

### **ENGINE CONTROL SYSTEM**

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| EGRC-BPT VALVE               | 0306         | P0402            | EC-355         |  |  |  |
| ENGINE SPEED SIG*4           | 1207         | P0725            | AT-115         |  |  |  |
| EVAP GROSS LEAK              | 0715         | P0455            | EC-398         |  |  |  |
| EVAP PURG FLOW/MON           | 0111         | P1447            | EC-507         |  |  |  |
|                              | <del>-</del> |                  | <del>-</del>   |  |  |  |

### TROUBLE DIAGNOSIS — INDEX

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

|                                      | D.         |                  | -               |   |
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| Items (CONSULT screen terms)         | ECM*1      | CONSULT<br>GST*2 | Reference page  |   |
| EVAP SYS PRES SEN                    | 0704       | P0450            | EC-388          | _ |
| EVAP SMALL LEAK                      | 0705       | P0440            | EC-364          | _ |
| EVAP SMALL LEAK                      | 0213       | P1440            | EC-483          | _ |
| FR O2 SE HEATER-B1                   | 0901       | P0135            | EC-244          | _ |
| FR O2 SE HEATER-B2                   | 1001       | P0155            | EC-244          | _ |
| FRONT O2 SENSOR-B1                   | 0503       | P0130            | EC-200          | - |
| FRONT O2 SENSOR-B1                   | 0415       | P0131            | EC-209          | - |
| FRONT O2 SENSOR-B1                   | 0414       | P0132            | EC-216          | - |
| FRONT O2 SENSOR-B1                   | 0413       | P0133            | EC-224          | _ |
| FRONT O2 SENSOR-B1                   | 0509       | P0134            | EC-235          | _ |
| FRONT O2 SENSOR-B2                   | 0303       | P0150            | EC-200          | _ |
| FRONT O2 SENSOR-B2                   | 0411       | P0151            | EC-209          | _ |
| FRONT O2 SENSOR-B2                   | 0410       | P0152            | EC-216          | _ |
| FRONT O2 SENSOR-B2                   | 0409       | P0153            | EC-224          | _ |
| FRONT O2 SENSOR-B2                   | 0412       | P0154            | EC-235          | _ |
| FUEL SYS LEAN/BK1                    | 0115       | P0171            | EC-294          | _ |
| FUEL SYS LEAN/BK2                    | 0210       | P0174            | EC-294          | _ |
| FUEL SYS RICH/BK1                    | 0114       | P0172            | EC-303          | _ |
| FUEL SYS RICH/BK2                    | 0209       | P0175            | EC-303          | _ |
| FUEL TEMP SEN/CIRC                   | 0402       | P0180            | EC-311          | _ |
| IACV/AAC VLV/CIRC                    | 0205       | P0505            | EC-413          | _ |
| IGN SIGNAL-PRIMARY                   | 0201       | P1320            | EC-451          | _ |
| KNOCK SENSOR                         | 0304       | P0325            | EC-324          | _ |
| L/PRES SOL/CIRC                      | 1205       | P0745            | AT-161          | _ |
| MAP/BARO SW SOL/CIRC                 | 1302       | P1105            | EC-435          |   |
| MAF SEN/CIRCUIT*3                    | 0102       | P0100            | EC-146          | _ |
| MULTI CYL MISFIRE                    | 0701       | P0300            | EC-317          |   |
| NATS MALFUNCTION                     | _          | _                | EC-74 or EL-284 | _ |
| NO SELF DIAGNOSTIC FAILURE INDICATED | 0505       | P0000            | _               | _ |
| NO SELF DIAGNOSTIC FAILURE INDICATED | Flashing*5 | No DTC           | EC-71           | _ |
| OVER HEAT                            | 0208       | _                | LC-17           | _ |
| O/L CLTCH S/CIRC                     | 1203       | P1760            | AT-184          | _ |
| P-N POS SW/CIRCUIT                   | 1003       | P1706            | EC-542          | _ |
| PNP SW/CIRC                          | 1101       | P0705            | AT-99           | _ |
| PURG VOLUME CONT/V                   | 1008       | P0443            | EC-374          | _ |
| PURG VOLUME CONT/V                   | 0214       | P1444            | EC-493          |   |



| Harra                        | DTC*6 |                  |                |
|------------------------------|-------|------------------|----------------|
| Items (CONSULT screen terms) | ECM*1 | CONSULT<br>GST*2 | Reference page |
| REAR O2 SENSOR-B1            | 0511  | P0137            | EC-251         |
| REAR O2 SENSOR-B1            | 0510  | P0138            | EC-260         |
| REAR O2 SENSOR-B1            | 0707  | P0139            | EC-269         |
| REAR O2 SENSOR-B1            | 0512  | P0140            | EC-278         |
| REAR O2 SENSOR-B2            | 0314  | P0157            | EC-251         |
| REAR O2 SENSOR-B2            | 0313  | P0158            | EC-260         |
| REAR O2 SENSOR-B2            | 0708  | P0159            | EC-269         |
| REAR O2 SENSOR-B2            | 0315  | P0160            | EC-278         |
| RR O2 SE HEATER-B1           | 0902  | P0141            | EC-287         |
| RR O2 SE HEATER-B2           | 1002  | P0161            | EC-287         |
| SFT SOL A/CIRC*3             | 1108  | P0750            | AT-167         |
| SFT SOL B/CIRC*3             | 1201  | P0755            | AT-171         |
| TCC SOLENOID/CIRC            | 1204  | P0740            | AT-147         |
| TP SEN/CIRC A/T*3            | 1206  | P1705            | AT-175         |
| TRTL POS SEN/CIRC*3          | 0403  | P0120            | EC-181         |
| TW CATALYST SYS-B1           | 0702  | P0420            | EC-360         |
| TW CATALYST SYS-B2           | 0703  | P0430            | EC-360         |
| VC CUT/V BYPASS/V            | 0311  | P1491            | EC-529         |
| VC/V BYPASS/V                | 0801  | P1490            | EC-522         |
| VEH SPEED SEN/CIRC           | 0104  | P0500            | EC-408         |
| VEH SPD SEN/CIRC*4           | 1102  | P0720            | AT-110         |
| VENT CONTROL VALVE           | 0903  | P0446            | EC-381         |
| VENT CONTROL VALVE           | 0215  | P1446            | EC-501         |
| VENT CONTROL VALVE           | 0309  | P1448            | EC-515         |

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

#### NOTE:

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

#### P NO. INDEX FOR DTC

NBEC0001S02

| DTC*6            |       | ltems                  |                 |  |
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| CONSULT<br>GST*2 | ECM*1 | (CONSULT screen terms) | Reference page  |  |
| _                | _     | Unable to access ECM   | EC-117          |  |
| _                | _     | NATS MALFUNCTION       | EC-74 or EL-284 |  |

<sup>\*2:</sup> These numbers are prescribed by SAE J2012.

<sup>\*3:</sup> When the fail-safe operation occurs, the MIL illuminates.

<sup>\*4:</sup> The MIL illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

<sup>\*5:</sup> While engine is running.

<sup>\*6: 1</sup>st trip DTC No. is the same as DTC No.

### TROUBLE DIAGNOSIS — INDEX



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

| DTC*6            |            | Itomo                                |                |   |  |
|------------------|------------|--------------------------------------|----------------|---|--|
| CONSULT<br>GST*2 | ECM*1      | Items (CONSULT screen terms)         | Reference page |   |  |
| No DTC           | Flashing*5 | NO SELF DIAGNOSTIC FAILURE INDICATED | EC-71          | _ |  |
| P0000            | 0505       | NO SELF DIAGNOSTIC FAILURE INDICATED | _              | _ |  |
| P0100            | 0102       | MAF SEN/CIRCUIT*3                    | EC-146         | _ |  |
| P0105            | 0803       | ABSL PRES SEN/CIRC                   | EC-156         | _ |  |
| P0110            | 0401       | AIR TEMP SEN/CIRC                    | EC-168         | _ |  |
| P0115            | 0103       | COOLANT T SEN/CIRC*3                 | EC-175         | _ |  |
| P0120            | 0403       | THRTL POS SEN/CIRC*3                 | EC-181         | _ |  |
| P0125            | 0908       | *COOLANT T SEN/CIRC                  | EC-194         | _ |  |
| P0130            | 0503       | FRONT O2 SENSOR-B1                   | EC-200         | _ |  |
| P0131            | 0415       | FRONT O2 SENSOR-B1                   | EC-209         | _ |  |
| P0132            | 0414       | FRONT O2 SENSOR-B1                   | EC-216         | _ |  |
| P0133            | 0413       | FRONT O2 SENSOR-B1                   | EC-224         | _ |  |
| P0134            | 0509       | FRONT O2 SENSOR-B1                   | EC-235         | _ |  |
| P0135            | 0901       | FR O2 SE HEATER-B1                   | EC-244         | _ |  |
| P0137            | 0511       | REAR O2 SENSOR-B1                    | EC-251         | _ |  |
| P0138            | 0510       | REAR O2 SENSOR-B1                    | EC-260         | _ |  |
| P0139            | 0707       | REAR O2 SENSOR-B1                    | EC-269         | _ |  |
| P0140            | 0512       | REAR O2 SENSOR-B1                    | EC-278         | _ |  |
| P0141            | 0902       | RR O2 SE HEATER-B1                   | EC-287         | _ |  |
| P0150            | 0303       | FRONT O2 SENSOR-B2                   | EC-200         | _ |  |
| P0151            | 0411       | FRONT O2 SENSOR-B2                   | EC-209         | _ |  |
| P0152            | 0410       | FRONT O2 SENSOR-B2                   | EC-216         | _ |  |
| P0153            | 0409       | FRONT O2 SENSOR-B2                   | EC-224         | _ |  |
| P0154            | 0412       | FRONT O2 SENSOR-B2                   | EC-235         | _ |  |
| P0155            | 1001       | FR O2 SE HEATER-B2                   | EC-244         | _ |  |
| P0157            | 0314       | REAR O2 SENSOR-B2                    | EC-251         | _ |  |
| P0158            | 0313       | REAR O2 SENSOR-B2                    | EC-260         | _ |  |
| P0159            | 0708       | REAR O2 SENSOR-B2                    | EC-269         | _ |  |
| P0160            | 0315       | REAR O2 SENSOR-B2                    | EC-278         | _ |  |
| P0161            | 1002       | RR O2 SE HEATER-B2                   | EC-287         | _ |  |
| P0171            | 0115       | FUEL SYS LEAN/BK1                    | EC-294         | _ |  |
| P0172            | 0114       | FUEL SYS RICH/BK1                    | EC-303         | _ |  |
| P0174            | 0210       | FUEL SYS LEAN/BK2                    | EC-294         | _ |  |
| P0175            | 0209       | FUEL SYS RICH/BK2                    | EC-303         | _ |  |
| P0180            | 0402       | FUEL TEMP SEN/CIRC                   | EC-311         | _ |  |
| P0300            | 0701       | MULTI CYL MISFIRE                    | EC-317         | _ |  |

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| DTC              | C*6   | Items                  |                |
|------------------|-------|------------------------|----------------|
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| P0301            | 0608  | CYL 1 MISFIRE          | EC-317         |
| P0302            | 0607  | CYL 2 MISFIRE          | EC-317         |
| P0303            | 0606  | CYL 3 MISFIRE          | EC-317         |
| P0304            | 0605  | CYL 4 MISFIRE          | EC-317         |
| P0305            | 0604  | CYL 5 MISFIRE          | EC-317         |
| P0306            | 0603  | CYL 6 MISFIRE          | EC-317         |
| P0325            | 0304  | KNOCK SENSOR           | EC-324         |
| P0335            | 0802  | CPS/CIRCUIT (OBD)      | EC-330         |
| P0340            | 0101  | CAM POS SEN/CIRC       | EC-336         |
| P0400            | 0302  | EGR SYSTEM             | EC-344         |
| P0402            | 0306  | EGRC-BPT VALVE         | EC-355         |
| P0420            | 0702  | TW CATALYST SYS-B1     | EC-360         |
| P0430            | 0703  | TW CATALYST SYS-B2     | EC-360         |
| P0440            | 0705  | EVAP SMALL LEAK        | EC-364         |
| P0443            | 1008  | PURG VOLUME CONT/V     | EC-374         |
| P0446            | 0903  | VENT CONTROL VALVE     | EC-381         |
| P0450            | 0704  | EVAP SYS PRES SEN      | EC-388         |
| P0455            | 0715  | EVAP GROSS LEAK        | EC-398         |
| P0500            | 0104  | VEH SPEED SEN/CIRC     | EC-408         |
| P0505            | 0205  | IACV/AAC VLV/CIRC      | EC-413         |
| P0510            | 0203  | CLOSED TP SW/CIRC      | EC-421         |
| P0600            | _     | A/T COMM LINE          | EC-428         |
| P0605            | 0301  | ECM                    | EC-433         |
| P0705            | 1101  | PNP SW/CIRC            | AT-99          |
| P0710            | 1208  | ATF TEMP SEN/CIRC      | AT-105         |
| P0720            | 1102  | VEH SPD SEN/CIRC A/T*4 | AT-110         |
| P0725            | 1207  | ENGINE SPEED SIG*4     | AT-115         |
| P0731            | 1103  | A/T 1ST GR FNCTN       | AT-119         |
| P0732            | 1104  | A/T 2ND GR FNCTN       | AT-125         |
| P0733            | 1105  | A/T 3RD GR FNCTN       | AT-131         |
| P0734            | 1106  | A/T 4TH GR FNCTN       | AT-137         |
| P0740            | 1204  | TCC SOLENOID/CIRC      | AT-147         |
| P0744            | 1107  | A/T TCC S/V FNCTN      | AT-152         |
| P0745            | 1205  | L/PRESS SOL/CIRC       | AT-161         |
| P0750            | 1108  | SFT SOL A/CIRC*3       | AT-167         |
| P0755            | 1201  | SFT SOL B/CIRC*3       | AT-171         |

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|   |                | Items                  | DTC*6 |                  |
|---|----------------|------------------------|-------|------------------|
| ( | Reference page | (CONSULT screen terms) | ECM*1 | CONSULT<br>GST*2 |
|   | EC-435         | MAP/BARO SW SOL/CIRC   | 1302  | P1105            |
| _ | EC-449         | CLOSED LOOP-B1         | 0307  | P1148            |
|   | EC-449         | CLOSED LOOP-B2         | 0308  | P1168            |
| _ | EC-451         | IGN SIGNAL-PRIMARY     | 0201  | P1320            |
|   | EC-458         | CPS/CIRC (OBD) COG     | 0905  | P1336            |
| _ | EC-464         | EGRC SOLENOID/V        | 1005  | P1400            |
| _ | EC-469         | EGR TEMP SEN/CIRC      | 0305  | P1401            |
|   | EC-475         | EGR SYSTEM             | 0514  | P1402            |
|   | EC-483         | EVAP SMALL LEAK        | 0213  | P1440            |
| _ | EC-493         | PURG VOLUME CONT/V     | 0214  | P1444            |
|   | EC-501         | VENT CONTROL VALVE     | 0215  | P1446            |
| _ | EC-507         | EVAP PURG FLOW/MON     | 0111  | P1447            |
| _ | EC-515         | VENT CONTROL VALVE     | 0309  | P1448            |
| _ | EC-522         | VC/V BYPASS/V          | 0801  | P1490            |
|   | EC-529         | VC CUT/V BYPASS/V      | 0311  | P1491            |
| _ | EC-537         | A/T DIAG COMM LINE     | 0804  | P1605            |
| _ | AT-175         | TP SEN/CIRC A/T*3      | 1206  | P1705            |
|   | EC-542         | P-N POS SW/CIRCUIT     | 1003  | P1706            |
| _ | AT-184         | O/R CLUTCH SOL/CIRC    | 1203  | P1760            |
|   | LC-17          | OVER HEAT              | 0208  | _                |

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

#### NOTE:

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

IDX

ST

RS

BT

HA

SC

EL

<sup>\*2:</sup> These numbers are prescribed by SAE J2012.

<sup>\*3:</sup> When the fail-safe operation occurs, the MIL illuminates.

<sup>\*4:</sup> The MIL illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

<sup>\*5:</sup> While engine is running.

<sup>\*6: 1</sup>st trip DTC No. is the same as DTC No.

#### **PRECAUTIONS**



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

IBEC00

The Supplemental Restraint System such as "AIR BAG" and "SEAT BELT PRE-TENSIONER" used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. The SRS system composition which is available to INFINITI QX4 is as follows.

- For a frontal collision
  - The Supplemental Restraint System consists of driver air bag module (located in the center of the steering wheel), front passenger air bag module (located on the instrument panel on passenger side), seat belt pre-tensioners, a diagnosis sensor unit, warning lamp, wiring harness and spiral cable.
- For a side collision
  - The Supplemental Restraint System consists of side air bag module (located in the outer side of front seat), satellite sensor, diagnosis sensor unit (one of components of air bags for a frontal collision), wiring harness, warning lamp (one of components of air bags for a frontal collision).

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. For removal of Spiral Cable and Air Bag Module, RS-18.
- Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.

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

NBEC0003

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

#### **CAUTION:**

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



### **Engine Fuel & Emission Control System**

NBEC0004

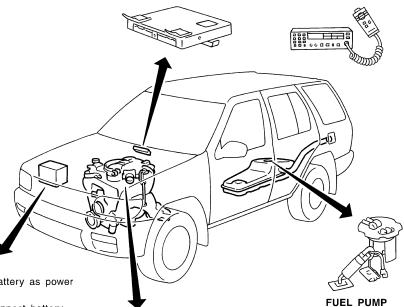
#### **ECM**

- 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

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



#### **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).



- 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.

SFF952RF

GI

MA

























HA

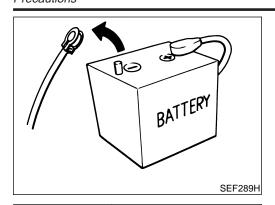






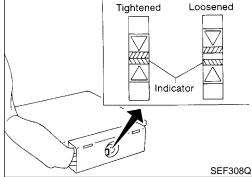
#### **PRECAUTIONS**





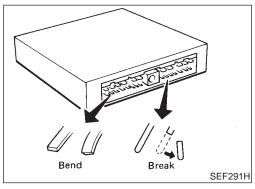
#### **Precautions**

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



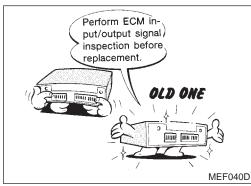
 When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.

2 : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



 When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.



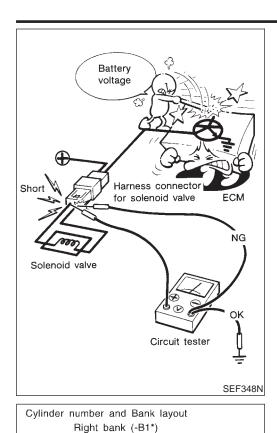
Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-127.



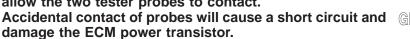
 After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".

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.





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



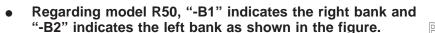
Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



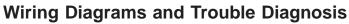
LC

EC

AT



AX



When you read Wiring diagrams, refer to the following:

GI-11, "HOW TO READ WIRING DIAGRAMS"

Front

\*: CONSULT indication

EL-9, "POWER SUPPLY ROUTING" for power distribution circuit

SEF926U

Left bank (-B2\*)

When you perform trouble diagnosis, refer to the following:

Crankshaft pulley

- GI-34, "HOW TO FOLLOW TEST GROUP IN TROUBLE DIAGNOSIS"
- GI-23, "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"

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Special Service Tools

### **PREPARATION**



### **Special Service Tools**

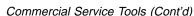
NBEC0007

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

### **Commercial Service Tools**

NBEC0008

|  |                         | NBEC0008  |
|--|-------------------------|---|
| Tool name<br>(Kent-Moore No.)                | Description             |   |
| Leak detector<br>(J41416)                    |                         | Locating the EVAP leak.   |
|  | NT703                   |   |
| EVAP service port<br>adapter<br>(J41413-OBD) |                         | Applying positive pressure through EVAP service port.   |
|  | NT704                   |   |
| Hose clipper                                 | Approx. 20 mm (0.79 in) | Clamping the EVAP purge hose between the fuel tank and EVAP canister applied to DTC P1440 [EVAP control system (small leak-positive pressure)]. |
|  |                         |   |





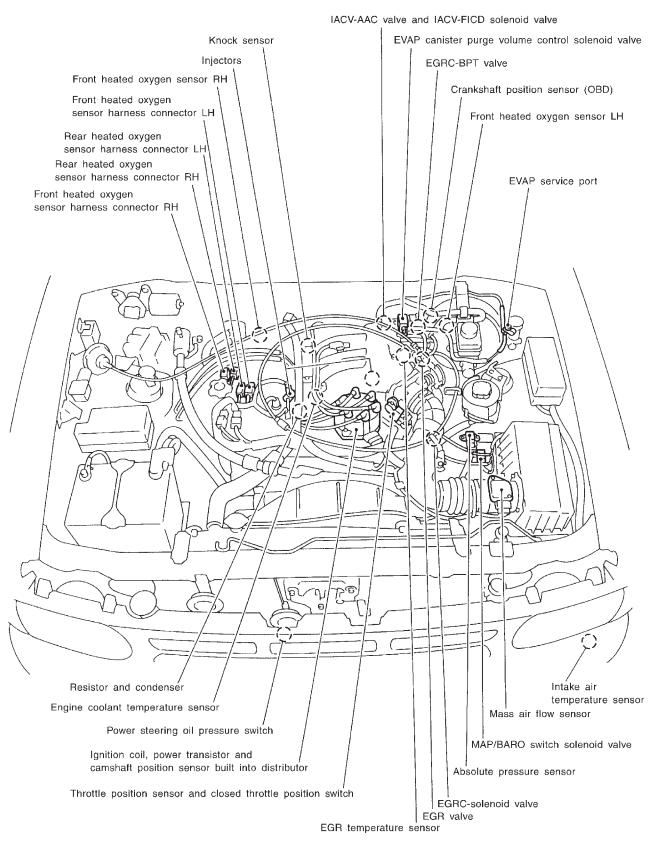
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| ool name<br>Kent-Moore No.)   | Description  |   |   |
|---|--|---|---|
| Fuel filler cap adapter   |  | Checking fuel tank vacuum relief valve opening pressure   | - |
|   |  | pressure  |   |
|   | , and the second |   |   |
|   | NT653  |   | _ |
| Socket wrench   |  | Removing and installing engine coolant temperature sensor   |   |
|   | 19 mm<br>(0.75 in) More than<br>32 mm<br>32 mm   |   |   |
|   | 32 mm<br>(1.26 in)   |   |   |
| Oxygen sensor thread<br>cleaner<br>J-43897-18)                              | a Mating b surface   | Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. | - |
| J-43897-12)   | shave cylinder   | a: J-43897-18 18 mm diameter, for Zirconia<br>Oxygen Sensor<br>b: J-43897-12 12 mm diameter, for Titania Oxy-<br>gen Sensor |   |
|   | V V  |   |   |
| Anti-seize lubricant Permatex <sup>TM</sup> 133AR or equivalent meeting MIL |  | Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.                                  | - |
| pecification MIL-A-907)   |  |   |   |
|   |  |   |   |
|   | NT779  |   | - |
|   |  |   |   |
|   |  |   |   |
|   |  |   |   |
|   |  |   |   |



