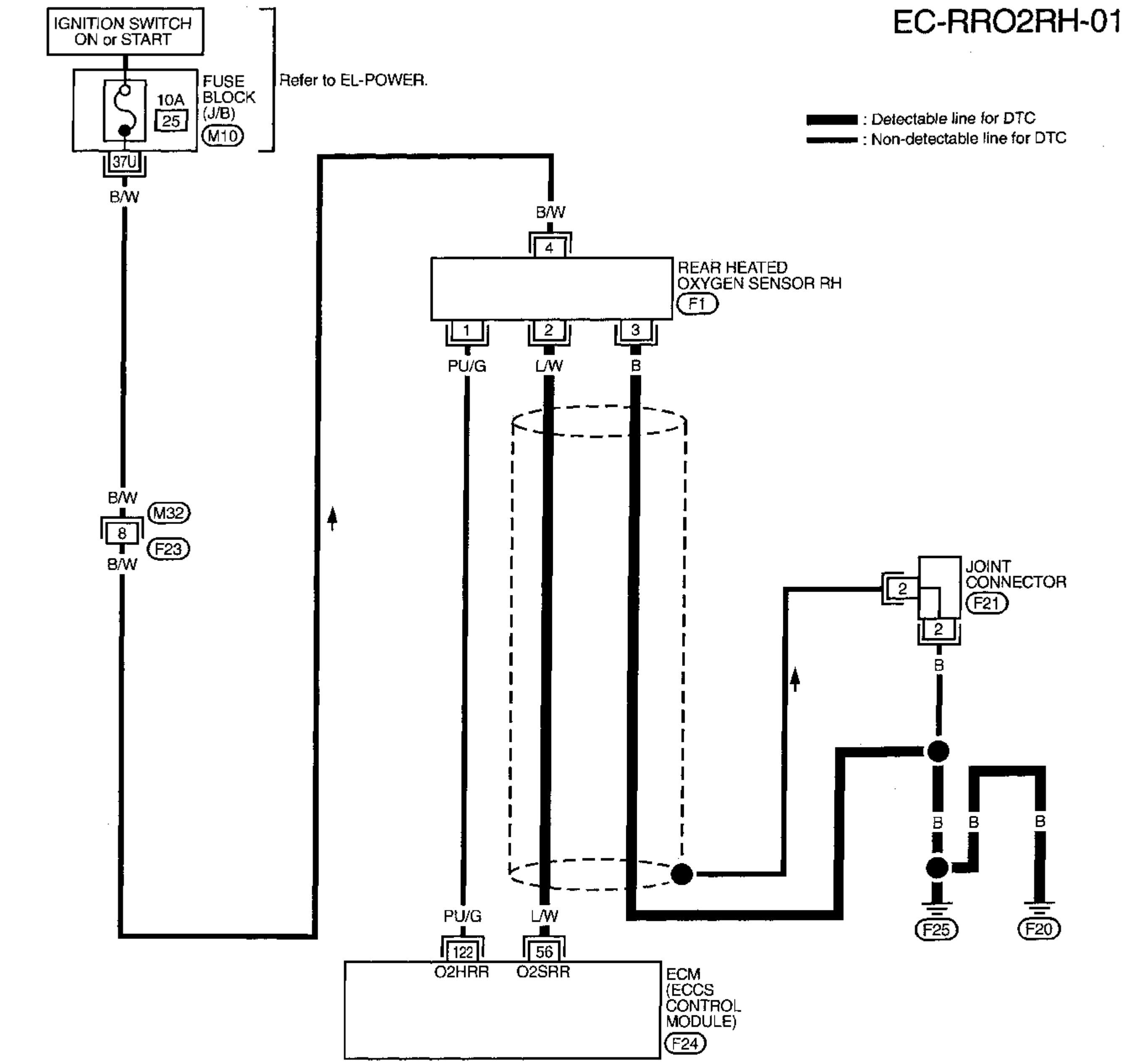
## Wiring Diagram

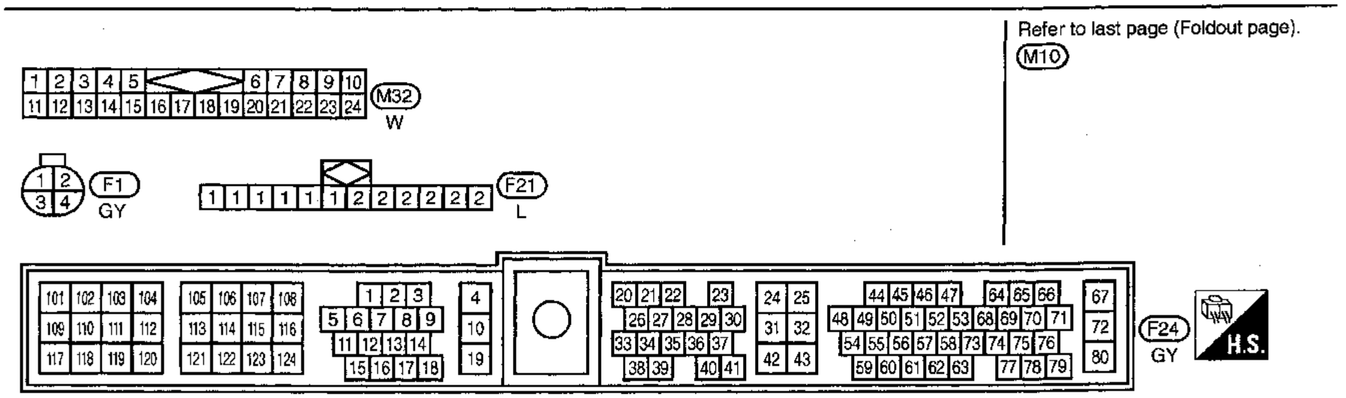
NBEC0110

### RIGHT BANK

NBEC0110S01

EC-RRO2RH-01



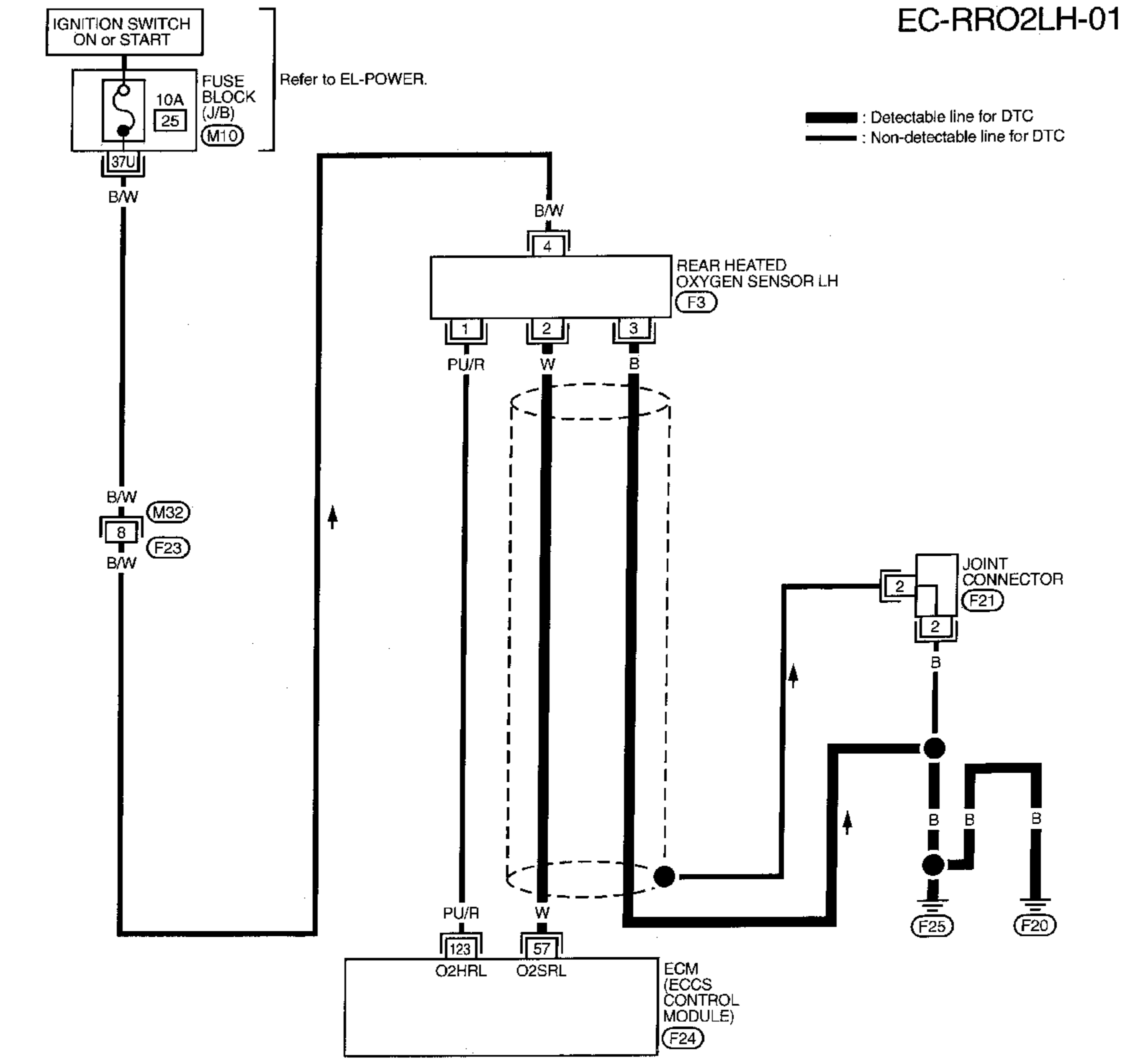



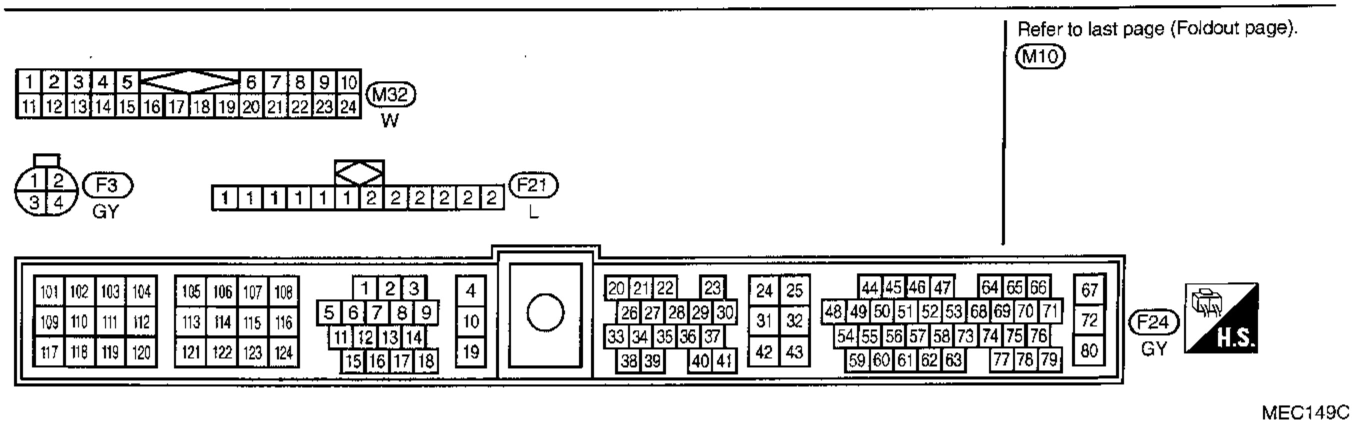

MEC145C

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## LEFT BANK

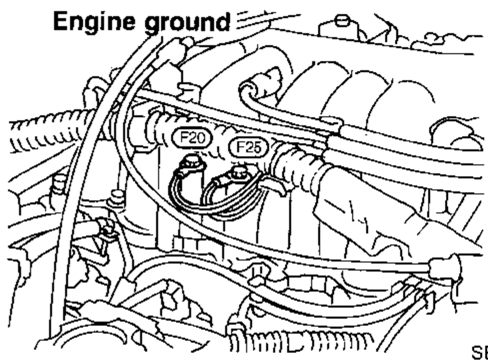
NBEC0110S02

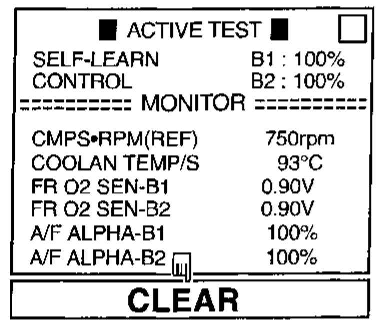


## Diagnostic Procedure

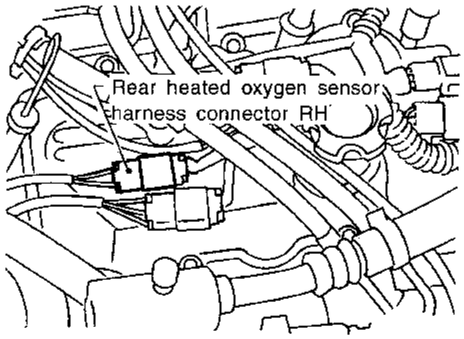
NBEC0111

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Loosen and retighten engine ground screws.<br><br>SEF031S | |
| ▶ | GO TO 2. |

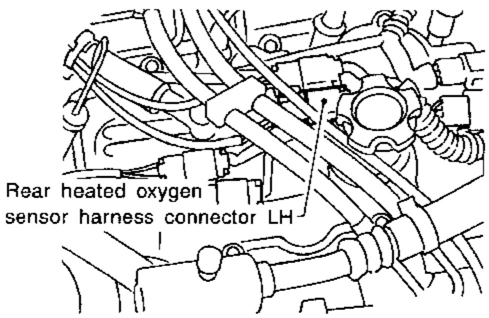
| 2 | CLEAR THE SELF-LEARNING DATA | |
|---|---|---|
| **With CONSULT**<br>1. Start engine and warm it up to normal operating temperature.<br>2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.<br>3. Clear the self-learning control coefficient by touching "CLEAR".<br><br>SEF921U<br>4. Run engine for at least 10 minutes at idle speed.<br>**Is the 1st trip DTC P0171 or P0174 detected?**<br>**Is it difficult to start engine?** | | |
| **Without CONSULT**<br>1. Start engine and warm it up to normal operating temperature.<br>2. Turn ignition switch "OFF".<br>3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.<br>4. Stop engine and reconnect mass air flow sensor harness connector.<br>5. Make sure DTC No. 0102 is displayed in Diagnostic Test Mode II.<br>6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure DTC No. 0505 is displayed in Diagnostic Test Mode II.<br>7. Run engine for at least 10 minutes at idle speed.<br>**Is the 1st trip DTC 0115 or 0210 detected?**<br>**Is it difficult to start engine?** | | |
| **Yes or No** | | |
| Yes | ▶ | Go to Trouble Diagnosis for "DTC P0171, P0174", EC-237. |
| No | ▶ | GO TO 3. |

| 3 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect corresponding rear heated oxygen sensor harness connector and ECM harness connector.

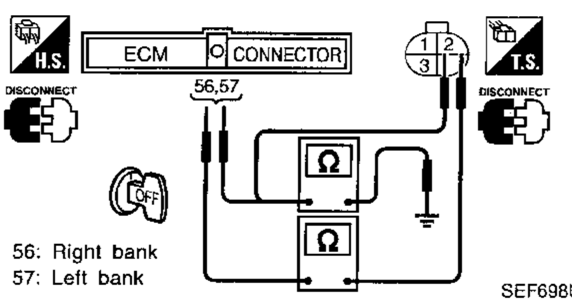



SEF990R




SEF992RB

3. Check harness continuity between ECM terminal 56 or 57 and sensor terminal 2.
   **Continuity should exist.**
4. Check harness continuity between ECM terminal 56 or 57 (or sensor terminal 2) and ground.
   **Continuity should not exist.**




SEF698U

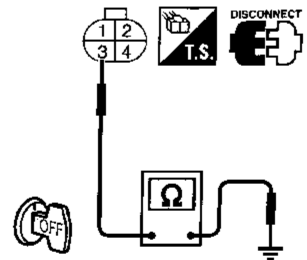
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK GROUND CIRCUIT |
|---|---|

1. Check harness continuity between terminal 3 and engine ground.
   **Continuity should exist.**




SEF699U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 5 | CHECK COMPONENT |
|---|---|

(Rear heated oxygen sensor)
Refer to "Component Inspection", EC-207.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace corresponding rear front heated sensor. |

| 6 | CHECK SHIELD CIRCUIT |
|---|---|

1. Remove joint connector.
2. Check the following.
- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

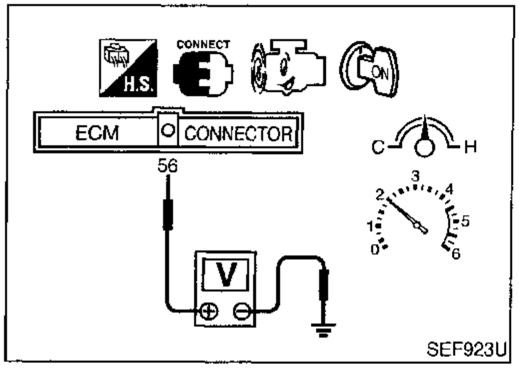
**OK or NG**

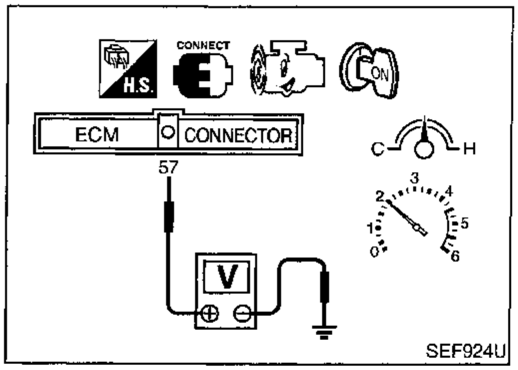
| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | **INSPECTION END** |




## Component Inspection

NBEC0436

### REAR HEATED OXYGEN SENSOR

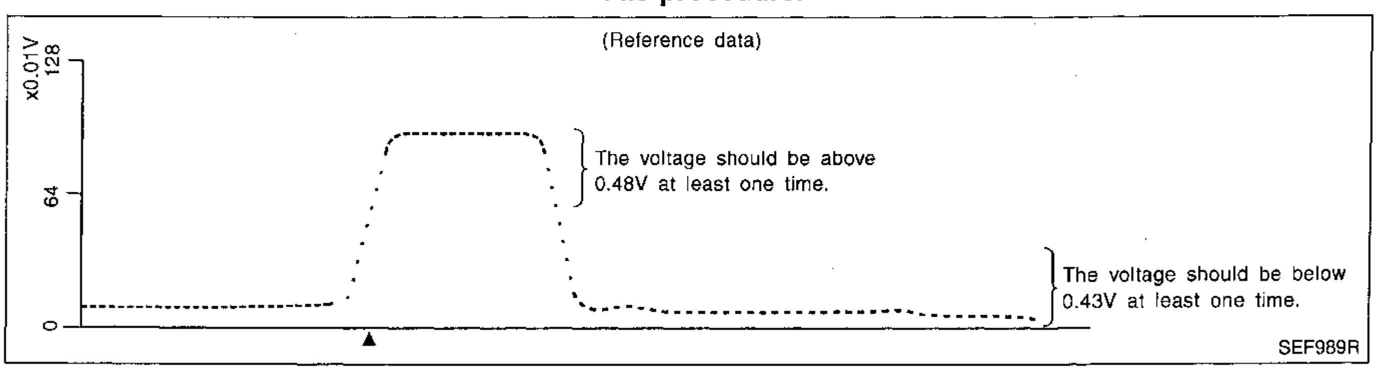
NBEC0436S01

**With CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
3) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   **"RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.**
   **"RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is –25%.**

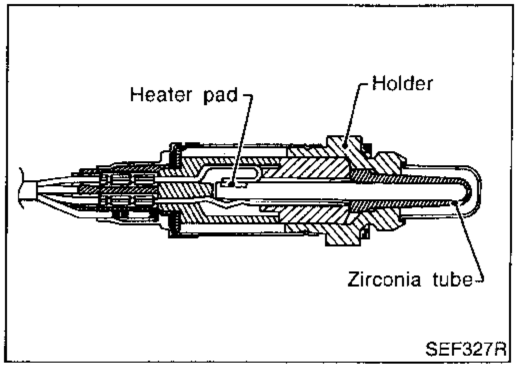
**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) engine 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 0.48V at least once during this procedure.**
   **If the voltage is above 0.48V at 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.
   **The voltage should be below 0.43V at least once during this procedure.**




**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.**



SEF327R

## Component Description

NBEC0437

The rear heated oxygen sensor, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
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

NBEC0438

Specification data are reference values.

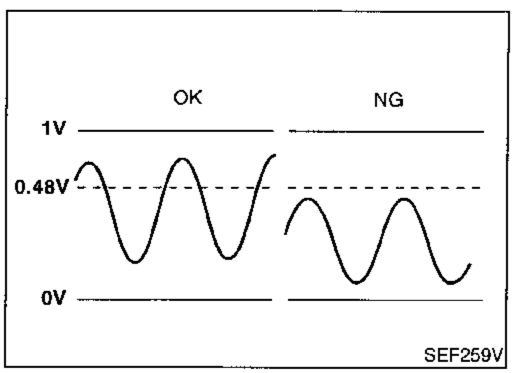
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| RR O2 SEN-B1<br>RR O2 SEN-B2 | • Engine: After warming up | Revving engine from idle up to 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| RR O2 MNTR-B1<br>RR O2 MNTR-B2 | | | LEAN ←→ RICH |

## ECM Terminals and Reference Value

NBEC0439

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 56 (Right bank) | L/W | Rear heated oxygen sensor | **[Engine is running]**<br>• **Warm-up condition**<br>• Revving engine from idle up to 2,000 rpm | 0 - Approximately 1.0V |
| 57 (Left bank) | W | | | |



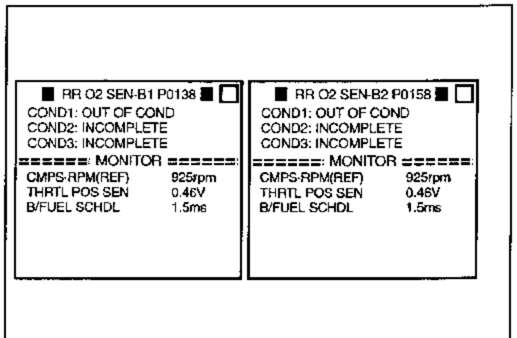
SEF259V

## On Board Diagnosis Logic

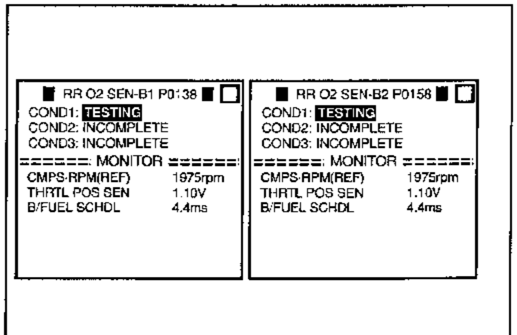
NBEC0440

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 the malfunctions of rear heated oxygen sensor, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.

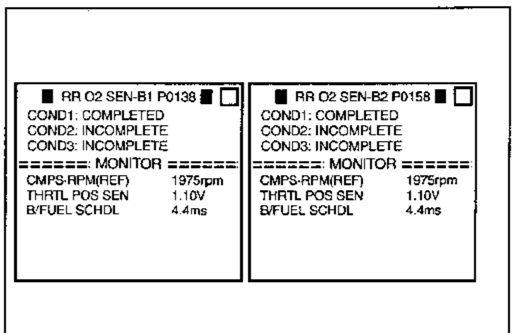
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0138<br>0510<br>(Right bank) | • The maximum voltage from the sensor is not reached to the specified voltage. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Rear heated oxygen sensor<br>• Fuel pressure<br>• Injectors<br>• Intake air leaks |
| P0158<br>0313<br>(Left bank) | | |



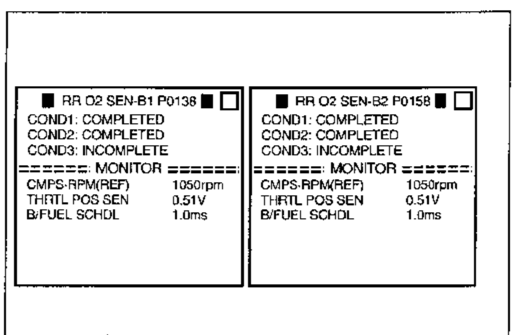
SEF379V



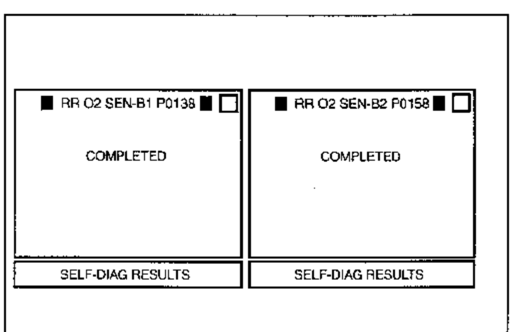
SEF380V



SEF381V



SEF382V



SEF559U

## DTC Confirmation Procedure

NBEC0441

**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 "DTC 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 in "Procedure for COND 1".**
- **Always perform at a temperature of more than −10°C (14°F).**

### With CONSULT

**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 SEN-B1 (-B2) P0138 (P0158)" of "RR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 30 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 2 in "Procedure for COND 3".
   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 60 seconds.)
   **CMPS·RPM (REF): 1,300 - 2,800 rpm**
   **Vehicle speed: 64 - 120 km/h (40 - 75 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.4 ms**
   **Selector lever: Suitable position**

NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct "Procedure for COND2".**

**Procedure for COND2**

1) While driving, release accelerator pedal completely with "OD" OFF from the above condition (step 7) until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:

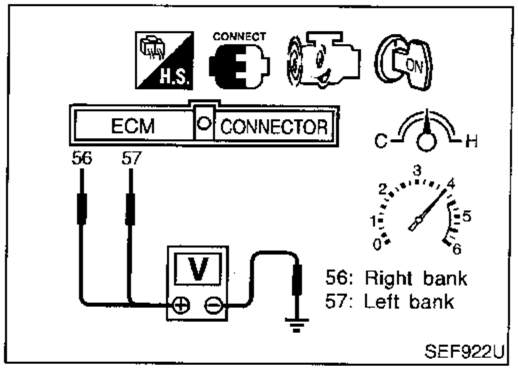
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".**

**Procedure for COND3**

1) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take maximum of approximately 6 minutes.)

NOTE:
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**

2) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
If "NG" is displayed, refer to "Diagnostic Procedure", EC-213.




## Overall Function Check

NBEC0442

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.

**Without CONSULT**

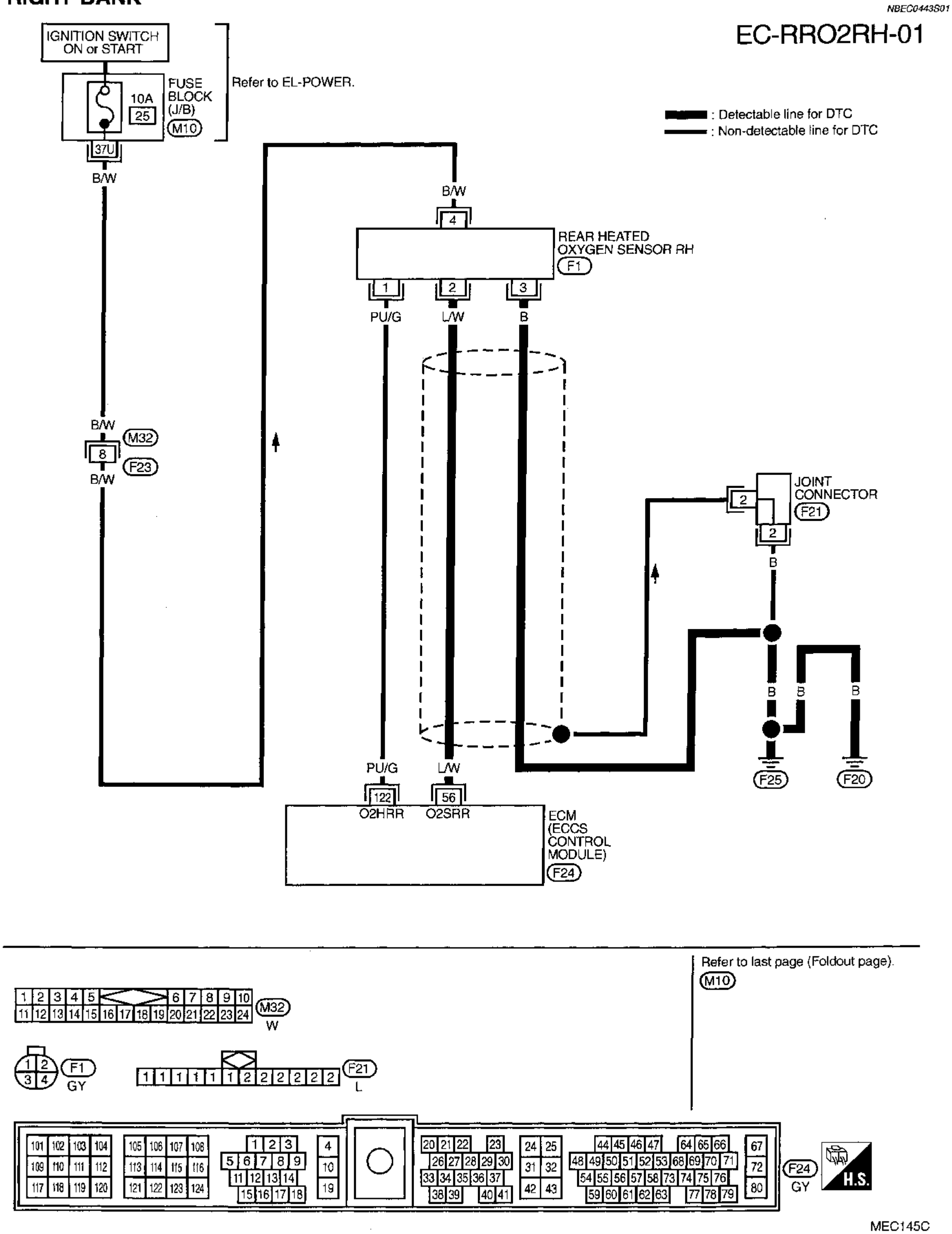
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(depress and release accelerator pedal as soon as possible)
**The voltage should be above 0.48V 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.
**The voltage should be above 0.48V at least once during this procedure.**

## Wiring Diagram

NBEC0443

### RIGHT BANK

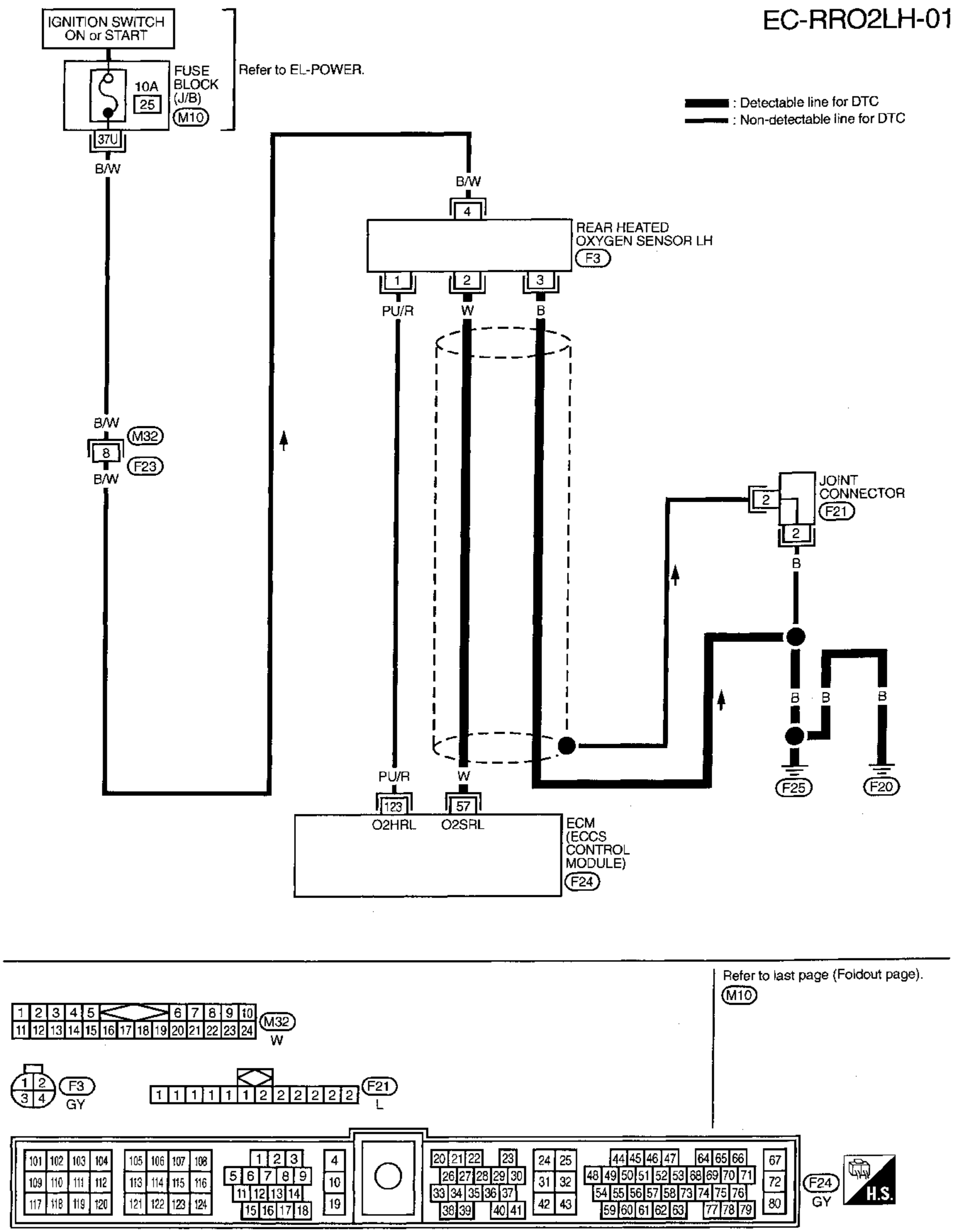
NBEC0443S01




GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## LEFT BANK

NBEC0443S02

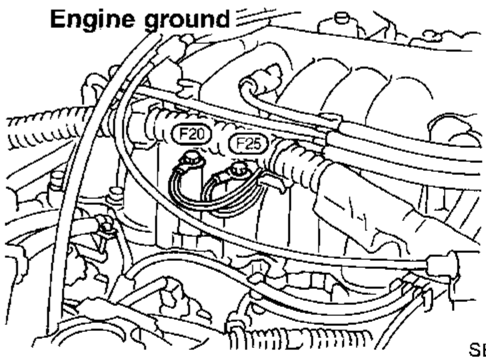



MEC149C

## Diagnostic Procedure

NBEC0444

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|
| | 1. Turn ignition switch "OFF".<br>2. Loosen and retighten engine ground screws. |



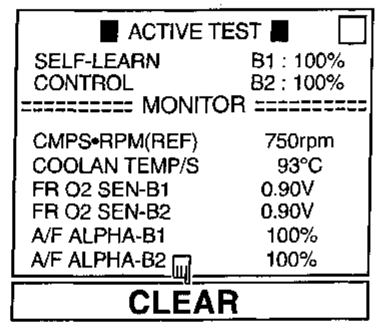

SEF031S

| | |
|---|---|
| ► | GO TO 2. |

| 2 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT**

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".




SEF921U

4. Run engine for at least 10 minutes at idle speed.
   **Is the 1st trip DTC P0172 or P0175 detected?**
   **Is it difficult to start engine?**

**Without CONSULT**

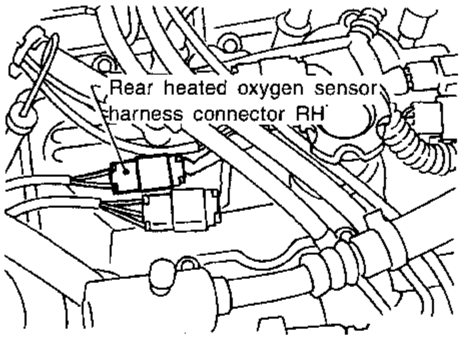
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure DTC No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure DTC 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 or 0209 detected?**
   **Is it difficult to start engine?**

**Yes or No**

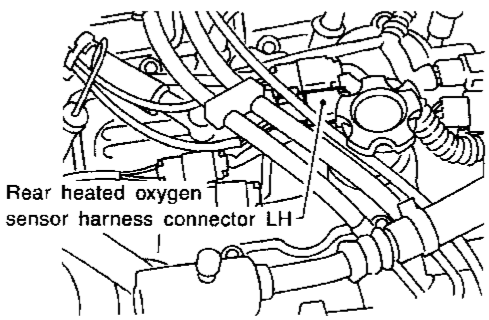
| | | |
|---|---|---|
| Yes | ► | Go to Trouble Diagnosis for "DTC P0172, P0175", EC-244. |
| No | ► | GO TO 3. |

## 3 CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect corresponding rear heated oxygen sensor harness connector and ECM harness connector.

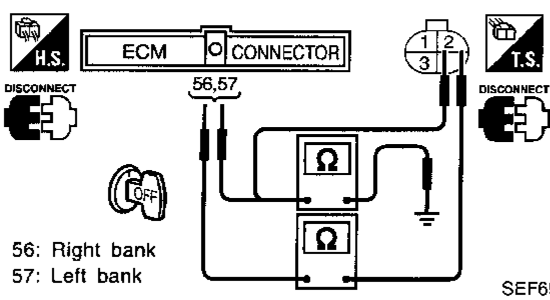



SEF990R




SEF992RB

3. Check harness continuity between ECM terminal 56 or 57 and sensor terminal 2.
   **Continuity should exist.**
4. Check harness continuity between ECM terminal 56 or 57 (or sensor terminal 2) and ground.
   **Continuity should not exist.**




SEF698U

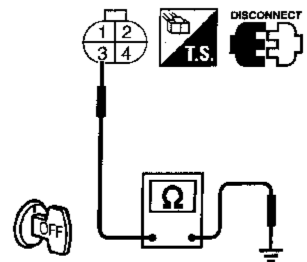
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 4 CHECK GROUND CIRCUIT

1. Check harness continuity between terminal 3 and engine ground.
   **Continuity should exist.**




SEF699U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 5 CHECK COMPONENT

(Rear heated oxygen sensor)
Refer to "Component Inspection", EC-215.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace corresponding rear front heated sensor. |

## 6 CHECK SHIELD CIRCUIT

1. Remove joint connector.
2. Check the following.

- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

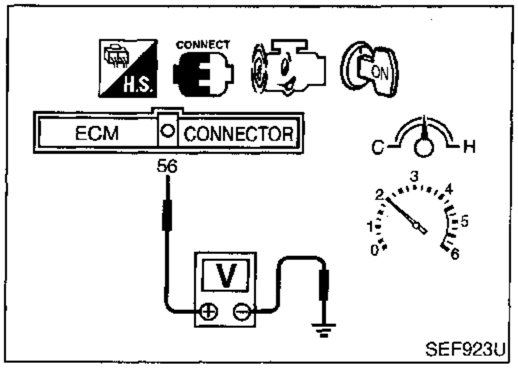
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

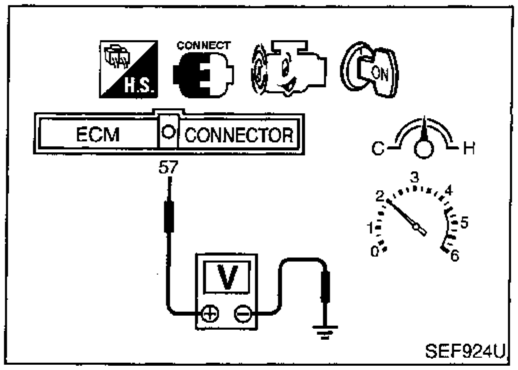
## 7 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | **INSPECTION END** |



SEF923U



SEF924U

## Component Inspection

NBEC0445

### REAR HEATED OXYGEN SENSOR

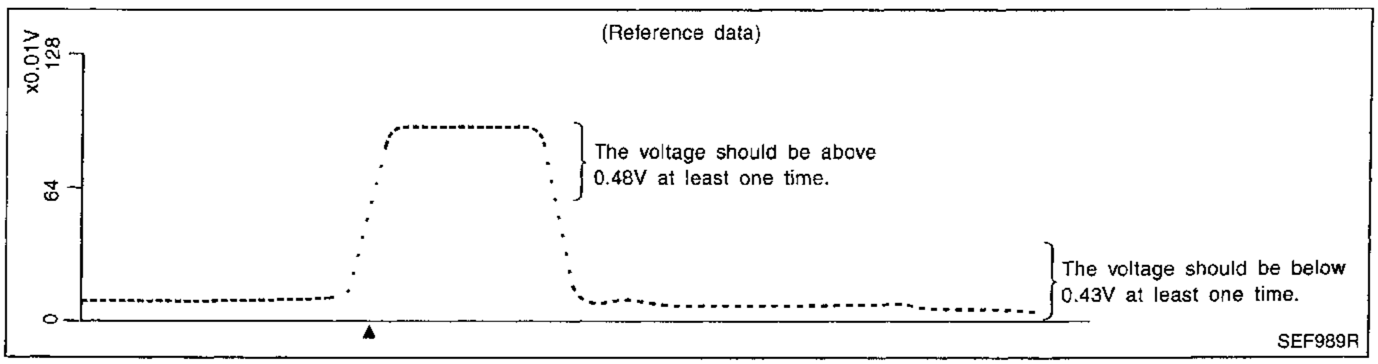
NBEC0445S01

**With CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
3) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   **"RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.**
   **"RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is −25%.**

**Without CONSULT**

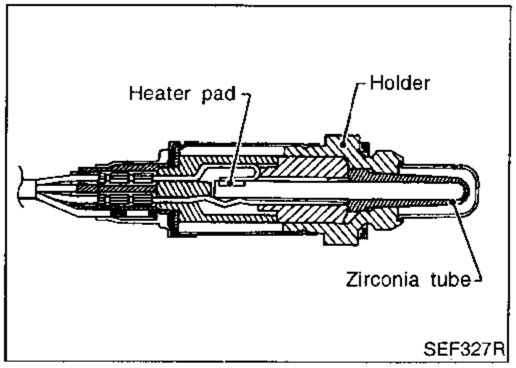
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)
   **The voltage should be above 0.48V at least once during this procedure.**
   **If the voltage is above 0.48V at 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.
   **The voltage should be below 0.43V at least once during this procedure.**



SEF989R

**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.**




## Component Description

NBEC0446

The rear heated oxygen sensor, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
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

NBEC0447

Specification data are reference values.

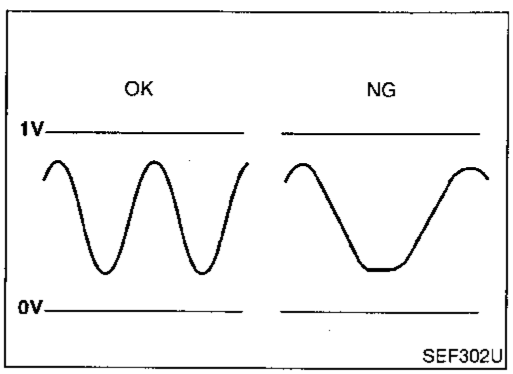
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| RR O2 SEN-B1<br>RR O2 SEN-B2 | • Engine: After warming up | Revving engine from idle up to 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| RR O2 MNTR-B1<br>RR O2 MNTR-B2 | | | LEAN ←→ RICH |

## ECM Terminals and Reference Value

NBEC0448

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 56 (Right bank) | L/W | Rear heated oxygen sensor | **[Engine is running]**<br>• Revving engine from idle up to 2,000 rpm | 0 - Approximately 1.0V |
| 57 (Left bank) | W | | | |

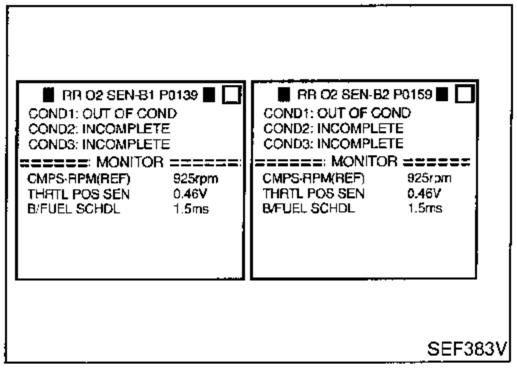



## On Board Diagnosis Logic

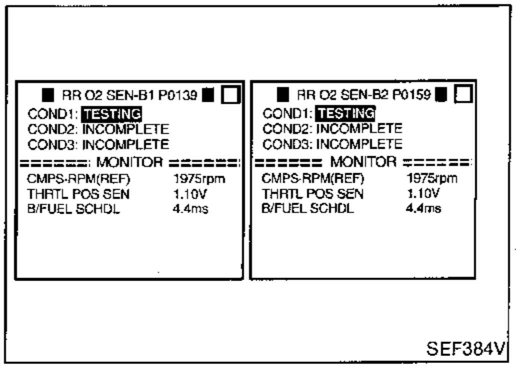
NBEC0449

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 the malfunctions of rear heated oxygen sensor, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.

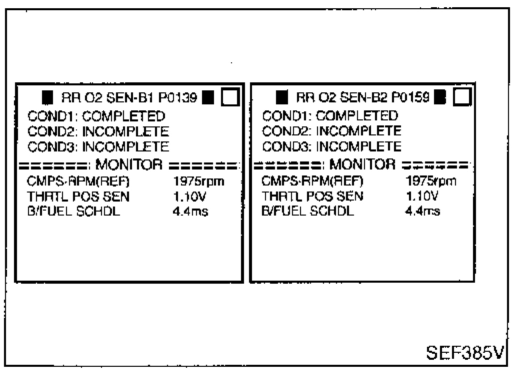
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0139<br>0707<br>(Right bank) | • It takes more time for the sensor to respond between rich and lean than the specified time. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Rear heated oxygen sensor<br>• Fuel pressure<br>• Injectors<br>• Intake air leaks |
| P0159<br>0708<br>(Left bank) | | |



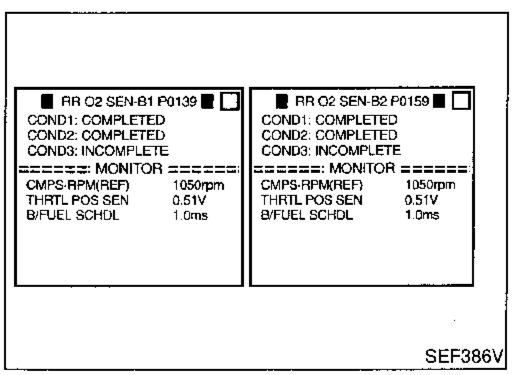
SEF383V



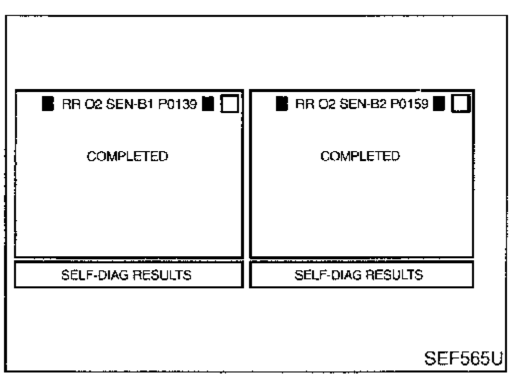
SEF384V



SEF385V



SEF386V



SEF565U

## DTC Confirmation Procedure

NBEC0450

**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 of more than −10°C (14°F).**

**With CONSULT**

**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 SEN-B1 (-B2) P0139 (P0159)" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 30 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 2 in "Procedure for COND3".
   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 60 seconds.)
   **CMPS·RPM (REF): 1,300 - 2,800 rpm**
   **Vehicle speed: 64 - 120 km/h (40 - 75 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.4 ms**
   **Selector lever: Suitable position**

NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct "Procedure for COND2".**

**Procedure for COND2**

1) While driving, release accelerator pedal completely with "OD" OFF from the above condition (step 7) until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" is already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".**

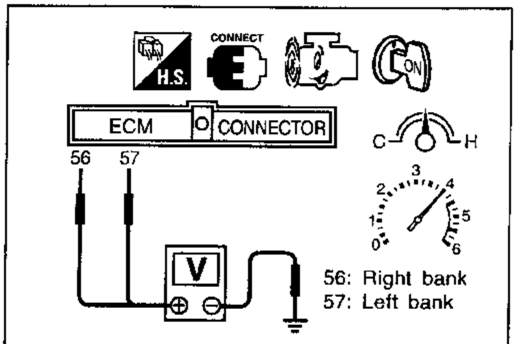
GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

**Procedure for COND3**

1) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take maximum of approximately 6 minutes.)

NOTE:
**If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**

2) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
   If "NG" is displayed, refer to "Diagnostic Procedure", EC-221.




SEF922U

## Overall Function Check

NBEC0451

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.

**Without CONSULT**

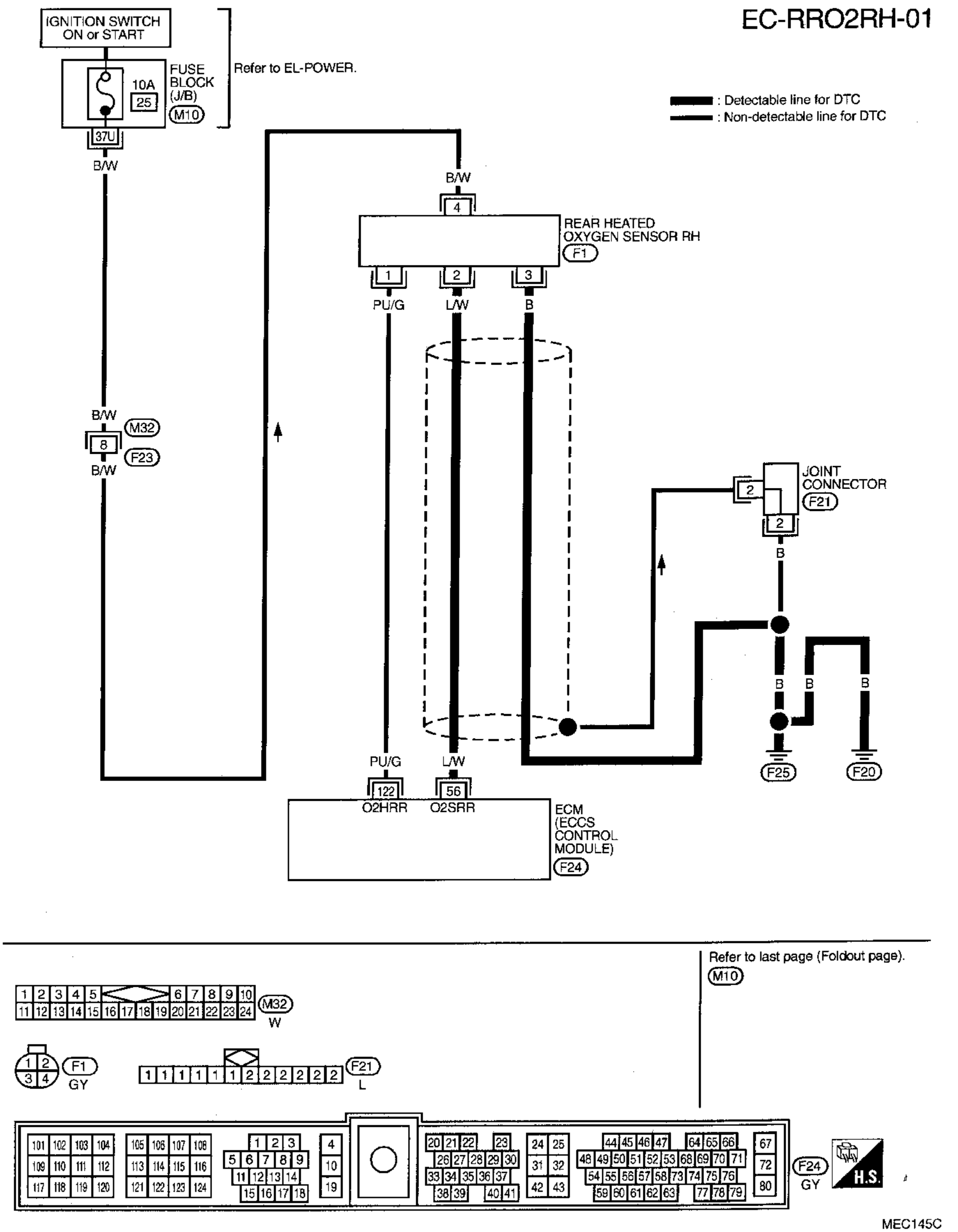
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator 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.
   **The voltage should change at more than 0.06V for 1 second during this procedure.**

## Wiring Diagram

NBEC0452

### RIGHT BANK

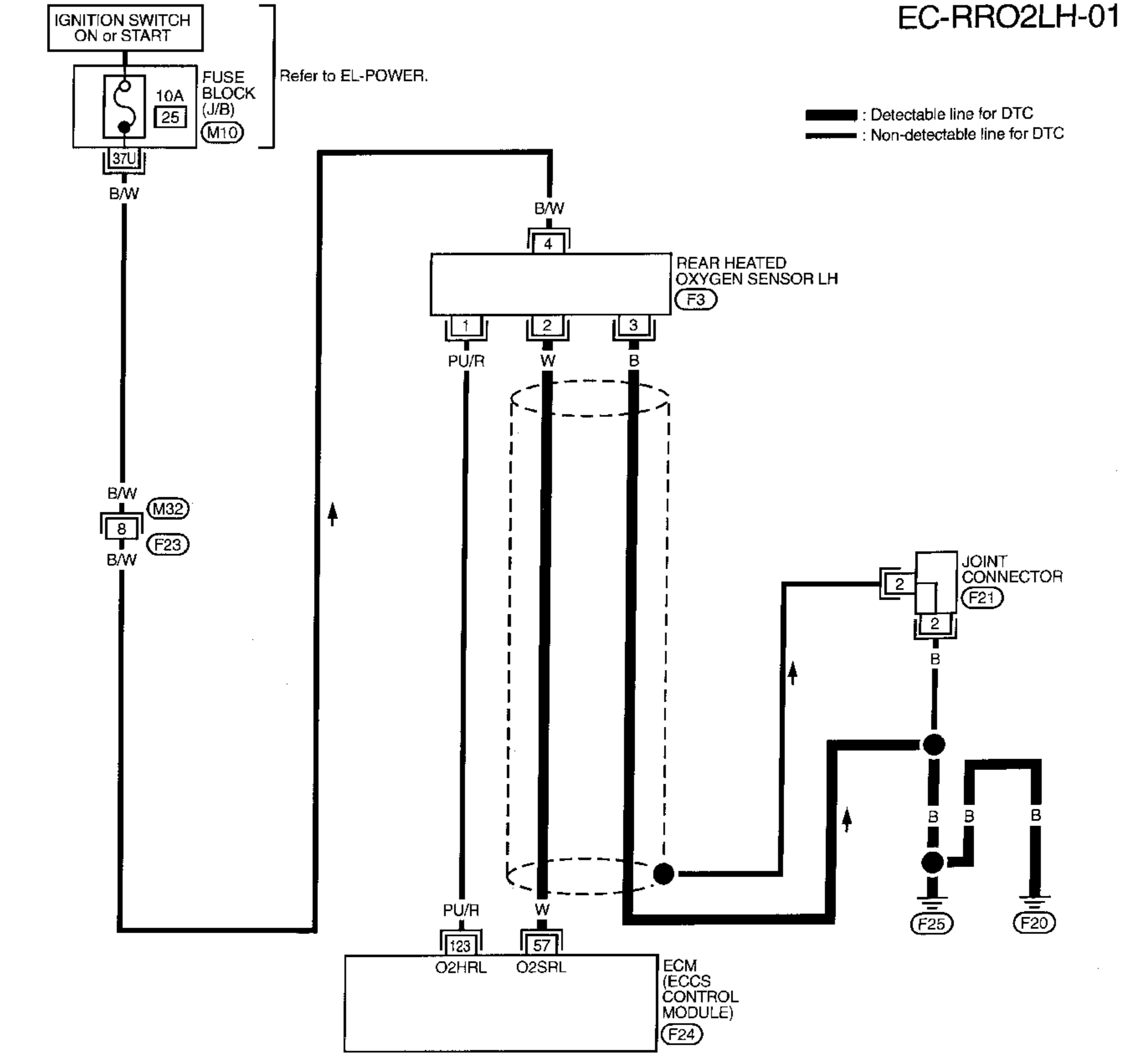
NBEC0452S01



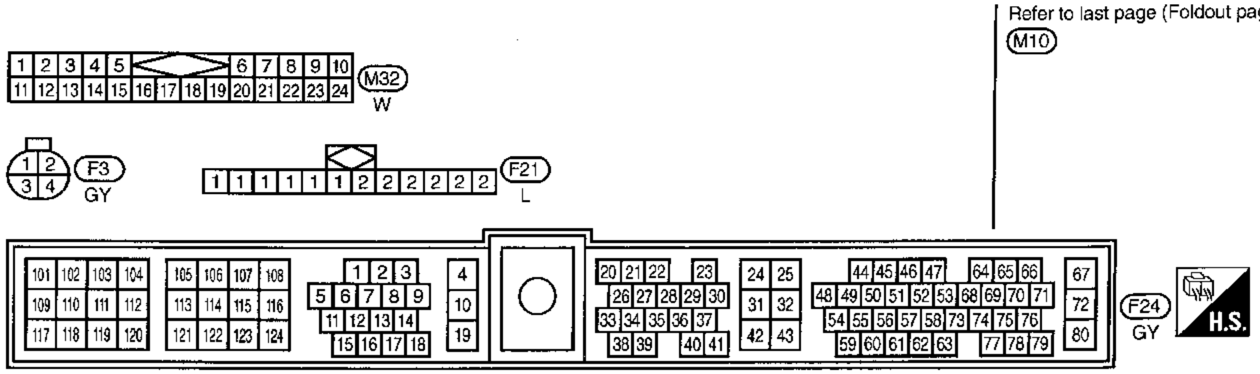
## LEFT BANK

NBEC0452S02

EC-RRO2LH-01




Refer to last page (Foldout page).
M10



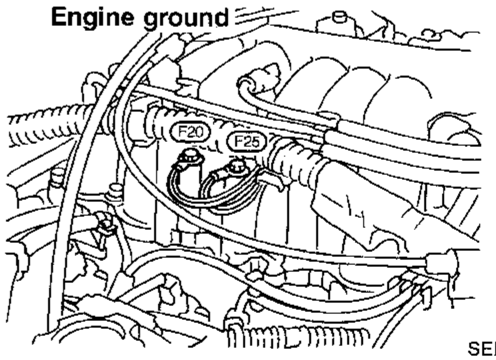

MEC149C

## Diagnostic Procedure

NBEC0453

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|

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

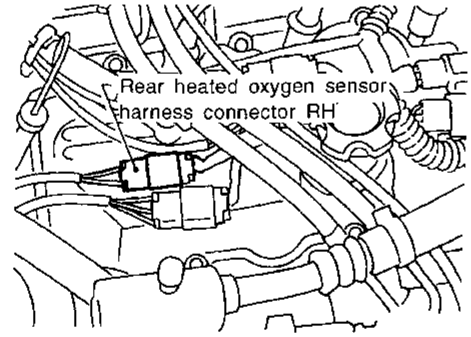



SEF031S

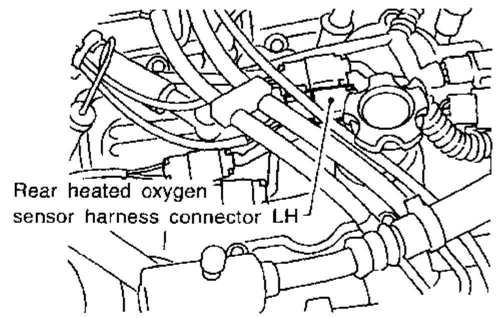
| | |
|---|---|
| ▶ | GO TO 2. |

| 2 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect corresponding rear heated oxygen sensor harness connector and ECM harness connector.

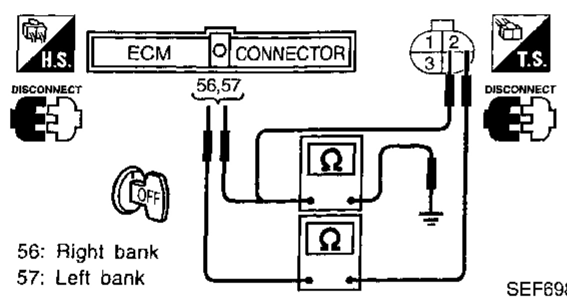



SEF990R




SEF992RB

2. Check harness continuity between ECM terminal 56 or 57 and sensor terminal 2.
   **Continuity should exist.**
3. Check harness continuity between ECM terminal 56 or 57 (or sensor terminal 2) and ground.
   **Continuity should not exist.**




SEF698U

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

**OK or NG**

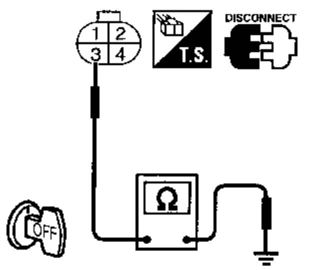
| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

*Diagnostic Procedure (Cont'd)*

### 3 CHECK GROUND CIRCUIT

Check harness continuity between terminal 3 and engine ground.
**Continuity should exist.**



SEF699U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 CHECK COMPONENT

(Rear heated oxygen sensor)
Refer to "Component Inspection", EC-222.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace corresponding rear heated oxygen sensor. |

### 5 CHECK SHIELD CIRCUIT

1. Remove joint connector.
2. Check the following.

- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

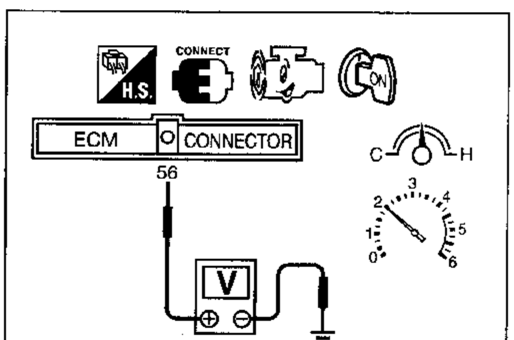
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

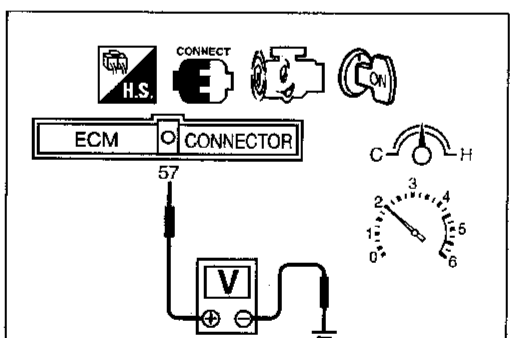
### 6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |



SEF923U



SEF924U

## Component Inspection

NBEC0454

### REAR HEATED OXYGEN SENSOR

NBEC0454S01

**With CONSULT**

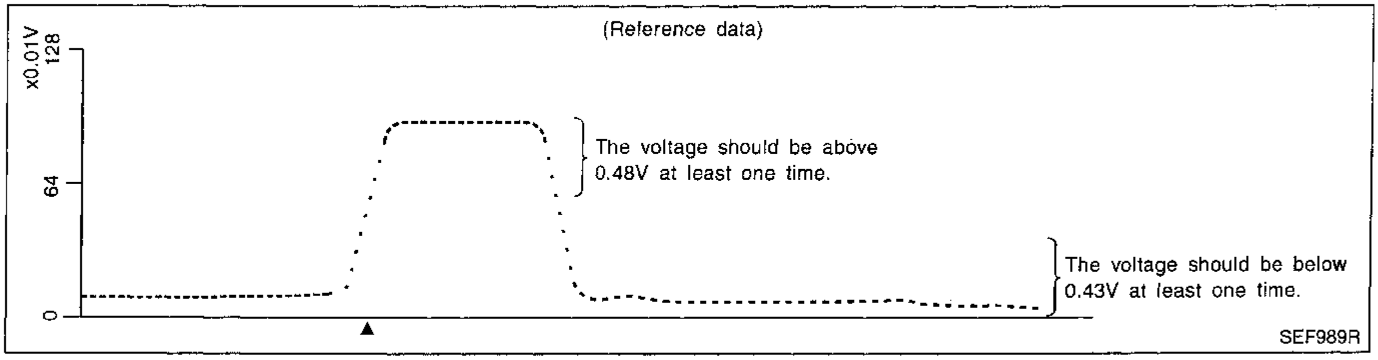
1) Start engine and warm it up to normal operating temperature.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
3) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   **"RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.**
   **"RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is −25%.**

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and ECM terminal 32 (engine 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 0.48V at least once during**

**this procedure.**
**If the voltage is above 0.48V at step 3, step 4 is not necessary.**

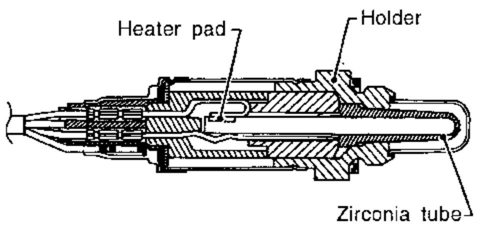
4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
**The voltage should be below 0.43V at least once during this procedure.**




SEF989R

**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.**



SEF327R

## Component Description

NBEC0455

The rear heated oxygen sensor, after three way catalyst, monitors the oxygen level in the exhaust gas on each bank.
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

NBEC0456

Specification data are reference values.

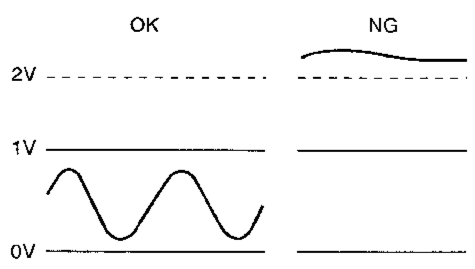
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| RR O2 SEN-B1<br>RR O2 SEN-B2 | • Engine: After warming up | Revving engine from idle up to 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| RR O2 MNTR-B1<br>RR O2 MNTR-B2 | | | LEAN ←→ RICH |

## ECM Terminals and Reference Value

NBEC0457

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 56 (Right bank) | L/W | Rear heated oxygen sensor | **[Engine is running]**<br>• **Warm-up condition**<br>• Revving engine from idle up to 2,000 rpm | 0 - Approximately 1.0V |
| 57 (Left bank) | W | | | |



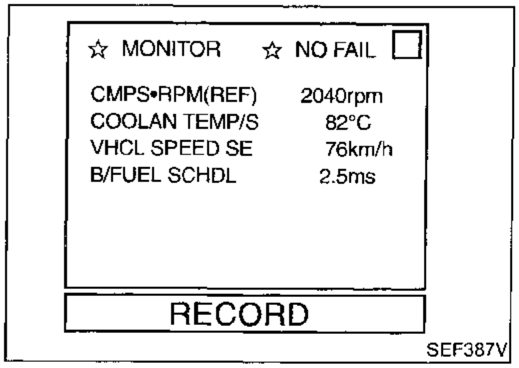
SEF305U

## On Board Diagnosis Logic

NBEC0458

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 the malfunctions of rear heated oxygen sensor, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0140<br>0512<br>(Right bank) | • An excessively high voltage from the sensor is sent to ECM. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Rear heated oxygen sensor |
| P0160<br>0315<br>(Left bank) | | |



SEF387V

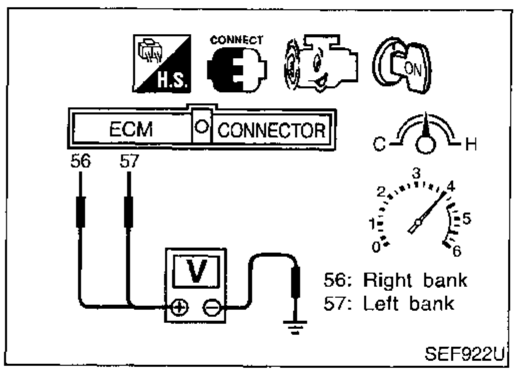
## DTC Confirmation Procedure

NBEC0459

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Meet the following conditions once.
   **CMPS·RPM (REF): 1,300 - 2,800 rpm**
   **VHCL SPEED SE: 64 - 120 km/h (40 - 75 MPH)**
   **B/FUEL SCHDL: 1.7 - 6.4 ms**
   **COOLAN TEMP/S: 70 - 100°C (158 - 212°F)**
   **Selector lever: Suitable position**
3) Stop vehicle with engine running.



SEF922U

## Overall Function Check

NBEC0460

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.

**Without CONSULT**

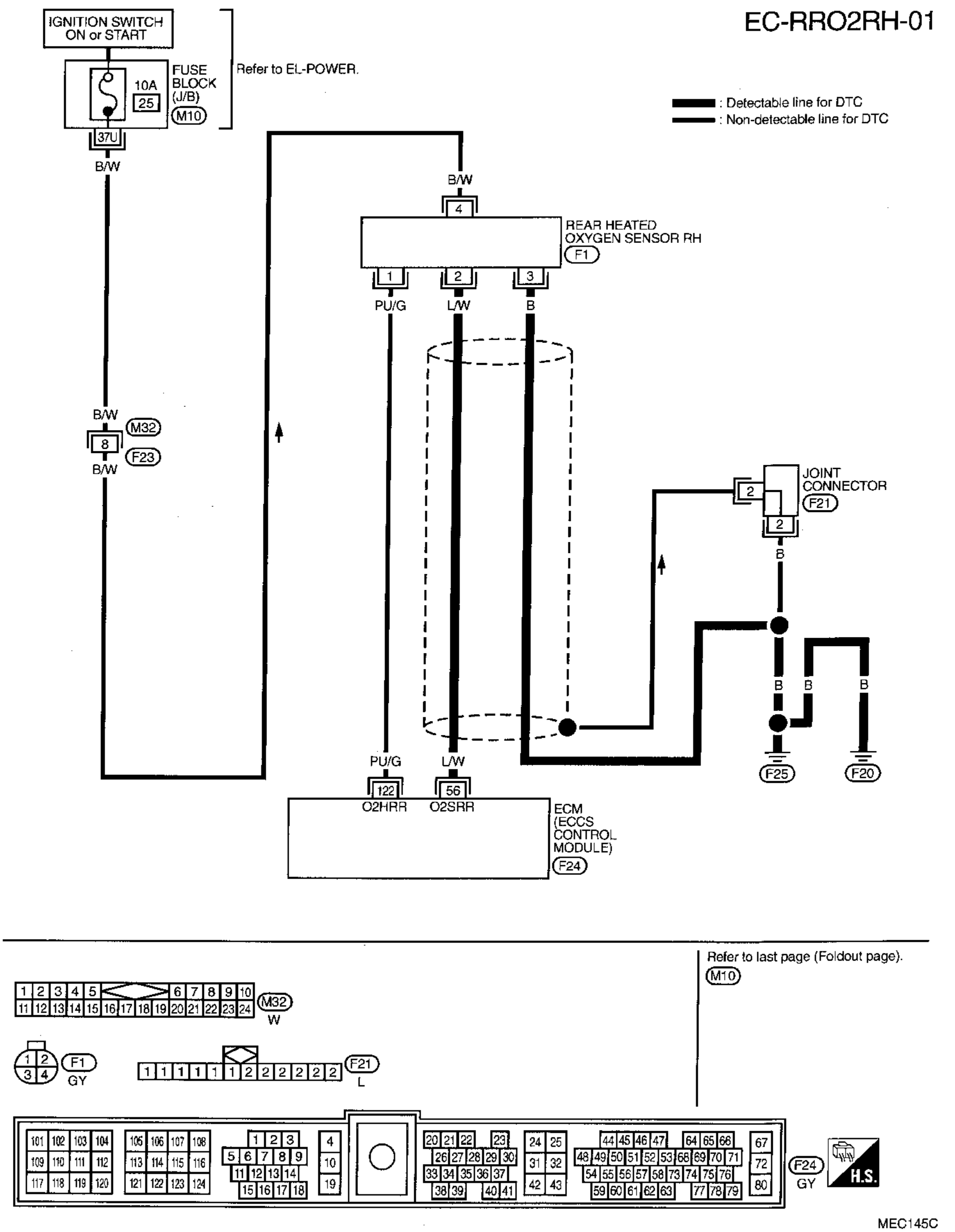
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)
   **The voltage should be below 2V during this procedure.**

## Wiring Diagram

NBEC0461

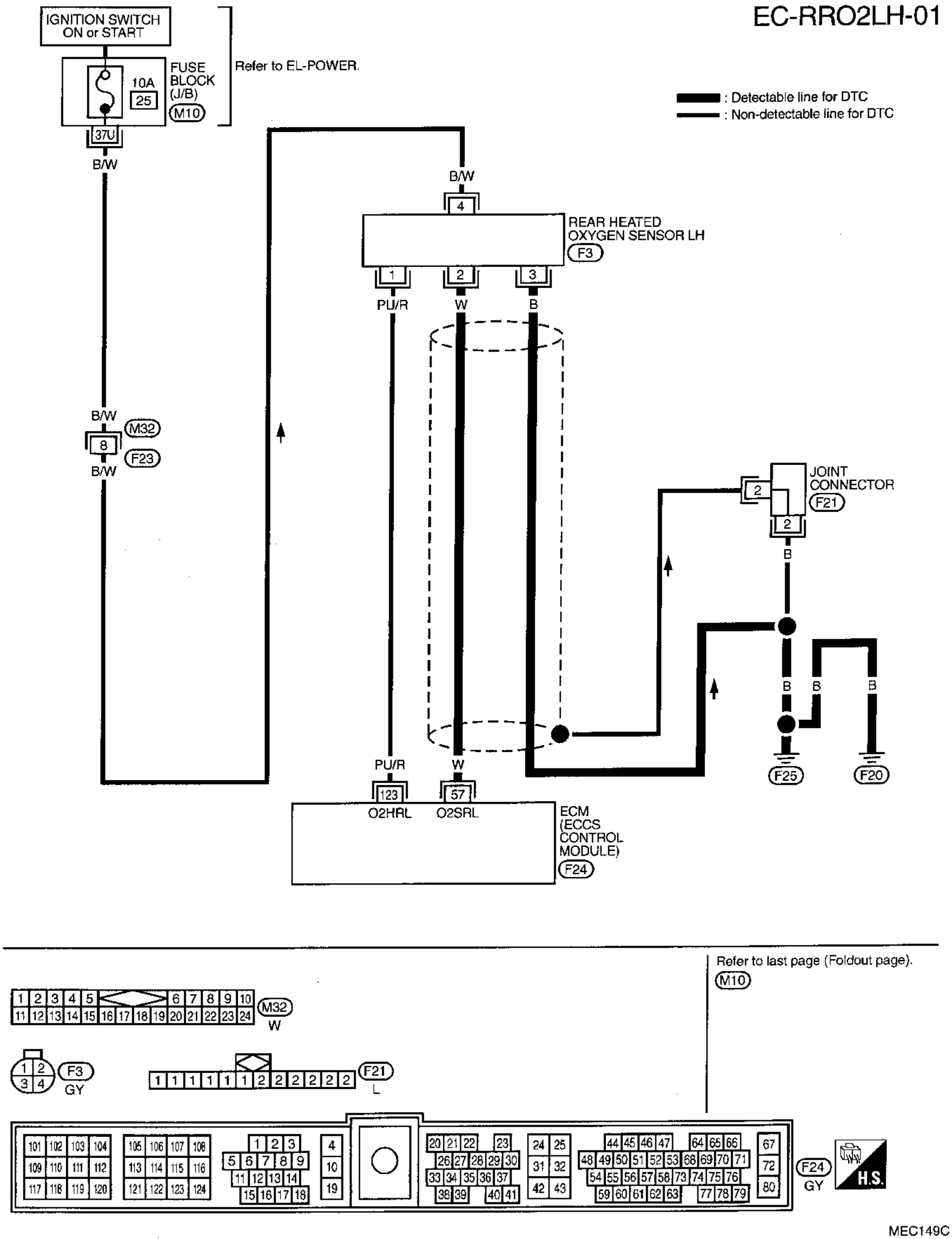
### RIGHT BANK

NBEC0461S01



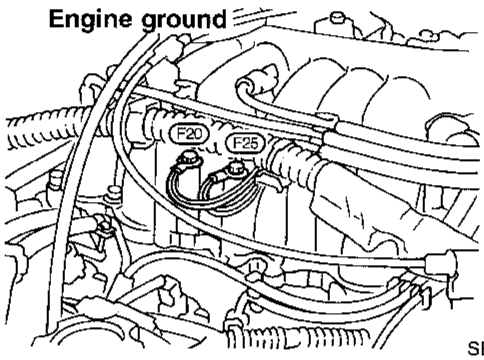
## LEFT BANK

NBEC0461S02

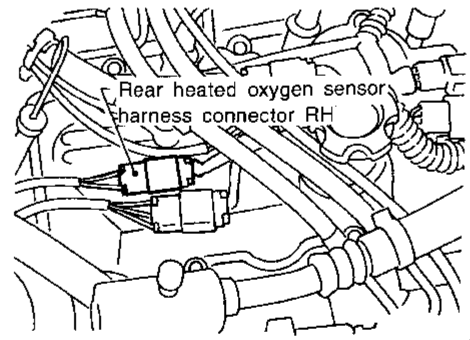
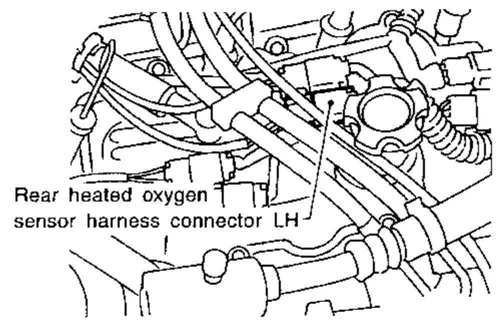
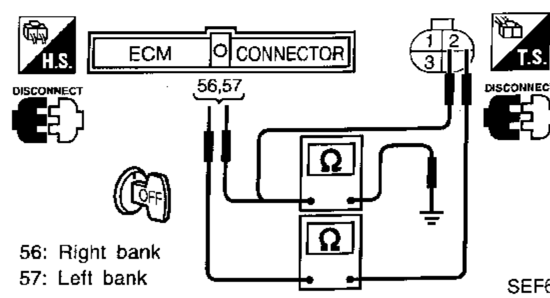


## Diagnostic Procedure

NBEC0462

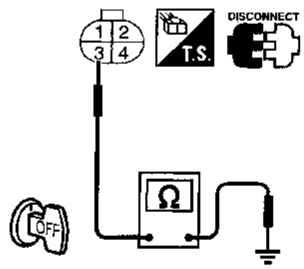
| 1 | RETIGHTEN GROUND SCREWS |
|---|---|
| | 1. Turn ignition switch "OFF".<br>2. Loosen and retighten engine ground screws.<br><br>SEF031S |
| ▶ | GO TO 2. |



| 2 | CHECK INPUT SIGNAL CIRCUIT | |
|---|---|---|
| | 1. Disconnect corresponding rear heated oxygen sensor harness connector and ECM harness connector.<br><br>SEF990R<br><br>SEF992RB<br>2. Check harness continuity between ECM terminal 56 or 57 and sensor terminal 2.<br>**Continuity should exist.**<br>3. Check harness continuity between ECM terminal 56 or 57 (or sensor terminal 2) and ground.<br>**Continuity should not exist.**<br><br>SEF698U<br>If OK, check harness for short to ground and short to power.<br>**OK or NG** | |
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3 | CHECK GROUND CIRCUIT |
|---|---|

Check harness continuity between terminal 3 and engine ground.
**Continuity should exist.**




SEF699U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK CONNECTORS FOR WATER |
|---|---|

Check rear heated oxygen sensor connector and harness connector for water.
**Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair or replace harness or connectors. |

| 5 | CHECK COMPONENT |
|---|---|

(Rear heated oxygen sensor)
Refer to "Component Inspection", EC-229.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace corresponding rear heated oxygen sensor. |

| 6 | CHECK SHIELD CIRCUIT |
|---|---|

1. Remove joint connector.
2. Check the following.
- Continuity between joint connector terminal and ground
- Joint connector
  (Refer to "HARNESS LAYOUT" in EL section.)
  **Continuity should exist.**
  If OK, check harness for short to ground and short to power. Then reconnect joint connector.