### **Engine Control Component Parts Location**

IBEC0009



SEF790U

#### **ENGINE AND EMISSION CONTROL OVERALL SYSTEM**



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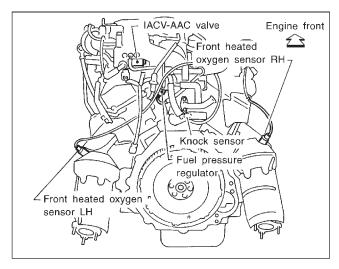
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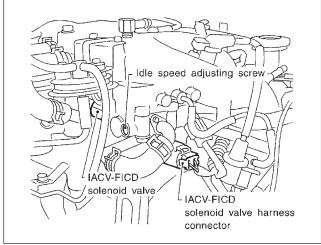
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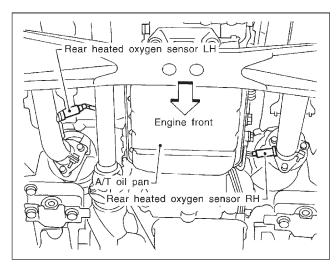
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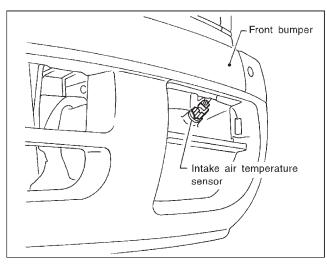
SC

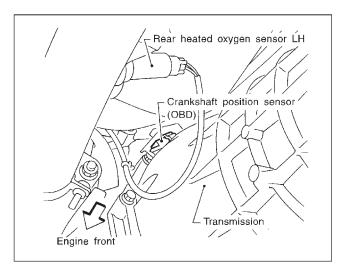
EL

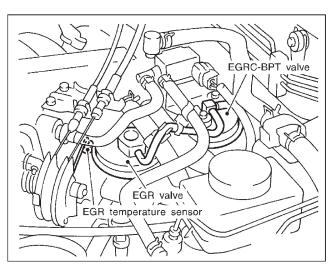






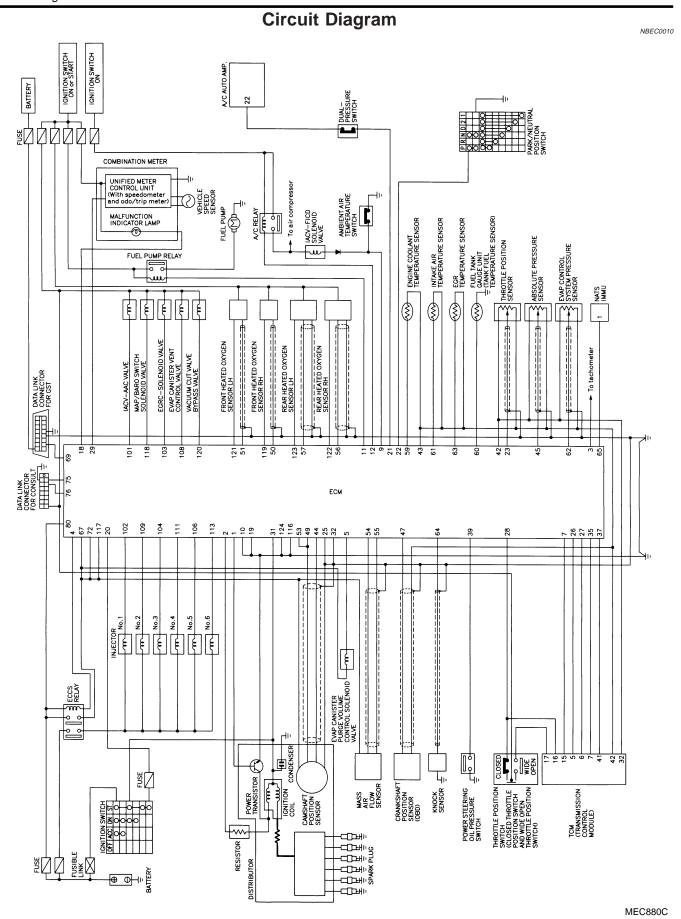




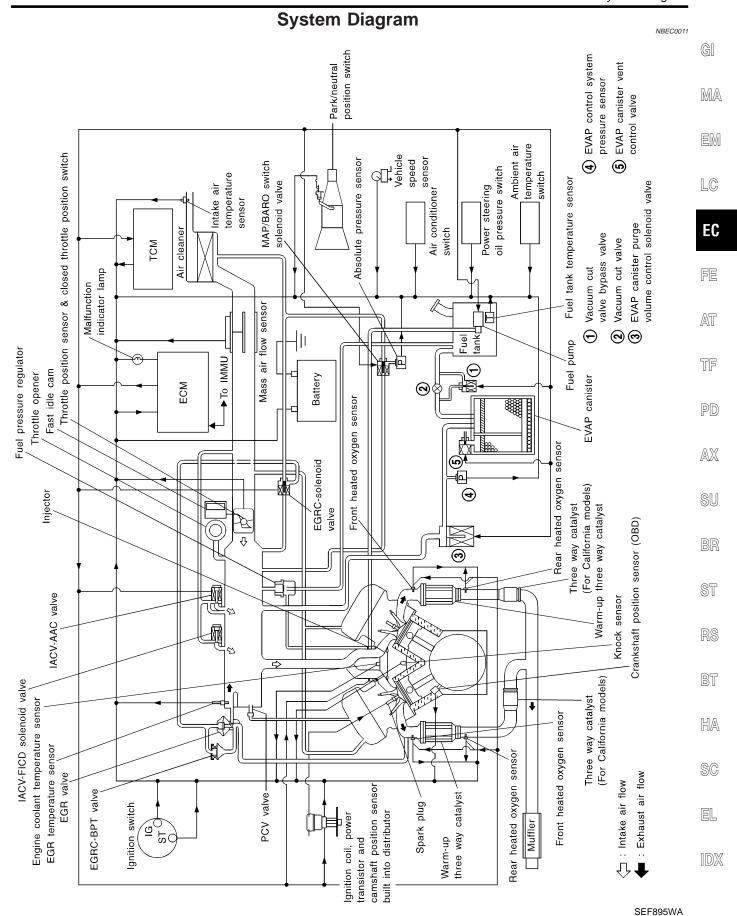


SEF791U







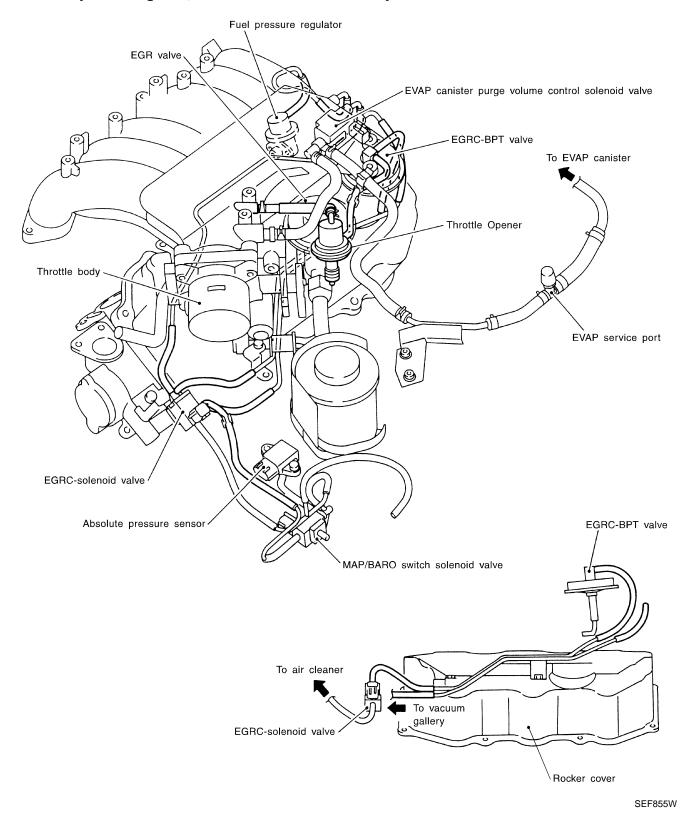




#### **Vacuum Hose Drawing**

Refer to "System Diagram", EC-23 for Vacuum Control System.

NBEC0012



#### NOTE:

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

#### **ENGINE AND EMISSION CONTROL OVERALL SYSTEM**

System Chart

| System Chart  | NBEC001:   |
|---|--|
| ECM Function  | Output (Actuator)  |
| 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 | MIL (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     Vacuum cut valve bypass valve     MAP/BARO switch solenoid valve  |
|   | ECM Function  Fuel injection & mixture ratio control  Distributor ignition system  Idle air control system  Fuel pump control  Front heated oxygen sensor monitor & on board diagnostic system  EGR control  Front heated oxygen sensor heater control  Rear heated oxygen sensor heater control  EVAP canister purge flow control  Air conditioning cut control |

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

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<sup>\*2:</sup> The DTC related to A/T will be sent to ECM.

<sup>\*3:</sup> This sensor is not used to control the engine system under normal conditions.

<sup>\*4:</sup> This switch will operate in place of the throttle position sensor to control EVAP parts if the sensor malfunctions.



Multiport Fuel Injection (MFI) System

#### Multiport Fuel Injection (MFI) System

### DESCRIPTION Input/Output Signal Line

NBFC0014

NRECO01450

| <u> </u>                           |  |                   | NBEC0014S0: |
|------------------------------------|--|-------------------|-------------|
| Sensor                             | Input Signal to ECM                                      | ECM func-<br>tion | Actuator    |
| Camshaft position sensor           | Engine speed and piston position                         |                   |             |
| 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 Throttle valve idle position           |                   |             |
| Park/Neutral position (PNP) switch | Gear position  |                   |             |
| Vehicle speed sensor               | Vehicle speed  | Fuel injec-       | laiaatau    |
| Ignition switch                    | Start signal   | tion control      | Injector    |
| 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                         |                   |             |

<sup>\*</sup> 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>

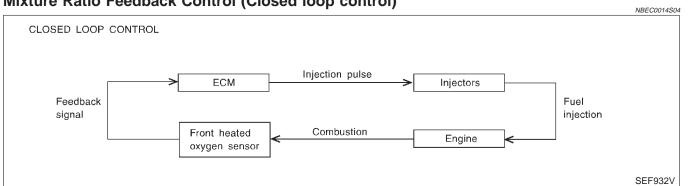
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from "N" to "D"
- High-load, high-speed operation

#### <Fuel decrease>

- During deceleration
- During high engine speed operation

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

Mixture Ratio Feedback Control (Closed loop control)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The 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-200. 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**

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

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

#### **Mixture Ratio Self-learning Control**

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the front heated oxygen sensor. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.

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

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

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

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

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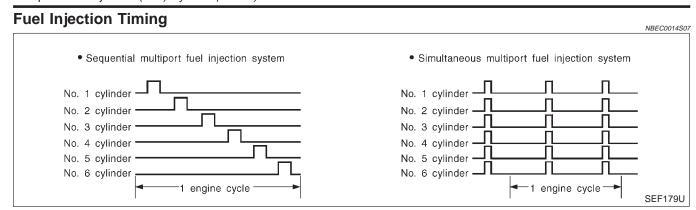
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Multiport Fuel Injection (MFI) System (Cont'd)



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

IBEC0014S070

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

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

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

Fuel Shut-off

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

#### **Distributor Ignition (DI) System**

### DESCRIPTION Input/Output Signal Line

NBEC0015

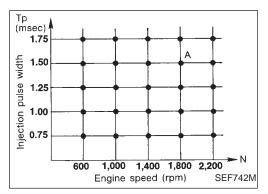
NBEC0015S01

|                                    |  |                   | INDECOUTS301     |
|------------------------------------|--|-------------------|------------------|
| Sensor                             | Input Signal to ECM                            | ECM func-<br>tion | Actuator         |
| Camshaft position sensor           | Engine speed and piston position               |                   |                  |
| Mass air flow sensor               | Amount of intake air                           |                   |                  |
| Engine coolant temperature sensor  | Engine coolant temperature                     |                   |                  |
| Throttle position sensor           | Throttle position Throttle valve idle position | Ignition          |                  |
| Vehicle speed sensor               | Vehicle speed                                  | timing con-       | Power transistor |
| Ignition switch                    | Start signal                                   |                   |                  |
| Knock sensor                       | Engine knocking                                |                   |                  |
| Park/Neutral position (PNP) switch | Gear position                                  |                   |                  |
| Battery                            | Battery voltage                                |                   |                  |

Distributor Ignition (DI) System (Cont'd)

System Description

NBEC0015S02



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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.

EC

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.

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

- 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 Input/Output Signal Line

NRFC0016

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

| relay |    |
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#### System Description

NRFC0016S02

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.

**EC-29** 

EL

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



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

### DESCRIPTION Input/Output Signal Line

NBEC0017

NBEC0017S01

| Sensor                             | Input Signal to ECM        | ECM func-<br>tion   | Actuator  |
|------------------------------------|----------------------------|---------------------|-----------|
| Vehicle speed sensor               | Vehicle speed              | Fuel cut<br>control | Injectors |
| Park/Neutral position (PNP) switch | Neutral position           |                     |           |
| Throttle position sensor           | Throttle position          |                     |           |
| Engine coolant temperature sensor  | Engine coolant temperature |                     |           |
| Camshaft position sensor           | Engine speed               |                     |           |

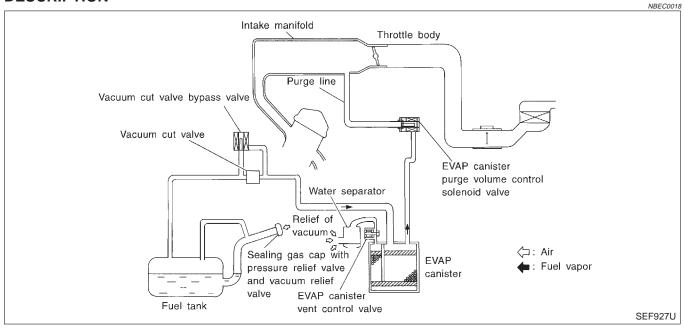
If the engine speed is above 2,500 rpm with no load (for example, in neutral and engine speed over 2,500 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 2,000 rpm, then fuel cut is cancelled.

#### NOTE:

This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-26.

#### **Evaporative Emission System**

#### DESCRIPTION



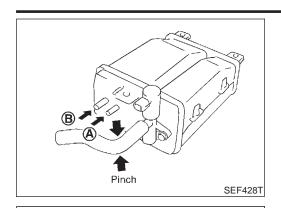
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

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

Evaporative Emission System (Cont'd,



### **INSPECTION EVAP Canister**

NBEC0019

NBEC0019S01

NBEC0019S02

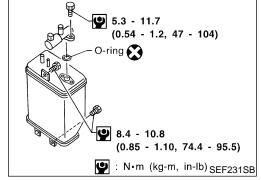
Check EVAP canister as follows:

- Pinch the fresh air hose.
- Blow air into port **A** and check that it flows freely out of port **B**.

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**Tightening Torque** 

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.

EC

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Wipe clean valve housing.

Check valve opening pressure and vacuum.

**Pressure:** 

15.3 - 20.0 kPa (0.156 - 0.204 kg/cm<sup>2</sup>, 2.22 - 2.90 psi)

Vacuum:

-6.0 to -3.3 kPa (-0.061 to -0.034 kg/cm<sup>2</sup>, -0.87 to -0.48 psi)

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

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

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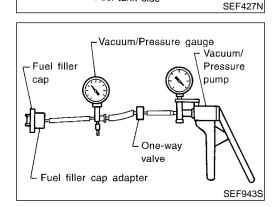
**Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve** 

NBEC0019S06

Refer to EC-374.

**Fuel Tank Temperature Sensor** 

NBEC0019S08



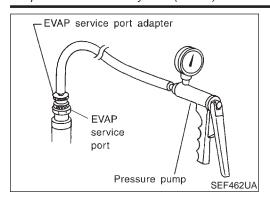
Fuel tank side

Valve B

Valve A

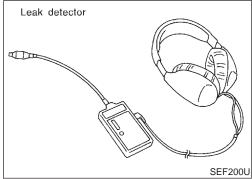
Refer to EC-311.

Evaporative Emission System (Cont'd)



#### **Evap Service Port**

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



### How to Detect Fuel Vapor Leakage CAUTION:

NBEC0019S10

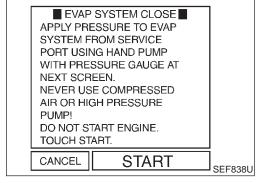
- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in EVAP system.

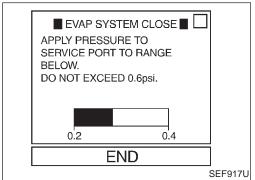
#### NOTE:

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

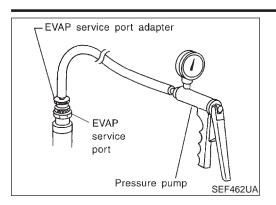
#### (P) With CONSULT

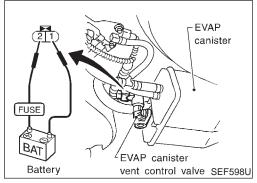
- 1) Attach the EVAP service port adapter securely to the EVAP service port.
- Also attach the pressure pump and hose to the EVAP service port adapter.
- 3) Turn ignition switch "ON".
- 4) Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
- 5) Touch "START". A bar graph (Pressure indicating 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.
- 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-34.

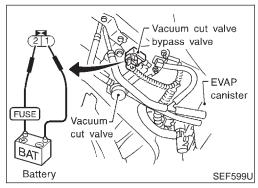




Evaporative Emission System (Cont'd,







#### **⋈** Without CONSULT

- Attach the EVAP service port adapter securely to the EVAP service port.
- Also attach the pressure pump with pressure gauge to the EVAP service port adapter.
- 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.
- To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm<sup>2</sup>, 0.2 to 0.4 psi).
- Remove EVAP service port adapter and hose with pressure pump.
- Locate the leak using a leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-34.

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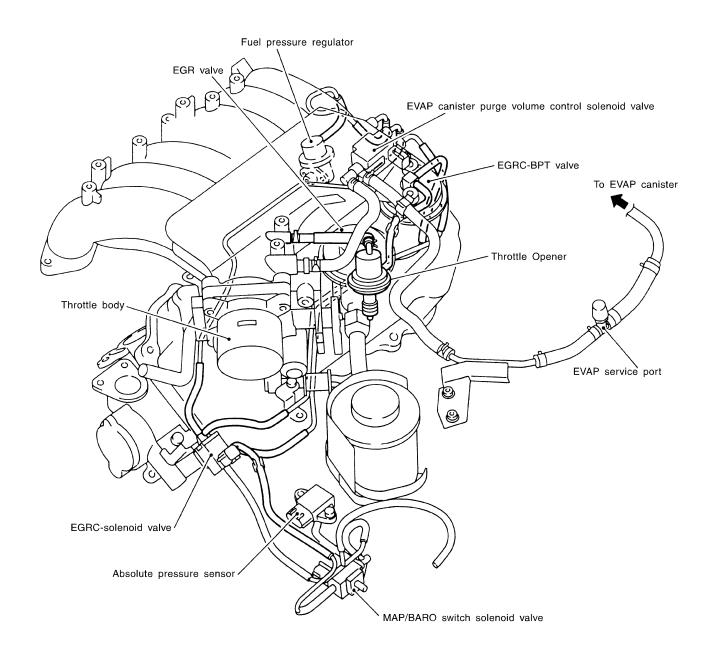
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#### **EVAPORATIVE EMISSION LINE DRAWING**

NBEC0020

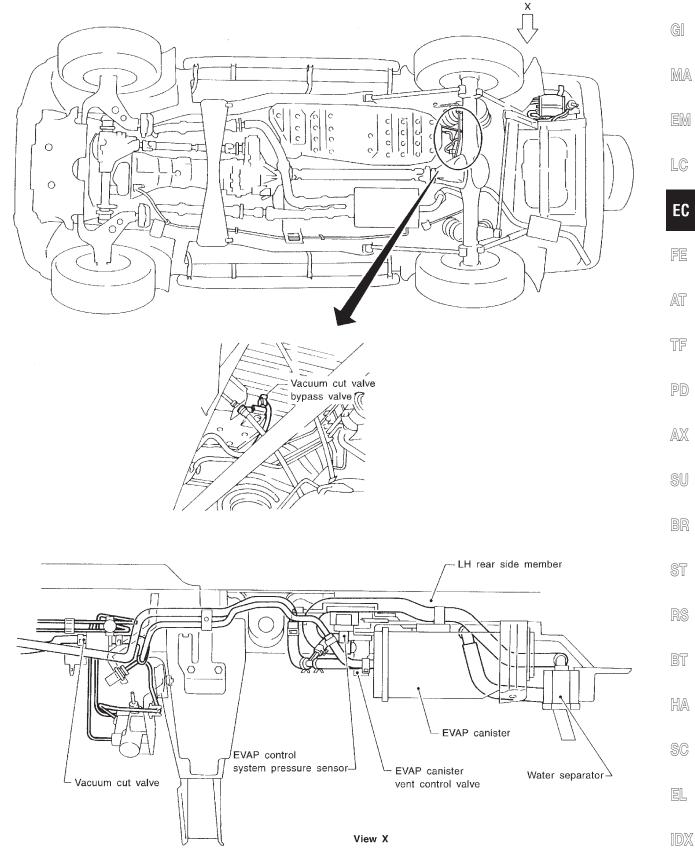


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#### NOTE:

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

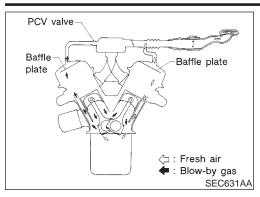


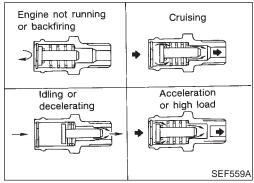


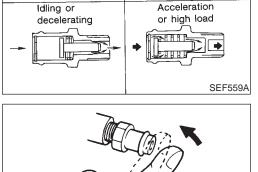
SEF870T

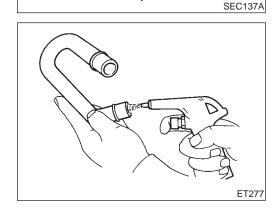


Positive Crankcase Ventilation









#### **Positive Crankcase Ventilation** 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.

#### INSPECTION

#### **PCV (Positive Crankcase Ventilation) Valve**

NREC0022

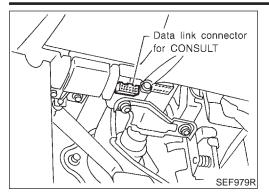
With engine running at idle, remove PCV valve ventilation hose from PCV valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.

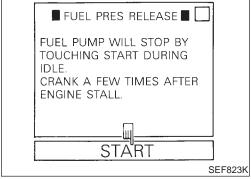
#### **PCV Valve Ventilation Hose**

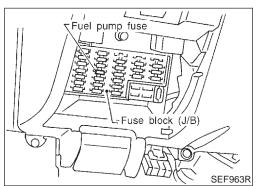
- Check hoses and hose connections for leaks.
- Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.

Fuel Pressure Release









#### **Fuel Pressure Release**

NBEC0023S01

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

#### (A) WITH CONSULT

Turn ignition switch "ON".

Perform "FUEL PRESSURE RELEASE" in "WORK SUP-PORT" mode with CONSULT.

Start engine.

After engine stalls, crank it two or three times to release all fuel pressure.

Turn ignition switch "OFF". 5.



MA

EC

AT

NREC0023502

#### **N** WITHOUT CONSULT

Remove fuel pump fuse located in fuse box.

Start engine.

After engine stalls, crank it two or three times to release all fuel pressure.

4. Turn ignition switch "OFF".

Reinstall fuel pump fuse after servicing fuel system.

AX

#### **Fuel Pressure Check**

When reconnecting fuel line, always use new clamps.

Make sure that clamp screw does not contact adjacent parts.

Use a torque driver to tighten clamps.

Use Pressure Gauge to check fuel pressure.

Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.

Release fuel pressure to zero.

Disconnect fuel hose between fuel filter and fuel tube (engine side).

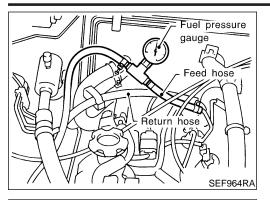
HA

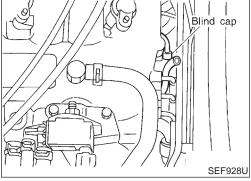
BT

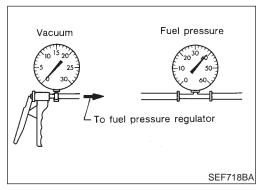
SC

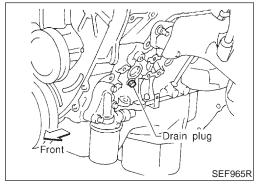
EL

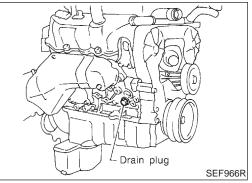












- 3. Install pressure gauge between fuel filter and fuel tube.
- 4. Start engine and check for fuel leakage.
- 5. Read the indication of fuel pressure gauge.

#### At idling:

With vacuum hose connected
Approximately 235 kPa (2.4 kg/cm², 34 psi)
With vacuum hose disconnected
Approximately 294 kPa (3.0 kg/cm², 43 psi)

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

## **Fuel Pressure Regulator Check**

NRFC0387

- 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.

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

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

#### Injector

#### REMOVAL AND INSTALLATION

NBEC0025

- Release fuel pressure to zero. Refer to EC-37.
- Drain coolant by removing drain plugs from both sides of cylinder block.
- 3. Separate ASCD and accelerator control wire from intake manifold collector.
- 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



MA

LC

EC

AT

AX

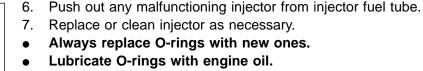
ST

HA

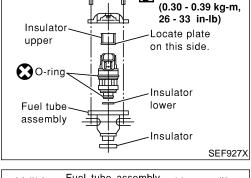
SC

NBFC0026

- Fuel pressure regulator
- **EVAP** canister
- **EGRC-BPT** valve
- d. Air hoses from
- Air duct
- IACV-AAC valve
- е Water hoses for
- Throttle body
- Air relief plug
- f. EVAP canister purge hose
- EGR flare tube g.
- 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.



Install injector to injector fuel tube assembly.



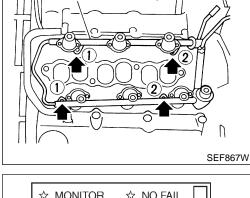
3.0 - 3.8 N·m

- Install injectors with fuel tube assembly to intake manifold. Tighten in numerical order shown in the figure.
- First, tighten all bolts to 4.9 to 6.0 N·m (0.5 to 0.61 kg-m, 3.6 to 4.4 ft-lb).
- 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.



8.

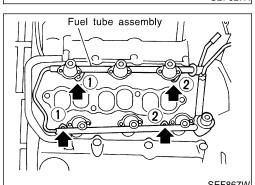
After properly connecting fuel hose to injector and fuel tube, check connection for fuel leakage.

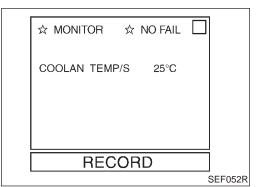


## Fast Idle Cam (FIC) INSPECTION AND ADJUSTMENT

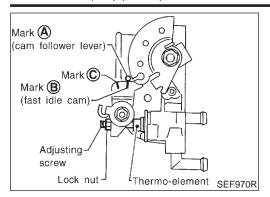
(P) With CONSULT

- Turn ignition switch "ON".
- See "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
- When engine coolant temperature is 20 to 30°C (68 to 86°F), make sure that the center of mark A is aligned with mark B as shown in the figure.





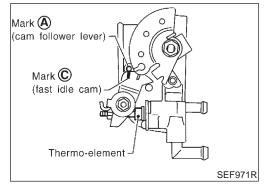




If NG, adjust by turning adjusting screw.

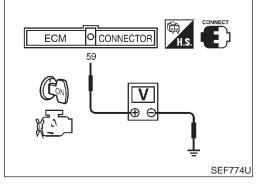
Lock nut:

(10 - 20 kg-cm, 8.7 - 17.4 in-lb)



4. Start engine and warm it up.

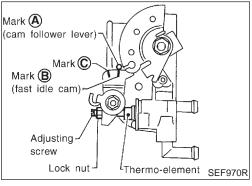
- 5. When engine coolant temperature is 75 to 85°C (167 to 185°F), check the following.
- The center of mark A is aligned with mark C.
- The cam follower lever's roller is not touching the fast idle cam.
- If NG, replace thermo-element and perform the above inspection and adjustment again.



#### **N** Without CONSULT

NBEC0026S02

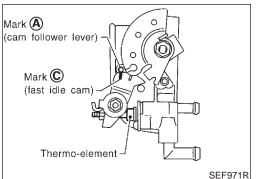
- 1. Turn ignition switch "ON".
- 2. Check voltage between ECM terminal 59 (Engine coolant temperature sensor signal) and ground.
- When the voltage is between 3.12 to 3.52V, make sure that the center of mark A is aligned with mark B as shown in the figure.



If NG, adjust by turning adjusting screw.

Lock nut:

9: 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 voltage is between 1.10 to 1.36V, 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

# Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

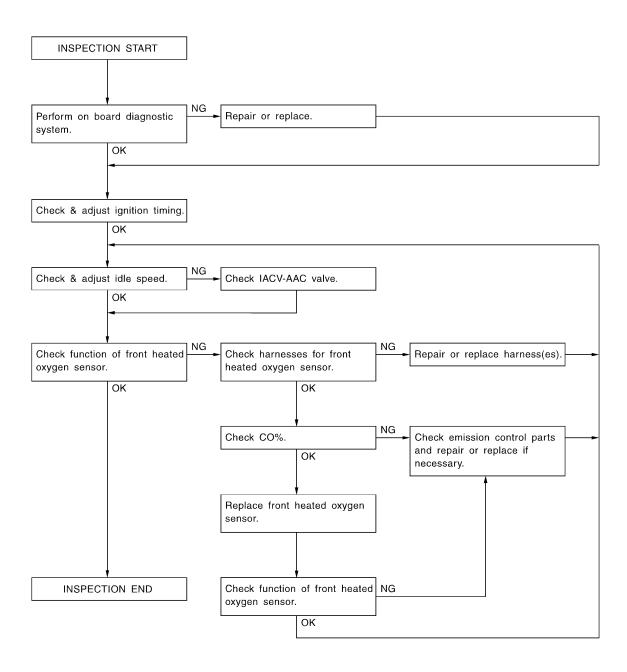
|    | Aujustinent  | NBEC0027    | G[                     |
|----|--|-------------|------------------------|
| PF | REPARATION   |             |                        |
| 1) | Make sure that the following parts are in good order.  | NBEC0027S01 |                        |
|    | Battery  |             | MA                     |
|    | Ignition system  |             | 2025 4                 |
|    | Engine oil and coolant levels  |             |                        |
|    | Fuses  |             | EM                     |
| •  | ECM harness connector  |             |                        |
| -  | Vacuum hoses   |             | LG                     |
| •  |  |             |                        |
| •  | Air intake system (Oil filler cap, oil level gauge, etc.)  |             |                        |
|    |  |             | EC                     |
| •  | Fuel pressure  |             |                        |
| •  | Engine compression   |             |                        |
| •  | EGR valve operation  |             | FE                     |
| •  | Throttle valve   |             |                        |
| •  | Evaporative emission system  |             | AT                     |
| 2) | On air conditioner equipped models, checks should be carried out while the air conditioner is "Ol  |             | 5 40                   |
| 3) | On automatic transmission equipped models, when checking idle rpm, ignition timing and mixture the also about the control of t | re ratio,   |                        |
| 4) | checks should be carried out while shift lever is in "N" position.   |             | TF                     |
| 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.  |             | PD                     |
| 6) | Keep front wheels pointed straight ahead.  |             |                        |
| 7) | Make the check after the cooling fan has stopped.  |             |                        |
|    |  |             | $\mathbb{A}\mathbb{X}$ |
|    |  |             |                        |
|    |  |             | SU                     |
|    |  |             | 90                     |
|    |  |             |                        |
|    |  |             | BR                     |
|    |  |             |                        |
|    |  |             | @T                     |
|    |  |             | ST                     |
|    |  |             |                        |
|    |  |             | RS                     |
|    |  |             |                        |
|    |  |             |                        |
|    |  |             | BT                     |
|    |  |             |                        |
|    |  |             | HA                     |
|    |  |             |                        |
|    |  |             | 00                     |
|    |  |             | SC                     |
|    |  |             |                        |
|    |  |             | EL                     |
|    |  |             |                        |
|    |  |             | 1150 °                 |
|    |  |             |                        |



## **Overall Inspection Sequence**

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

NBFC0027S0101



SEF304Y

#### NOTE:

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

EL

[DX

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

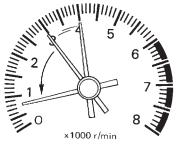
## **INSPECTION START** 1. Visually check the following: GI · Air cleaner clogging Hoses and ducts for leaks • EGR valve operation MA Electrical connectors Gasket Throttle valve and throttle position sensor operation 2. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Ensure engine stays below 1,000 rpm. LC **TEMP** EC 120 270 FE SEF976U 3. Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load. TF AX x1000 r/min SEF977U 4. Perform diagnostic test mode II (Self-diagnostic results). Refer to EC-72. SERVICE SEF217U OK or NG HA OK GO TO 2. NG 1. Repair or replace components as necessary. 2. GO TO 2. SC



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

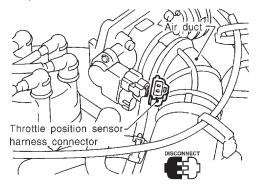
#### CHECK IGNITION TIMING

- 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.



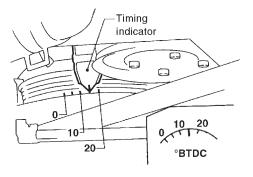
SEF978U

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.

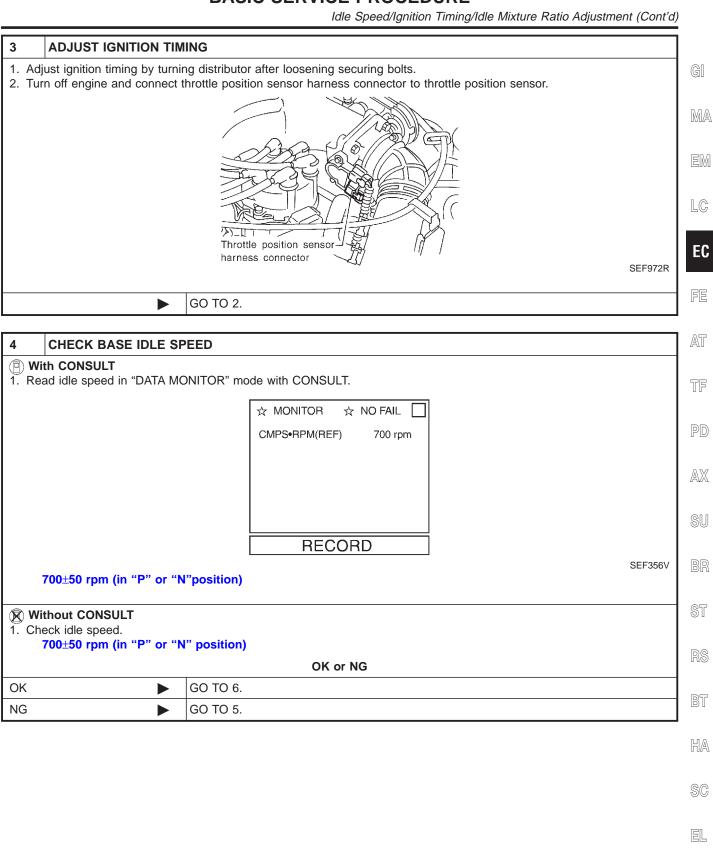


SEF371S

15°±2° BTDC (in "P" or "N" position)

| 0 | Κ | or | N  | G |
|---|---|----|----|---|
| v | n | UI | 14 | u |

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





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

| Tale Speed/Igrillion Tilling/Iale Mixture Kalic   | Adjustinent (Conta)   |
|---|---|
| 5 ADJUST BASE IDLE SPEED  |   |
| Rev engine (2,000 - 3,000 rpm) 2 or 3     Adjust idle speed by turning idle speed   | times under no-load then run engine at idle speed. adjusting screw. |
|   | EGRC-BPT valve  Open Close  |
| 700±50 rpm (in "P" or "N" positio   | n)  |
| ► GO TO 6   | 5.  |
|   |   |
| 6 CHECK TARGET IDLE SPEED   |   |
| <ul> <li>With CONSULT</li> <li>1. Turn off engine and connect throttle po</li> <li>2. Start and rev engine (2,000 - 3,000 rpn</li> <li>3. Read idle speed in "DATA MONITOR" in</li> </ul> | n) 2 or 3 times under no-load then run at idle speed.               |
|   | CMPS•RPM(REF) 750 rpm   |

| (F) With CONSULT   |   |
|--|---|
|  | hrottle position sensor harness connector.                    |
|  | 3,000 rpm) 2 or 3 times under no-load then run at idle speed. |
| 3. Read idle speed in "DATA MO   | ONITOR" mode with CONSULT.                                    |
|  | ☆ MONITOR ☆ NO FAIL □   |
|  | CMPS•RPM(REF) 750 rpm   |
|  | 750 Ipin  |
|  |   |
|  |   |
|  |   |
|  |   |
|  |   |
|  | RECORD  |
|  | SEF357V   |
| 750±50 rpm (in "P" or "N   | " position)   |
|  |   |
| Without CONSULT  |   |
|  | hrottle position sensor harness connector.                    |
| <ol> <li>Start and rev engine (2,000 -</li> <li>Check idle speed.</li> </ol> | 3,000 rpm) 2 or 3 times under no-load then run at idle speed. |
| 750±50 rpm (in "P" or "N   | l" nosition)  |
| 700±00 1pm (m 1 01 1   |   |
|  | OK or NG  |
| OK (With CONSULT)  | GO TO 8.  |
| OK (Without CONSULT)   | GO TO 9.  |
| NG   | GO TO 7.  |



HA

SC

EL

| - DETECT  |   |
|---|---|
| 7 DETECT MALFU  | NCTIONING PART  |
| <ol> <li>Check IACV-AAC valve</li> <li>Check ECM function by</li> </ol>     | and replace if necessary. Refer to EC-413. harness and repair if necessary. Refer to EC-413. substituting another known good ECM. e of a problem, but this is rarely the case.)   |
| With<br>CONSULT   | <b>▶</b> GO TO 8.   |
| Without<br>CONSULT  | <b>▶</b> GO TO 9.   |
| CHECK FRONT I   | IEATED OXYGEN SENSOR LH SIGNAL  |
| With CONSULT  |   |
| . Run engine at about 2<br>. See "FR O2 MNTR-B2<br>. Running engine at 2,00 | 000 rpm for about 2 minutes under no-load.  'in "DATA MONITOR" mode.  0 rpm under no-load (engine is warmed up to normal operating temperature.), check that the een "LEAN" and "RICH" more than 5 times during 10 seconds. |
|   | ☆ MONITOR ☆ NO FAIL □   |
|   | CMPS•RPM(REF) 2087rpm FR O2 MNTR-B1 LEAN FR O2 MNTR-B2 RICH   |
|   |   |
|   |   |
|   | RECORD  |
| 1 time: RICH $ ightarrow$ LEAN 2 times: RICH $ ightarrow$ LEA               | SEF358V   |
| 2 times: RICH → LEA   | SEF358V $\rightarrow$ RICH $\rightarrow$ RICH $\rightarrow$ LEAN $\rightarrow$ RICH OK or NG  |
|   | SEF358V $\rightarrow$ RICH $\rightarrow$ LEAN $\rightarrow$ RICH  |

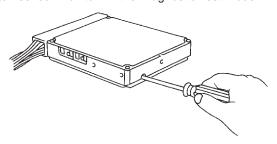


Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

#### 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-72.



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



SEF217U

SEF979U

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

OK or NG

#### 10 CHECK FRONT HEATED OXYGEN SENSOR LH SIGNAL

#### (P) With CONSULT

- 1. Warm up engine to normal operating temperature.
- 2. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
- 3. See "FR O2 MNTR-B2" in "DATA MONITOR" mode.
- 4. 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  $\rightarrow$  LEAN  $\rightarrow$  RICH
  - 2 times: RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH

#### **Without CONSULT**

- 1. Set "Left bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-72.
- 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                   | <b></b> | GO TO 11. |



EC

FE

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

| 11    | DETECT MALFUNCTIO   | NING PART                                      | ]           |  |  |
|-------|---|--|-------------|--|--|
| Check | the following.  |  |             |  |  |
| 1. Ch | eck fuel pressure regulator                                       | Refer to EC-38.                                | ""          |  |  |
| 2. Ch | eck mass air flow sensor a  | nd its circuit. Refer to EC-146.               | 1           |  |  |
| 3. Ch | eck injector and its circuit.                                     | Refer to EC-548.                               | MA          |  |  |
| Cle   | Clean or replace if necessary.                                    |  |             |  |  |
| 4. Ch | eck engine coolant temper   | ature sensor and its circuit. Refer to EC-194. | 1           |  |  |
| 5. Ch | eck ECM function by subst   | ituting another known good ECM.                |             |  |  |
| (EC   | (ECM may be the cause of a problem, but this is rarely the case.) |  |             |  |  |
|       | <b>•</b>  | GO TO 2.                                       | ]           |  |  |
|       |   |  | <b>-</b> LC |  |  |
|       |   |  | 7           |  |  |

| 12 CHECK FRONT H                           | ED OXYGEN SENSOR RH SIGNAL   |             |
|--|--|-------------|
|  | rpm under no-load (engine is warmed up to normal operating temperature.), chec | ck that the |
| monitor fluctuates between                 | 'LEAN" and "RICH" more than 5 times during 10 seconds.                         |             |
|  | ☆ MONITOR ☆ NO FAIL □  |             |
|  | CMPS•RPM(REF) 2087rpm FR O2 MNTR-B1 LEAN FR O2 MNTR-B2 RICH                    |             |
|  |  |             |
|  | RECORD   |             |
| 1 time: RICH → LEAN                        |  | SEF358\     |
| /  | RICH → LEAN → RICH   |             |
|  | OK or NG   |             |
| OK   | INSPECTION END   |             |
| NG (Monitor does not fluctuate.)           | GO TO 16.  |             |
| NG (Monitor fluctuates less than 5 times.) | Replace front heated oxygen sensor RH.     GO TO 14.                           |             |

AT TF PD  $\mathbb{A}\mathbb{X}$ SU BR ST RS BT HA SC EL 

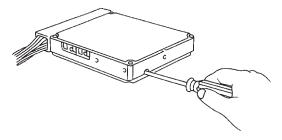


Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

#### 3 CHECK FRONT HEATED OXYGEN SENSOR RH SIGNAL

#### (R) Without CONSULT

1. Set "Right bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-72.



SEF979U

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



SEF217U

| OK                                 | <b></b>  | INSPECTION END  |
|------------------------------------|----------|---|
| NG (MIL does not blink.)           | <b>•</b> | GO TO 16.   |
| NG (MIL blinks less than 5 times.) | <b>•</b> | <ol> <li>Replace front heated oxygen sensor RH.</li> <li>GO TO 14.</li> </ol> |

OK or NG

#### 14 CHECK FRONT HEATED OXYGEN SENSOR RH SIGNAL

#### (P) With CONSULT

- 1. Warm up engine to normal operating temperature.
- 2. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
- 3. See "FR O2 MNTR-B1" in "DATA MONITOR" mode.
- 4. 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  $\rightarrow$  LEAN  $\rightarrow$  RICH

2 times: RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH  $\rightarrow$  LEAN  $\rightarrow$  RICH

#### Without CONSULT

- 1. Set "Right bank front heated oxygen sensor monitor" in the Diagnostic Test Mode II. Refer to EC-72.
- 2. Make sure that MIL goes on more than 5 times during 10 seconds at 2,000 rpm.

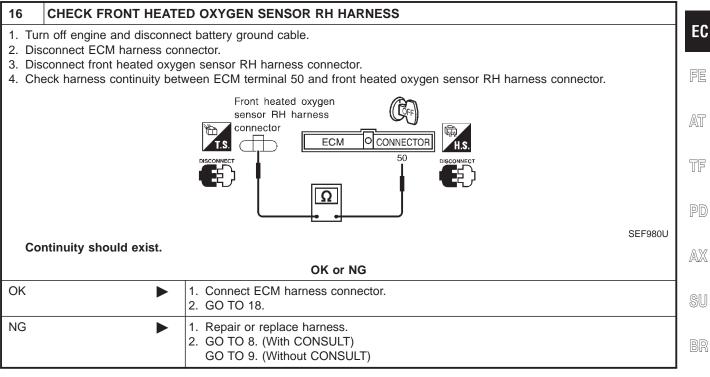
#### OK or NG

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



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

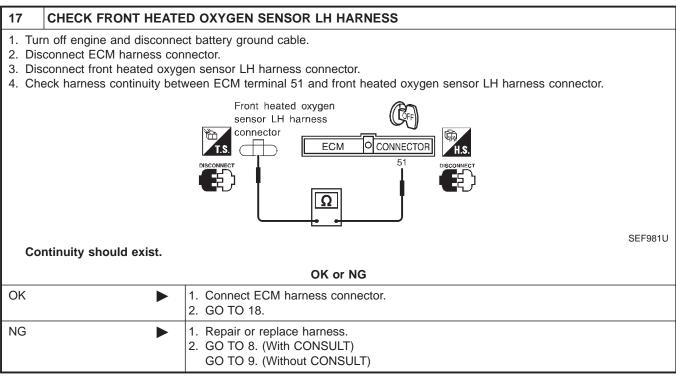
| 15   | DETECT MALFUNCTIONING PART                     |  |  |   |  |  |  |
|------|--|--|--|---|--|--|--|
| Chec | theck the following.                           |  |  |   |  |  |  |
| 1. C | Check fuel pressure regulator. Refer to EC-38. |  |  |   |  |  |  |
| 2. C | heck mass air flow sensor a                    | nd its circuit. Refer to EC-146.               |  |   |  |  |  |
| 3. C | heck injector and its circuit.                 | Refer to EC-548.                               |  | N |  |  |  |
| C    |  | ш  |  |   |  |  |  |
| 4. C | heck engine coolant temper                     | ature sensor and its circuit. Refer to EC-194. |  |   |  |  |  |
| 5. C | heck ECM function by subst                     | ituting another known good ECM.                |  | 5 |  |  |  |
| (E   | ECM may be the cause of a                      | problem, but this is rarely the case.)         |  |   |  |  |  |
|      | <b>•</b>                                       | GO TO 2.                                       |  | п |  |  |  |
|      |  |  |  | L |  |  |  |
| 16   | CHECK EDON'T HEATE                             | D OXYGEN SENSOR RH HARNESS                     |  | _ |  |  |  |

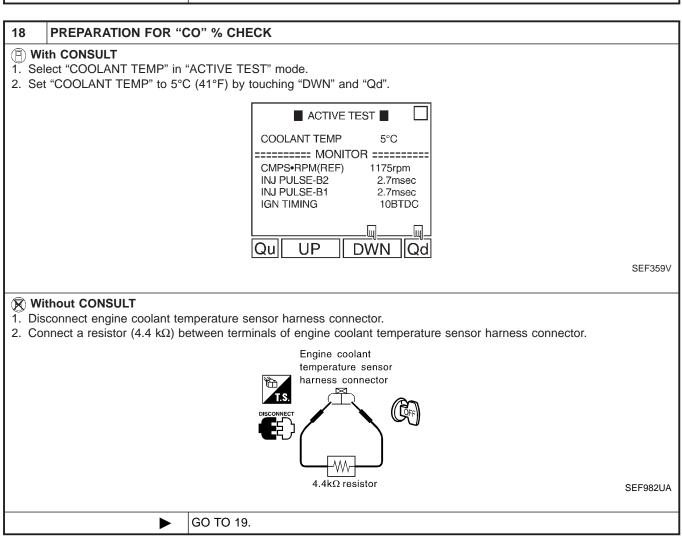


AX ST BT HA SC 



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







|  | Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd  | ))       |  |  |  |
|--|---|----------|--|--|--|
| 19   | CHECK "CO" %  | j        |  |  |  |
| 1. S   | tart engine and warm it up until engine coolant temperature indicator points to the middle of gauge.  | GI       |  |  |  |
|  | TEMP  |          |  |  |  |
|  | 120 <b>270</b>  | EM<br>LC |  |  |  |
| 2. R   | ev engine (2,000 - 3,000 rpm) two or three times under no-load, then run engine at idle speed.  | EC       |  |  |  |
|  | 5 6   | FE       |  |  |  |
|  |   | AT       |  |  |  |
| 4. (§<br>A<br>a. D   | *1000 r/min SEF978U  Theck "CO" %.  Idle CO: 1.5 - 9.5%  Without CONSULT  fter checking CO%,  isconnect the resistor from terminals of engine coolant temperature sensor.  connect engine coolant temperature sensor. | TF PD    |  |  |  |
| b. C   | Office of the coolant temperature sensor harness connector to engine coolant temperature sensor.  OK or NG  |          |  |  |  |
| OK   | Replace front heated oxygen sensor LH.     GO TO 10.  | SU       |  |  |  |
| NG   | ▶ GO TO 20.   | ]<br>Br  |  |  |  |
|  |   | <br>1    |  |  |  |
| 20<br>Char   | DETECT MALFUNCTIONING PART  | ST       |  |  |  |
| Check the following.  1. Connect front heated oxygen sensor harness connectors to front heated oxygen sensor.  2. Check fuel pressure regulator. Refer to EC-38.  3. Check mass air flow sensor and its circuit. Refer to EC-146.  4. Check injector and its circuit. Refer to EC-548. |   |          |  |  |  |
| С  | lean or replace if necessary. heck engine coolant temperature sensor and its circuit. Refer to EC-194.  | Bī       |  |  |  |

- 5. Check engine coolant temperature sensor and its circuit. Refer to EC-194.6. 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.