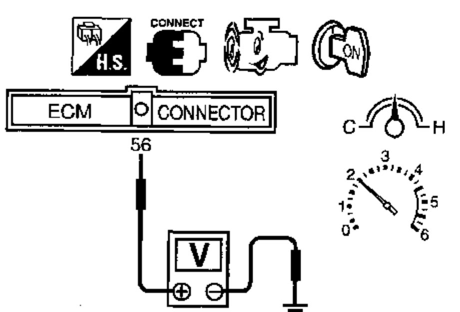
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

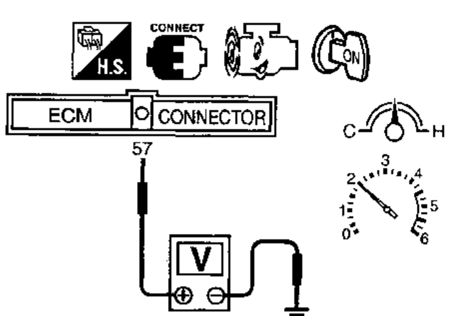
| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |




SEF923U




SEF924U

## Component Inspection

NBEC0463

### REAR HEATED OXYGEN SENSOR

NBEC0463S01

**With CONSULT**

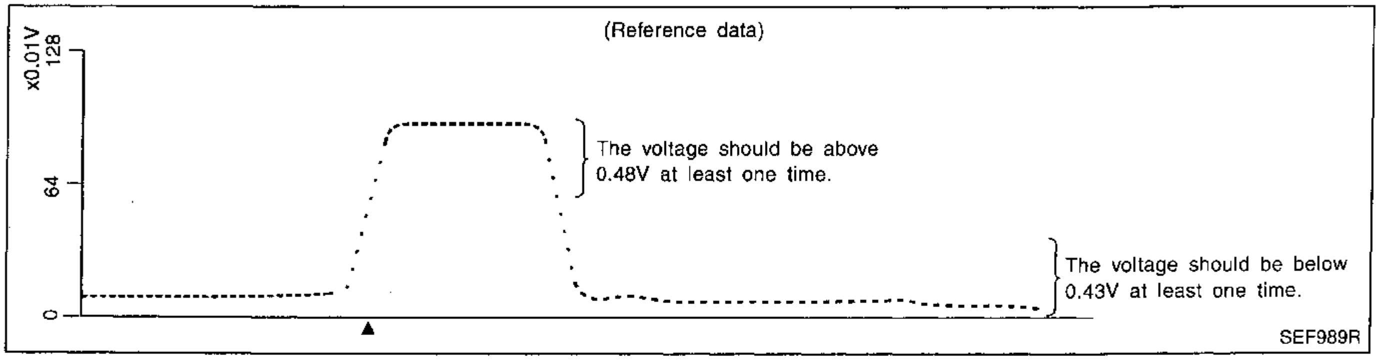
1) Start engine and warm it up to normal operating temperature.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CONSULT.
3) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   **"RR O2 SEN-B1 (-B2)" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.**
   **"RR O2 SEN-B1 (-B2)" should be below 0.43V at least once when the "FUEL INJECTION" is –25%.**

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine 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 0.48V at least once during**

**this procedure.**
**If the voltage is above 0.48V at 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.
**The voltage should be below 0.43V at least once during this procedure.**




**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.**

## Description

NBEC0112

### SYSTEM DESCRIPTION

NBEC0112S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Rear heated oxygen sensor heater control | Rear heated oxygen sensor heaters |

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

### OPERATION

NBEC0112S02

| Engine speed rpm | Rear heated oxygen sensor heaters |
|---|---|
| Above 3,200 | OFF |
| Below 3,200 | ON |

## CONSULT Reference Value in Data Monitor Mode

NBEC0113

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| RR O2 HTR-B1<br>RR O2 HTR-B2 | • Engine speed: Idle | ON |
| | • Engine speed: Above 3,200 rpm | OFF |

## ECM Terminals and Reference Value

NBEC0114

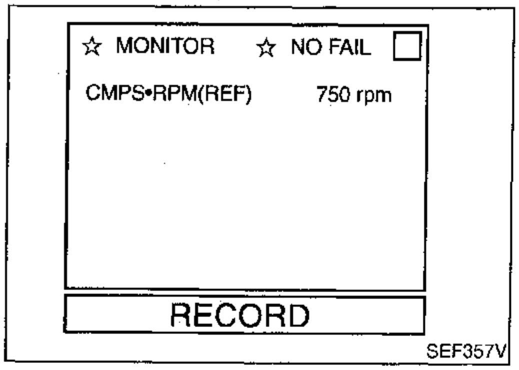
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 122 (Right bank) | PU/G | Rear heated oxygen sensor heater | **[Engine is running]**<br>• Engine speed is below 3,200 rpm | Approximately 0.4V |
| 123 (Left bank) | PU/R | | **[Engine is running]**<br>• Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

NBEC0115

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0141<br>0902<br>(Right bank) | • The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range.<br>(An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.) | • Harness or connectors<br>(The rear heated oxygen sensor heater circuit is open or shorted.)<br>• Rear heated oxygen sensor heater |
| P0161<br>1002<br>(Left bank) | | |




SEF357V

## DTC Confirmation Procedure

NBEC0116

NOTE:
If "DTC 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.**

**With CONSULT**

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.

**With GST**

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 6 seconds at idle speed.
4) Select "MODE 3" with GST.

**No Tools**

1) Start engine and run it for at least 6 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.

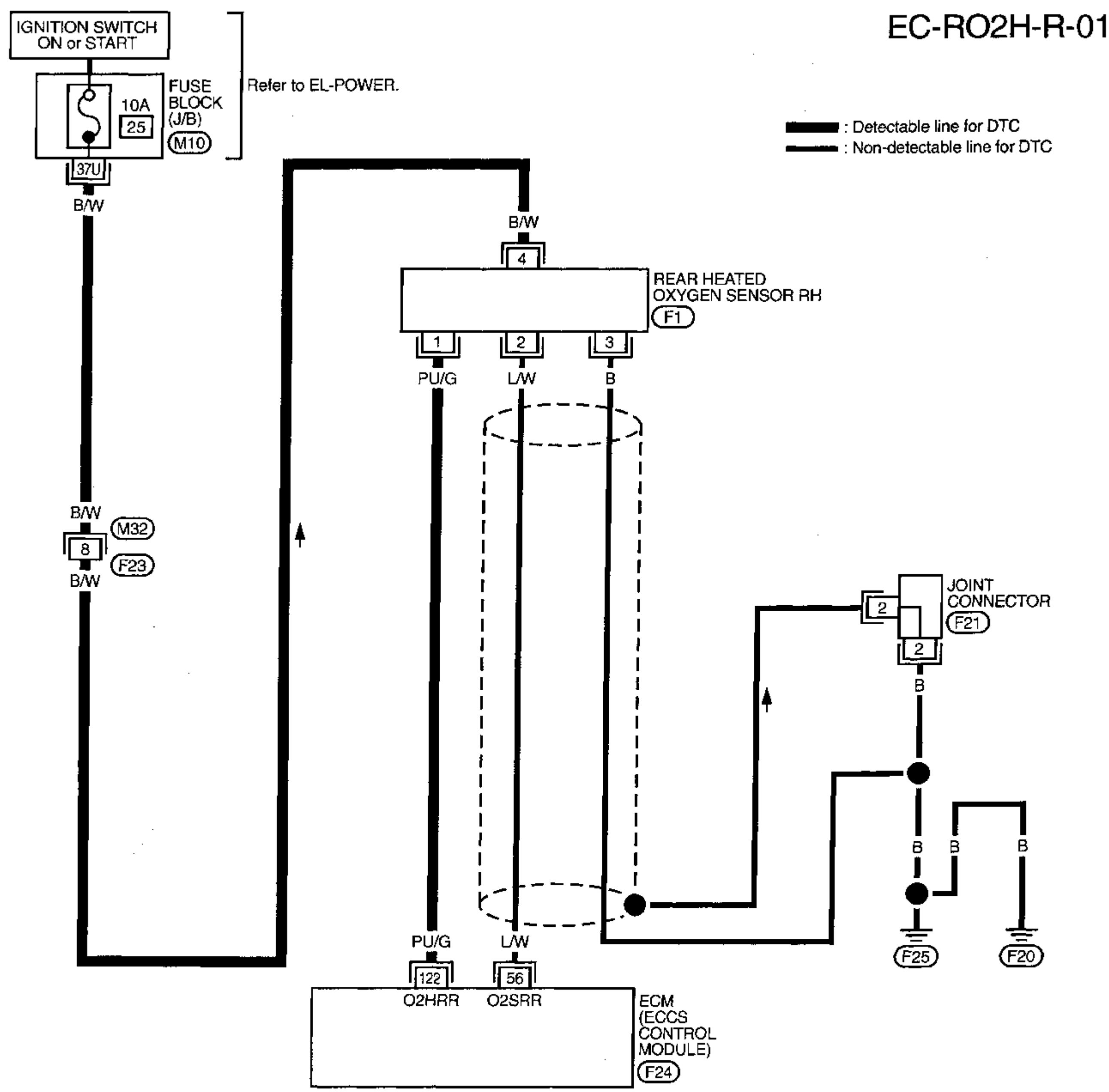
- **When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.**

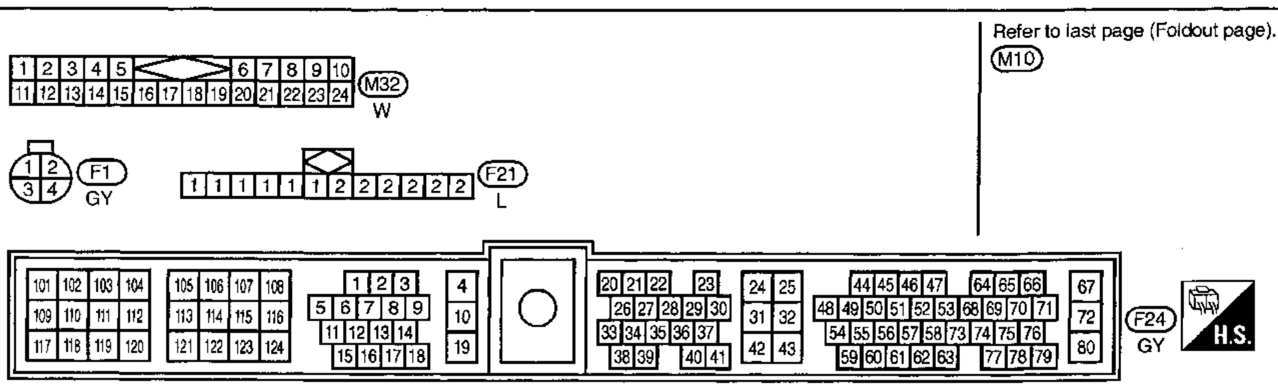
## Wiring Diagram

NBEC0117

### RIGHT BANK

NBEC0117S01



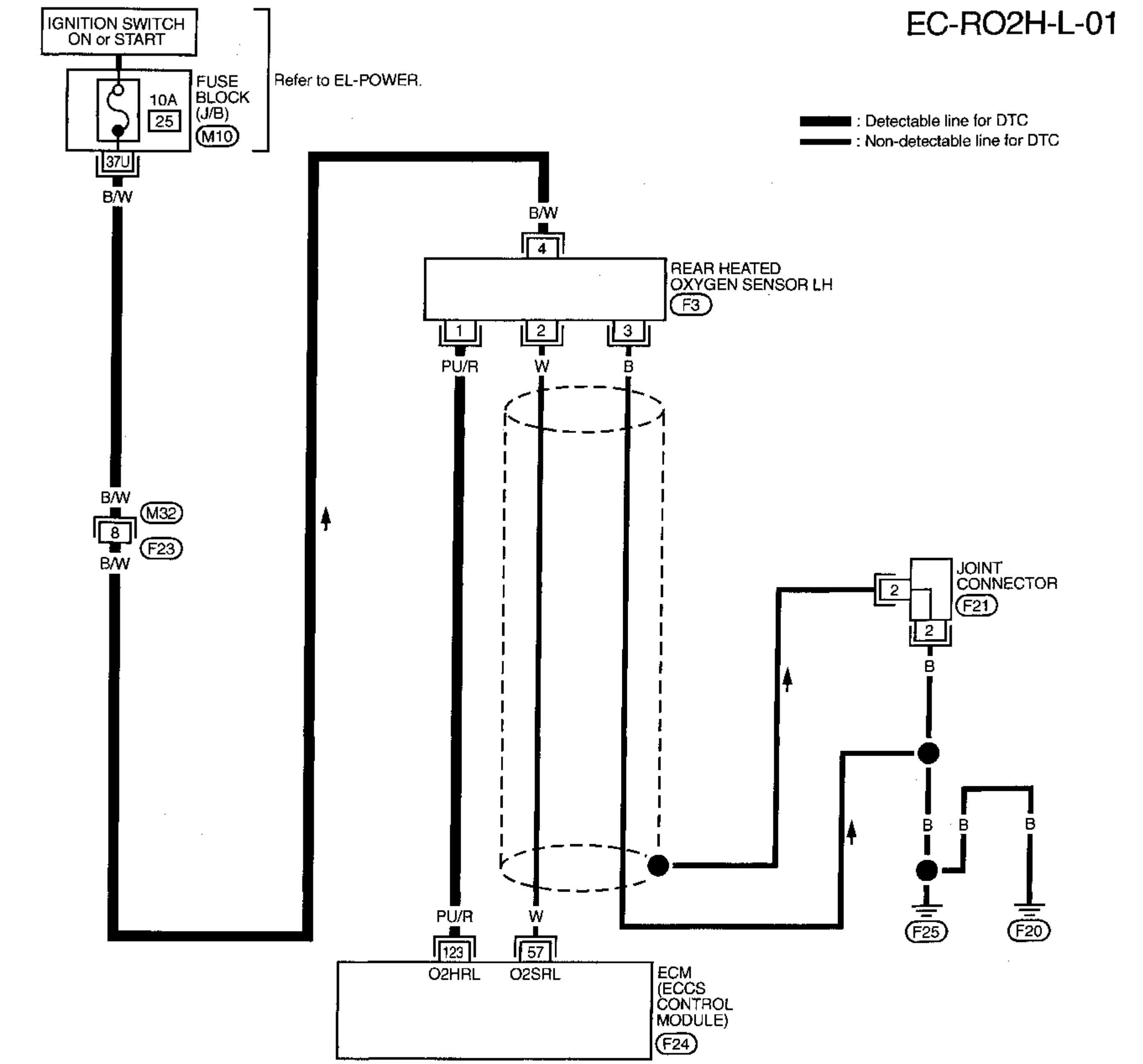



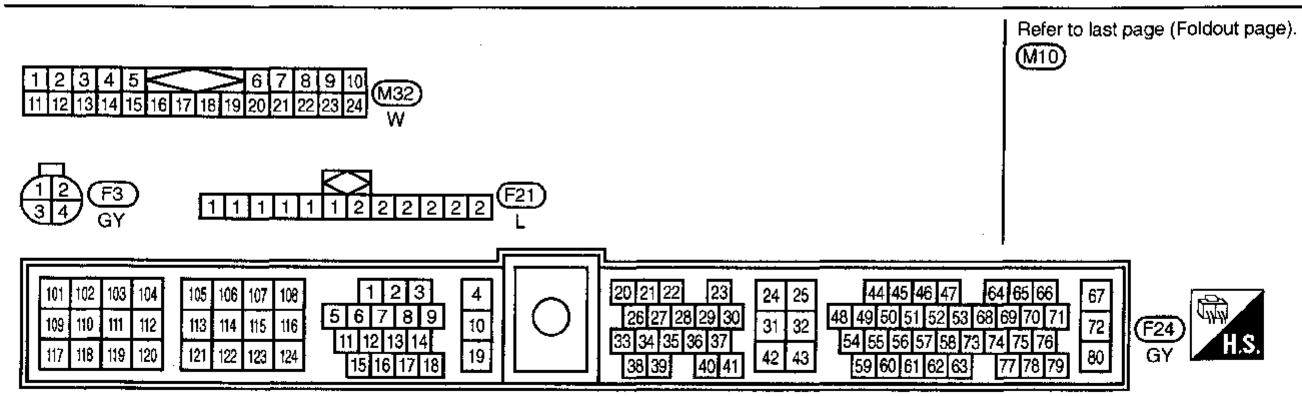

MEC146C

*Wiring Diagram (Cont'd)*

## LEFT BANK

NBEC0117S02



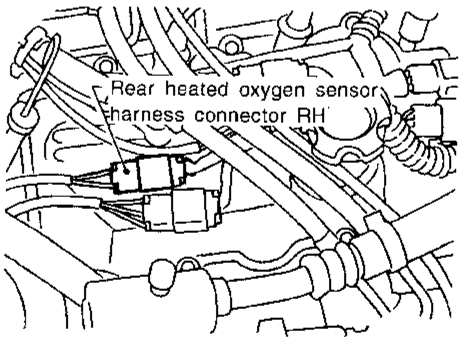

MEC150C

## Diagnostic Procedure

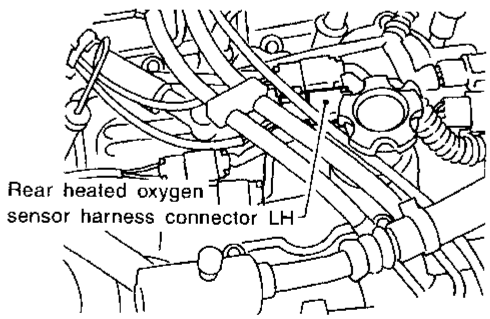
NBEC0118

### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect corresponding rear heated oxygen sensor harness connector.

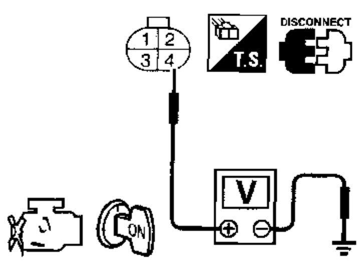



SEF990R




SEF992RB

3. Turn ignition switch "ON".
4. Check voltage between terminal 4 and ground.
   **Voltage: Battery voltage**




SEF700U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

### 2 DETECT MALFUNCTIONING PART

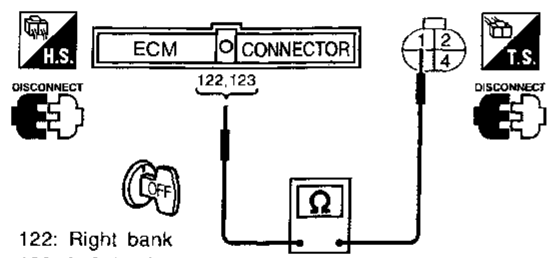
Check the following.

- Harness connectors F23, M32
- Harness connector M10
- 10A fuse
- Harness for open or short between rear heated oxygen sensor and fuse

| | |
|---|---|
| ▶ | Repair harness or connectors. |

### 3 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 122 or 123 and sensor terminal 1.
   **Continuity should exist.**




122: Right bank
123: Left bank

SEF701U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 CHECK COMPONENT

(Rear heated oxygen sensor heater)
Refer to "COMPONENT INSPECTION", EC-236.

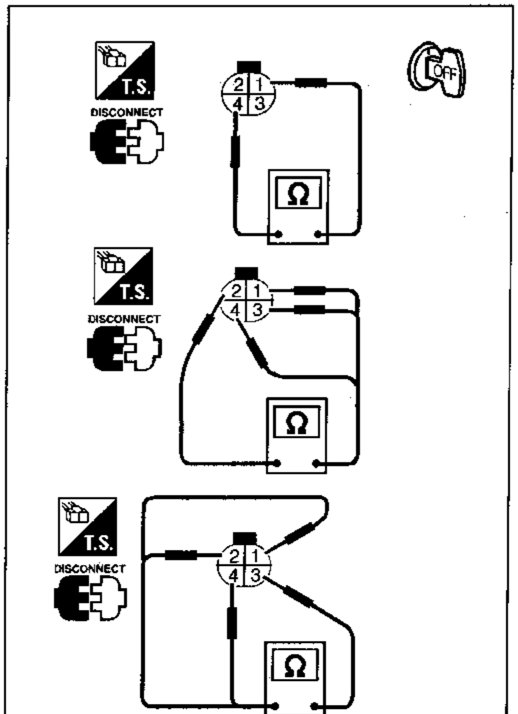
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace rear heated oxygen sensor |

### 5 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | **INSPECTION END** |



SEF116S

## Component Inspection

NBEC0119

### REAR HEATED OXYGEN SENSOR HEATER

NBEC0119S01

Check the following.

1. Check resistance between terminals 4 and 1.
   **Resistance: 2.3 - 4.3Ω at 25°C (77°F)**
2. Check continuity.

| Terminal No. | Continuity |
|---|---|
| 2 and 1, 3, 4 | No |
| 3 and 1, 2, 4 | |

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.**

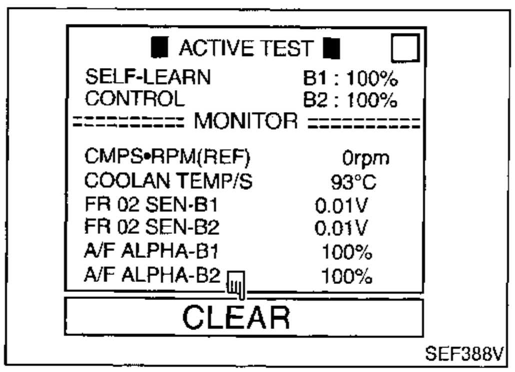
## On Board Diagnosis Logic

NBEC0150

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 sensors. 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).

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Front heated oxygen sensors | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Injectors |

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0171<br>0115<br>(Right bank)<br><br>P0174<br>0210<br>(Left bank) | • Fuel injection system does not operate properly.<br>• The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | • Intake air leaks<br>• Front heated oxygen sensor<br>• Injectors<br>• Exhaust gas leaks<br>• Incorrect fuel pressure<br>• Lack of fuel<br>• Mass air flow sensor |



SEF388V

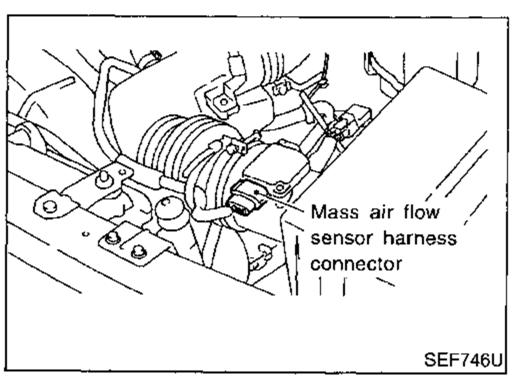
## DTC Confirmation Procedure

NBEC0151

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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 or P0174 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, too.
8) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-241. If engine does not start, check exhaust and intake air leak visually.



SEF746U

**With GST**

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 5 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 let it idle for at least 10 minutes.

8) Select "MODE 7" with GST. The 1st trip DTC P0171 or P0174 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-241. If engine does not start, check exhaust and intake air leak visually.

**Without CONSULT**

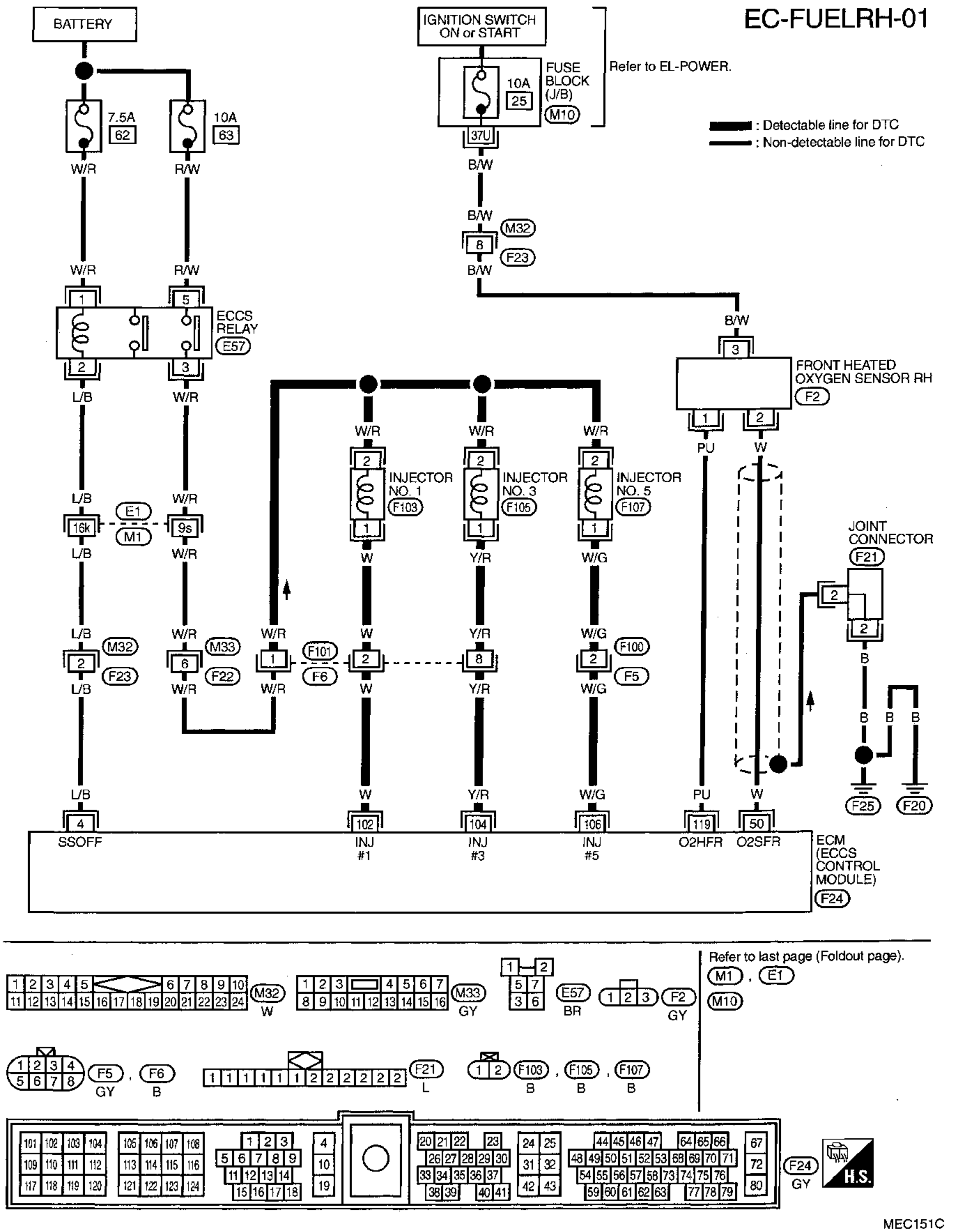
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness 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 let it idle for at least 10 minutes.
   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-241. If engine does not start, check exhaust and intake air leak visually.

## Wiring Diagram

NBEC0152

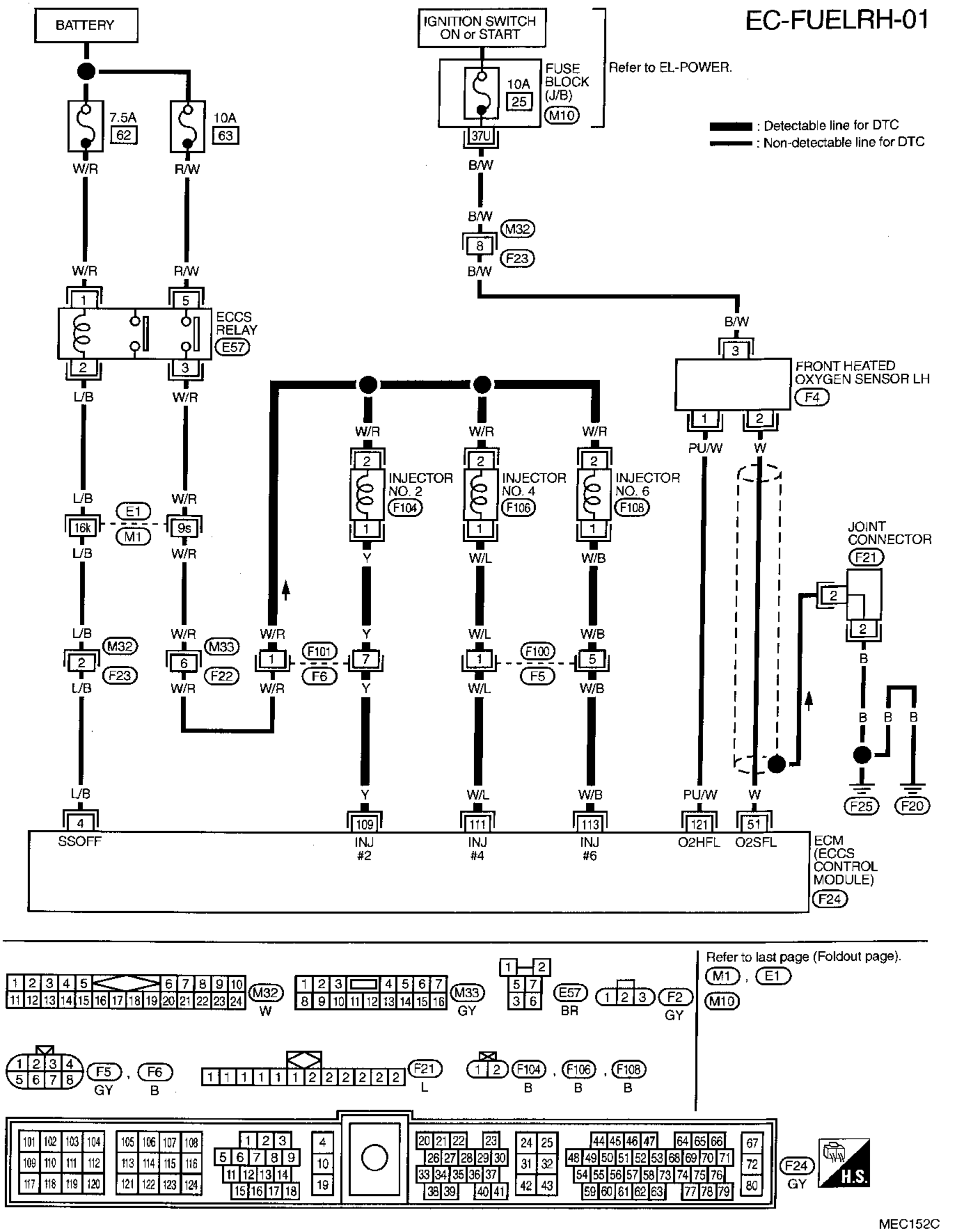
### RIGHT BANK

NBEC0152S01



## LEFT BANK

NBEC0152S02



## Diagnostic Procedure

NBEC0153

GI
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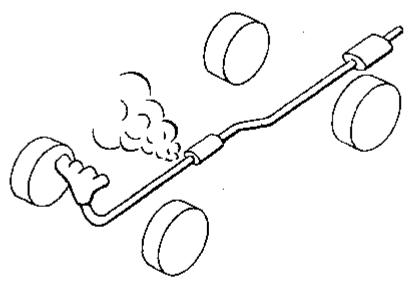
| 1 | CHECK EXHAUST AIR LEAK |
|---|---|

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.



SEF099P

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace. |

| 2 | CHECK FOR INTAKE AIR LEAK |
|---|---|

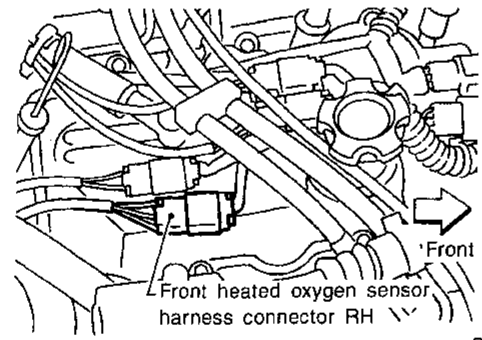
Listen for an intake air leak after the mass air flow sensor.

**OK or NG**

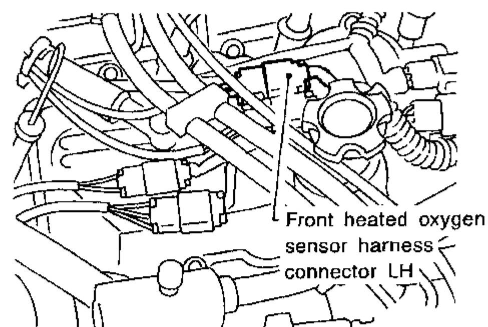
| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace. |

| 3 | CHECK FRONT HEATED OXYGEN SENSOR |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector and ECM harness connector.

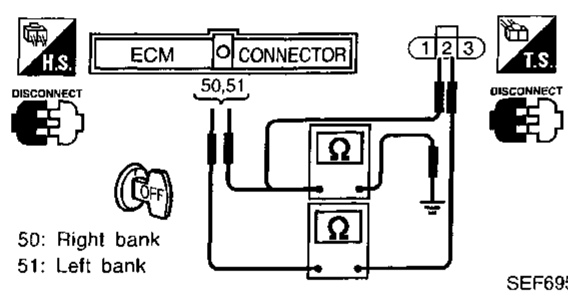



SEF987R




SEF994RB

3. Check harness continuity between ECM terminal 50 or 51 and sensor terminal 2.
   **Continuity should exist.**
4. Check harness continuity between ECM terminal 50 or 51 (or sensor terminal 2) and ground.
   **Continuity should not exist.**
   If OK, check harness for short to ground and short to power.




SEF695U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 4 CHECK FUEL PRESSURE

1. Release fuel pressure to zero.
   Refer to EC-31.
2. Install fuel pressure gauge and check fuel pressure.
   **At idling:**
   **When fuel pressure regulator valve vacuum hose is connected.**
   **235 kPa (2.4 kg/cm$^2$, 34 psi)**
   **When fuel pressure regulator valve vacuum hose is disconnected.**
   **294 kPa (3.0 kg/cm$^2$, 43 psi)**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

## 5 DETECT MALFUNCTIONING PART

Check the following.
- Fuel pump and circuit (Refer to EC-439.)
- Fuel pressure regulator (Refer to EC-32.)
- Fuel lines (Refer to "ENGINE MAINTENANCE" in MA section.)
- Fuel filter for clogging

| | | |
|---|---|---|
| | ▶ | Repair or replace. |

## 6 CHECK MASS AIR FLOW SENSOR

**With CONSULT**
1. Install all parts removed.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
   **3.3 - 4.8 g·m/sec: at idling**
   **12.0 - 14.9 g·m/sec: at 2,500 rpm**

**With GST**
1. Install all parts removed.
2. Check "MASS AIR FLOW" in MODE 1 with GST.
   **3.3 - 4.8 g·m/sec: at idling**
   **12.0 - 14.9 g·m/sec: at 2,500 rpm**

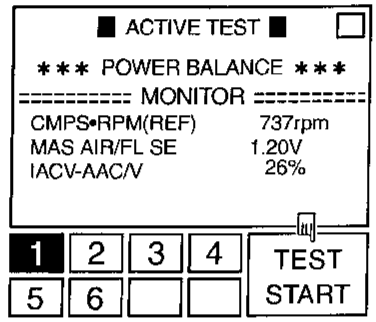
**No Tools**
1. Install all parts removed.
2. Check voltage between ECM terminal 54 and ground.
   **1.0 - 1.7V: at idling**
   **1.7 - 2.3V: at 2,500 rpm**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-115. |

## 7 CHECK FUNCTION OF INJECTORS

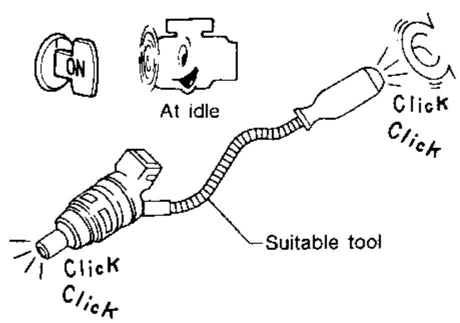
**With CONSULT**
1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.




SEF389V

3. Make sure that each circuit produces a momentary engine speed drop.

**Without CONSULT**
1. Start engine.
2. Listen to each injector operating sound.
   **Clicking noise should be heard.**



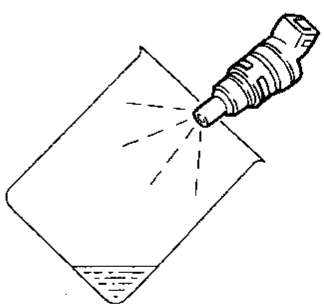

MEC703B

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Perform trouble diagnosis for "INJECTORS", EC-429. |

| 8 | CHECK INJECTOR |
|---|---|

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Disconnect injector harness connectors on left bank (for DTC P0171), right bank (for DTC P0174).
4. Remove injector gallery assembly. Refer to EC-33.
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors on right bank (for DTC P0171), left bank (for DTC P0174) should remain connected.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each injector.
7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.
   **Fuel should be sprayed evenly for each injector.**



SEF595Q

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace injectors from which fuel does not spray out. Always replace O-ring with new ones. |

| 9 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |

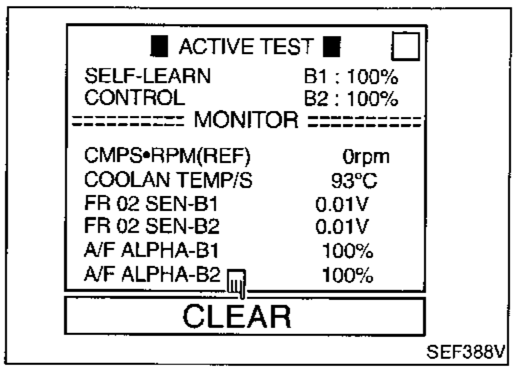
## On Board Diagnosis Logic

NBEC0154

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 sensors. 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 light up the MIL (2 trip detection logic).

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Front heated oxygen sensors | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Injectors |

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0172<br>0114<br>(Right bank)<br><br>P0175<br>0209<br>(Left bank) | • Fuel injection system does not operate properly.<br>• The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | • Front heated oxygen sensor<br>• Injectors<br>• Exhaust gas leaks<br>• Incorrect fuel pressure<br>• Mass air flow sensor |




SEF388V

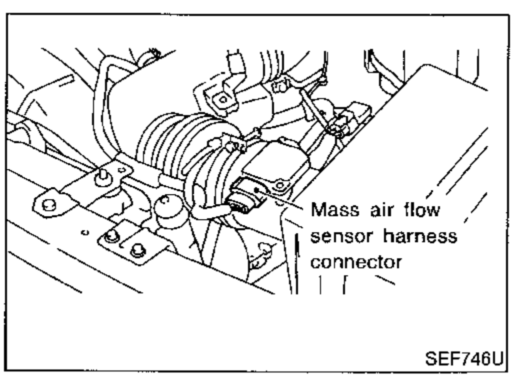
## DTC Confirmation Procedure

NBEC0155

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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, P0175 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, too.
8) Crank engine while depressing accelerator pedal.
   If engine starts, go to "Diagnostic Procedure", EC-248. If engine does not start, remove ignition plugs and check for fouling, etc.




SEF746U

**With GST**

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 5 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 let it idle for at least 10 minutes.

8) Select "MODE 7" with GST. The 1st trip DTC P0172 or P0175 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-248. If engine does not start, check exhaust and intake air leak visually.

**Without CONSULT**

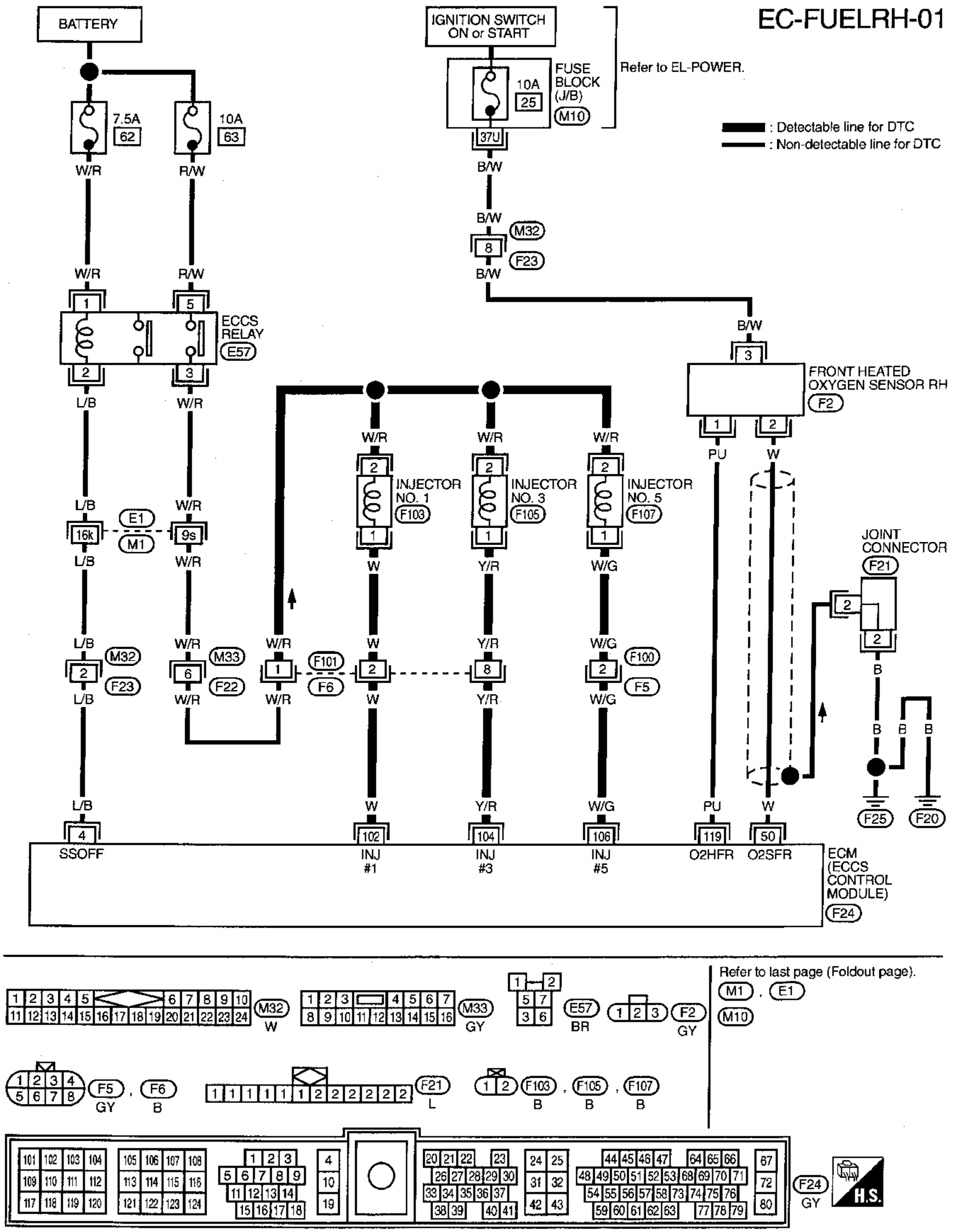
1) Disconnect mass air flow sensor harness connector.
2) Start engine and run it for at least 5 seconds at idle speed.
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Turn ignition switch "ON".
5) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
6) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
8) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC 0114 or 0209 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 also has a malfunction.
10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-248. If engine does not start, remove ignition plugs and check for fouling, etc.

## Wiring Diagram

NBEC0156

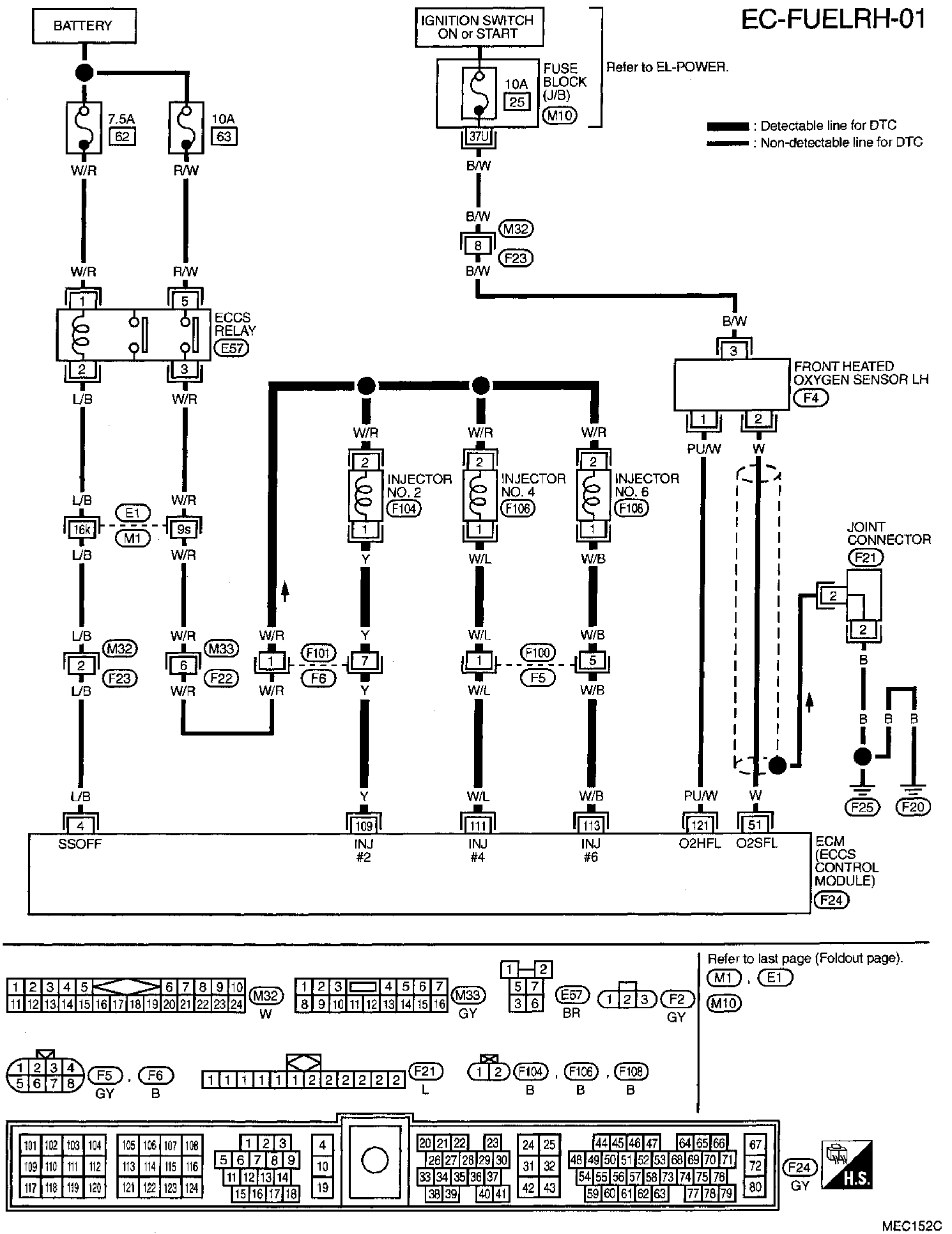
### RIGHT BANK

NBEC0156S01



## LEFT BANK

NBEC0156S02

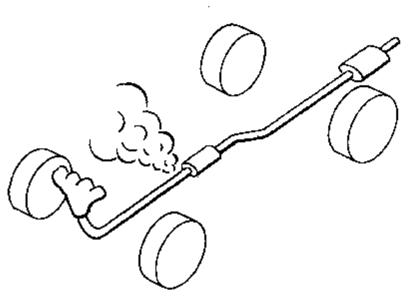


## Diagnostic Procedure

NBEC0157

### 1 CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before three way catalyst.



SEF099P

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace. |

### 2 CHECK FOR INTAKE AIR LEAK

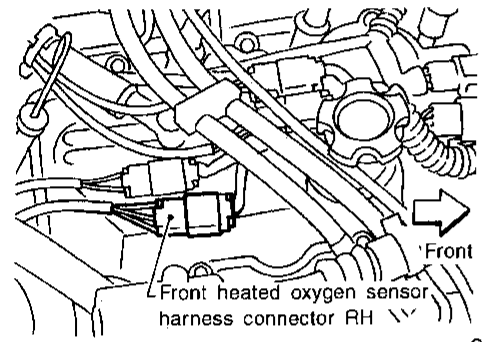
Listen for an intake air leak after the mass air flow sensor.

**OK or NG**

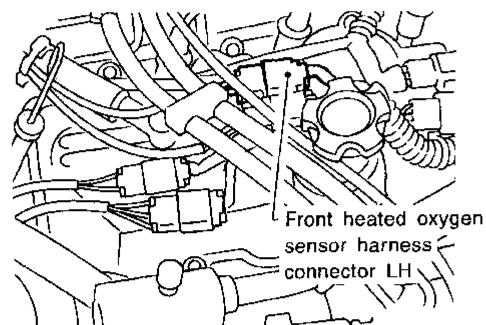
| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace. |

### 3 CHECK FRONT HEATED OXYGEN SENSOR

1. Turn ignition switch "OFF".
2. Disconnect corresponding front heated oxygen sensor harness connector and ECM harness connector.

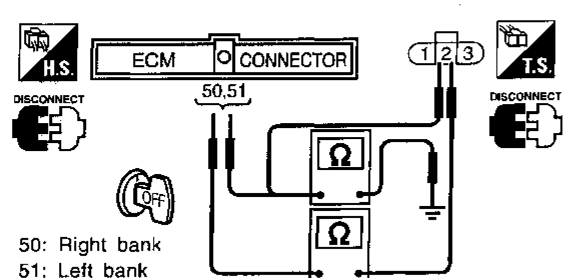



SEF987R




SEF994RB

3. Check harness continuity between ECM terminal 50 or 51 and sensor terminal 2.
   **Continuity should exist.**
4. Check harness continuity between ECM terminal 50 or 51 (or sensor terminal 2) and ground.
   **Continuity should not exist.**
   If OK, check harness for short to ground and short to power.




SEF695U

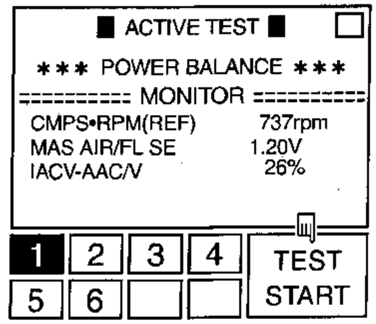
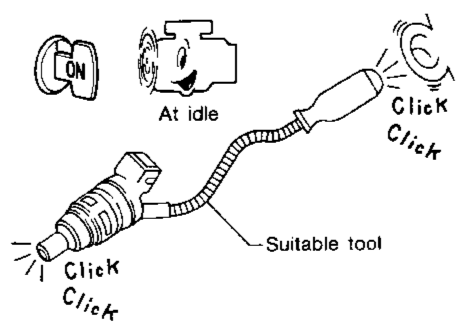
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK FUEL PRESSURE | |
|---|---|---|
| 1. Release fuel pressure to zero.<br>Refer to EC-31.<br>2. Install fuel pressure gauge and check fuel pressure.<br>**At idling:**<br>**When fuel pressure regulator valve vacuum hose is connected.**<br>**235 kPa (2.4 kg/cm$^2$, 34 psi)**<br>**When fuel pressure regulator valve vacuum hose is disconnected.**<br>**294 kPa (3.0 kg/cm$^2$, 43 psi)**<br>**OK or NG** | | |
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

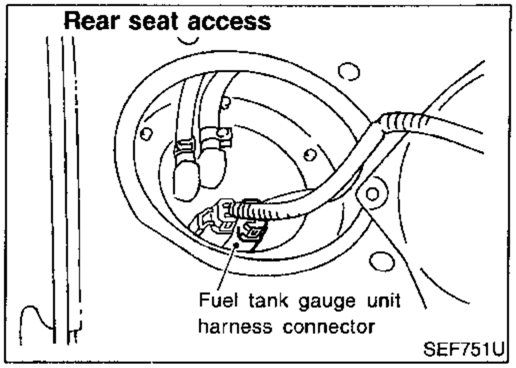
| 5 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>● Fuel pump and circuit (Refer to EC-439.)<br>● Fuel pressure regulator (Refer to EC-32.) | | |
| | ▶ | Repair or replace. |

| 6 | CHECK MASS AIR FLOW SENSOR | |
|---|---|---|
| **With CONSULT**<br>1. Install all parts removed.<br>2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.<br>**3.3 - 4.8 g·m/sec: at idling**<br>**12.0 - 14.9 g·m/sec: at 2,500 rpm** | | |
| **With GST**<br>1. Install all parts removed.<br>2. Check "MASS AIR FLOW" in MODE 1 with GST.<br>**3.3 - 4.8 g·m/sec: at idling**<br>**12.0 - 14.9 g·m/sec: at 2,500 rpm** | | |
| **No Tools**<br>1. Install all parts removed.<br>2. Check voltage between ECM terminal 54 and ground.<br>**1.0 - 1.7V: at idling**<br>**1.7 - 2.3V: at 2,500 rpm**<br>**OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-115. |

| 7 | CHECK FUNCTION OF INJECTORS | |
|---|---|---|
| **With CONSULT**<br>1. Start engine.<br>2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.<br><br><br>SEF389V<br>3. Make sure that each circuit produces a momentary engine speed drop. | | |
| **Without CONSULT**<br>1. Start engine.<br>2. Listen to each injector operating sound.<br>**Clicking noise should be heard.**<br><br><br>MEC703B<br>**OK or NG** | | |
| OK | ▶ | GO TO 8. |
| NG | ▶ | Perform trouble diagnosis for "INJECTORS", EC-429. |

| 8 | CHECK INJECTOR | |
|---|---|---|
| 1. Remove injector assembly. Refer to EC-33.<br>Keep fuel hose and all injectors connected to injector gallery.<br>2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.<br>3. Disconnect injector harness connectors left bank (for DTC P0172), right bank (for P0175).<br>The injector harness connectors on right bank (for P0172), left bank (for P0175) should remain connected.<br>4. Disconnect all ignition coil harness connectors.<br>5. Prepare pans or saucers under each injectors.<br>6. Crank engine for about 3 seconds.<br>Make sure fuel does not drip from injector.<br>**OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace the injectors from which fuel is dripping. Always replace O-ring with new one. |

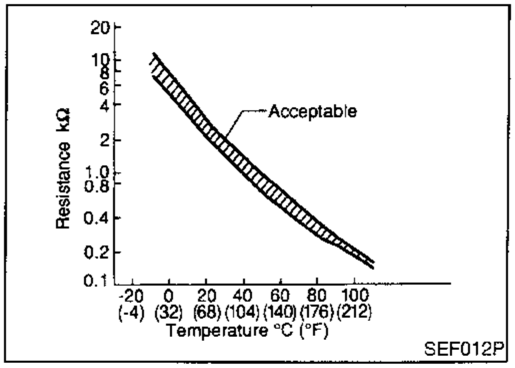
| 9 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |




## Component Description

NBEC0166

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 60 (Tank fuel temperature sensor) and ECM terminal 32 (ECCS ground).

## On Board Diagnosis Logic

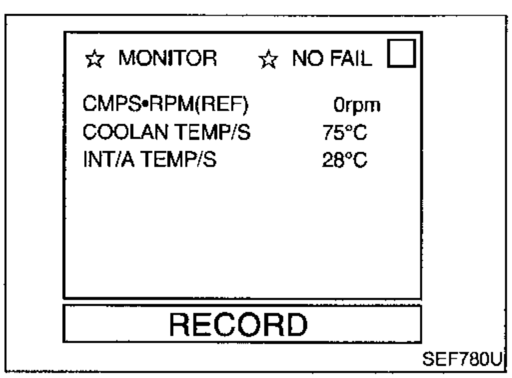
NBEC0167

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0180<br>0402 | • An excessively high or low voltage is sent to ECM.<br>• Rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | • Harness or connectors<br>(The sensor circuit is open or shorted.)<br>• Tank fuel temperature sensor |

## DTC Confirmation Procedure

NBEC0168

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

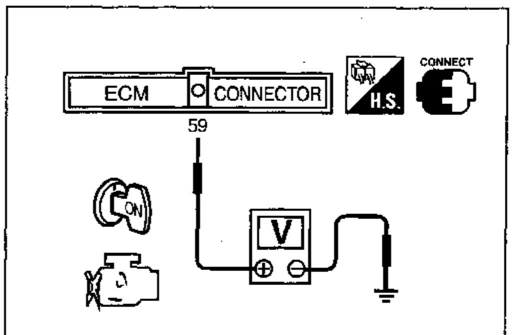



**With CONSULT**

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-254.
   If the result is OK, go to following step.
4) Cool engine down until "COOLAN TEMP/S" is less than 90°C (194°F). If "COOLAN TEMP/S" is already less than 90°C (194°F) before step 4, the result will be OK.
5) Wait at least 10 seconds.

**With GST**

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-254.
   If the result is OK, go to following step.
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.



SEF781U

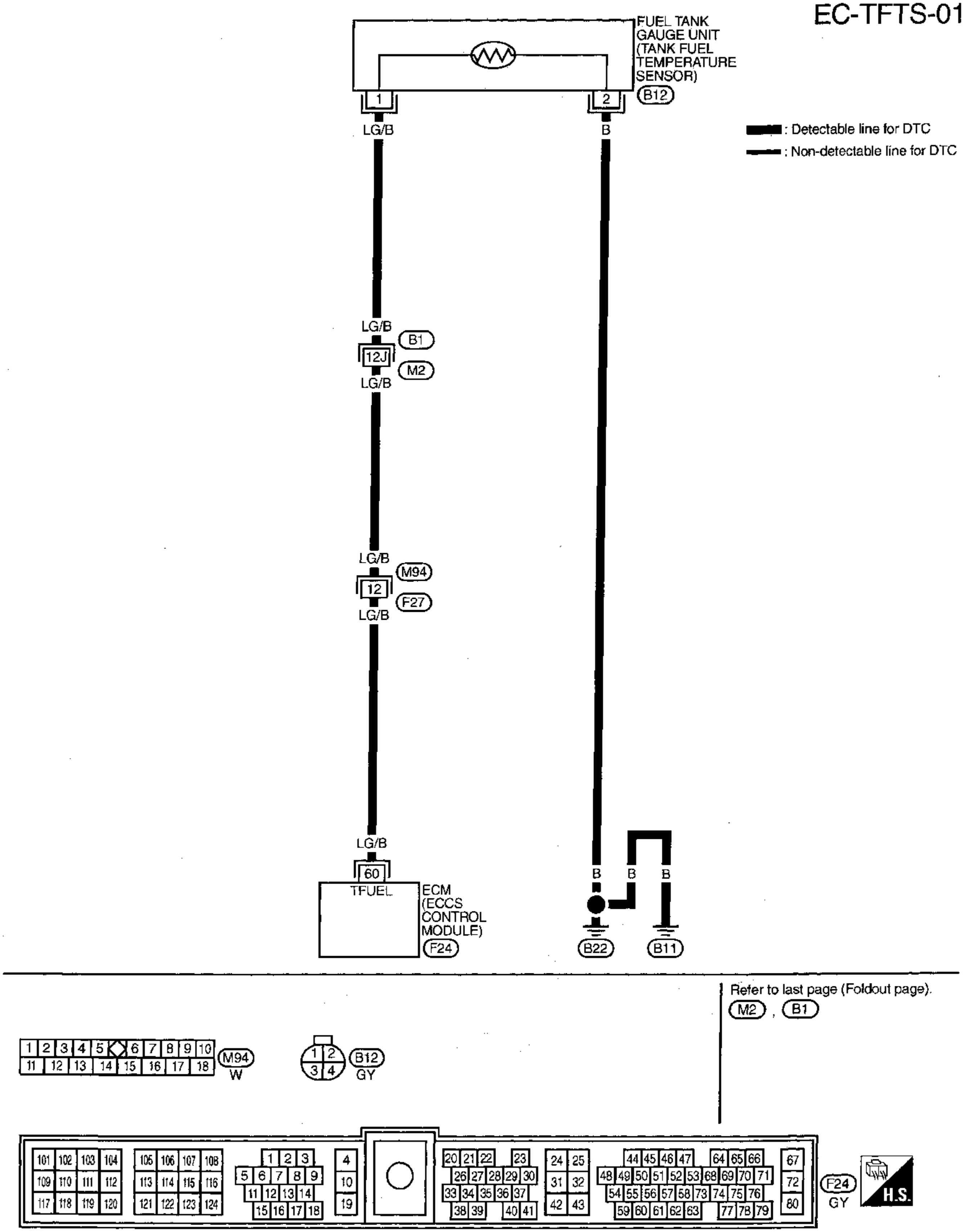
**No Tools**

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-254.
   If the result is OK, go to following step.
4) Cool engine down until the voltage between ECM terminal 59 (Engine coolant temperature sensor signal) 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.

## Wiring Diagram

NBEC0169

EC-TFTS-01



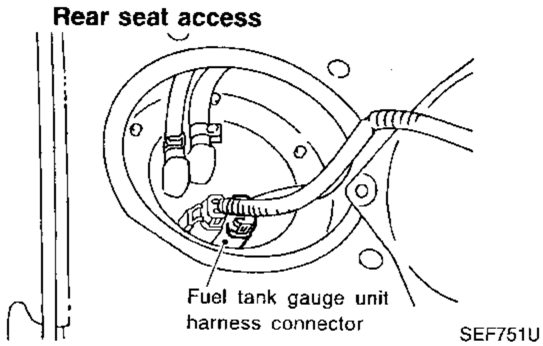

MEC153C

## Diagnostic Procedure

NBEC0170

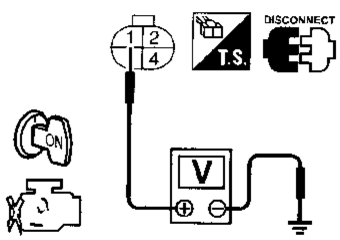
### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect fuel tank gauge unit harness connector.




SEF751U

3. Turn ignition switch "ON".
4. Check voltage between terminal 1 and ground with CONSULT or tester.
   **Voltage: Approximately 5V**




SEF702U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

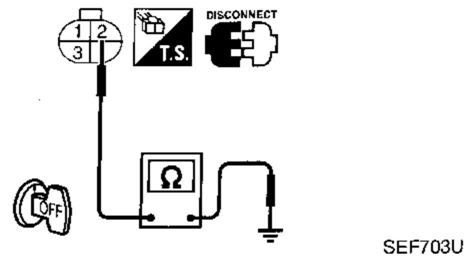
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B1, M2
- Harness connectors M94, F27
- Harness for open or short between ECM and tank fuel temperature sensor

| | |
|---|---|
| ▶ | Repair harness or connector. |

### 3 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 2 and body ground.
   **Continuity should exist.**




SEF703U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 CHECK COMPONENT

(Tank fuel temperature sensor)
Refer to "Component Inspection", EC-254.

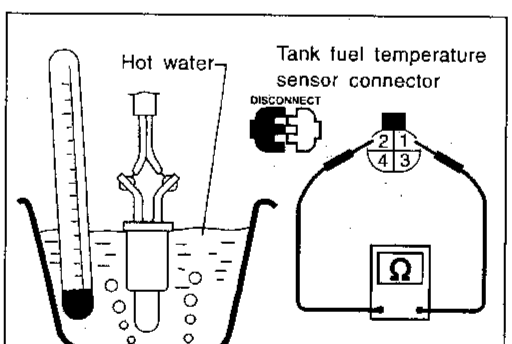
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace tank fuel temperature sensor. |

### 5 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |




SEF379T

## Component Inspection

NBEC0171

### TANK FUEL TEMPERATURE SENSOR

NBEC0171S01

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.

## On Board Diagnosis Logic

NBEC0172

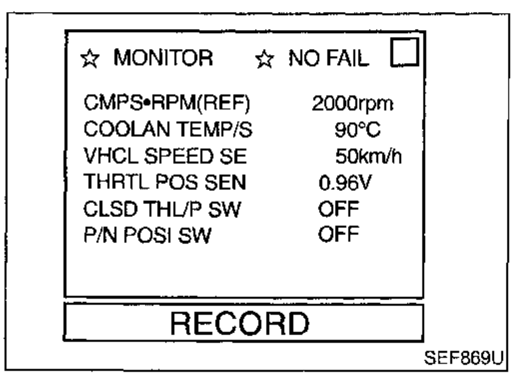
If a misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (OBD), the misfire is diagnosed.

| Sensor | Input Signal to ECM | ECM function |
|---|---|---|
| Crankshaft position sensor (OBD) | Engine speed | On board diagnosis of misfire |

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.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0300 (0701) | Multiple cylinders misfire. | • Improper spark plug<br>• Insufficient compression<br>• Incorrect fuel pressure<br>• EGR valve<br>• The injector circuit is open or shorted<br>• Injectors<br>• Intake air leak<br>• The ignition secondary circuit is open or shorted<br>• Lack of fuel<br>• Drive plate<br>• Front heated oxygen sensor |
| P0301 (0608) | • No. 1 cylinder misfires. | |
| P0302 (0607) | • No. 2 cylinder misfires. | |
| P0303 (0606) | • No. 3 cylinder misfires. | |
| P0304 (0605) | • No. 4 cylinder misfires. | |
| P0305 (0604) | • No. 5 cylinder misfires. | |
| P0306 (0603) | • No. 6 cylinder misfires. | |




SEF869U

## DTC Confirmation Procedure

NBEC0173

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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.**

**With GST**

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.

**No Tools**

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.

## Diagnostic Procedure

NBEC0174

| 1 | CHECK FOR INTAKE AIR LEAK |
|---|---|
| Start engine and run it at idle speed. Listen for the sound of the intake air leak. | |
| **OK or NG** | |
| OK ▶ | GO TO 2. |
| NG ▶ | Discover air leak location and repair. |

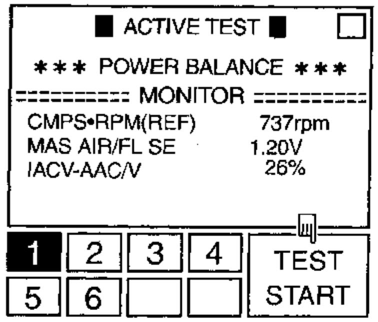
| 2 | CHECK FOR EXHAUST SYSTEM CLOGGING |
|---|---|
| Stop engine and visually check exhaust tube, three way catalyst and muffler for dents. | |
| **OK or NG** | |
| OK ▶ | GO TO 3. |
| NG ▶ | Repair or replace it. |

| 3 | CHECK EGR FUNCTION |
|---|---|
| Perform "DTC Confirmation Procedure" of "DTC P1402 EGR FUNCTION (OPEN)". Refer to EC-374. | |
| **OK or NG** | |
| OK ▶ | GO TO 4. |
| NG ▶ | Repair EGR system. |

| 4 | PERFORM POWER BALANCE TEST |
|---|---|

**With CONSULT**

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

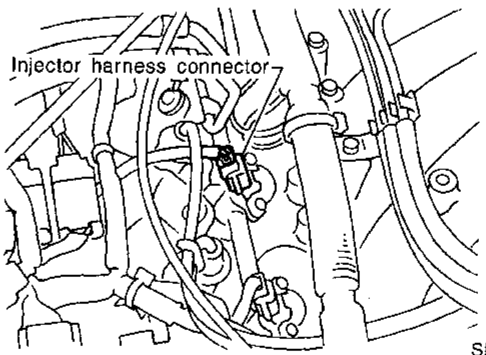



SEF389V

2. Is there any cylinder which does not produce a momentary engine speed drop?

**Without CONSULT**

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



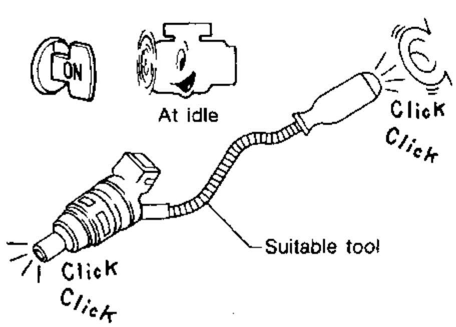

SEF995R

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 5. |
| No | ▶ | GO TO 8. |

| 5 | CHECK INJECTOR |
|---|---|

Does each injector make an operating sound at idle?



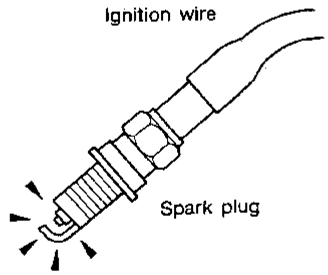

MEC703B

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 6. |
| No | ▶ | Check injector(s) and circuit(s). Refer to EC-429. |

| 6 | CHECK IGNITION SPARK |
|---|---|

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




SEF282G

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

| 7 | CHECK COMPONENT |
|---|---|

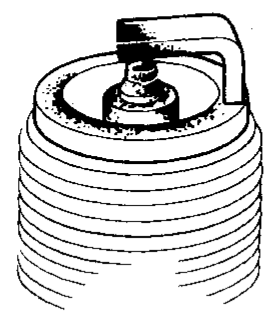
(Ignition wires)
Refer to "Component Inspection", EC-259.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | Check ignition coil, power transistor and their circuits. Refer to EC-350. |
| NG | ▶ | Replace. |

| 8 | CHECK SPARK PLUGS |
|---|---|

Remove the spark plugs and check for fouling, etc.



SEF156I

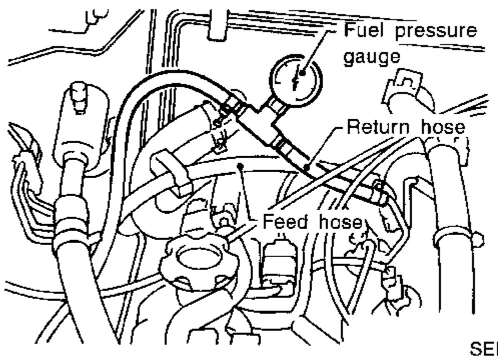
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to "ENGINE MAINTENANCE" in MA section. |

*Diagnostic Procedure (Cont'd)*

| 9 | CHECK FUEL PRESSURE |
|---|---|

1. Install any parts removed.
2. Release fuel pressure to zero.
   Refer to EC-31.
3. Install fuel pressure gauge and check fuel pressure.
   **At idle:**
   **Approx. 235 kPa (2.4 kg/cm², 34 psi)**




SEF964R

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | GO TO 10. |

| 10 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Fuel pump and circuit (Refer to EC-439.)
- Fuel pressure regulator (Refer to EC-32.)
- Fuel lines (Refer to "ENGINE MAINTENANCE" in MA section.)
- Fuel filter for clogging

| | | |
|---|---|---|
| | ▶ | Repair or replace. |

| 11 | CHECK IGNITION TIMING |
|---|---|

Perform "Basic Inspection", EC-85.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | Adjust ignition timing. |

| 12 | CHECK COMPONENT |
|---|---|

(Front heated oxygen sensor LH/RH)
Refer to "Component Inspection", EC-164.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 13. |
| NG | ▶ | Replace front heated oxygen sensor. |

| 13 | CHECK MASS AIR FLOW SENSOR |
|---|---|

**With CONSULT**
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
**3.3 - 4.8 g·m/sec: at idling**
**12.0 - 14.9 g·m/sec: at 2,500 rpm**

**With GST**
Check "MASS AIR FLOW" in MODE 1 with GST.
**3.3 - 4.8 g·m/sec: at idling**
**12.0 - 14.9 g·m/sec: at 2,500 rpm**

**No Tools**
Check voltage between ECM terminal 54 and ground.
**1.0 - 1.7V: at idling**
**1.7 - 2.3V: at 2,500 rpm**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 14. |
| NG | ▶ | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-115. |

| 14 | CHECK COMPRESSION PRESSURE |
|---|---|

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | Check pistons, piston rings, valves, valve seats and cylinder head gaskets. |

| 15 | CHECK SYMPTOM MATRIX CHART |
|---|---|

Check items on the rough idle symptom in "Symptom Matrix Chart", EC-89.