**EC-53** 

HA

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EL



#### Introduction

ECO028

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

| 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.

X: Applicable —: Not applicable

|   | DTC | 1st trip DTC | Freeze Frame data | 1st trip Freeze<br>Frame data | SRT code | Test value |
|---|-----|--------------|-------------------|-------------------------------|----------|------------|
| Diagnostic test mode II (Self-diagnostic results) | X   | X*1          | _                 | _                             | _        | _          |
| CONSULT   | Х   | Х            | Х                 | Х                             | Х        | _          |
| GST   | Х   | X*2          | Х                 | _                             | Х        | Х          |

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

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-117.)

## **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.

X: Applicable —: Not Exit

|   | MIL      |                |          |                | DTC                                      |       | 1st trip DTC           |                        |
|---|----------|----------------|----------|----------------|--|-------|------------------------|------------------------|
| Items   | 1st trip |                | 2nd trip |                | 4.11.                                    | 0.143 | 4.1.1.                 | 0.117                  |
|   | Blinking | Lighting<br>up | Blinking | Lighting<br>up | 1st trip 2nd tri<br>displaying displayii |       | 1st trip<br>displaying | 2nd trip<br>displaying |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 — 0608) is being detected | Х        | _              | _        | _              | _  | _     | Х                      | _                      |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 — 0608) is being detected | _        | _              | Х        | _              | _  | Х     | _                      | _                      |
| Closed loop control — DTC: P1148 (0307), P1168 (0308)   | _        | Х              | _        | _              | Х  | _     | Х                      | _                      |
| Fail-safe items (Refer to EC-117.)  | _        | Х              | _        | _              | X*1                                      | _     | X*1                    | _                      |
| Except above  | _        | _              | _        | Х              | _  | Х     | Х                      | _                      |

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

Two Trip Detection Logic (Cont'd)

\*1: Except "ECM"

## **Emission-related Diagnostic Information**

#### DTC AND 1ST TRIP DTC

NBEC0030

(C0030501

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.

MA

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-68.

EC

For malfunctions in which 1st trip DTCs are displayed, refer to EC-65. 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.

F

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-97. 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.

90

- 2) (P) With CONSULT
  - With GST

Bl

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.)

ST

- 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.

RS

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.

HA

If the DTC is being detected currently, the time data will be "0".

SC

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

EL

Emission-related Diagnostic Information (Cont'd)

|                | ■ SELF-DIAG RESULTS ■                            |                            | ■ SELF-DIAG RESULTS ■                               |         |
|----------------|--|----------------------------|---|---------|
| DTC<br>display | FAILURE DETECTED TIME IACV-AAC VALVE 0 [ P0505 ] | 1st trip<br>D⊤C<br>display | FAILURE DETECTED TIME IACV-AAC VALVE [11] [ P0505 ] |         |
|                | ERASE PRINT FFdata                               |                            | ERASE PRINT FFdata                                  |         |
|                |  |                            |   | SEF180U |

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

IBEC0030S02

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-83.

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) 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-68.

#### SYSTEM READINESS TEST (SRT) CODE

NBEC0030S03

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

Emission-related Diagnostic Information (Cont'd)

#### NOTE:

The SRT will also indicate "INCMP" if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates "CMPLT" for all test items, the inspector will continue with the emissions test. However, if the SRT indicates "INCMP" for one or more of the SRT items the vehicle is returned to the customer untested.

MA

#### NOTE:

If MIL is "ON" during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates "CMPLT" for all test items. Therefore, it is important to check SRT ("CMPLT") and DTC (No DTCs) before the inspection.

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Emission-related Diagnostic Information (Cont'd)

#### **SRT Item**

The table below shows required self-diagnostic items to set the SRT to "CMPLT".

=NBFC0030S0307

| SRT item<br>(CONSULT indication) | Perfor-<br>mance Pri-<br>ority*2 | Required self-diagnostic items to set the SRT to "CMPLT" | Corresponding DTC No. |
|----------------------------------|----------------------------------|--|-----------------------|
| CATALYST                         | 3                                | Three way catalyst function                              | P0420, P0430          |
| EVAP SYSTEM                      | 2                                | EVAP control system (small leak) (negative pressure)     | P0440                 |
|                                  | _                                | EVAP control system (small leak) (positive pressure)     | P1440*1               |
|                                  | 3                                | EVAP control system purge flow monitoring                | P1447                 |
| O2 SENSOR                        | 3                                | Front heated oxygen sensor (circuit)                     | P0130, P0150          |
|                                  |                                  | Front heated oxygen sensor (lean shift monitoring)       | P0131, P0151          |
|                                  |                                  | Front heated oxygen sensor (rich shift monitoring)       | P0132, P0152          |
|                                  |                                  | Front heated oxygen sensor (response monitoring)         | P0133, P0153          |
|                                  |                                  | Front heated oxygen sensor (high voltage)                | P0134, P0154          |
|                                  |                                  | Rear heated oxygen sensor (min. voltage monitoring)      | P0137, P0157          |
|                                  |                                  | Rear heated oxygen sensor (max. voltage monitoring)      | P0138, P0158          |
|                                  |                                  | Rear heated oxygen sensor (response monitoring)          | P0139, P0159          |
|                                  |                                  | Rear heated oxygen sensor (high voltage)                 | P0140, P0160          |
| O2 SEN HEATER                    | 3                                | Front heated oxygen sensor heater                        | P0135, P0155          |
|                                  |                                  | Rear heated oxygen sensor heater                         | P0141, P0161          |
| EGR SYSTEM                       | 3                                | EGR function (close)                                     | P0400                 |
|                                  |                                  | EGRC-BPT valve function                                  | P0402                 |
|                                  | 1                                | EGR function (open)                                      | P1402                 |

<sup>\*1:</sup> P1440 [EVAP control system (small leak) (positive pressure) diagnosis] is one type of SRT related diagnosis. This diagnosis, however, does not contribute to setting the SRT as "CMPLT", when no malfunction exists in the EVAP system. Therefore, P0440 must be used instead of P1440.

<sup>\*2:</sup> If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT.



Emission-related Diagnostic Information (Cont'd

#### **SRT Set Timing**

BEC0030S03

SRT is set as "CMPLT" after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

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| Self-diagnosis result |        |                   | Example      |         |                           |                                  |     |  |  |
|-----------------------|--------|-------------------|--------------|---------|---------------------------|----------------------------------|-----|--|--|
|                       |        | Diagnosis         | ← ON → OF    |         | ition cycle<br>OFF ← ON → | $OFF  \leftarrow ON \rightarrow$ | _   |  |  |
| All OK                | Case 1 | P0400             | OK (1)       | — (1)   | OK (2)                    | — (2)                            | -   |  |  |
|                       |        | P0402             | OK (1)       | — (1)   | — (1)                     | OK (2)                           | _   |  |  |
|                       |        | P1402             | OK (1)       | OK (2)  | — (2)                     | — (2)                            | -   |  |  |
|                       |        | SRT of EGR        | "CMPLT"      | "CMPLT" | "CMPLT"                   | "CMPLT"                          |     |  |  |
|                       | Case 2 | P0400             | OK (1)       | — (1)   | — (1)                     | — (1)                            | - I |  |  |
|                       |        | P0402             | — (0)        | — (0)   | OK (1)                    | — (1)                            | _   |  |  |
|                       |        | P1402             | OK (1)       | OK (2)  | — (2)                     | — (2)                            | _   |  |  |
|                       |        | SRT of EGR        | "INCMP"      | "INCMP" | "CMPLT"                   | "CMPLT"                          | _   |  |  |
| NG exists             | Case 3 | P0400             | ОК           | OK      | _                         | _                                | _   |  |  |
|                       |        | P0402             | _            | _       | _                         | _                                | _   |  |  |
|                       |        | P1402             | NG           | _       | NG                        | NG<br>(Consecutive NG)           | _   |  |  |
|                       |        | (1st trip)<br>DTC | 1st trip DTC | _       | 1st trip DTC              | DTC<br>(= MIL "ON")              | _   |  |  |
|                       |        | SRT of EGR        | "INCMP"      | "INCMP" | "INCMP"                   | "CMPLT"                          | _   |  |  |

OK: Self-diagnosis is carried out and the result is OK.

NG: Self-diagnosis is carried out and the result is NG.

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT".  $\rightarrow$  Case 1 above

When all SRT related self-diagnoses showed OK results through several different cycles, the SRT will indicate "CMPLT" at the time the respective self-diagnoses have at least one OK result.  $\rightarrow$  Case 2 above If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT".  $\rightarrow$  Case 3 above

The table above shows that the minimum number of cycles for setting SRT as "INCMP" is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary of each self-diagnosis to be executed twice (Case 3) for the following reasons:

- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory must be erased from ECM after repair.
- If the 1st trip DTC is erased, all the SRT will indicate "INCMP".

#### NOTE:

SRT can be set as "CMPLT" together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates "CMPLT".

#### SRT Service Procedure

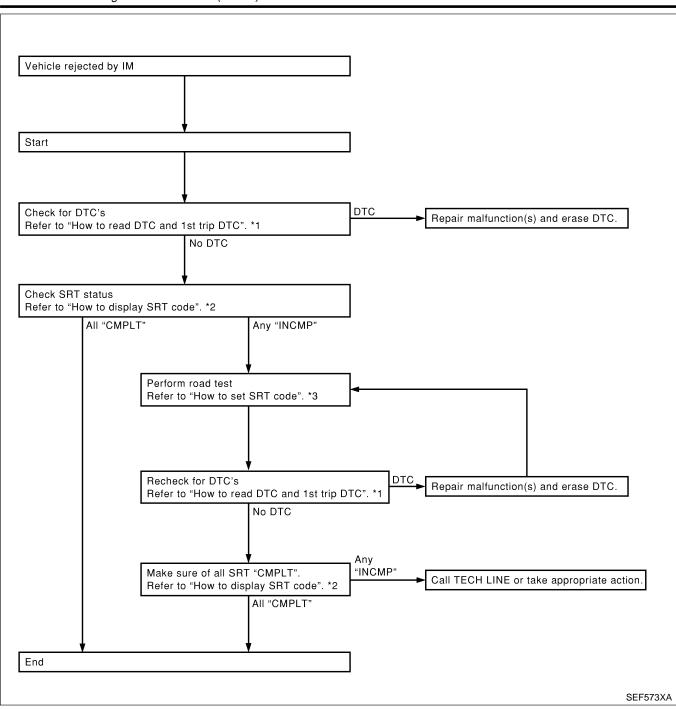
If a vehicle has failed the state emissions inspection due to one or more SRT items indicating "INCMP", review the flowchart diagnostic sequence on the next page.

**EC-59** 

<sup>—:</sup> Self-diagnosis is not carried out.

**\$\dagger** 

Emission-related Diagnostic Information (Cont'd)



#### **How to Display SRT Code**

NBEC0030S0301

#### 1. (P) 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 on next page.

"INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

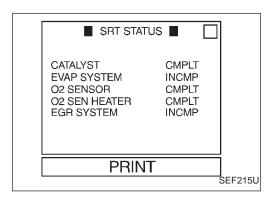


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Emission-related Diagnostic Information (Cont'd)



#### How to Set SRT Code

IBEC0030S0302

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.

#### (II) With CONSULT

Perform corresponding DTC Confirmation Procedure one by one based on "Performance Priority" in the table on EC-58.

## **®** Without CONSULT

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.

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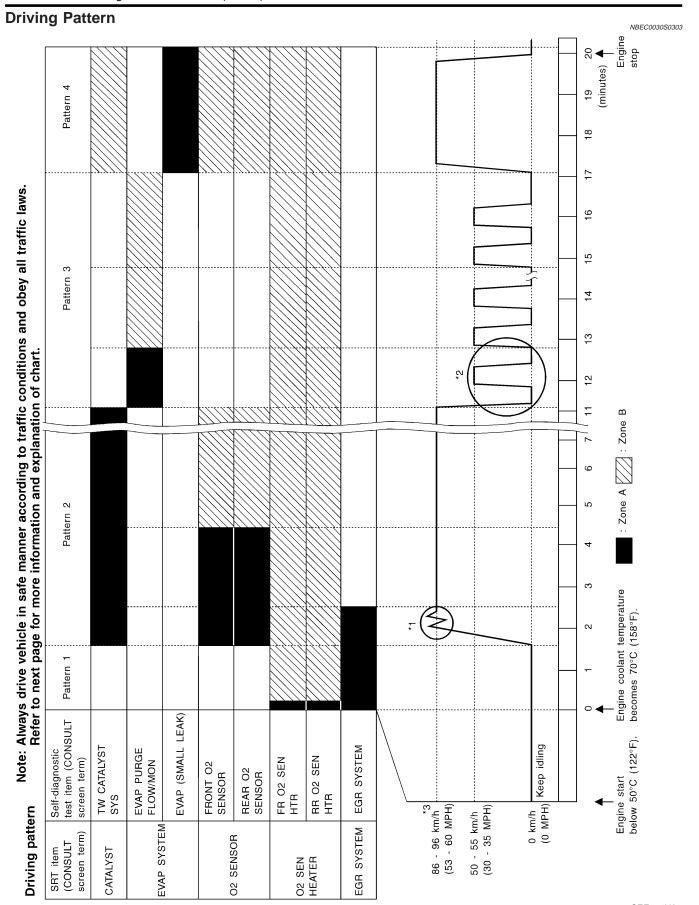
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Emission-related Diagnostic Information (Cont'd)



Emission-related Diagnostic Information (Cont'd)

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

Zone A refers to the range where the time required, for the diagnosis under normal conditions\*, is the shortest.

Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

\*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 30°C (68 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
   Under different conditions [For example: ambient air temperature other than 20 30°C (68 86°F)], diagnosis may also be performed.

#### Pattern 1:

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

#### Pattern 2

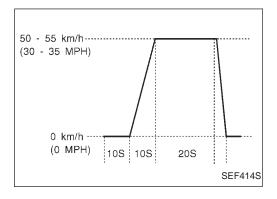
When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted.
 In this case, the time required for diagnosis may be extended.

#### 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 (0 MPH) and let engine idle.
- 2) Repeat driving pattern shown below at least 10 times.
- During acceleration, hold the accelerator pedal as steady as possible.
- 3) Repeat steps 1 and 2 until the EGR system SRT is set.



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

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

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

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NBEC0030S0304



Emission-related Diagnostic Information (Cont'd)

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

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

NBEC0030S04

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

|             |   |              |              | 11         |             |
|-------------|---|--------------|--------------|------------|-------------|
| SRT item    | Calf diagnostic test item                 | Test value ( | GST display) | Toot limit | Application |
| SKT item    | Self-diagnostic test item                 | TID          | CID          | Test limit | Application |
| CATALVET    | Three way catalyst function (Right bank)  | 01H          | 01H          | Max.       | ×           |
| CATALYST    | Three way catalyst function (Left bank)   | 03H          | 02H          | Max.       | ×           |
| EVAD CVCTEM | EVAP control system<br>(Small leak)       | 05H          | 03H          | Max.       | ×           |
| EVAP SYSTEM | EVAP control system purge flow monitoring | 06H          | 83H          | Min.       | х           |
|             |   | 09H          | 04H          | Max.       | Х           |
|             |   | 0AH          | 84H          | Min.       | Х           |
|             | Front heated oxygen sensor (Right bank)   | 0BH          | 04H          | Max.       | Х           |
|             |   | 0CH          | 04H          | Max.       | Х           |
|             |   | 0DH          | 04H          | Max.       | Х           |
|             |   | 11H          | 05H          | Max.       | X           |
|             | Front heated oxygen sensor<br>(Left bank) | 12H          | 85H          | Min.       | Х           |
|             |   | 13H          | 05H          | Max.       | X           |
| O2 SENSOR   |   | 14H          | 05H          | Max.       | X           |
| OZ SENSOR   |   | 15H          | 05H          | Max.       | X           |
|             |   | 19H          | 86H          | Min.       | X           |
|             | Rear heated oxygen sensor                 | 1AH          | 86H          | Min.       | X           |
|             | (Right bank)                              | 1BH          | 06H          | Max.       | Х           |
|             |   | 1CH          | 06H          | Max.       | X           |
|             |   | 21H          | 87H          | Min.       | X           |
|             | Rear heated oxygen sensor                 | 22H          | 87H          | Min.       | X           |
|             | (Left bank)                               | 23H          | 07H          | Max.       | X           |
|             |   | 24H          | 07H          | Max.       | Х           |

Emission-related Diagnostic Information (Cont'd)

| ODT its m        | Calfalia wa aatia taat itawa      | Test value (0 | GST display) | To ad line id |             |      |
|------------------|-----------------------------------|---------------|--------------|---------------|-------------|------|
| SRT item         | Self-diagnostic test item         | TID           | CID          | Test limit    | Application | (    |
|                  | Front heated oxygen sensor heater | 29H           | 08H          | Max.          | Х           | _    |
|                  | (Right bank)                      | 2AH           | 88H          | Min.          | Х           | _    |
|                  | Front heated oxygen sensor heater | 2BH           | 09H          | Max.          | Х           | _    |
| 02 SENSOR HEATER | (Left bank)                       | 2CH           | 89H          | Min.          | Х           | _    |
| 2 SENSOR HEATER  | Rear heated oxygen sensor heater  | 2DH           | 0AH          | Max.          | Х           |      |
|                  | (Right bank)                      | 2EH           | 8AH          | Min.          | Х           | _    |
|                  | Rear heated oxygen sensor heater  | 2FH           | 0BH          | Max.          | X           | - E( |
|                  | (Left bank)                       | 30H           | 8BH          | Min.          | X           |      |
|                  |                                   | 31H           | 8CH          | Min.          | X           | _    |
|                  |                                   | 32H           | 8CH          | Min.          | X           |      |
|                  | EGR function                      | 33H           | 8CH          | Min.          | X           | _    |
| EGR SYSTEM       |                                   | 34H           | 8CH          | Min.          | X           | _    |
|                  |                                   | 35H           | 0CH          | Max.          | Х           | _    |
|                  | EGRC-BPT valve function           | 36H           | 0CH          | Max.          | Х           | _    |
|                  | EGRO-BPT valve function           | 37H           | 8CH          | Min.          | Х           | _    |

#### **EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS**

| EMISSION-RELATED L                   | DIAGNOSTIC       | INFORMA | HON HEWS |                          | X: Applicable  | —: Not applicable | AX      |
|--------------------------------------|------------------|---------|----------|--------------------------|----------------|-------------------|---------|
| ltarra                               | DTC*4            |         |          | Test value/              |                | Deference         |         |
| Items<br>(CONSULT screen terms)      | CONSULT<br>GST*2 | ECM*1   | SRT code | Test limit<br>(GST only) | 1st trip DTC*4 | Reference<br>page | SU      |
| NO SELF DIAGNOSTIC FAILURE INDICATED | P0000            | 0505    | _        | _                        | _              | _                 | BR      |
| MAF SEN/CIRCUIT                      | P0100            | 0102    | _        | _                        | Х              | EC-146            |         |
| ABSL PRES SEN/CIRC                   | P0105            | 0803    | _        | _                        | Х              | EC-156            | ST      |
| AIR TEMP SEN/CIRC                    | P0110            | 0401    | _        | _                        | Х              | EC-168            | <u></u> |
| COOLANT T SEN/CIRC                   | P0115            | 0103    | _        | _                        | Х              | EC-175            | RS      |
| THRTL POS SEN/CIRC                   | P0120            | 0403    | _        | _                        | Х              | EC-181            | BT      |
| *COOLAN T SEN/CIRC                   | P0125            | 0908    | _        | _                        | Х              | EC-194            |         |
| FRONT O2 SENSOR-B1                   | P0130            | 0503    | Х        | Х                        | X*3            | EC-200            | HA      |
| FRONT O2 SENSOR-B1                   | P0131            | 0415    | Х        | Х                        | X*3            | EC-209            | 0 00 0  |
| FRONT O2 SENSOR-B1                   | P0132            | 0414    | Х        | Х                        | X*3            | EC-216            | SC      |
| FRONT O2 SENSOR-B1                   | P0133            | 0413    | Х        | Х                        | X*3            | EC-224            |         |
| FRONT O2 SENSOR-B1                   | P0134            | 0509    | Х        | Х                        | X*3            | EC-235            | EL      |
| FR O2 SE HEATER-B1                   | P0135            | 0901    | Х        | Х                        | X*3            | EC-244            |         |
| REAR O2 SENSOR-B1                    | P0137            | 0511    | Х        | Х                        | X*3            | EC-251            |         |
| REAR O2 SENSOR-B1                    | P0138            | 0510    | Х        | Х                        | X*3            | EC-260            |         |
| REAR O2 SENSOR-B1                    | P0139            | 0707    | Х        | Х                        | X*3            | EC-269            |         |
| REAR O2 SENSOR-B1                    | P0140            | 0512    | Х        | Х                        | X*3            | EC-278            |         |