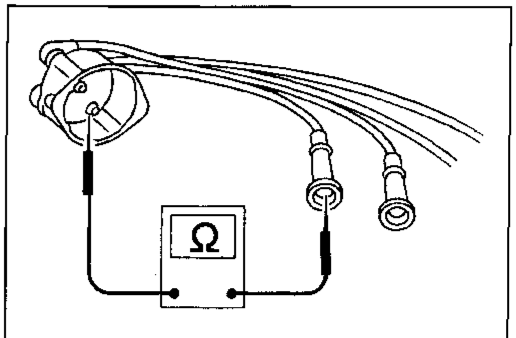
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 16. |
| NG | ▶ | Repair or replace. |

| 16 | ERASE THE 1ST TRIP DTC |
|---|---|
| Some tests may cause a 1st trip Diagnostic Trouble Code to be set. Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-55. | |
| ▶ | GO TO 17. |

| 17 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX



SEF174P

## Component Inspection
NBEC0175

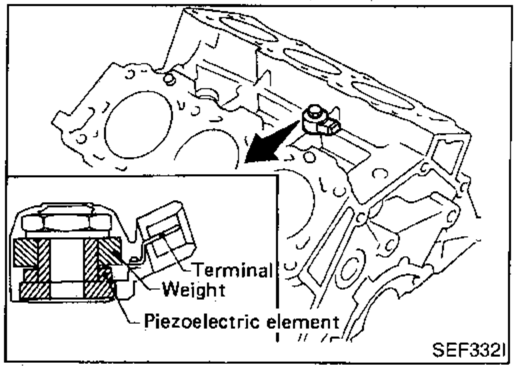
### IGNITION WIRES
NBEC0175S01

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:**

| Cylinder No. | Resistance kΩ [at 25°C (77°F)] |
|---|---|
| 1 | Approximately 6.5 |
| 2 | Approximately 10.0 |
| 3 | Approximately 8.5 |
| 4 | Approximately 12.5 |
| 5 | Approximately 8.5 |
| 6 | Approximately 11.0 |

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.




## Component Description

NBEC0176

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

NBEC0177

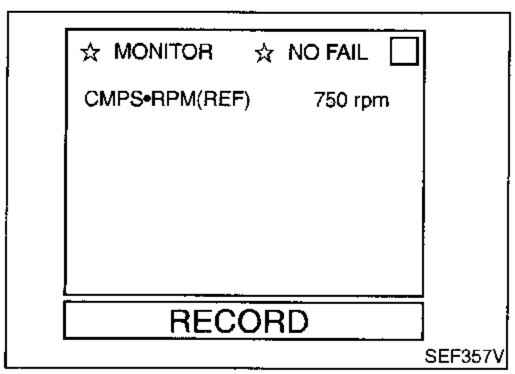
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 64 | W | Knock sensor | **[Engine is running]**<br>• Idle speed | Approximately 2.5V |

## On Board Diagnosis Logic

NBEC0178

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0325<br>0304 | • An excessively low or high voltage from the knock sensor is sent to ECM. | • Harness or connectors<br>(The knock sensor circuit is open or shorted.)<br>• Knock sensor |




## DTC Confirmation Procedure

NBEC0179

NOTE:
If "DTC 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.**

**With CONSULT**

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.

**With GST**

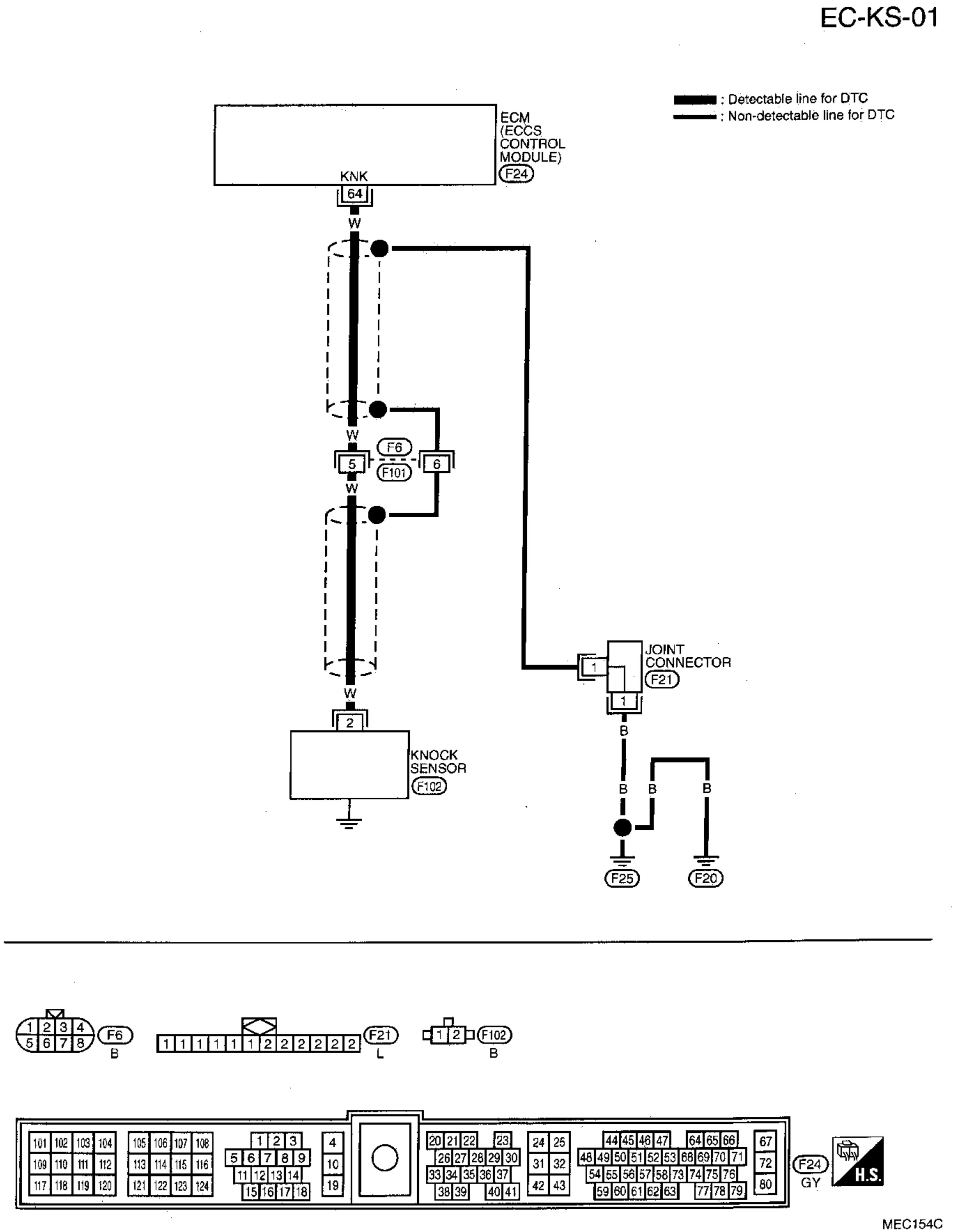
1) Start engine and run it for at least 5 seconds at idle speed.
2) Select "MODE 3" with GST.

**No Tools**

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.

## Wiring Diagram

NBEC0180



## Diagnostic Procedure

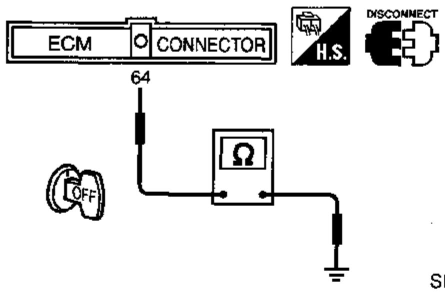
NBEC0181

### 1 CHECK INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 64 and engine ground.

**Resistance:**

**Approximately 500 - 620 kΩ [at 25°C (77°F)]**




SEF704U

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

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

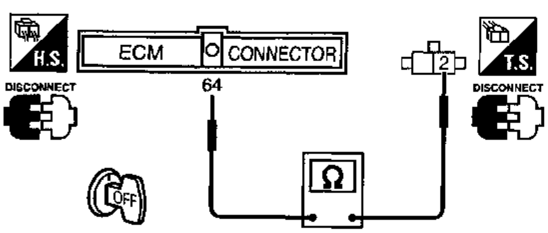
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 2. |

### 2 CHECK INPUT SIGNAL CIRCUIT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 64 and terminal 2.

**Continuity should exist.**




SEF705U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

### 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F6, F101
- Harness for open or short between ECM and knock sensor

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 CHECK COMPONENT

(Knock sensor)

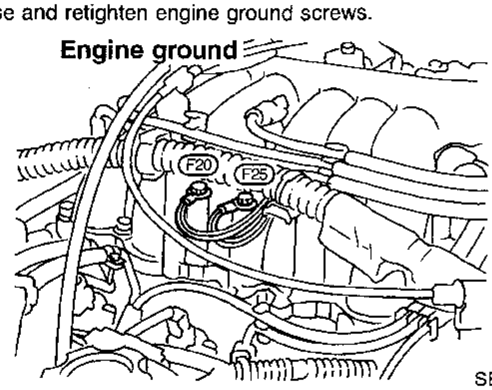
Refer to "Component Inspection", EC-263.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace knock sensor. |

### 5 RETIGHTEN GROUND SCREWS

Loose and retighten engine ground screws.

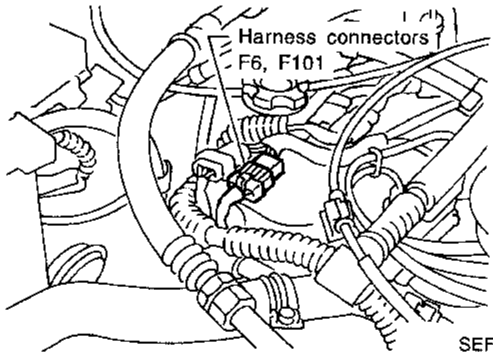



SEF031S

| | |
|---|---|
| ▶ | GO TO 6. |

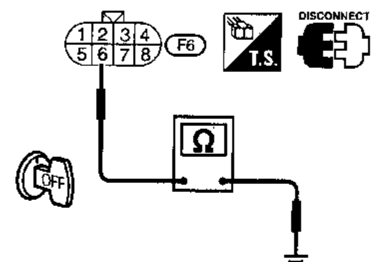
| 6 | CHECK SHIELD CIRCUIT |
|---|---|

1. Disconnect harness connectors F6 and F101.




SEF996RA

2. Check harness continuity between terminal 6 and ground.
   **Continuity should exist.**




SEF782U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

| 7 | DETECT MALFUNCTIONING PART |
|---|---|

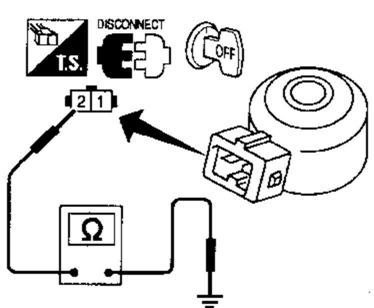
Check the following.
- Harness connectors F6 and F101
- Joint connector F21
  (Refer to "HARNESS LAYOUT" in EL section.)
- Harness for open or short between harness connector F6 and engine ground

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |




SEF546P

## Component Inspection

NBEC0182

### KNOCK SENSOR

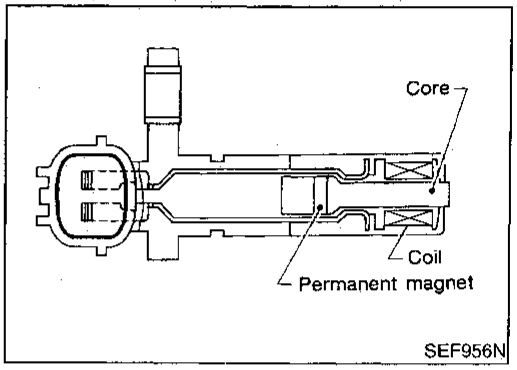
NBEC0182S01

- Use an ohmmeter which can measure more than 10 MΩ.

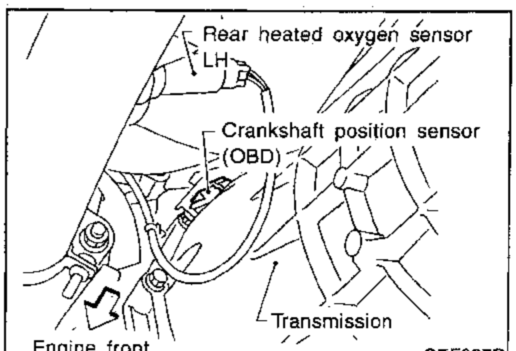
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal 2 and ground.
   **Resistance: 500 - 620 kΩ [at 25°C (77°F)]**

**CAUTION:**

**Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.**



SEF956N



SEF997R

## Component Description

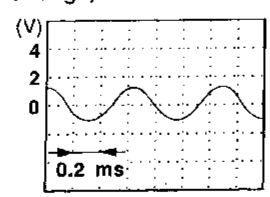
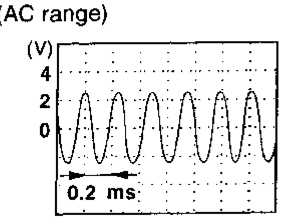
NBEC0183

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 used to control the engine system. It is used only for the on board diagnosis.

## ECM Terminals and Reference Value

NBEC0184

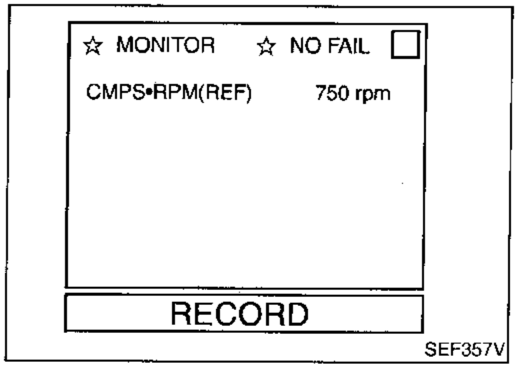
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 47 | L | Crankshaft position sensor (OBD) | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | Approximately 1V<br>(AC range)<br><br><br>SEF003V |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | Approximately 2V<br>(AC range)<br><br><br>SEF004V |

## On Board Diagnosis Logic

NBEC0185

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0335<br>0802 | • 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. | • Harness or connectors<br>(The crankshaft position sensor (OBD) circuit is open.)<br>• Crankshaft position sensor (OBD) |



SEF357V

## DTC Confirmation Procedure

NBEC0186

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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.

**With GST**

1) Start engine and run it for at least 15 seconds at idle speed.
2) Select "MODE 7" with GST.

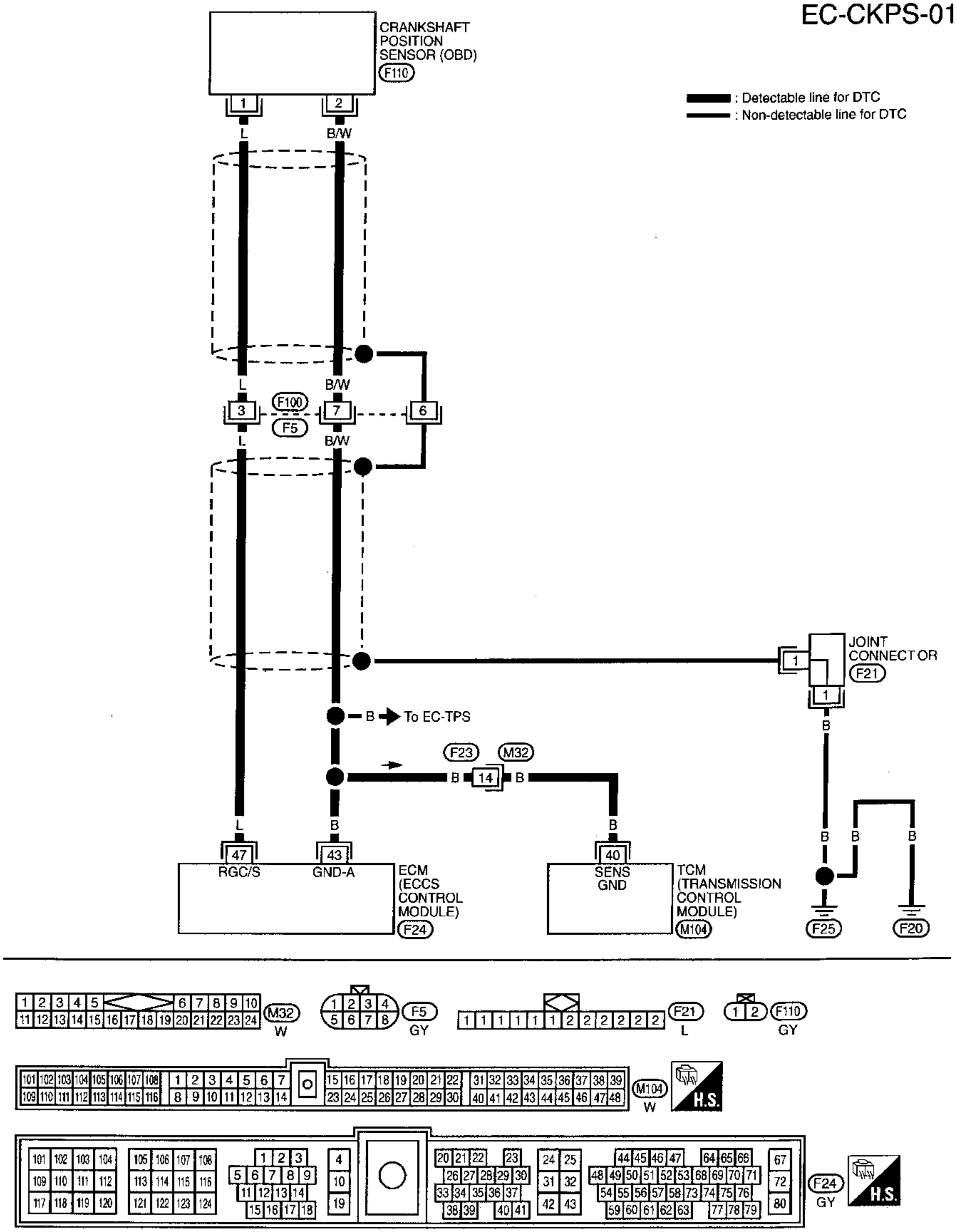
**No Tools**

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.

## Wiring Diagram

NBEC0187

EC-CKPS-01



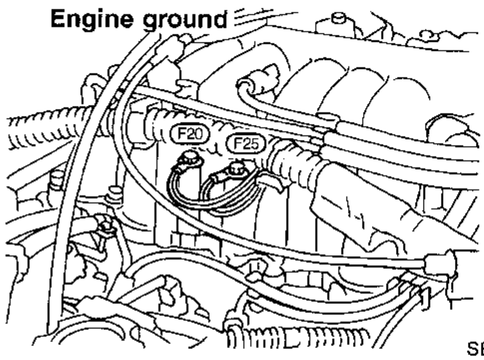

MEC155C

## Diagnostic Procedure

NBEC0188

| 1 | RETIGHTEN GROUND SCREWS |
|---|---|

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

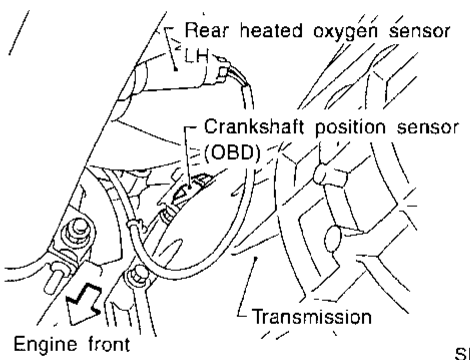



SEF031S

| | |
|---|---|
| ▶ | GO TO 2. |

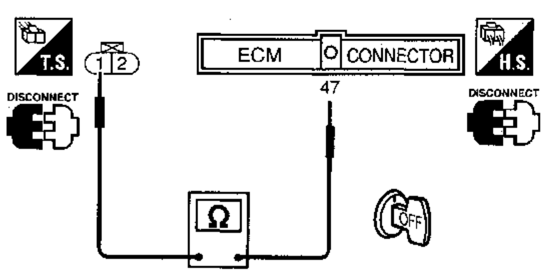
| 2 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.




SEF997R

2. Check continuity between ECM terminal 47 and terminal 1.
**Continuity should exist.**




SEF706U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

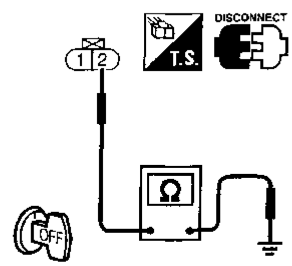
| 3 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F5, F100
- Harness for open or short between ECM and crankshaft position sensor (OBD)

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK GROUND CIRCUIT |
|---|---|

1. Reconnect ECM harness connector.
2. Check harness continuity between terminal 2 and engine ground.
**Continuity should exist.**




SEF707U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

| 5 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F5, F100
- Harness connectors F23, M32
- Harness for open or short between crankshaft position sensor (OBD) and ECM
- Harness for open or short between crankshaft position sensor (OBD) and TCM (Transmission control module)

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK COMPONENT |
|---|---|

[Crankshaft position sensor (OBD)]
Refer to "Component Inspection", EC-268.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace crankshaft position sensor (OBD). |

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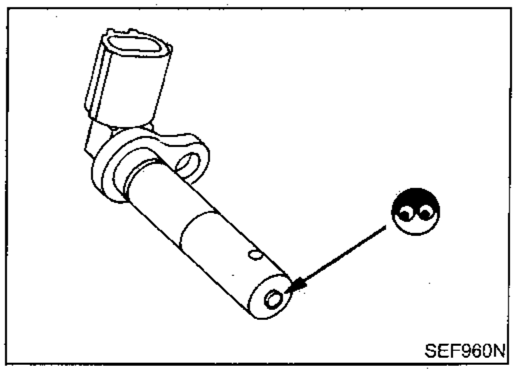
| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |

## Component Inspection

NBEC0189

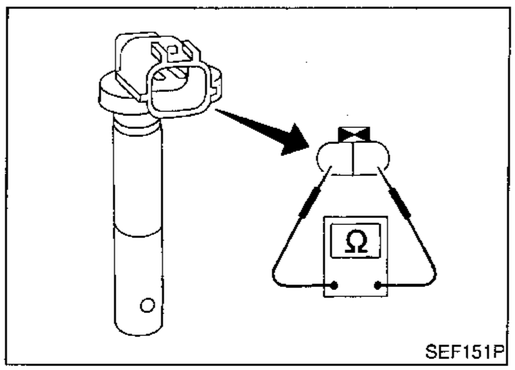
### CRANKSHAFT POSITION SENSOR (OBD)

NBEC0189S01



SEF960N

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.

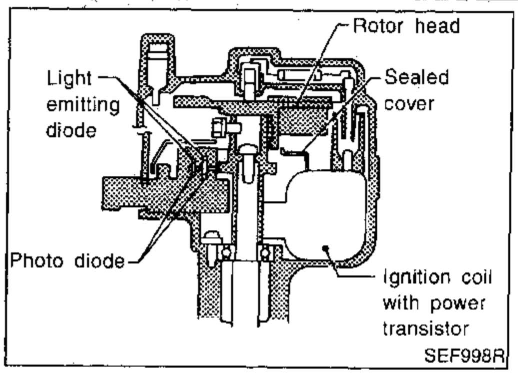


SEF151P

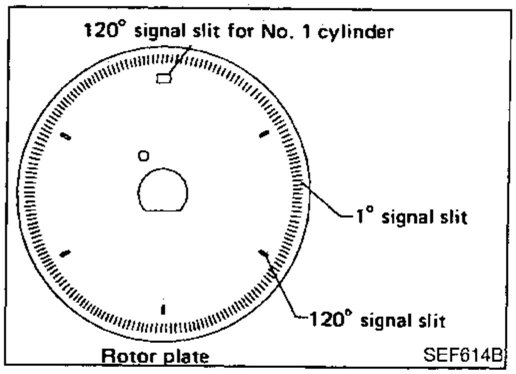
5. Check resistance as shown in the figure.

   **Resistance: Approximately 166.5 - 203.5Ω [at 20°C (68°F)]**

   If NG, replace crankshaft position sensor (OBD).



SEF998R



SEF614B

## Component Description

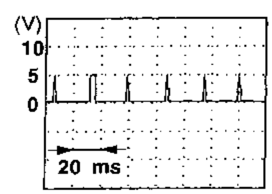
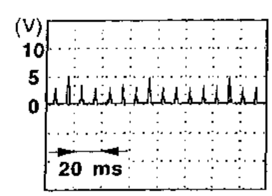
NBEC0190

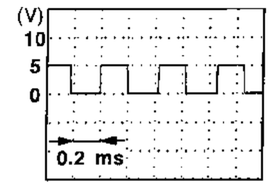
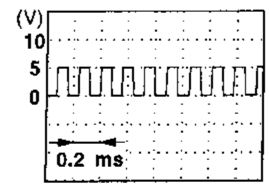
The camshaft position sensor is a basic component of the ECCS. It monitors engine speed and piston position. These input signals to the ECM are used to control fuel injection, ignition timing and other functions.
The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for a 1° (POS) signal and 6 slits for a 120° (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

NBEC0191

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 4 | L/B | ECCS relay (Self-shut-off) | **[Engine is running]** **[Ignition switch "OFF"]** • For a few seconds after turning ignition switch "OFF" | 0 - 1.5V |
| | | | **[Ignition switch "OFF"]** • A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 44 | L | Camshaft position sensor (Reference signal) | **[Engine is running]** • Idle speed | 0.3 - 0.5V   SEF997U |
| 48 | L | | **[Engine is running]** • Engine speed is 2,000 rpm | 0.3 - 0.5V   SEF998U |

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 49 | B/W | Camshaft position sensor (Position signal) | **[Engine is running]** <br>● **Warm-up condition** <br>● Idle speed | Approximately 2.5V   SEF999U |
| | | | **[Engine is running]** <br>● Engine speed is 2,000 rpm | Approximately 2.5V   SEF001V |
| 67 | B/W | Power supply for ECM | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/W | | | |
| 117 | B/W | Current return | **[Engine is running]** <br>● Idle speed | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

NBEC0192

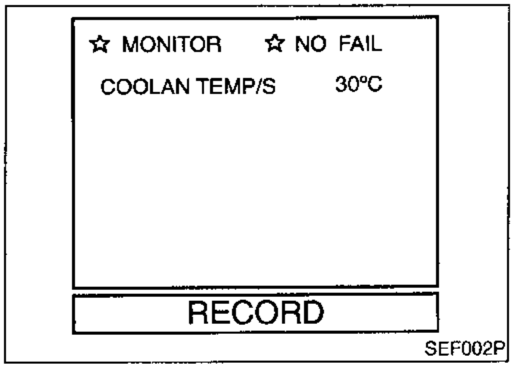
| DTC No. | Malfunction is detected when ... | | Check Items (Possible Cause) |
|---|---|---|---|
| P0340 0101 | A) | Either 1° or 120° signal is not sent to ECM for the first few seconds during engine cranking. | ● Harness or connectors (The camshaft position sensor circuit is open or shorted.) <br>● Camshaft position sensor <br>● Starter motor (Refer to EL section.) <br>● Starting system circuit (Refer to EL section.) <br>● Dead (Weak) battery |
| | B) | Either 1° or 120° 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 120° signal is not in the normal range during the specified engine speed. | |

## DTC Confirmation Procedure

NBEC0193

NOTE:

- **Perform "PROCEDURE FOR MALFUNCTION A" first. If DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND C".**
- If "DTC 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

NBEC0193S01

**CAUTION:**

**Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.**

**With CONSULT**

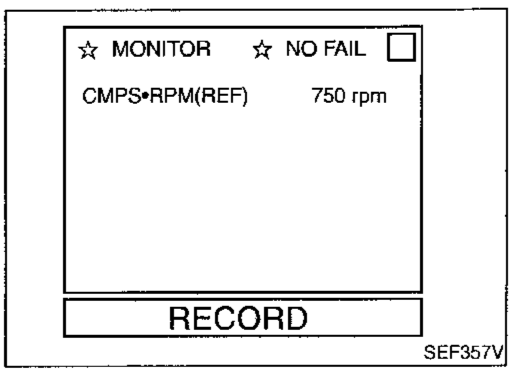
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Crank engine for at least 2 seconds.

**With GST**

1) Crank engine for at least 2 seconds.
2) Select "MODE 7" with GST.

**No Tools**

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

NBEC0193S02

**CAUTION:**

**Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.**

**With CONSULT**

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.

**With GST**

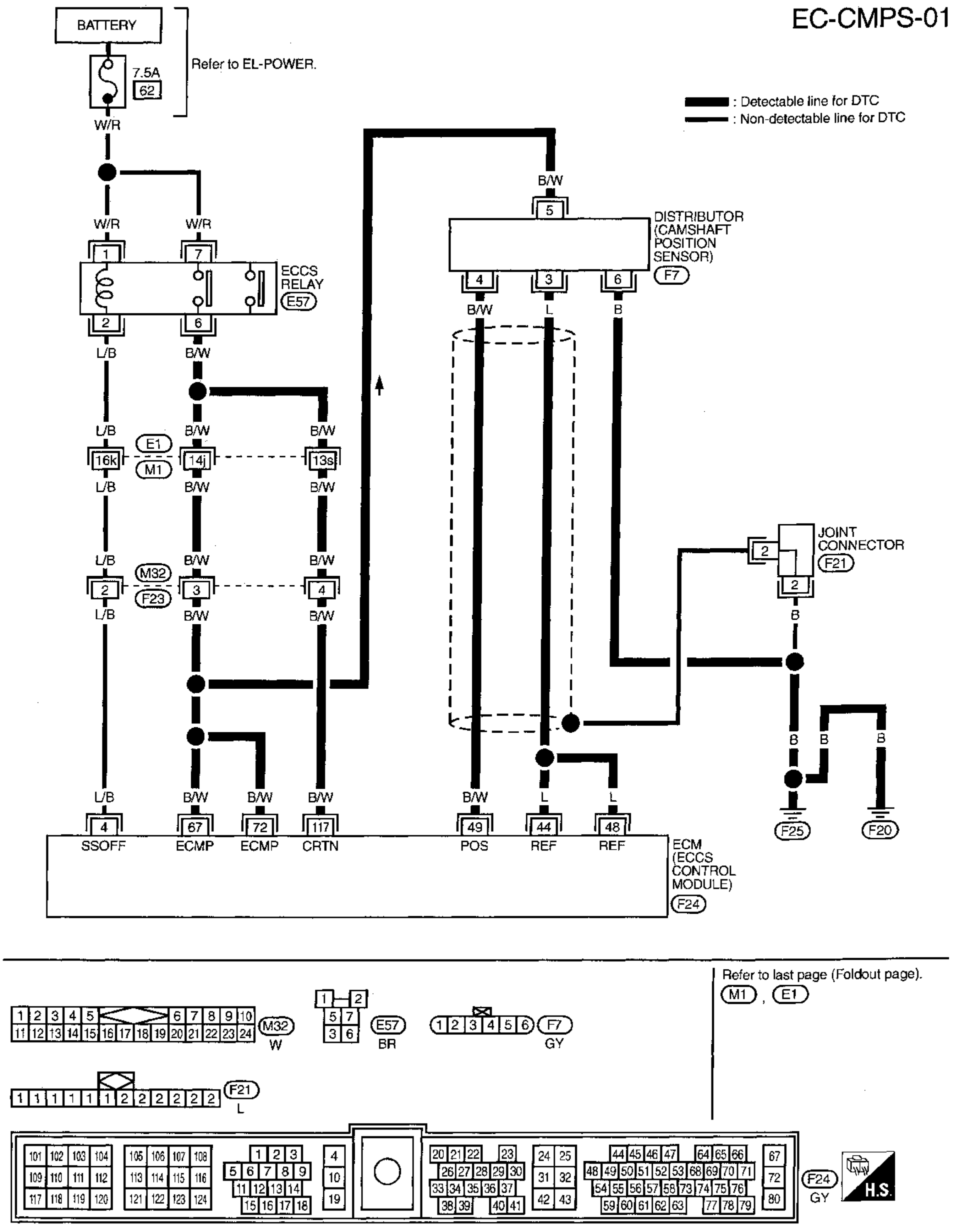
1) Start engine and run it for at least 2 seconds at idle speed.
2) Select "MODE 7" with GST.

**No Tools**

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.

## Wiring Diagram

NBEC0194



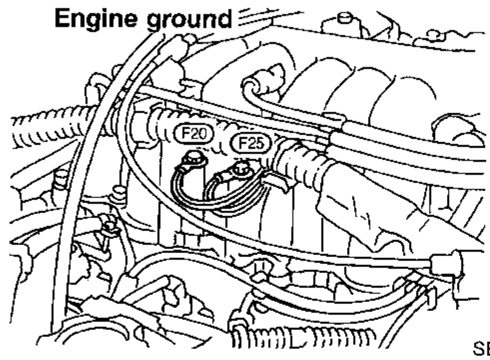

MEC156C

## Diagnostic Procedure

NBEC0195

### 1 RETIGHTEN GROUND SCREWS

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

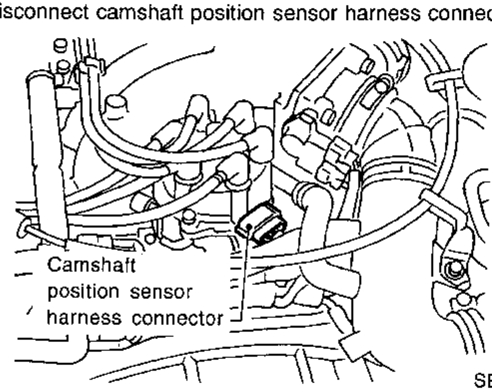



SEF031S

| | |
|---|---|
| ▶ | GO TO 2. |

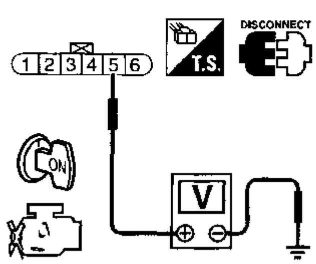
### 2 CHECK POWER SUPPLY

1. Disconnect camshaft position sensor harness connector.




SEF999R

2. Turn ignition switch "ON".
3. Check voltage between terminal 5 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF708U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

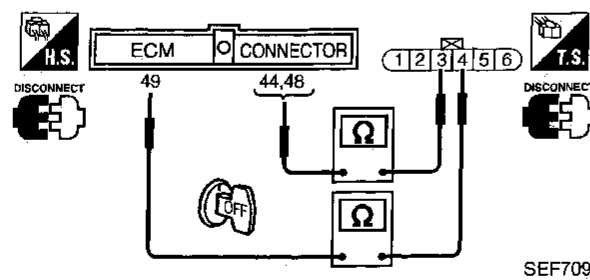
### 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F23, M32
- Harness connectors M1, E1
- Harness for open or short between camshaft position sensor and ECCS relay
- Harness for open or short between camshaft position sensor and ECM

| | |
|---|---|
| ▶ | Repair harness or connectors. |

### 4 CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between sensor terminal 4 and ECM terminal 49, sensor terminal 3 and ECM terminals 44, 48.
   **Continuity should exist.**




SEF709U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

GI
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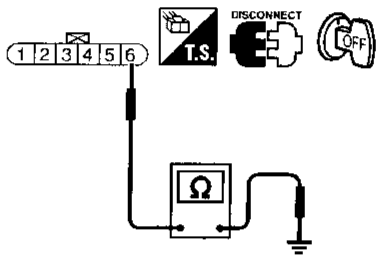
| 5 | CHECK GROUND CIRCUIT | |
|---|---|---|
| 1. Turn ignition switch "OFF".<br>2. Check harness continuity between sensor terminal 6 and engine ground.<br>**Continuity should exist.** | | |




SEF710U

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

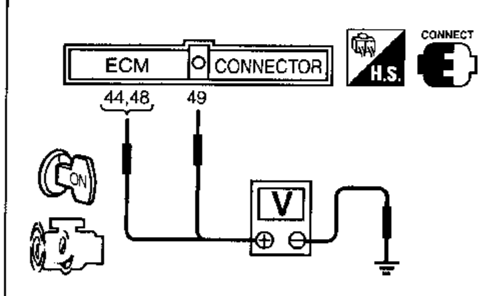
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK COMPONENT | |
|---|---|---|
| (Camshaft position sensor)<br>Refer to "Component Inspection", EC-274.<br>**OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace camshaft position sensor. |

| 7 | CHECK SHIELD CIRCUIT | |
|---|---|---|
| 1. Remove joint connector.<br>2. Check the following.<br>• Continuity between joint connector terminal and ground<br>• Joint connector<br>(Refer to "HARNESS LAYOUT" in EL section.)<br>**Continuity should exist.**<br>If OK, check harness for short to ground and short to power. Then reconnect joint connector.<br>**OK or NG** | | |
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |




SEF752U

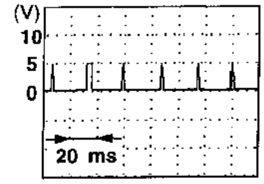
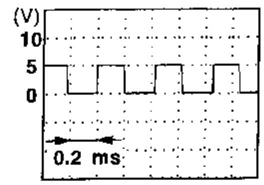
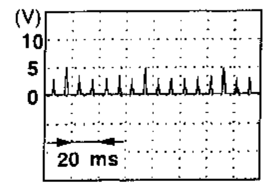
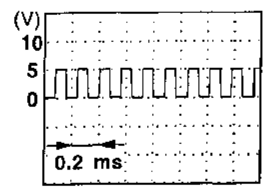
## Component Inspection

NBEC0196

### CAMSHAFT POSITION SENSOR

NBEC0196S01

1. Install any parts removed.
2. Start engine.
3. Check voltage between ECM terminals 44, 48 and ground, ECM terminal 49 and ground with DC range.

| Condition | ECM terminal | Voltage |
|---|---|---|
| Engine running at idle | 44, 48 and ground | 0.3 - 0.5V   SEF997U |
| | 49 and ground | Approximately 2.5V   SEF999U |
| Engine speed is 2,000 rpm | 44, 48 and ground | 0.3 - 0.5V   SEF998U |
| | 49 and ground | Approximately 2.5V   SEF001V |

If NG, replace distributor assembly with camshaft position sensor.

# Description

NBEC0197

## SYSTEM DESCRIPTION

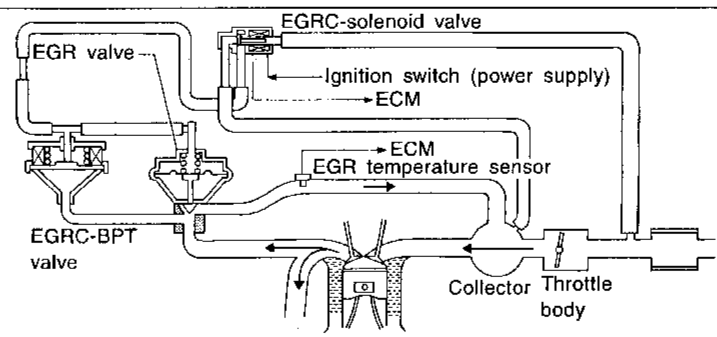
NBEC0197S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | EGR control | EGRC-solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |

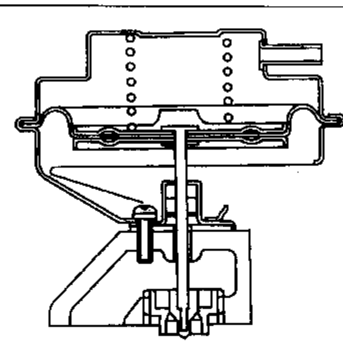
This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-solenoid valve. When the ECM detects any of the following conditions, current does not flow through the solenoid valve. This causes the intake manifold 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

EGR and vacuum




SEF317U



SEF783K

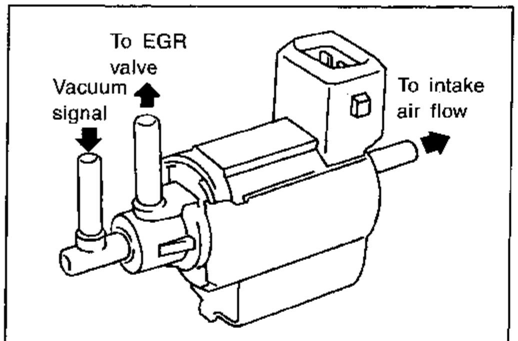
## COMPONENT DESCRIPTION

NBEC0197S02

### Exhaust Gas Recirculation (EGR) Valve

NBEC0197S0201

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to EGRC-BPT valve operation. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

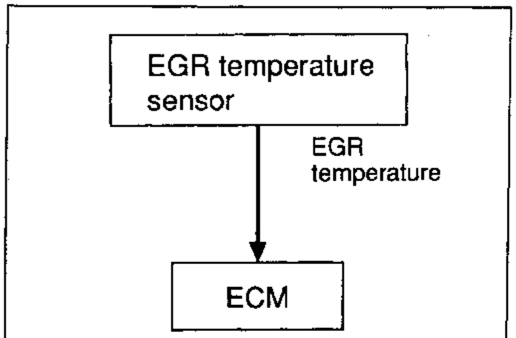



SEF318U

### EGRC-solenoid Valve

NBEC0197S0202

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 (from the intake manifold collector to the EGR valve) 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.



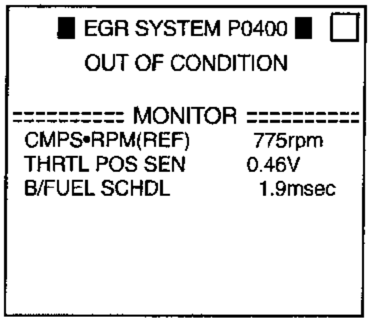

SEF073P

## On Board Diagnosis Logic

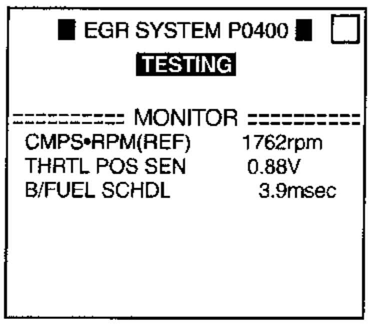
NBEC0198

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.

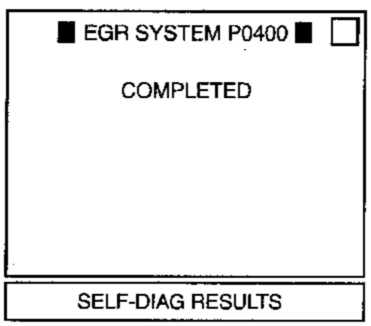
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0400<br>0302 | The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition. | • EGR valve stuck closed<br>• EGRC-BPT valve<br>• Vacuum hoses<br>• EGRC-solenoid valve<br>• EGR passage<br>• EGR temperature sensor<br>• Exhaust gas leaks |



SEF783U



SEF784U



SEF785U

## DTC Confirmation Procedure

NBEC0464

**CAUTION:**

**Always drive vehicle at a safe speed.**

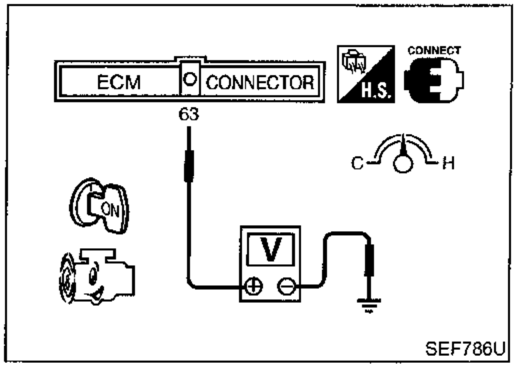
NOTE:
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- During the test, P0400 will not be stored in ECM even though "NG" is displayed on the CONSULT screen.

**TESTING CONDITION:**

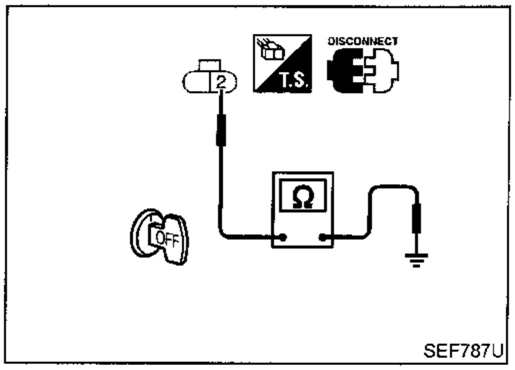
**Always perform the test at a temperature of –10°C (14°F) or higher.**

**With CONSULT**

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 engine 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 "COOLAN TEMP/S" value. When the "COOLAN TEMP/S" value 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.
   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): 1,600 - 2,400 rpm**
   **B/FUEL SCHDL: 3.0 - 4.5 ms**
   **THRTL POS SEN:**
   **X – (X + 0.7) 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-281.



SEF786U



SEF787U

## Overall Function Check

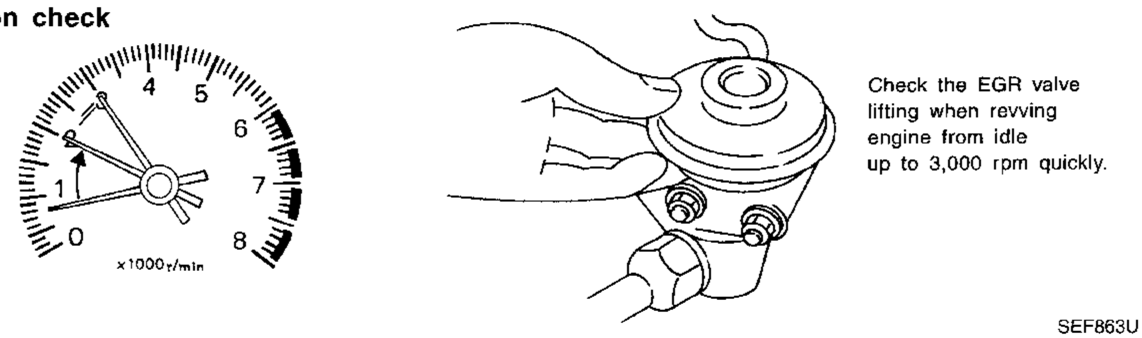
NBEC0199

Use this procedure to check the overall EGR function. During this check, a 1st trip DTC might not be confirmed.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Check the EGR valve lifting when revving engine from idle up to 3,000 rpm quickly under no load.
   **EGR valve should lift up and down without sticking.**
3) Check voltage between ECM terminal 63 (EGR temperature sensor signal) and ground at idle speed.
   **Less than 4.5V should exist.**
4) Turn ignition switch "OFF".
5) Disconnect EGR temperature sensor harness connector.
6) Check harness continuity between EGR temperature sensor harness connector terminal 2 and ground.
   **Continuity should exist.**
7) Perform "EGR TEMPERATURE SENSOR", "Component Inspection", EC-372.

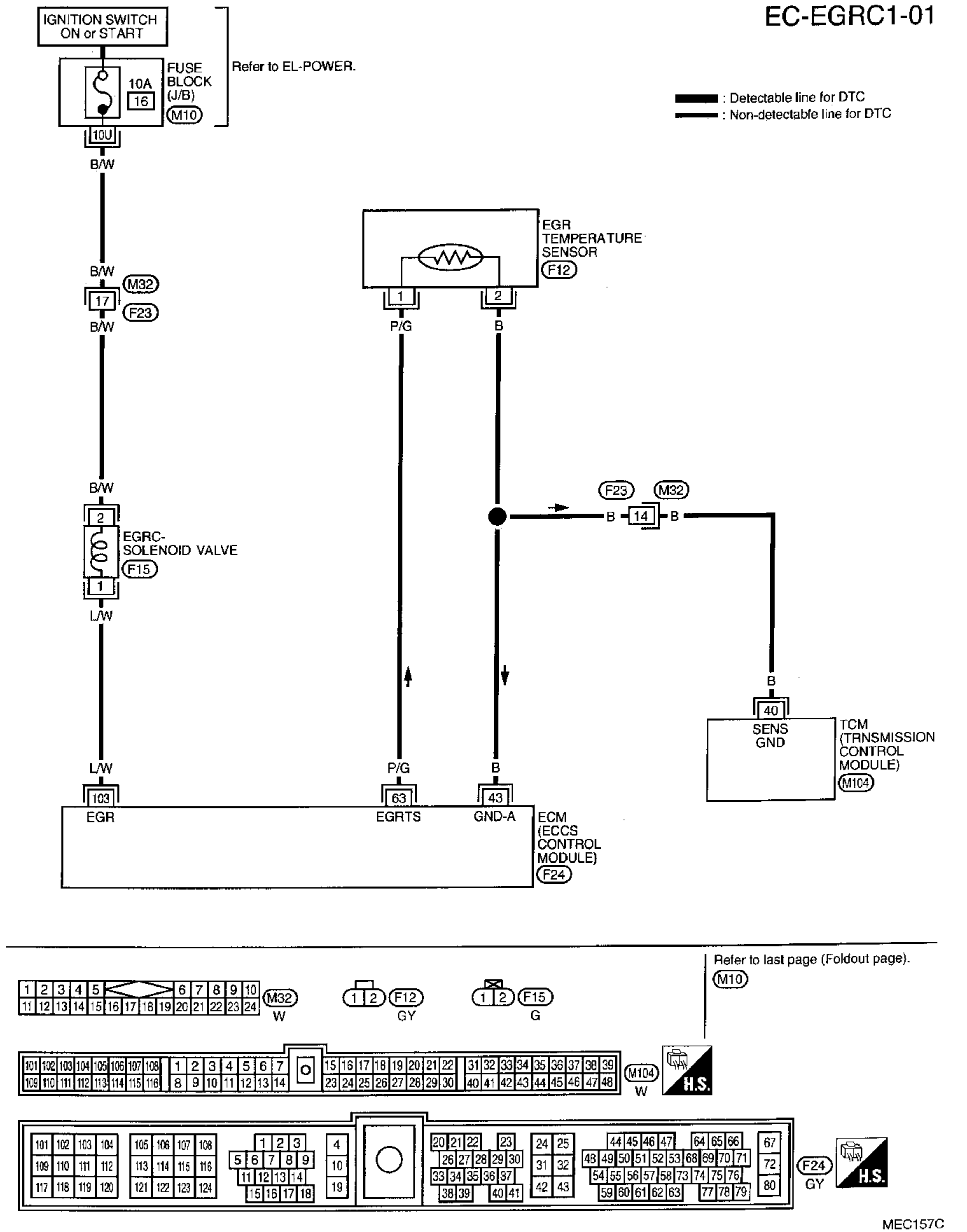
**Overall function check**



SEF863U

## Wiring Diagram

NBEC0200



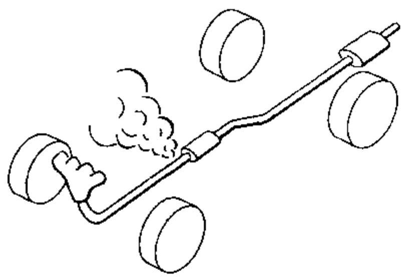

MEC157C

## Diagnostic Procedure

NBEC0201

| 1 | CHECK EXHAUST SYSTEM |
|---|---|

1. Start engine.
2. Check exhaust pipes and muffler for leaks.



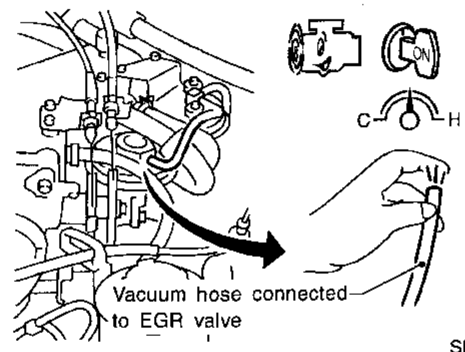
SEF099P

**OK or NG**

| | | |
|---|---|---|
| OK (With CONSULT) | ▶ | GO TO 2. |
| OK (Without CONSULT) | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace exhaust system. |

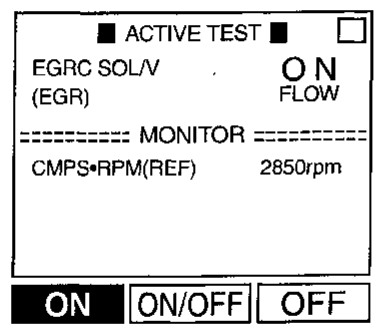
| 2 | CHECK VACUUM SOURCE TO EGR VALVE |
|---|---|

**With CONSULT**
1. Warm engine up to normal operating temperature.
2. Disconnect vacuum hose to EGR valve.
3. Check for vacuum existence at idle.
   **Vacuum should not exist at idle.**




SEF049S

4. Check for vacuum existence when revving engine from idle up to 3,000 rpm with the following methods.
- Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "ON".
  **Vacuum should exist when revving engine.**




SEF788U

**OK or NG**

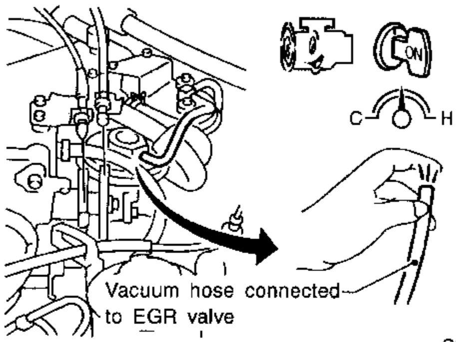
| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 5. |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## 3 CHECK VACUUM SOURCE TO EGR VALVE

**Without CONSULT**

1. Warm engine up to normal operating temperature.
2. Disconnect vacuum hose to EGR valve.
3. Check for vacuum existence at idle.
   **Vacuum should not exist at idle.**




SEF049S

4. Check for vacuum existence when revving engine from idle up to 3,000 rpm quickly.
   **Vacuum should exist when revving engine.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 5. |

## 4 CHECK COMPONENT

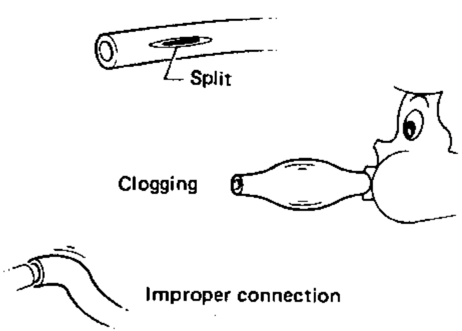
(EGR valve)
Refer to "Component Inspection", EC-283.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace EGR valve. |

## 5 CHECK VACUUM HOSE

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




SEF109L

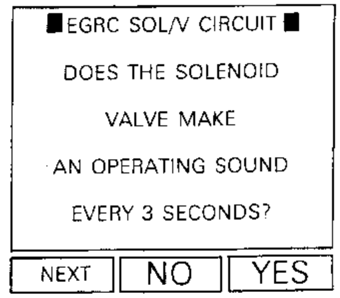
**OK or NG**

| | | |
|---|---|---|
| OK (With CONSULT) | ▶ | GO TO 6. |
| OK (Without CONSULT) | ▶ | GO TO 7. |
| NG | ▶ | Repair or replace vacuum hose. |

## 6 CHECK COMPONENT

**With CONSULT**
(EGRC-solenoid valve)

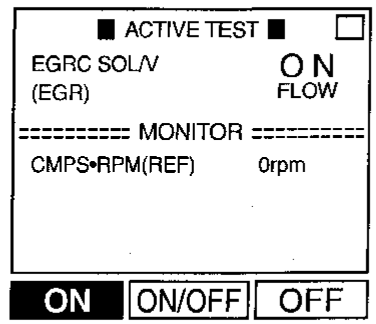
1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.




MEF957D

**With CONSULT**
(EGRC-solenoid valve)

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



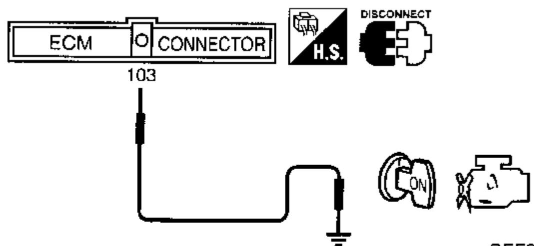

SEF789U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair or replace EGRC-solenoid valve or repair circuit. |

| 7 | CHECK COMPONENT | |
|---|---|---|

**Without CONSULT**
(EGRC-solenoid valve)
1. Disconnect ECM harness connector.
2. Turn ignition switch "ON".
3. Connect a suitable jumper wire between ECM terminal 103 and engine ground.



SEF354V

4. Check operating sound of EGRC-solenoid valve when disconnecting and connecting the jumper wire.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair or replace EGRC-solenoid valve or repair circuit. |

| 8 | CHECK COMPONENT | |
|---|---|---|

(EGRC-solenoid valve)
Refer to "Component Inspection", EC-365.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace EGRC-solenoid valve. |

| 9 | CHECK COMPONENT | |
|---|---|---|

(EGRC-BPT valve)
Refer to "Component Inspection", EC-283.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace EGRC-BPT valve. |

| 10 | CHECK COMPONENT | |
|---|---|---|

(EGR temperature sensor)
Refer to "Component Inspection", EC-372.

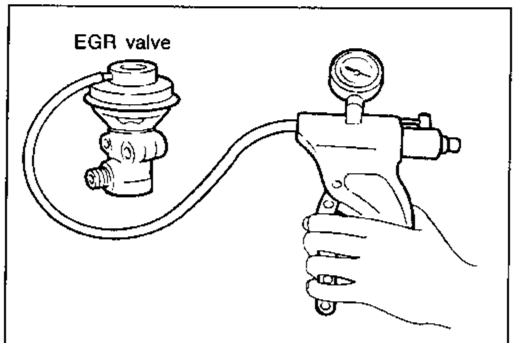
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace EGR temperature sensor. |

| 11 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |



MEF137D

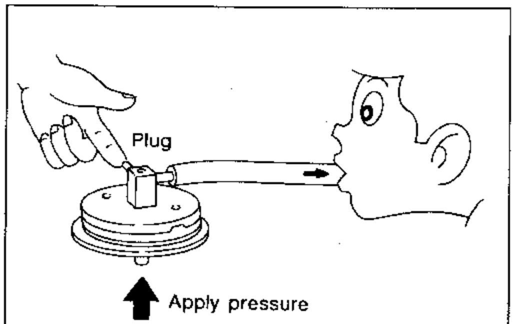
## Component Inspection

*NBEC0202*

### EGR VALVE

*NBEC0202S01*

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



SEF083P

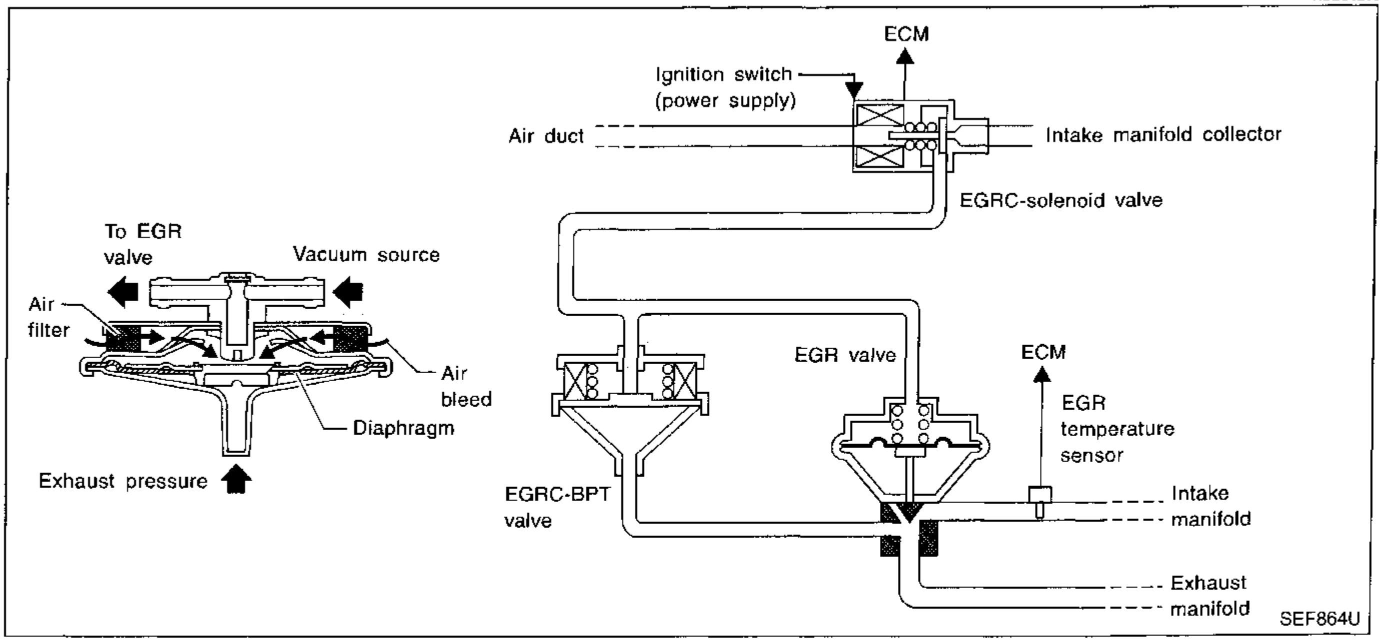
### EGRC-BPT VALVE

*NBEC0202S04*

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 $mmH_2O$, 3.94 $inH_2O$) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

## Description

NBEC0203




### SYSTEM DESCRIPTION

NBEC0203S01

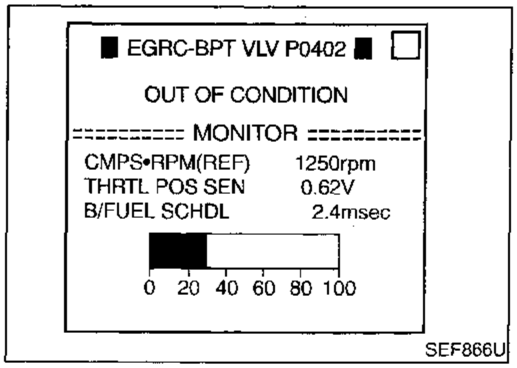
The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling intake manifold vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

## On Board Diagnosis Logic

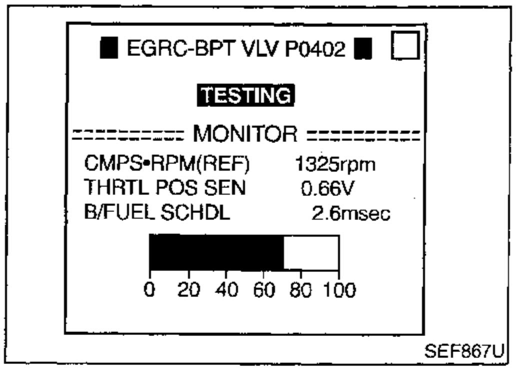
NBEC0204

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.

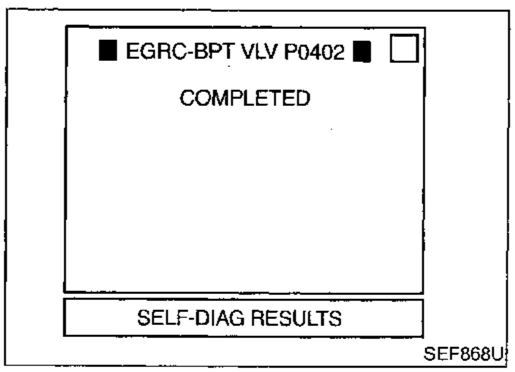
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0402<br>0306 | • The EGRC-BPT valve does not operate properly. | • EGRC-BPT valve<br>• EGR valve<br>• Loose or disconnected rubber tube<br>• Blocked rubber tube<br>• Camshaft position sensor<br>• Blocked exhaust system<br>• Orifice<br>• Mass air flow sensor<br>• EGRC-solenoid valve |



SEF866U



SEF867U



SEF868U

## DTC Confirmation Procedure

NBEC0465

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC 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.**

**With CONSULT**

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.

   **CMPS·RPM (REF): 1,200 - 1,800 rpm**
   **Vehicle speed: 30 - 60 km/h (19 - 37 MPH)**
   **B/FUEL SCHDL: 2.3 - 2.8 ms**
   **THRTL POS SEN:**
   **X – (X + 0.30) V**
   **X = Voltage value measured at step 6**
   **Selector lever: Suitable position**

- **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-286.

## Overall Function Check

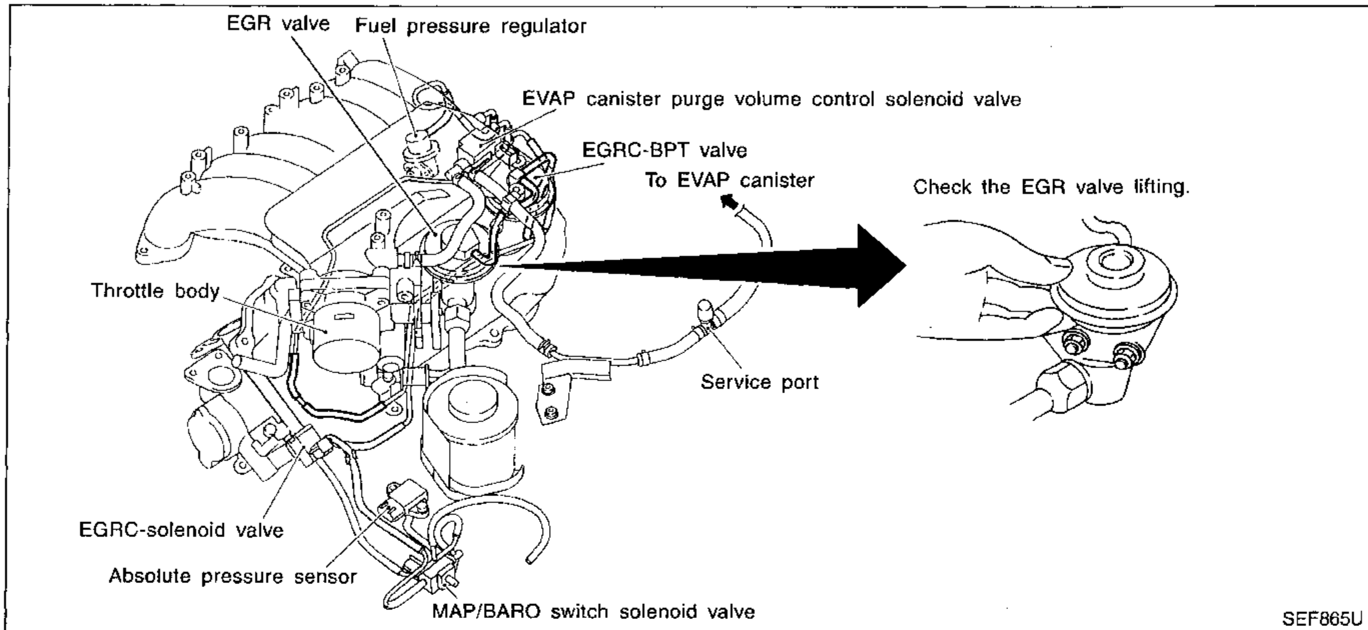
NBEC0205

Use this procedure to check the overall function of the EGRC-BPT valve. During this check, a 1st trip DTC might not be confirmed.

**Without CONSULT**

1. Disconnect the rubber tube to intake manifold collector at the EGRC-solenoid valve.
2. Disconnect the rubber tube to the EGRC-BPT valve at the EGRC-solenoid valve.
3. Connect two rubber tubes disconnected in steps 1 and 2. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
4. Start engine.
5. Check for the EGR valve lifting with engine at idle speed under no load.
   **EGR valve should remain closed.**

6. Check the EGR valve lifting when revving from idle up to 3,000 rpm under no load.
   **EGR valve should lift up, and go down without sticking when the engine is returned to idle.**




## Diagnostic Procedure

NBEC0466

| 1 | CHECK HOSE | |
|---|---|---|
| 1. Turn ignition switch "OFF".<br>2. Check vacuum hose for clogging and improper connection. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace vacuum hose. |

| 2 | CHECK EXHAUST SYSTEM | |
|---|---|---|
| Check exhaust system for collapse. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace exhaust system. |

| 3 | CHECK ORIFICE | |
|---|---|---|
| Check if orifice is installed in vacuum hose between EGRC-BPT valve and EGRC-solenoid valve. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 4. |
| NG | ▶ | Replace vacuum hose. |

| 4 | CHECK COMPONENT | |
|---|---|---|
| (EGRC-BPT valve)<br>Refer to "Component Inspection", EC-287. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace EGRC-BPT valve. |

| 5 | CHECK COMPONENT | |
|---|---|---|
| (Camshaft position sensor)<br>Refer to "Component inspection", EC-274. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace camshaft position sensor. |

| 6 | CHECK COMPONENT | |
|---|---|---|
| (Mass air flow sensor)<br>Refer to "Component Inspection", EC-122. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace mass air flow sensor. |

| 7 | CHECK COMPONENT | |
|---|---|---|
| (EGRC-solenoid valve)<br>Refer to "Component Inspection", EC-365.<br>**OK or NG** | | |
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace EGRC-solenoid valve. |

| 8 | CHECK COMPONENT | |
|---|---|---|
| (EGR valve)<br>Refer to "Component Inspection", EC-283.<br>**OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace EGR valve. |

| 9 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |

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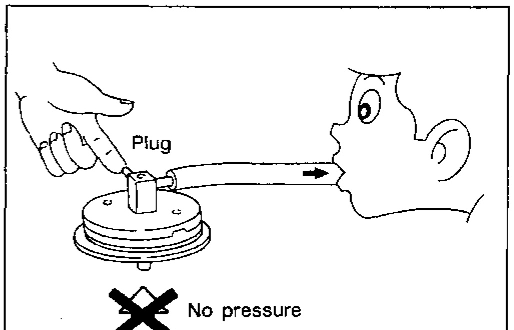


SEF172P

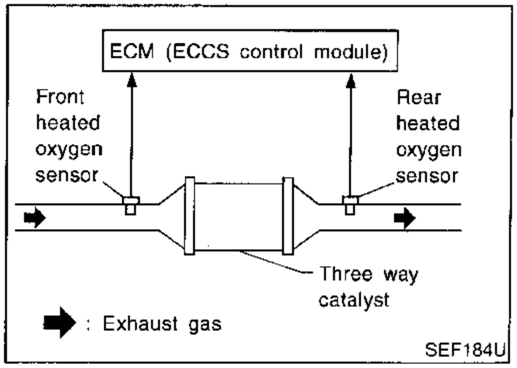
## Component Inspection

NBEC0206

### EGRC-BPT VALVE

NBEC0206S01

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.**

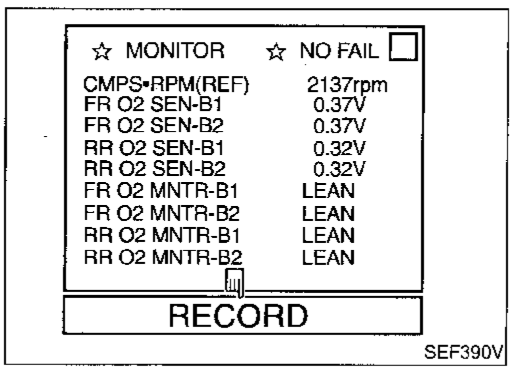


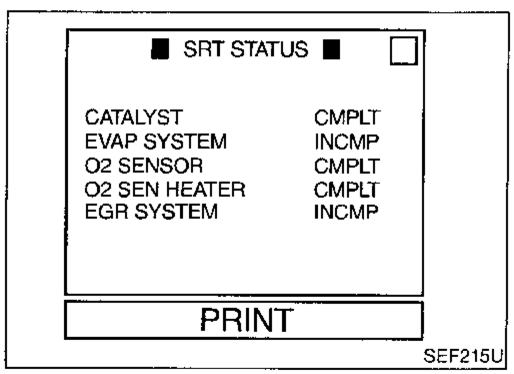

## On Board Diagnosis Logic

NBEC0207

The ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.
A warm-up 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 warm-up three way catalyst malfunction is diagnosed.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0420<br>0702<br>(right bank) | • Warm-up three way catalyst does not operate properly.<br>• Warm-up three way catalyst does not have enough oxygen storage capacity. | • Warm-up three way catalyst<br>• Exhaust tube<br>• Intake air leaks<br>• Injectors<br>• Injector leaks<br>• Spark plug<br>• Improper ignition timing |
| P0430<br>0703<br>(left bank) | | |




## DTC Confirmation Procedure

NBEC0467

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set "MANU TRIG" and "HI SPEED", then select "FR O2 SEN-B1 (-B2)", "RR O2 SEN-B1 (-B2)", "FR O2 MNTR-B1 (-B2)", "RR O2 MNTR-B1 (-B2)" 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-B1 (-B2)" is much less than that of "FR O2 MNTR-B1 (-B2)" as shown below.
   **Switching frequency ratio = A/B**
   **A: Rear heated oxygen sensor switching frequency**
   **B: 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 is not operating properly.
   **If the "FR O2 MNTR-B1 (-B2)" does not indicate "RICH" and "LEAN" periodically more than 5 times within 10 seconds at step 3, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-178.)**
   If the result is NG, go to "Diagnostic Procedure", EC-290.
   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 86 to 96 km/h (53 to 60 MPH) with D position ("OD" ON) for at least 10 consecutive

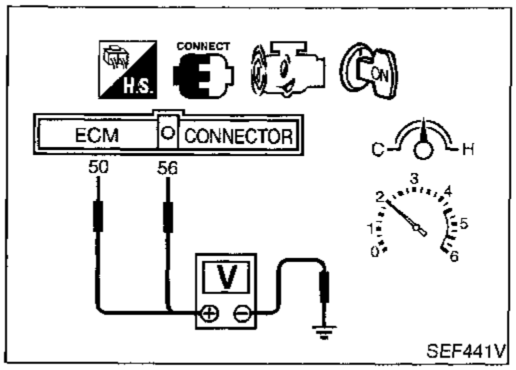
minutes.
(Drive the vehicle in an area where vehicle speed and accelerator pressure can be held steady and constant.)
If the result is NG, go to "Diagnostic Procedure", EC-290.

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.

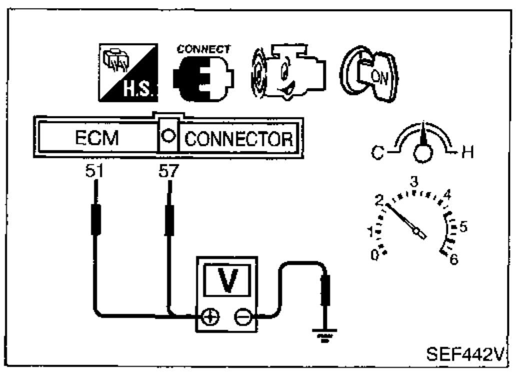
## Overall Function Check

NBEC0208

Use this procedure to check the overall function of the warm-up three way catalyst. During this check, a 1st trip DTC might not be confirmed.



SEF441V



SEF442V

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeters probes between ECM terminals 50 (front heated oxygen sensor right bank signal), 51 (front heated oxygen sensor left bank signal) and engine ground, and ECM terminals 56 (rear heated oxygen sensor right bank signal), 57 (rear heated oxygen sensor left bank signal) and engine 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 56 and engine ground, or 57 and engine ground is very less than that of ECM terminals 50 and engine ground, or 51 and engine ground.
**Switching frequency ratio = A/B**
**A: Rear heated oxygen sensor voltage switching frequency**
**B: Front heated oxygen sensor voltage switching frequency**
**This ratio should be less than 0.75.**
If the ratio is greater than above, it means warm-up three way catalyst does not operate properly.

NOTE:
If the voltage at terminal 50 or 51 does not switch periodically more than 5 times within 10 seconds at step 4, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-178.)

## Diagnostic Procedure

NBEC0209

### 1 CHECK EXHAUST SYSTEM

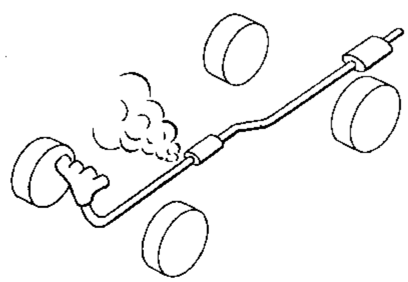
Visually check exhaust tubes and muffler for dent.

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 2. |
| NG ▶ | Repair or replace it. |

### 2 CHECK EXHAUST AIR LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust air leak before the warm-up three way catalyst.



SEF099P

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 3. |
| NG ▶ | Repair or replace. |

### 3 CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 4. |
| NG ▶ | Repair or replace. |

### 4 CHECK IGNITION TIMING

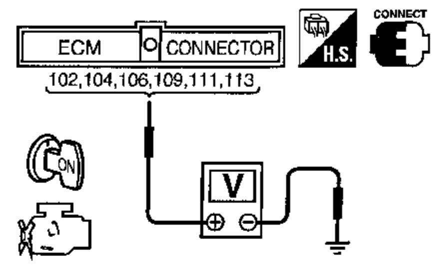
Check ignition timing.
Refer to "TROUBLE DIAGNOSIS — BASIC INSPECTION", EC-85.