Emission-related Diagnostic Information (Cont'd)

| Items                  | DTC*4            |       |          | Test value/              |                | Reference         |
|------------------------|------------------|-------|----------|--------------------------|----------------|-------------------|
| (CONSULT screen terms) | CONSULT<br>GST*2 | ECM*1 | SRT code | Test limit<br>(GST only) | 1st trip DTC*4 | Reference<br>page |
| RR O2 SE HEATER-B1     | P0141            | 0902  | Х        | Х                        | X*3            | EC-287            |
| FRONT O2 SENSOR-B2     | P0150            | 0303  | Х        | Х                        | X*3            | EC-200            |
| FRONT O2 SENSOR-B2     | P0151            | 0411  | Х        | Х                        | X*3            | EC-209            |
| FRONT O2 SENSOR-B2     | P0152            | 0410  | Х        | Х                        | X*3            | EC-216            |
| FRONT O2 SENSOR-B2     | P0153            | 0409  | Х        | Х                        | X*3            | EC-224            |
| FRONT O2 SENSOR-B2     | P0154            | 0412  | Х        | Х                        | X*3            | EC-235            |
| FR O2 SE HEATER-B2     | P0155            | 1001  | Х        | Х                        | X*3            | EC-244            |
| REAR O2 SENSOR-B2      | P0157            | 0314  | Х        | Х                        | X*3            | EC-251            |
| REAR O2 SENSOR-B2      | P0158            | 0313  | Х        | Х                        | X*3            | EC-260            |
| REAR O2 SENSOR-B2      | P0159            | 0708  | Х        | Х                        | X*3            | EC-269            |
| REAR O2 SENSOR-B2      | P0160            | 0315  | Х        | Х                        | X*3            | EC-278            |
| RR O2 SE HEATER-B2     | P0161            | 1002  | Х        | Х                        | X*3            | EC-287            |
| FUEL SYS LEAN/BK1      | P0171            | 0115  | _        | _                        | Х              | EC-294            |
| FUEL SYS RICH/BK1      | P0172            | 0114  | _        | _                        | Х              | EC-303            |
| FUEL SYS LEAN/BK2      | P0174            | 0210  | _        | _                        | Х              | EC-294            |
| FUEL SYS RICH/BK2      | P0175            | 0209  | _        | _                        | Х              | EC-303            |
| FUEL TEMP SEN/CIRC     | P0180            | 0402  | _        | _                        | Х              | EC-311            |
| MULTI CYL MISFIRE      | P0300            | 0701  | _        | _                        | Х              | EC-317            |
| CYL 1 MISFIRE          | P0301            | 0608  | _        | _                        | Х              | EC-317            |
| CYL 2 MISFIRE          | P0302            | 0607  | _        | _                        | Х              | EC-317            |
| CYL 3 MISFIRE          | P0303            | 0606  | _        | _                        | Х              | EC-317            |
| CYL 4 MISFIRE          | P0304            | 0605  | _        | _                        | Х              | EC-317            |
| CYL 5 MISFIRE          | P0305            | 0604  | _        | _                        | Х              | EC-317            |
| CYL 6 MISFIRE          | P0306            | 0603  | _        | _                        | Х              | EC-317            |
| KNOCK SEN/CIRC         | P0325            | 0304  | _        | _                        | _              | EC-324            |
| CPS/CIRCUIT (OBD)      | P0335            | 0802  | _        | _                        | Х              | EC-330            |
| CAM POS SEN/CIRC       | P0340            | 0101  | _        | _                        | Х              | EC-336            |
| EGR SYSTEM             | P0400            | 0302  | Х        | Х                        | X*3            | EC-344            |
| EGRC-BPT VALVE         | P0402            | 0306  | Х        | Х                        | X*3            | EC-355            |
| TW CATALYST SYS-B1     | P0420            | 0702  | Х        | Х                        | X*3            | EC-360            |
| TW CATALYST SYS-B2     | P0430            | 0703  | Х        | Х                        | X*3            | EC-360            |
| EVAP SMALL LEAK        | P0440            | 0705  | Х        | Х                        | X*3            | EC-364            |
| PURG VOLUME CONT/V     | P0443            | 1008  | _        | _                        | Х              | EC-374            |
| VENT CONTROL VALVE     | P0446            | 0903  | _        | _                        | Х              | EC-381            |
| EVAPO SYS PRES SEN     | P0450            | 0704  | _        | _                        | Х              | EC-388            |
| EVAP GROSS LEAK        | P0455            | 0715  | _        | Х                        | X*3            | EC-398            |

Emission-related Diagnostic Information (Cont'd)

| Itama                           | DTC*4            |       |          | Test value/              |                | Reference |          |
|---------------------------------|------------------|-------|----------|--------------------------|----------------|-----------|----------|
| Items<br>(CONSULT screen terms) | CONSULT<br>GST*2 | ECM*1 | SRT code | Test limit<br>(GST only) | 1st trip DTC*4 | page      | G        |
| VEH SPEED SEN/CIRC              | P0500            | 0104  | _        | _                        | Х              | EC-408    | -<br>_ [ |
| IACV/AAC VLV/CIRC               | P0505            | 0205  | _        | _                        | Х              | EC-413    | - 1      |
| CLOSED TP SW/CIRC               | P0510            | 0203  | _        | _                        | Х              | EC-421    | -<br>    |
| A/T COMM LINE                   | P0600            | _     | _        | _                        | _              | EC-428    | - '      |
| ECM                             | P0605            | 0301  | _        | _                        | Х              | EC-433    | -        |
| PNP SW/CIRC                     | P0705            | 1101  | _        | _                        | Х              | AT-99     |          |
| ATF TEMP SEN/CIRC               | P0710            | 1208  | _        | _                        | Х              | AT-105    |          |
| VEH SPD SEN/CIR AT              | P0720            | 1102  | _        | _                        | Х              | AT-110    | -        |
| ENGINE SPEED SIG                | P0725            | 1207  | _        | _                        | Х              | AT-115    |          |
| A/T 1ST GR FNCTN                | P0731            | 1103  | _        | _                        | Х              | AT-119    | -        |
| A/T 2ND GR FNCTN                | P0732            | 1104  | _        | _                        | Х              | AT-125    | -        |
| A/T 3RD GR FNCTN                | P0733            | 1105  | _        | _                        | Х              | AT-131    | -        |
| A/T 4TH GR FNCTN                | P0734            | 1106  | _        | _                        | Х              | AT-137    | -        |
| TCC SOLENOID/CIRC               | P0740            | 1204  | _        | _                        | Х              | AT-147    | -        |
| A/T TCC S/V FNCTN               | P0744            | 1107  | _        | _                        | Х              | AT-152    | -        |
| L/PRESS SOL/CIRC                | P0745            | 1205  | _        | _                        | Х              | AT-161    | -        |
| SFT SOL A/CIRC                  | P0750            | 1108  | _        | _                        | Х              | AT-167    | -        |
| SFT SOL B/CIRC                  | P0755            | 1201  | _        | _                        | Х              | AT-171    | -        |
| MAP/BARO SW SOL/CIR             | P1105            | 1302  | _        | _                        | Х              | EC-435    | -        |
| CLOSED LOOP-B1                  | P1148            | 0307  | _        | _                        | Х              | EC-449    | _        |
| CLOSED LOOP-B2                  | P1168            | 0308  | _        | _                        | Х              | EC-449    | -        |
| IGN SIGNAL-PRIMARY              | P1320            | 0201  | _        | _                        | Х              | EC-451    | _        |
| CPS/CIRC (OBD) COG              | P1336            | 0905  | _        | _                        | Х              | EC-458    | -        |
| EGRC SOLENOID/V                 | P1400            | 1005  | _        | _                        | Х              | EC-464    | -        |
| EGR TEMP SEN/CIRC               | P1401            | 0305  | _        | _                        | Х              | EC-469    | -        |
| EGR SYSTEM                      | P1402            | 0514  | Х        | Х                        | X*3            | EC-475    | -        |
| EVAP SMALL LEAK                 | P1440            | 0213  | Х        | Х                        | X*3            | EC-483    | -        |
| PURG VOLUME CONT/V              | P1444            | 0214  | _        | _                        | Х              | EC-493    | -        |
| VENT CONTROL VALVE              | P1446            | 0215  | _        | _                        | Х              | EC-501    | -        |
| EVAP PURG FLOW/MON              | P1447            | 0111  | Х        | Х                        | X*3            | EC-507    | -        |
| VENT CONTROL VALVE              | P1448            | 0309  | _        | _                        | Х              | EC-515    | -        |
| VC/V BYPASS/V                   | P1490            | 0801  | _        | _                        | Х              | EC-522    | -        |
| VC CUT/V BYPASS/V               | P1491            | 0311  | _        | _                        | Х              | EC-529    | -        |
| A/T DIAG COMM LINE              | P1605            | 0804  | _        | _                        | Х              | EC-537    | -        |
| TP SEN/CIRC A/T                 | P1705            | 1206  | _        | _                        | Х              | AT-175    | -        |
| P-N POS SW/CIRCUIT              | P1706            | 1003  | _        | _                        | X              | EC-542    | -        |



Emission-related Diagnostic Information (Cont'd)

| Items                  | DTC*4            |       |          | Test value/              |                | Reference |
|------------------------|------------------|-------|----------|--------------------------|----------------|-----------|
| (CONSULT screen terms) | CONSULT<br>GST*2 | ECM*1 | SRT code | Test limit<br>(GST only) | 1st trip DTC*4 | page      |
| O/R CLTCH SOL/CIRC     | P1760            | 1203  | _        | _                        | Х              | AT-184    |

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

#### NOTE:

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

## HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION How to Erase DTC ( With CONSULT)

NBEC0030S06

NBEC0030S0601

#### NOTE:

#### If the DTC is not for A/T related items (see EC-8), 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".
- 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).

<sup>\*2:</sup> These numbers are prescribed by SAE J2012.

<sup>\*3:</sup> These are not displayed with GST.

<sup>\*4: 1</sup>st trip DTC No. is the same as DTC No.

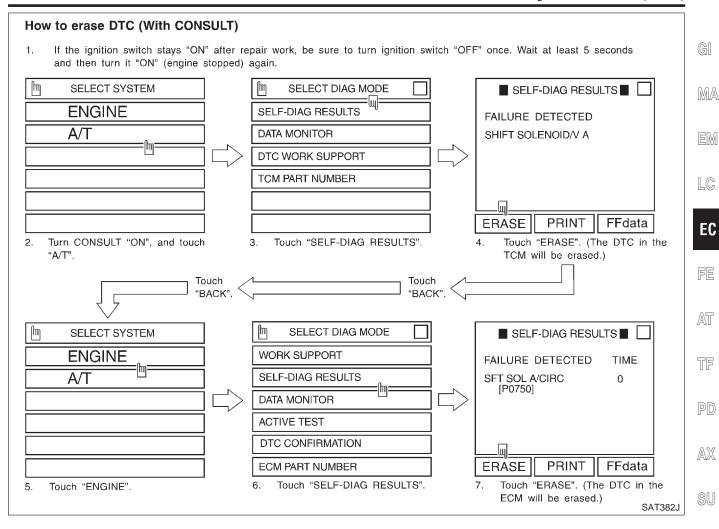
NBEC0030S0602

NBEC0030S0603

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Emission-related Diagnostic Information (Cont'd)



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) NOTE:

If the DTC is not for A/T related items (see EC-8), 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) NOTE:

If the DTC is not for A/T related items (see EC-8), 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.)
- Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-72.)

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.





Emission-related Diagnostic Information (Cont'd)

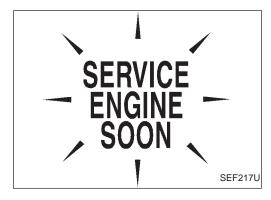
- If the battery is disconnected, the emission-related diagnostic information will be lost after approx.
   24 hours.
- Erasing the emission-related diagnostic information using CONSULT or GST is easier and quicker than switching the mode selector on the ECM.
- The following data are cleared when the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



The MIL is located on the instrument panel.

- 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") or see EC-582.
- 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.



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Malfunction Indicator Lamp (MIL) (Cont'd)

#### On Board Diagnostic System Function

The on board diagnostic system has the following four functions.

=NBFC0031S01

| Ignition switch in "ON" position   Engine stopped   WARNING   This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip.    Warning   Warning   Self-Diagnostic   Engine stopped   Engine stopped   Engine stopped   Engine stopped   Engine munning   FRONT HEATED OXYGEN   Sensor Monitor   This function allows the fuel mixture condition (lean or rich), monitored by front heated oxygen sensor, to be read. | Diagnostic Test<br>Mode | KEY and ENG.<br>Status | Function   | Explanation of Function  |
|--|-------------------------|------------------------|------------|--|
| WARNING  detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip.  "Misfire (Possible three way catalyst damage)"  "Closed loop control"  Fail-safe mode  Mode II  Ugnition switch in "ON" position  Engine stopped  Engine stopped  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   | Mode I                  | "ON" position          | BULB CHECK | open circuit, etc.).  If the MIL does not come on, check MIL circuit and ECM   |
| Engine stopped  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   |                         | Engine running         |            | detected twice in two consecutive driving cycles (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected.  The following malfunctions will light up or blink the MIL in the 1st trip.  • "Misfire (Possible three way catalyst damage)"  • "Closed loop control" |
| SENSOR MONITOR rich), monitored by front heated oxygen sensor, to be   | Mode II                 | "ON" position          |            | This function allows DTCs and 1st trip DTCs to be read.  |
|  |                         | Engine running         |            | rich), monitored by front heated oxygen sensor, to be  |

#### **MIL Flashing without DTC**

If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM test mode selector following "How to Switch Diagnostic Test Modes", EC-72.

How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-72.)

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

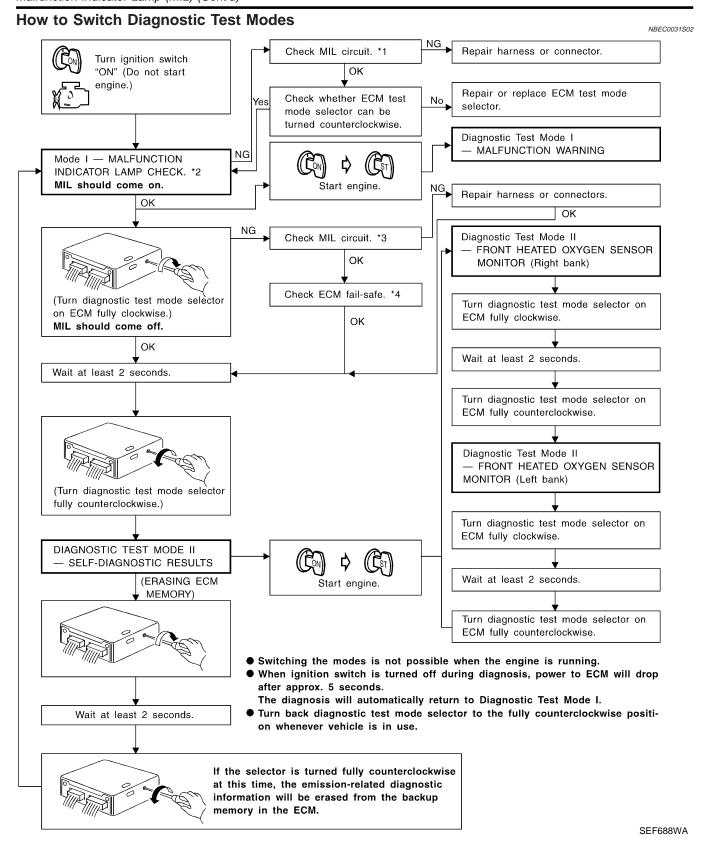
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Malfunction Indicator Lamp (MIL) (Cont'd)



\*1 EC-582 \*2 EC-70 \*3 EC-582

\*4 EC-117

Malfunction Indicator Lamp (MIL) (Cont'd)



#### Diagnostic Test Mode I — Bulb Check

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") or see EC-582.

# Diagnostic Test Mode I — Malfunction Warning

| IRF | COL | 231 | S04 |
|-----|-----|-----|-----|
|     |     |     |     |

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

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

LC

# Diagnostic Test Mode II — Self-diagnostic Results

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

EC

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.

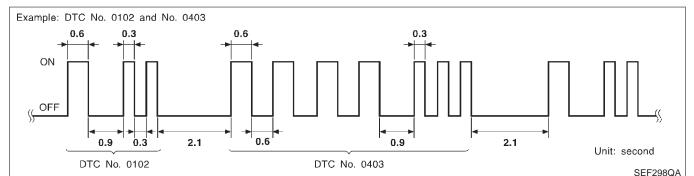
AT

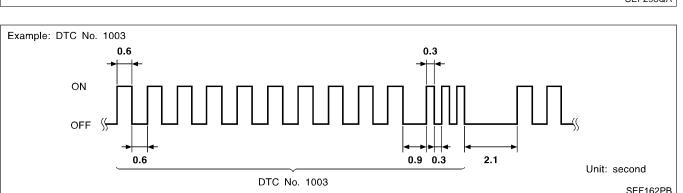
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Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the MIL blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about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

SC

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-8.)

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

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-72.)

- 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.



Malfunction Indicator Lamp (MIL) (Cont'd)

#### Diagnostic Test Mode II — Front Heated Oxygen Sensor Monitor

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                                      | Closed loop system                        |  |
| *Remains ON or OFF | Any condition                             | Open loop system                          |  |

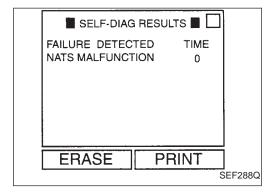
<sup>\*:</sup> Maintains conditions just before switching to open loop.

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.

## IVIS (Infiniti Vehicle Immobilizer System — NATS)

- If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNC-TION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E980U). Refer to EL-287, "IVIS (Infiniti Vehicle Immobilizer System — NATS").
- Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.
- When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E980U). Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to **CONSULT** operation manual, NATS.



# **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-54.
- 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.



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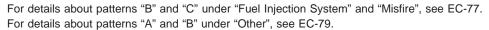
LC

OBD System Operation Chart (Cont'd)

| QI. | I N/I N/ | IVD. | Y CI | 1 A E | T          |
|-----|----------|------|------|-------|------------|
| ่อน | , IVI IV | IAK  | I G  | ΤАГ   | <b>T</b> I |

NBEC0032S02

|                                     |                       |                   | NBEC0032S02    |
|-------------------------------------|-----------------------|-------------------|----------------|
| Items                               | Fuel Injection System | Misfire           | Other          |
| MIL (goes off)                      | 3 (pattern B)         | 3 (pattern B)     | 3 (pattern B)  |
| DTC, Freeze Frame Data (no display) | 80 (pattern C)        | 80 (pattern C)    | 40 (pattern A) |
| 1st Trip DTC (clear)                | 1 (pattern C), *1     | 1 (pattern C), *1 | 1 (pattern B)  |
| 1st Trip Freeze Frame Data (clear)  | *1, *2                | *1, *2            | 1 (pattern B)  |



<sup>\*1:</sup> Clear timing is at the moment OK is detected.



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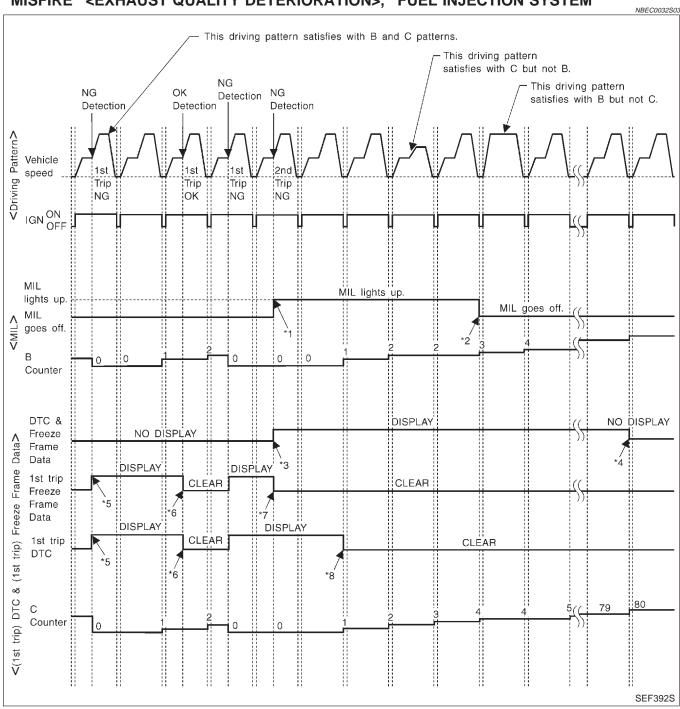
EL

<sup>\*2:</sup> Clear timing is when the same malfunction is detected in the 2nd trip.



OBD System Operation Chart (Cont'd)

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



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

OBD System Operation Chart (Cont'd)

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

# <Driving Pattern B>

NBEC0032S04

NBEC0032S0401

Conving Fattern by

Driving pattern B means the vehicle operation as follows:

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

MA

- 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 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")

## EM

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## <Driving Pattern C>

Driving pattern C means the vehicle operation as follows:

NBEC0032S0402

 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).



AT

Example:

If the stored freeze frame data is as follows:

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

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

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



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

 The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

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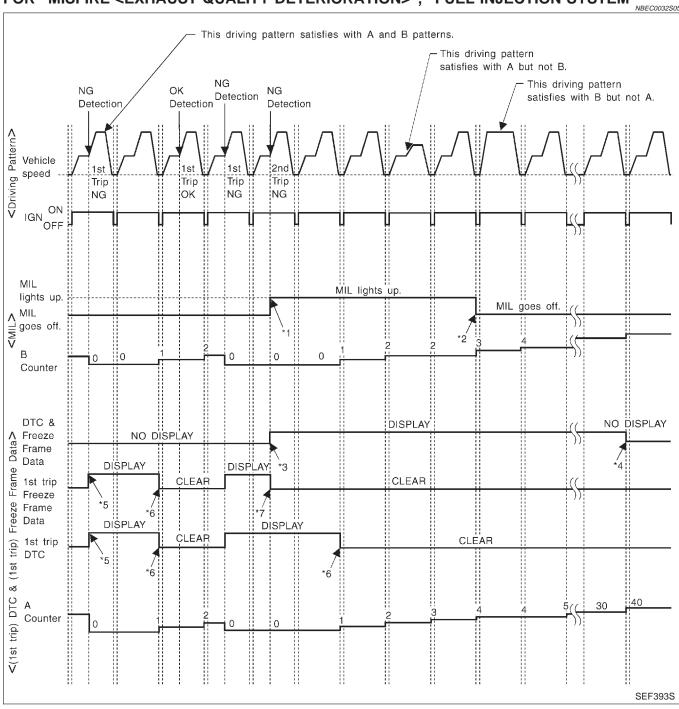
SG

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OBD System Operation Chart (Cont'd)

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

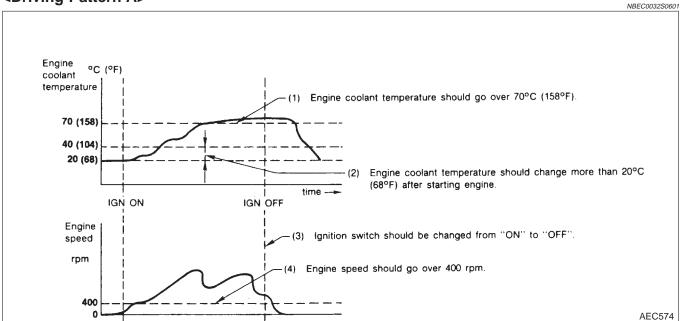


- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.
- \*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.
- '4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame
  - data still remain in ECM.)
- \*5: When a malfunction is detected for the first time, the 1st trip DTC
- and the 1st trip freeze frame data will be stored in ECM.
- \*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

OBD System Operation Chart (Cont'd)







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

#### <Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

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

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



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NBEC0032S0602

NBEC0032S06

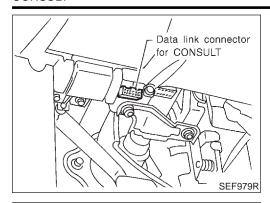


HA

SC

EL





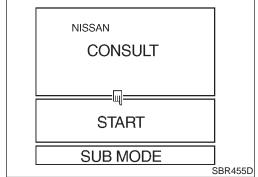
# **CONSULT**

#### **CONSULT INSPECTION PROCEDURE**

=NBEC0033

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.)