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 5. |
| NG ▶ | Adjust ignition timing. |

### 5 CHECK INJECTORS

1. Refer to WIRING DIAGRAM for Injectors, EC-429.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals 102, 104, 106, 109, 111 and 113 and ground with CONSULT or tester.
   **Battery voltage should exist.**

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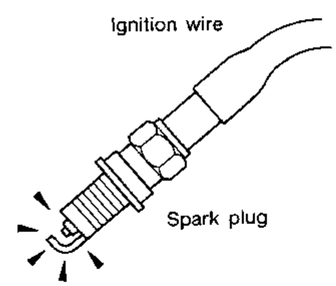
**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 6. |
| NG ▶ | Perform "Diagnostic Procedure", "INJECTOR", EC-431. |

### 6 CHECK IGNITION SPARK

1. Turn ignition switch "OFF".
2. Disconnect ignition wire from spark plug.
3. Connect a known good spark plug to the ignition wire.
4. Place end of spark plug against a suitable ground and crank engine.
5. Check for spark.




SEF282G

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 8. |
| NG ▶ | GO TO 7. |

### 7 CHECK COMPONENT

(Ignition wires)
Refer to "Component Inspection", EC-259.

**OK or NG**

| | |
|---|---|
| OK ▶ | Check ignition coil, power transistor and their circuits. Refer to EC-350. |
| NG ▶ | Replace. |

| 8 | CHECK INJECTOR | |
|---|---|---|
| 1. Turn ignition switch "OFF".<br>2. Remove injector assembly.<br>Refer to EC-33.<br>Keep fuel hose and all injectors connected to injector gallery.<br>3. Disconnect all ignition coil harness connectors.<br>4. Turn ignition switch "ON".<br>Make sure fuel does not drip from injector. | | |
| Does not drip | ▶ | GO TO 9. |
| Drips | ▶ | Replace the injector(s) from which fuel is dripping. |

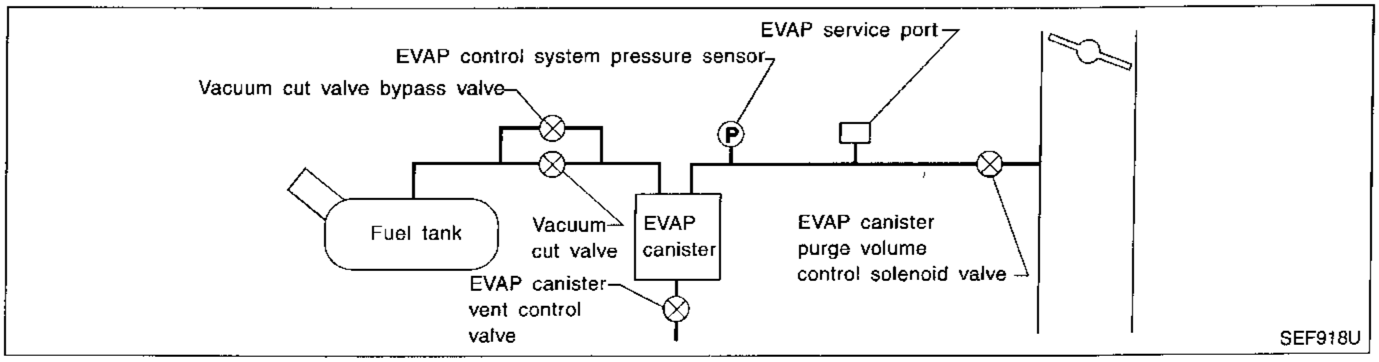
| 9 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| Trouble is fixed | ▶ | INSPECTION END |
| Trouble is not fixed | ▶ | Replace warm-up three way catalyst. |

## On Board Diagnosis Logic

NBEC0210

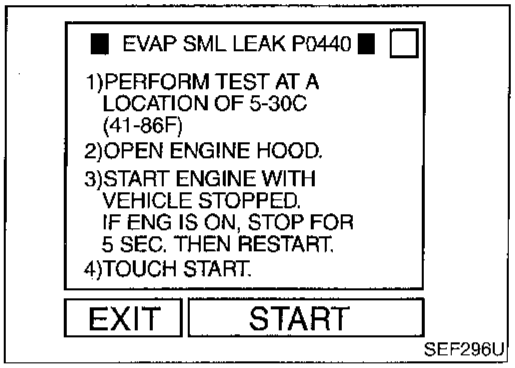
NOTE:
**If both DTC P0440 and P1448 are displayed, perform trouble diagnosis for "DTC P1448" first. (See EC-404.)**

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.




| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0440<br>0705 | • EVAP control system has a leak.<br>• EVAP control system does not operate properly. | • Incorrect fuel tank vacuum relief valve<br>• Incorrect fuel filler cap used<br>• Fuel filler cap remains open or fails to close.<br>• Foreign matter caught in fuel filler cap.<br>• Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.<br>• Foreign matter caught in EVAP canister vent control valve.<br>• EVAP canister or fuel tank leaks<br>• EVAP purge line (pipe and rubber tube) leaks<br>• EVAP purge line rubber tube bent.<br>• Blocked or bent rubber tube to EVAP control system pressure sensor<br>• Loose or disconnected rubber tube<br>• EVAP canister vent control valve<br>• EVAP canister purge volume control solenoid valve<br>• Absolute pressure sensor<br>• Tank fuel temperature sensor<br>• MAP/BARO switch solenoid valve<br>• Blocked or bent rubber tube to MAP/BARO switch solenoid valve<br>• O-ring of EVAP canister vent control valve is missing or damaged.<br>• EVAP canister is saturated with water.<br>• EVAP control system pressure sensor |

**CAUTION:**
- **Use only a genuine 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.**



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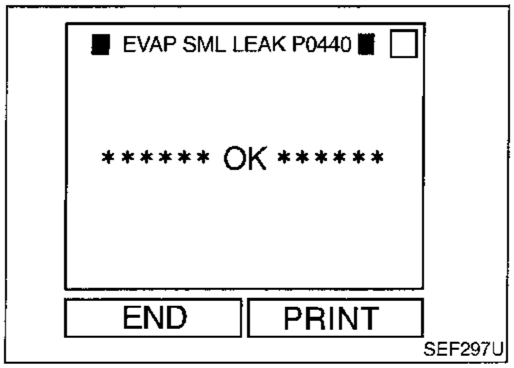

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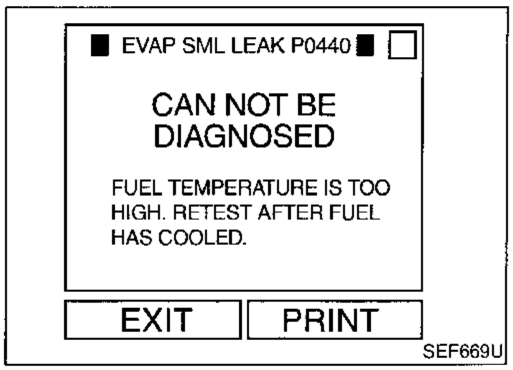


SEF669U

## DTC Confirmation Procedure

NBEC0211

NOTE:

- **If both DTC P0440 and P1448 are displayed, perform trouble diagnosis for "DTC P1448" first. (See EC-404.)**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- If "DTC 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. If not, inspect fuel filler cap and fuel tank separately. Refer to EC-294.**
- **Always perform test at a temperature of 5 to 30°C (41 to 86°F).**
- **It is better that the fuel level is low.**

**With CONSULT**

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.)
  This test with engine at idle will take approximately 5 minutes.

6) Make sure that "OK" is displayed.
   If "NG" is displayed, refer to "Diagnostic Procedure", EC-294.

**With GST**

NOTE:

- Be sure to read the explanation of "Driving Pattern" on EC-49 before driving vehicle.
- It is better that the fuel level is low.

1) Start engine.
2) Drive vehicle according to "Driving Pattern", EC-49.
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-49.
8) Stop vehicle.
9) Select "MODE 3" with GST.
- If P0440 is displayed on the screen, go to "Diagnostic Procedure", EC-294.

- If P1440 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1440", EC-382.
- If P1447 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1447", EC-401.
- 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.

**No Tools**

NOTE:

- Be sure to read the explanation of "Driving Pattern" on EC-49 before driving vehicle.
- It is better that the fuel level is low.

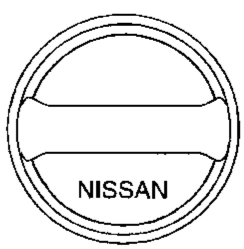
1) Start engine.
2) Drive vehicle according to "Driving Pattern", EC-49.
3) Stop vehicle.
4) Turn ignition switch "OFF" and wait at least 5 seconds.
5) Perform the step 1 to 4 again.
6) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

## Diagnostic Procedure

NBEC0212

| 1 | CHECK FUEL FILLER CAP | |
|---|---|---|

1. Check for genuine fuel filler cap design.




SEF915U

2. Check for air releasing sound while opening the fuel filler cap.
3. Make sure there are no foreign objects around the fuel filler cap so that the cap can close properly.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG (Step 1) | ▶ | Replace with genuine fuel filler cap. |
| NG (Step 2) | ▶ | Retighten until the ratching sound is heard. |
| NG (Step 3) | ▶ | Remove fuel filler cap, then clean cap and fuel filler neck threads using air blower. |

| 2 | CHECK COMPONENT | |
|---|---|---|

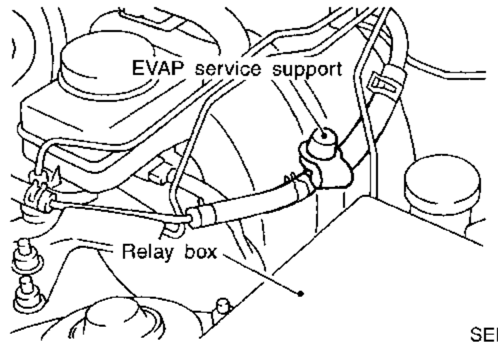
(Fuel tank vacuum relief valve)
Refer to "Evaporative Emission System", EC-24.

**OK or NG**

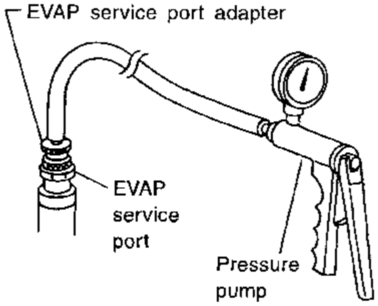
| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Replace fuel filler cap with a genuine one. |

## 3 INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.




SEF907U



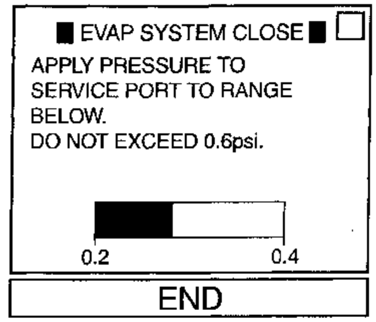

SEF916U

| | | |
|---|---|---|
| Models with CONSULT | ▶ | GO TO 4. |
| Models without CONSULT | ▶ | GO TO 5. |

## 4 CHECK FOR EVAP LEAK

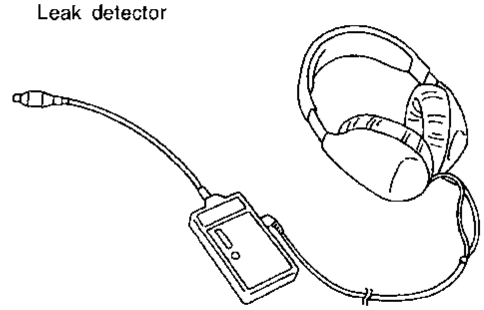
**With CONSULT**

1. Turn ignition switch "ON".
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure to the EVAP line until the pressure indicator reaches the middle of the bar graph.




SEF917U

4. Using EVAP leak detector, locate the EVAP leak. Refer to the instruction manual for more details about the leak detector.
   Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-28.




SEF200U

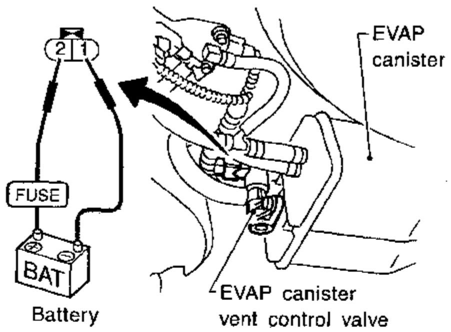
- **Never use compressed air or a high pressure pump.**
- **Improper installation of the EVAP service port adapter to the EVAP service port may cause a leak.**
- **Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair or replace. |

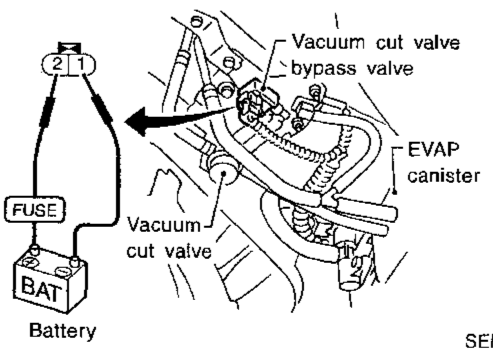
| 5 | CHECK FOR EVAP LEAK |
|---|---|

**Without CONSULT**
1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)



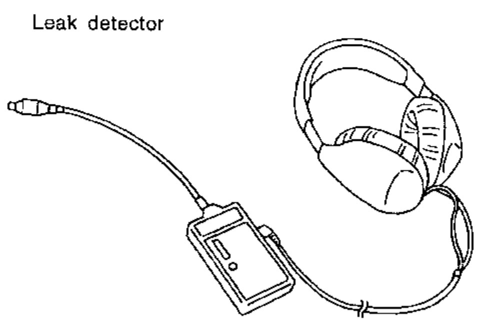

SEF598U

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)




SEF599U

4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.
5. Using EVAP leak detector, locate the EVAP leak. Refer to the instruction manual for more details about the leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-28.




SEF200U

- **Never use compressed air or a high pressure pump.**
- **Improper installation of the EVAP service port adapter to the EVAP service port may cause a leak.**
- **Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair or replace. |

| 6 | CHECK COMPONENT |
|---|---|

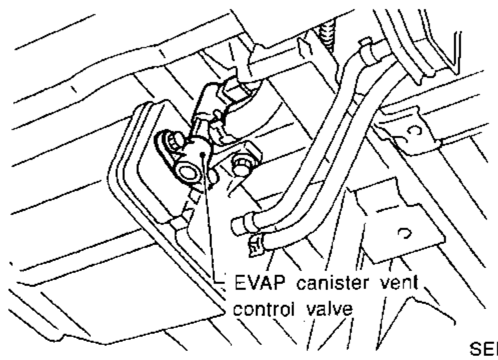
(Water separator)
Refer to "Component Inspection", EC-398.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace water separator. |

| 7 | CHECK COMPONENT AND CIRCUIT |
|---|---|

(EVAP canister vent control valve and O-ring)
Refer to "DTC Confirmation Procedure", EC-305.



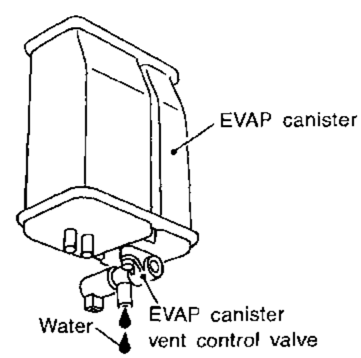

SEF143S

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair or replace EVAP canister vent control valve and O-ring or harness/connector. |

| 8 | 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.




SEF596U

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 9. |
| No (With CONSULT) | ▶ | GO TO 11. |
| No (Without CONSULT) | ▶ | GO TO 12. |

## 9 CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
**The weight should be less than 1.8 kg (4.0 lb).**

**OK or NG**

| | | |
|---|---|---|
| OK (With CONSULT) | ▶ | GO TO 11. |
| OK (Without CONSULT) | ▶ | GO TO 12. |
| NG | ▶ | GO TO 10. |

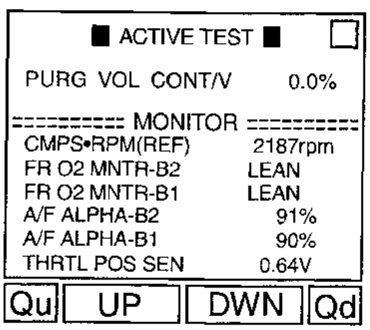
## 10 DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and water separator for clogging or poor connection

| | | |
|---|---|---|
| | ▶ | Repair hose or replace EVAP canister. |

## 11 CHECK COMPONENT

**With CONSULT**
(EVAP canister purge volume control solenoid valve)
1. Disconnect vacuum 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.




SEF908U

4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   **Vacuum should exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | GO TO 13. |

## 12 CHECK COMPONENT

**Without CONSULT**
(EVAP canister purge volume control solenoid valve)
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.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   **Vacuum should exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | GO TO 13. |

## 13 CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-18.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 14. |
| NG | ▶ | Repair or reconnect the hose. |

## 14 CHECK COMPONENT

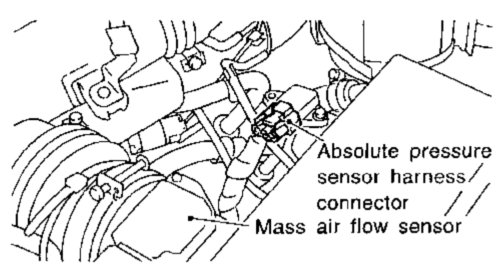
(EVAP canister purge volume control solenoid valve)
Refer to "Component Inspection", EC-304.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | Replace EVAP canister purge volume control solenoid valve. |

## 15 CHECK COMPONENT

(Absolute pressure sensor)
Refer to "Component Inspection", EC-131.



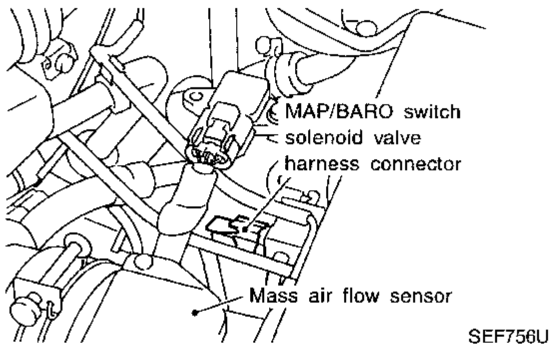

SEF748U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 16. |
| NG | ▶ | Replace absolute pressure sensor. |

| 16 | CHECK COMPONENT AND CIRCUIT | |
|---|---|---|

(MAP/BARO switch solenoid valve)
Refer to "Component Inspection", EC-347.

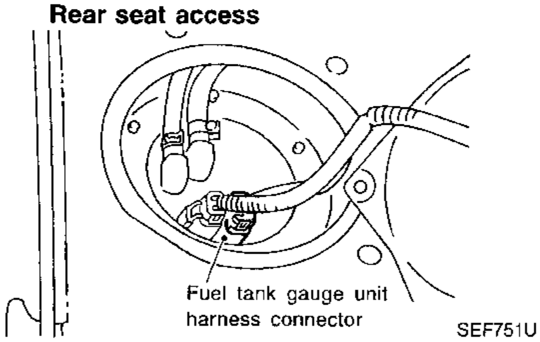



**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 17. |
| NG | ▶ | Replace MAP/BARO switch solenoid valve. |

| 17 | CHECK COMPONENT | |
|---|---|---|

(Tank fuel temperature sensor)
Refer to "Component Inspection", EC-254.

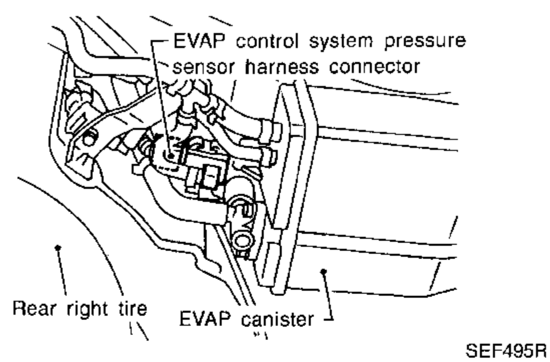



**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 18. |
| NG | ▶ | Replace tank fuel temperature sensor. |

| 18 | CHECK COMPONENT | |
|---|---|---|

(EVAP control system pressure sensor)
Refer to "Component Inspection", EC-317.




**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 19. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 19 | CHECK EVAP PURGE LINE | |
|---|---|---|

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to "Evaporative Emission System", EC-24.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 20. |
| NG | ▶ | Repair or reconnect the hose. |

| 20 | CLEAN EVAP PURGE LINE | |
|---|---|---|

Clean EVAP purge line (pipe and rubber tube) using air blower.

| | | |
|---|---|---|
| | ▶ | GO TO 21. |

| 21 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |

# Description

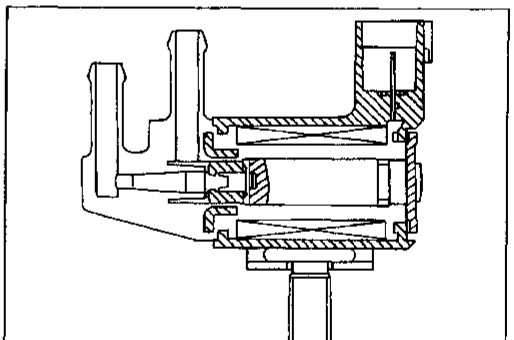
## SYSTEM DESCRIPTION

NBEC0214

NBEC0214S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |
| Throttle position switch | Closed throttle position | | |
| Front heated oxygen sensors | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Tank fuel temperature sensor | Fuel temperature in fuel tank | | |
| Vehicle speed sensor | Vehicle speed | | |

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.


SEF337U

## COMPONENT DESCRIPTION

NBEC0214S02

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.

# CONSULT Reference Value in Data Monitor Mode

NBEC0215

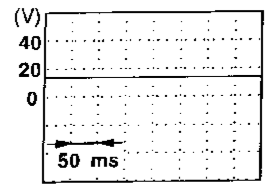
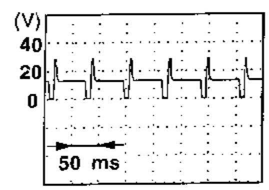
Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| PURG VOL C/V | • Engine: After warming up<br>• Air conditioner switch "OFF"<br>• Shift lever: "N"<br>• No-load | Idle (Vehicle stopped) | 0% |
| | | 2,000 rpm | — |

## ECM Terminals and Reference Value

*NBEC0216*

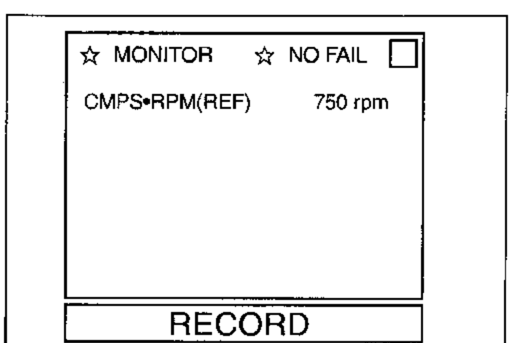
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 4 | L/B | ECCS relay (Self-shut-off) | **[Engine is running]** **[Ignition switch "OFF"]** • For a few seconds after turning ignition switch "OFF" | 0 - 1.5V |
| | | | **[Ignition switch "OFF"]** • A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 5 | LG/B | EVAP canister purge volume control solenoid valve | **[Engine is running]** • Idle speed | BATTERY VOLTAGE (11 - 14V)   SEF994U |
| | | | **[Engine is running]** • Engine speed is 2,000 rpm | BATTERY VOLTAGE (11 - 14V)   SEF995U |
| 67 | B/W | Power supply for ECM | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |
| 72 | B/W | | | |
| 117 | B/W | Current return | **[Engine is running]** • Idle speed | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

*NBEC0217*

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0443 1008 | An improper voltage signal is sent to ECM through the valve. | • Harness or connectors (The valve circuit is open or shorted.) • EVAP canister purge volume control solenoid valve |



SEF357V

## DTC Confirmation Procedure

*NBEC0218*

NOTE:

If "DTC 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.**

**With CONSULT**

1) Turn ignition switch "ON".

2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle for at least 13 seconds.

**With GST**

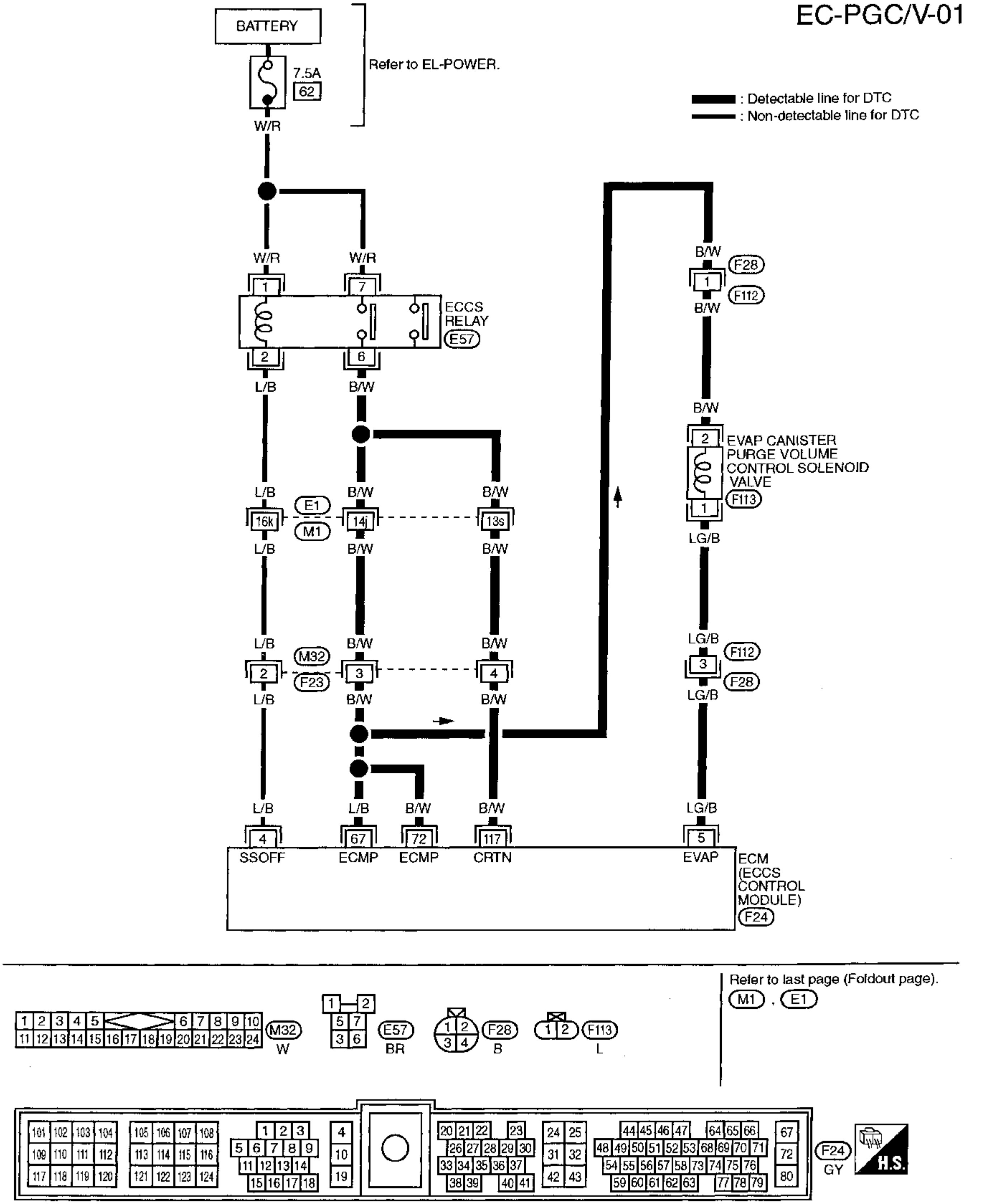
1) Start engine and let it idle for at least 13 seconds.
2) Select "MODE 7" with GST.

**No Tools**

1) Start engine and let it idle for at least 13 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.

## Wiring Diagram

NBEC0219



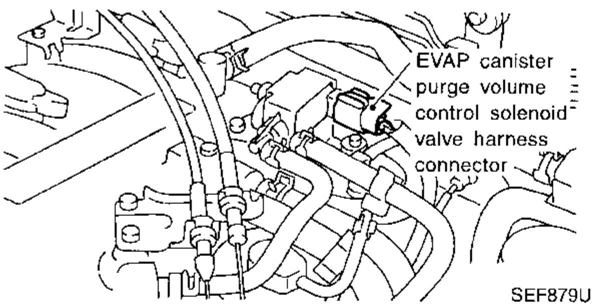

MEC341C

## Diagnostic Procedure

NBEC0220

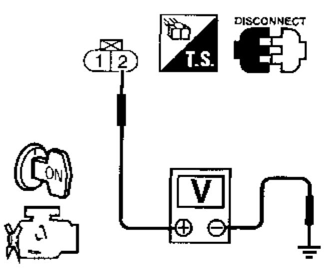
| 1 | CHECK POWER SUPPLY |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF879U

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
**Voltage: Battery voltage**



SEF880U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

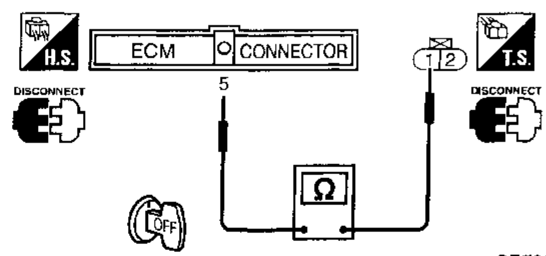
| 2 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors E1, M1
- Harness connectors M32, F23
- Harness connectors F28, F112
- 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

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

| 3 | 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.**



SEF881U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

| 4 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F28, F112
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 5 | CHECK COMPONENT |
|---|---|

(EVAP canister purge volume control solenoid valve)
Refer to "Component Inspection", EC-304.

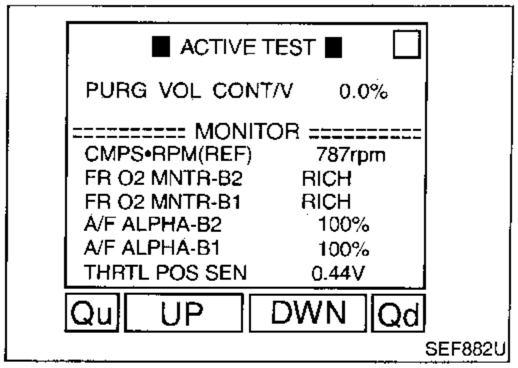
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace EVAP canister purge volume control solenoid valve. |

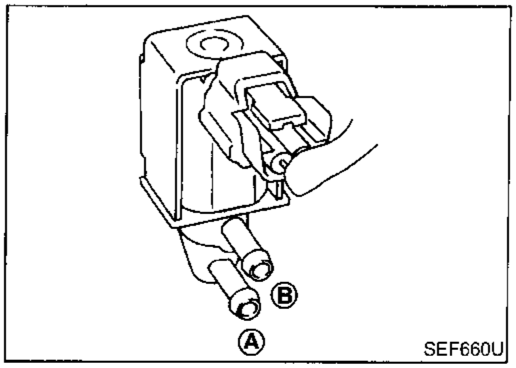
| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

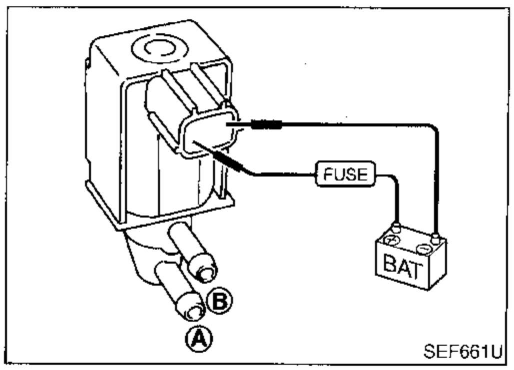
| | | |
|---|---|---|
| | ▶ | INSPECTION END |



SEF882U



SEF660U



SEF661U

## Component Inspection

NBEC0221

### EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NBEC0221S01

**With CONSULT**

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<br>PURG VOL CONT/V value | Air passage continuity between A and B |
|---|---|
| 100.0% | Yes |
| 0.0% | No |

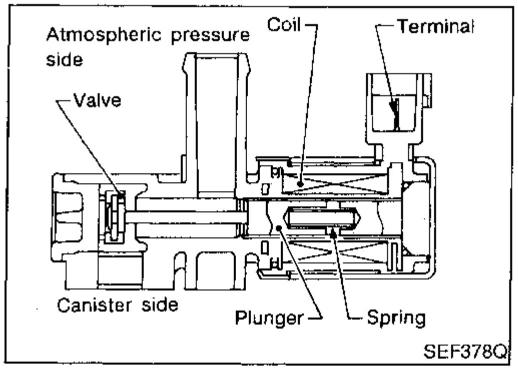
If NG, replace the EVAP canister purge volume control solenoid valve.

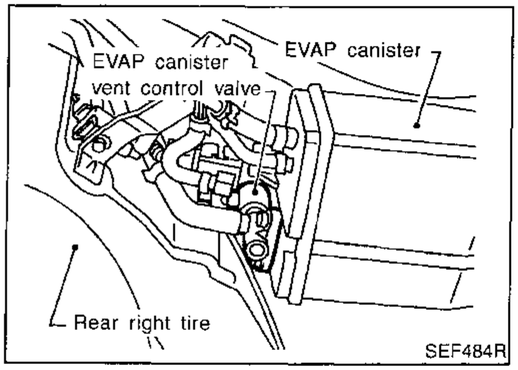
**Without CONSULT**

Check air passage continuity.

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

If NG, replace solenoid valve.




## Component Description

NBEC0222

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid 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

NBEC0223

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| VENT CONT/V | • Ignition switch: ON | OFF |

## ECM Terminals and Reference Value

NBEC0224

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 108 | G/R | EVAP canister vent control valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

NBEC0225

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0446<br>0903 | An improper voltage signal is sent to ECM through EVAP canister vent control valve. | • Harness or connectors<br>(The valve circuit is open or shorted.)<br>• EVAP canister vent control valve |

## DTC Confirmation Procedure

NBEC0226

**CAUTION:**

**Always drive vehicle at a safe speed.**

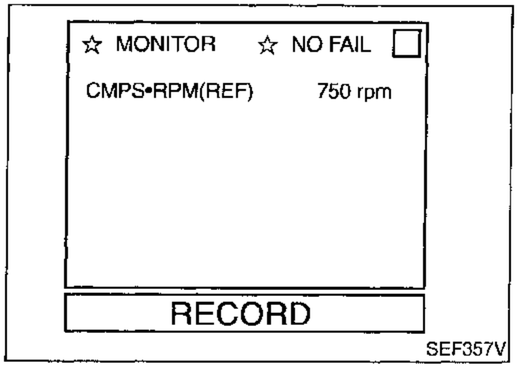
NOTE:

If "DTC 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.**

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX




SEF357V

**With CONSULT**

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 8 seconds.

**With GST**

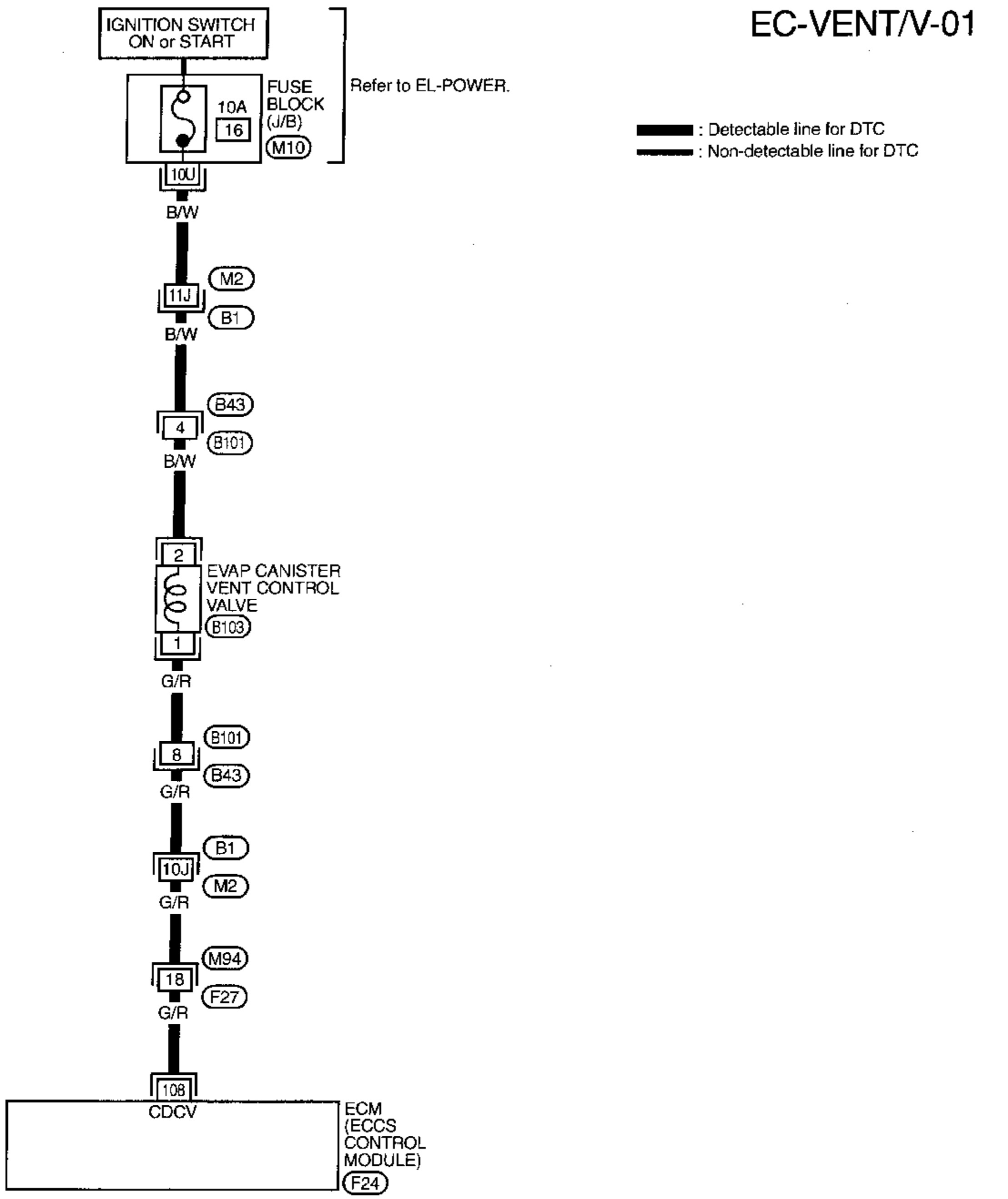
1) Start engine and wait at least 8 seconds.
2) Select "MODE 7" with GST.

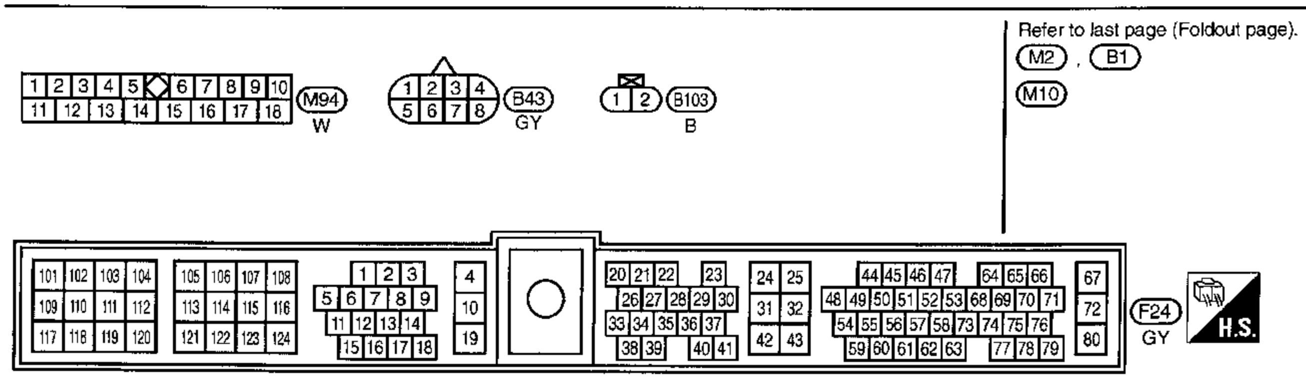
**No Tools**

1) Start engine and wait at least 8 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.

## Wiring Diagram

NBEC0228




MEC158C

## Diagnostic Procedure

NBEC0229

### 1 INSPECTION START

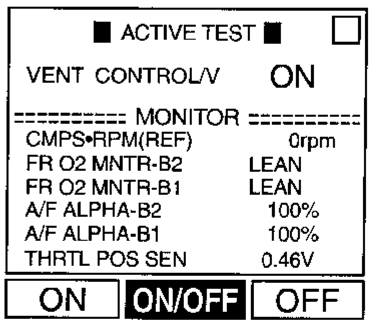
Do you have CONSULT?

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 2. |
| No | ▶ | GO TO 3. |

### 2 CHECK CIRCUIT

1. Turn ignition switch "OFF" and then turn "ON".
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON/OFF" on CONSULT screen.




SEF883U

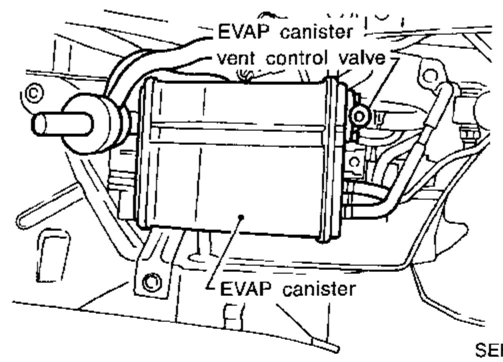
4. Check for operating sound of the valve.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 3. |

### 3 CHECK POWER SUPPLY

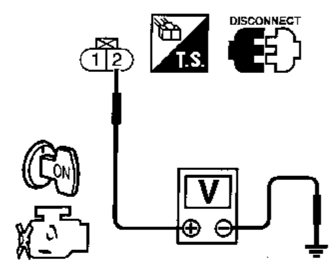
1. Turn ignition switch "OFF".
2. Disconnect EVAP canister vent control valve harness connector.




SEF872T

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.

   **Voltage: Battery voltage**




SEF884U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

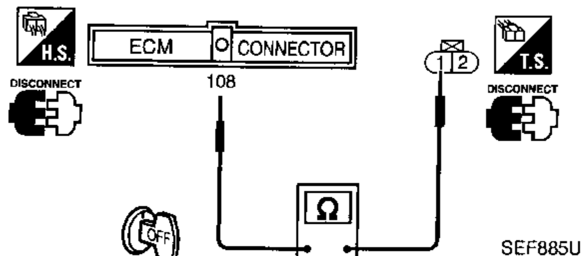
### 4 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M2, B1
- Harness connectors B43, B101
- 10A fuse
- Harness for open or short between EVAP canister vent control valve and fuse

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

| 5 | CHECK OUTPUT SIGNAL CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and terminal 1.
   **Continuity should exist.**



SEF885U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

| 6 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors B101, B43
- Harness connectors B1, M2
- Harness connectors M94, F27
- Harness for open or short between EVAP canister vent control valve and ECM

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK COMPONENT |
|---|---|

(EVAP canister vent control valve)
Refer to "Component Inspection" EC-309.

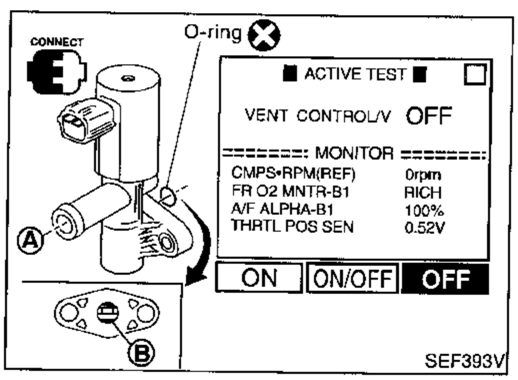
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace EVAP canister vent control valve. |

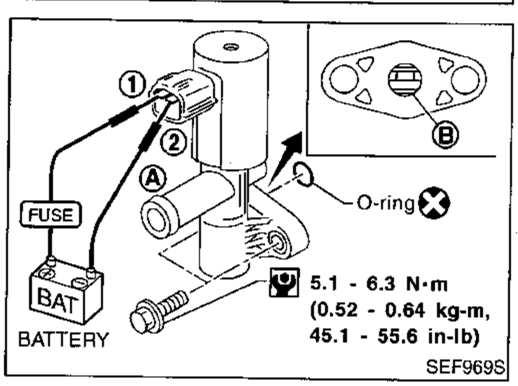
| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |



SEF393V



SEF969S

## Component Inspection

NBEC0230

### EVAP CANISTER VENT CONTROL VALVE

NBEC0230S01

Check air passage continuity.

**With CONSULT**

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

| Condition VENT CONTROL/V | Air passage continuity between **A** and **B** |
|---|---|
| ON | No |
| OFF | Yes |

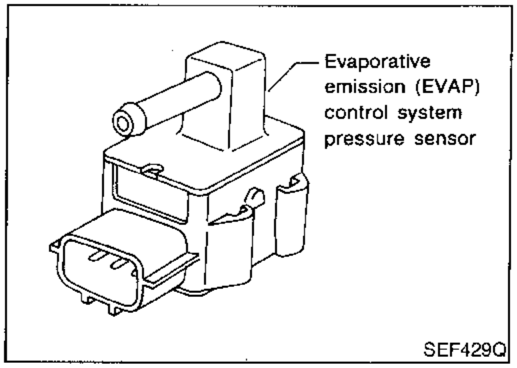
**Without CONSULT**

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

If NG, clean valve using air blower or replace as necessary.

**If portion B is rusted, replace EVAP canister vent control valve.**

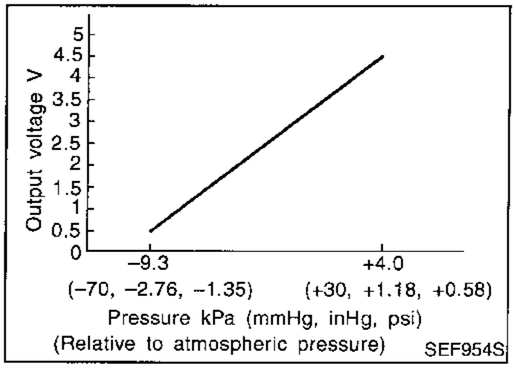
**Make sure new O-ring is installed properly.**




## Component Description

NBEC0231

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

NBEC0232

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| EVAP SYS PRES | • Ignition switch: ON | Approx. 3.4V |

## ECM Terminals and Reference Value

NBEC0233

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 42 | P/B | Sensors' power supply | **[Ignition switch "ON"]** | Approximately 5V |
| 43 | B | Sensors' ground | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | Approximately 0V |
| 62 | G/B | EVAP control system pressure sensor | **[Ignition switch "ON"]** | Approximately 3.4V |

## On Board Diagnosis Logic

NBEC0234

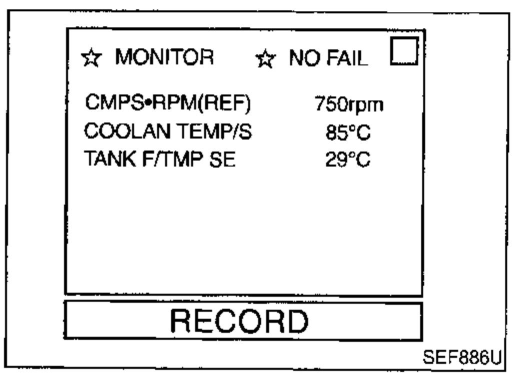
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0450<br>0704 | • An improper voltage signal from EVAP control system pressure sensor is sent to ECM. | • Harness or connectors<br>(The EVAP control system pressure sensor circuit is open or shorted.)<br>• Rubber hose to EVAP control system pressure sensor is clogged, vent, kinked, disconnected or improper connection.<br>• EVAP control system pressure sensor<br>• EVAP canister vent control valve (The valve is stuck open.)<br>• EVAP canister purge volume control solenoid valve<br>• EVAP canister<br>• Rubber hose from EVAP canister vent control valve to water separator |

## DTC Confirmation Procedure

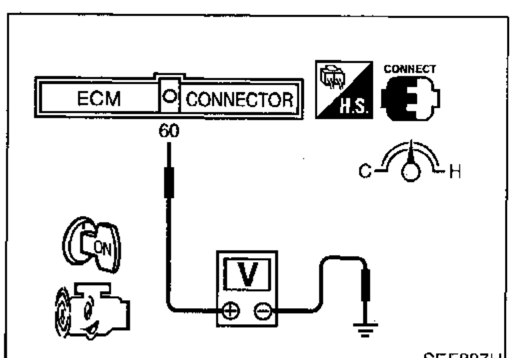
NBEC0235

NOTE:
If "DTC 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.**




SEF886U




SEF887U

**With CONSULT**

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.

**With GST**

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal 60 (Tank fuel temperature sensor signal) 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.

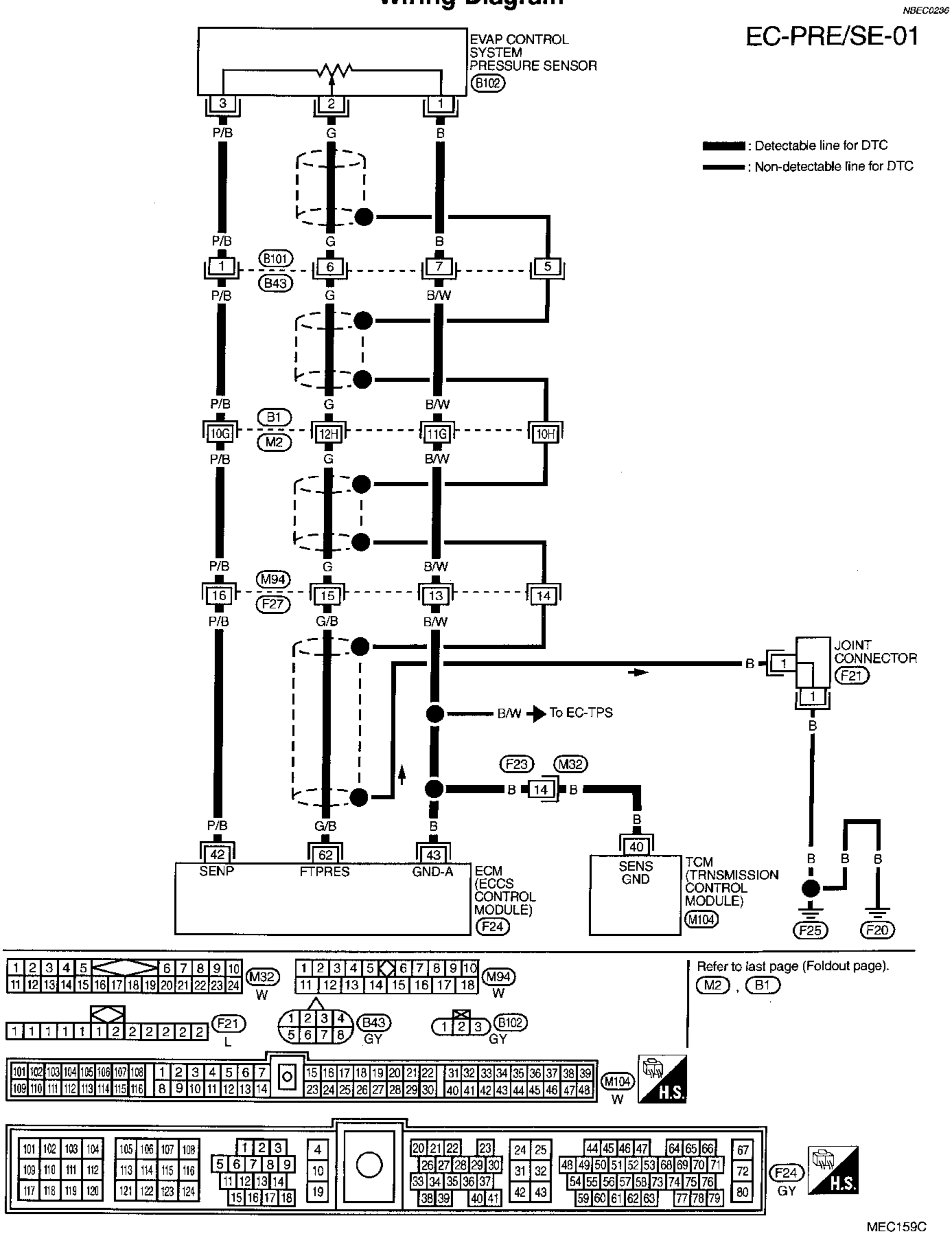
**No Tools**

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal 60 (Tank fuel temperature sensor signal) 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.

## Wiring Diagram

NBEC0236

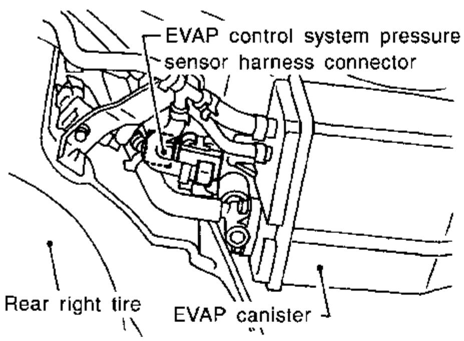


## Diagnostic Procedure

NBEC0237

### 1 CHECK RUBBER TUBE

1. Turn ignition switch "OFF".
2. Check rubber tube connected to the sensor for clogging, vent, kink, disconnection or improper connection.



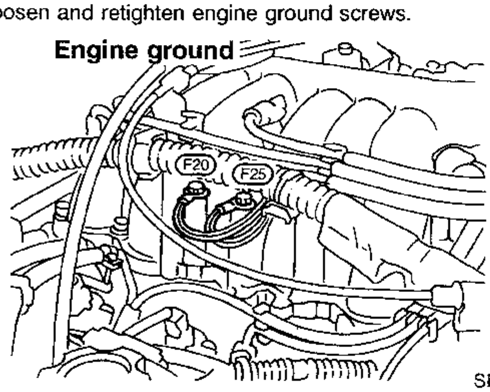

SEF495R

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Reconnect, repair or replace. |

### 2 RETIGHTEN GROUND SCREWS

1. Loosen and retighten engine ground screws.




SEF031S

| | | |
|---|---|---|
| | ▶ | GO TO 3. |

### 3 CHECK CONNECTOR

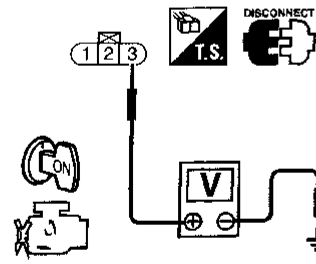
1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.
   **Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair or replace harness connector. |

### 4 CHECK POWER SUPPLY

1. Turn ignition switch "ON".
2. Check voltage between terminal 3 and ground with CONSULT or tester.
   **Voltage: Approximately 5V**




SEF889U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

### 5 DETECT MALFUNCTIONING PART

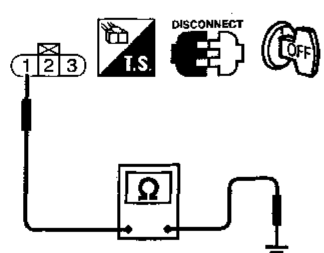
Check the following.

- Harness connectors B101, B43
- Harness connectors B1, M2
- Harness connectors M94, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

### 6 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF890U

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

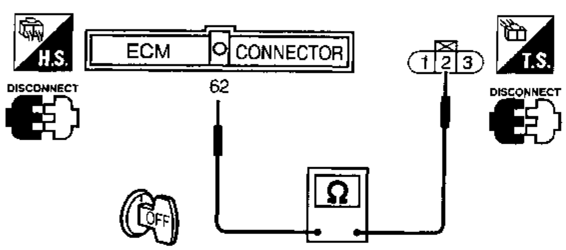
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

*Diagnostic Procedure (Cont'd)*

| 7 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>• Harness connectors B101, B43<br>• Harness connectors B1, M2<br>• Harness connectors M94, F27<br>• Harness connectors F23, M32<br>• Harness for open or short between EVAP control system pressure sensor and ECM<br>• Harness for open or short between EVAP control system pressure sensor and TCM (Transmission control module) | | |
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK INPUT SIGNAL CIRCUIT | |
|---|---|---|
| 1. Disconnect ECM harness connector.<br>2. Check harness continuity between ECM terminal 62 and terminal 2.<br>**Continuity should exist.** | | |




SEF891U

| | | |
|---|---|---|
| If OK, check harness for short to ground and short to power. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 10. |
| NG | ▶ | GO TO 9. |

| 9 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>• Harness connectors B101, B43<br>• Harness connectors B1, M2<br>• Harness connectors M94, F27<br>• Harness for open or short between ECM and EVAP control system pressure sensor | | |
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 10 | CHECK COMPONENT | |
|---|---|---|
| (EVAP canister purge volume control solenoid valve)<br>Refer to "Component Inspection", EC-304. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace EVAP canister purge volume control solenoid valve. |

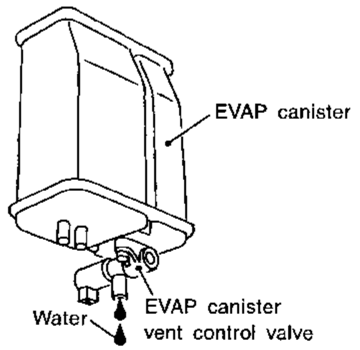
| 11 | CHECK COMPONENT | |
|---|---|---|
| (EVAP canister vent control valve)<br>Refer to "Component Inspection", EC-309. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 12. |
| NG | ▶ | Replace EVAP canister vent control valve. |

| 12 | CHECK COMPONENT | |
|---|---|---|
| (EVAP control system pressure sensor)<br>Refer to "Component Inspection", EC-317. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 13. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 13 | CHECK RUBBER TUBE | |
|---|---|---|
| 1. Check obstructed water separator and rubber tube connected to EVAP canister vent control valve.<br>2. Clean the rubber tube using air blower. For water separator, refer to EC-398. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 14. |
| NG | ▶ | Clean, repair or replace rubber tube and/or water separator. |

### 14 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.




SEF596U

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 15. |
| No | ▶ | GO TO 17. |

### 15 CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
**The weight should be less than 1.8 kg (4.0 lb).**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 17. |
| NG | ▶ | GO TO 16. |

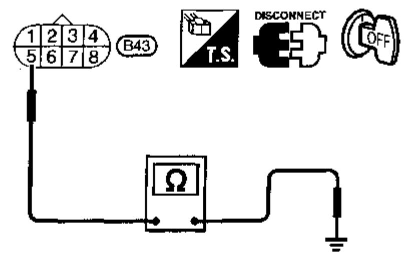
### 16 DETECT MALFUNCTIONING PART

**Check the following.**
- EVAP canister for damage
- EVAP hose between EVAP canister and water separator for clogging or poor connection

| | |
|---|---|
| ▶ | Repair hose or replace EVAP canister. |

### 17 CHECK SHIELD CIRCUIT

1. Reconnect harness connectors disconnected.
2. Disconnect harness connectors B43, B101.
3. Check harness continuity between terminal 5 and engine ground.
**Continuity should exist.**




SEF892U

If OK, check harness for short to ground and short to power. Then reconnect joint connector.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 19. |
| NG | ▶ | GO TO 18. |

### 18 DETECT MALFUNCTIONING PART

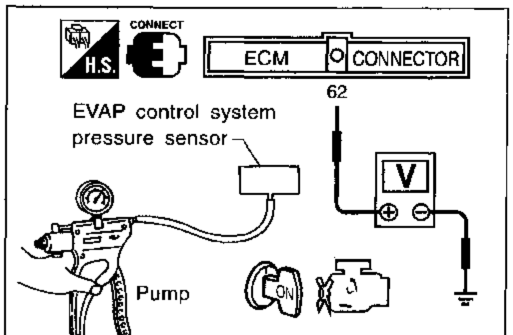
Check the following.
- Harness connectors F27, M94
- Harness connectors M2, B1
- Harness connectors B43, B101
- Joint connector F21 (Refer to "HARNESS LAYOUT" in EL section.)
- Harness for open or short between harness connector B43 and engine ground

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 19 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |




SEF894U

## Component Inspection

NBEC0238

### EVAP CONTROL SYSTEM PRESSURE SENSOR

NBEC0238S01

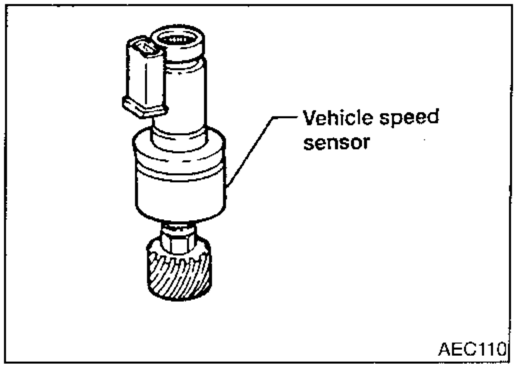
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
5. Check input voltage between ECM terminal 62 and 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 below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**

6. If NG, replace EVAP control system pressure sensor.



AEC110

## Component Description

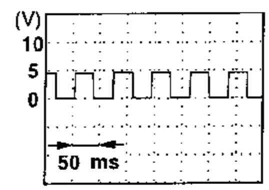
NBEC0239

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

NBEC0240

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 29 | W/L | Vehicle speed sensor | **[Engine is running]**<br>• Lift up the vehicle<br>• In 1st gear position<br>• Vehicle speed is 40 km/h (25 MPH) | 2 - 3V<br><br>SEF996U |



## On Board Diagnosis Logic

NBEC0241

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0500<br>0104 | • The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven. | • Harness or connector<br>(The vehicle speed sensor circuit is open or shorted.)<br>• Vehicle speed sensor |

## DTC Confirmation Procedure

NBEC0242

**CAUTION:**

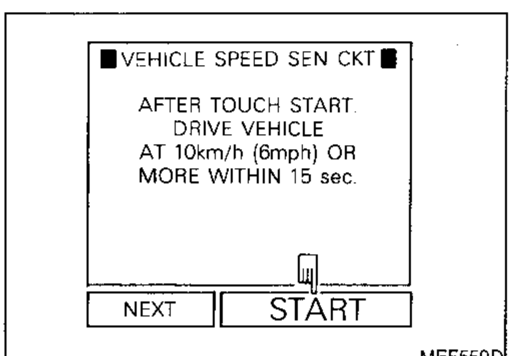
**Always drive vehicle at a safe speed.**

NOTE:

If "DTC 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.**



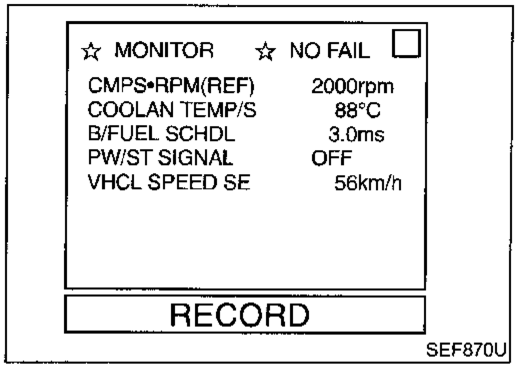
MEF559D

**With CONSULT**

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

**With CONSULT**

1) Start engine
2) Read "VHCL SPEED SE" 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-322.
If OK, go to following step.



SEF870U

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): 2,000 - 2,800 rpm**
   **COOLAN TEMP/S: More than 70°C (158°F)**
   **B/FUEL SCHDL: 2.3 - 3.7 ms**
   **Selector lever: Suitable position**
   **PW/ST SIGNAL: OFF**

## Overall Function Check

NBEC0468

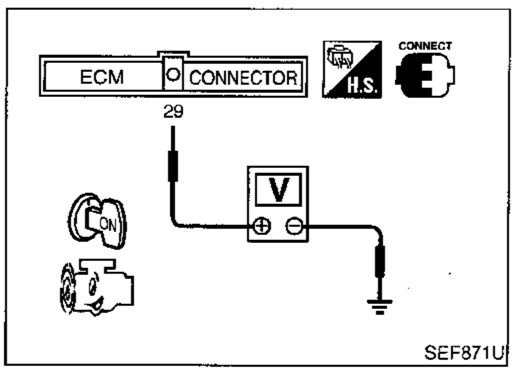
Use this procedure to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

**With GST**

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.

**No Tools**

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.

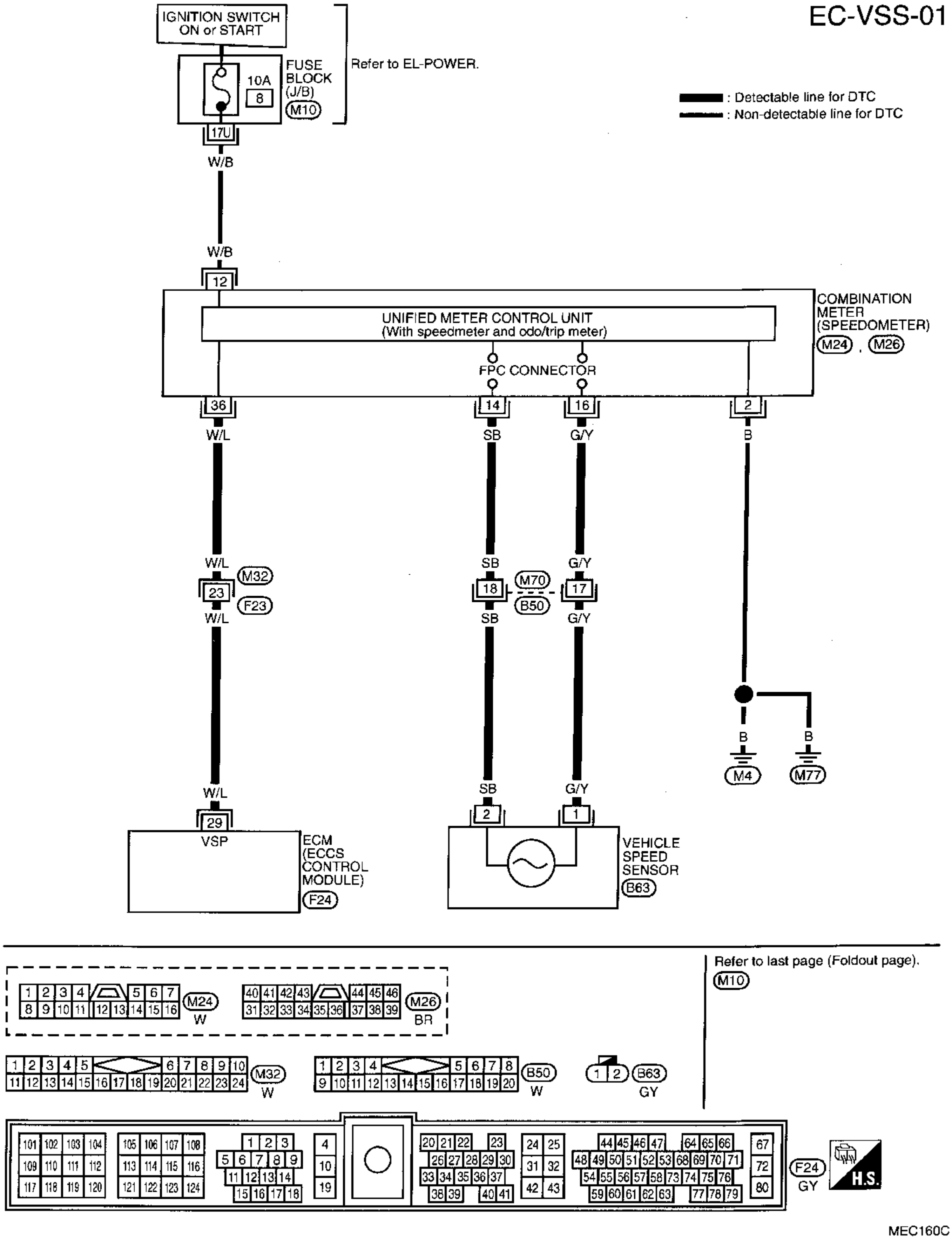


SEF871U

## Wiring Diagram

NBEC0243

EC-VSS-01

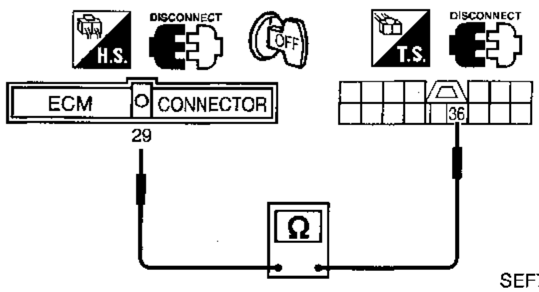


## Diagnostic Procedure

NBEC0244

| 1 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal 29 and meter terminal 36.
   **Continuity should exist.**




SEF712U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

| 2 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors M32, F23
- Harness for open or short between ECM and combination meter

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3 | CHECK SPEEDOMETER FUNCTION |
|---|---|

Make sure that speedometer functions properly.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

| 4 | CHECK SPEEDOMETER CIRCUIT |
|---|---|

Check the following.
- Harness connectors M70, B50
- Harness for open or short between combination meter and vehicle speed sensor

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | Check combination meter and vehicle speed sensor. Refer to EL section. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |

## Description

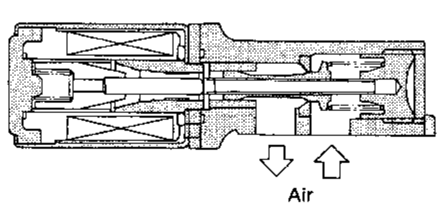
NBEC0245

### SYSTEM DESCRIPTION

NBEC0245S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Idle air control | IACV-AAC valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |
| Park/Neutral position switch | Park/Neutral position | | |
| Air conditioner switch | Air conditioner operation | | |
| Power steering oil pressure switch | Power steering load signal | | |
| Battery | Battery voltage | | |
| Vehicle speed sensor | Vehicle speed | | |
| Ambient air temperature switch | Ambient air temperature | | |
| Intake air temperature sensor | Intake air temperature | | |
| Absolute pressure sensor | Ambient barometic pressure | | |

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).



SEF040E

### COMPONENT DESCRIPTION

NBEC0245S02

#### IACV-AAC Valve

NBEC0245S0201

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.

## CONSULT Reference Value in Data Monitor Mode

NBEC0246

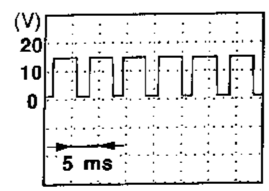
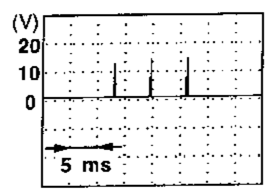
Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| IACV-AAC/V | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | 10 - 20% |
| | | 2,000 rpm | — |

## ECM Terminals and Reference Value

NBEC0247

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 101 | OR | IACV-AAC valve | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | 8 - 11V<br><br>SEF005V |
| | | | **[Engine is running]**<br>• **Warm-up condition**<br>• Engine speed is 3,000 rpm | 1 - 2V<br><br>SEF006V |

## On Board Diagnosis Logic

NBEC0248

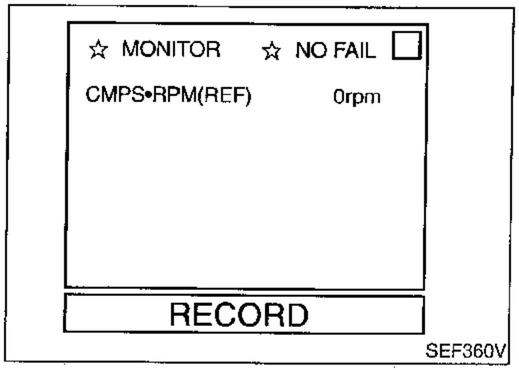
| DTC No. | Malfunction is detected when ... | | Check Items (Possible Cause) |
|---|---|---|---|
| P0505<br>0205 | A) | The IACV-AAC valve does not operate properly. | • Harness or connectors<br>(The IACV-AAC valve circuit is open.)<br>• IACV-AAC valve |
| | B) | The IACV-AAC valve does not operate properly. | • Harness or connectors<br>(The IACV-AAC valve circuit is shorted.)<br>• IACV-AAC valve |

## DTC Confirmation Procedure

NBEC0249

NOTE:

- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- **Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".**



SEF360V

### PROCEDURE FOR MALFUNCTION A

NBEC0249S01

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 10.5V.**

**With CONSULT**

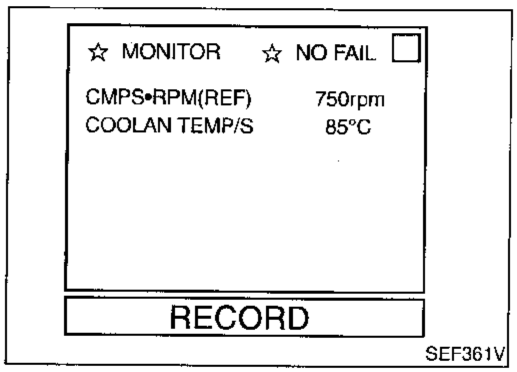
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 2 seconds.

**With GST**

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

**No Tools**

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.



SEF361V

### PROCEDURE FOR MALFUNCTION B

NBEC0249S02

**TESTING CONDITION:**

**Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**

**With CONSULT**

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.

**With GST**

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.

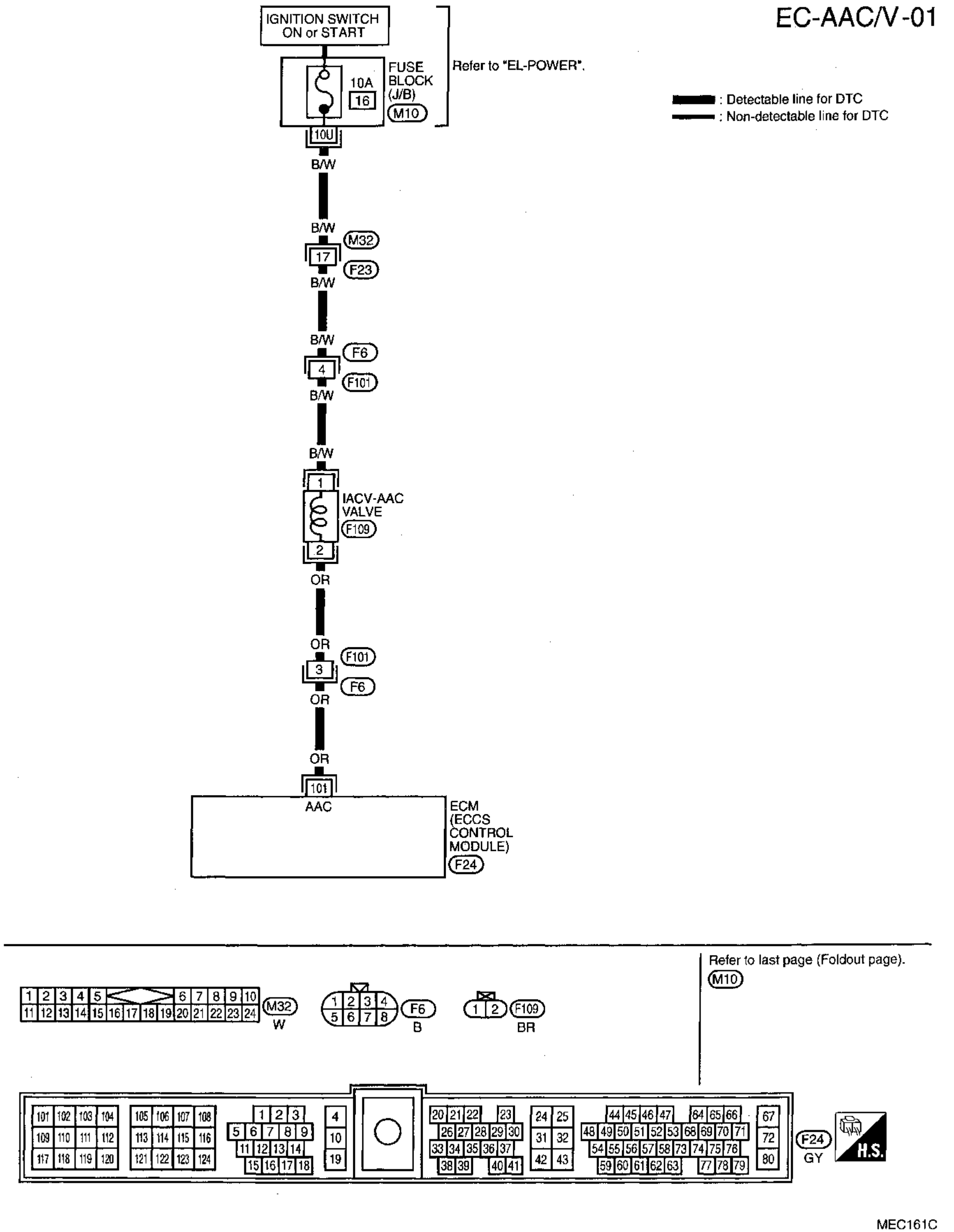
**No Tools**

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.