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

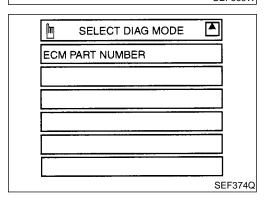
| SELECT_SYSTEM   | ]       |
|-----------------|---------|
| ENGINE ('98MY~) | ]       |
| A/T             | ]       |
| AIRBAG          | ]       |
| ABS             | ]       |
| ALL MODE 4WD    | ]       |
| IVCS            | ]       |
| 5               | SEF868W |

5. Touch "ENGINE".

| SELECT DIAG MODE [     | ▼       |   |
|------------------------|---------|---|
| WORK SUPPORT           |         |   |
| SELF-DIAG RESULTS      |         |   |
| DATA MONITOR           |         |   |
| ACTIVE TEST            |         |   |
| DTC & SRT CONFIRMATION |         |   |
| FUNCTION TEST          |         |   |
|                        | SFF869\ | W |

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 UE991 program card. Screen differs in accordance with the program card used.





CONSULT (Cont'd)

# ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

|       |   |                      |       | DIAGNO                     | STIC TEST            | MODE           |                     |                             |                       | ? |
|-------|---|----------------------|-------|----------------------------|----------------------|----------------|---------------------|-----------------------------|-----------------------|---|
| Item  |   | Weby                 |       | SELF-DIAGNOSTIC<br>RESULTS |                      |                | DTC<br>CONFIRMATION |                             |                       | • |
|       |   | WORK<br>SUP-<br>PORT | DTC*1 | FREEZE<br>FRAME<br>DATA*2  | DATA<br>MONI-<br>TOR | ACTIVE<br>TEST | SRT<br>STA-<br>TUS  | DTC<br>WORK<br>SUP-<br>PORT | FUNC-<br>TION<br>TEST |   |
|       | Camshaft position sensor  |                      | Х     | Х                          | Х                    |                |                     |                             |                       |   |
|       | Mass air flow sensor  |                      | Х     |                            | Х                    |                |                     |                             |                       |   |
|       | Engine coolant temperature sensor                                 |                      | Х     | х                          | Х                    | Х              |                     |                             |                       |   |
|       | Front heated oxygen sensor  |                      | Х     |                            | X                    |                | Х                   | X                           | X                     |   |
|       | Rear heated oxygen sensor   |                      | X     |                            | Х                    |                | Χ                   | Х                           |                       |   |
|       | Vehicle speed sensor  |                      | Х     | Х                          | Х                    |                |                     |                             | Х                     |   |
|       | Throttle position sensor  |                      | Х     |                            | Х                    |                |                     |                             | Х                     |   |
|       | Fuel tank temperature sensor                                      |                      | x     |                            | X                    | Х              |                     |                             |                       |   |
|       | EVAP control system pressure sensor                               |                      | X     |                            | X                    |                |                     |                             |                       |   |
|       | Absolute pressure sensor  |                      | Х     |                            | Х                    |                |                     |                             |                       |   |
|       | EGR temperature sensor  |                      | Х     |                            | Х                    |                |                     |                             |                       |   |
|       | Intake air temperature sensor                                     |                      | X     |                            | Х                    |                |                     |                             |                       |   |
| INPUT | Crankshaft position sensor (OBD)                                  |                      | х     |                            |                      |                |                     |                             |                       |   |
|       | Knock sensor  |                      | Х     |                            |                      |                |                     |                             |                       |   |
|       | Ignition switch (start signal)                                    |                      |       |                            | Х                    |                |                     |                             | X                     |   |
|       | Closed throttle position switch                                   |                      | х     |                            |                      |                |                     |                             |                       |   |
|       | Closed throttle position switch (throttle position sensor signal) |                      |       |                            | Х                    |                |                     |                             | Х                     |   |
|       | Air conditioner switch  |                      |       |                            | Х                    |                |                     |                             |                       |   |
|       | Park/Neutral position (PNP) switch                                |                      | Х     |                            | Х                    |                |                     |                             | Х                     |   |
|       | Power steering oil pressure switch                                |                      |       |                            | Х                    |                |                     |                             | Х                     |   |
|       | Air conditioner switch  |                      |       |                            | Х                    |                |                     |                             |                       |   |
|       | Battery voltage   |                      |       |                            | Х                    |                |                     |                             |                       |   |
|       | Ambient air temperature switch                                    |                      |       |                            | Х                    |                |                     |                             |                       |   |



|                                |       |   |                          | DIAGNOSTIC TEST MODE      |              |                    |                |                             |              |       |
|--------------------------------|-------|---|--------------------------|---------------------------|--------------|--------------------|----------------|-----------------------------|--------------|-------|
|                                | Maria |   | SELF-DIAGNOST<br>RESULTS |                           |              | DATA               | ACTIVE<br>TEST | DTC<br>CONFIRMATION         |              | FUNC- |
| Item                           |       | SUP-<br>PORT                                      | DTC*1                    | FREEZE<br>FRAME<br>DATA*2 | MONI-<br>TOR | SRT<br>STA-<br>TUS |                | DTC<br>WORK<br>SUP-<br>PORT | TION<br>TEST |       |
|                                |       | Injectors   |                          |                           |              | Х                  | Х              |                             |              | Х     |
|                                |       | Power transistor (Ignition timing)                |                          | X<br>(Ignition<br>signal) |              | Х                  | х              |                             |              | Х     |
|                                |       | IACV-AAC valve                                    | Х                        | Х                         |              | Х                  | Х              |                             |              | Х     |
| PARTS                          |       | EVAP canister purge volume control solenoid valve |                          | Х                         |              | Х                  | Х              |                             | х            |       |
| L                              |       | Air conditioner relay                             |                          |                           |              | Х                  |                |                             |              |       |
| ONE                            |       | Fuel pump relay                                   | Х                        |                           |              | Х                  | Х              |                             |              | Х     |
| OMF                            | OUT-  | EGRC-solenoid valve                               |                          | Х                         |              | Х                  | Х              |                             |              | X*3   |
| ROL C                          | PUT   | Front heated oxygen sensor heater                 |                          | X                         |              | Х                  |                | Х                           |              |       |
| CONT                           |       | Rear heated oxygen sensor heater                  |                          | х                         |              | Х                  |                | Х                           |              |       |
| ENGINE CONTROL COMPONENT PARTS |       | EVAP canister vent control valve                  |                          | х                         |              | Х                  | Х              |                             |              |       |
| _                              |       | Vacuum cut valve bypass valve                     |                          | х                         |              | Х                  | Х              |                             | х            |       |
|                                |       | MAP/BARO switch solenoid valve                    |                          | Х                         |              | Х                  | Х              |                             |              |       |
|                                |       | Calculated load value                             |                          |                           | Х            | Х                  |                |                             |              |       |

X: Applicable

<sup>\*1:</sup> This item includes 1st trip DTCs.

<sup>\*2:</sup> 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-56.

<sup>\*3:</sup> If this function test mode is not available, use the ACTIVE TEST mode.

CONSULT (Cont'd)

|                         | FUNCTION =NBEC0033S0   | 13        |
|-------------------------|--|-----------|
| Diagnostic test mode    | Function   | -<br>Gl   |
| Work support            | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.       | -<br>- Ma |
| 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.    | LC        |
| DTC & SRT 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".   | EC        |
| ECM part number         | ECM part number can be read.   | -<br>FE   |

- \*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

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| WORK ITEM             | CONDITION  | USAGE   | $\mathbb{A}\mathbb{X}$ |
|-----------------------|--|---|------------------------|
| IACV-AAC VALVE ADJ    | SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS.  • ENGINE WARMED UP  • NO-LOAD                         | When adjusting initial ignition timing and idle speed | SU                     |
| FUEL PRESSURE RELEASE | FUEL PUMP WILL STOP BY TOUCHING "START"<br>DURING IDLING.<br>CRANK A FEW TIMES AFTER ENGINE STALLS.                            | When releasing fuel pressure from fuel line           | BR                     |
| 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 | When detecting EVAP vapor leak point of EVAP system   | ST                     |
|                       | THE FOLLOWING CONDITIONS.  IGN SW "ON"  ENGINE NOT RUNNING   |   | RS                     |
|                       | <ul> <li>AMBIENT TEMPERATURE IS ABOVE 0°C (32°F).</li> <li>NO VACUUM AND NO HIGH PRESSURE IN EVAP<br/>SYSTEM</li> </ul>        |   | BT                     |
|                       | TANK FUEL TEMP. IS MORE THAN 0°C (32°F).  WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE"                                 |   | HA                     |
|                       | WHEN TRYING TO EXECUTE "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY           |   | SC                     |
|                       | APPROPRIATE INSTRUCTION. NOTE: WHEN STARTING ENGINE, CONSULT MAY DISPLAY   |   | EL                     |
|                       | "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN IN USING CHARGED BATTERY.   |   | IDX                    |

# SELF-DIAGNOSTIC MODE DTC and 1st Trip DTC

NBEC0033S05

Regarding items of "DTC and 1st trip DTC", refer to "TROUBLE DIAGNOSIS — INDEX" (See EC-8.)





#### Freeze Frame Data and 1st Trip Freeze Frame Data Freeze frame data item\*1 Description DIAG TROUBLE CODE • ECCS component part/control system has a trouble code, it is displayed as "PXXXX". (Refer to [PXXXX] "TROUBLE DIAGNOSIS — INDEX", EC-8.) • "Fuel injection system status" at the moment a malfunction is detected is displayed. FUEL SYS-B1\*2 • One mode in the following is displayed. "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control FUEL SYS-B2\*2 "MODE 5": Open loop - has not yet satisfied condition to go to closed loop The calculated load value at the moment a malfunction is detected is displayed. CAL/LD VALUE [%] COOLANT TEMP [°C] or • The engine coolant temperature at the moment a malfunction is detected is displayed. • "Short-term fuel trim" at the moment a malfunction is detected is displayed. S-FUEL TRIM-B1 [%] The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel S-FUEL TRIM-B2 [%] schedule. • "Long-term fuel trim" at the moment a malfunction is detected is displayed. L-FUEL TRIM-B1 [%] The long-term fuel trim indicates much more gradual feedback compensation to the base fuel L-FUEL TRIM-B2 [%] 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 • The vehicle speed at the moment a malfunction is detected is displayed. [mph] ABSOL PRESS [kPa] or The absolute pressure at the moment a malfunction is detected is displayed. [kg/cm<sup>2</sup>] or [psi] B/FUEL SCHDL [msec] The base fuel schedule at the moment a malfunction is detected is displayed.

• The intake air temperature at the moment a malfunction is detected is displayed.

INT/A TEMP SE [°C] or

[°F]

<sup>\*1:</sup> The items are the same as those of 1st trip freeze frame data.

<sup>\*2:</sup> Regarding R50 model, "-B1" indicates right bank and "-B2" indicates left bank.

CONSULT (Cont'd



#### **DATA MONITOR MODE** =NBFC0033S06 **ECM** Main Description Monitored item [Unit] input Remarks signals signals MA • Indicates the engine speed computed CMPS-RPM (REF) from the REF signal (120° signal) of $\bigcirc$ $\bigcirc$ [rpm] the camshaft position sensor. • The signal voltage of the mass air flow • When the engine is stopped, a certain MAS AIR/FL SE [V] $\bigcirc$ $\bigcirc$ sensor is displayed. value is indicated. LC • When the engine coolant temperature • The engine coolant temperature sensor is open or short-circuited, ECM **COOLAN TEMP/S** (determined by the signal voltage of enters fail-safe mode. The engine $\bigcirc$ $\bigcirc$ the engine coolant temperature sen-[°C] or [°F] EC coolant temperature determined by the sor) is displayed. ECM is displayed. FR O2 SEN-B2 [V] $\bigcirc$ $\bigcirc$ • The signal voltage of the front heated oxygen sensor is displayed. FR O2 SEN-B1 [V] $\bigcirc$ RR O2 SEN-B1 [V] $\bigcirc$ $\bigcirc$ • The signal voltage of the rear heated AT oxygen sensor is displayed. $\bigcirc$ RR O2 SEN-B2 [V] • Display of front heated oxygen sensor signal during air-fuel ratio feedback FR O2 MNTR-B2 · After turning ON the ignition switch, $\bigcirc$ $\bigcirc$ control: [RICH/LEAN] "RICH" is displayed until air-fuel mix-RICH ... means the mixture became ture ratio feedback control begins. "rich", and control is being affected • When the air-fuel ratio feedback is toward a leaner mixture. clamped, the value just before the FR O2 MNTR-B1 LEAN ... means the mixture became $\bigcirc$ $\bigcirc$ clamping is displayed continuously. AX [RICH/LEAN] "lean", and control is being affected toward a rich mixture. • Display of rear heated oxygen sensor RR O2 MNTR-B1 signal: $\bigcirc$ [RICH/LEAN] RICH ... means the amount of oxygen • When the engine is stopped, a certain after three way catalyst is relatively value is indicated. LEAN ... means the amount of oxygen RR O2 MNTR-B2 $\bigcirc$ $\bigcirc$ after three way catalyst is relatively [RICH/LEAN] large. • The vehicle speed computed from the VHCL SPEED SE vehicle speed sensor signal is dis- $\bigcirc$ $\bigcirc$ [km/h] or [mph] played. • The power supply voltage of ECM is BATTERY VOLT [V] $\bigcirc$ $\bigcirc$ displayed. • The throttle position sensor signal volt-THRTL POS SEN [V] $\bigcirc$ $\bigcirc$ age is displayed. HA • The fuel temperature judged from the TANK F/TMP SE $\bigcirc$ tank fuel temperature sensor signal [°C] or [°F] SC voltage is displayed. • The signal voltage of the EGR tem-EGR TEMP SEN [V] $\bigcirc$ perature sensor is displayed. EL • The intake air temperature determined INT/A TEMP SE by the signal voltage of the intake air $\bigcirc$ [°C] or [°F] temperature sensor is indicated. START SIGNAL • Indicates [ON/OFF] condition from the • After starting the engine, [OFF] is dis- $\bigcirc$ $\bigcirc$ [ON/OFF] starter signal. played regardless of the starter signal.



CONSULT (Cont'd)

| Monitored item [Unit]     | ECM<br>input<br>signals | Main<br>signals | Description   | Remarks  |
|---------------------------|-------------------------|-----------------|---|--|
| CLSD THL/P SW<br>[ON/OFF] |                         |                 | Indicates mechanical contact [ON/OFF] condition of the closed throttle position switch.   |  |
| CLSD THL POS<br>[ON/OFF]  | 0                       | 0               | <ul> <li>Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal.</li> </ul>  |  |
| AIR COND SIG<br>[ON/OFF]  | 0                       | 0               | Indicates [ON/OFF] condition of the air<br>conditioner switch as determined by<br>the air conditioner signal.   |  |
| P/N POSI SW<br>[ON/OFF]   | 0                       | 0               | Indicates [ON/OFF] condition from the park/neutral position switch signal.  |  |
| PW/ST SIGNAL<br>[ON/OFF]  | 0                       | 0               | [ON/OFF] condition of the power<br>steering oil pressure switch deter-<br>mined by the power steering oil pres-<br>sure signal is indicated.  |  |
| AMB TEMP SW<br>[ON/OFF]   | 0                       | 0               | Indicates [ON/OFF] condition from the ambient air temperature switch signal.  |  |
| IGNITION SW<br>[ON/OFF]   | 0                       |                 | Indicates [ON/OFF] condition from ignition switch.  |  |
| INJ PULSE-B2 [msec]       |                         | 0               | Indicates the actual fuel injection pulse width compensated by ECM according  | When the engine is stopped, a certain  |
| INJ PULSE-B1 [msec]       |                         |                 | to the input signals.   | computed value is indicated.   |
| B/FUEL SCHDL<br>[msec]    |                         | 0               | "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.  |  |
| IGN TIMING [BTDC]         |                         | 0               | Indicates the ignition timing computed<br>by ECM according to the input signals.  | When the engine is stopped, a certain value is indicated.                    |
| IACV-AAC/V [%]            |                         | 0               | Indicates the IACV-AAC valve control value computed by ECM according to the input signals.  |  |
| PURG VOL C/V [%]          |                         |                 | <ul> <li>Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul> |  |
| A/F ALPHA-B2 [%]          |                         |                 | The mean value of the air-fuel ratio  | When the engine is stopped, a certain value is indicated.                    |
| A/F ALPHA-B1 [%]          |                         |                 | feedback correction factor per cycle is indicated.  | This data also includes the data for<br>the air-fuel ratio learning control. |
| EVAP SYS PRES [V]         |                         |                 | The signal voltage of EVAP control<br>system pressure sensor is displayed.  |  |
| AIR COND RLY<br>[ON/OFF]  |                         |                 | The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.   |  |
| FUEL PUMP RLY<br>[ON/OFF] |                         |                 | <ul> <li>Indicates the fuel pump relay control<br/>condition determined by ECM accord-<br/>ing to the input signals.</li> </ul>   |  |

CONSULT (Cont'd)

|                                      |                         |                 |   | CONSULT (Cont'd)  |                |
|--------------------------------------|-------------------------|-----------------|---|---|----------------|
| Monitored item [Unit]                | ECM<br>input<br>signals | Main<br>signals | Description   | Remarks   | GI             |
| EGRC SOL/V<br>[ON/OFF]<br>(FLOW/CUT) |                         |                 | <ul> <li>The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>ON EGR is operational OFF EGR operation is cut-off</li> </ul>    |   | MA<br>EM       |
| VENT CONT/V<br>[ON/OFF]              |                         |                 | <ul> <li>The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated.</li> <li>ON Closed OFF Open</li> </ul>                       |   | LC<br>EC       |
| FR O2 HTR-B1<br>[ON/OFF]             |                         |                 | Indicates [ON/OFF] condition of front<br>heated oxygen sensor heater deter-<br>mined by ECM according to the input  |   | FE             |
| FR O2 HTR-B2<br>[ON/OFF]             |                         |                 | signals.  |   | AT             |
| RR O2 HTR-B1<br>[ON/OFF]             |                         |                 | Indicates [ON/OFF] condition of rear<br>heated oxygen sensor heater deter-  |   | TF             |
| RR O2 HTR-B2<br>[ON/OFF]             |                         |                 | mined by ECM according to the input signals.  |   |                |
| VC/V BYPASS/V<br>[ON/OFF]            |                         |                 | <ul> <li>The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated.</li> <li>ON Open OFF Closed</li> </ul>                          |   | PD             |
| CAL/LD VALUE [%]                     |                         |                 | "Calculated load value" indicates the value of the current airflow divided by peak airflow.   |   | SU<br>BR       |
| 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.   |   | ST             |
| MASS AIRFLOW<br>[g·m/s]              |                         |                 | <ul> <li>Indicates the mass airflow computed<br/>by ECM according to the signal volt-<br/>age of the mass airflow sensor.</li> </ul>  |   | RS             |
| MAP/BARO SW/V<br>[MAP/BARO]          |                         |                 | The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated.  MAP Intake manifold absolute pressure BARO Ambient barometric pressure |   | BT<br>HA<br>SC |
| ABSOL PRES/SE [V]                    |                         |                 | The signal voltage of the absolute pressure sensor is displayed.  |   |                |
| VOLTAGE [V]                          |                         |                 | Voltage measured by the voltage probe.  |   | EL             |
| PULSE<br>[msec] or [Hz] or [%]       |                         |                 | Pulse width, frequency or duty cycle measured by the pulse probe.   | <ul> <li>Only "#" is displayed if item is unable to be measured.</li> <li>Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.</li> </ul> | IDX            |



# CONSULT (Cont'd)

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

CONSULT (Cont'd)

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

# **DTC CONFIRMATION MODE SRT STATUS Mode**

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-56.

EC

#### **SRT WORK SUPPORT Mode**

The SRT status and some of the data monitor items can be read.

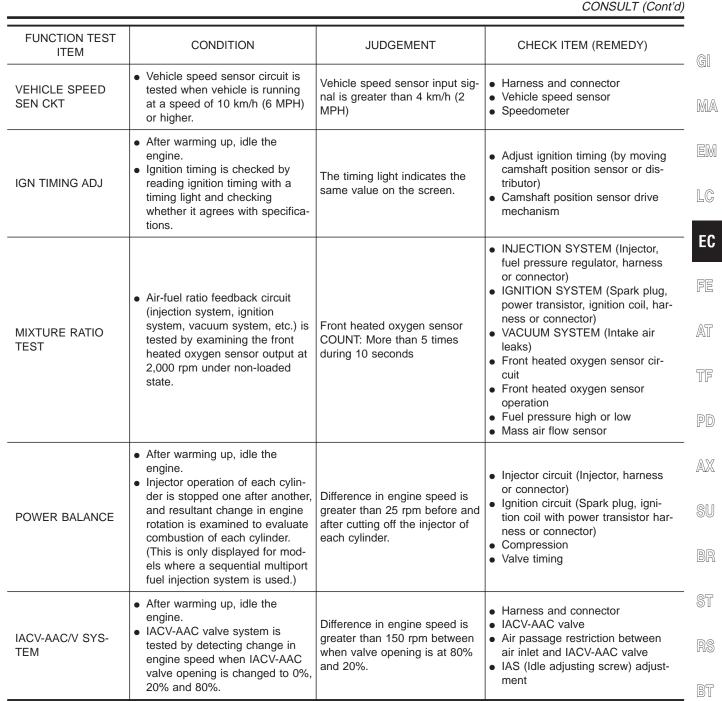


# DTC Work Support Mode

|                         | DIC WOIK            | Support Mode               | NBEC0033S1002  | TF        |
|-------------------------|---------------------|----------------------------|----------------|-----------|
| Test mode               | Test item           | Condition                  | Reference page | шш        |
|                         | PURGE FLOW P1447    |                            | EC-507         | PD        |
|                         | VC CUT/V BP/V P1491 |                            | EC-529         |           |
| EVAPORATIVE SYS-<br>TEM | PURG VOL CN/V P1444 |                            | EC-493         | AX        |
|                         | EVAP SML LEAK P0440 |                            | EC-364         |           |
|                         | EVAP SML LEAK P1440 |                            | EC-483         | SU        |
|                         | FR O2 SEN-B1 P0131  |                            | EC-209         |           |
|                         | FR O2 SEN-B1 P0132  |                            | EC-216         | BR        |
|                         | FR O2 SEN-B1 P0133  |                            | EC-224         |           |
| ED OO OENOOD            | FR O2 SEN-B1 P0130  |                            | EC-200         | ST        |
| FR O2 SENSOR            | FR O2 SEN-B2 P0151  |                            | EC-209         |           |
|                         | FR O2 SEN-B2 P0152  | Refer to corresponding     | EC-216         | RS        |
|                         | FR O2 SEN-B2 P0153  | trouble diagnosis for DTC. | EC-224         |           |
|                         | FR O2 SEN-B2 P0150  |                            | EC-200         | BT        |
|                         | RR O2 SEN-B1 P0137  |                            | EC-251         |           |
|                         | RR O2 SEN-B1 P0138  |                            | EC-260         | HA        |
| RR O2 SENSOR            | RR O2 SEN-B1 P0139  |                            | EC-269         | @@        |
| RR UZ SENSUR            | RR O2 SEN-B2 P0157  |                            | EC-251         | - SC<br>- |
|                         | RR O2 SEN-B2 P0158  |                            | EC-260         |           |
|                         | RR O2 SEN-B2 P0159  |                            | EC-269         | EL        |
|                         | EGR SYSTEM P0400    |                            | EC-344         |           |
| EGR SYSTEM              | EGRC-BPT/VLV P0402  |                            | EC-355         | ששוו      |
|                         | EGR SYSTEM P1402    |                            | EC-475         |           |



| FUNCTION TEST MODE        |   |   |                |  |  |
|---------------------------|---|---|----------------|--|--|
| FUNCTION TEST<br>ITEM     | CONDITION   | JUDGEM  | ENT            | CHECK ITEM (REMEDY)  |  |
| SELF-DIAG<br>RESULTS      | Ignition switch: ON     (Engine stopped)     Displays the results of on board diagnostic system.  | _   |                | Objective system   |  |
| CLOSED THROTTLE           | <ul> <li>Ignition switch: ON         (Engine stopped)</li> <li>More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump.</li> <li>Throttle position sensor circuit is</li> </ul>   | Throttle valve: opened  | OFF            | <ul> <li>Harness and connector</li> <li>Throttle position sensor (Closed throttle position)</li> <li>Throttle position sensor (Closed</li> </ul>   |  |
| POSI                      | 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: closed  | ON             | throttle position) adjustment Throttle linkage Verify operation in DATA MONITOR mode.  |  |
| THROTTLE POSI<br>SEN CKT  | Ignition switch: ON     (Engine stopped)     Throttle position sensor circuit is tested when throttle is opened and closed fully.   | Range (Throttle valve fully opened — Throttle valve fully closed) | More than 3.0V | <ul> <li>Harness and connector</li> <li>Throttle position sensor</li> <li>Throttle position sensor adjustment</li> <li>Throttle linkage</li> <li>Verify operation in DATA MONITOR mode.</li> </ul> |  |
| PARK/NEUT POSI<br>SW CKT  | Ignition switch: ON     (Engine stopped)     PNP switch circuit is tested   | Out of N/P positions In N/P positions                             | OFF            | Harness and connector     PNP switch     Linkage or PNP switch adjustment  |  |
|                           |   |   | ON             | Linkage or PNP switch adjustment   |  |
| FUEL PUMP CIR-<br>CUIT    | <ul> <li>Ignition switch: ON         (Engine stopped)</li> <li>Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.</li> </ul>   | There is pressure pulsation on the fuel feed hose.                |                | <ul> <li>Harness and connector</li> <li>Fuel pump</li> <li>Fuel pump relay</li> <li>Fuel filter clogging</li> <li>Fuel level</li> </ul>  |  |
| EGRC SOL/V CIR-<br>CUIT*  | <ul> <li>Ignition switch: ON         (Engine stopped)</li> <li>EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise.</li> </ul>   | The solenoid valve operating sound evonds.                        |                | Harness and connector     EGRC-solenoid valve  |  |
| START SIGNAL CIR-<br>CUIT | <ul> <li>Ignition switch: ON → START</li> <li>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.</li> </ul> | Start signal: OFF -   | → ON           | <ul><li>Harness and connector</li><li>Ignition switch</li></ul>  |  |
| PW/ST SIGNAL CIR-<br>CUIT | Ignition switch: ON     (Engine running)     Power steering oil pressure switch circuit is tested when  | Locked position   | ON             | Harness and connector     Power steering oil pressure switch   |  |
|                           | steering wheel is rotated fully and then set to a straight line running position.   | Neutral position  | OFF            | Power steering oil pump  |  |



<sup>\*:</sup> If this function test mode is not available, use the ACTIVE TEST mode.