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## Wiring Diagram

NBEC0250

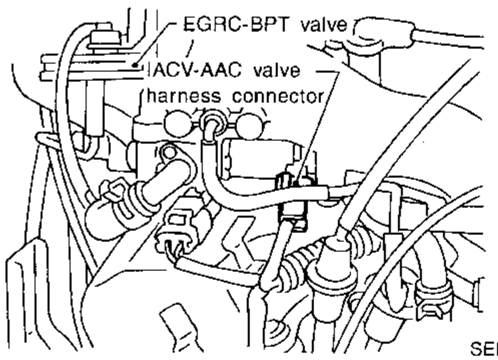


## Diagnostic Procedure

NBEC0251

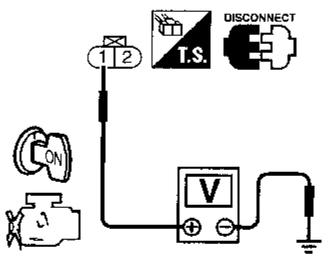
### 1 CHECK POWER SUPPLY

1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.




SEF007S

3. Turn ignition switch "ON".
4. Check voltage between terminal 1 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF713U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

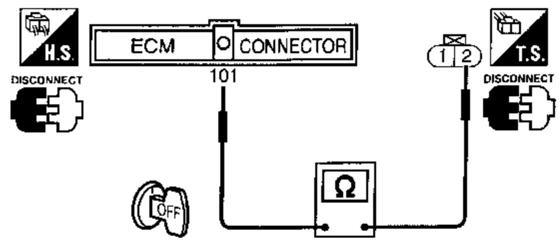
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F101, F6
- Harness connectors F23, M32
- 10A fuse
- Harness for open or short between IACV-AAC valve and fuse

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

### 3 CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 101 and terminal 2.
   **Continuity should exist.**




SEF714U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F6, F101
- Harness for open or short between IACV-AAC valve and ECM

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 5 CHECK COMPONENT

(IACV-AAC valve)
Refer to "Component Inspection", EC-328.

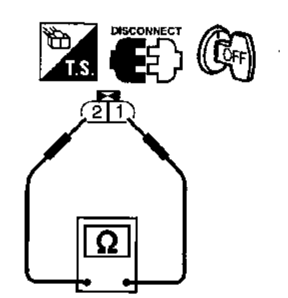
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace IACV-AAC valve. |

### 6 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |



SEF057S

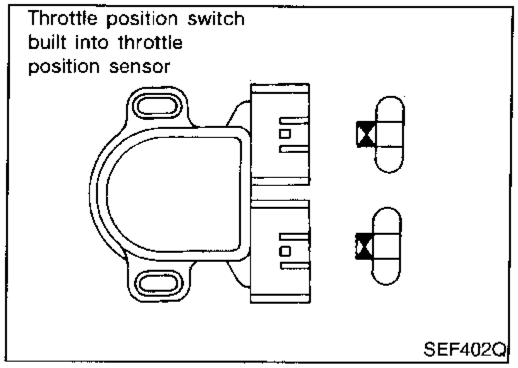
## Component Inspection

NBEC0252

### IACV-AAC VALVE

NBEC0252S01

1. Disconnect IACV-AAC valve harness connector.
2. Remove IACV-AAC valve.
- Check IACV-AAC valve resistance.
  **Resistance:**
  **Approximately 10Ω [at 20°C (68°F)]**
- Check plunger for seizing or sticking.
- Check for broken spring.
3. Supply battery voltage between IACV-AAC valve connector terminals.
   **Plunger should move.**



SEF402Q

## Component Description

NBEC0253

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.
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

NBEC0255

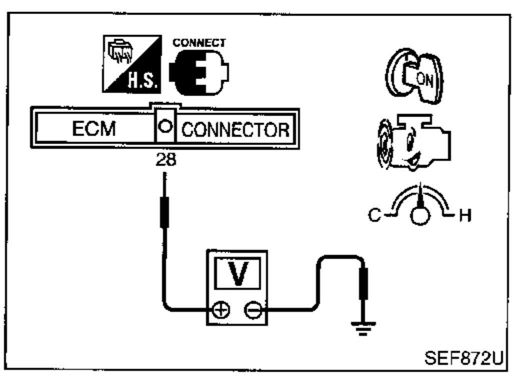
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 28 | OR/W | Throttle position switch (Closed position) | **[Ignition switch "ON"]**<br>• **Warm-up condition**<br>• Accelerator pedal fully released | BATTERY VOLTAGE (11 - 14V) |
| | | | **[Ignition switch "ON"]**<br>• Accelerator pedal depressed | Approximately 0V |

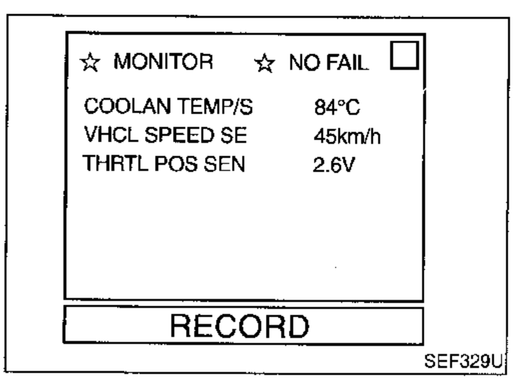
## On Board Diagnosis Logic

NBEC0256

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0510<br>0203 | • Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened. | • Harness or connectors<br>(The closed throttle position switch circuit is shorted.)<br>• Closed throttle position switch<br>• Throttle position sensor |



SEF872U



SEF329U

## DTC Confirmation Procedure

NBEC0257

**CAUTION:**

**Always drive vehicle at a safe speed.**

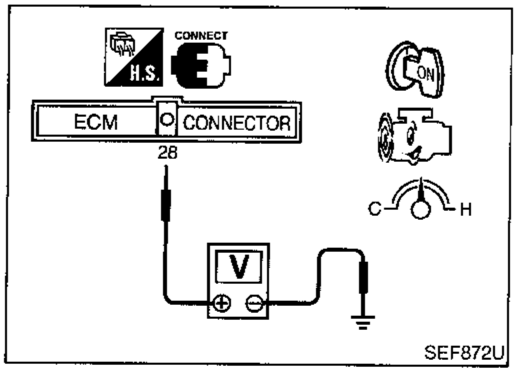
NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Check voltage between ECM terminal 28 (Closed throttle position switch signal) and ground under the following conditions.
   **At idle: Battery voltage**
   **At 2,000 rpm: Approximately 0V**
   If the check result is NG, go to "Diagnostic Procedure", EC-332.
   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.**



SEF872U

## Overall Function Check

NBEC0469

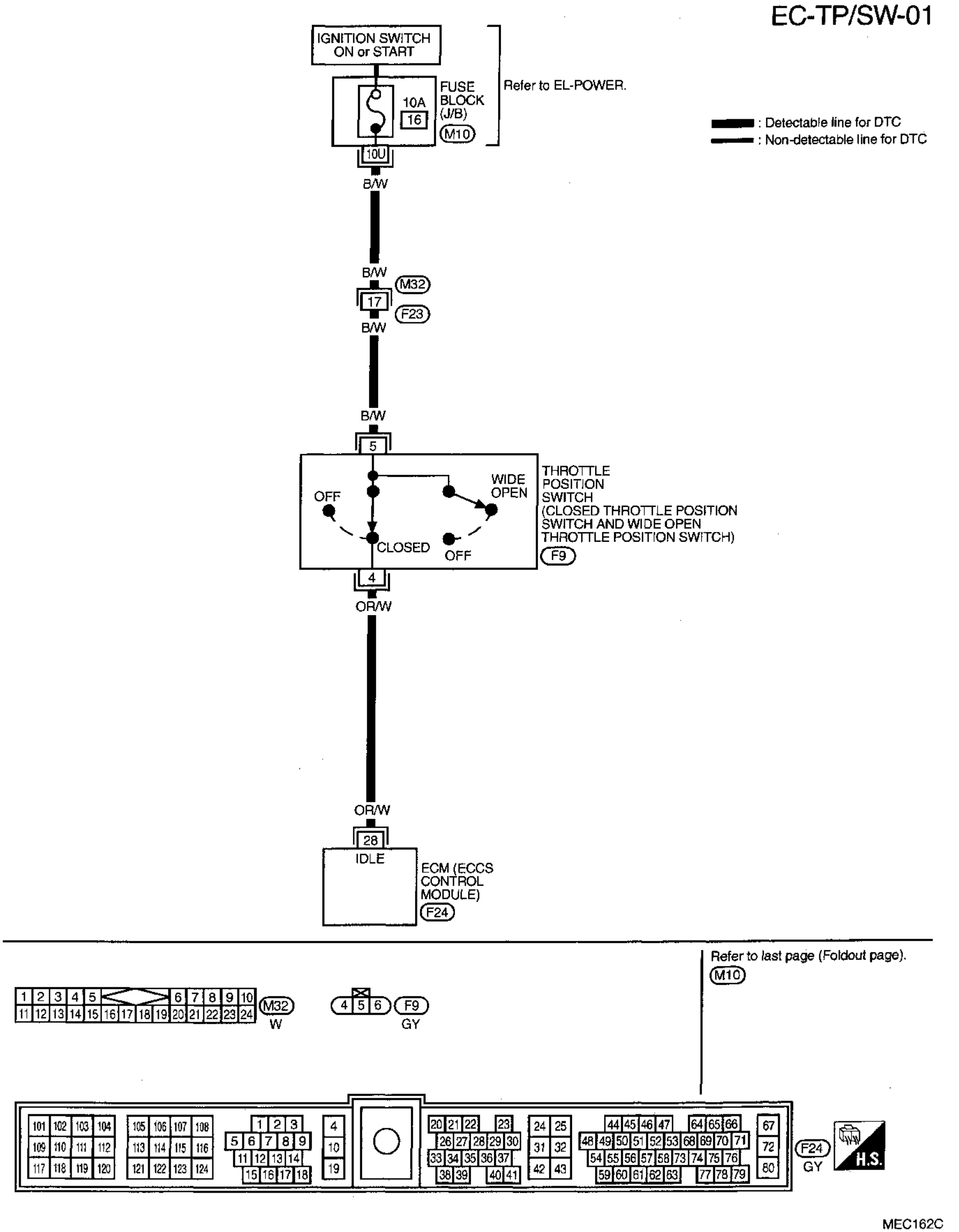
Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.

**Without CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal 28 (Closed throttle position switch signal) and ground under the following conditions.
   **At idle: Battery voltage**
   **At 2,000 rpm: Approximately 0V**

## Wiring Diagram

NBEC0258

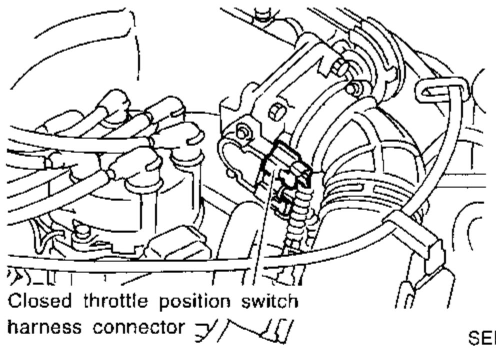


## Diagnostic Procedure

NBEC0259

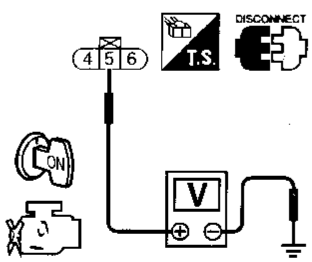
### 1 CHECK POWER SUPPLY

1. Turn ignition switch “OFF”.
2. Disconnect throttle position switch harness connector.




SEF753U

3. Turn ignition switch “ON”.
4. Check voltage between terminal 5 and engine ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF715U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

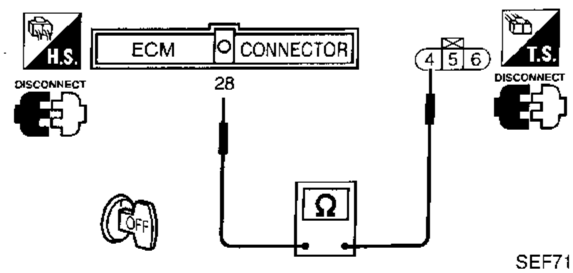
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- 10A fuse
- Harness for open or short between throttle position switch and fuse

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

### 3 CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 28 and terminal 4.
   **Continuity should exist.**




SEF716U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 ADJUST THROTTLE POSITION SWITCH

Perform BASIC INSPECTION, EC-85.

| | | |
|---|---|---|
| | ▶ | GO TO 5. |

### 5 CHECK COMPONENT

(Closed throttle position switch)
Refer to “Component Inspection”, EC-333.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace throttle position switch. |

### 6 CHECK COMPONENT

(Throttle position sensor)
Refer to “Component Inspection”, EC-152.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace throttle position sensor. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |

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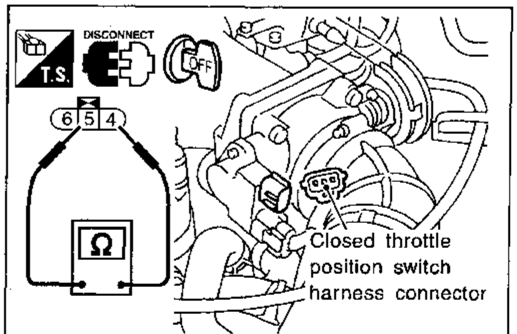


SEF754U

## Component Inspection

NBEC0260

### CLOSED THROTTLE POSITION SWITCH

NBEC0260S01

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 4 while opening throttle valve manually.

| Throttle valve conditions | Continuity |
|---|---|
| Completely closed | Yes |
| Partially open or completely open | No |

If NG, replace throttle position switch.

## System Description

NBEC0261

These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/deceleration.
Voltage signals are exchanged between ECM and TCM (Transmission control module).

## ECM Terminals and Reference Value

NBEC0262

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

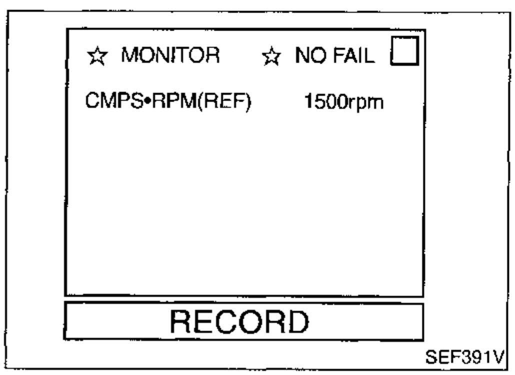
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 26 | PU/W | A/T signal No. 1 | **[Ignition switch "ON"]**<br>**[Engine is running]**<br>● Idle speed | 6 - 8V |
| 27 | P/B | A/T signal No. 2 | **[Ignition switch "ON"]**<br>**[Engine is running]**<br>● Idle speed | 6 - 8V |
| 35 | P | A/T signal No. 3 | **[Ignition switch "ON"]** | 0V |

## On Board Diagnosis Logic

NBEC0263

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0600* | ● ECM receives incorrect voltage from TCM (Transmission control module) continuously. | ● Harness or connectors<br>[The circuit between ECM and TCM (Transmission control module) is open or shorted.] |

*: This DTC can be detected only by "DATA MONITOR (AUTO TRIG)" with CONSULT.




SEF391V

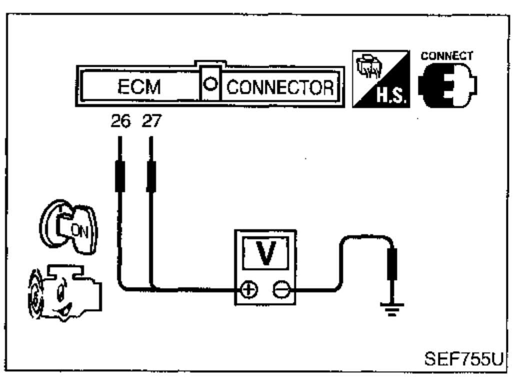
## DTC Confirmation Procedure

NBEC0264

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT.
3. Start engine, and rev engine more than 1,000 rpm once, then let it idle for more than 40 seconds.




SEF755U

## Overall Function Check

NBEC0265

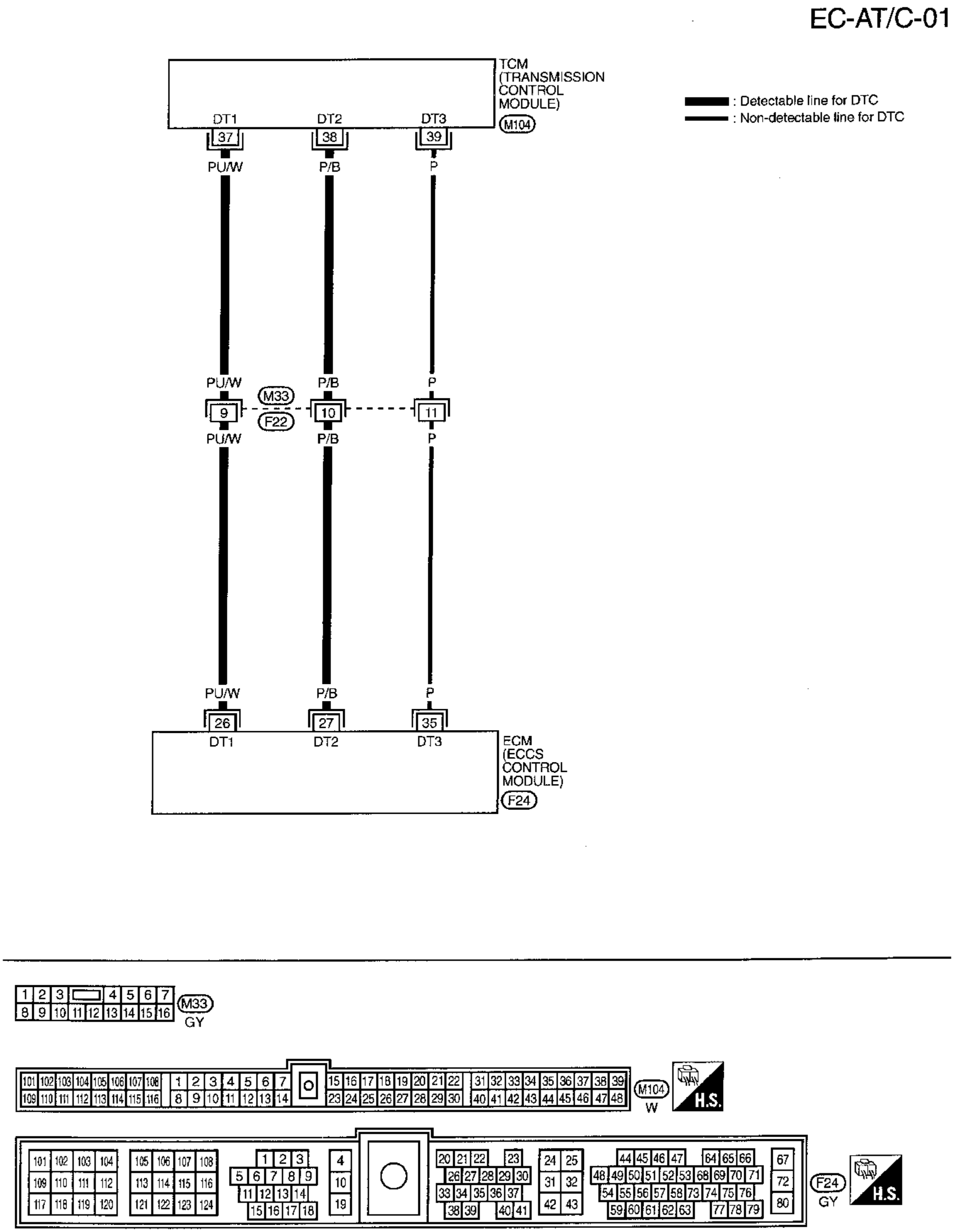
Use this procedure to check the overall function of the A/T control circuit. During this check, a DTC might not be confirmed.

**Without CONSULT**

1. Start engine.
2. Check voltage between
   ECM terminal 26 and ground.
   ECM terminal 27 and ground.
   **Voltage: 6 - 8V**

## Wiring Diagram

NBEC0266



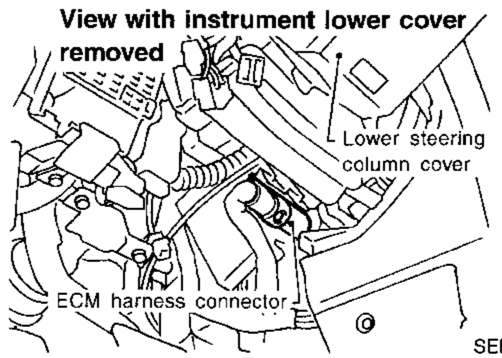

MEC163C

## Diagnostic Procedure

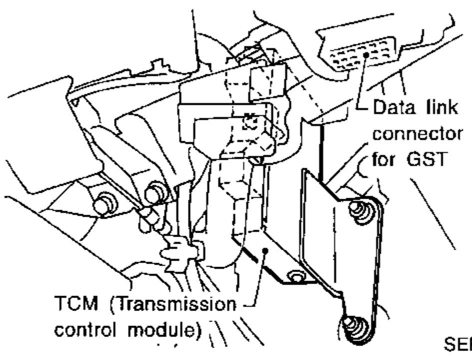
NBEC0267

### 1 CHECK INPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and TCM (Transmission control module) harness connector.

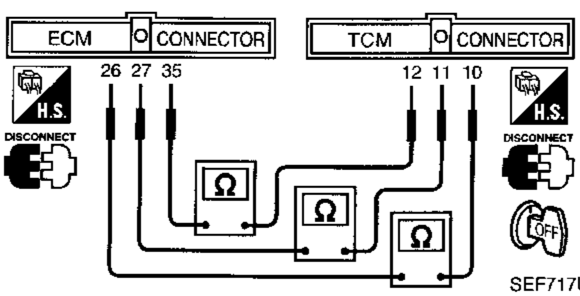



SEF981R




SEF008SB

3. Check harness continuity between ECM terminal 26 and terminal 10, ECM terminal 27 and terminal 11, ECM terminal 35 and terminal 12.
**Continuity should exist.**




SEF717U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

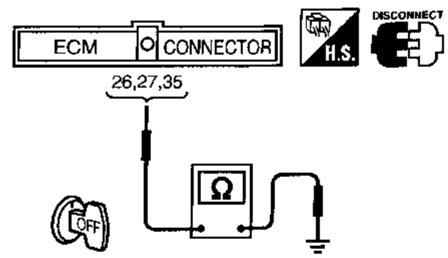
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F22, M33
- Harness for open or short between ECM and TCM (Transmission control module)

| | |
|---|---|
| ▶ | Repair harness or connectors. |

### 3 CHECK INPUT SIGNAL CIRCUIT

Check harness continuity between ECM terminal 26 and ground, ECM terminal 27 and ground, ECM terminal 35 and ground.
**Continuity should not exist.**




SEF718U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

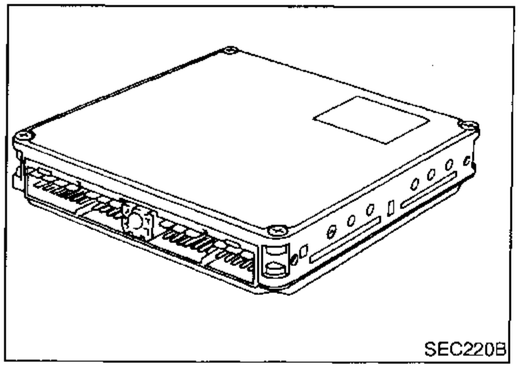
Check the harness for open or short between ECM and TCM (Transmission control module).

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness. |

### 5 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |


SEC220B

## Component Description

NBEC0268

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

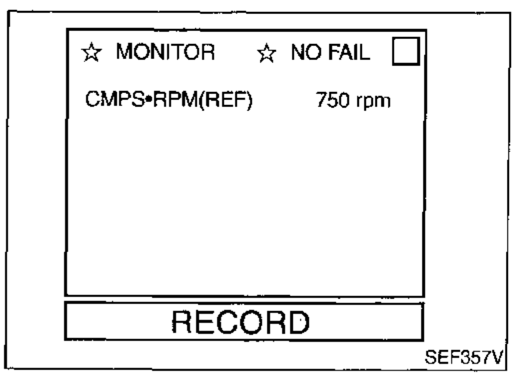
NBEC0269

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P0605<br>0301 | • ECM calculation function is malfunctioning. | • ECM<br>(ECCS control module) |

## DTC Confirmation Procedure

NBEC0270

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



SEF357V

**With CONSULT**
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine.
4) Run engine for at least 2 seconds at idle speed.

**With GST**
1) Turn ignition switch "ON".
2) Start engine.
3) Run engine for at least 2 seconds at idle speed.
4) Select "Mode 7" with GST.

**No Tools**
1) Turn ignition switch "ON".
2) Start engine and wait at least 2 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.

## Diagnostic Procedure

=NBEC0271

| 1 | INSPECTION START | |
|---|---|---|
| **With CONSULT**<br>1. Turn ignition switch "ON".<br>2. Select "SELF DIAG RESULTS" mode with CONSULT.<br>3. Touch "ERASE".<br>4. **Perform "DTC Confirmation Procedure".**<br>See EC-337.<br>5. Is the 1st trip DTC P0605 (0301) displayed again? | | |
| **With GST**<br>1. Turn ignition switch "ON".<br>2. Select MODE 4 with GST.<br>3. Touch "ERASE".<br>4. **Perform "DTC Confirmation Procedure".**<br>See EC-337.<br>5. Is the 1st trip DTC P0605 (0301) displayed again? | | |
| **No Tools**<br>1. Turn ignition switch "ON".<br>2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Refer to EC-55.<br>3. **Perform "DTC Confirmation Procedure".**<br>See EC-337.<br>4. Is the 1st trip DTC P0605 (0301) displayed again?<br>**Yes or No** | | |
| Yes | ▶ | Replace ECM. |
| No | ▶ | INSPECTION END |

## Description

NBEC0279

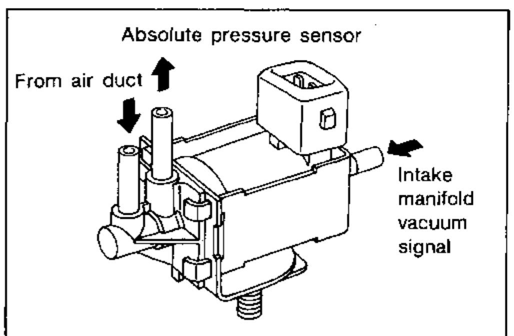
### SYSTEM DESCRIPTION

NBEC0279S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | ECM (ECCS control module) | MAP/BARO switch solenoid valve |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |
| Vehicle speed sensor | Vehicle speed | | |

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 | • For 5 seconds after turning ignition switch ON<br>or<br>• For 5 seconds after starting engine<br>or<br>• More than 5 minutes after the solenoid valve shuts OFF.<br>and<br>• Throttle valve is shut or almost fully shut for more than 5 seconds<br>and<br>• Vehicle speed is less than 100 km/h (62 MPH). |



SEF417Q

### COMPONENT DESCRIPTION

NBEC0279S02

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

NBEC0280

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| MAP/BARO SW/V | • Ignition switch: ON (Engine stopped) | | MAP |
| | • Engine speed: Idle | For 5 seconds after starting engine | BARO |
| | | More than 5 seconds after starting engine | MAP |

## ECM Terminals and Reference Value

NBEC0281

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 118 | G/OR | MAP/BARO switch solenoid valve | **[Ignition switch "ON"]**<br>• Engine is not running<br>• For 5 seconds after ignition switch is turned "ON"<br>**[Engine is running]**<br>• Idle (for 5 seconds after engine start) | 0 - 1V |
| | | | **[Ignition switch "ON"]**<br>• Engine is not running<br>• More than 5 seconds after ignition switch is turned "ON"<br>**[Engine is running]**<br>• Idle (More than 5 seconds after engine start) | BATTERY VOLTAGE<br>(11 - 14V) |

## On Board Diagnosis Logic

NBEC0282

| DTC No. | Malfunction is detected when ... | | Check Items (Possible Cause) |
|---|---|---|---|
| P1105<br>1302 | A) | MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve. | • Harness or connectors<br>(MAP/BARO switch solenoid valve circuit is open or shorted.)<br>• 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. | • Harness or connectors<br>(MAP/BARO switch solenoid valve circuit is open or shorted.)<br>• Hoses<br>(Hoses are clogged or disconnected.)<br>• Absolute pressure sensor<br>• MAP/BARO switch solenoid valve |

## DTC Confirmation Procedure

NBEC0283

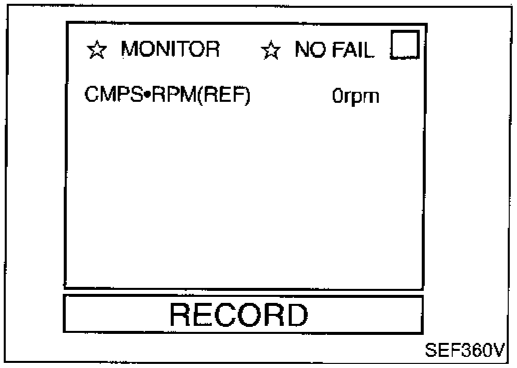
**Perform "PROCEDURE FOR MALFUNCTION A" first. If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".**

NOTE:
If "DTC 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

NBEC0283S01

**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 11V.**



SEF360V

**With CONSULT**

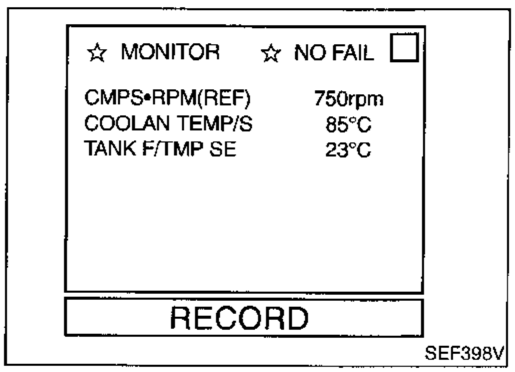
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Wait at least 10 seconds.

**With GST**

1) Turn ignition switch "ON" and wait at least 10 seconds.
2) Select "MODE 7" with GST.

**No Tools**

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.



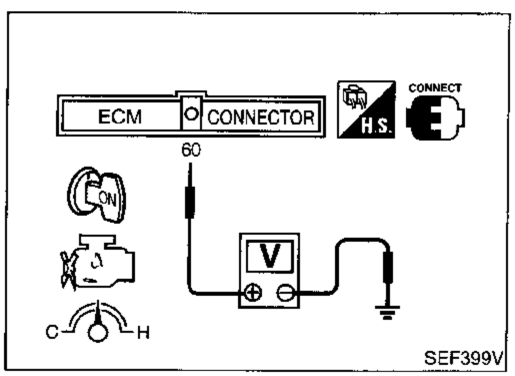
SEF398V

### PROCEDURE FOR MALFUNCTION B

NBEC0283S02

**With CONSULT**

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/TMP SE" is more than 0°C (32°F).
5) Start engine and let it idle for at least 10 seconds.



SEF399V

**With GST**

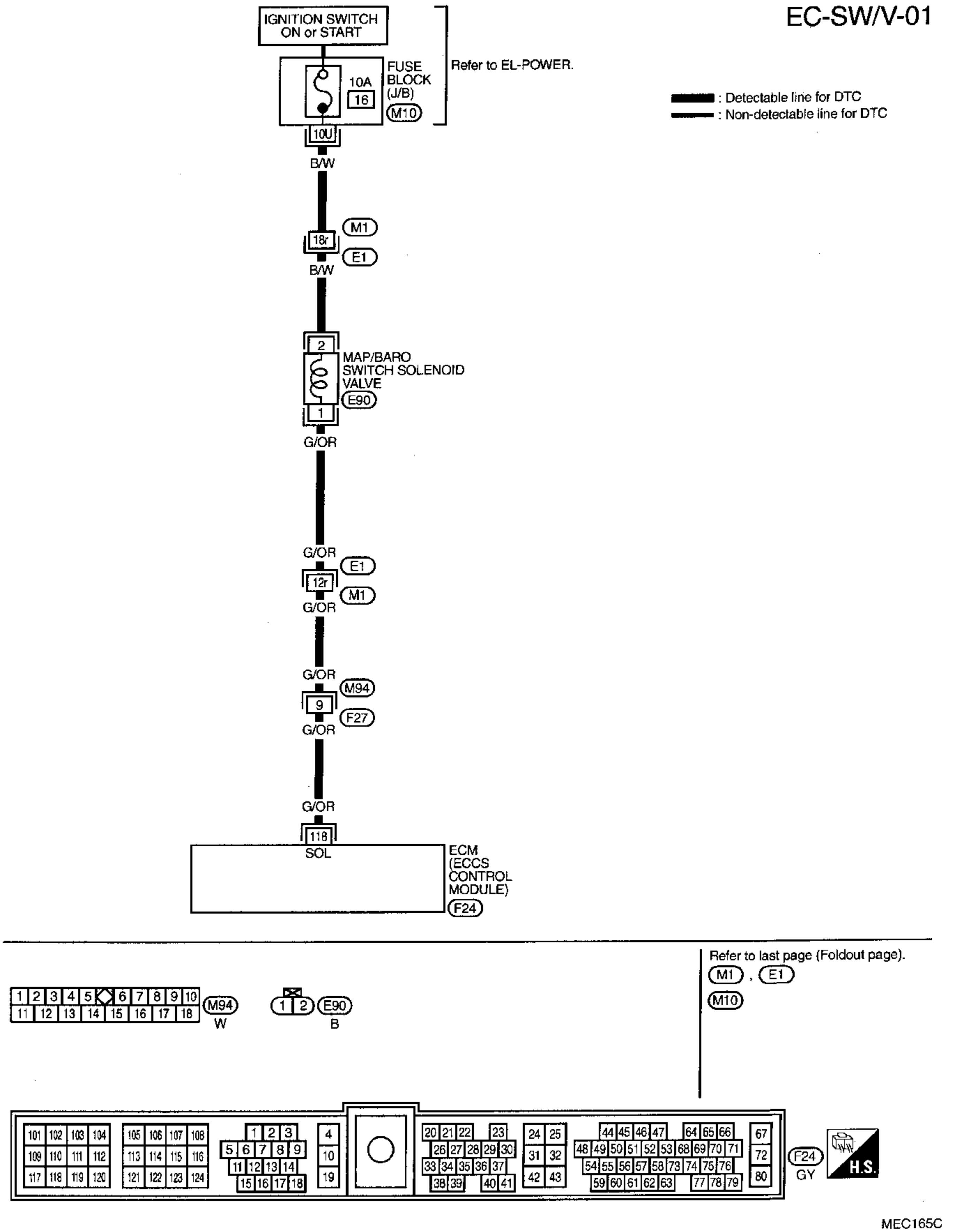
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON".
4) Check that voltage between ECM terminal 60 (Tank fuel temperature sensor signal) and ground is less than 4.2V.
5) Start engine and let it idle for at least 10 seconds.
6) Select "MODE 7" with GST.

**No Tools**

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 (Tank fuel temperature sensor signal) 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.

## Wiring Diagram

NBEC0284



## Diagnostic Procedure

NBEC0285

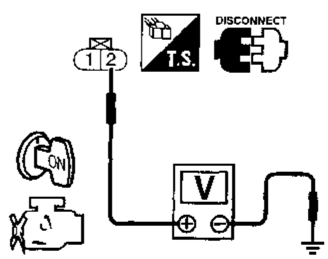
**If the trouble is duplicated after "PROCEDURE FOR MALFUNCTION A", perform "PROCEDURE A" below. If the trouble is duplicated after "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE B" on next page.**

### PROCEDURE A

NBEC0285S01

**1 CHECK POWER SUPPLY**

1. Turn ignition switch "OFF".
2. Disconnect MAP/BARO switch solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF719U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

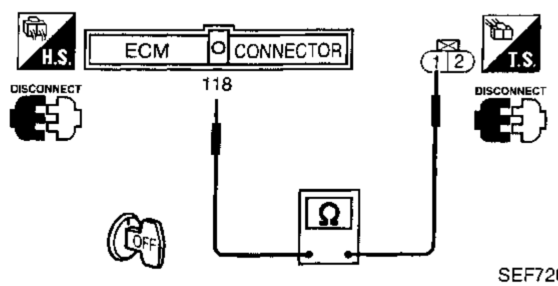
**2 DETECT MALFUNCTIONING PART**

Check the following.
- Harness connectors M1, E1
- 10A fuse
- Harness for open or short between MAP/BARO switch solenoid valve and fuse

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

**3 CHECK OUTPUT SIGNAL CIRCUIT**

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 118 and terminal 1 with CONSULT or tester.
   **Continuity should exist.**




SEF720U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

**4 DETECT MALFUNCTIONING PART**

Check the following.
- Harness connectors E1, M1
- Harness connectors M94, F27
- Harness for open or short between MAP/BARO switch solenoid valve and ECM

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

**5 CHECK COMPONENT**

(MAP/BARO switch solenoid valve)
Refer to "Component Inspection", EC-347.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace MAP/BARO switch solenoid valve. |

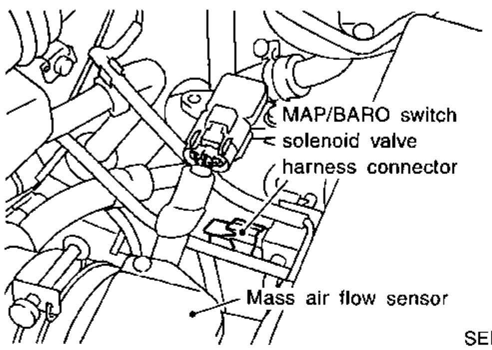
| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |

## PROCEDURE B

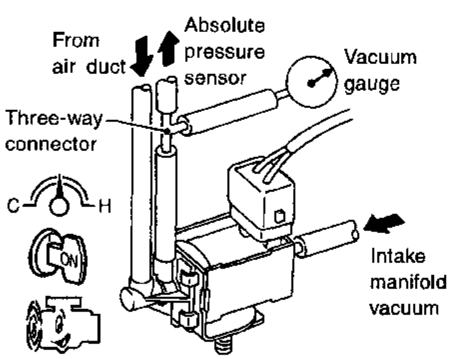
NBEC0285S02

### 1 INSPECTION START

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Attach the vacuum gauge between MAP/BARO switch solenoid valve and rubber tube connected to absolute pressure sensor.



SEF756U



SEF676T

| | | |
|---|---|---|
| Models with CONSULT | ▶ | GO TO 2. |
| Models without CONSULT | ▶ | GO TO 3. |

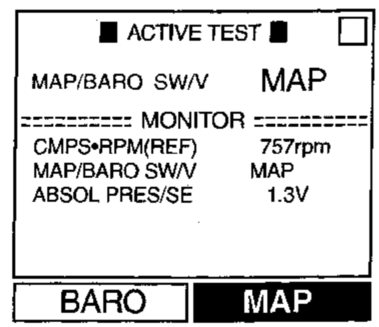
### 2 CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR

**With CONSULT**

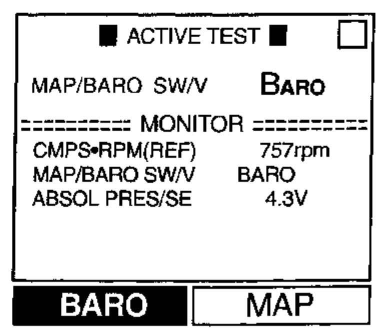
1. Start engine and let it idle.
2. Select "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "MAP" and "BARO" alternately and check for vacuum.

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

MTBL0079



SEF396V



SEF397V

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | GO TO 4. |

## 3 CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR

**Without CONSULT**

1. Start engine and let it idle.
2. Check for vacuum under the following condition.

| Condition | Vacuum |
|---|---|
| For 5 seconds after starting engine | Should not exist |
| More than 5 seconds after starting engine | Should exist |

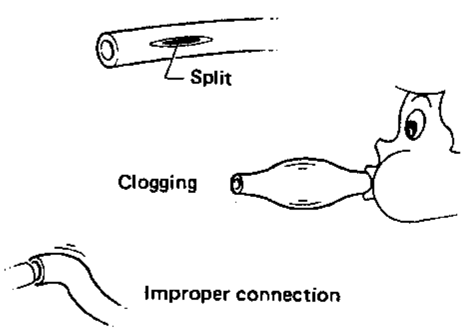
MTBL0080

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | GO TO 4. |

## 4 CHECK VACUUM HOSE

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



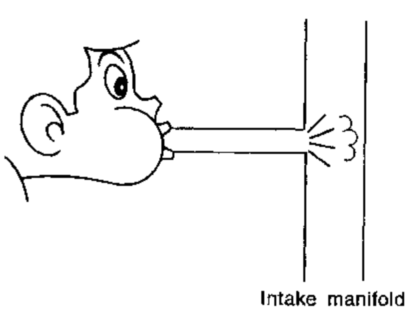

SEF109L

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Clean, repair or reconnect the hose. |

## 5 CHECK VACUUM PORT

Check vacuum port for clogging.



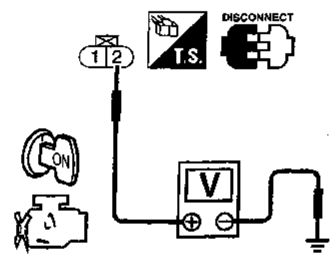

SEF368U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Clean or repair the vacuum port. |

## 6 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect MAP/BARO switch solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF719U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

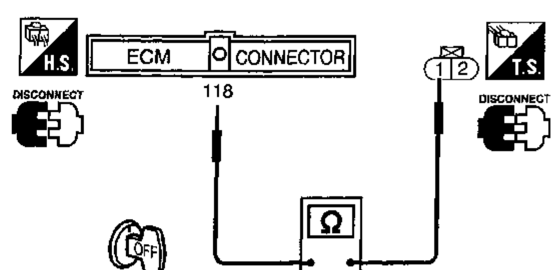
## 7 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M1, E1
- 10A fuse
- Harness for open or short between MAP/BARO switch solenoid valve and fuse

| | |
|---|---|
| ▶ | Repair harness or connectors. |

## 8 CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 118 and terminal 1 with CONSULT or tester.
   **Continuity should exist.**




SEF720U

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

**OK or NG**

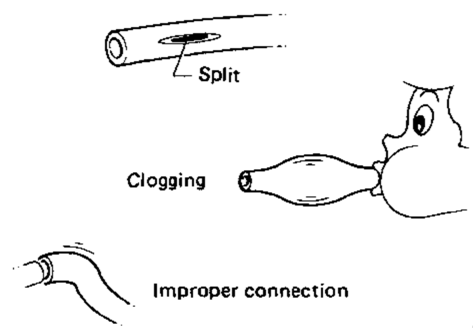
| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | GO TO 9. |

| 9 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>• Harness connectors E1, M1<br>• Harness connectors M94, F27<br>• Harness for open or short between MAP/BARO switch solenoid valve and ECM | |
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 10 | CHECK COMPONENT | |
|---|---|---|
| (MAP/BARO switch solenoid valve)<br>Refer to "Component Inspection", EC-347. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace MAP/BARO switch solenoid valve. |

| 11 | CHECK INTAKE SYSTEM | |
|---|---|---|
| Check intake system for air leaks. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 15. |
| NG | ▶ | Repair it. |

| 12 | CHECK HOSE BETWEEN ABSOLUTE PRESSURE SENSOR AND MAP/BARO SWITCH SOLENOID VALVE | |
|---|---|---|
| Check hose for clogging, cracks, disconnection or improper connection. | | |



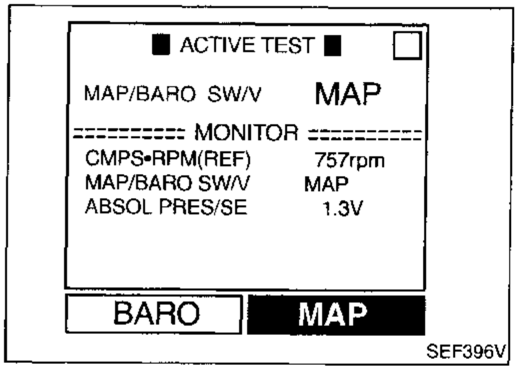

SEF109L

| **OK or NG** | | |
|---|---|---|
| OK | ▶ | GO TO 13. |
| NG | ▶ | Repair or reconnect hose. |

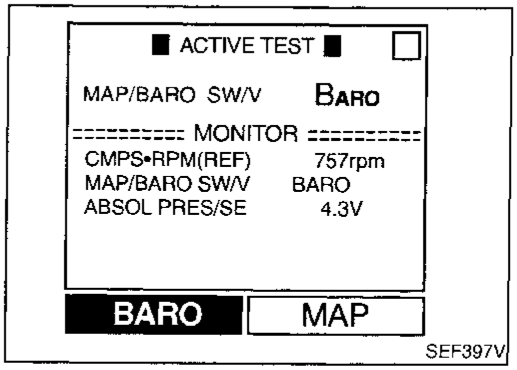
| 13 | CHECK HARNESS CONNECTOR | |
|---|---|---|
| 1. Disconnect absolute pressure sensor harness connector.<br>2. Check sensor harness connector for water.<br>**Water should not exist.** | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 14. |
| NG | ▶ | Repair or replace harness connector. |

| 14 | CHECK COMPONENT | |
|---|---|---|
| (Absolute pressure sensor)<br>Refer to "Component Inspection", EC-131. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 15. |
| NG | ▶ | Replace absolute pressure sensor. |

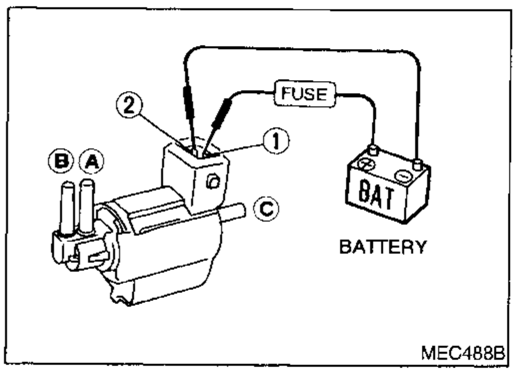
| 15 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |



SEF396V



SEF397V



MEC488B

## Component Inspection

NBEC0286

### MAP/BARO SWITCH SOLENOID VALVE

NBEC0286S01

**With CONSULT**

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.

**Without CONSULT**

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.

## On Board Diagnosis Logic

NBEC0470

**★ The closed loop control has the one trip detection logic.**

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1148<br>0307<br>(Right bank) | • The closed loop control function for right bank does not operate even when vehicle is driving in the specified condition. | • The front heated oxygen sensor circuit is open or shorted.<br>• Front heated oxygen sensor<br>• Front heated oxygen sensor heater |
| P1168<br>0308<br>(Left bank) | • The closed loop control function for left bank does not operate even when vehicle is driving in the specified condition. | • The front heated oxygen sensor circuit is open or shorted.<br>• Front heated oxygen sensor<br>• Front heated oxygen sensor heater |

## DTC Confirmation Procedure

NBEC0471

**CAUTION:**

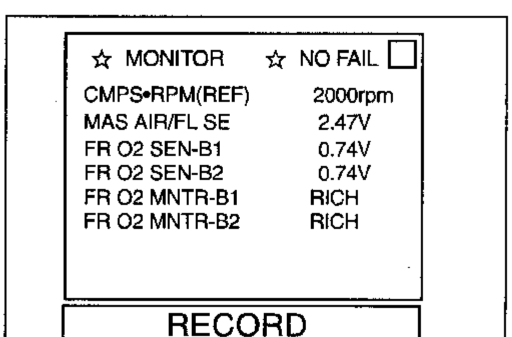
**Always drive vehicle at a safe speed.**

NOTE:

If "DTC 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 3,200 rpm during the "DTC Confirmation Procedure". If the engine speed limit is exceeded, retry the procedure from step 2.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**




SEF392V

**With CONSULT**

1) Start engine and warm it up to normal operating temperature.
2) Select "DATA MONITOR" mode with CONSULT.
3) Hold engine speed at 2,000 rpm and check one of the following.

- "FR O2 SENSOR" voltage should go above 0.70V at least once.
- "FR O2 SENSOR" voltage should go below 0.21V at least once.

If the check result is NG, perform "Diagnosis Procedure", EC-349.

If the check result is OK, perform the following step.

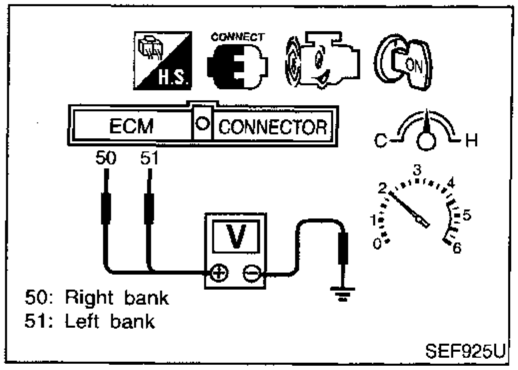
4) Let engine idle at least 3 minutes.
5) Maintain the following condition at least 50 consecutive seconds.

   **B/FUEL SCHDL: 1.7 ms or more**
   **CMPS·RPM (POS): 1,600 - 3,000 rpm**
   **Selector lever: Suitable position**
   **VHCL SPEED SE: More than 70 km/h (43 MPH)**

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## Overall Function Check

NBEC0472




SEF925U

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

**Without CONSULT**

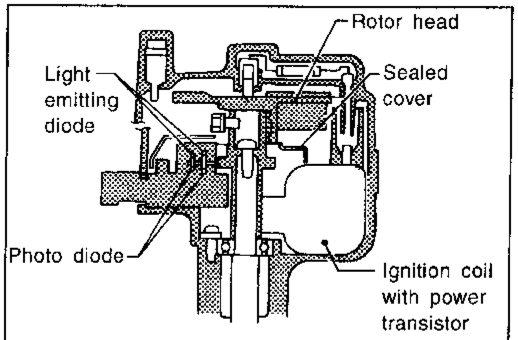
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 50 (front heated oxygen sensor right bank signal) or 51 (front heated oxygen sensor left bank signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no-load.

- The voltage should go above 0.70V at least once.
- The voltage should go below 0.21V at least once.

## Diagnostic Procedure

NBEC0473

Perform trouble diagnosis for "DTC P0133, P0153", EC-178.



SEF998R

## Component Description
NBEC0287

### IGNITION COIL & POWER TRANSISTOR
NBEC0287S01

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.

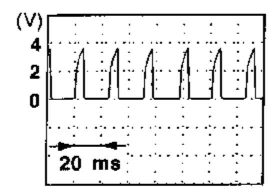
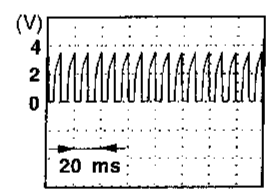
## CONSULT Reference Value in Data Monitor Mode
NBEC0288

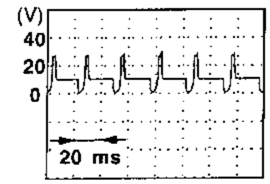
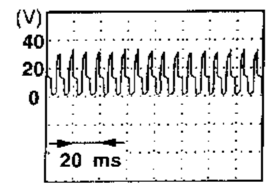
Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| IGNITION SW | • Ignition switch: ON → OFF → ON | ON → OFF → ON |

## ECM Terminals and Reference Value
NBEC0289

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

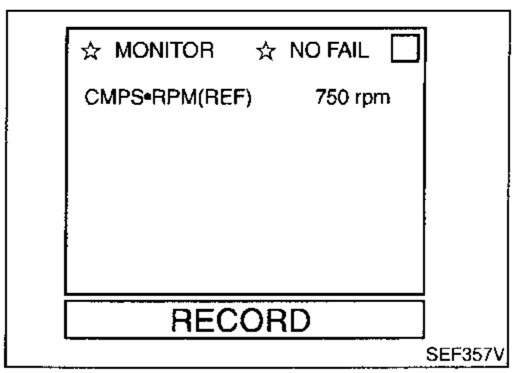
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 1 | W/B | Ignition signal | **[Engine is running]**<br>• Idle speed | 0.7V<br><br>SEF988U |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | 1.1 - 1.5V<br><br>SEF989U |

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 2 | W/G | Ignition check | **[Engine is running]**<br>● **Warm-up condition**<br>● Idle speed | Approximately 12V<br><br>SEF990U |
| | | | **[Engine is running]**<br>● Engine speed is 2,000 rpm. | Approximately 11V<br><br>SEF991U |

## On Board Diagnosis Logic

NBEC0290

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1320<br>0201 | ● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running. | ● Harness or connectors<br>(The ignition primary circuit is open or shorted.)<br>● Power transistor unit.<br>● Resistor<br>● Camshaft position sensor<br>● Camshaft position sensor circuit |



SEF357V

## DTC Confirmation Procedure

NBEC0291

NOTE:
- If "DTC 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 CAMSHAFT POSITION SENSOR (CMPS)" first. Refer to EC-269.**

**With CONSULT**

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.)

**With GST**

1) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
2) Select MODE 7 with GST.

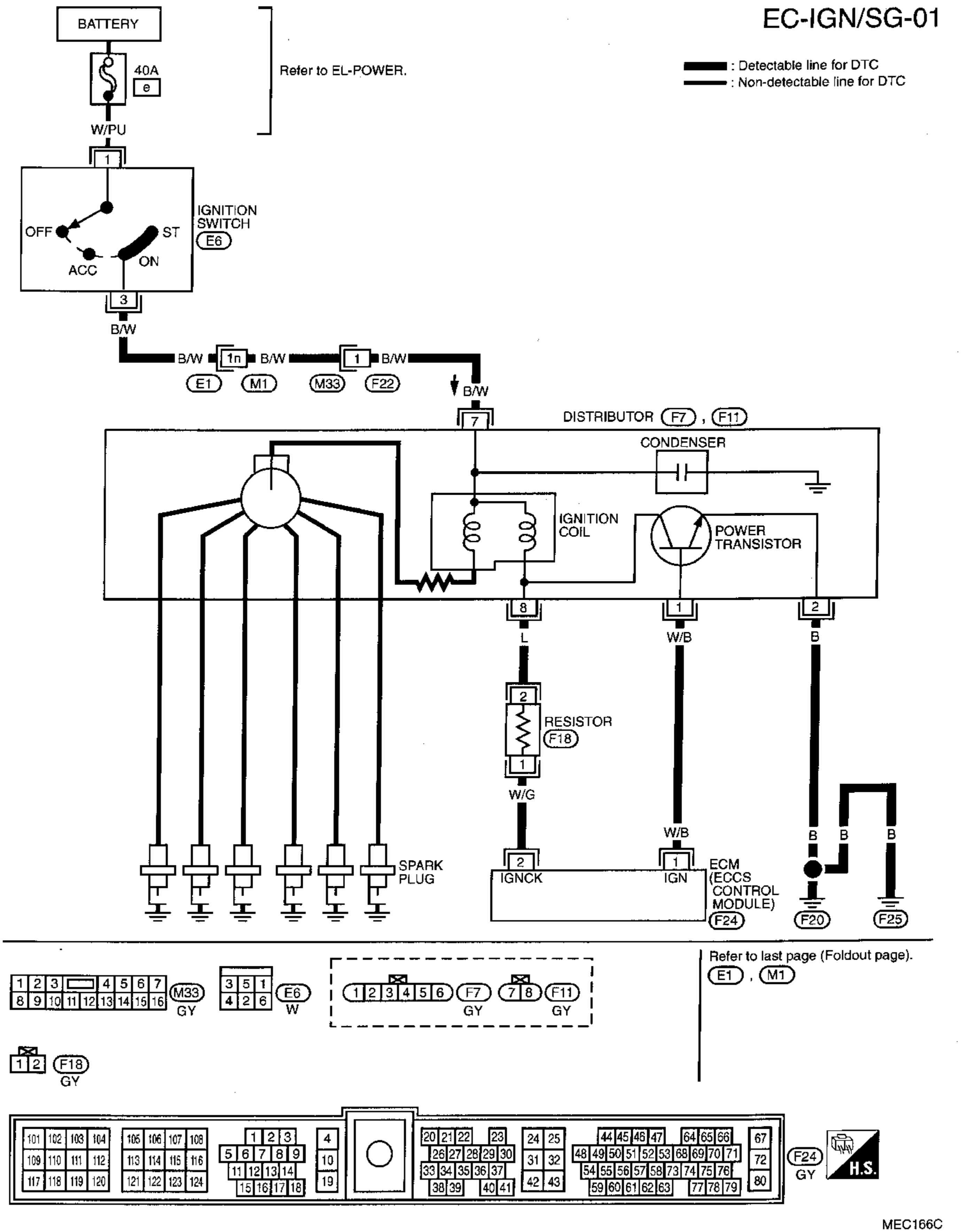
**No Tools**

1) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)

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

## Wiring Diagram

NBEC0292




GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

# Diagnostic Procedure

NBEC0293

## 1 CHECK ENGINE START

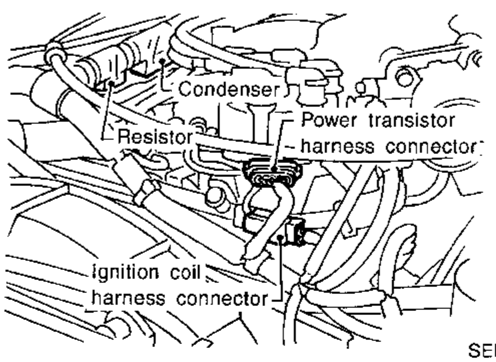
Turn ignition switch "OFF", and restart engine.
**Is engine running?**

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 7. |
| No | ▶ | GO TO 2. |

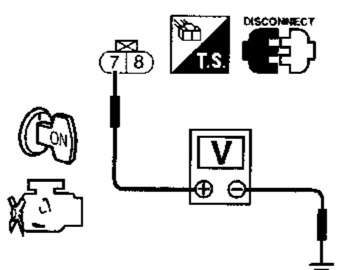
## 2 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect ignition coil harness connector.




SEF012S

3. Turn ignition switch "ON".
4. Check voltage between terminal 7 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF721U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

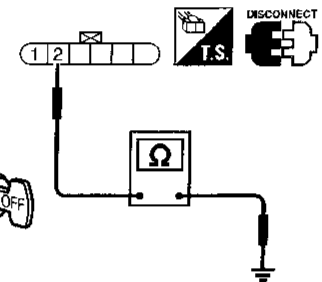
## 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F22, M33
- Harness connectors M1, E1
- Harness for open or short between ignition coil and ignition switch

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

## 4 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.**




SEF722U

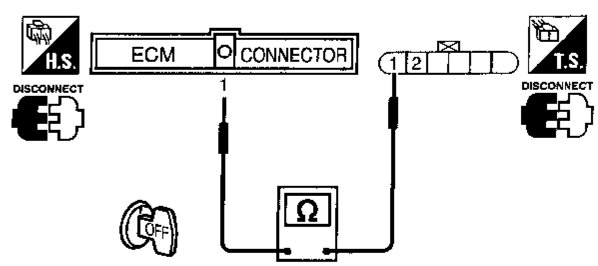
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 5 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.**




SEF723U

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

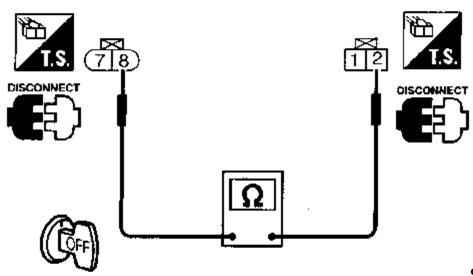
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

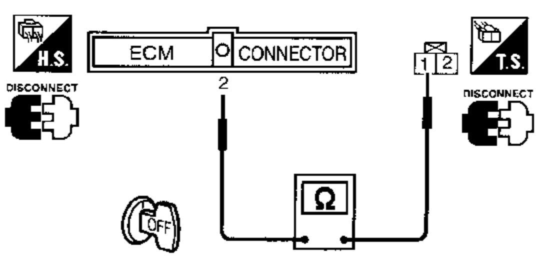
| 6 | CHECK COMPONENTS | |
|---|---|---|
| (Ignition coil, power transistor)<br>Refer to "Component Inspection", EC-356.<br>**OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace malfunctioning component(s). |

| 7 | 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 2, resistor terminal 1 and ECM terminal 2.
   **Continuity should exist.**




SEF724U




SEF725U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK COMPONENT | |
|---|---|---|
| (Resistor)<br>Refer to "Component Inspection", EC-356.<br>**OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace resistor. |

| 9 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |

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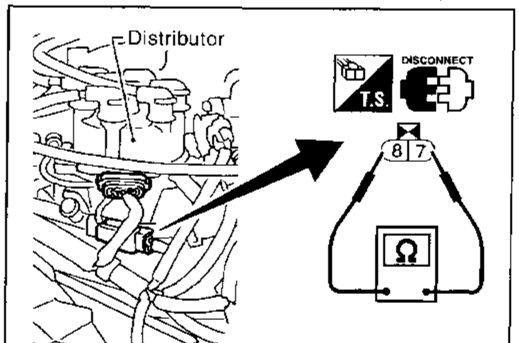
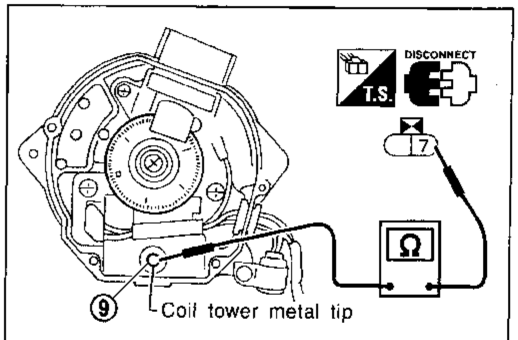


SEF013S



SEF014S

## Component Inspection

NBEC0294

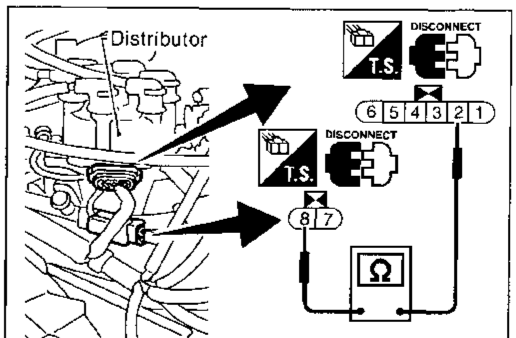
### IGNITION COIL

NBEC0294S01

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

| Terminal | Resistance [at 25°C (77°F)] |
|---|---|
| 7 - 8 (Primary coil) | 0.5 - 1.0Ω |
| 7 - 9 (Secondary coil) | Approximately 12 kΩ |

For checking secondary coil, remove distributor cap and measure resistance between coil tower metal tip 9 and terminal 7. If NG, replace distributor assembly as a unit.



SEF015S

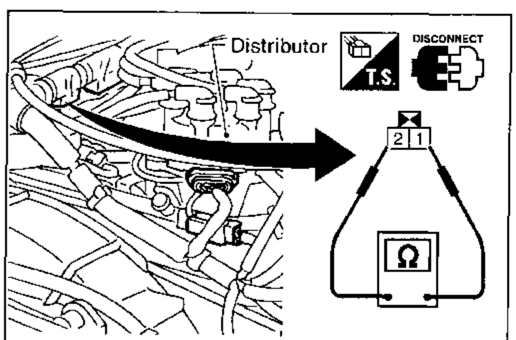
### POWER TRANSISTOR

NBEC0294S02

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.



SEF757U

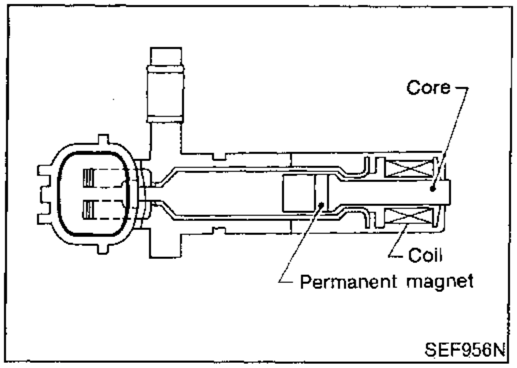
### RESISTOR

NBEC0294S03

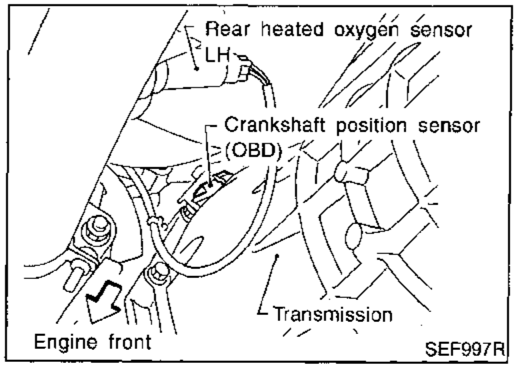
1. Disconnect resistor harness connector.
2. Check resistance between terminals 1 and 2.

   **Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]**

   If NG, replace resistor.



SEF956N



SEF997R

## Component Description

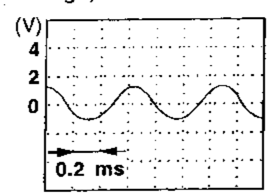
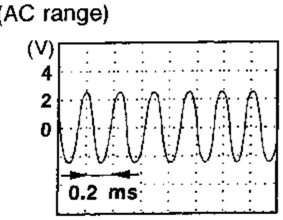
NBEC0295

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 used to control the engine system.
It is used only for the on board diagnosis.

## ECM Terminals and Reference Value

NBEC0296

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 47 | L | Crankshaft position sensor (OBD) | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | Approximately 1V<br>(AC range)<br><br>SEF003V |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | Approximately 2V<br>(AC range)<br><br>SEF004V |

## On Board Diagnosis Logic

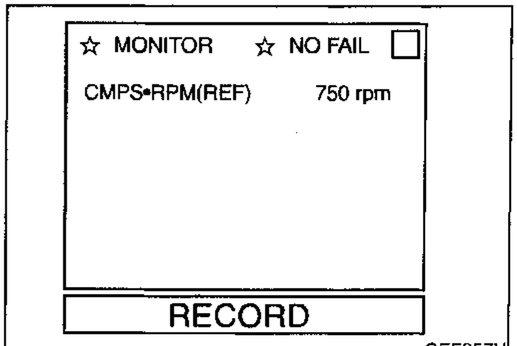
NBEC0297

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1336<br>0905 | • A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM. | • Harness or connectors<br>• Crankshaft position sensor (OBD)<br>• Drive plate/Flywheel |

## DTC Confirmation Procedure

NBEC0298

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



SEF357V

**With CONSULT**

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.

**With GST**

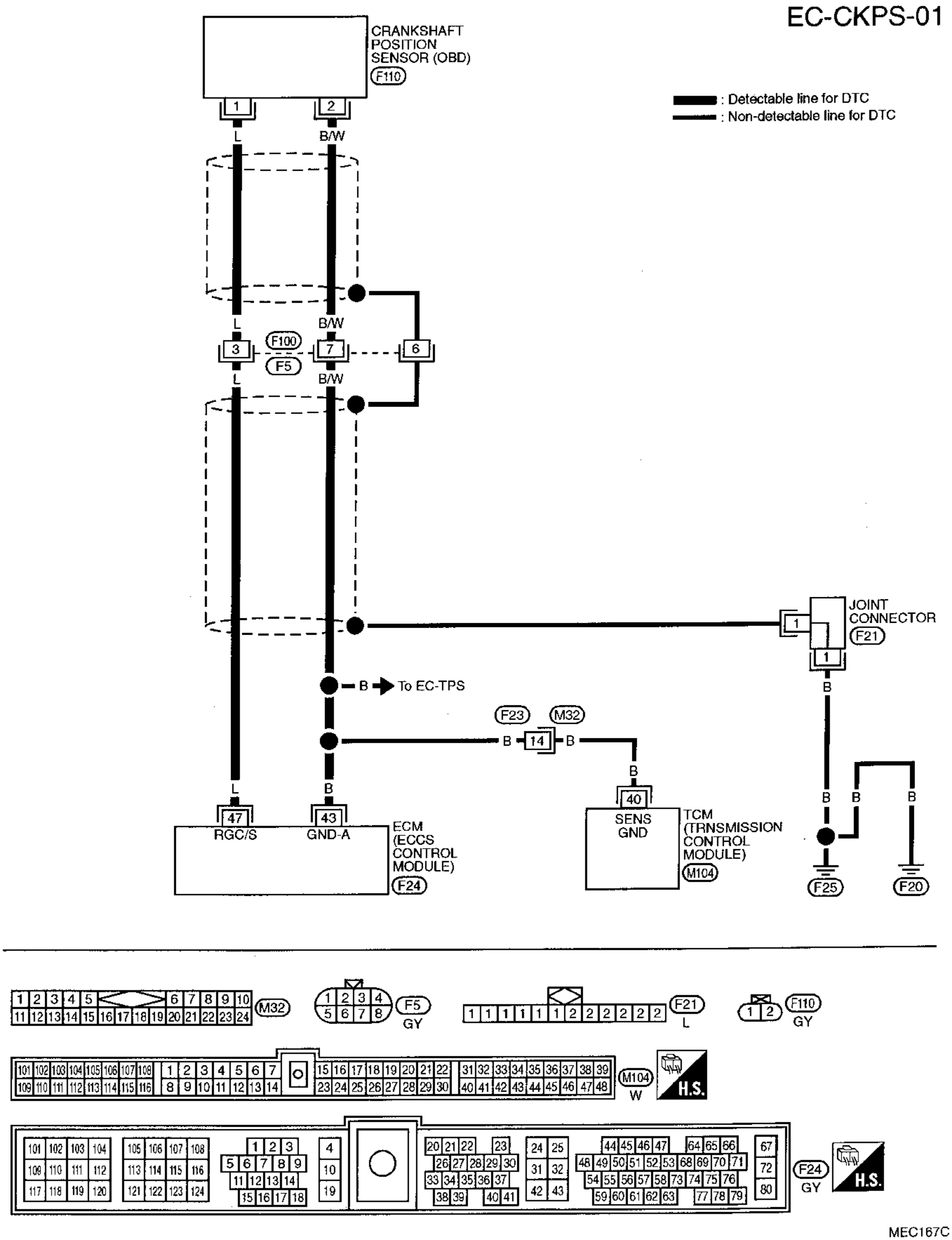
1) Start engine and run it for at least 2 minutes at idle speed.
2) Select "MODE 7" with GST.

**No Tools**

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.

## Wiring Diagram

NBEC0299

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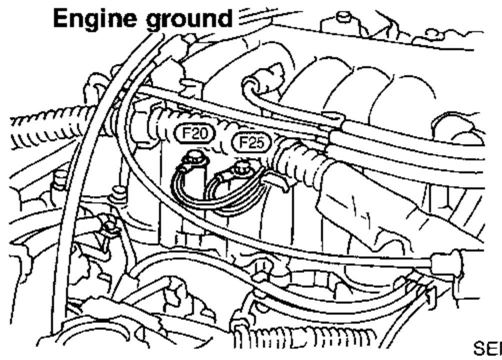
# Diagnostic Procedure

NBEC0300

## 1 RETIGHTEN GROUND SCERWS

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

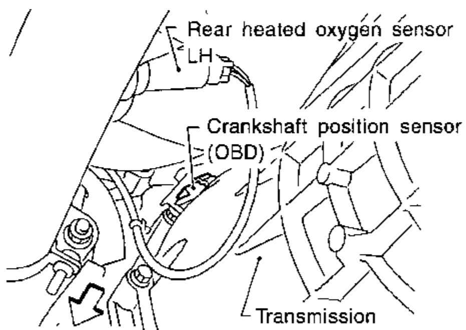



SEF031S

| | |
|---|---|
| ▶ | GO TO 2. |

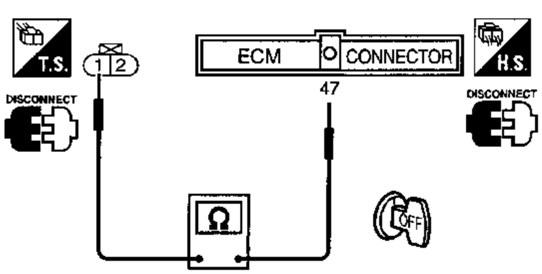
## 2 CHECK INPUT SIGNAL CIRCUIT

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.




SEF997R

2. Check continuity between ECM terminal 47 and terminal 1.
**Continuity should exist.**




SEF706U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

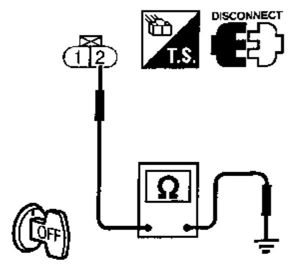
## 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F100, F5
- Harness for open or short between ECM and crankshaft position sensor (OBD)

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 4 CHECK GROUND CIRCUIT

1. Reconnect ECM harness connectors.
2. Check harness continuity between terminal 2 and engine ground.
**Continuity should exist.**




SEF707U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

## 5 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F100, F5
- Harness connectors F23, M32
- Harness for open or short between crankshaft position sensor (OBD) and ECM
- Harness for open or short between crankshaft position sensor (OBD) and TCM (Transmission control module)

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 6 CHECK IMPROPER INSTALLATION

1. Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD).
2. Perform "DTC Confirmation Procedure", EC-358 again.

**Is a 1st trip DTC P1336 (0905) detected?**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 7. |
| No | ▶ | INSPECTION END |

| 7 | CHECK COMPONENT | |
|---|---|---|
| [Crankshaft position sensor (OBD)]<br>Refer to "Component Inspection" EC-361. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace crankshaft position sensor (OBD). |

| 8 | CHECK SHIELD CIRCUIT | |
|---|---|---|
| 1. Remove joint connector.<br>2. Check the following.<br>• Continuity between joint connector terminal and ground<br>• Joint connector<br>(Refer to "HARNESS LAYOUT" in EL section.)<br>**Continuity should exist.**<br>If OK, check harness for short to ground and short to power. Then reconnect joint connector. | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 9 | CHECK GEAR TOOTH | |
|---|---|---|
| Visually check for chipping flywheel or drive plate gear tooth (cog). | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace the flywheel or drive plate. |

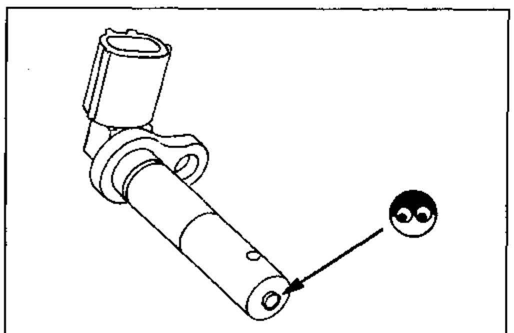
| 10 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |

## Component Inspection

*NBEC0301*

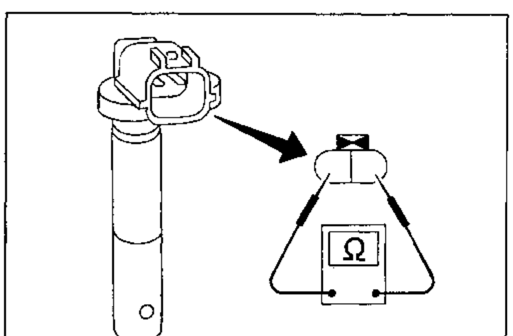
### CRANKSHAFT POSITION SENSOR (OBD)

*NBEC0301S01*



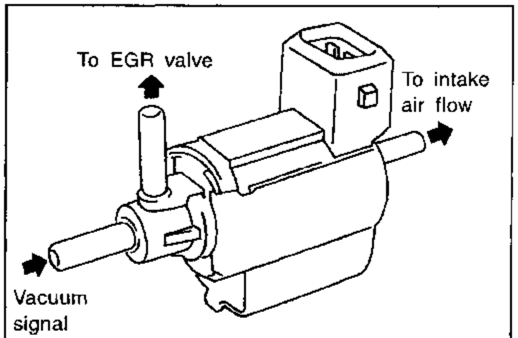
SEF960N

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.



SEF151P

5. Check resistance as shown in the figure.
   **Resistance: Approximately 166.5 - 203.5Ω [at 20°C (68°F)]**



SEF758U

## Component Description

NBEC0302

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 (from the intake manifold collector) 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.