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

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

- "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.

- "MANU TRIG" (Manual trigger):
- DTC/1st trip DTC and malfunction item will not be displayed



HA

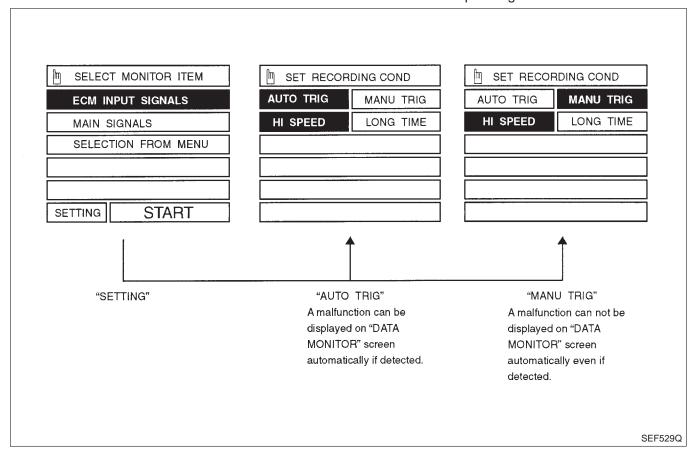


automatically on CONSULT screen even though a malfunction is detected by ECM.

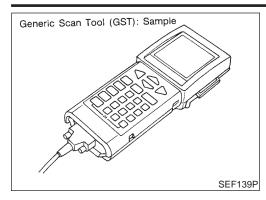
DATA MONITOR can be performed continuously even though a malfunction is detected.

Use these triggers as follows:

- "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)



Data link connector for GST

# Generic Scan Tool (GST) DESCRIPTION

NBEC0034

h SAE J1978

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.

MA

LC

SEF980R

#### **GST INSPECTION PROCEDURE**

NBEC0034S02

1. Turn off ignition switch.

EC

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.)

FE

AT

TF

VTX GENERIC OBD II
PROGRAM CARD

Press [ENTER]

Sample screen\* SEF398S

3. Turn on ignition switch.

4. Enter the program according to instruction on the screen or in the operation manual.

AX

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

SU

BK

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

ST

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

38

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HA

SC

OBD II FUNCTIONS

F0: DATA LIST

F1: FREEZE DATA

F2: DTCs

F3: SNAPSHOT

F4: CLEAR DIAG INFO

F5: O2 TEST RESULTS

F6: READINESS TESTS F7: ON BOARD TESTS

F8: EXPAND DIAG PROT

F9: UNIT CONVERSION

Sample screen\*

SEF416S



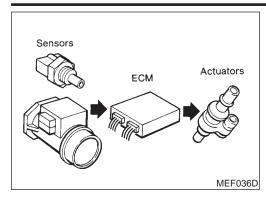
Generic Scan Tool (GST) (Cont'd)

|        | FUNCTION NBEC0034S03 |  |  |  |  |
|--------|----------------------|--|--|--|--|
| Di     | agnostic 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-83).]   |  |  |  |
| 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:  Clear number of diagnostic trouble codes (MODE 1)  Clear diagnostic trouble codes (MODE 3)  Clear trouble code for freeze frame data (MODE 1)  Clear freeze frame data (MODE 2)  Reset status of system monitoring test (MODE 1)  Clear on board monitoring test results (MODE 6 and 7)   |  |  |  |
| MODE 6 | (ON BOARD TESTS)     | This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.   |  |  |  |
| MODE 7 | (ON BOARD TESTS)     | This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.   |  |  |  |
| MODE 8 | _                    | This mode can close EVAP system in ignition switch "ON" position (Engine stopped).  When this mode is performed, the following parts can be opened or closed.  EVAP canister vent control valve open  Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function.  Low ambient temperature  Low battery voltage  Engine running  Ignition switch "OFF"  Low fuel temperature  Too much pressure is applied to EVAP system |  |  |  |
| MODE 9 | CALIBRATION ID       | This mode enables the off board to request vehicle specific vehicle information such as Vehicle Identification Number (VIN) and calibration IDs.   |  |  |  |

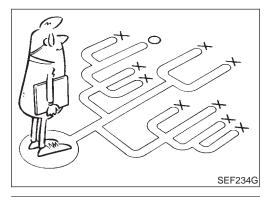
### TROUBLE DIAGNOSIS — INTRODUCTION

Introduction









#### **KEY POINTS**

WHAT ..... Vehicle & engine model WHEN ..... Date, Frequencies WHERE..... Road conditions

.... Operating conditions, Weather conditions,

Symptoms

SEF907L

#### Introduction

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

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

A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow" on EC-97.

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

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

#### **DIAGNOSTIC WORKSHEET**

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

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

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

Some conditions may cause the 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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# TROUBLE DIAGNOSIS — INTRODUCTION



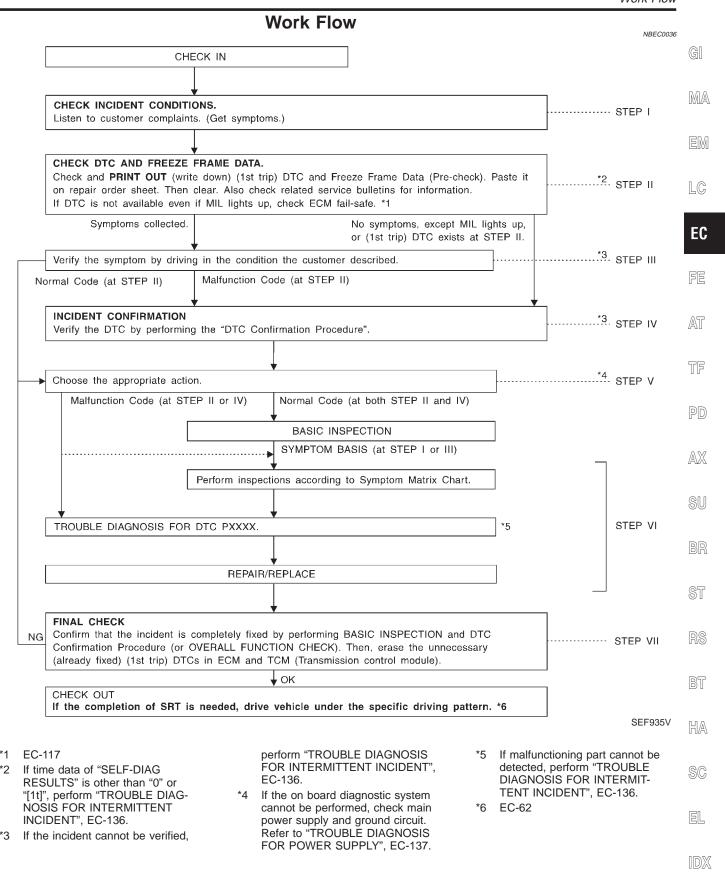
# **Worksheet Sample**

NBEC0035S0101

| Customer na  | me 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 ☐ Fuel filler cap was left off or incorrectly  | y screwed on.                              |  |
|  | ☐ Startability | ☐ Impossible to start ☐ No combus ☐ Partial combustion affected by th ☐ Partial combustion NOT affected ☐ Possible but hard to start ☐ Other | nrottle position<br>d by throttle position |  |
| Symptoms   | □ Idling       | ☐ No fast idle ☐ Unstable ☐ H☐ Others [  | High idle                                  |  |
| <b>- - - - - - - - - -</b>                             | ☐ Driveability | ☐ Stumble ☐ Surge ☐ Knock☐ Intake backfire ☐ Exhaust backfi☐ Others [  |  |  |
|  | ☐ Engine stall | ☐ At the time of start ☐ While idling ☐ While accelerating ☐ While dece  | elerating                                  |  |
| Incident occurrence                                    |                | ☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime  |  |  |
| Frequency  |                | ☐ All the time ☐ Under certain cond  | ditions                                    |  |
| Weather con-   | ditions        | ☐ Not affected   |  |  |
|  | Weather        | ☐ Fine ☐ Raining ☐ Snowing   | Others [                                   |  |
|  | Temperature    | ☐ Hot ☐ Warm ☐ Cool ☐  | Cold Humid °F                              |  |
|  |                | ☐ Cold ☐ During warm-up ☐  | After warm-up                              |  |
| Engine conditions  Road conditions  Driving conditions |                | Engine speed   | 4,000 6,000 8,000 rpm                      |  |
|  |                | ☐ In town ☐ In suburbs ☐ Hig   | nhway                                      |  |
|  |                | □ Not affected     □ At starting   □ While idling     □ While accelerating   □ While cruis     □ While decelerating   □ While turni          | •  |  |
|  |                | Vehicle speed  | 30 40 50 60 MPH                            |  |
| Malfunction i  | ndicator lamp  | ☐ Turned on ☐ Not turned on  |  |  |

MTBL0017







|          | 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-96.  |
| 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-68.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV.  If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. 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-118.)  Also check related service bulletins for information.  |
| STEP III | Try to confirm the symptom and under what conditions the incident occurs.  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.  If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. 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.  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.  If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. 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. 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.  If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX.  If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-99.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-118.)   |
| 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". Gently shake the related connectors, components or wiring harness with CONSULT set in "DATA MONITOR (AUTO TRIG)" mode.  Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT. Refer to EC-122, EC-127.  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").  Repair or replace the malfunction parts.  If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |
| 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.  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.  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-68.)  |

Basic Inspection



# **Basic Inspection**

Precaution:

NBEC0037

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.

LC

EC

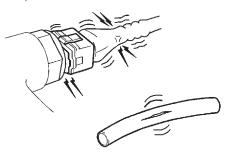
AT

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#### **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

| Models with CONSULT  | <b></b>  | GO TO 2.  |
|----------------------|----------|-----------|
| Models with GST      |          | GO TO 2.  |
| Models with No Tools | <b>•</b> | GO TO 16. |

| @ | ПП     |
|---|--------|
| 9 | $\cup$ |
|   |        |

AX

#### 2 CONNECT CONSULT OR GST TO THE VEHICLE

(P) With CONSULT

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-80.

₩ith GST

Connect "GST" to the data link connector for GST.

Refer to EC-93.

| Models with CONSULT | <b>•</b> | GO TO 3.  |
|---------------------|----------|-----------|
| Models with GST     |          | GO TO 15. |



HA

SC

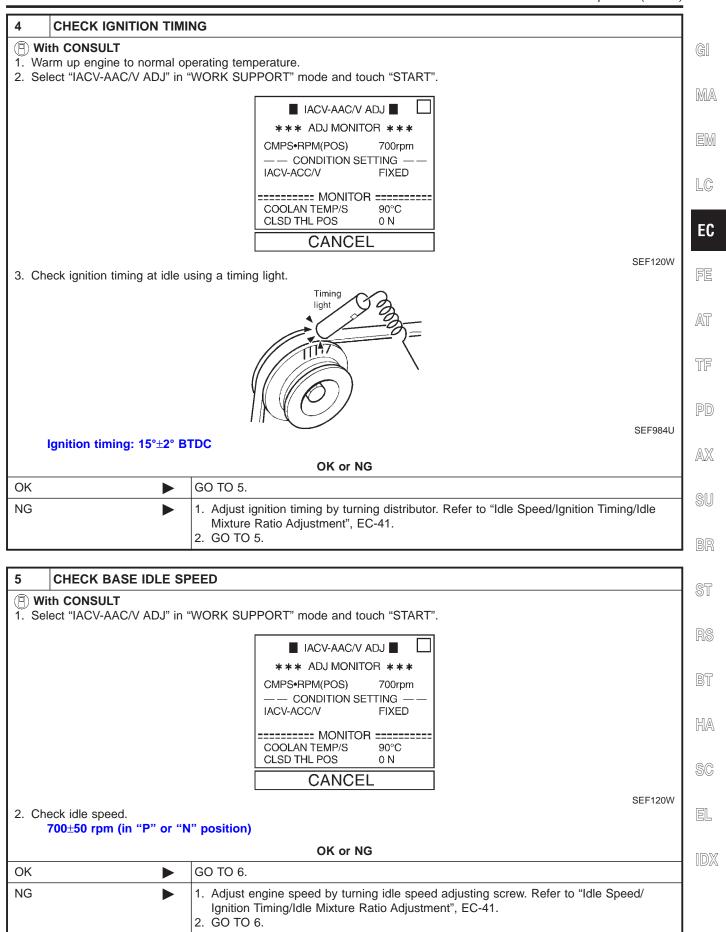
EL



Basic Inspection (Cont'd)

| 3 CHECK FI CAM FUNCT  | TION   |    |  |  |
|---|--|----|--|--|
| <ul> <li>With CONSULT</li> <li>Turn ignition switch "ON".</li> <li>Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.</li> <li>Start engine and warm it up.</li> </ul> |  |    |  |  |
|   | ☆ MONITOR ☆ NO FAIL  |    |  |  |
|   | COOLAN TEMP/S 80°C   |    |  |  |
|   | RECORD   |    |  |  |
| <ul> <li>The center of mark A is aligned</li> </ul>   | ature is 75 to 85°C (167 to 185°F), check the following. and with mark <b>C</b> . is not touching the fast idle cam. | 2P |  |  |
| Mark (A) (cam follower lever)  Mark (C) (fast idle cam)  Thermo-element   |  |    |  |  |
|   | SEF97  | 1R |  |  |
|   | OK or NG   |    |  |  |
| OK •  | GO TO 4.   |    |  |  |
| NG  | Check FI cam. Refer to "Fast Idle Cam (FIC)", EC-39.   |    |  |  |

Basic Inspection (Cont'd)





Basic Inspection (Cont'd)

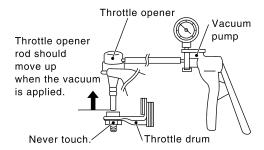
#### 6 CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION-I

(P) With CONSULT

#### NOTE:

Always check ignition timing and base idle speed before performing the following.

- 1. Warm up engine to normal operating temperature.
- 2. Check FI cam, refer to procedure 3.
- 3. Stop engine.
- 4. Remove the vacuum hose connected to the throttle opener.
- 5. Connect suitable vacuum hose to vacuum pump as shown below.



SEF793W

6. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)]

GO TO 7.



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Basic Inspection (Cont'd)

# CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION-II 1. Turn ignition switch "ON". GI 2. Select "CLSD THL/P SW" in "DATA MONITOR" mode. 3. Read "CLSD THL/P SW" signal under the following conditions. • Insert a 0.3 mm (0.012 in) and 0.4 mm (0.016 in) feeler gauge alternately between the throttle adjust screw (TAS) and MA throttle drum as shown in the figure and check the signal. EM Feeler gauge LC Throttle 😞 EC adjust screw (never adjust) Throttle drum FE AEC887A AT ☆ MONITOR ☆ NO FAIL CLSD THL/P SW ON TF PD **RECORD** AX SEF577W "CLSD THL/P SW" signal should remain "ON" while inserting 0.3 mm (0.012 in) feeler gauge. "CLSD THL/P SW" signal should remain "OFF" while inserting 0.4 mm (0.016 in) feeler gauge. SU OK or NG GO TO 12. OK GO TO 8. NG ST BT



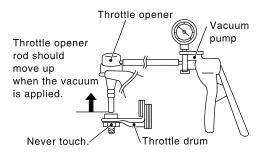
Basic Inspection (Cont'd)

#### 8 ADJUSTMENT THROTTLE POSITION SWITCH IDLE POSITION

(P) With CONSULT

#### NOTE:

- Never adjust throttle adjust screw (TAS).
- Do not touch throttle drum when checking "CLSD THL/P SW" signal, doing so may cause an incorrect adjustment.
- 1. Warm up engine to normal operating temperature.
- 2. Check FI cam. Refer to procedure 3.
- 3. Stop engine.
- 4. Loosen throttle position sensor fixing bolts.
- 5. Remove the vacuum hose connected to the throttle opener.
- 6. Connect suitable vacuum hose to vacuum pump as shown below.

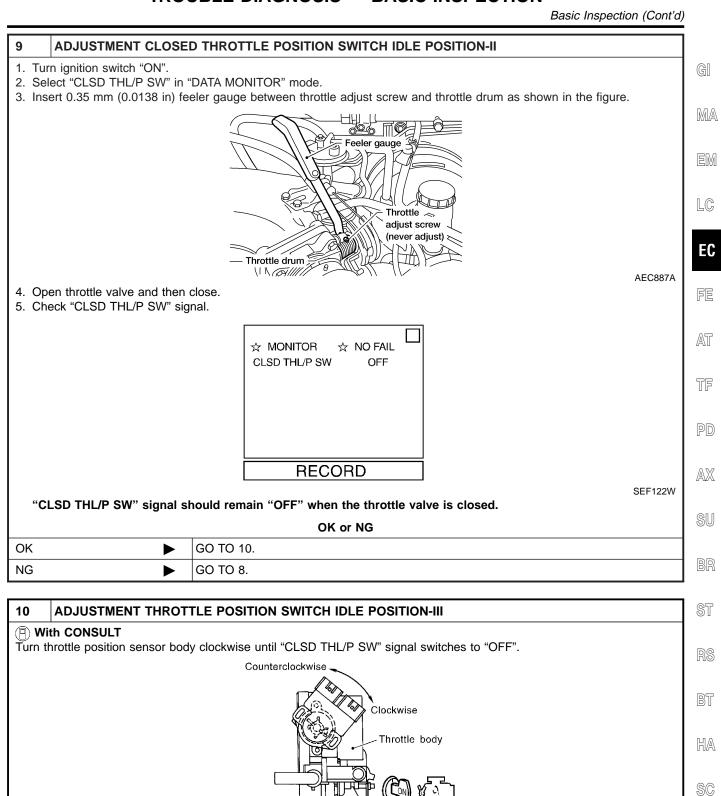


SEF793W

7. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.82 inHg)] until the throttle drum becomes free from the rod of the throttle opener. During adjustment procedure, vacuum should be applied.



GO TO 9.



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SEF689W

GO TO 11.

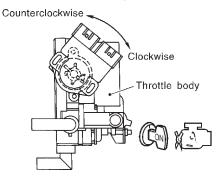


Basic Inspection (Cont'd)

#### 11 ADJUSTMENT THROTTLE POSITION SWITCH IDLE POSITION-IV

#### (P) With CONSULT

- 1. Remove 0.35 mm (0.0138 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge.
- 2. Temporarily tighten sensor body fixing bolts as follows.
- Gradually move the sensor body counterclockwise and stop it when "CLSD THL/P SW" signal switches from "OFF" to "ON", then temporarily tighten sensor body fixing bolts.



SEF689W

- 3. Make sure two or three times that the signal is "ON" when the throttle valve is closed and "OFF" when it is opened.
- 4. Remove 0.3 mm (0.012 in) feeler gauge then insert 0.4 mm (0.016 in) feeler gauge.
- 5. Make sure two or three times that the signal remains "OFF" when the throttle valve is closed.
- 6. Tighten throttle position sensor.
- 7. Check the "CLSD THL/P SW" signal again.

The signal remains "OFF" while closing throttle valve.

OK or NG

| OK   | GO TO 12. |
|------|-----------|
| NG ► | GO TO 8.  |

Basic Inspection (Cont'd)

# 12 RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY (P) With CONSULT NOTE: Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly. MA 1. Remove feeler gauge. 2. Start engine. 3. Warm up engine to normal operating temperature. 4. Select "CLSD THL POS" in "DATA MONITOR" mode. 5. Stop engine. (Turn ignition switch "OFF".) 6. Turn ignition switch "ON" and wait at least 5 seconds. LC EC AT SEF864V 7. Turn ignition switch "OFF" and wait at least 5 seconds. 8. Repeat steps 6 and 7 until "CLSD THL POS" signal changes to "ON". ☆ MONITOR ☆ NO FAIL CLSD THL POS ON AX RECORD SEF123W GO TO 13. 13 **REMOVE VACUUM PUMP** 1. Release vacuum from the throttle opener. 2. Remove vacuum pump and vacuum hose from the throttle opener. 3. Reinstall the original vacuum hose to the throttle opener securely. GO TO 14. HA 14 **CHECK TARGET IDLE SPEED** SC (P) With CONSULT 1. Start engine and warm it up to normal operating temperature. EL 2. Select "CMPS-RPM (REF)" in "DATA MONITOR" mode. 3. Check idle speed. 750±50 rpm (in "P" or "N" position) OK or NG OK **INSPECTION END** NG Adjust idle speed. Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment",

EC-41.

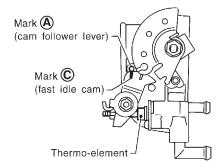




#### 15 CHECK FI CAM FUNCTION

# **With GST**

- 1. Turn ignition switch "ON".
- 2. Select "MODE 1" with GST.
- 3. Start engine and warm it up.
- 4. When engine coolant temperature is 75 to 85°C (167 to 185°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.