## CONSULT Reference Value in Data Monitor Mode

NBEC0303

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| EGRC SOL/V | • Engine: After warming up<br>• Air conditioner switch: "OFF"<br>• Shift lever: "N"<br>• No-load | Idle | OFF |
| | | Engine speed: Revving from idle up to 3,000 rpm quickly | ON |

## ECM Terminals and Reference Value

NBEC0304

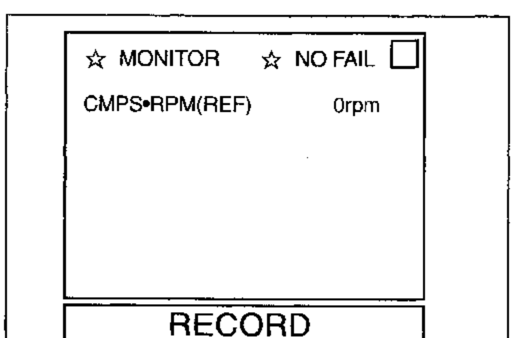
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 103 | L/W | EGRC-solenoid valve | **[Engine is running]**<br>• **Warm-up condition**<br>• Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |
| | | | **[Engine is running]**<br>• **Warm-up condition**<br>• Revving engine from idle up to 3,000 rpm quickly | 0 - 1.5V |

## On Board Diagnosis Logic

NBEC0305

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1400<br>1005 | • The improper voltage signal is sent to ECM through EGRC-solenoid valve. | • Harness or connectors<br>(The EGRC-solenoid valve circuit is open or shorted.)<br>• EGRC-solenoid valve |



SEF360V

## DTC Confirmation Procedure

NBEC0306

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC 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.**

**With CONSULT**

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

**With GST**

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

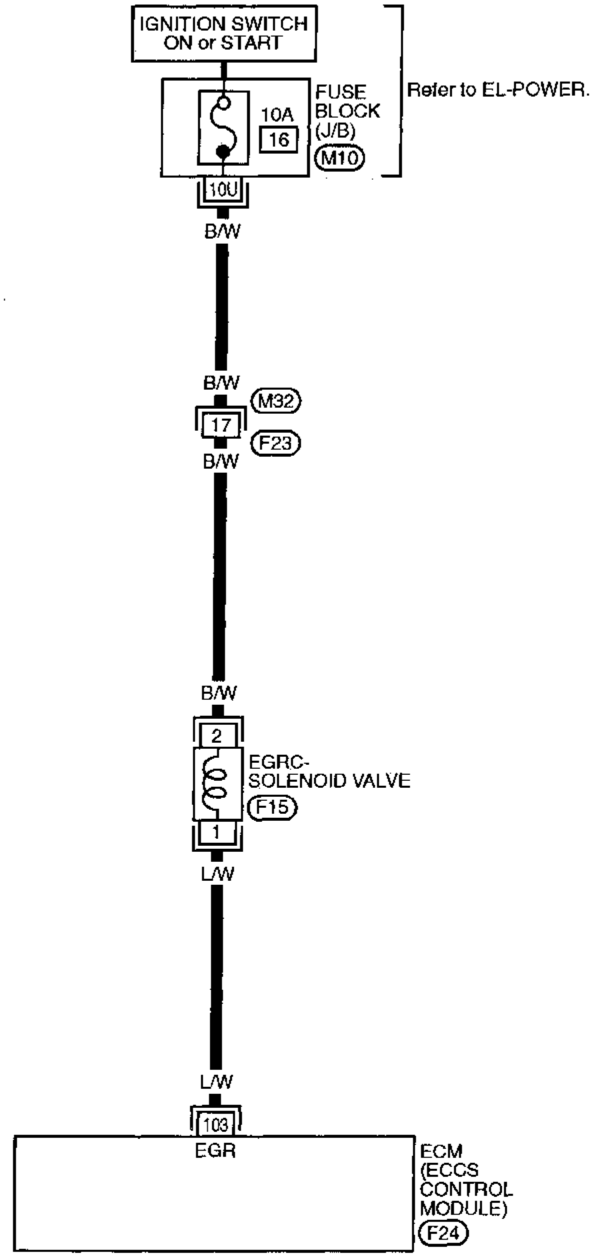
**No Tools**

1) Turn ignition switch "ON" and wait at least 5 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.

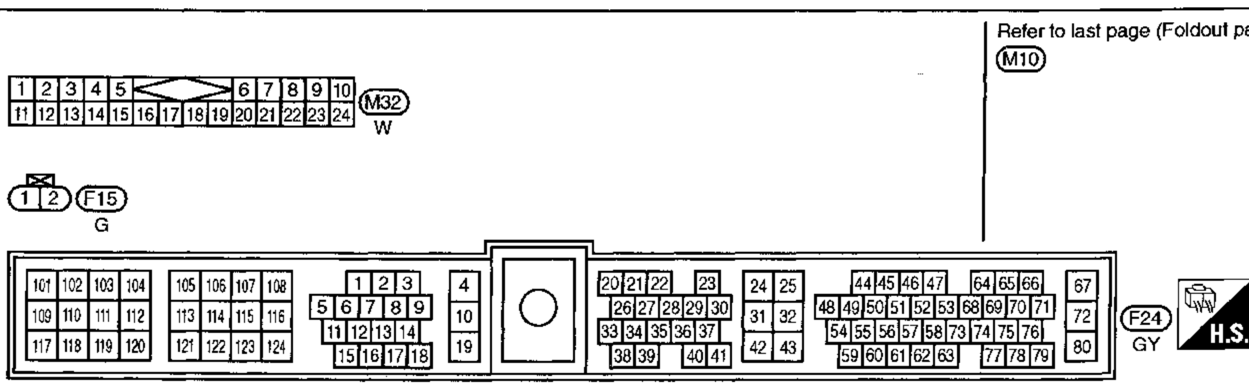
## Wiring Diagram

NBEC0307

EC-EGRC/V-01




: Detectable line for DTC
: Non-detectable line for DTC



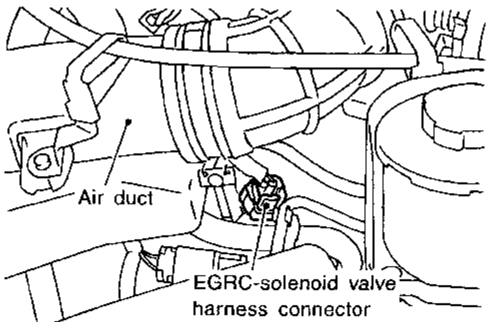

MEC168C

## Diagnostic Procedure

NBEC0308

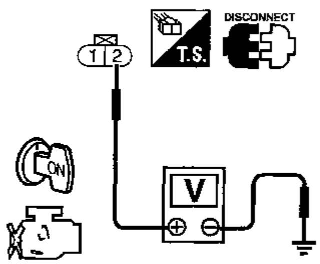
| 1 | CHECK POWER SUPPLY |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect EGRC-solenoid valve harness connector.




SEF759U

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF726U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

| 2 | DETECT MALFUNCTIONING PART |
|---|---|

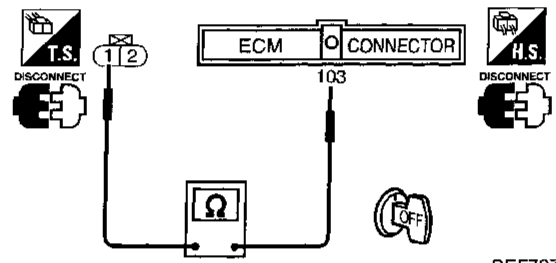
Check the following.

- Harness connectors F23, M32
- 10A fuse
- Harness for open or short between EGRC-solenoid valve and fuse

| | |
|---|---|
| ▶ | Repair harness or connectors. |

| 3 | CHECK OUTPUT SIGNAL CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 103 and terminal 1.
   **Continuity should exist.**




SEF727U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK COMPONENT |
|---|---|

(EGRC-solenoid valve)
Refer to "Component Inspection", EC-365.

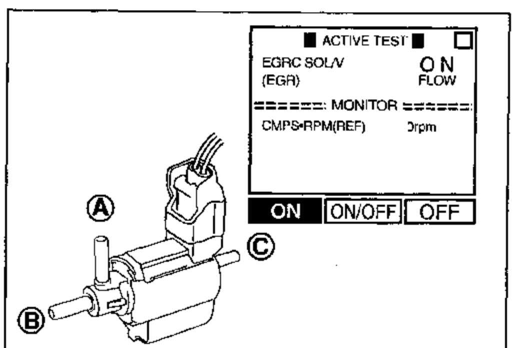
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace EGRC-solenoid valve. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |




SEF400V

## Component Inspection

NBEC0309

### EGRC-SOLENOID VALVE

NBEC0309S01

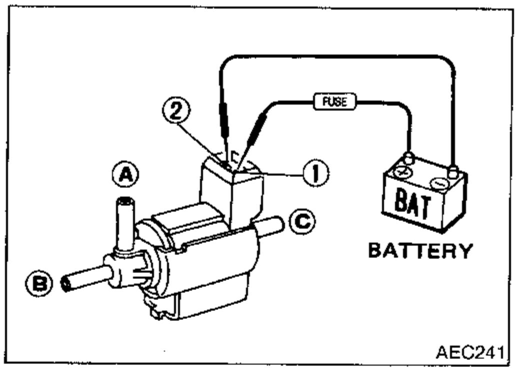
Check air passage continuity.

**With CONSULT**

Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

| Conditions | Air passage continuity between **A** and **B** | Air passage continuity between **A** and **C** |
|---|---|---|
| ON | Yes | No |
| OFF | No | Yes |

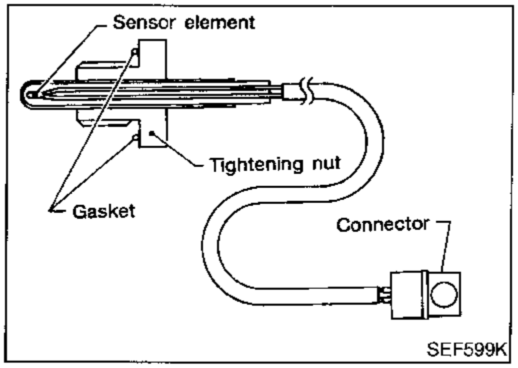

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX




### Without CONSULT

| 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 |

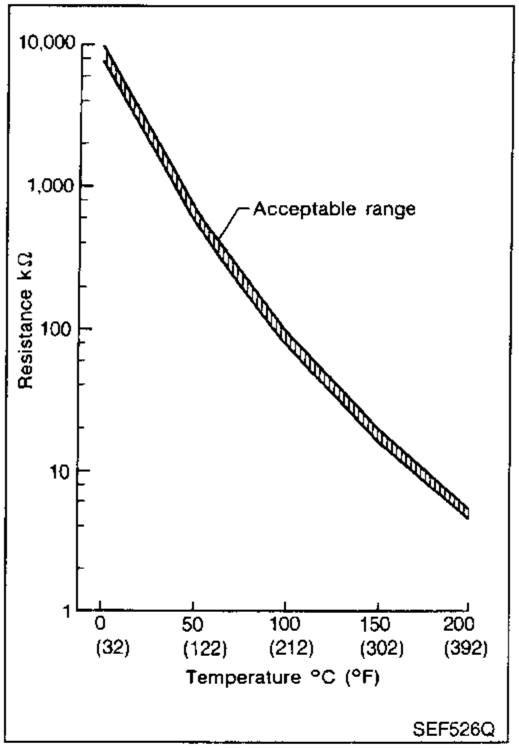
If NG or operation takes more than 1 second, replace solenoid valve.




## Component Description

NBEC0310

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 (ECCS ground).
When EGR system is operating.
Voltage: 0 - 1.5V

## On Board Diagnosis Logic

NBEC0311

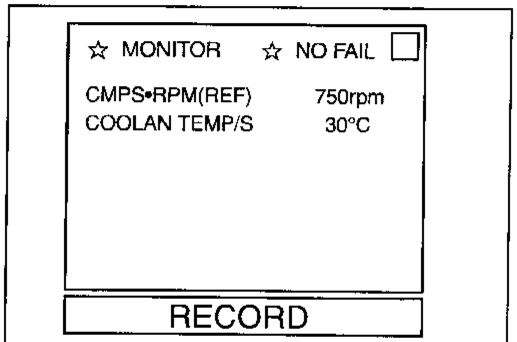
| DTC No. | | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|---|
| P1401<br>0305 | A) | An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low. | • Harness or connectors<br>(The EGR temperature sensor circuit is shorted.)<br>• EGR temperature sensor<br>• 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. | • Harness or connectors<br>(The EGR temperature sensor circuit is open.)<br>• EGR temperature sensor<br>• Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve |

## DTC Confirmation Procedure

NBEC0474

**Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".**

NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

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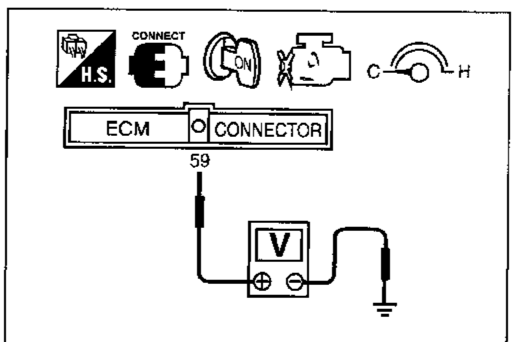



SEF874U

### PROCEDURE FOR MALFUNCTION A

NBEC0474S01

**With CONSULT**

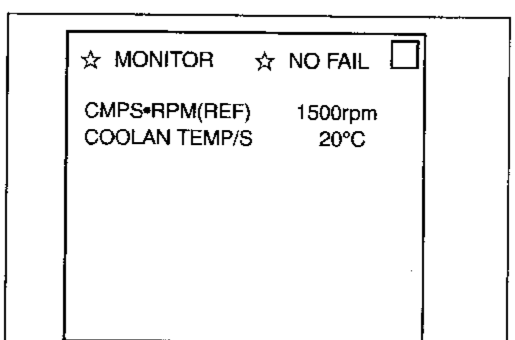
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Verify that "COOLAN TEMP/S" is less than 40°C (104°F).
   **If the engine coolant temperature is above the range, cool the engine down.**
4) Start engine and let it idle for at least 8 seconds.

**With GST**

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.

**No Tools**

1) Turn ignition switch "ON".
2) Verify that voltage between ECM terminal 59 (engine coolant temperature sensor signal) 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.




SEF873U

### PROCEDURE FOR MALFUNCTION B

NBEC0474S02

**CAUTION:**

**Always drive vehicle at a safe speed.**

**TESTING CONDITION:**

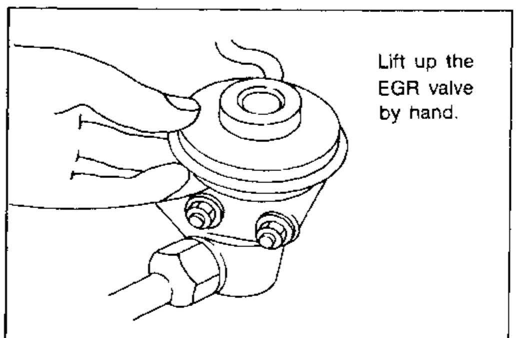
**Always perform the test at a temperature of −10°C (14°F) or higher.**

**With CONSULT**

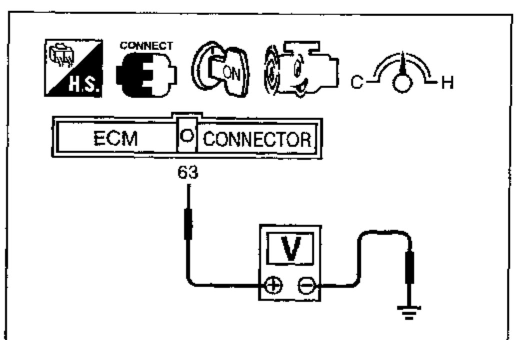
1) Start engine and warm it up to normal operating temperature.
2) Run engine at idle for at least 2 minutes.
3) Confirm that EGR valve is not lifting.
   If the check result is NG, go to trouble diagnoses for "DTC

P0400, P0402 and P1402". (See pages EC-276, 284 and 373.)

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 1.5V.**
   If the check result is NG, go to "Diagnostic Procedure", EC-371.
   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): 1,600 - 2,400 rpm**
    **B/FUEL SCHDL: 3.0 - 4.5 ms**
    **THRTL POS SEN:**
    **X – (X + 0.70) V**
    **X = Voltage value measured at step 8**
    **Selector lever: Suitable position**



SEF360Q



SEF875U

## Overall Function Check

NBEC0312

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

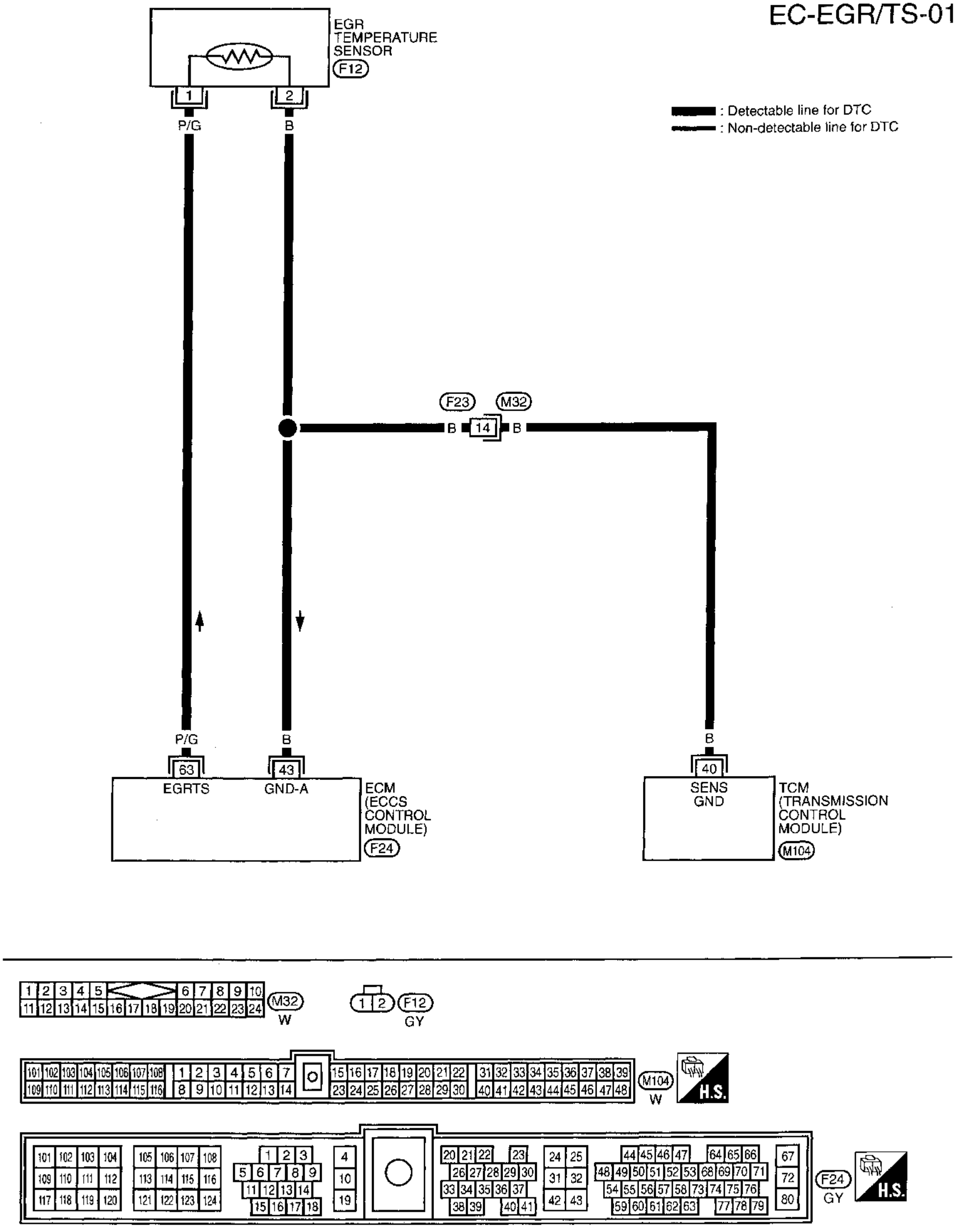
NBEC0312S01

**Without CONSULT**

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 P0400 and P0402 (See pages EC-276 and 284).
4) Check voltage between ECM terminal 63 (EGR temperature sensor signal) and ground at about 1,500 rpm with EGR valve lifted up to the full position by hand.
   **Voltage should decrease to less than 1.5V.**
5) If step 4 is OK, perform trouble diagnoses for "DTC P0400, P0402 and P1402" (See pages EC-276, 284 and 373).

## Wiring Diagram

NBEC0313



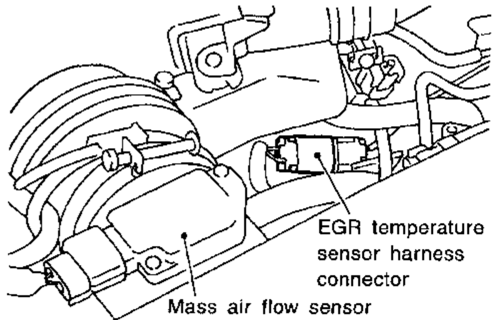

MEC169C

## Diagnostic Procedure

NBEC0314

### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect EGR temperature sensor harness connector.

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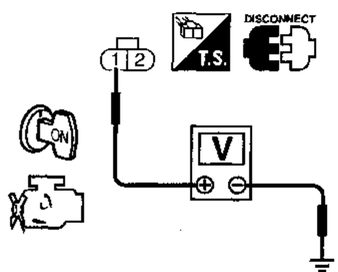
3. Turn ignition switch "ON".
4. Check voltage between terminal 1 and ground with CONSULT or tester.
   **Voltage: Approximately 5V**



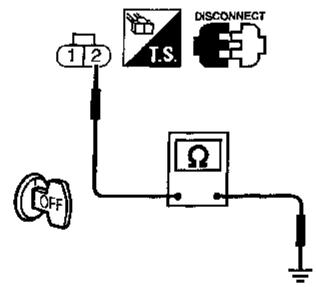

SEF728U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair harness or connectors. |

### 2 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Check harness continuity between terminal 2 and engine ground.
   **Continuity should exist.**




SEF729U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

### 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F23, M32
- Harness for open or short between ECM and EGR temperature sensor
- Harness for open or short between TCM (Transmission control module) and EGR temperature sensor

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connector. |

### 4 CHECK COMPONENT

(EGR temperature sensor)
Refer to "Component Inspection", EC-372.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace EGR temperature sensor. |

### 5 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |

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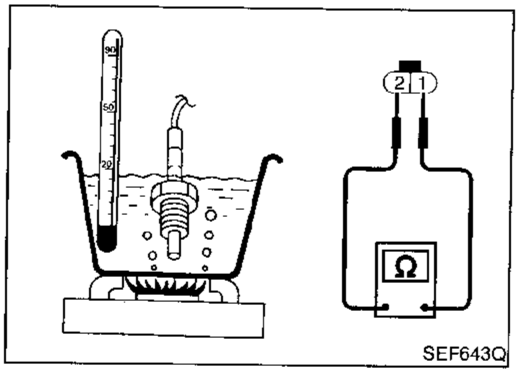
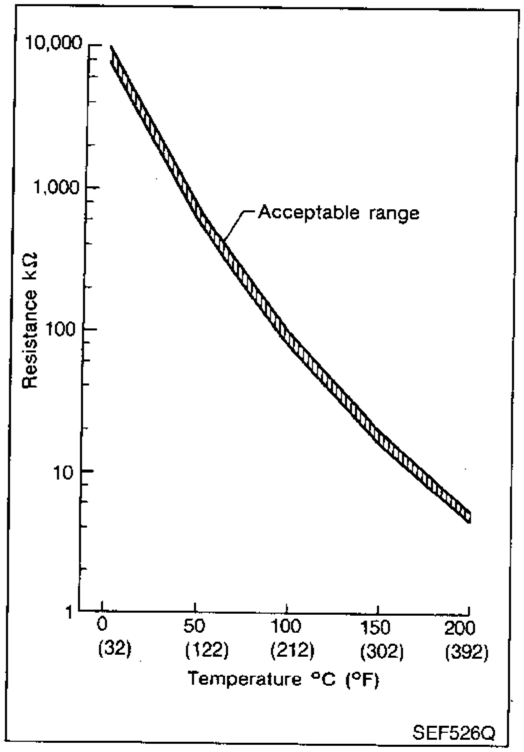

SEF643Q



SEF526Q

# Component Inspection

NBEC0315

## EGR TEMPERATURE SENSOR

NBEC0315S01

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.

## Description

NBEC0475

### SYSTEM DESCRIPTION

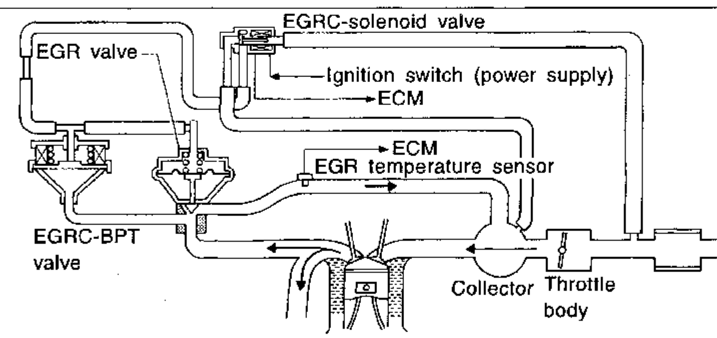
NBEC0475S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | EGR control | EGRC-solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |

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 does not flow through the solenoid valve. This causes the intake manifold 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

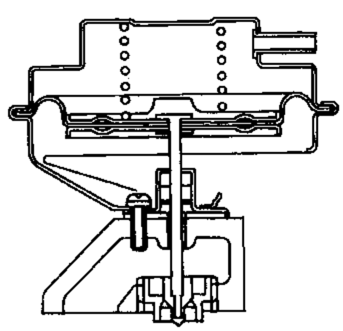
**EGR and vacuum**




SEF317U

### COMPONENT DESCRIPTION

NBEC0475S02



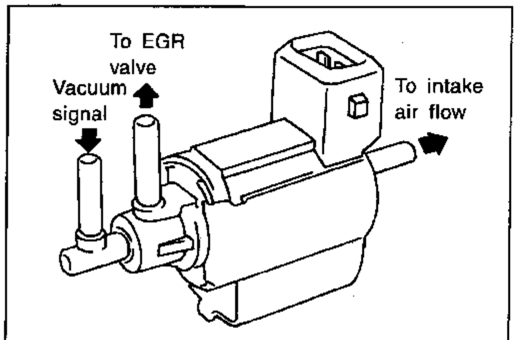
SEF783K

#### Exhaust Gas Recirculation (EGR) Valve

NBEC0475S0201

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to EGRC-BPT valve operation. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

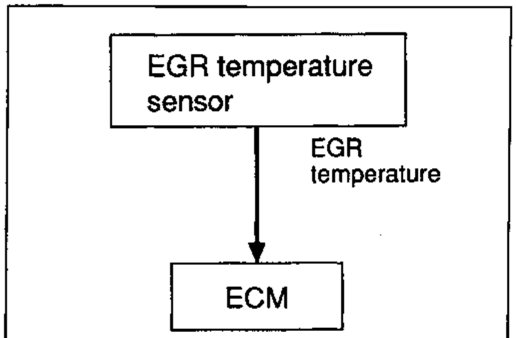


SEF318U

### EGRC-solenoid Valve

NBEC0475S0202

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 (from the intake manifold colletctor) 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.



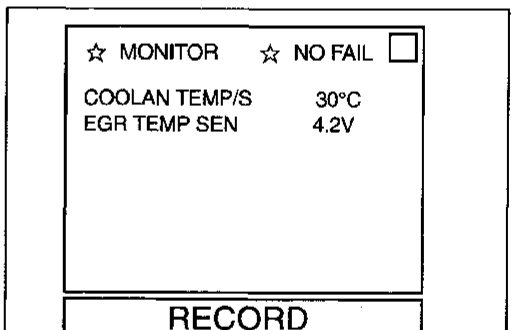
SEF073P

## On Board Diagnosis Logic

NBEC0476

If the EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1402<br>0514 | The exhaust gas recirculation (EGR) flow is excessively high during the specified driving condition. | • EGRC-solenoid valve<br>• EGR valve leaking or stuck open<br>• EGR temperature sensor<br>• EGRC-BPT valve |



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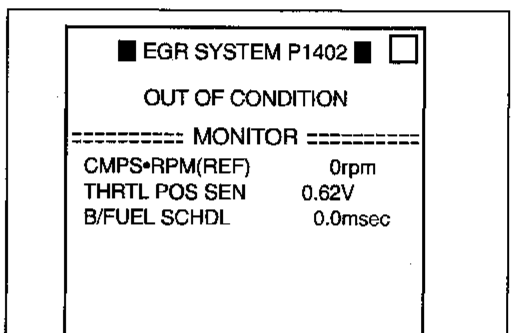


SEF895U

## DTC Confirmation Procedure

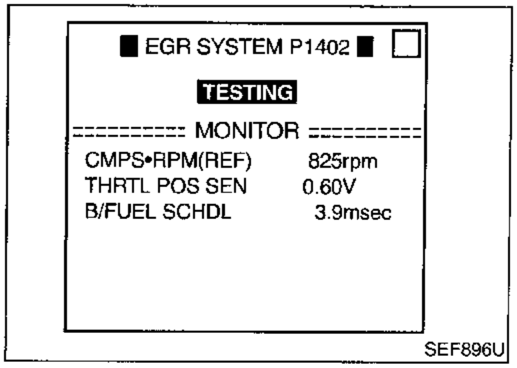
NBEC0477

NOTE:
If "DTC 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.**



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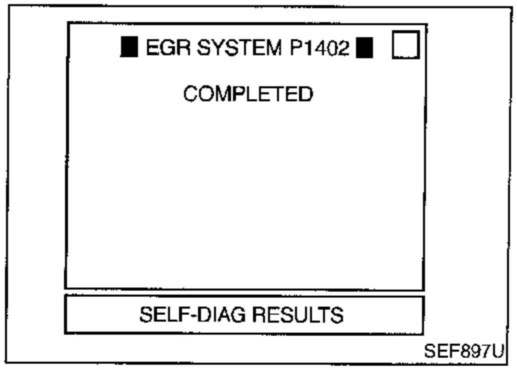

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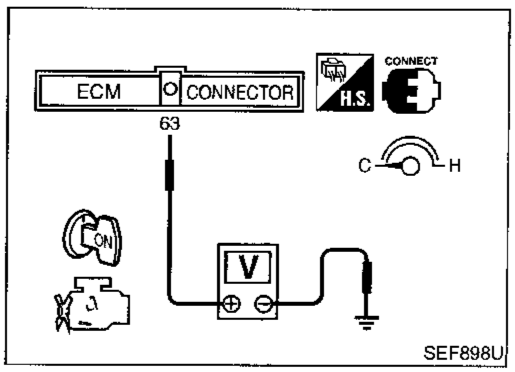
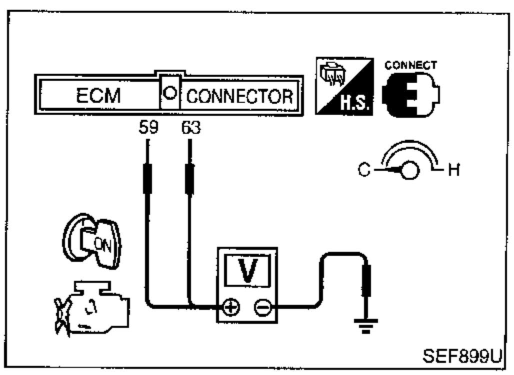


SEF898U



SEF899U

**With CONSULT**

1) Turn ignition switch "ON".
2) Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
3) Touch "START".
4) Start engine and let it idle until "TESTING" on CONSULT screen is turned to "COMPLETED". (It will take 60 seconds or more.)
   **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-377.

**With GST**

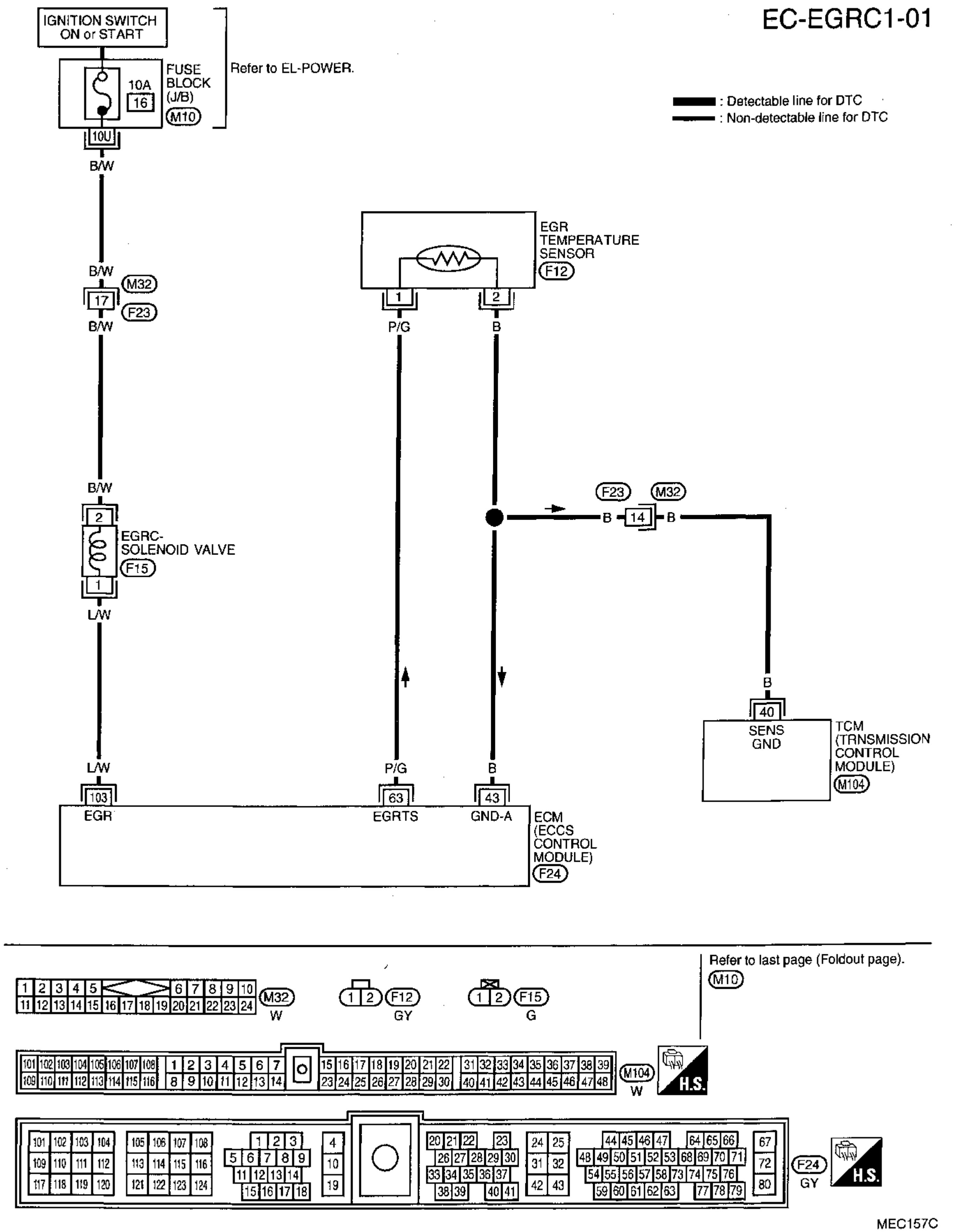
1) Turn ignition switch "ON" and select "MODE 1" with GST.
2) Check that engine coolant temperature is within the range of −10 to 40°C (14 to 104°F).
3) Check that voltage between ECM terminal 63 (EGR temperature sensor signal) and ground is less than 4.8V.
4) Start engine and let it idle for at least 60 seconds.
5) Stop engine.
6) Perform from step 1 to 4.
7) Select "MODE 3" with GST.

**No Tools**

1) Turn ignition switch "ON".
2) Check the following voltages.
   **ECM terminal 59 (engine coolant temperature sensor signal) and ground:**
   **1.5 - 4.4V**
   **ECM terminal 63 (EGR temperature sensor signal) 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.

## Wiring Diagram

NBEC0478

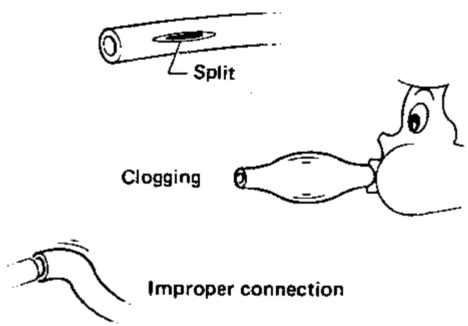


## Diagnostic Procedure

NBEC0479

| 1 | CHECK VACUUM HOSE |
|---|---|

1. Turn ignition switch "OFF".
2. Check vacuum hose for clogging, cracks or improper connection. Refer to "Vacuum Hose Drawing", EC-18.



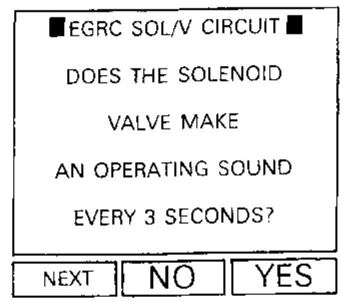

SEF109L

**OK or NG**

| | | |
|---|---|---|
| OK (with CONSULT) | ▶ | GO TO 2. |
| OK (without CONSULT) | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace vacuum hose. |

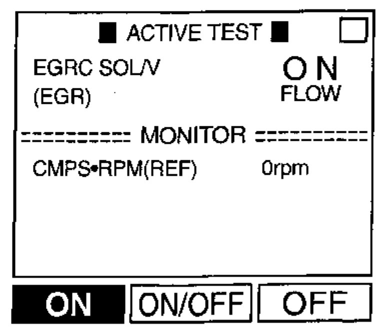
| 2 | CHECK COMPONENT |
|---|---|

**With CONSULT**
(EGRC-solenoid valve)
1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.




MEF957D

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



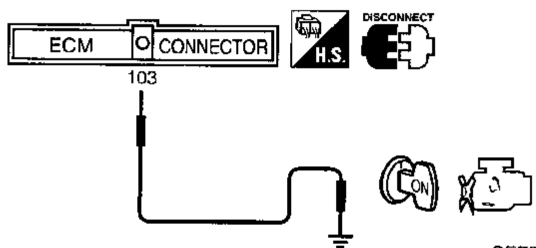

SEF789U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair or replace EGRC-solenoid valve or repair circuit. |

| 3 | CHECK COMPONENT |
|---|---|

**Without CONSULT**
(EGRC-solenoid valve)
1. Disconnect ECM harness connector.
2. Turn ignition switch "ON".
3. Connect a suitable jumper wire between ECM terminal 103 and engine ground.




SEF354V

4. Check operating sound of EGRC-solenoid valve when disconnecting and connecting the jumper wire.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair or replace EGRC-solenoid valve or repair circuit. |

| 4 | CHECK COMPONENT |
|---|---|

(EGRC-solenoid valve)
Refer to "Component Inspection", EC-365.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace EGRC-solenoid valve. |

| 5 | CHECK COMPONENT |
|---|---|

(EGR valve)
Refer to "Component Inspection", EC-378.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace EGR valve. |

| 6 | CHECK COMPONENT |
|---|---|

(EGRC-BPT valve)
Refer to "Component Inspection", EC-379.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace EGRC-BPT valve. |

| 7 | CHECK COMPONENT |
|---|---|

(EGR temperature sensor)
Refer to "Component Inspection", EC-372.

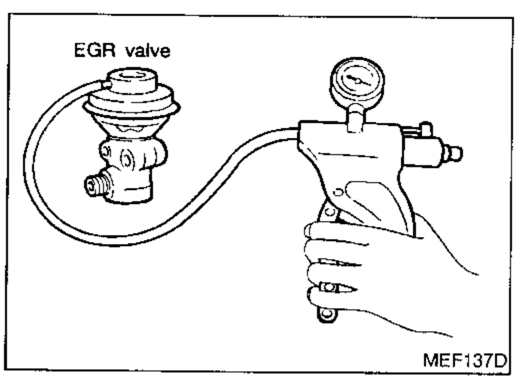
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace EGR temperature sensor. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |




MEF137D

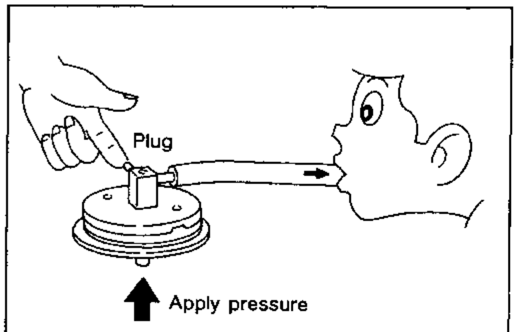
## Component Inspection

NBEC0480

### EGR VALVE

NBEC0480S01

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



SEF083P

## EGRC-BPT VALVE

NBEC0480S04

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 $mmH_2O$, 3.94 $inH_2O$) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

## On Board Diagnosis Logic

NBEC0481

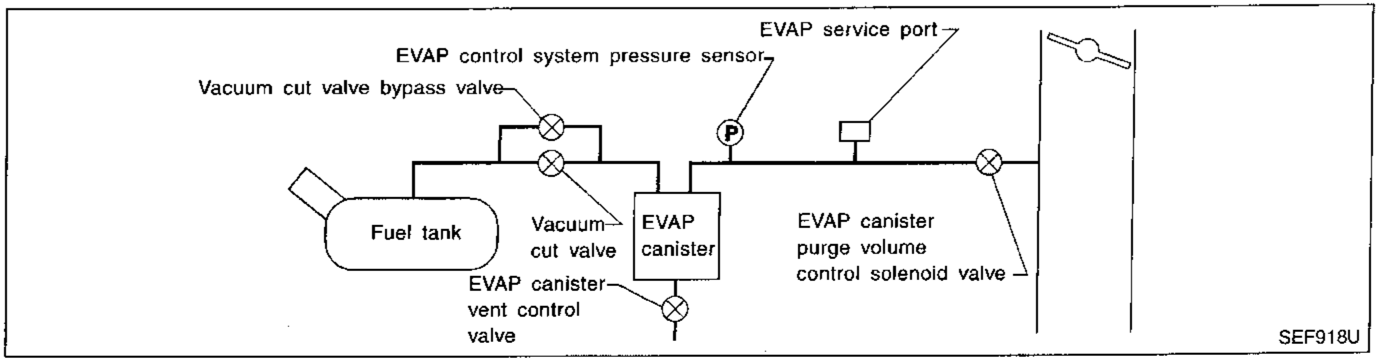
NOTE:

**If both DTC P1440 and P1448 are displayed, perform trouble diagnosis for "DTC P1448" first. (See EC-404.)**

This diagnosis detects leaks in the EVAP purge line using of 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.



SEF918U

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1440<br>0213 | • EVAP control system has a leak.<br>• EVAP control system does not operate properly. | • Incorrect fuel tank vacuum relief valve<br>• Incorrect fuel filler cap used<br>• Fuel filler cap remains open or fails to close.<br>• Foreign matter caught in fuel filler cap.<br>• Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.<br>• Foreign matter caught in EVAP canister vent control valve.<br>• EVAP canister or fuel tank leaks<br>• EVAP purge line (pipe and rubber tube) leaks<br>• EVAP purge line rubber tube bent.<br>• Blocked or bent rubber tube to EVAP control system pressure sensor<br>• Loose or disconnected rubber tube<br>• EVAP canister vent control valve and the circuit<br>• EVAP canister purge volume control solenoid valve<br>• Absolute pressure sensor<br>• Tank fuel temperature sensor<br>• MAP/BARO switch solenoid valve<br>• Blocked or bent rubber tube to MAP/BARO switch solenoid valve<br>• O-ring of EVAP canister vent control valve is missing or damaged.<br>• Water separator<br>• EVAP canister is saturated with water. |

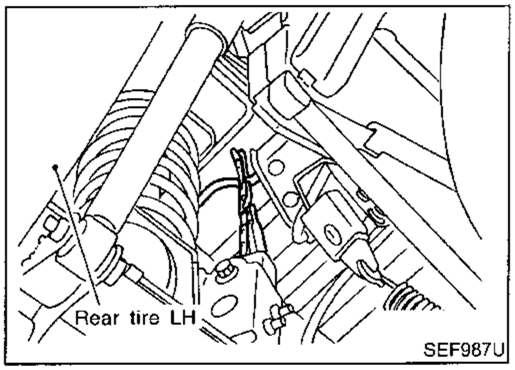
**CAUTION:**

- **Use only a genuine 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.**

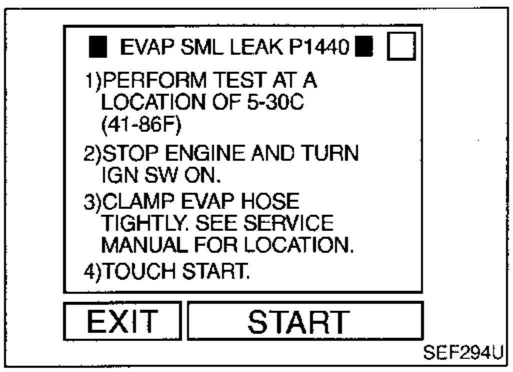
## DTC Confirmation Procedure

*NBEC0482*

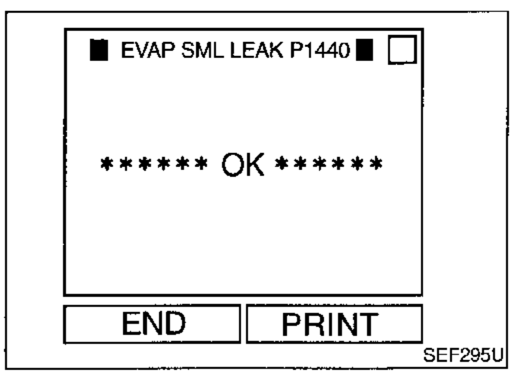
NOTE:
- **If both DTC P1440 and P1448 are displayed, perform trouble diagnosis for "DTC P1448" first. (See EC-404.)**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



SEF987U



SEF294U



SEF295U

**With CONSULT**

**CAUTION:**
- **Never use compressed air or high pressure pump. Otherwise, EVAP system may be damaged.**
- **Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in EVAP system.**

NOTE:
- Always remove EVAP service port adapter from EVAP 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.

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-382.

**With GST**

NOTE:
- Be sure to read the explanation of "Driving Pattern" on EC-49 before driving vehicle.
- It is better that fuel level is low.

1) Start engine.
2) Drive vehicle according to "Driving Pattern", EC-49.
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-49.
8) Stop vehicle.
9) Select "MODE 3" with GST.
   - If P0440 is displayed on the screen, go to "Diagnostic Procedure", EC-294.
   - If P1440 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1440", EC-382.
   - If P1447 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1447", EC-401.
   - 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.

**No Tools**

NOTE:

- Be sure to read the explanation of "Driving Pattern" on EC-49 before driving vehicle.
- It is better that the fuel level is low.

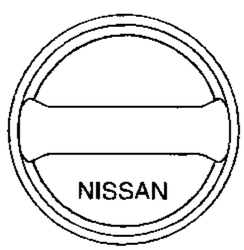
1) Start engine.
2) Drive vehicle according to "Driving Pattern", EC-49.
3) Stop vehicle.
4) Turn ignition switch "OFF" and wait at least 5 seconds.
5) Perform the step 1 to 4 again.
6) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

## Diagnostic Procedure

NBEC0483

| 1 | CHECK FUEL FILLER CAP |
|---|---|

1. Turn ignition switch "OFF".
2. Check for genuine fuel filler cap design.




SEF915U

3. Check for air releasing sound while opening the fuel filler cap.
4. Make sure there are no foreign objects around the fuel filler cap so that the cap can close properly.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG (Step 2) | ▶ | Replace with a genuine fuel filler cap. |
| NG (Step 3) | ▶ | Retighten until the ratching sound is heard. |
| NG (Step 4) | ▶ | Remove fuel filler cap, then clean cap and fuel filler neck threads using air blower. |

| 2 | CHECK COMPONENT |
|---|---|

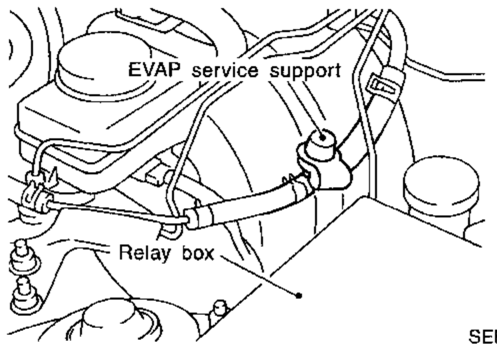
(Fuel tank vacuum relief valve)
Refer to "Evaporative Emission System", EC-24.

**OK or NG**

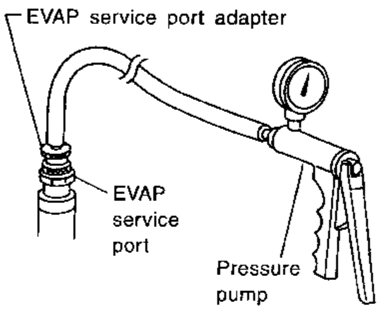
| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Replace fuel filler cap with a genuine one. |

| 3 | INSTALL THE PRESSURE PUMP |
|---|---|

To locate EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.




SEF907U




SEF916U

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

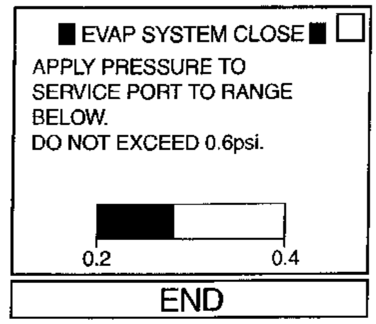
| | | |
|---|---|---|
| Models with CONSULT | ▶ | GO TO 4. |
| Models without CONSULT | ▶ | GO TO 5. |

| 4 | CHECK FOR EVAP LEAK |
|---|---|

**With CONSULT**

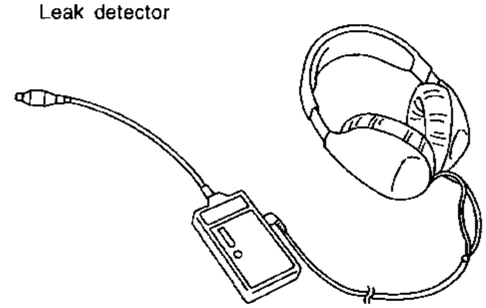
1. Turn ignition switch "ON".
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply pressure to the EVAP line until the pressure indicator reaches the middle of the bar graph.

- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm$^2$, 0.6 psi) of pressure in the system.**




SEF917U

4. Remove EVAP service port adapter and pressure pump.
5. Using EVAP leak detector, locate the EVAP leak. Refer to the instruction manual for more details about the leak detector.
   Refer to "Evaporative Emission Line Drawing", EC-24.




SEF200U

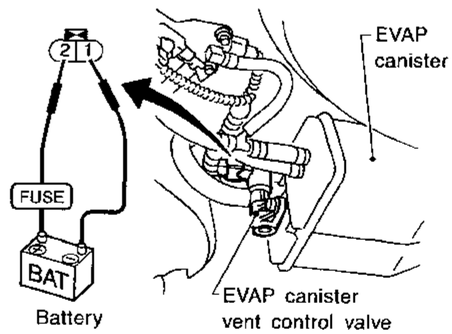
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair or replace. |

## 5 CHECK FOR EVAP LEAK

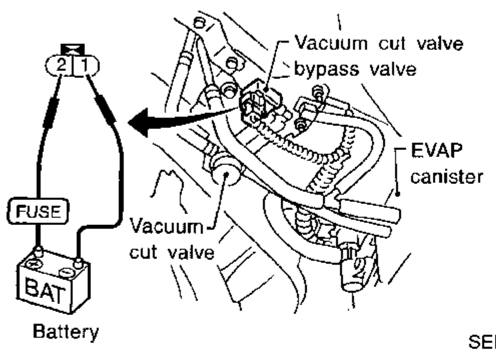
**Without CONSULT**

1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)




SEF598U

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)

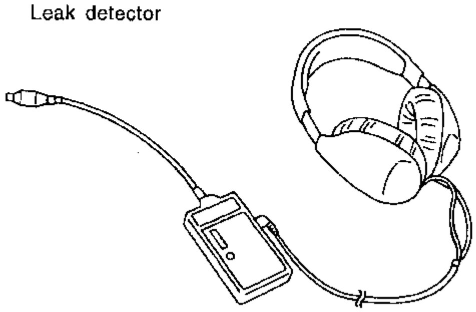



SEF599U

4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg).
- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.**

5. Remove EVAP service port adapter and pressure pump.
6. Using EVAP leak detector, locate the EVAP leak. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-24.

Leak detector



SEF200U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair or replace. |

## 6 CHECK COMPONENT

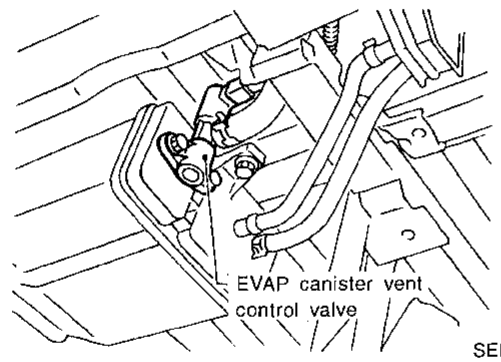
(Water separator)
Refer to "Component Inspection", EC-398.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace water separator. |

## 7 CHECK COMPONENT AND CIRCUIT

(EVAP canister vent control valve and O-ring)
Refer to "DTC Confirmation Procedure", EC-305.



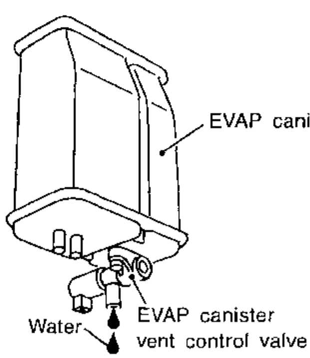

SEF143S

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair or replace EVAP canister vent control valve and O-ring or harness/connector. |

## 8 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.




SEF596U

**Yes or No**

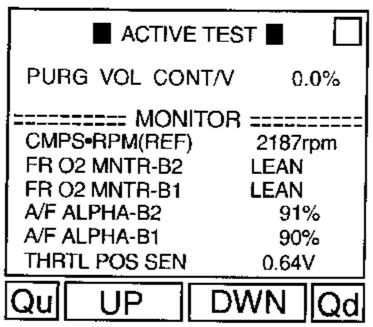
| | | |
|---|---|---|
| Yes | ▶ | GO TO 9. |
| No (With CONSULT) | ▶ | GO TO 11. |
| No (Without CONSULT) | ▶ | GO TO 12. |

| 9 | CHECK EVAP CANISTER | |
|---|---|---|
| Weigh the EVAP canister with the EVAP canister vent control valve attached.<br>**The weight should be less than 1.8 kg (4.0 lb).**<br>**OK or NG** | | |
| OK (With CONSULT) | ▶ | GO TO 11. |
| OK (Without CONSULT) | ▶ | GO TO 12. |
| NG | ▶ | GO TO 10. |

| 10 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>● EVAP canister for damage<br>● EVAP hose between EVAP canister and water separator for clogging or poor connection | | |
| | ▶ | Repair hose or replace EVAP canister. |

### 11 CHECK COMPONENT

**With CONSULT**
(EVAP canister purge volume control solenoid valve)
1. Disconnect vacuum 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.




SEF908U

4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0%
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
**Vacuum should exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | GO TO 13. |

### 12 CHECK COMPONENT

**Without CONSULT**
(EVAP canister purge volume control solenoid valve)
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.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
**Vacuum should exist.**

**OK or NG**

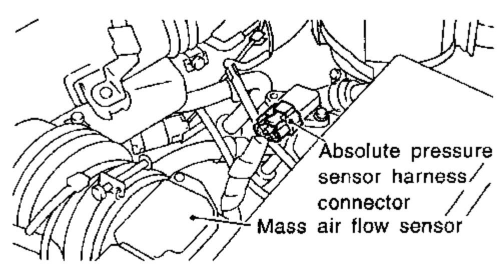
| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | GO TO 13. |

| 13 | CHECK VACUUM HOSE | |
|---|---|---|
| Check vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-18.<br>**OK or NG** | | |
| OK | ▶ | GO TO 14. |
| NG | ▶ | Repair or reconnect the hose. |

| 14 | CHECK COMPONENT | |
|---|---|---|
| (EVAP canister purge volume control solenoid valve)<br>Refer to "Component Inspection", EC-393.<br>**OK or NG** | | |
| OK | ▶ | GO TO 15. |
| NG | ▶ | Replace EVAP canister purge volume control solenoid valve. |

### 15 CHECK COMPONENT

(Absolute pressure sensor)
Refer to "Component Inspection", EC-131.




SEF748U

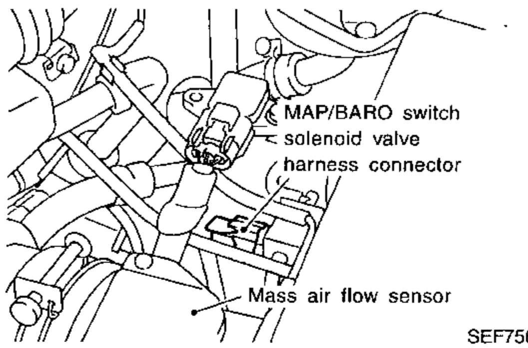
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 16. |
| NG | ▶ | Replace absolute pressure sensor. |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

| 16 | CHECK COMPONENT AND CIRCUIT | |
|---|---|---|

(MAP/BARO switch solenoid valve)
Refer to "Component Inspection", EC-347.



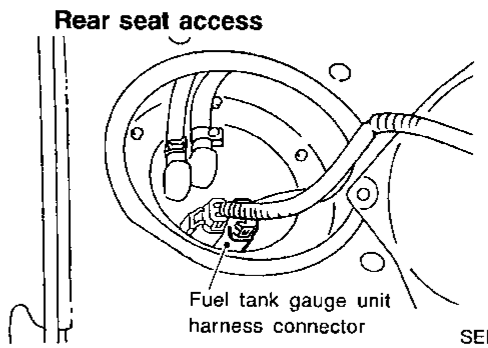

SEF756U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 17. |
| NG | ▶ | Replace MAP/BARO switch solenoid valve. |

| 17 | CHECK COMPONENT | |
|---|---|---|

(Tank fuel temperature sensor)
Refer to "Component Inspection", EC-254.




SEF751U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 18. |
| NG | ▶ | Replace tank fuel temperature sensor. |

| 18 | CHECK COMPONENT | |
|---|---|---|

(EVAP control system pressure sensor)
Refer to "Component Inspection", EC-317.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 19. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 19 | CHECK EVAP PURGE LINE | |
|---|---|---|

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to "Evaporative Emission System", EC-24.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 20. |
| NG | ▶ | Repair or reconnect the hose. |

| 20 | CLEAN EVAP PURGE LINE | |
|---|---|---|

Clean EVAP purge line (pipe and rubber tube) using air blower.

| | | |
|---|---|---|
| | ▶ | GO TO 21. |

| 21 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |

## Description

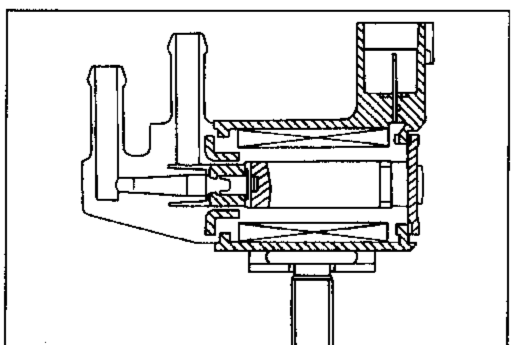
NBEC0325

### SYSTEM DESCRIPTION

NBEC0325S01

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |
| Throttle position switch | Closed throttle position | | |
| Front heated oxygen sensors | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Tank fuel temperature sensor | Fuel temperature in fuel tank | | |
| Vehicle speed sensor | Vehicle speed | | |

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.



SEF337U

### COMPONENT DESCRIPTION

NBEC0325S02

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.

## CONSULT Reference Value in Data Monitor Mode

NBEC0326

Specification data are reference values.

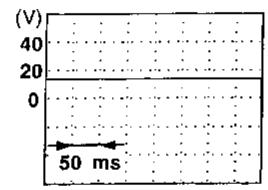
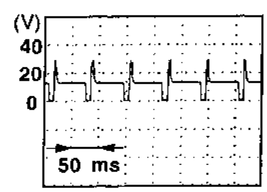
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| PURG VOL C/V | • Engine: After warming up<br>• Air conditioner switch "OFF"<br>• Shift lever: "N"<br>• No-load | Idle (Vehicle stopped) | 0% |
| | | 2,000 rpm | — |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## ECM Terminals and Reference Value

NBEC0327

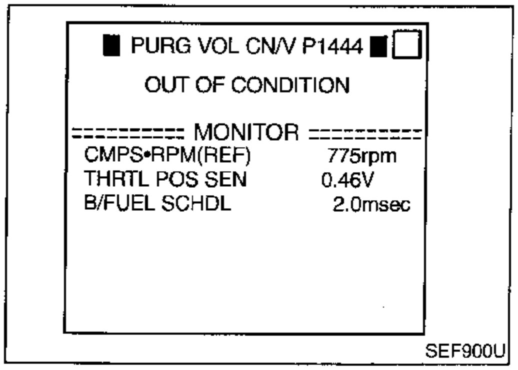
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 4 | L/B | ECCS relay (Self-shut-off) | **[Engine is running]**<br>**[Ignition switch "OFF"]**<br>• For a few seconds after turning ignition switch "OFF" | 0 - 1.5V |
| | | | **[Ignition switch "OFF"]**<br>• A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE<br>(11 - 14V) |
| 5 | LG/B | EVAP canister purge volume control solenoid valve | **[Engine is running]**<br>• Idle speed | BATTERY VOLTAGE<br>(11 - 14V)<br><br>SEF994U |
| | | | **[Engine is running]**<br>• Engine speed is 2,000 rpm | BATTERY VOLTAGE<br>(11 - 14V)<br><br>SEF995U |
| 67 | B/W | Power supply for ECM | **[Ignition switch "ON"]** | BATTERY VOLTAGE<br>(11 - 14V) |
| 72 | B/W | | | |
| 117 | B/W | Current return | **[Engine is running]**<br>• Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |

## On Board Diagnosis Logic

NBEC0328

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1444<br>0214 | The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | • EVAP control system pressure sensor<br>• EVAP canister purge volume control solenoid valve (The valve is stuck open.)<br>• EVAP canister vent control valve<br>• EVAP canister<br>• Hoses<br>(Hoses are connected incorrectly or clogged.) |



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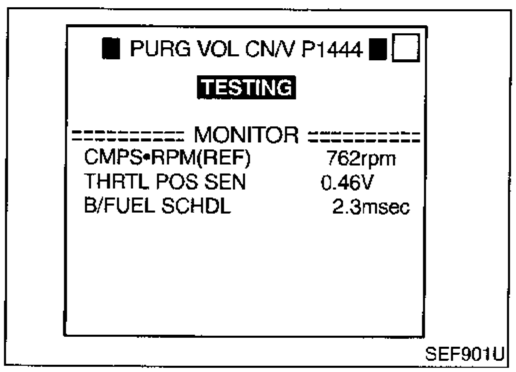

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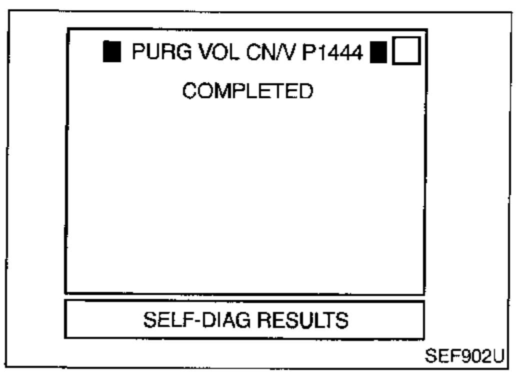


SEF902U

## DTC Confirmation Procedure

NBEC0329

NOTE:
If "DTC 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.**

**With CONSULT**

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 C/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 for at least 2 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", EC-391.

**With GST**

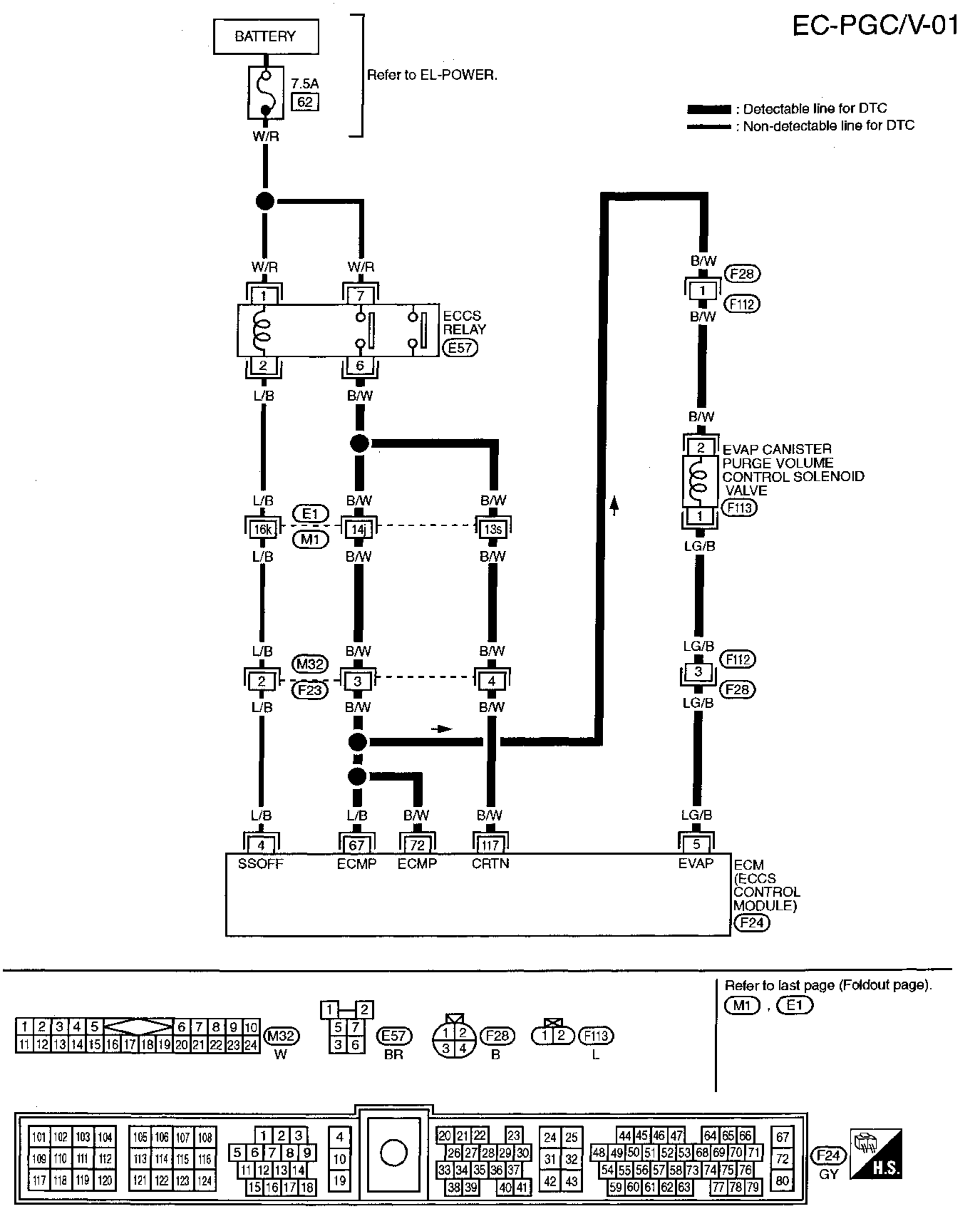
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and let it idle for at least 2 seconds.
4) Select "MODE 7" with GST.

**No Tools**

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 2 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.

## Wiring Diagram

NBEC0330



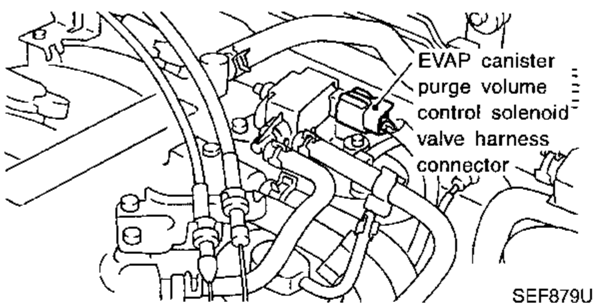

MEC341C

## Diagnostic Procedure

NBEC0331

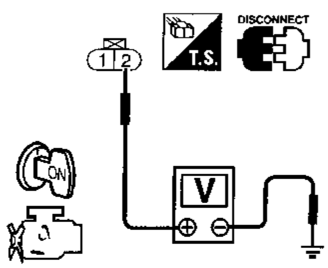
### 1 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.




SEF879U

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and engine ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF880U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

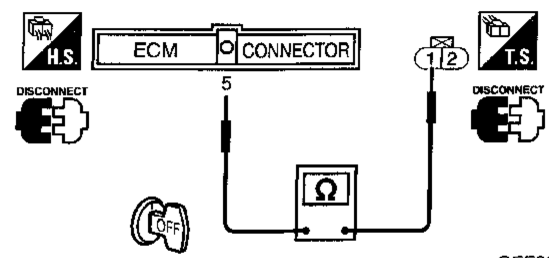
### 2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1
- Harness connectors M32, F23
- Harness connectors F28, F112
- 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

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

### 3 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.**




SEF881U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F28, F112
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 5 CHECK COMPONENT

(EVAP control system pressure sensor)
Refer to "Component Inspection", EC-317.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

### 6 CHECK COMPONENT

(EVAP canister purge volume control solenoid valve)
Refer to "Component Inspection", EC-393.

**OK or NG**

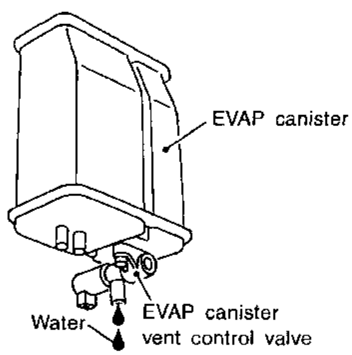
| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace EVAP canister purge volume control solenoid valve. |

| 7 | CHECK COMPONENT | |
|---|---|---|
| (EVAP canister vent control valve)<br>Refer to "Component Inspection", EC-398.<br>**OK or NG** | | |
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace EVAP canister vent control valve. |

| 8 | CHECK RUBBER TUBE | |
|---|---|---|
| Check for obstructed water separator and rubber tube connected to EVAP canister vent control valve and clean the rubber tube using air blower. For water separator, refer to EC-398.<br>**OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Clean, repair or replace rubber tube and/or water separator. |

| 9 | 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.



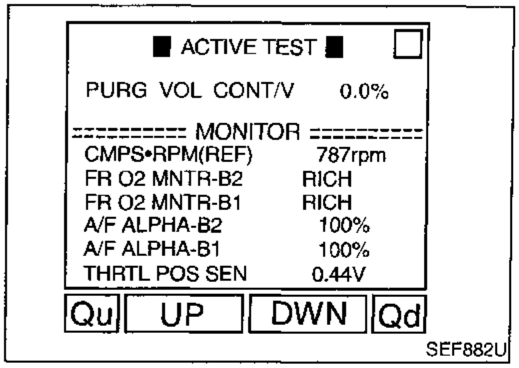

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 10. |
| No | ▶ | GO TO 12. |

| 10 | CHECK EVAP CANISTER | |
|---|---|---|
| Weigh the EVAP canister with the EVAP canister vent control valve attached.<br>**The weight should be less than 1.8 kg (4.0 lb).**<br>**OK or NG** | | |
| OK | ▶ | GO TO 12. |
| NG | ▶ | GO TO 11. |

| 11 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>● EVAP canister for damage<br>● EVAP hose between EVAP canister and water separater for clogging or poor connection | | |
| | ▶ | Repair hose or replace EVAP canister. |

| 12 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |



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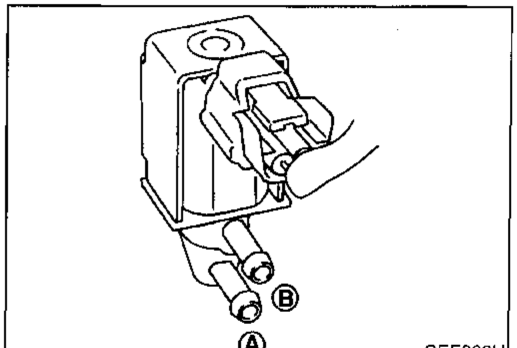

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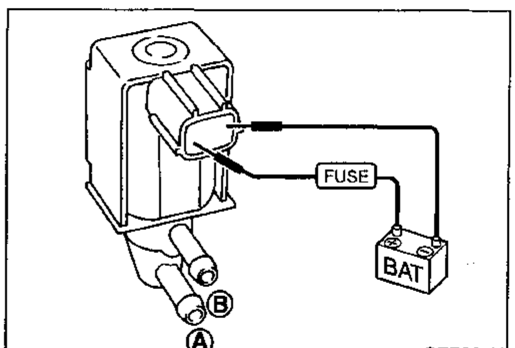

SEF661U

## Component Inspection

NBEC0332

### EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

NBEC0332S01

**With CONSULT**

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<br>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.

**Without CONSULT**

Check air passage continuity.

| Condition | Air passage continuity between **A** and **B** |
|---|---|
| 12V direct current supply between terminals | Yes |
| No supply | No |

If NG, replace solenoid valve.

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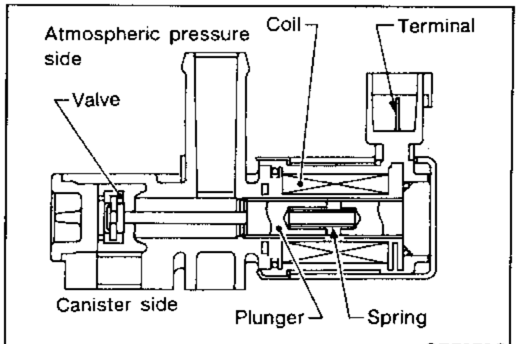
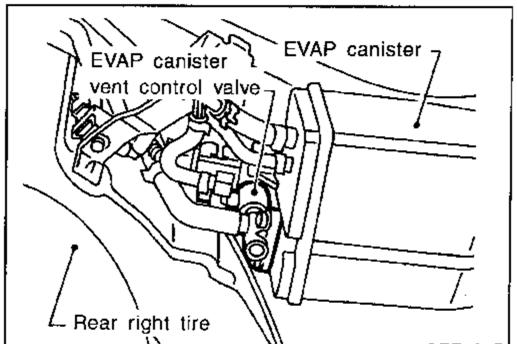


SEF378Q



SEF484R

## Component Description

NBEC0484

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid 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

NBEC0485

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| VENT CONT/V | • Ignition switch: ON | OFF |

## ECM Terminals and Reference Value

NBEC0486

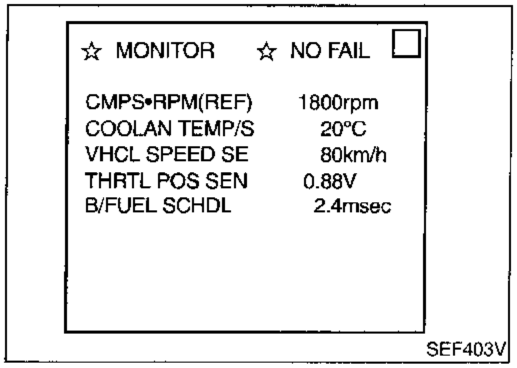
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 108 | G/R | EVAP canister vent control valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

NBEC0487

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1446<br>0215 | • EVAP canister vent control valve remains closed under specified driving conditions. | • EVAP canister vent control valve<br>• EVAP control system pressure sensor and the circuit<br>• Blocked rubber tube to EVAP canister vent control valve<br>• Water separator<br>• EVAP canister is saturated with water. |



SEF403V

## DTC Confirmation Procedure

NBEC0488

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**With CONSULT**

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 reveal soon.**

**With GST**

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.

**No Tools**

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.

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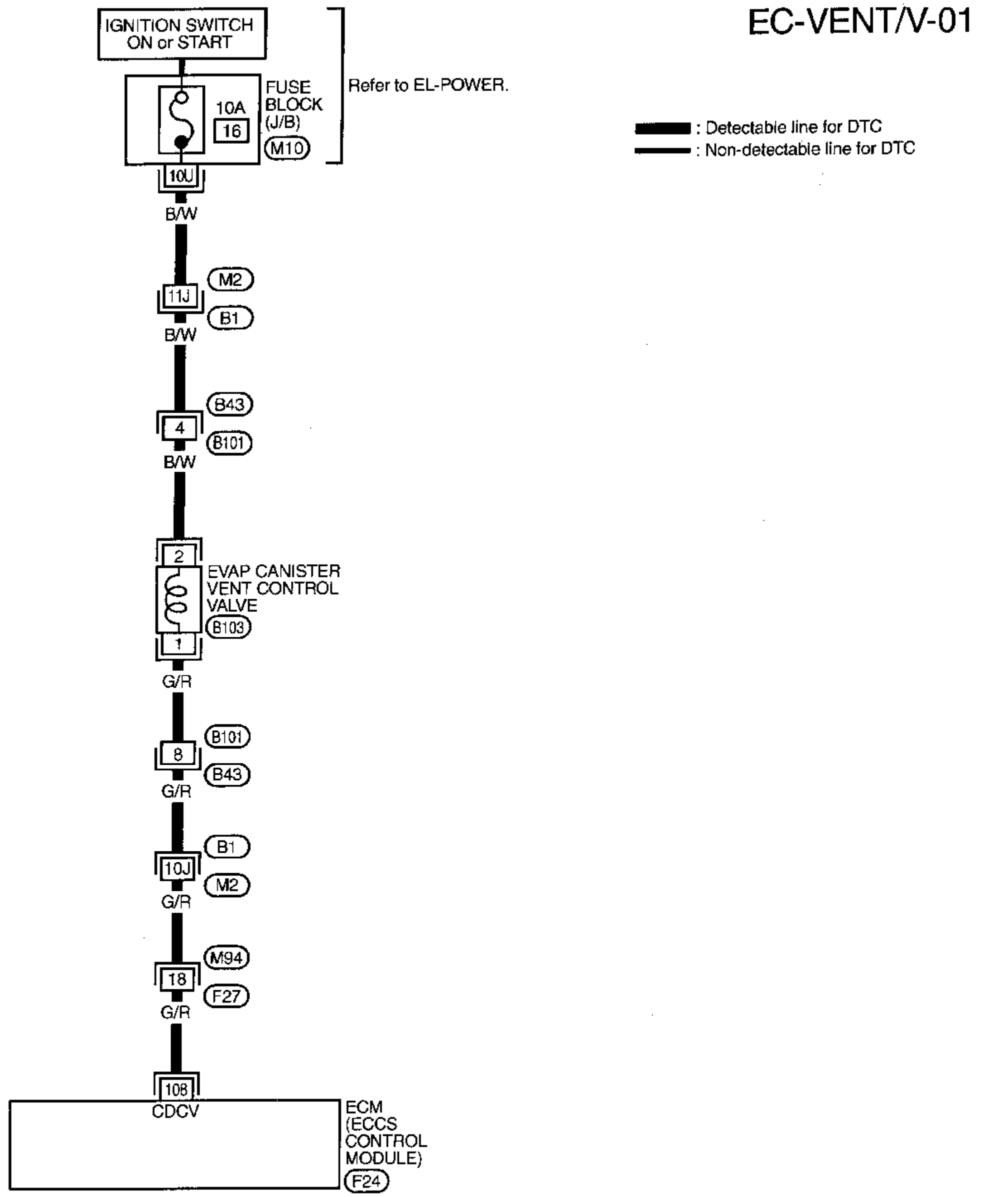
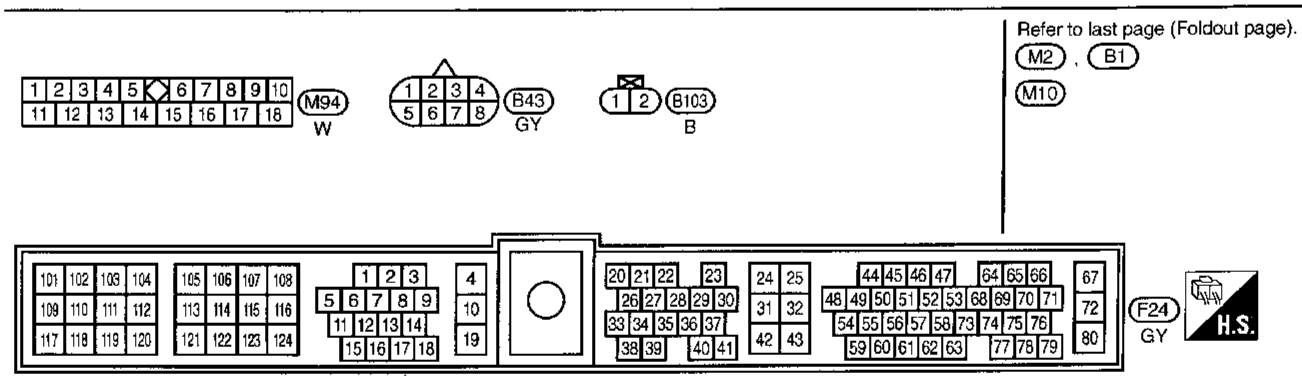
## Wiring Diagram

NBEC0489



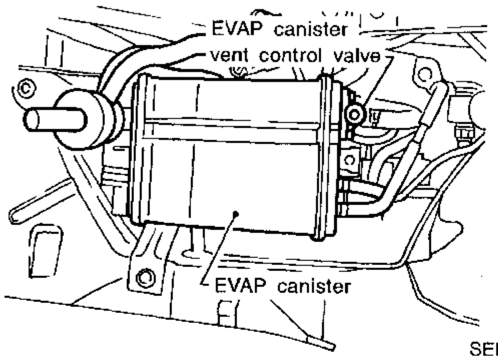

MEC158C

# Diagnostic Procedure

NBEC0490

| 1 | CHECK RUBBER TUBE |
|---|---|

1. Turn ignition switch "OFF".
2. Check obstructed water separator and rubber tube connected to EVAP canister vent control valve.
3. Clean the rubber tube using air blower. For water separator, refer to EC-398.




SEF872T

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Clean, repair or replace rubber tube and/or water separator. |

| 2 | CHECK COMPONENT |
|---|---|

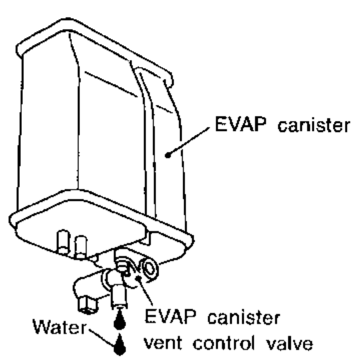
(EVAP canister vent control valve and O-ring)
Refer to "Component Inspection", EC-398.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Replace EVAP canister vent control valve and O-ring. |

| 3 | 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.




SEF596U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 6. |

| 4 | CHECK EVAP CANISTER |
|---|---|

Weigh the EVAP canister with the EVAP canister vent control valve attached.
**The weight should be less than 1.8 kg (4.0 lb).**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

| 5 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and water separator for clogging or poor connection

| | | |
|---|---|---|
| | ▶ | Repair hose or replace EVAP canister. |

| 6 | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE |
|---|---|

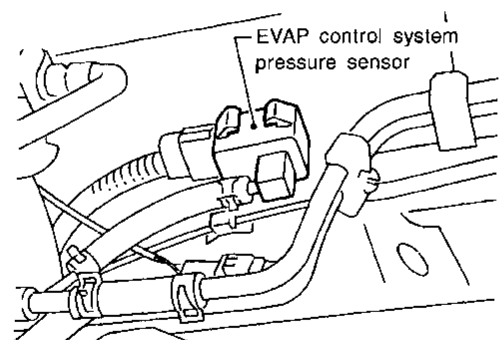
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair it. |

| 7 | CHECK CONNECTOR |
|---|---|

1. Disconnect EVAP control system pressure sensor harness connector.




SEF190S

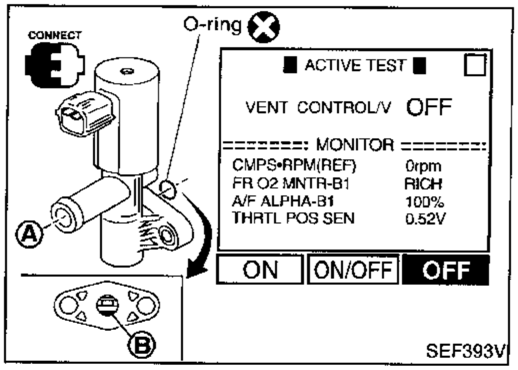
2. Check connectors for water.
   **Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 8 | CHECK COMPONENT AND CIRCUIT | |
|---|---|---|
| (EVAP control system pressure sensor)<br>Refer to "DTC Confirmation Procedure" for DTC P0450, EC-312. | | |
| | **OK or NG** | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 9 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |



SEF393V

## Component Inspection

NBEC0491

### EVAP CANISTER VENT CONTROL VALVE

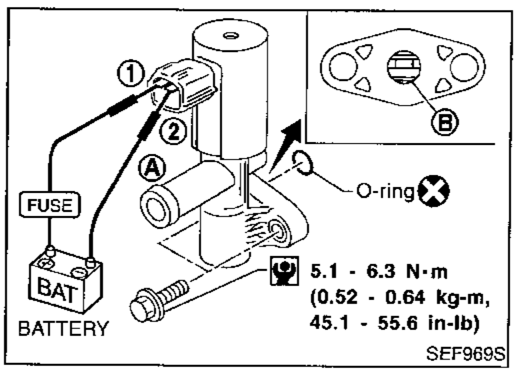
NBEC0491S01

Check air passage continuity.

**With CONSULT**

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

| Condition VENT CONTROL/V | Air passage continuity between **A** and **B** |
|---|---|
| ON | No |
| OFF | Yes |

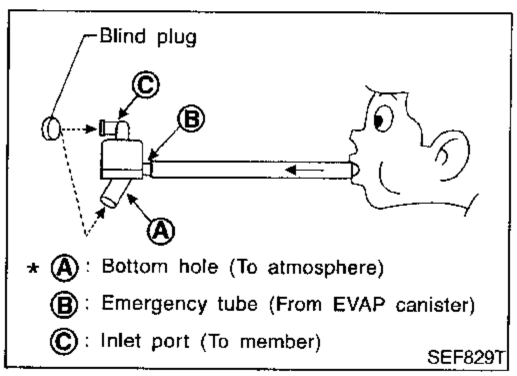


SEF969S

**Without CONSULT**

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

If NG, 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.**



SEF829T

### WATER SEPARATOR

NBEC0491S02

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.

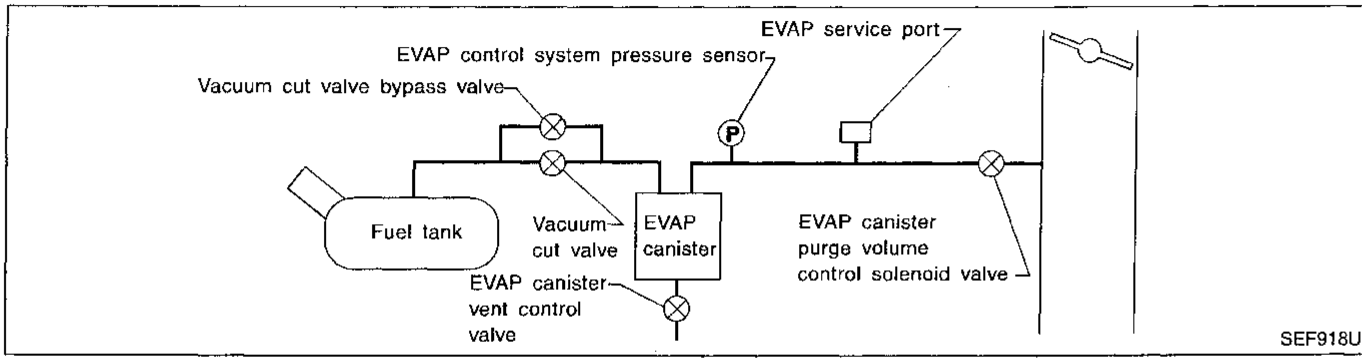
NOTE:

- Do not disassemble water separator.

## System Description

NBEC0333

NOTE:
**If both DTC P0510 and P1447 are displayed, perform trouble diagnosis for "DTC P0510" first. (See EC-329.)**




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

NBEC0334

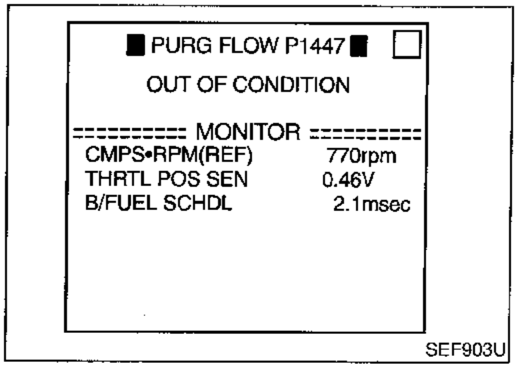
Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1447<br>0111 | • EVAP control system does not operate properly.<br>• EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. | • EVAP canister purge volume control solenoid valve stuck closed<br>• EVAP control system pressure sensor and the circuit<br>• Loose, disconnected or improper connection of rubber tube<br>• Blocked rubber tube<br>• Blocked or bent rubber tube to MAP/BARO switch solenoid valve<br>• Cracked EVAP canister<br>• Closed throttle position switch<br>• Blocked purge port<br>• EVAP canister vent control valve |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## DTC Confirmation Procedure

NBEC0335




SEF903U

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**TESTING CONDITION:**

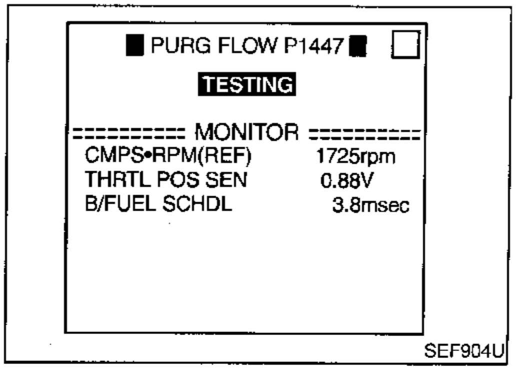
**Always perform test at a temperature of 5°C (41°F) or more.**

**With CONSULT**

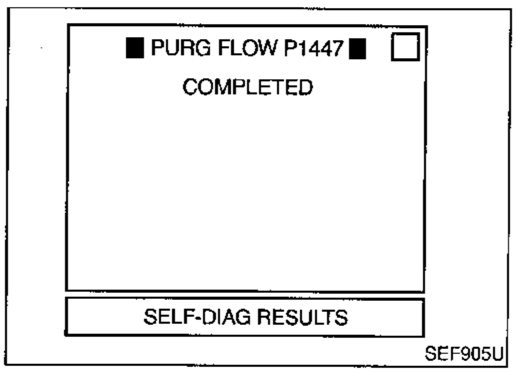
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and let it idle for at least 70 seconds.
4) Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CONSULT.
5) Touch "START".
   If "COMPLETED" is displayed, go to step 7.
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 35 seconds.)

   **Selector lever: Suitable position**
   **Vehicle speed: 32 - 100 km/h (20 - 62 MPH)**
   **CMPS·RPM (REF): 500 - 3,400 rpm**
   **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-401.




SEF904U

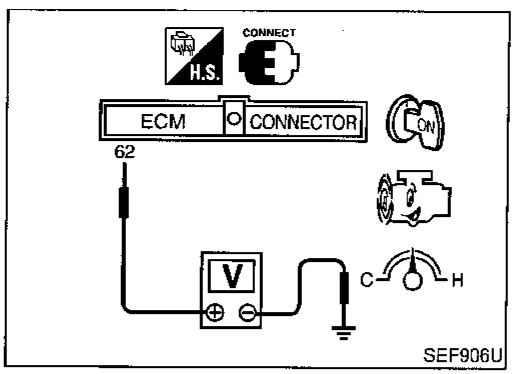



SEF905U

## Overall Function Check

NBEC0492

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.




SEF906U

**Without CONSULT**

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 70 seconds.
5) Set voltmeter probes to ECM terminals 62 (EVAP control system pressure sensor signal) and ground.
6) Check EVAP control system pressure sensor value at idle speed and note it.
7) Establish and maintain the following conditions for at least 1 minute.

   **Air conditioner switch: ON**
   **Steering wheel: Fully turned**
   **Headlamp switch: ON**
   **Rear window defogger switch: ON**
   **Engine speed: Approx. 3,000 rpm**
   **Gear position:**

**Any position other than "P", "N" or "R"**

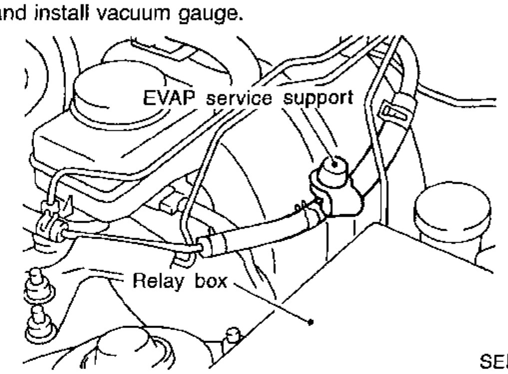
Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.

## Diagnostic Procedure

NBEC0336

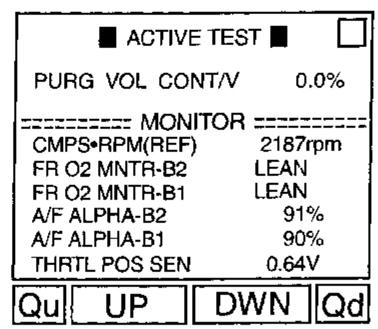
| 1 | CHECK EVAP CANISTER |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Check EVAP canister for cracks.<br>**OK or NG** | |
| OK (With CONSULT) ▶ | GO TO 2. |
| OK (Without CONSULT) ▶ | GO TO 3. |
| NG ▶ | Replace EVAP canister. |

| 2 | CHECK PURGE FLOW |
|---|---|
| **With CONSULT**<br>1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. | |




SEF907U

2. Start engine and let it idle.
3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT.




SEF908U

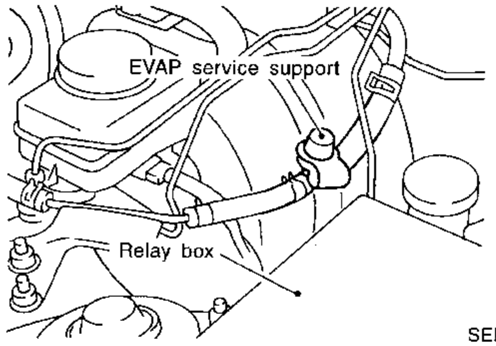
4. Rev engine up to 2,000 rpm.
5. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL CONT/V" opening.
   **100.0%: Vacuum should exist.**
   **0.0%: Vacuum should not exist.**

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 7. |
| NG ▶ | GO TO 4. |

| 3 | CHECK PURGE FLOW |
|---|---|

**Without CONSULT**
1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.



SEF907U

4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum gauge indication when revving engine up to 2,000 rpm.
**Vacuum should exist.**
6. Release the accelerator pedal fully and let idle.
**Vacuum should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 4. |

| 4 | CHECK EVAP PURGE LINE |
|---|---|

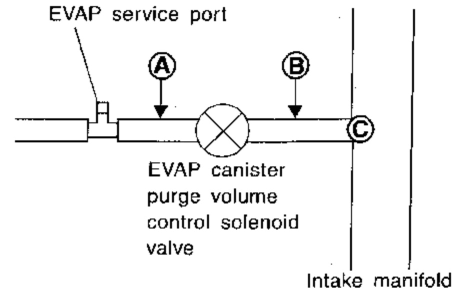
Check EVAP purge line for improper connection or disconnection.
Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-28.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair it. |

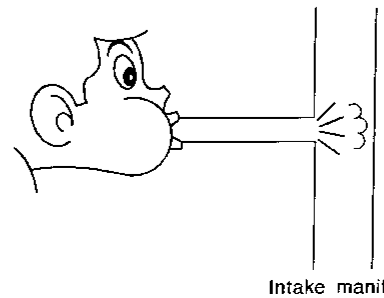
| 5 | CHECK EVAP PURGE HOSE AND PURGE PORT |
|---|---|

1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.



SEF367U

2. Blow air into each hose and EVAP purge port **C**.
3. Check that air flows freely.



SEF368U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Repair or clean hoses and/or purge port. |

| 6 | CHECK COMPONENT |
|---|---|

(EVAP canister purge volume control solenoid valve)
Refer to "Component Inspection", EC-393.

**OK or NG**

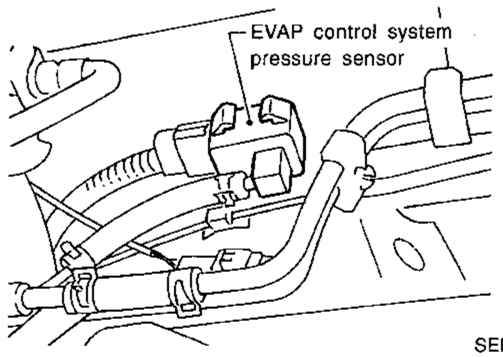
| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace EVAP canister purge volume control solenoid valve. |

| 7 | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE |
|---|---|

1. Turn ignition switch "OFF".
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair it. |

| 8 | CHECK CONNECTOR | |
|---|---|---|
| 1. Disconnect EVAP control system pressure sensor harness connector.   2. Check connectors for water. **Water should not exist.** **OK or NG** | | |
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

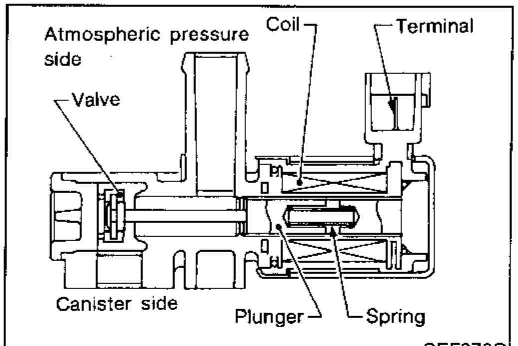
| 9 | CHECK COMPONENT AND CIRCUIT | |
|---|---|---|
| (EVAP control system pressure sensor) Refer to "DTC Confirmation Procedure" for DTC P0450, EC-312. **OK or NG** | | |
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 10 | CHECK COMPONENT | |
|---|---|---|
| (EVAP canister vent control valve) Refer to "Component Inspection", EC-398. **OK or NG** | | |
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace EVAP canister vent control valve. |

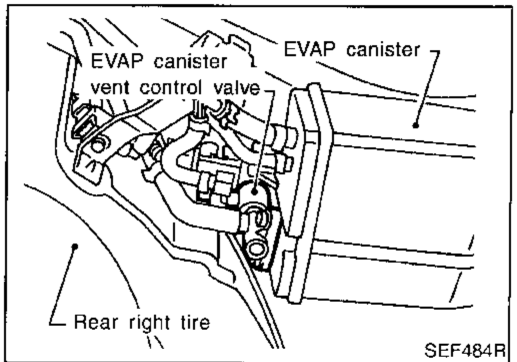
| 11 | CHECK EVAP PURGE LINE | |
|---|---|---|
| Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-28. **OK or NG** | | |
| OK | ▶ | GO TO 12. |
| NG | ▶ | Replace it. |

| 12 | CLEAN EVAP PURGE LINE | |
|---|---|---|
| Clean EVAP purge line (pipe and rubber tube) using air blower. | | |
| | ▶ | GO TO 13. |

| 13 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | | |
| | ▶ | INSPECTION END |



SEF378Q



SEF484R

## Component Description

NBEC0493

NOTE:

**If both DTC P0440, P1440 and P1448 are displayed, 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 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

NBEC0494

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| VENT CONT/V | • Ignition switch: ON | OFF |

## ECM Terminals and Reference Value

NBEC0495

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 108 | G/R | EVAP canister vent control valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

NBEC0496

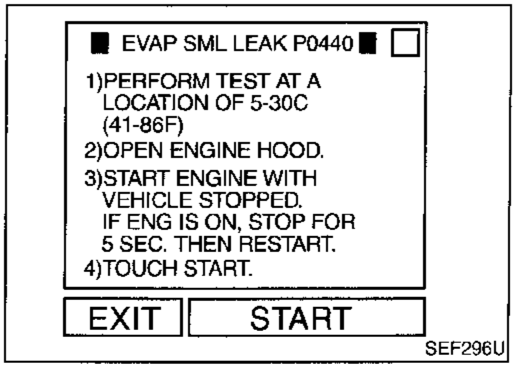
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1448<br>0309 | • EVAP canister vent control valve remains opened under specified driving conditions. | • EVAP canister vent control valve<br>• EVAP control system pressure sensor<br>• Blocked rubber tube to EVAP canister vent control valve<br>• Water separator<br>• EVAP canister is saturated with water.<br>• Vacuum cut valve |

## DTC Confirmation Procedure

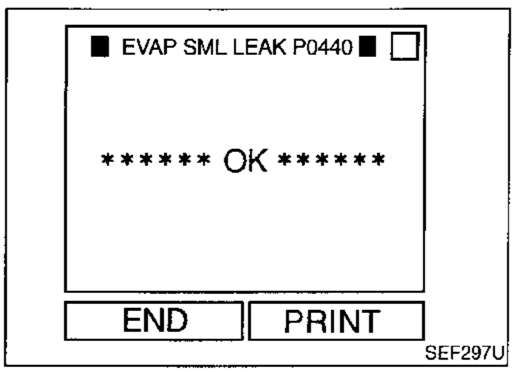
NBEC0497

NOTE:

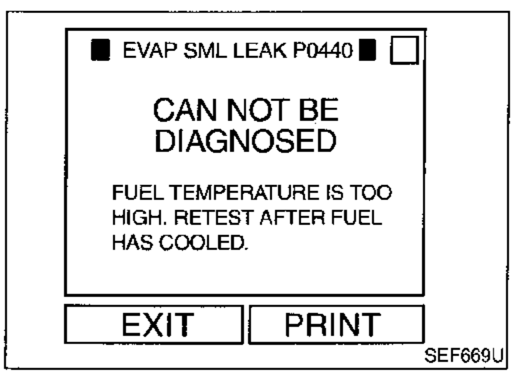
- **If both DTC P0440 or P1440 and P1448 are displayed, perform trouble diagnosis for "DTC P1448" first.**
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.
- Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.



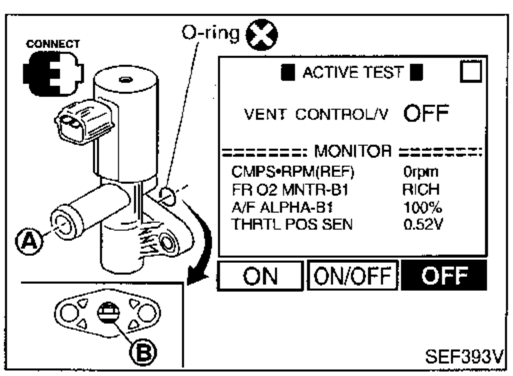

SEF296U




SEF297U




SEF669U




SEF393V

**With CONSULT**

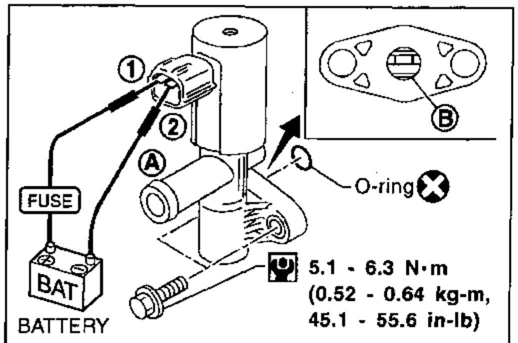
**TESTING CONDITION:**

- **Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full. If not, inspect fuel filler cap and fuel tank separately. Refer to EC-25.**
- **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) Select "EVAP SML LEAK P0440" 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, go to following step. **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.)**
4) Disconnect hose from water separator.
5) Select "VENT CONTROL/V" of "ACTIVE TEST" mode with CONSULT.
6) Touch "ON" and "OFF" alternately.
7) Make sure the following.

| Condition VENT CONTROL/V | Air passage continuity between **A** and **B** |
|---|---|
| ON | No |
| OFF | Yes |

If the result is NG, go to "Diagnostic Procedure", EC-408.
If the result is OK, go to "Diagnostic Procedure" for DTC P0440, EC-294.



SEF969S

## Overall Function Check

NBEC0498

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.

**Without CONSULT**

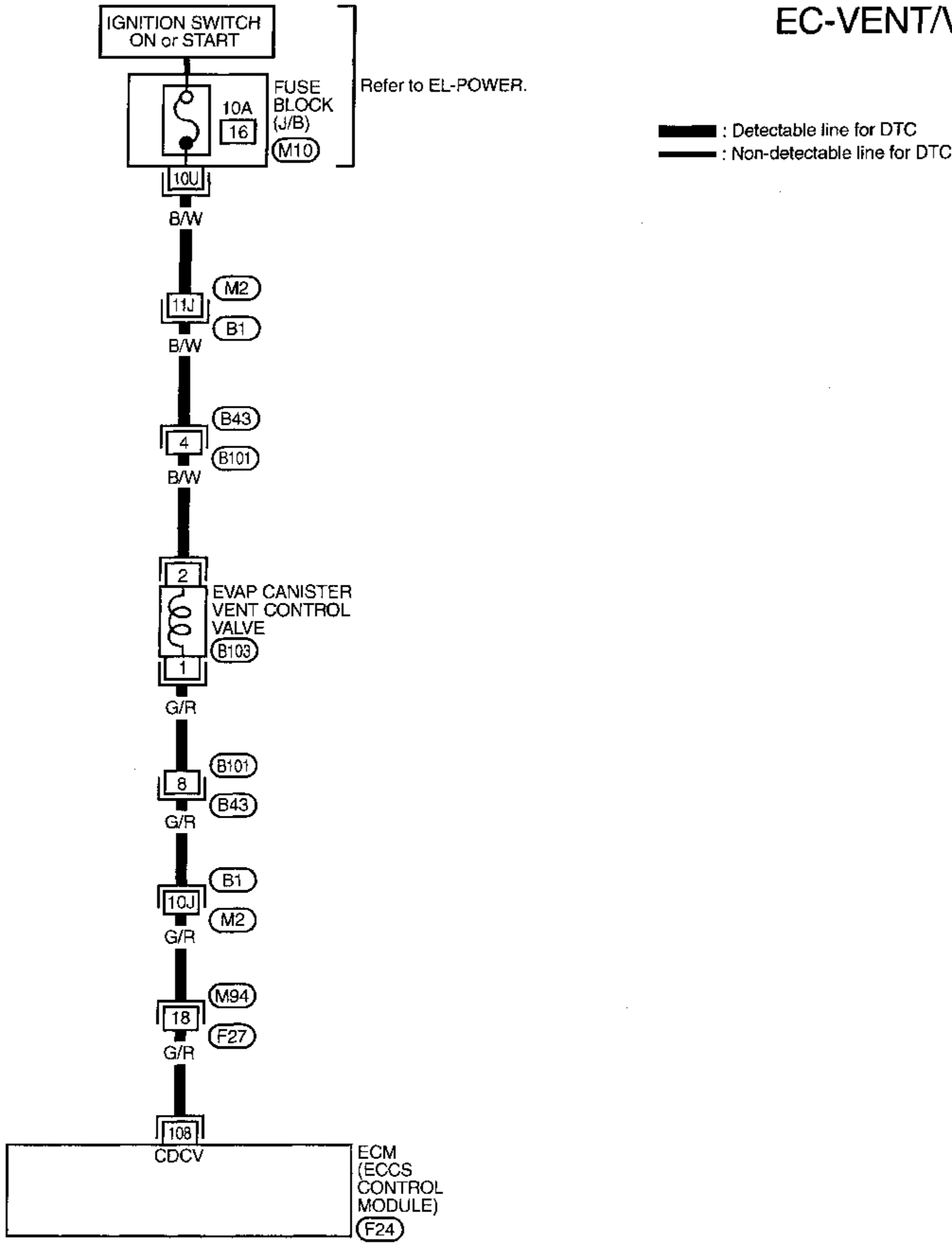
1) Disconnect hose from water separator.
2) Disconnect EVAP canister vent control valve harness connector.
3) Verify the following.

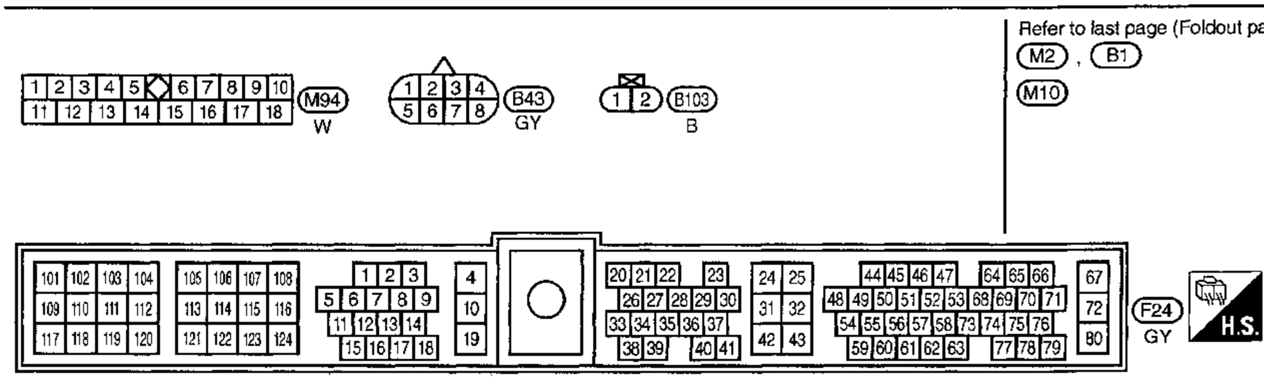
| Condition | Air passage continuity |
|---|---|
| 12V direct current supply between terminals 1 and 2 | No |
| No supply | Yes |

If the result is NG, go to "Diagnostic Procedure", EC-408.
If the result is OK, go to "Diagnostic Procedure" for DTC P0440, EC-294.

## Wiring Diagram

NBEC0499



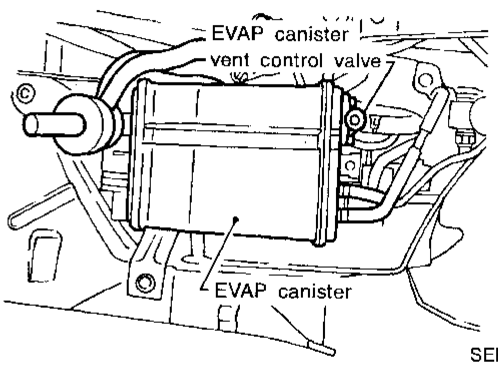

MEC158C

## Diagnostic Procedure

NBEC0500

| 1 | CHECK RUBBER TUBE |
|---|---|

1. Turn ignition switch "OFF".
2. Check obstructed water separator and rubber tube connected to EVAP canister vent control valve.
3. Clean the rubber tube using air blower. For water separator, refer to EC-409.




SEF872T

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Clean, repair or replace rubber tube and/or water separator. |

| 2 | CHECK COMPONENT |
|---|---|

(EVAP canister vent control valve and O-ring)
Refer to "Component Inspection", EC-409.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Replace EVAP canister vent control valve and O-ring. |

| 3 | CHECK COMPONENT |
|---|---|

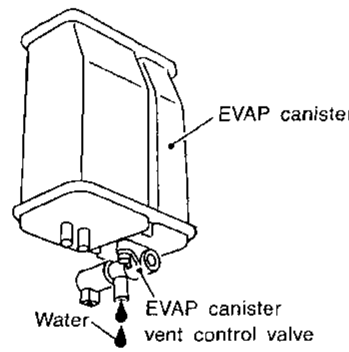
(Vacuum cut valve)
Refer to "Component Inspection", EC-421.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | Replace vacuum cut valve. |

| 4 | 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.




SEF596U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 7. |

| 5 | CHECK EVAP CANISTER |
|---|---|

Weigh the EVAP canister with the EVAP canister vent control valve attached.
**The weight should be less than 1.8 kg (4.0 lb).**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace the EVAP canister. |

| 6 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and water separator for clogging or poor connection

| | | |
|---|---|---|
| | ▶ | Repair hose or replace EVAP canister. |

| 7 | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE |
|---|---|

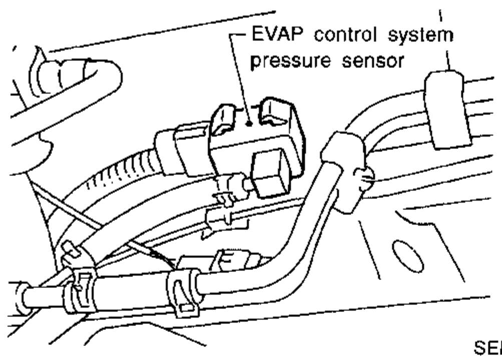
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Repair it. |

| 8 | CHECK CONNECTOR |
|---|---|

1. Disconnect EVAP control system pressure sensor harness connector.




SEF190S

2. Check connectors for water.
   **Water should not exist.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 9 | CHECK COMPONENT AND CIRCUIT |
|---|---|

(EVAP control system pressure sensor)
Refer to "DTC Confirmation Procedure" for DTC P0450, EC-312.

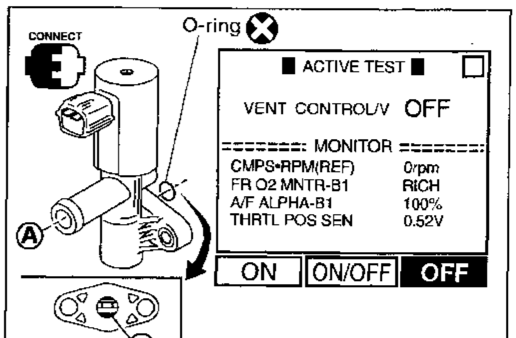
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace EVAP control system pressure sensor. |

| 10 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |




SEF393V

## Component Inspection

### EVAP CANISTER VENT CONTROL VALVE

*NBEC0501*

*NBEC0501S01*

Check air passage continuity.

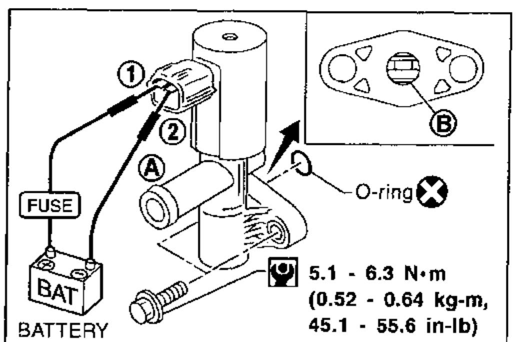
**With CONSULT**

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

| Condition VENT CONTROL/V | Air passage continuity between **A** and **B** |
|---|---|
| ON | No |
| OFF | Yes |

**Without CONSULT**

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




SEF969S

If NG, 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.**

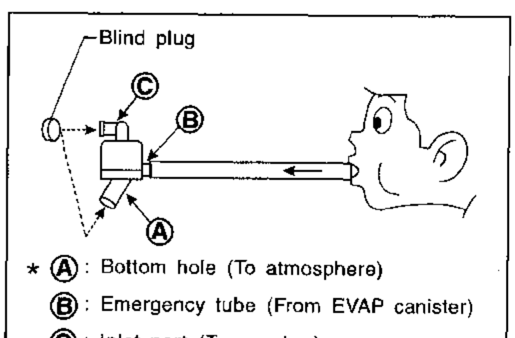
### WATER SEPARATOR

*NBEC0501S02*

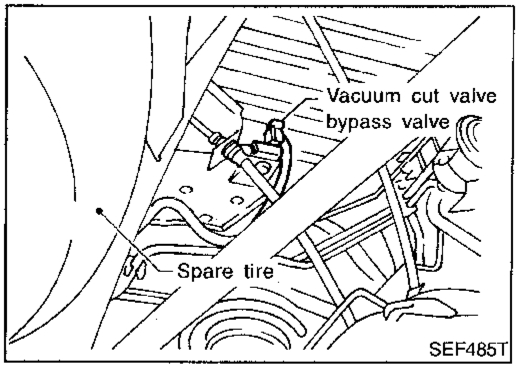
1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that **A** and **C** are not clogged by blowing air into **B** with **A**, and then **C** plugged.
5. In case of NG in items 2 - 4, replace the parts.

NOTE:

- Do not disassemble water separator.




SEF829T



SEF485T

## Description

NBEC0502

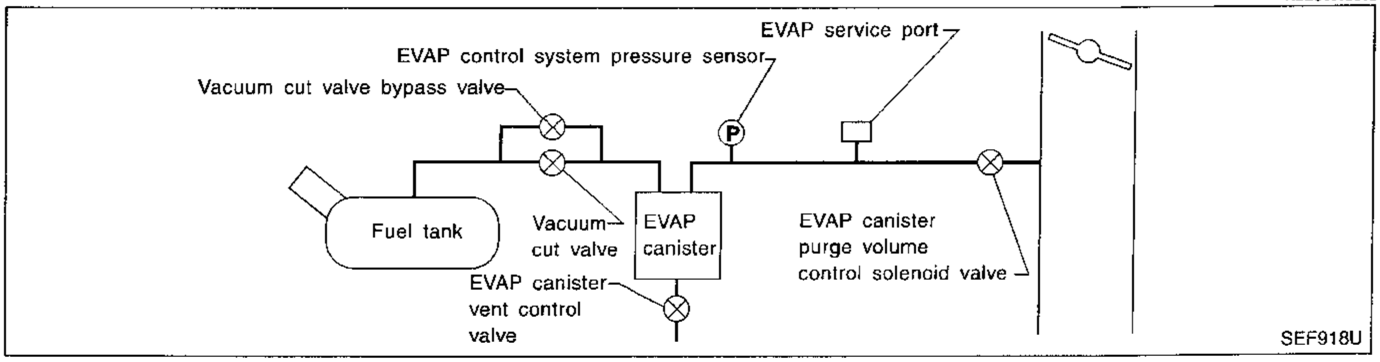
### COMPONENT DESCRIPTION

NBEC0502S01

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

NBEC0502S02



SEF918U

## CONSULT Reference Value in Data Monitor Mode

NBEC0503

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| VC/V BYPASS/V | • Ignition switch: ON | OFF |

## ECM Terminals and Reference Value

NBEC0504

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 120 | G/R | Vacuum cut valve bypass valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |

## On Board Diagnosis Logic

NBEC0505

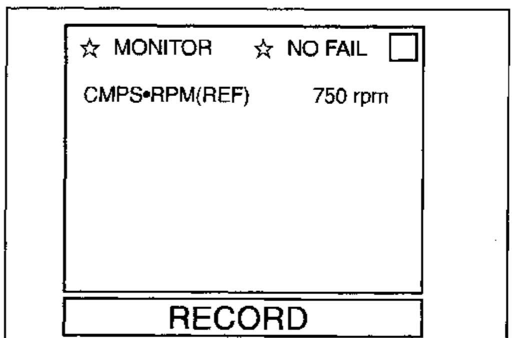
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1490<br>0801 | An improper voltage signal is sent to ECM through vacuum cut valve bypass valve. | • Harness or connectors<br>(The vacuum cut valve bypass valve circuit is open or shorted.)<br>• Vacuum cut valve bypass valve |

## DTC Confirmation Procedure

NBEC0506

NOTE:
If "DTC 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 11V at idle speed.**



SEF357V

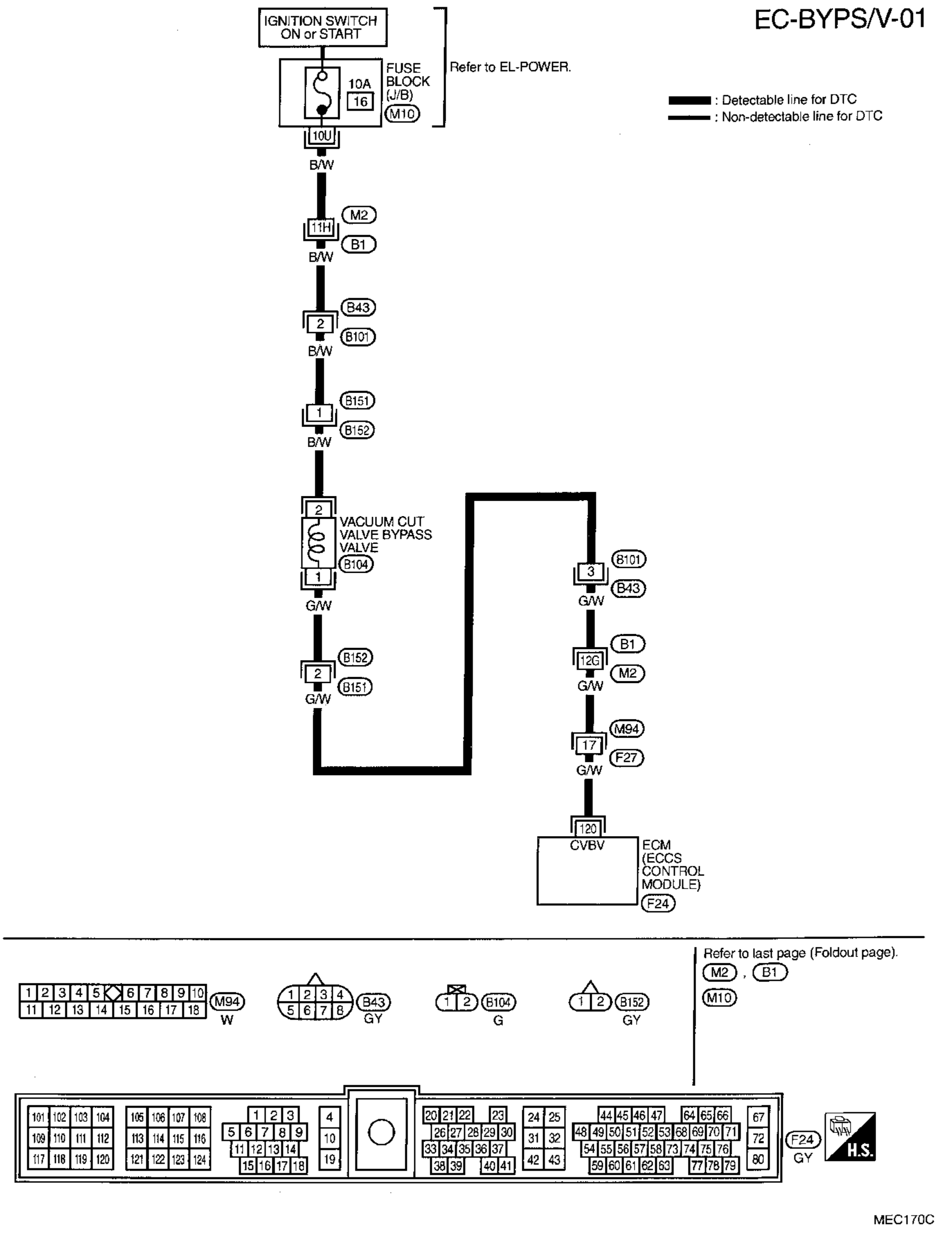
**With CONSULT**
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 5 seconds.

**With GST**
1) Start engine and wait at least 5 seconds.
2) Select "MODE 7" with GST.

**No Tools**
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.

## Wiring Diagram

NBEC0507



## Diagnostic Procedure

NBEC0508

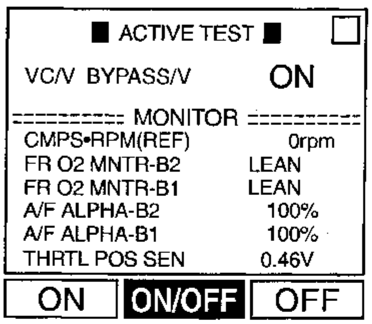
| 1 | INSPECTION START |
|---|---|
| Do you have CONSULT?<br>**Yes or No** | |

| | |
|---|---|
| Yes ▶ | GO TO 2. |
| No ▶ | GO TO 3. |

| 2 | CHECK CIRCUIT |
|---|---|

**With CONSULT**

1. Turn ignition switch "OFF" and then "ON".
2. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT.
3. Touch "ON/OFF" on CONSULT screen.




SEF909U

4. Make sure that clicking sound is heard from the vacuum cut valve bypass valve.

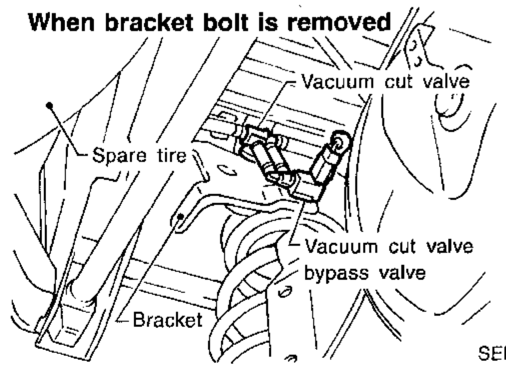
**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 7. |
| NG ▶ | GO TO 3. |

| 3 | CHECK POWER SUPPLY |
|---|---|

**Without CONSULT**

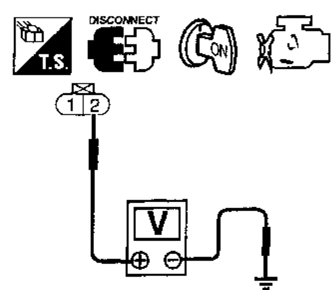
1. Turn ignition switch "OFF".
2. Disconnect vacuum cut valve bypass valve harness connector.




SEF486T

3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.

**Voltage: Battery voltage**




SEF877T

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 5. |
| NG ▶ | GO TO 4. |

| 4 | DETECT MALFUNCTIONING PART |
|---|---|

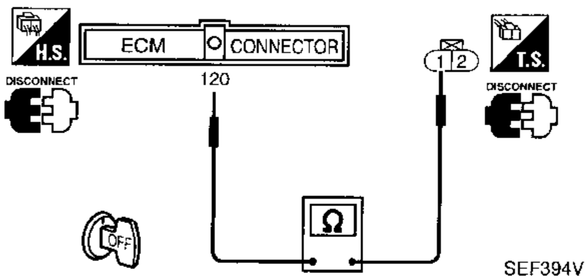
Check the following.

- Harness connectors M2, B1
- Harness connectors B43, B101
- Harness connectors B151, B152
- 10A fuse
- Harness for open or short between vacuum cut valve bypass valve and fuse

| | |
|---|---|
| ▶ | Repair harness or connectors. |

### 5 CHECK OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 120 and terminal 1.
   **Continuity should exist.**



SEF394V

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

### 6 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B151, B152
- Harness connectors B101, B43
- Harness connectors B1, M2
- Harness connectors M94, F27
- Harness for open or short between vacuum cut valve bypass valve and ECM

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 7 CHECK COMPONENT

(Vacuum cut valve bypass valve)
Refer to "Component Inspection", EC-414.

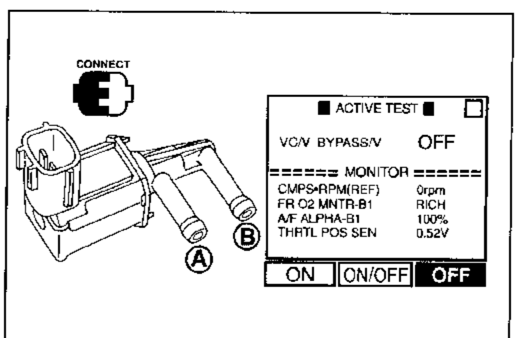
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace vacuum cut valve bypass valve. |

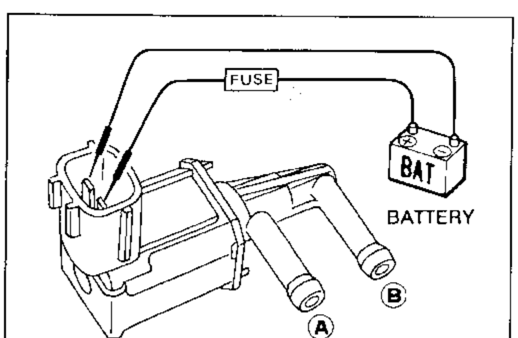
### 8 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |



SEF395V



SEF351Q

## Component Inspection

NBEC0509

### VACUUM CUT VALVE BYPASS VALVE

NBEC0509S01

Check air passage continuity.

**With CONSULT**

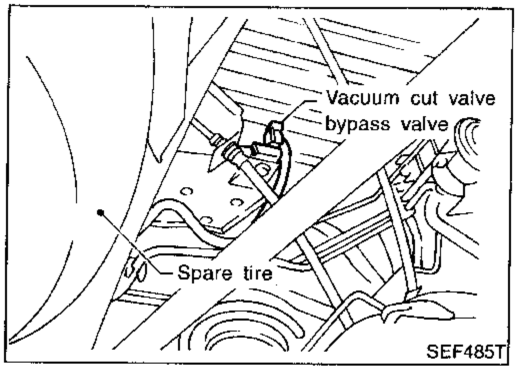
Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.

| Condition VC/V BYPASS/V | Air passage continuity between **A** and **B** |
|---|---|
| ON | No |
| OFF | Yes |

**Without CONSULT**

| 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.




## Description

NBEC0510

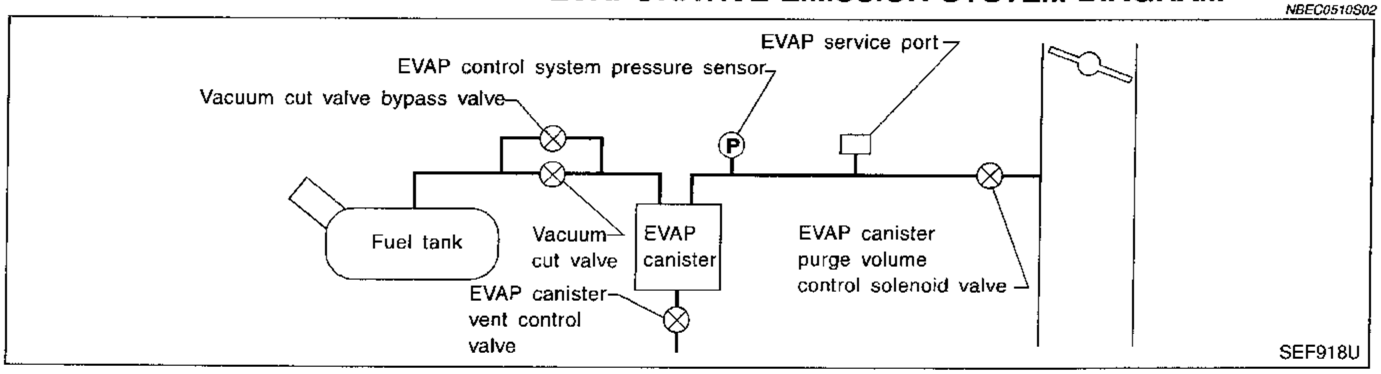
### COMPONENT DESCRIPTION

NBEC0510S01

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

NBEC0510S02




## CONSULT Reference Value in Data Monitor Mode

NBEC0511

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| VC/V BYPASS/V | • Ignition switch: ON | OFF |

## ECM Terminals and Reference Value

NBEC0512

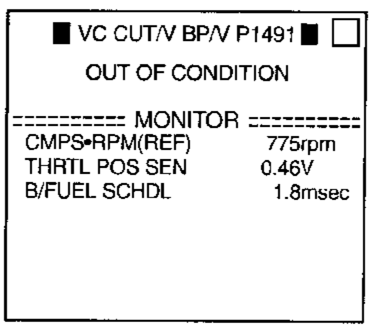
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 120 | G/R | Vacuum cut valve bypass valve | **[Ignition switch "ON"]** | BATTERY VOLTAGE (11 - 14V) |

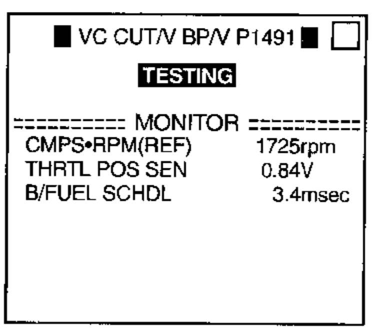
## On Board Diagnosis Logic

NBEC0513

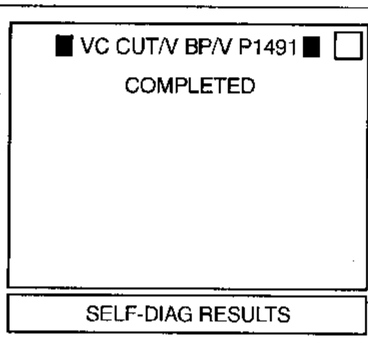
| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1491<br>0311 | Vacuum cut valve bypass valve does not operate properly. | • Vacuum cut valve bypass valve<br>• Vacuum cut valve<br>• Bypass hoses for clogging<br>• EVAP control system pressure sensor<br>• EVAP canister vent control valve<br>• Hose between fuel tank and vacuum cut valve clogged<br>• Hose between vacuum cut valve and EVAP canister clogged<br>• EVAP canister<br>• EVAP purge port of fuel tank for clogging |



SEF910U



SEF911U



SEF912U

## DTC Confirmation Procedure

NBEC0514

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

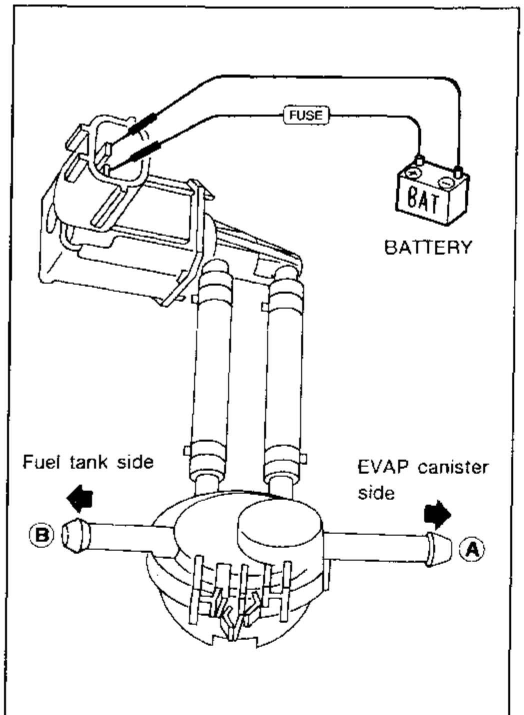
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

**TESTING CONDITION:**

**Always perform test at a temperature of 5 to 30°C (41 to 86°F).**

**With CONSULT**

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 70 seconds.
5) Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
6) Touch "START".
   If "COMPLETED" is displayed, go to step 8.
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): 500 - 3,000 rpm**
   **Selector lever: Suitable position**
   **Vehicle speed: 36 - 100 km/h (22 - 62 MPH)**
   **B/FUEL SCHDL: 0.5 - 5.0 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-419.



SEF530Q

## Overall Function Check

NBEC0515

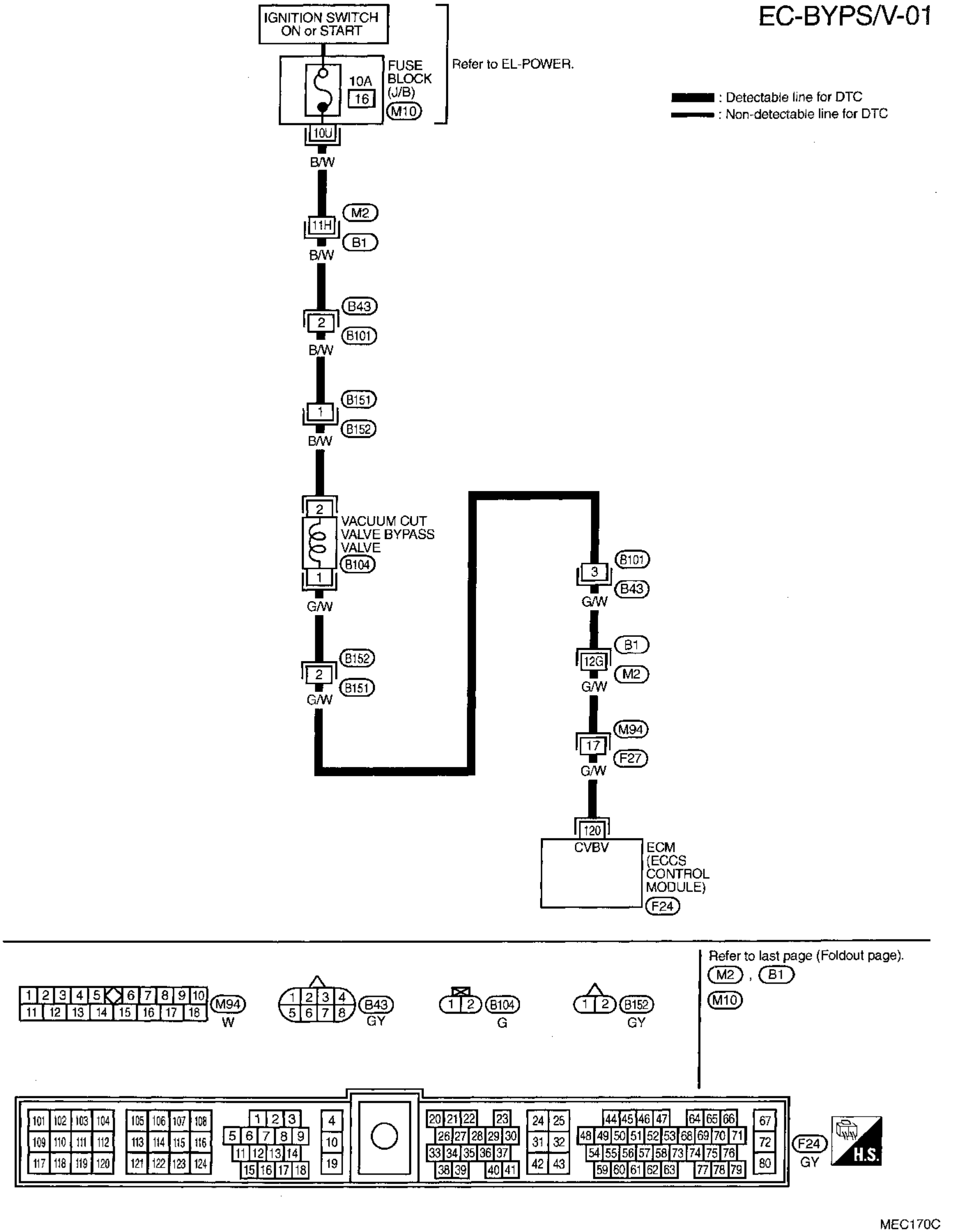
Use this procedure to check the overall function of vacuum cut valve bypass valve. During this check, the 1st trip DTC might not be confirmed.

**Without CONSULT**

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**.

## Wiring Diagram

NBEC0516



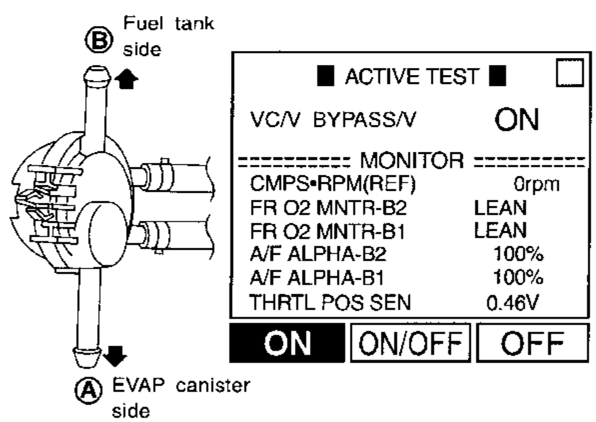
## Diagnostic Procedure

NBEC0517

| 1 | INSPECTION START | |
|---|---|---|
| Do you have CONSULT? | | |
| | **Yes or No** | |
| Yes | ▶ | GO TO 2. |
| No | ▶ | GO TO 3. |

| 2 | CHECK COMPONENT | |
|---|---|---|

**With CONSULT**
1. Turn ignition switch "OFF".
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port A and check that there is no suction from port B.
4. Apply vacuum to port B and check that there is suction from port A.
5. Blow air in port B and check that there is a resistance to flow out of port A.
6. Turn ignition switch "ON".
7. Select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT and touch "ON".
8. Blow air in port A and check that air flows freely out of port B.
9. Blow air in port B and check that air flows freely out of port A.

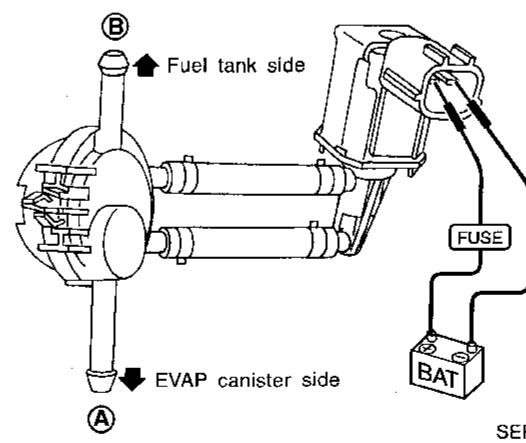



SEF913U

| | **OK or NG** | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 5. |

| 3 | CHECK COMPONENT | |
|---|---|---|

**Without CONSULT**
1. Turn ignition switch "OFF".
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port A and check that there is no suction from port B.
4. Apply vacuum to port B and check that there is suction from port A.
5. Blow air in port B and check that there is a resistance to flow out of port A.
6. Disconnect vacuum cut valve bypass valve harness connector.
7. Supply battery voltage to the terminal.
8. Blow air in port A and check that air flows freely out of port B.
9. Blow air in port B and check that air flows freely out of port A.




SEF914U

| | **OK or NG** | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 5. |

| 4 | CHECK EVAP PURGE LINE | |
|---|---|---|

1. Check EVAP purge line between EVAP canister and fuel tank for clogging or disconnection.
2. Check EVAP purge port of fuel tank for clogging.
3. Check EVAP canister. Refer to EC-25.

| | **OK or NG** | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG (Step 1) | ▶ | Repair it. |
| NG (Step 2) | ▶ | Clean EVAP purge port. |
| NG (Step 3) | ▶ | Replace EVAP canister. |

| 5 | CHECK BYPASS HOSE |
|---|---|
| Check bypass hoses for clogging.<br>**OK or NG** | |
| OK ▶ | GO TO 6. |
| NG ▶ | Repair or replace hoses. |

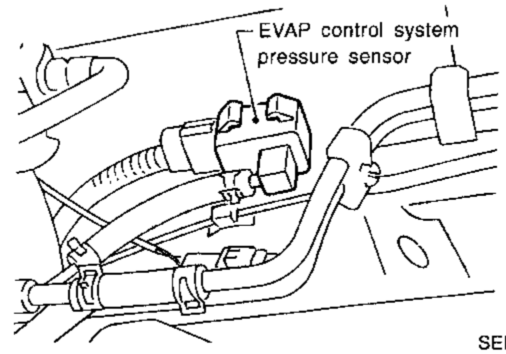
| 6 | CHECK COMPONENT |
|---|---|
| (Vacuum cut valve bypass valve)<br>Refer to "Component Inspection", EC-421.<br>**OK or NG** | |
| OK ▶ | GO TO 7. |
| NG ▶ | Replace vacuum cut valve bypass valve. |

| 7 | CHECK COMPONENT |
|---|---|
| (Vacuum cut valve)<br>Refer to "Component Inspection", EC-421.<br>**OK or NG** | |
| OK ▶ | GO TO 8. |
| NG ▶ | Replace vacuum cut valve. |

| 8 | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.<br>**OK or NG** | |
| OK ▶ | GO TO 9. |
| NG ▶ | Repair it |

**9 CHECK CONNECTOR**

1. Disconnect EVAP control system pressure sensor harness connector.




SEF190S

2. Check connectors for water.
   **Water should not exist.**

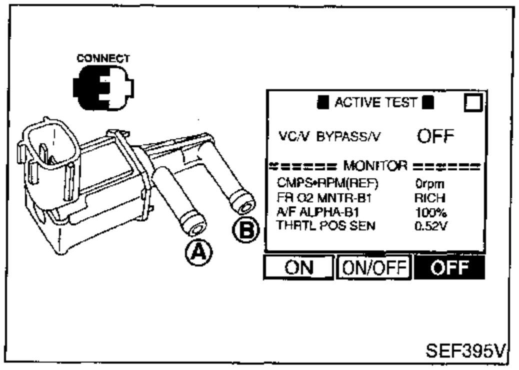
**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 10. |
| NG ▶ | Replace EVAP control system pressure sensor. |

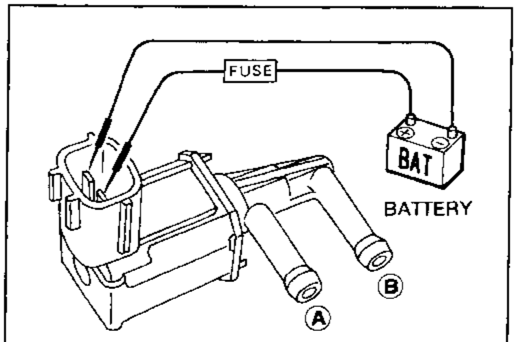
| 10 | CHECK COMPONENT AND CIRCUIT |
|---|---|
| (EVAP control system pressure sensor)<br>Refer to "DTC Confirmation Procedure" for DTC P0450, EC-312.<br>**OK or NG** | |
| OK ▶ | GO TO 11. |
| NG ▶ | Replace EVAP control system pressure sensor. |

| 11 | CHECK COMPONENT |
|---|---|
| (EVAP canister vent control valve)<br>Refer to "Component Inspection", EC-409.<br>**OK or NG** | |
| OK ▶ | GO TO 12. |
| NG ▶ | Replace EVAP canister vent control valve. |

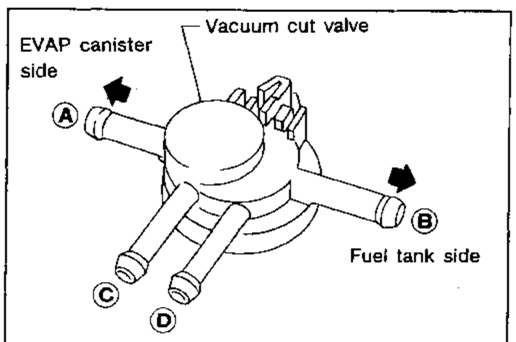
| 12 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107. | |
| ▶ | INSPECTION END |



SEF395V



SEF351Q



SEF379Q

## Component Inspection

NBEC0518

### VACUUM CUT VALVE BYPASS VALVE

NBEC0518S01

Check air passage continuity.

**With CONSULT**

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 |

**Without CONSULT**

| 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

NBEC0518S02

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**.

GI
MA
EM
LC
EC
FE
AT
TF
PD
AX
SU
BR
ST
RS
BT
HA
SC
EL
IDX

## Component Description

NBEC0338

The malfunction information related to A/T (Automatic Transmission) is transferred through the line (circuit) from TCM (Transmission control module) to ECM. Therefore, be sure to erase the malfunction information such as DTC not only in TCM (Transmission control module) but also ECM after the A/T related repair.

## ECM Terminals and Reference Value

NBEC0339

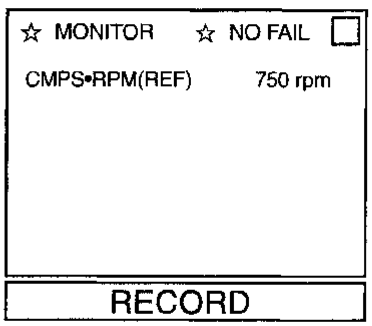
Specification data are reference values and are measured between each terminal and 32 (ECCS ground).

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 7 | Y/G | A/T check signal | **[Ignition switch "ON"]**<br>**[Engine is running]** | 0 - 3.0V |

## On Board Diagnosis Logic

NBEC0340

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1605<br>0804 | • An incorrect signal from TCM (Transmission control module)s is sent to ECM. | • Harness or connectors<br>(The communication line circuit between ECM and TCM (Transmission control module) is open or shorted.)<br>• Dead (Weak) battery<br>• TCM (Transmission control module) |




SEF357V

## DTC Confirmation Procedure

NBEC0341

NOTE:
If "DTC 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.**

**With CONSULT**

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 40 seconds.

**With GST**

1) Turn ignition switch "ON".
2) Start engine and wait at least 40 seconds.
3) Select "MODE 7" with GST.

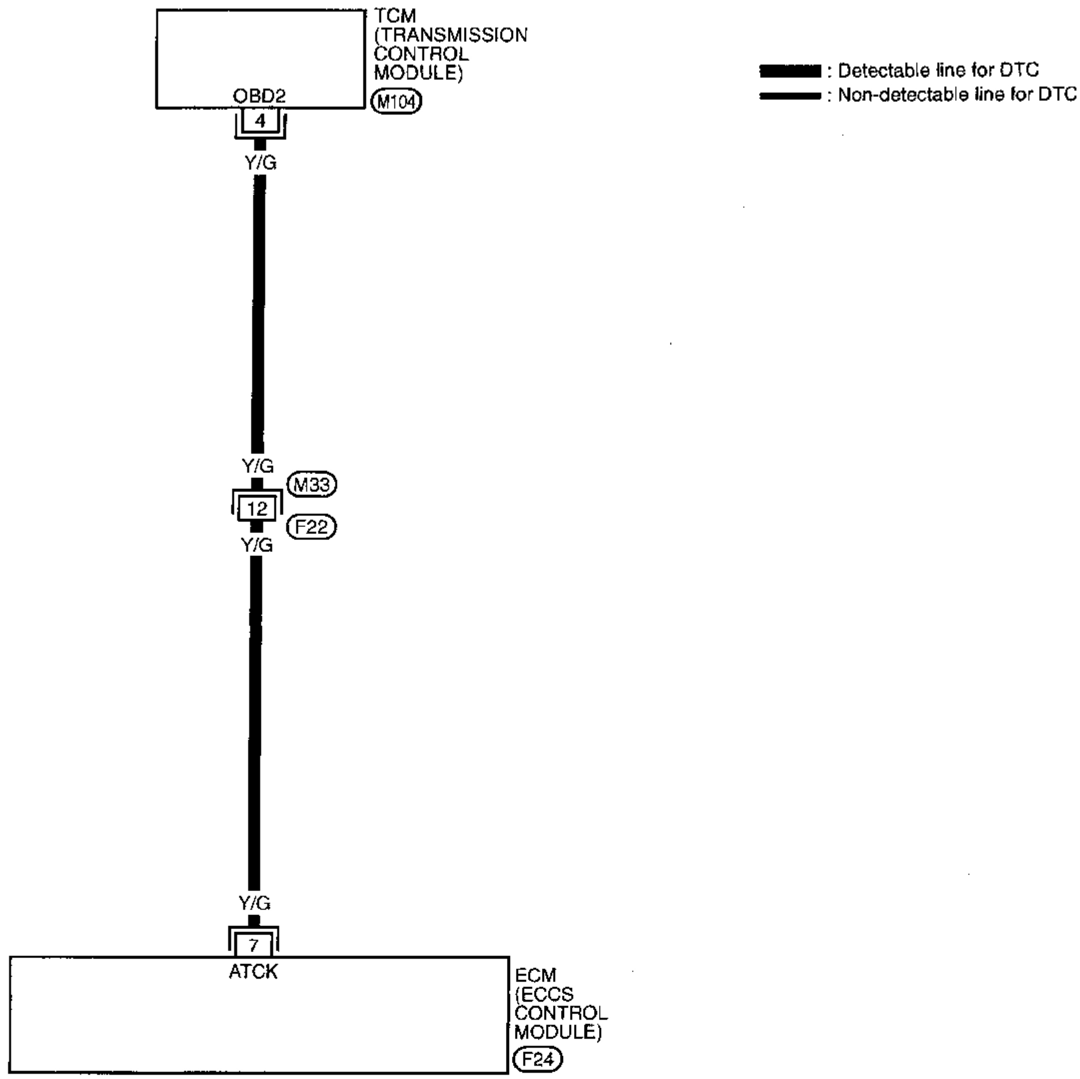
**No Tools**

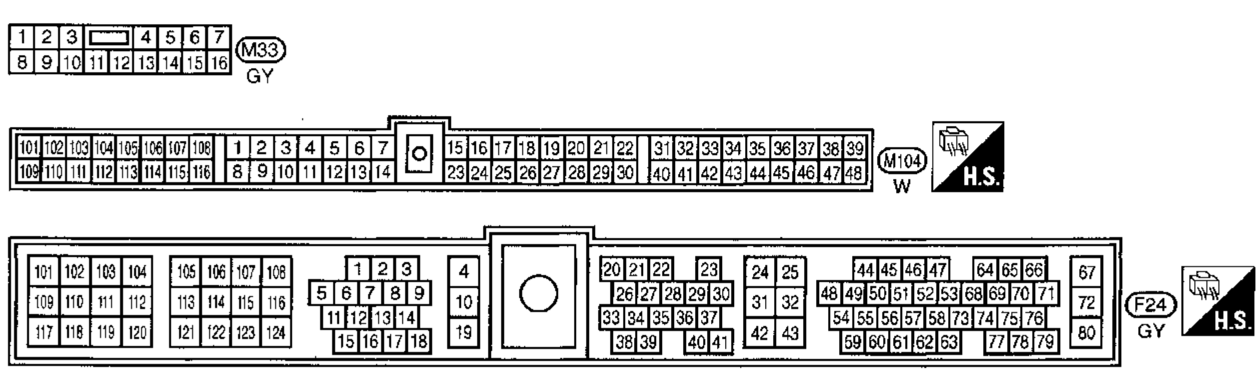
1) Turn ignition switch "ON".
2) Start engine and wait at least 40 seconds.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

## Wiring Diagram

NBEC0342

EC-ATDIAG-01



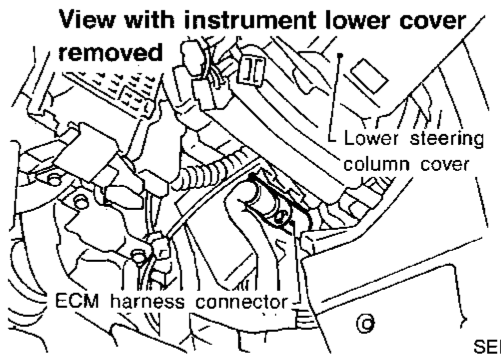

MEC171C

## Diagnostic Procedure

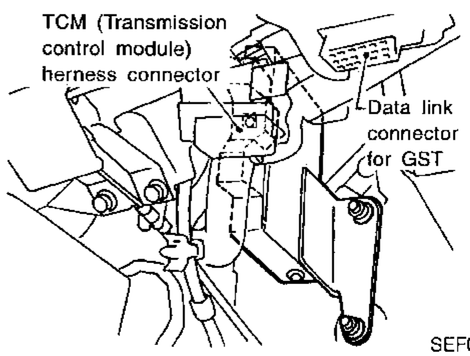
NBEC0343

| 1 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and TCM (Transmission control module) harness connector.

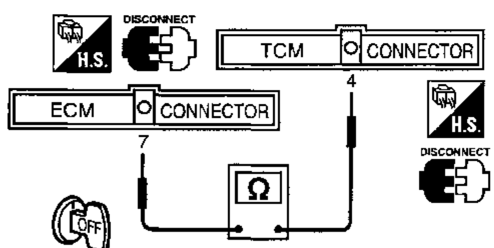



SEF981R




SEF017SA

3. Check harness continuity between ECM terminal 7 and TCM (Transmission control module) terminal 4.
**Continuity should exist.**




SEF730U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | GO TO 2. |

| 2 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors M33, F22
- Harness for open or short between ECM and TCM (Transmission control module)

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3 | CHECK INTERMITTENT INCIDENT |
|---|---|

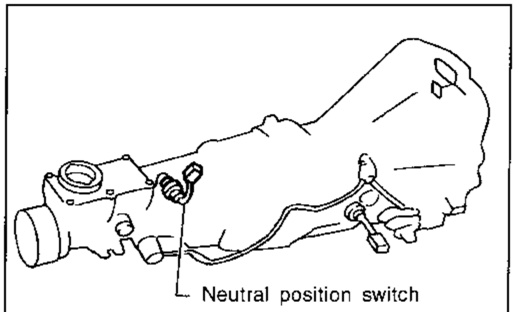
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |

## Component Description

NBEC0272

When the gear position is "P" (A/T models only) or "N", park/neutral position switch is "ON".
ECM detects the position because the continuity of the line (the "ON" signal) exists.




SEF009S

## CONSULT Reference Value in Data Monitor Mode

NBEC0273

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

NBEC0274

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 22 | L/B | Inhibitor switch/Neutral position switch | **[Ignition switch "ON"]**<br>• Gear position is "N" or "P" (A/T models)<br>• Gear position is neutral (M/T models) | Approximately 0V |
| | | | **[Ignition switch "ON"]**<br>• Except the above gear position | Approximately 5V |

## On Board Diagnosis Logic

NBEC0275

| DTC No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1706<br>1003 | • The signal of the park/neutral position switch is not changed in the process of engine starting and driving. | • Harness or connectors<br>(The neutral position switch or inhibitor switch circuit is open or shorted.)<br>• Neutral position switch<br>• Inhibitor switch |

## DTC Confirmation Procedure

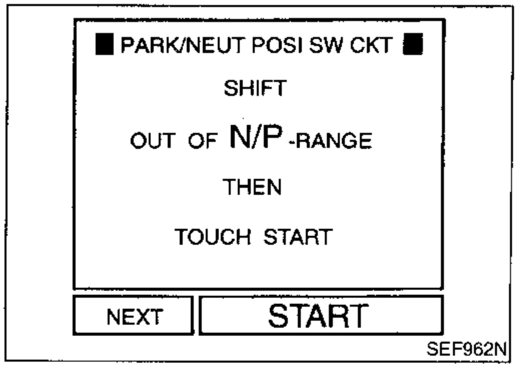
NBEC0276

**CAUTION:**

**Always drive vehicle at a safe speed.**

NOTE:

If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.



SEF962N

**With CONSULT**

1) Turn ignition switch "ON".
2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

**With CONSULT**

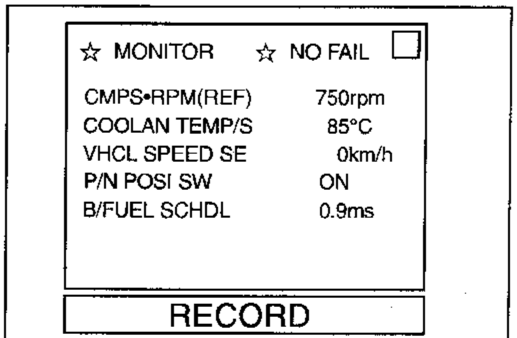
1) Turn ignition switch "ON".
2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT. Then check the "P/N POSI SW" signal under the following conditions.

| Position (Selector lever) | Known good signal |
|---|---|
| "N" and "P" position | ON |
| Except the above position | OFF |

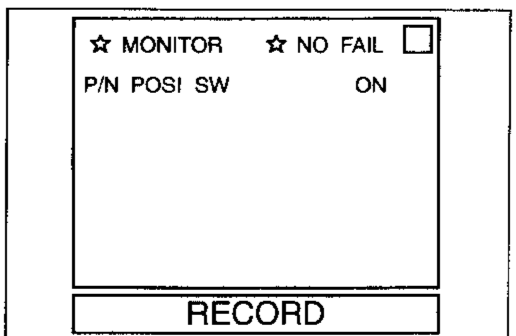
If NG, go to "Diagnostic Procedure", EC-428.
If OK, go to following step.

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 - 2,600 rpm**
**COOLAN TEMP/S: More than 70°C (158°F)**
**B/FUEL SCHDL: 1.7 - 6.5 ms**
**VHCL SPEED SE: 70 - 100 km/h (43 - 62 MPH)**
**Selector lever: Suitable position**



SEF876U



SEF963N

## Overall Function Check

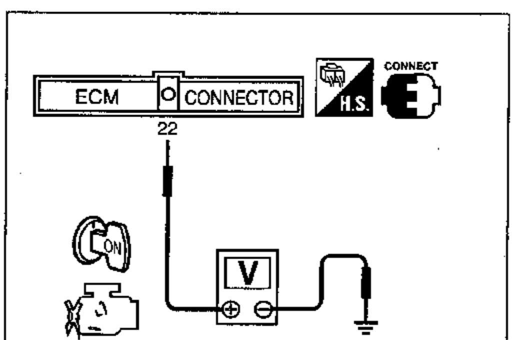
NBEC0519

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.

**Without CONSULT**

1) Turn ignition switch "ON".
2) Check voltage between ECM terminal 22 and body ground under the following conditions.

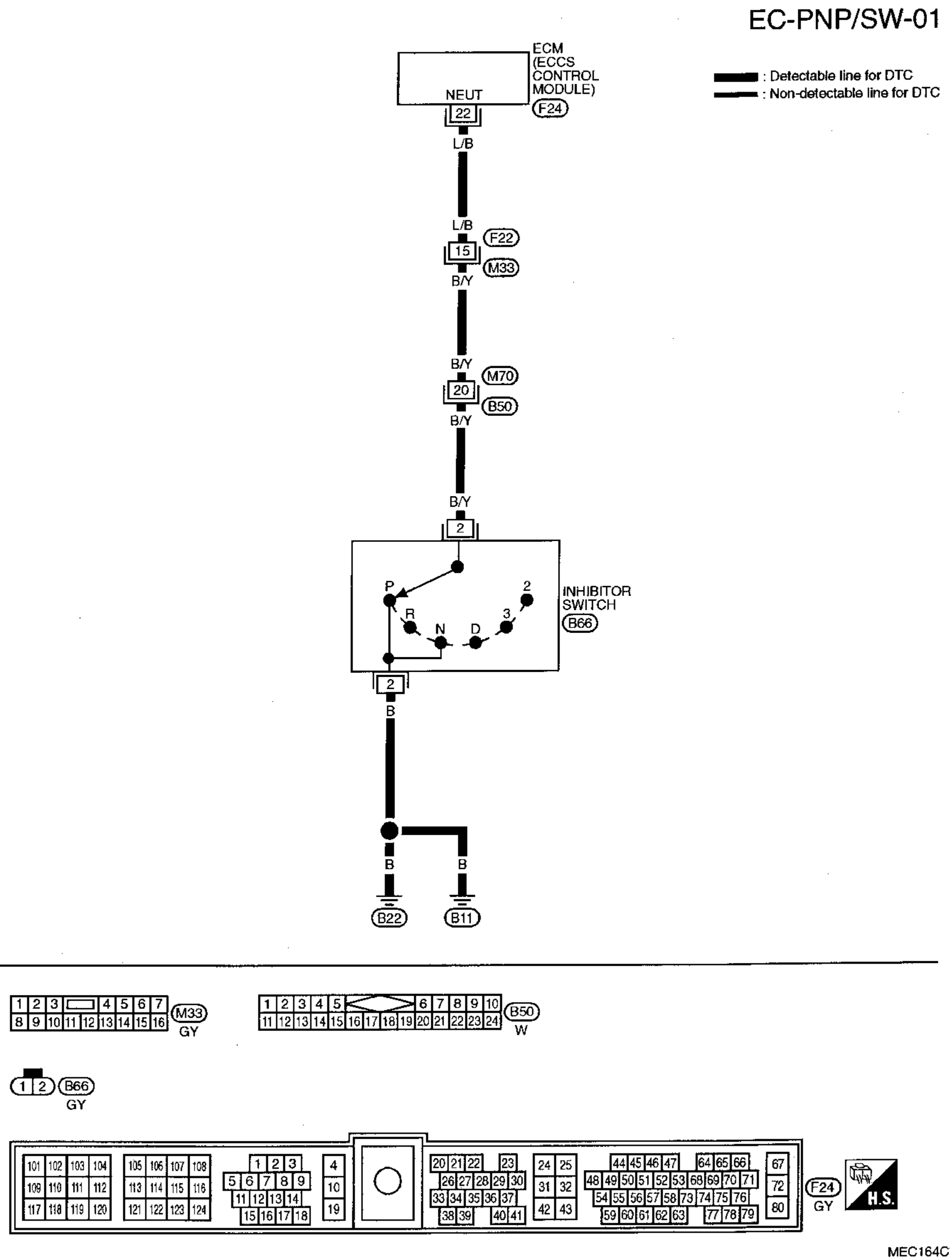
| Condition (Gear position) | Voltage (V) (Known good data) |
|---|---|
| "P" and "N" position | Approx. 0 |
| Except the above position | Approx. 5 |



SEF877U

## Wiring Diagram

NBEC0277



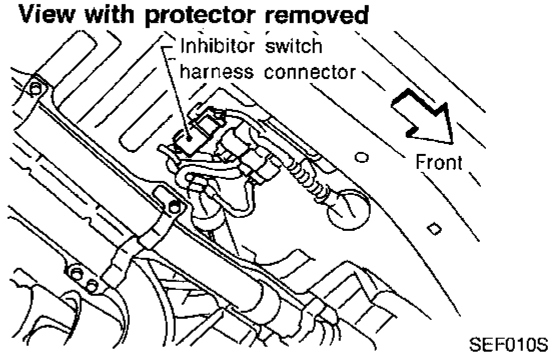
## Diagnostic Procedure

NBEC0278

### 1 CHECK GROUND CIRCUIT

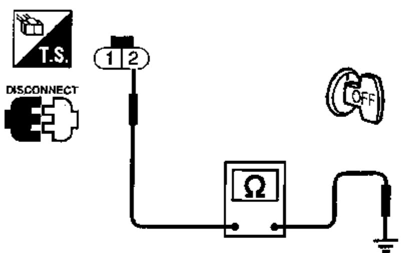
1. Turn ignition switch "OFF".
2. Disconnect inhibitor switch harness connector.

**View with protector removed**




SEF010S

3. Check harness continuity between terminal 2 and body ground.
**Continuity should exist.**




SEF762U

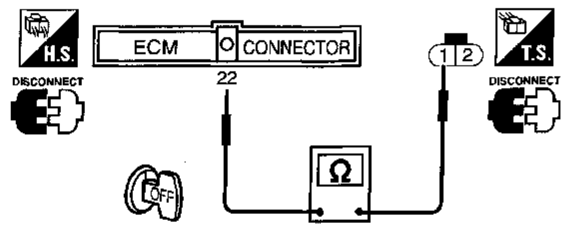
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 2 CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 22 and switch terminal 1.
**Continuity should exist.**




SEF763U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

### 3 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F22, M33
- Harness connectors M70, B50
- Harness for open or short between ECM and inhibitor switch

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

### 4 CHECK COMPONENT

(Inhibitor switch)
Refer to "DTC P0705 INHIBITOR SWITCH" in AT section.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace inhibitor switch. |

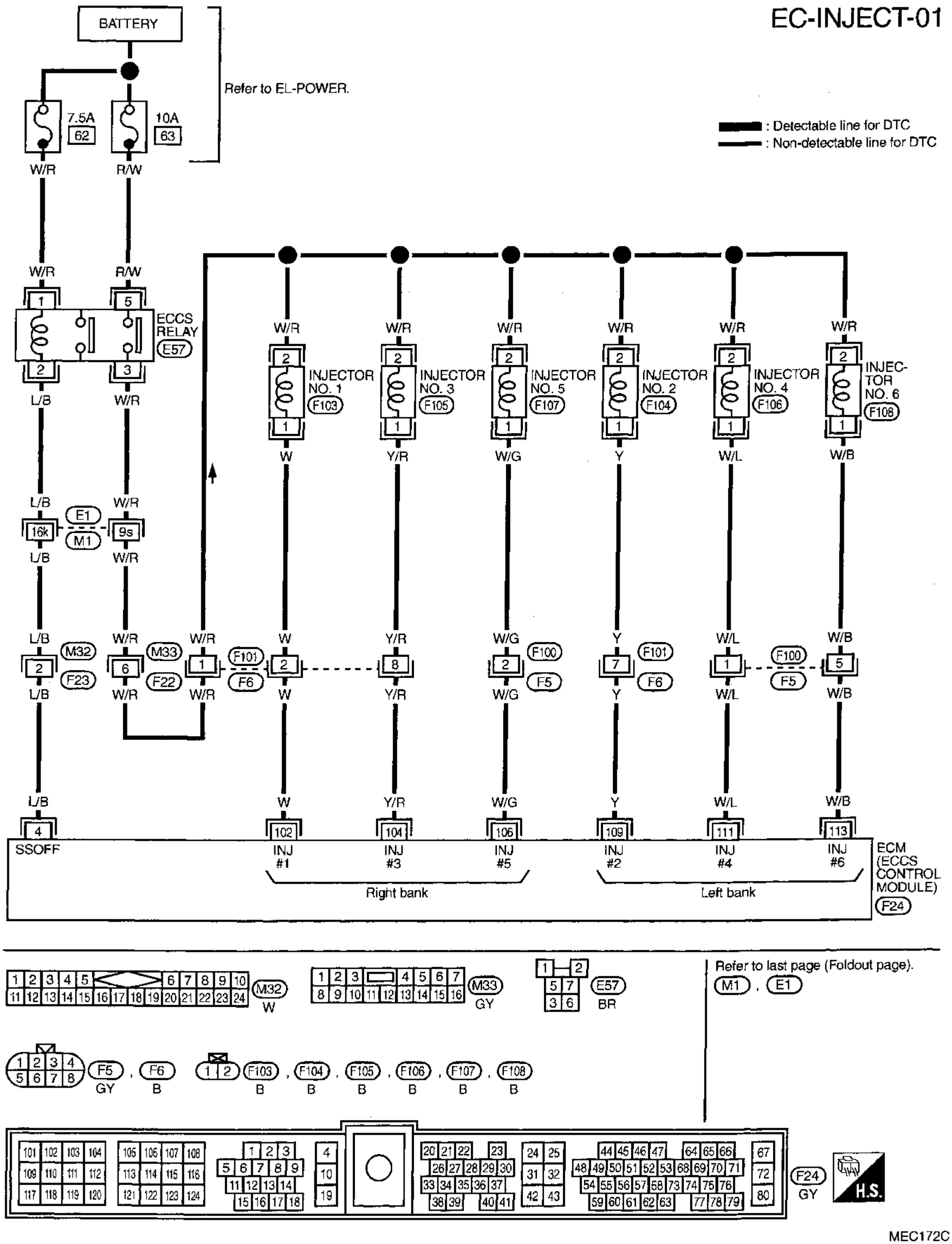
### 5 CHECK INTERMITTENT INCIDENT

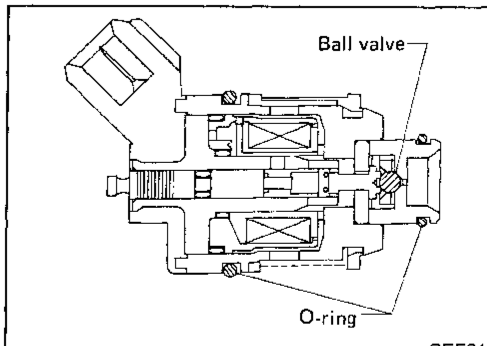
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |

## Wiring Diagram

NBEC0344





SEF812J

## Component Description

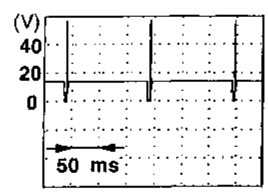
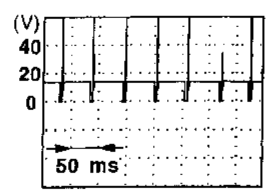
NBEC0345

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

NBEC0346

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 4 | L/B | ECCS relay (Self-shut-off) | **[Engine is running]** **[Ignition switch "OFF"]** • For a few seconds after turning ignition switch "OFF" | 0 - 1.5V |
| | | | **[Ignition switch "OFF"]** • A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 102<br>104<br>106<br>109<br>111<br>113 | W<br>Y/R<br>W/G<br>Y<br>W/L<br>W/B | Injector No. 1<br>Injector No. 3<br>Injector No. 5<br>Injector No. 2<br>Injector No. 4<br>Injector No. 6 | **[Engine is running]** • **Warm-up condition** • Idle speed | BATTERY VOLTAGE (11 - 14V)   SEF007V |
| | | | **[Engine is running]** • **Warm-up condition** • Engine speed is 2,000 rpm | BATTERY VOLTAGE (11 - 14V)   SEF008V |

## Diagnostic Procedure

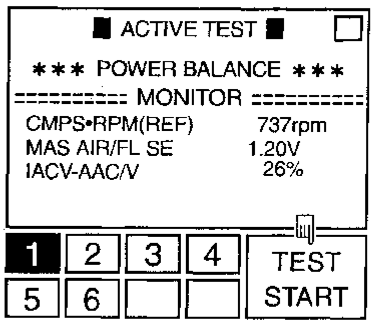
NBEC0347

| 1 | INSPECTION START | |
|---|---|---|
| Turn ignition switch to "START".<br>**Is any cylinder ignited?** | | |
| **Yes or No** | | |
| Yes | ▶ | GO TO 2. |
| No | ▶ | GO TO 9. |

| 2 | CHECK OVERALL FUNCTION | |
|---|---|---|

Ⓟ **With CONSULT**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.

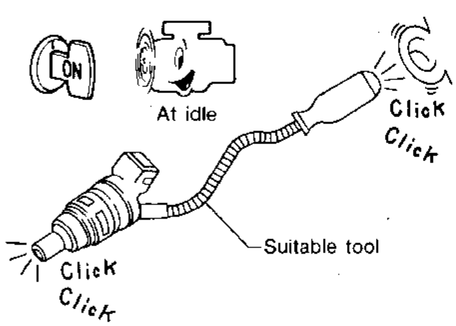



SEF389V

3. Make sure that each circuit produces a momentary engine speed drop.

Ⓧ **Without CONSULT**

1. Start engine.
2. Listen to each injector operating sound.
   **Clicking noise should be heard.**

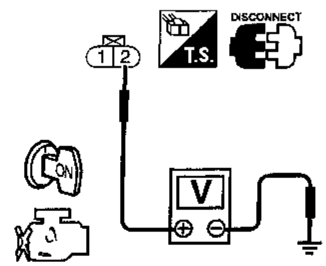



MEC703B

| **OK or NG** | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 3. |

| 3 | CHECK POWER SUPPLY-I | |
|---|---|---|

1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage: Battery voltage**



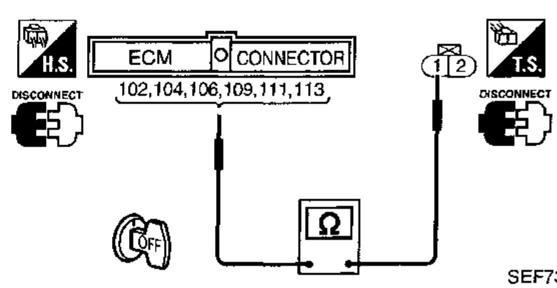

SEF731U

| **OK or NG** | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

| 4 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>● Harness connectors F6, M101<br>● Harness for open or short between injector and harness connector F101 | | |
| | ▶ | Repair harness or connectors. |

| 5 | CHECK OUTPUT SIGNAL CIRCUIT | |
|---|---|---|

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, 106, 109, 111, 113.
   **Continuity should exist.**




SEF732U

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

| **OK or NG** | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

| 6 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F100, F5
- Harness connectors F101, F6
- Harness for open or short between ECM and injector

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK COMPONENT |
|---|---|

(Injector)
Refer to "Component Inspection" EC-434.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace injector. |

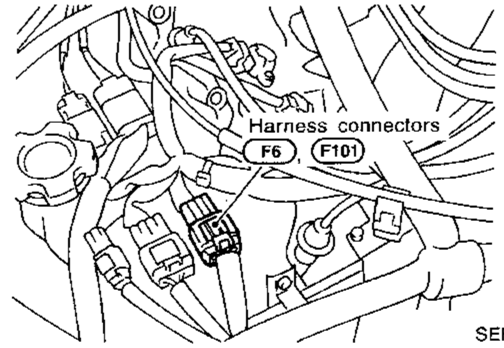
| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |

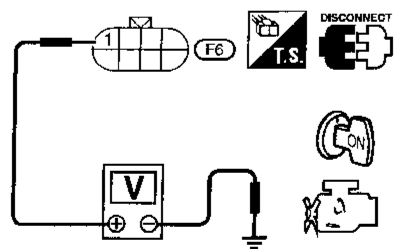
| 9 | CHECK POWER SUPPLY-II |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect harness connectors F6 and F101.




SEF768U

3. Turn ignition switch "ON".
4. Check voltage between harness connector F6 terminal 1 and ground with CONSULT or tester.
   **Voltage: Battery voltage**



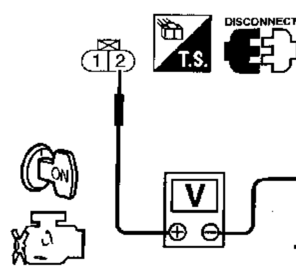

SEF769U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | GO TO 11. |

| 10 | CHECK POWER SUPPLY-III |
|---|---|

1. Turn ignition switch "OFF".
2. Reconnect harness connectors F6 and F101.
3. Disconnect injector harness connector.
4. Turn ignition switch "ON".
5. Check voltage between terminal 2 and ground with CONSULT or tester.
   **Voltage: Battery voltage**



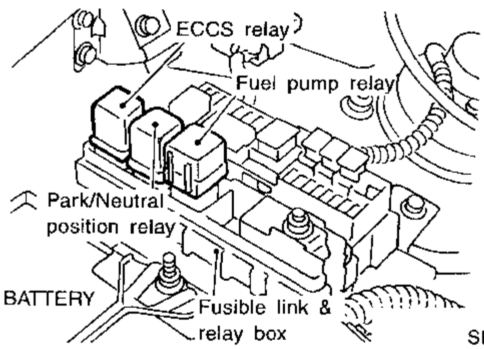

SEF731U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

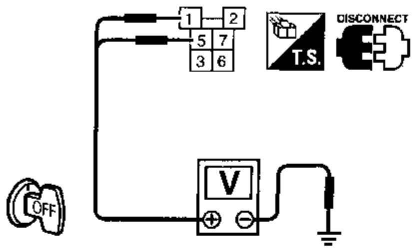
## 11 CHECK POWER SUPPLY-IV

1. Turn ignition switch "OFF".
2. Disconnect ECCS relay.




SEF681U

3. Check voltage between terminals 1, 5 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF770U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 13. |
| NG | ▶ | GO TO 12. |

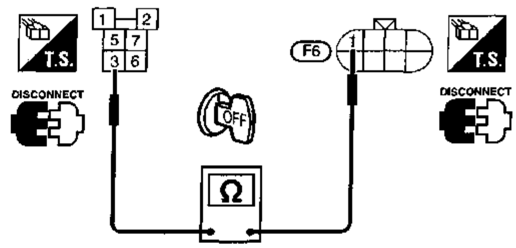
## 12 DETECT MALFUNCTIONING PART

Check the following:
- 7.5A fuse
- 10A fuse
- Harness for open or short between ECCS relay and battery

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

## 13 CHECK POWER SUPPLY-V

Check harness continuity between relay terminal 3 and harness connector F6 terminal 1.
**Continuity should exist.**




SEF771U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | GO TO 14. |

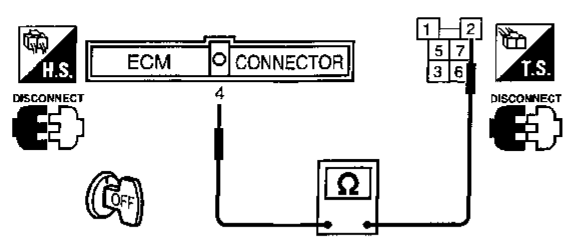
## 14 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1
- Harness connectors M33, F22
- Harness for open or short between ECCS relay and harness connector F6

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 15 CHECK OUTPUT SIGNAL CIRCUIT

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



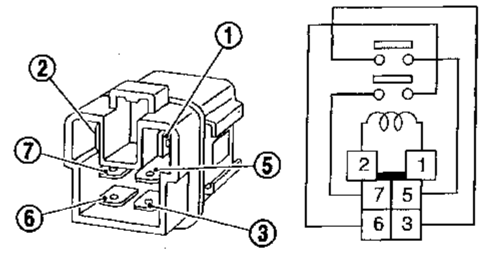

SEF677U

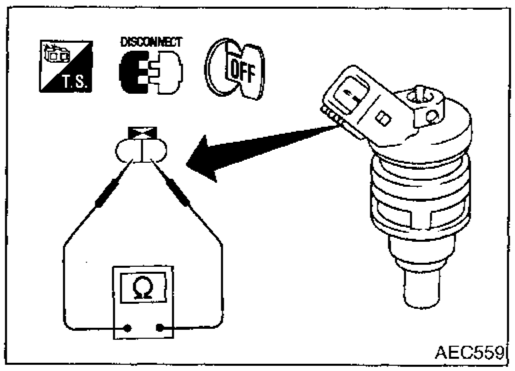
If OK, check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 17. |
| NG | ▶ | GO TO 16. |

| 16 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>• Harness connectors E1, M1<br>• Harness connectors M32, F23<br>• Harness for open or short between ECM and ECCS relay | | |
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 17 | CHECK ECCS RELAY | |
|---|---|---|
| 1. Apply 12V direct current between relay terminals 1 and 2.<br>2. Check continuity between relay terminals 3 and 5, 6 and 7.<br>**12V (1 - 2) applied: Continuity exists.**<br>**No voltage applied: No continuity** | | |
| <br>SEF745U<br>**OK or NG** | | |
| OK | ▶ | Go to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-108. |
| NG | ▶ | Replace ECCS relay. |



AEC559I

## Component Inspection

NBEC0348

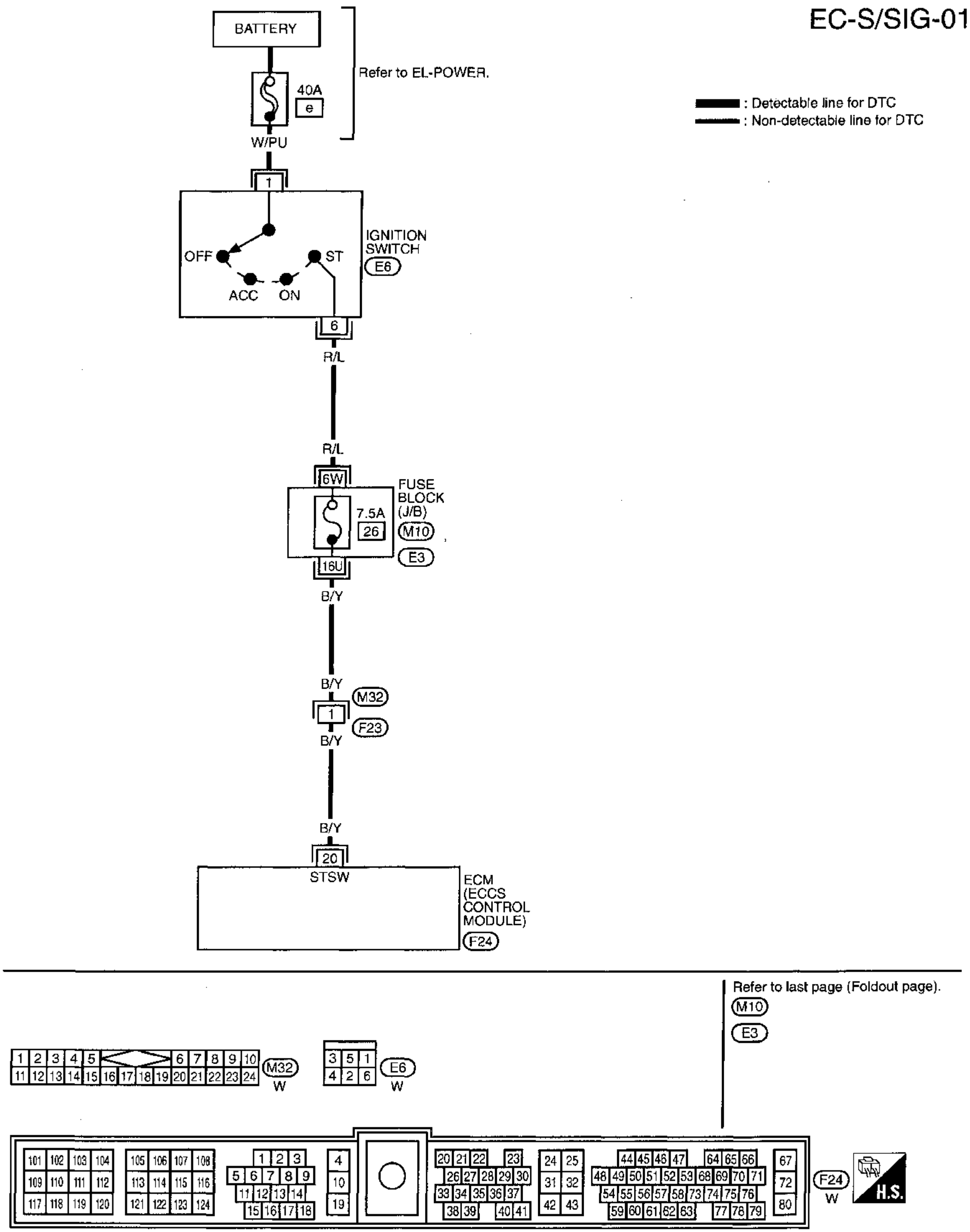
### INJECTOR

NBEC0348S01

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.

## Wiring Diagram

NBEC0349




MEC173C

## CONSULT Reference Value in Data Monitor Mode

NBEC0350

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| START SIGNAL | • Ignition switch: ON → START → ON | OFF → ON → OFF |

## ECM Terminals and Reference Value

NBEC0351

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 20 | B/Y | Start signal | **[Ignition switch "ON"]** | Approximately 0V |
| | | | **[Ignition switch "START"]** | BATTERY VOLTAGE (11 - 14V) |

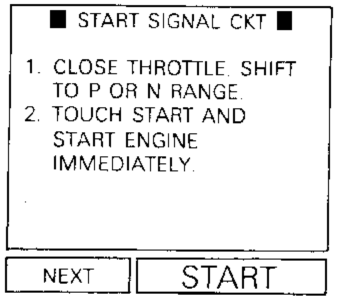
## Diagnostic Procedure

NBEC0352

| 1 | INSPECTION START | |
|---|---|---|
| Do you have CONSULT? | | |
| **Yes or No** | | |
| Yes | ▶ | GO TO 2. |
| No | ▶ | GO TO 3. |

| 2 | CHECK OVERALL FUNCTION |
|---|---|

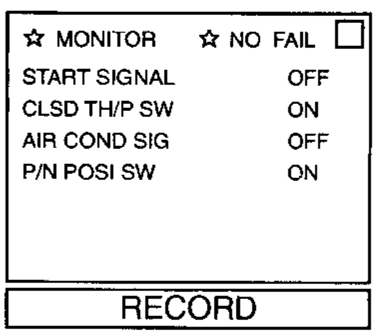
Ⓗ **With CONSULT**
1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.




SEF191L

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

**IGN "ON"**
**OFF**
**IGN "START"**
**ON**




SEF111P

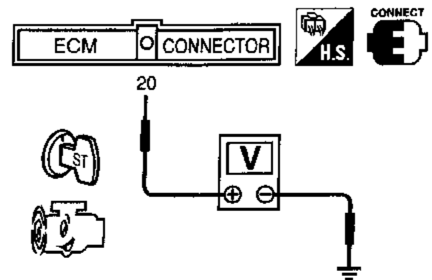
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 4. |

| 3 | CHECK OVERALL FUNCTION |
|---|---|

Ⓧ **Without CONSULT**
1. Turn ignition switch to "START".
2. Check voltage between ECM terminal 20 and ground.

**Voltage:**
**Ignition switch "START"**
**Battery voltage**
**Except above**
**Approximately 0V**




SEF733U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 4. |

| 4 | CHECK STARTING SYSTEM |
|---|---|

Turn ignition switch "OFF", then turn it to "START".
**Does starter motor operate?**

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 5. |
| No | ▶ | Refer to EL section "STARTING SYSTEM". |

| 5 | CHECK FUSE |
|---|---|

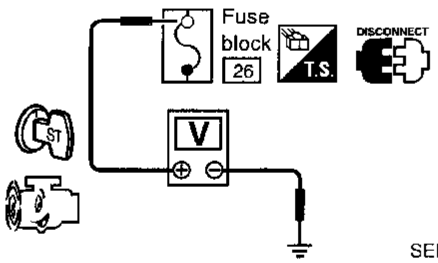
1. Disconnect 7.5A fuse.
2. Check if 7.5A fuse is OK.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace 7.5A fuse. |

## 6 CHECK INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch to "START".
2. Check voltage between fuse block and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF734U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

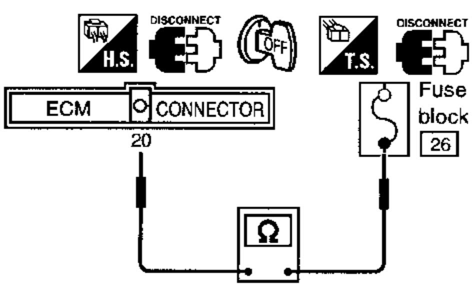
## 7 DETECT MALFUNCTIONING PART

Check the following.
- Harness connector E3
- Fuse block (J/B)
- Harness for open or short between fuse block and ignition switch

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

## 8 CHECK INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 20 and fuse block.
   **Continuity should exist.**




SEF735U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | GO TO 9. |

## 9 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- Harness connectors M10
- Fuse block (J/B)
- Harness for open or short between ECM and fuse block

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

## 10 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |

## Description

NBEC0353

### SYSTEM DESCRIPTION

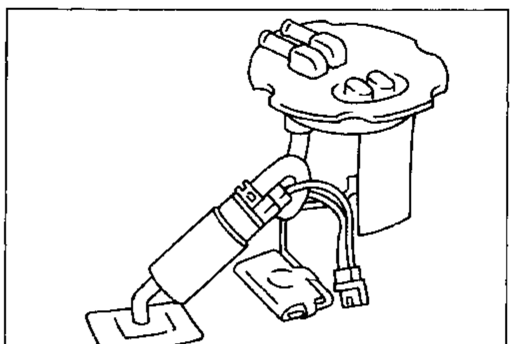
NBEC0353S01

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Fuel pump control | Fuel pump relay |
| Ignition switch | Start signal | | |

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 120° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to operate. If the 120° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation |
|---|---|
| Ignition switch is turned to ON. | Operates for 5 seconds |
| Engine running and cranking | Operates |
| When engine is stopped | Stops in 1.5 seconds |
| Except as shown above | Stops |



SEF018S

### COMPONENT DESCRIPTION

NBEC0353S02

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

NBEC0354

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| FUEL PUMP RLY | • Ignition switch is turned to ON. (Operates for 5 seconds.)<br>• Engine running and cranking | ON |
| | Except as shown above | OFF |

## ECM Terminals and Reference Value

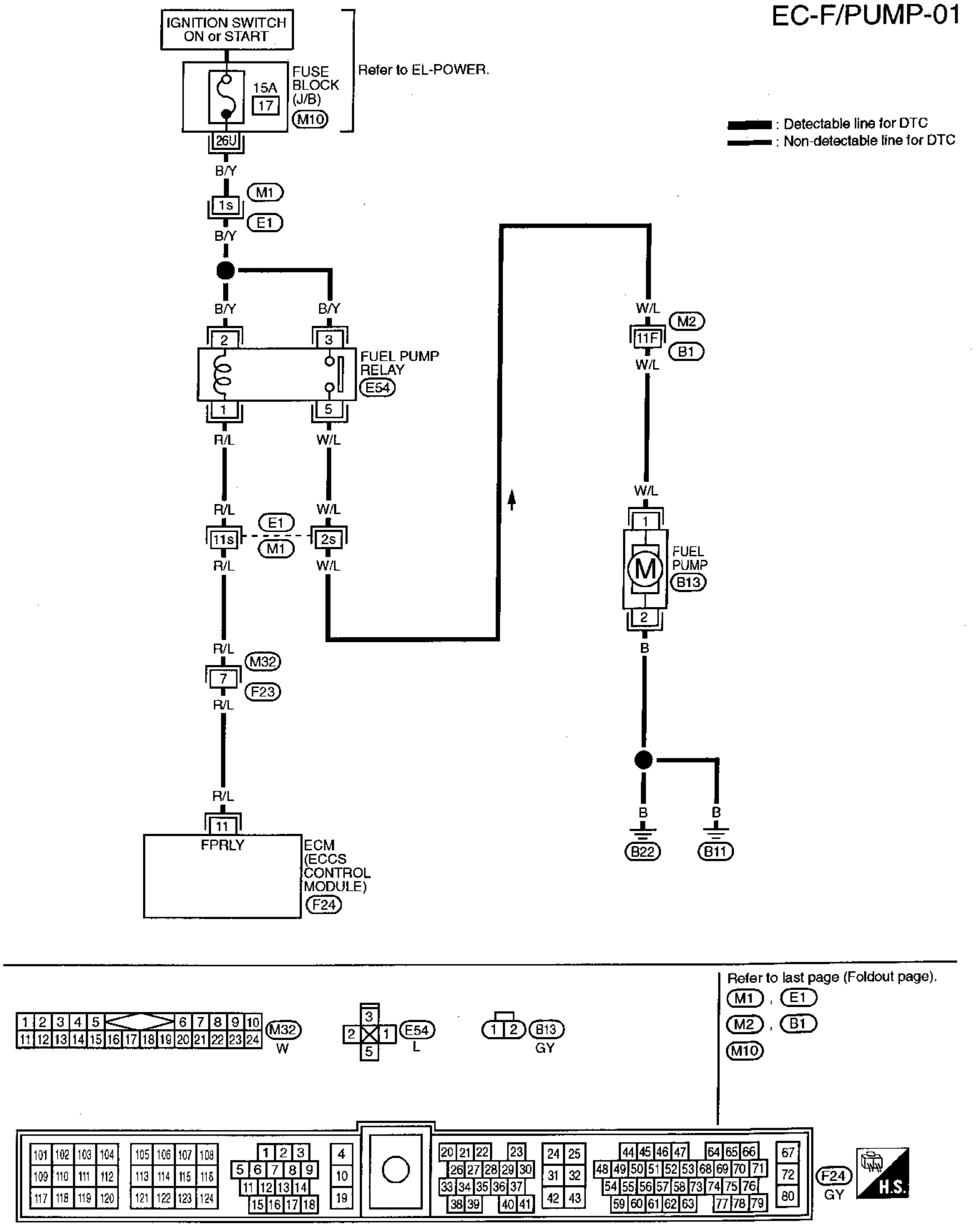
*NBEC0355*

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 11 | R/L | Fuel pump relay | **[Ignition switch "ON"]**<br>● For 5 seconds after turning ignition switch "ON"<br>**[Engine is running]** | 0 - 1V |
| | | | **[Ignition switch "ON"]**<br>● More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE<br>(11 - 14V) |

## Wiring Diagram

NBEC0356



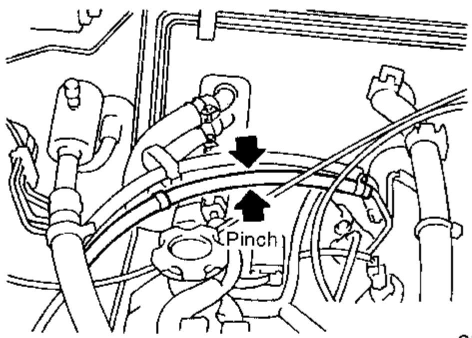

MEC174C

## Diagnostic Procedure

NBEC0357

### 1 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".**



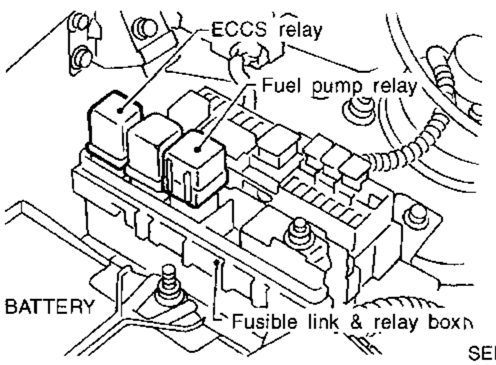

SEF019S

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 2. |

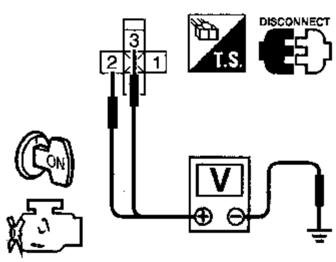
### 2 CHECK POWER SUPPLY

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.




SEF020S

3. Turn ignition switch "ON".
4. Check voltage between terminals 2, 3 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF736U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 4. |
| NG | ▶ | GO TO 3. |

### 3 DETECT MALFUNCTIONING PART

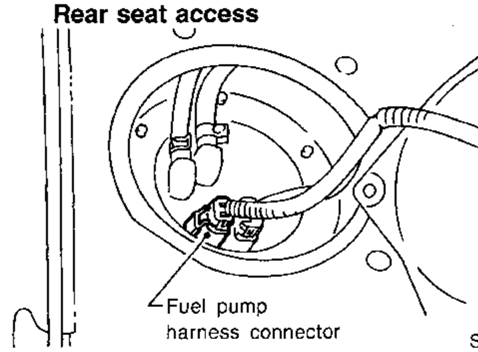
Check the following.
- Harness connectors E1, M1
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

| | |
|---|---|
| ▶ | Repair harness or connectors. |

### 4 CHECK POWER AND GROUND CIRCUIT

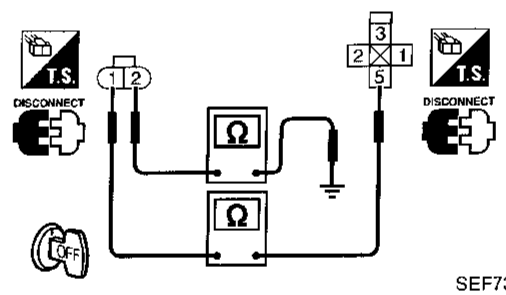
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.

**Rear seat access**




SEF021S

3. Check harness continuity between terminal 2 and body ground, terminal 1 and fuel pump relay connector terminal 5.
   **Continuity should exist.**




SEF737U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

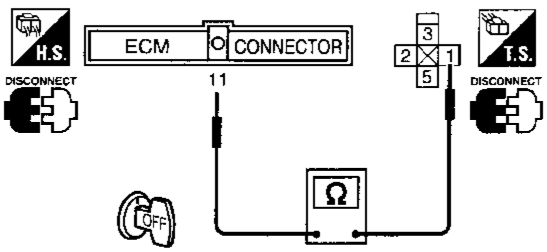
| 5 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors M2, B1
- Harness connectors E1, M1
- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK OUTPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 11 and fuel pump relay connector terminal 1.
   **Continuity should exist.**




SEF738U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | GO TO 7. |

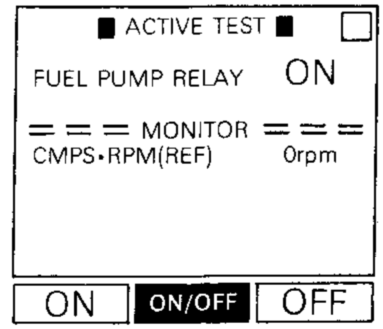
| 7 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F23, M32
- Harness connectors M1, E1
- Harness for open or short between ECM and fuel pump relay

| | |
|---|---|
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK COMPONENT |
|---|---|

**With CONSULT**
(Fuel pump relay)
1. Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.




MEF309F

**Without CONSULT**
(Fuel pump relay)
Refer to "Component Inspection", EC-444.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace fuel pump relay. |

| 9 | CHECK COMPONENT |
|---|---|

(Fuel pump)
Refer to "Component Inspection", EC-444.

**OK or NG**

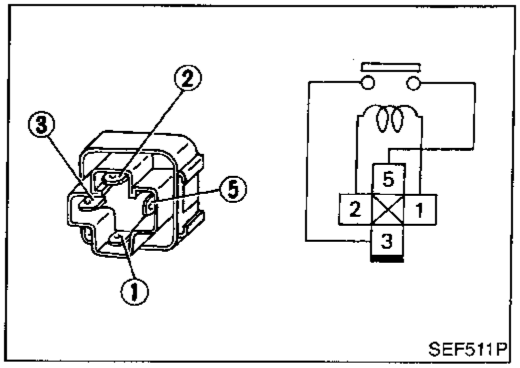
| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace fuel pump. |

| 10 | CHECK INTERMITTENT INCIDENT |
|---|---|

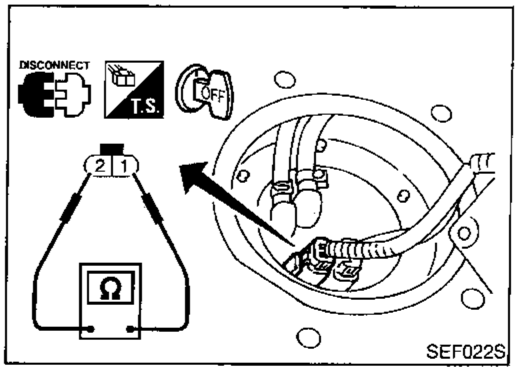
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | |
|---|---|
| ▶ | INSPECTION END |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX



SEF511P



SEF022S

## Component Inspection

NBEC0358

### FUEL PUMP RELAY

NBEC0358S01

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.

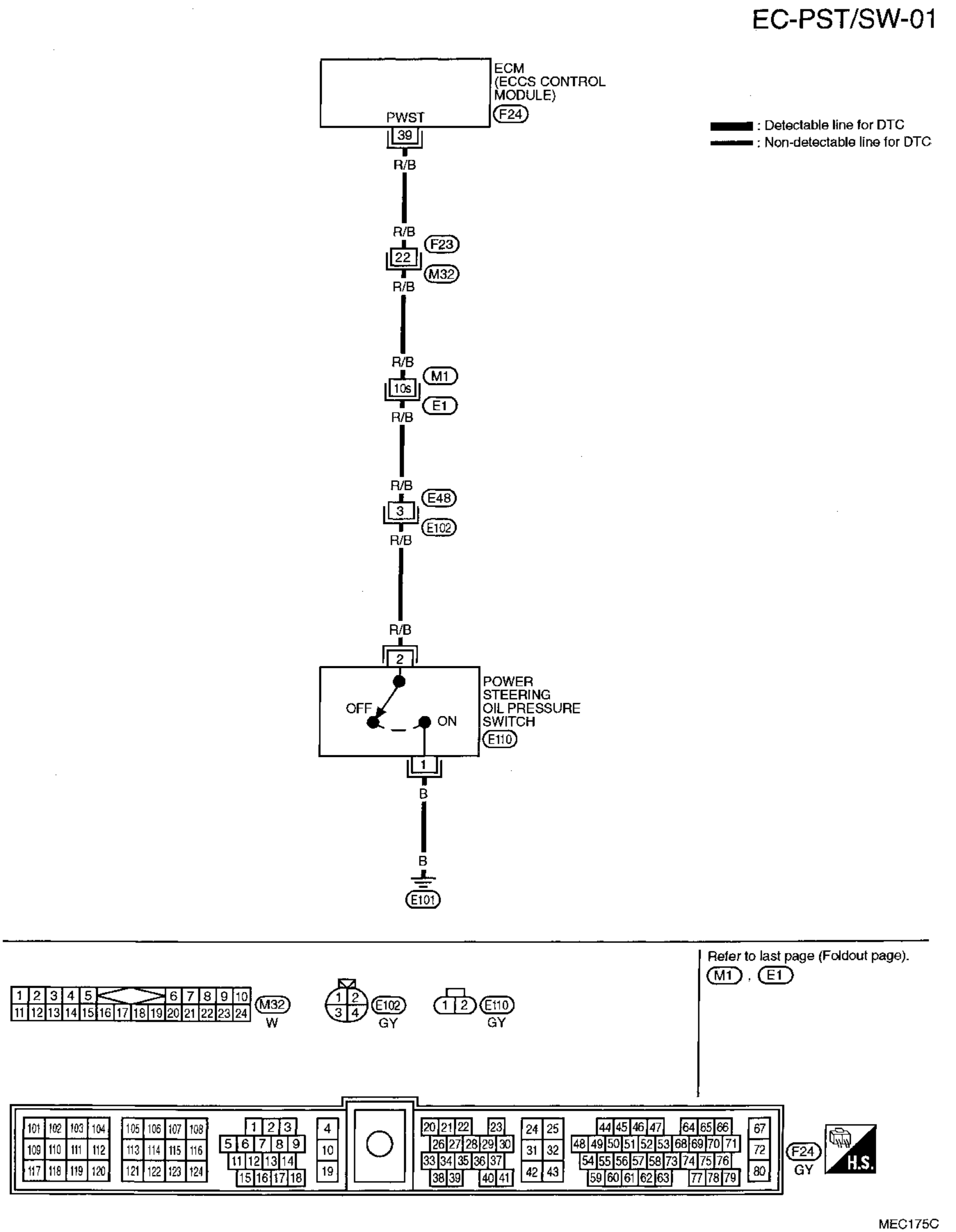
### FUEL PUMP

NBEC0358S02

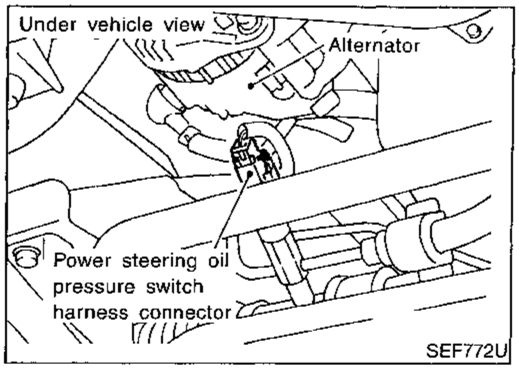
1. Disconnect fuel pump harness connector.
2. Check resistance between terminals 1 and 2.
   **Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]**
   If NG, replace fuel pump.

## Wiring Diagram

NBEC0359




GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX




## Component Description

NBEC0360

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

NBEC0361

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| PW/ST SIGNAL | • Engine: After warming up, idle the engine | Steering wheel in neutral position (forward direction) | OFF |
| | | The steering wheel is fully turned. | ON |

## ECM Terminals and Reference Value

NBEC0362

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 39 | R/B | Power steering oil pressure switch | **[Engine is running]**<br>• Steering wheel is being fully turned | 0V |
| | | | **[Engine is running]**<br>• Steering wheel is not being turned | Approximately 5V |

## Diagnostic Procedure

=NBEC0363

### 1 INSPECTION START

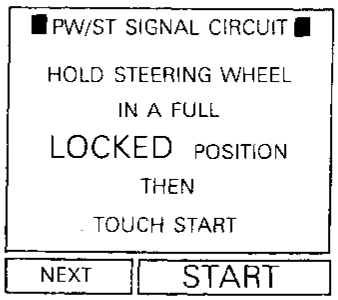
Do you have CONSULT?

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 2. |
| No | ▶ | GO TO 3. |

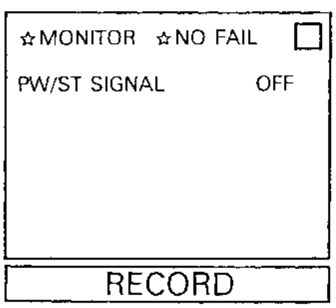
### 2 CHECK OVERALL FUNCTION

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




MEF023E

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



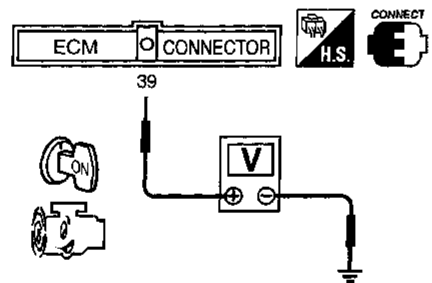

SEF591I

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 4. |

### 3 CHECK OVERALL FUNCTION

**Without CONSULT**
1. Start engine.
2. Check voltage between ECM terminal 39 and ground.
   **Voltage:**
   **When steering wheel is turned quickly.**
   **Approximately 0V**
   **Except above**
   **Approximately 5V**



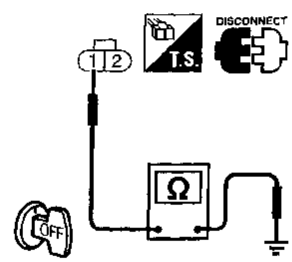

SEF739U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 4. |

### 4 CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between terminal 1 and engine ground.
   **Continuity should exist.**




SEF740U

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

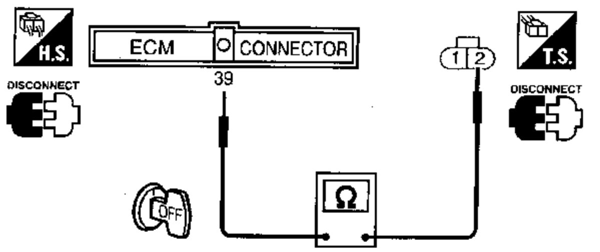
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

| 5 | CHECK INPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 39 and terminal 2.
   **Continuity should exist.**




SEF741U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

| 6 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F23, M32
- Harness connectors M1, E1
- Harness connectors E48, E102
- Harness for open or short between ECM and power steering oil pressure switch

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK COMPONENT |
|---|---|

(Power steering oil pressure switch)
Refer to "Component Inspection", EC-448.

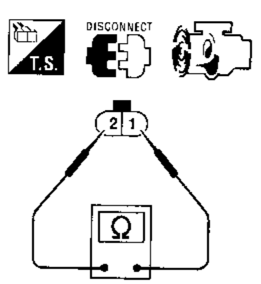
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace power steering oil pressure switch. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |




AEC762

## Component Inspection

NBEC0364

### POWER STEERING OIL PRESSURE SWITCH

NBEC0364S01

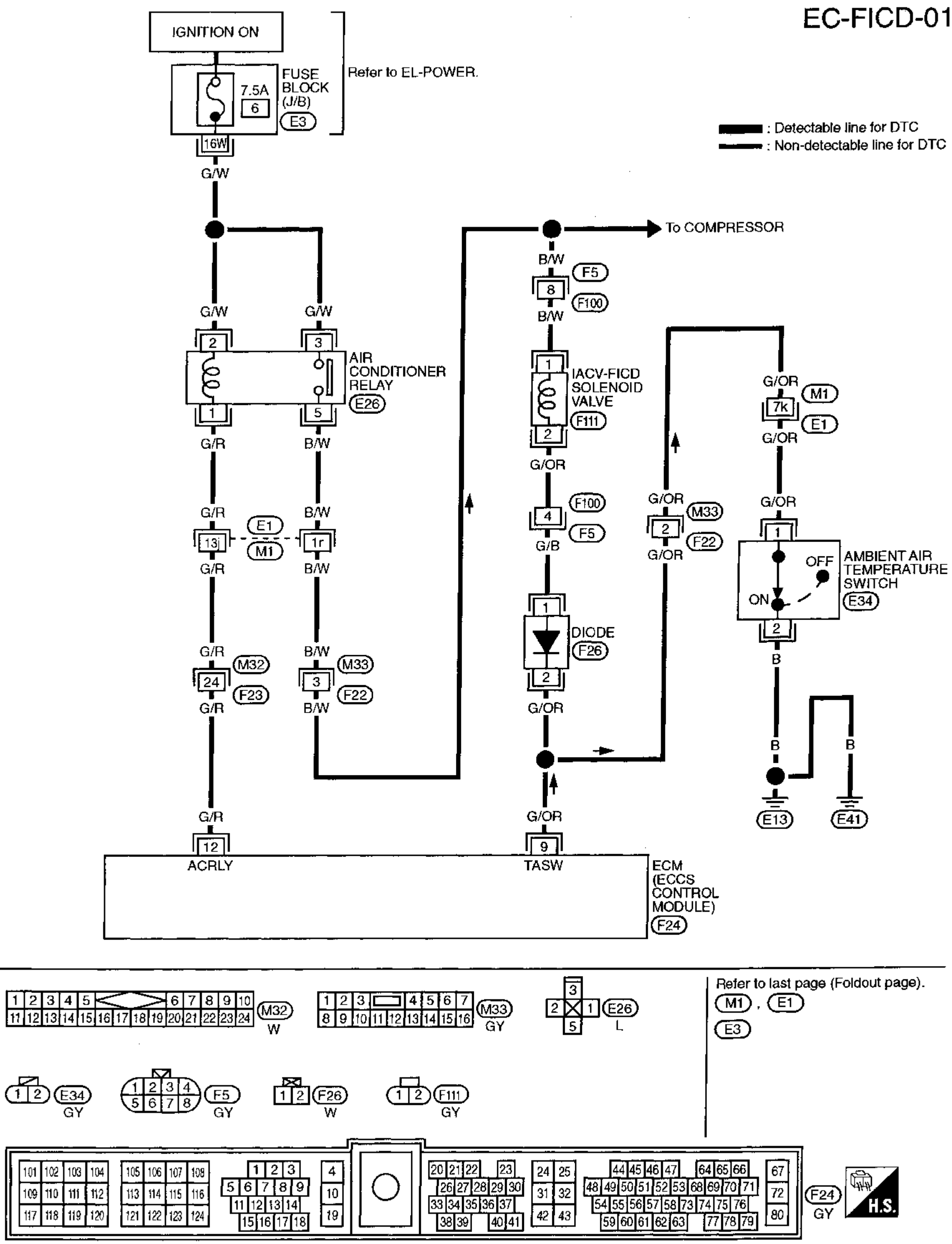
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals 1 and 2.

| Conditions | Continuity |
|---|---|
| Steering wheel is being fully turned | Yes |
| Steering wheel is not being turned | No |

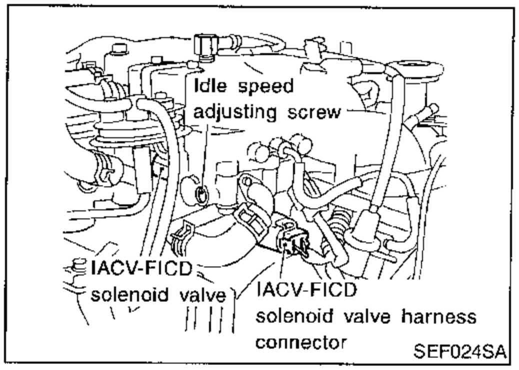
If NG, replace power steering oil pressure switch.

## Wiring Diagram

NBEC0365




MEC176C




## Component Description

NBEC0366

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

NBEC0367

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 9 | G/OR | Ambient air temperature switch | **[Engine is running]**<br>● Idle speed<br>● Ambient air temperature is above 23.5°C (74°F)<br>● Air conditioner is operating | 0V |
| | | | **[Engine is running]**<br>● Idle speed<br>● Ambient air temperature is below 23.5°C (74°F)<br>● Air conditioner is operating | BATTERY VOLTAGE (11 - 14V) |
| | | | **[Engine is running]**<br>● Idle speed<br>● Ambient air temperature is below 23.5°C (74°F)<br>● Air conditioner is not operating | Approximately 5V |
| 12 | G/R | Air conditioner relay | **[Engine is running]**<br>● Both A/C switch and blower fan switch are "ON"* | 0 - 1V |
| | | | **[Engine is running]**<br>● A/C switch is "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 21 | B/W | Air conditioner switch | **[Engine is running]**<br>● Both A/C switch and blower fan switch are "ON" (Compressor operates)* | Approximately 0V |
| | | | **[Engine is running]**<br>● Air conditioner switch is "OFF" | Approximately 5V |

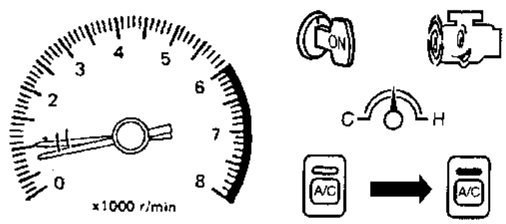
*: Any mode except "OFF", ambient air temperature is above 23.5°C (74°F).

## Diagnostic Procedure

=NBEC0368

| 1 | CHECK OVERALL FUNCTION |
|---|---|

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   **750±50 rpm (in "N" position)**
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch "ON".
4. Recheck idle speed.
   **800 rpm or more (in "N" position)**




SEF742U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | INSPECTION END |
| NG | ▶ | GO TO 2. |

| 2 | CHECK AIR CONDITIONER FUNCTION |
|---|---|

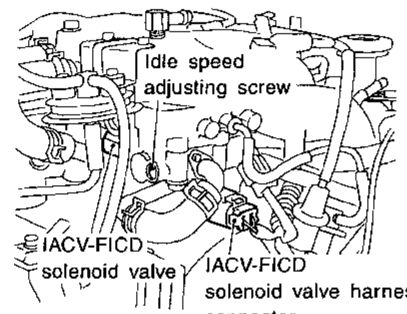
Check if air conditioner compressor functions normally.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Refer to HA section ("TROUBLE DIAGNOSES"). |

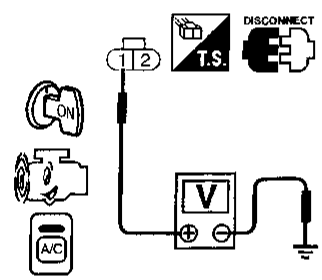
| 3 | CHECK POWER SUPPLY |
|---|---|

1. Turn air conditioner switch and blower fan switch "OFF".
2. Stop engine.
3. Disconnect IACV-FICD solenoid valve harness connector.




SEF024SA

4. Start engine, then turn air conditioner switch and blower fan switch "ON".
5. Check voltage between terminal 1 and ground with CONSULT or tester.
   **Voltage: Battery voltage**




SEF743U

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

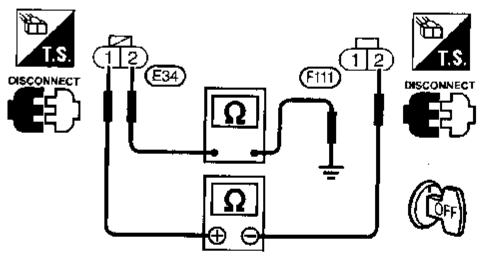
| 4 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F5, F100
- Harness for open or short between IACV-FICD solenoid valve and harness connector F22

| | | |
|---|---|---|
| | ▶ | Repair harness or connectors. |

| 5 | CHECK GROUND CIRCUIT |
|---|---|

1. Stop engine.
2. Disconnect ambient air temperature switch harness connector.
3. Check harness continuity between switch terminal 2 and body ground, switch terminal 1 and solenoid valve terminal 2.
**Continuity should exist.**



SEF744U

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

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

| 6 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F100, F5
- Harness connectors F22, M33
- Harness connectors M1, E1
- Diode F26
- Harness for open or short between IACV-FICD solenoid valve and ambient air temperature switch
- Harness for open or short between ambient air temperature switch and ground

| | | |
|---|---|---|
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK COMPONENT |
|---|---|

(Ambient air temperature switch)
Refer to HA section.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace Ambient air temperature switch. |

| 8 | CHECK COMPONENT |
|---|---|

(IACV-FICD solenoid valve)
Refer to "Component Inspection", EC-452.

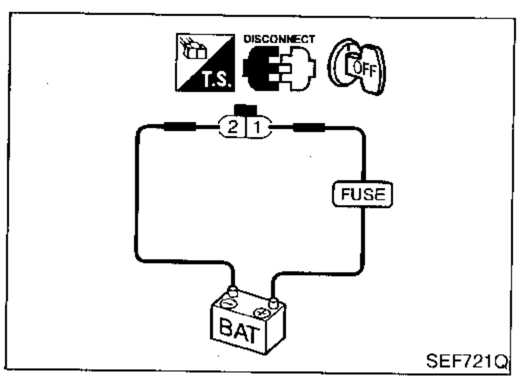
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Replace IACV-FICD solenoid valve. |

| 9 | CHECK INTERMITTENT INCIDENT |
|---|---|

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-107.

| | | |
|---|---|---|
| | ▶ | INSPECTION END |



SEF721Q

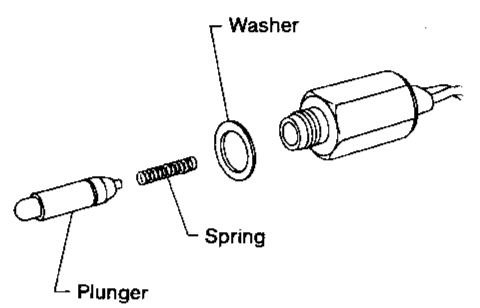
## Component Inspection

NBEC0369

### IACV-FICD SOLENOID VALVE

NBEC0369S01

Disconnect IACV-FICD solenoid valve harness connector.
- Check for clicking sound when applying 12V direct current to terminals.



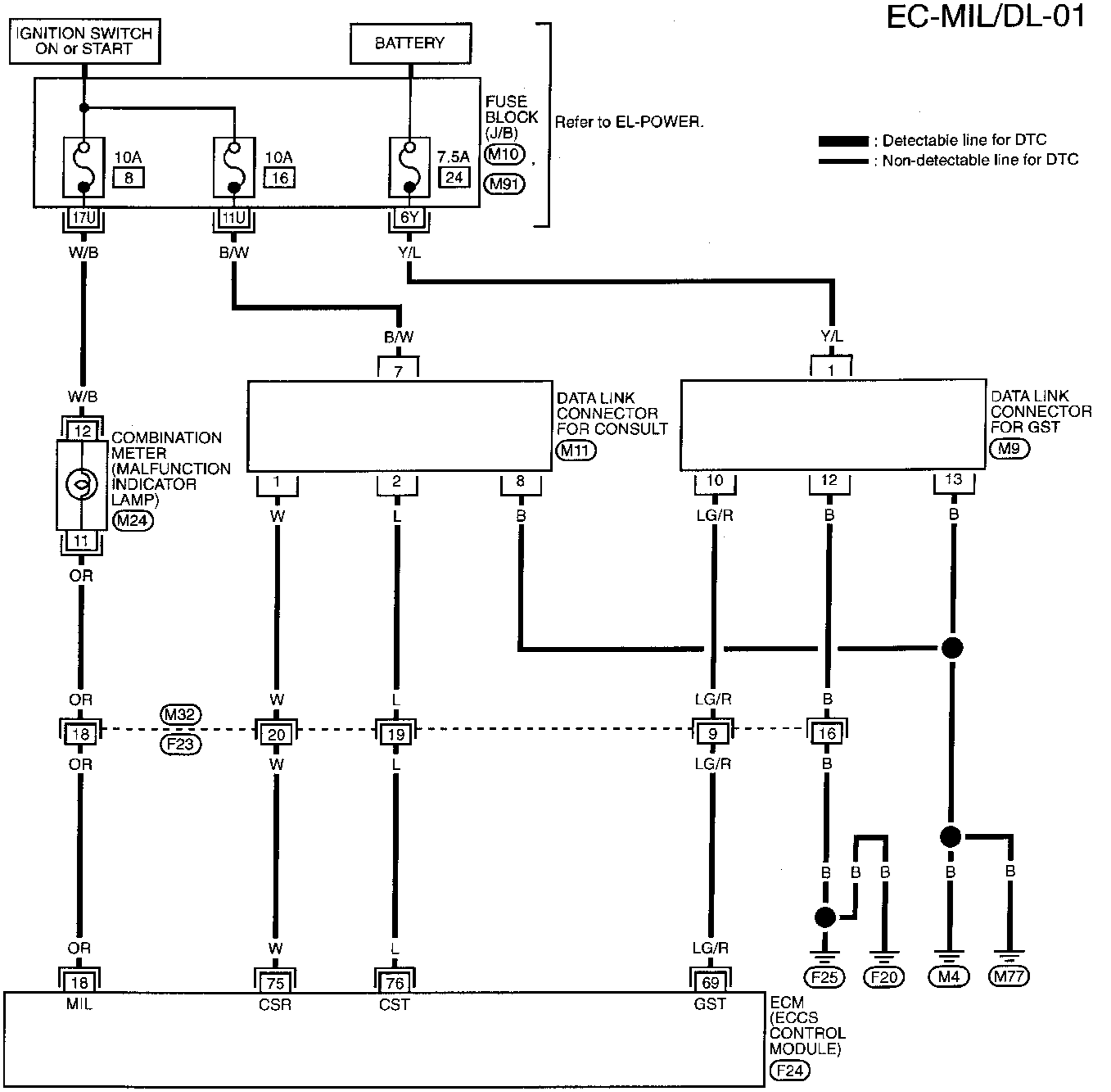

SEF097K

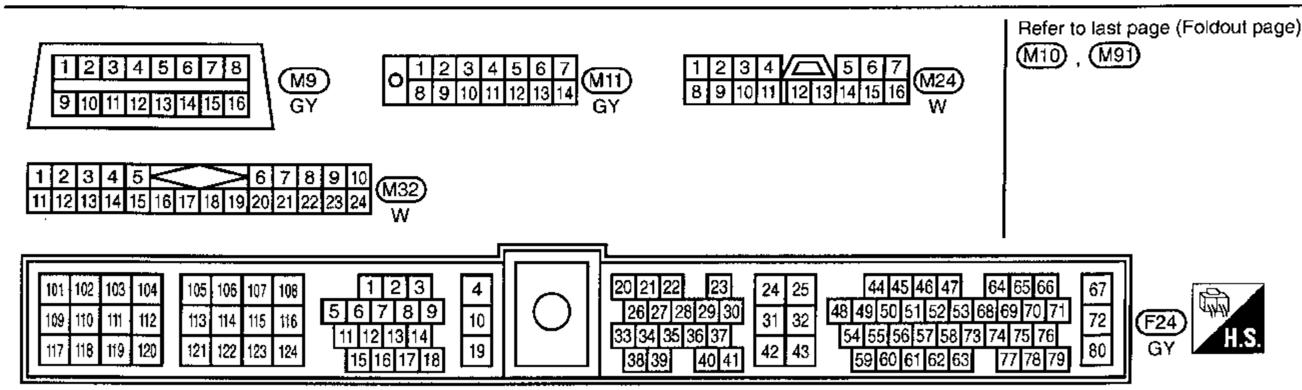
- Check plunger for seizing or sticking.
- Check for broken spring.

## Wiring Diagram

NBEC0370

EC-MIL/DL-01




MEC177C

## Fuel Pressure Regulator

NBEC0371

| | | |
|---|---|---|
| Fuel pressure at idling kPa (kg/cm², psi) | | |
| | Vacuum hose is connected | Approximately 235 (2.4, 34) |
| | Vacuum hose is disconnected | Approximately 294 (3.0, 43) |

GI MA EM LC EC FE AT TF PD AX SU BR ST RS BT HA SC EL IDX

## Idle Speed and Ignition Timing

NBEC0372

| | | |
|---|---|---|
| Idle speed*1 rpm | No-load*2 (in "N" position) | 750±50 (700*3) |
| | Air conditioner: ON (in "N" position) | 850 or more |
| Ignition timing | | 15°±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 & rear defogger)
- Steering wheel: Kept in straight-ahead position

*3: Disconnect throttle position sensor

## Ignition Coil

NBEC0373

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

## Mass Air Flow Sensor

NBEC0374

| | |
|---|---|
| Supply voltage | Battery voltage (11 - 14)V |
| Output voltage at idle | 1.0 - 1.7*V |
| Mass air flow (Using CONSULT or GST) | 3.3 - 4.8 g·m/sec at idle*<br>12.0 - 14.9 g·m/sec at 2,500 rpm* |

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

## Engine Coolant Temperature Sensor

NBEC0375

| 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

NBEC0376

| 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 |

## Front Heated Oxygen Sensor Heater

NBEC0377

| | |
|---|---|
| Resistance [at 25°C (77°F)] | 2.3 - 4.3Ω |

## Fuel Pump

NBEC0378

| | |
|---|---|
| Resistance [at 25°C (77°F)] | 0.2 - 5.0Ω |

## IACV-AAC Valve

NBEC0379

| | |
|---|---|
| Resistance [at 20°C (68°F)] | Approximately 10.0Ω |

## Injector

NBEC0380

| | |
|---|---|
| Resistance [at 25°C (77°F)] | 10 - 14Ω |

## Resistor

NBEC0381

| | |
|---|---|
| Resistance [at 25°C (77°F)] | Approximately 2.2 kΩ |

## Throttle Position Sensor

NBEC0382

| 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 |

## Calculated Load Value

NBEC0383

| | Calculated load value % (Using CONSULT or GST) |
|---|---|
| At idle | 18.0 - 26.0 |
| At 2,500 rpm | 18.0 - 21.0 |

## Intake Air Temperature Sensor

NBEC0384

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

## Rear Heated Oxygen Sensor Heater

NBEC0385

| | |
|---|---|
| Resistance [at 25°C (77°F)] | 2.3 - 4.3Ω |

## Crankshaft Position Sensor (OBD)

NBEC0386

| | |
|---|---|
| Resistance [at 20°C (68°F)] | 166.5 - 203.5Ω |

## Tank Fuel Temperature Sensor

NBEC0521

| Temperature °C (°F) | Resistance kΩ |
|---|---|
| 20 (68) | 2.3 - 2.7 |
| 50 (122) | 0.79 - 0.90 |