SEF971R

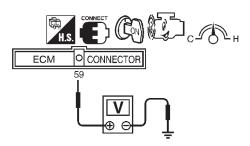
#### OK or NG

| L | OK | GO TO 17.  |
|---|----|--|
|   | NG | Check FI cam. Refer to "Fast Idle Cam (FIC)", EC-39. |

#### 16 CHECK FI CAM FUNCTION

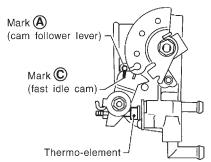
#### No Tools

- 1. Set the voltmeter between ECM terminal 59 (Engine coolant temperature sensor signal) and ground.
- 2. Start engine and warm it up.



SEF119W

- 3. When the voltage is between 1.10 to 1.36V, 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.



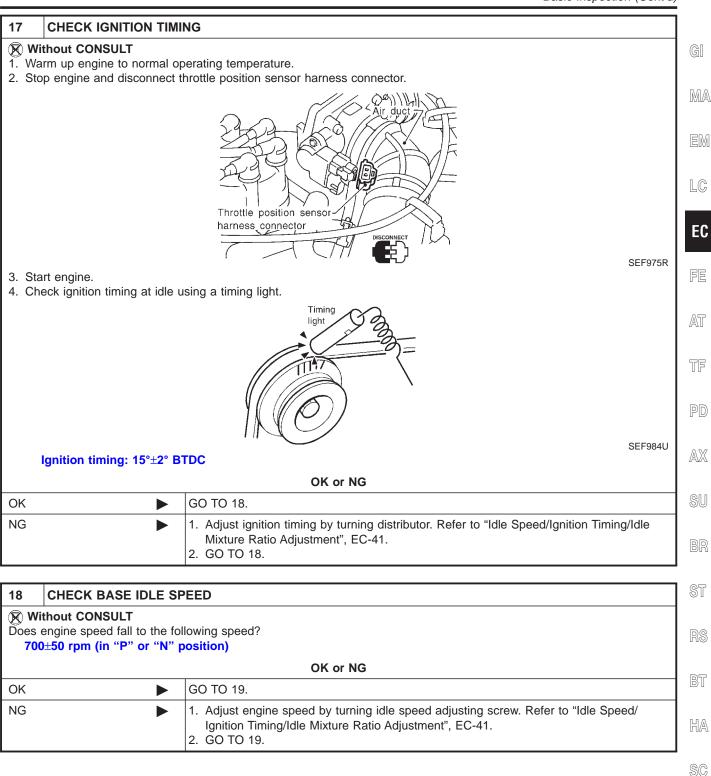
SEF971R

OK or NG

| ı | OK • | GO TO 17.  |
|---|------|--|
| ı | NG • | Check FI cam. Refer to "Fast Idle Cam (FIC)", EC-39. |

**\$\dagger** 

Basic Inspection (Cont'd)



EL



Basic Inspection (Cont'd)

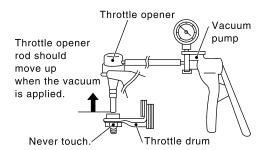
#### 19 CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION

#### **⋈** Without CONSULT

#### NOTE:

Always check ignition timing and base idle speed before performing the following.

- 1. Warm up engine to normal operating temperature.
- 2. Check FI cam, refer to procedure 12 or 13.
- 3. Stop engine.
- 4. Remove the vacuum hose connected to the throttle opener.
- 5. Connect suitable vacuum hose to vacuum pump as shown below.



SEF793W

6. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener. During checking procedure, vacuum should be applied.

GO TO 20.



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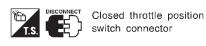
HA

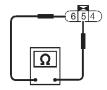
SC

Basic Inspection (Cont'd)

#### 20 CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION-I

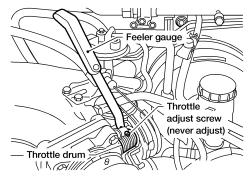
- 1. Disconnect closed throttle position switch harness connector.
- 2. Check continuity between closed throttle position switch terminals 5 and 6 under the following conditions.





SEF862V

• Insert the 0.3 mm (0.012 in) and 0.4 mm (0.016 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure.



AEC887A

#### OK or NG

| OK • | GO TO 25. |
|------|-----------|
| NG ► | GO TO 21. |

<sup>&</sup>quot;Continuity should exist" while inserting 0.3 mm (0.012 in) feeler gauge.

<sup>&</sup>quot;Continuity should not exist" while inserting 0.4 mm (0.016 in) feeler gauge.



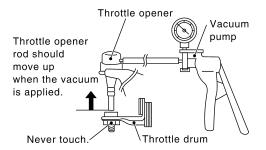
Basic Inspection (Cont'd)

#### 21 ADJUSTMENT THROTTLE POSITION SWITCH IDLE POSITION

#### Without CONSULT

#### NOTE:

- Never adjust throttle adjust screw (TAS).
- Do not touch throttle drum when checking "continuity", doing so may cause an incorrect adjustment.
- 1. Warm up engine to normal operating temperature.
- 2. Check FI cam. Refer to procedure 12 or 13.
- 3. Stop engine.
- 4. Loosen throttle position sensor fixing bolts.
- 5. Remove the vacuum hose connected to the throttle opener.
- 6. Connect suitable vacuum hose to vacuum pump as shown below.

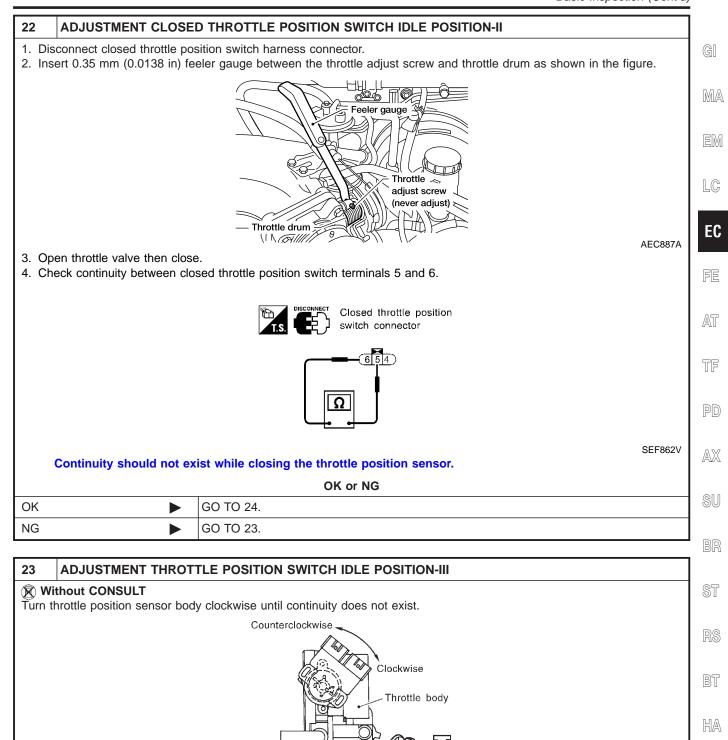


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7. Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener. During adjustment procedure, vacuum should be applied.

GO TO 22.

Basic Inspection (Cont'd)



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SEF689W

GO TO 24.

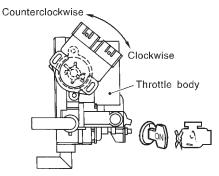




#### 24 ADJUSTMENT THROTTLE POSITION SWITCH IDLE POSITION-IV

#### Without CONSULT

- 1. Remove 0.35 mm (0.0138 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge.
- 2. Temporarily tighten sensor body fixing bolts as follows.
- Gradually move the sensor body counterclockwise and stop it when the continuity comes to exist, then temporarily tighten sensor body fixing bolts.



SEF689W

- 3. Make sure two or three times that the continuity exists when the throttle valve is closed and continuity does not exist when it is opened.
- 4. Remove 0.3 mm (0.012 in) feeler gauge then insert 0.4 mm (0.016 in) feeler gauge.
- 5. Make sure two or three times that the continuity does not exist when the throttle valve is closed.
- 6. Tighten throttle position sensor.
- 7. Check the continuity again.

Continuity does not exist while closing the throttle valve.

OK or NG

| OK • | GO TO 25. |
|------|-----------|
| NG • | GO TO 21. |

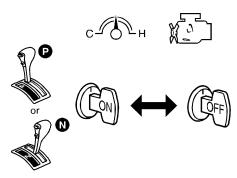
#### 25 RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

#### **⋈** Without CONSULT

#### NOTE:

Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.

- 1. Remove feeler gauge.
- 2. Start engine.
- 3. Warm up engine to normal operating temperature.
- 4. Stop engine. (Turn ignition switch "OFF".)
- 5. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

- 6. Turn ignition switch "OFF" and wait at least 5 seconds.
- 7. Repeat steps 5 and 6, 20 times.
  - ► GO TO 26.



Basic Inspection (Cont'd)

| 26 REINSTALLATION                                 |  | ]         |
|---|--|-----------|
| Without CONSULT  1. Release vacuum from the three | ottle opener   | GI        |
| 2. Remove vacuum pump and v                       | acuum hose from the throttle opener.   |           |
|   | hose to the throttle opener securely. ensor harness connector and closed throttle position switch harness connector. | MA        |
|   | to 3,000 rpm) two or three times under no-load and then run engine at idle speed.                                    |           |
| <b>•</b>  | GO TO 27.  | EM        |
| 27 CHECK TARGET IDLE                              | SPEED  | 1         |
| Without CONSULT                                   | SI ELD   | LC        |
| 1. Start engine and warm it up t                  | o normal operating temperature.  | Ε.        |
| 2. Check idle speed. 750±50 rpm (in "P" or "N     | l" nosition)   | EC        |
| 730±30 1pm (m 1 01 N                              | OK or NG   |           |
| OK •  | GO TO 28.  | FE        |
|   |  | -         |
| NG •  | Adjust idle speed. Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment", EC-41.                       | AT        |
|   |  | TF        |
| 28 ERASE UNNECESSAR                               |  |           |
| After this inspection, unnecessar                 | y DTC No. might be displayed.<br>If and TCM (Transmission control module).   |           |
|   | SSION-RELATED DIAGNOSTIC INFORMATION", EC-68 and "HOW TO ERASE DTC" in   | PD        |
| AT section.                                       |  |           |
| <b>•</b>  | INSPECTION END   |           |
|   |  |           |
|   |  | SU        |
|   |  |           |
|   |  | BR        |
|   |  |           |
|   |  | ST        |
|   |  |           |
|   |  | RS        |
|   |  |           |
|   |  | BT        |
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|   |  |           |
|   |  | en        |
|   |  |           |
|   |  |           |
|   |  | EL<br>IDX |



DTC Inspection Priority Chart

# **DTC Inspection Priority Chart**

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

| Priority | Detected items (DTC)   |
|----------|--|
| 1        | <ul> <li>P0100 Mass air flow sensor (0102)</li> <li>P0110 Intake air temperature sensor (0401)</li> <li>P0115 P0125 Engine coolant temperature sensor (0103) (0908)</li> <li>P0120 Throttle position sensor (0403)</li> <li>P0180 Fuel tank temperature sensor (0402)</li> <li>P0325 Knock sensor (0304)</li> <li>P0335 P1336 Crankshaft position sensor (OBD) (0802) (0905)</li> <li>P0340 Camshaft position sensor (0101)</li> <li>P0500 Vehicle speed sensor (0104)</li> <li>P0600 A/T communication line</li> <li>P0605 ECM (0301)</li> <li>P1320 Ignition signal (0201)</li> <li>P1400 EGRC-solenoid valve (1005)</li> <li>P1605 A/T diagnosis communication line (0804)</li> <li>P1706 Park/Neutral position (PNP) switch (1003)</li> </ul>  |
| 2        | <ul> <li>P0105 Absolute pressure sensor (0803)</li> <li>P0130-P0134, P0150-P0154 Front heated oxygen sensor (0413-0415) (0503) (0509), (0303) (0409-0412)</li> <li>P0135 P0155 Front heated oxygen sensor heater (0901) (1001)</li> <li>P0137-P0140, P0157-P0160 Rear heated oxygen sensor (0510-0512) (0707), (0313-0315) (0708)</li> <li>P0141 P0161 Rear heated oxygen sensor heater (0902) (1002)</li> <li>P0443 P1444 EVAP canister purge volume control solenoid valve (1008) (0214)</li> <li>P0446 P1446 P1448 EVAP canister vent control valve (0903) (0215) (0309)</li> <li>P0450 EVAP control system pressure sensor (0704)</li> <li>P0510 Closed throttle position switch (0203)</li> <li>P0705-P0755 P1705 P1760 A/T related sensors, solenoid valves and switches (1101-1208)</li> <li>P1105 MAP/BARO switch solenoid valve (1302)</li> <li>P1401 EGR temperature sensor (0305)</li> <li>P1490 P1491 Vacuum cut valve bypass valve (0801) (0311)</li> <li>P1447 EVAP control system purge flow monitoring (0111)</li> </ul> |
| 3        | <ul> <li>P0172 P0171 P0175 P0174 Fuel injection system function (0114) (0115) (0209) (0210)</li> <li>P0306 - P0300 Misfire (0603 - 0701)</li> <li>P0400 P1402 EGR function (0302) (0514)</li> <li>P0402 EGRC-BPT valve function (0306)</li> <li>P0420 P0430 Three way catalyst function (0702) (0703)</li> <li>P0440 P1440, P0455 EVAP control system (SMALL LEAK) (0705) (0213), (GROSS LEAK) (0715)</li> <li>P0505 IACV-AAC valve (0205)</li> <li>P0731-P0734 P0744 A/T function (1103 - 1106) (1107)</li> <li>P1148 P1168 Closed loop control (0307) (0308)</li> </ul>  |

Fail-safe Chart



# **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.

| DTC                        | No.  |   |  |  |
|----------------------------|--|---|--|--|
| CONSULT<br>GST             | ECM*1  | Detected items                            | Engine operation   | ng condition in fail-safe mode   |
| P0100                      | 0102   | Mass air flow sensor circuit              | Engine speed will not rise more  | than 2,400 rpm due to the fuel cut.  |
| P0115                      | 0103   | Engine coolant temperature sensor circuit | after turning ignition switch "ON  | be determined by ECM based on the time " or "START". 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)   |
| P0120                      | 0403   | Throttle position sensor circuit          | Throttle position will be determithe engine speed. Therefore, acceleration will be p   | ned based on the injected fuel amount and  |
|                            |  |   | Condition  | Driving condition  |
|                            |  |   | When engine is idling  | Normal   |
|                            |  |   | When accelerating  | Poor acceleration  |
| Unable to<br>access<br>ECM | Unable to<br>access<br>Diagnostic<br>Test Mode<br>II | ECM                                       | When the fail-safe system active condition in the CPU of ECM), warn the driver. However it is not possible to act Engine control with fail-safe When ECM fail-safe is operatin | ition ECM was judged to be malfunctioning. ates (i.e., if the ECM detects a malfunction the MIL on the instrument panel lights to cess ECM and DTC cannot be confirmed. g, fuel injection, ignition timing, fuel pump operation are controlled under certain limita- |
|                            |  |   |  | ECM fail-safe operation  |
|                            |  |   | Engine speed   | Engine speed will not rise more than 3,000 rpm   |
|                            |  |   | Fuel injection   | Simultaneous multiport fuel injection system   |
|                            |  |   | Ignition timing  | Ignition timing is fixed at the preset valve   |
|                            |  |   | Fuel pump  | Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls  |
|                            |  |   | IACV-AAC valve   | Full open  |
|                            |  |   | Replace ECM, if ECM fail-safe  | condition is confirmed.  |

<sup>\*1:</sup> In Diagnostic Test Mode II (Self-diagnostic results)

Symptom Matrix Chart



# Symptom Matrix Chart SYSTEM — BASIC ENGINE CONTROL SYSTEM

NBEC0040 NBEC0040S01

|            |                                       |                                  |              |                              |                        |                                 | SY                 | MPT                | OM               |                        |                                  |                            |                           |                             | NBECUU4USU        |
|------------|---------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-------------------|
|            |                                       | 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<br>page |
| Warranty   | symptom code                          | AA                               | АВ           | AC                           | AD                     | AE                              | AF                 | AG                 | АН               | AJ                     | AK                               | AL                         | AM                        | НА                          |                   |
| Fuel       | Fuel pump circuit                     | 1                                | 1            | 2                            | 3                      | 2                               |                    | 3                  | 2                |                        |                                  | 3                          |                           | 1                           | EC-563            |
|            | Injector circuit                      | '                                | '            |                              |                        |                                 |                    | 2                  |                  |                        |                                  |                            |                           |                             | EC-550            |
|            | Fuel pressure regulator system        |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EC-38             |
|            | Evaporative emission system           | 4                                | 4            | 4                            | 4                      | 4                               | 4                  | 4                  | 3                | 3                      |                                  | 4                          |                           |                             | EC-30             |
| Air        | Positive crankcase ventilation system |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            | 1                         |                             | EC-36             |
|            | Incorrect idle speed adjustment       | 3                                | 3            |                              |                        |                                 | 1                  | 1                  | 1                | 1                      |                                  | 1                          |                           |                             | EC-41             |
|            | IACV-AAC valve circuit                | 2                                | 1            | 3                            | 3                      | 3                               | 2                  | 2                  | 2                | 2                      |                                  | 3                          |                           | 1                           | EC-413            |
|            | IACV-FICD solenoid valve circuit      |                                  | 2            | ]                            | 3                      | 3                               | 3                  | 3                  |                  |                        |                                  | 3                          |                           |                             | EC-577            |
| Ignition   | Incorrect ignition timing adjustment  | 3                                | 3            | 1                            | 1                      | 1                               |                    | 1                  | 1                |                        |                                  | 1                          |                           |                             | EC-41             |
|            | Ignition circuit                      | 1                                | 1            |                              | 2                      | 2                               |                    | 2                  | 2                |                        |                                  | 2                          |                           |                             | EC-451            |
| EGR        | EGRC-solenoid valve circuit           |                                  | 2            | 2                            | 3                      | 3                               |                    |                    |                  |                        |                                  | 3                          |                           |                             | EC-464            |
|            | EGR system                            | 4                                | 4            | 4                            | 4                      | 4                               | 4                  | 4                  | 3                | 3                      |                                  | 4                          |                           |                             | EC-344, 475       |
| Main pow   | er supply and ground circuit          | 1                                | 2            | 3                            | 3                      | 3                               |                    | 3                  | 2                |                        | 1                                | 3                          |                           | 1                           | EC-137            |
| Air condit | ioner circuit                         | 2                                | _            | 3                            | 3                      | 3                               | 3                  | 3                  | ~                | 2                      |                                  | 3                          |                           | 1                           | HA-30             |

<sup>1 - 6:</sup> The numbers refer to the order of the inspection. (continued on next page)

RS

BT

HA

SC

EL

Symptom Matrix Chart (Cont'd)

|   |                                  |              |                              |                        |                                 | SY                 | MPT                | OM               |                        |                                  |                            |                           |                             |                   |      |
|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-------------------|------|
|   | 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<br>page |      |
| Warranty symptom code                         | AA                               | АВ           | AC                           | AD                     | AE                              | AF                 | AG                 | АН               | AJ                     | AK                               | AL                         | AM                        | НА                          | -                 |      |
| Camshaft position sensor circuit              |                                  |              |                              | 2                      |                                 |                    |                    | 2                |                        |                                  |                            |                           |                             | EC-336            | AT   |
| Mass air flow sensor circuit                  | 1                                | 1            | 2                            |                        | 2                               |                    |                    |                  |                        |                                  | 2                          |                           |                             | EC-146            |      |
| Front heated oxygen sensor circuit            |                                  | ]            |                              | 3                      |                                 |                    | 2                  |                  |                        |                                  |                            |                           |                             | EC-200            | TF   |
| Engine coolant temperature sensor circuit     | 1                                | 2            | 3                            |                        | 3                               | 3                  |                    |                  | 2                      |                                  | 3                          |                           |                             | EC-175, 194       |      |
| Throttle position sensor circuit              |                                  | 1            | 2                            |                        | 2                               | 2                  |                    |                  |                        |                                  | 2                          |                           |                             | EC-181            | PC   |
| Incorrect throttle position sensor adjustment |                                  | 3            | 1                            |                        | 1                               | 1                  | 1                  | 1                | 1                      |                                  | 1                          |                           |                             | EC-99             |      |
| Vehicle speed sensor circuit                  |                                  | 2            |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EC-408            |      |
| Knock sensor circuit                          |                                  |              | 3                            | 3                      | 3                               |                    |                    |                  |                        |                                  | 3                          |                           |                             | EC-324            | @1   |
| ECM   | 2                                | 2            |                              | 3                      |                                 | 3                  | 3                  | 2                | 2                      | 1                                |                            |                           |                             | EC-433, 117       | · SU |
| Start signal circuit                          | 1                                |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EC-558            | BF   |
| Park/Neutral position (PNP) switch circuit    |                                  |              | 3                            |                        | 3                               |                    | 3                  | 2                |                        |                                  | 3                          |                           |                             | EC-542            |      |
| Power steering oil pressure switch circuit    |                                  | 2            |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EC-571            | . ST |

<sup>1 - 6:</sup> The numbers refer to the order of the inspection. (continued on next page)

**EC-119** 



Symptom Matrix Chart (Cont'd)

|            |  | S                                | YST          | EM-                          | — E                    | NG                              | INE                | ME                 | CH               | ANI                    | CAL                              | . &                        | OTH                       | IER                         | NBEC0040S03            |
|------------|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|------------------------|
|            |  |                                  |              |                              |                        |                                 | SY                 | MPT                | ОМ               |                        |                                  |                            |                           |                             |                        |
|            |  | 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<br>section   |
| Warranty s | symptom code   | AA                               | АВ           | AC                           | AD                     | AE                              | AF                 | AG                 | АН               | AJ                     | AK                               | AL                         | AM                        | НА                          |                        |
| Fuel       | Fuel tank  | - 5                              |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | FE-4                   |
|            | 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-3                   |
|            | Air leakage from intake manifold/<br>Collector/Gasket            |                                  |              |                              | 5                      | -                               |                    |                    |                  |                        |                                  |                            |                           |                             | _                      |
| Cranking   | Battery  |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                        |
|            | Alternator circuit   |                                  | 1            | 1                            |                        | 1                               |                    | 1                  | 1                |                        |                                  | 1                          |                           | 1                           | SC-3, SC-9<br>and SC-6 |
|            | Starter circuit  | 1                                |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                        |
|            | Park/neutral position (PNP) switch                               |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | AT-99                  |
|            | Drive plate  | 6                                |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EM-54                  |

<sup>1 - 6:</sup> The numbers refer to the order of the inspection. (continued on next page)

Symptom Matrix Chart (Cont'd)

|                      |  |                                  |              |                              |                        |                                 | SY                 | MPT                | ОМ               |                        |                                  |                            |                           |                             |                           |      |
|----------------------|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|---------------------------|------|
|                      |  | 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<br>section      |      |
| Warranty             | symptom code   | AA                               | АВ           | AC                           | AD                     | AE                              | AF                 | AG                 | АН               | AJ                     | AK                               | AL                         | AM                        | НА                          |                           |      |
| Engine               | Cylinder head  | 5                                | 5            | 5                            | 5                      | 5                               |                    | 5                  | 5                |                        |                                  | 5                          |                           |                             |                           | A1   |
|                      | Cylinder head gasket                                     | J                                | 3            | 3                            | J                      |                                 |                    |                    | 3                |                        | 2                                | 3                          | 2                         |                             |                           |      |
|                      | Cylinder block   |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           | T    |
|                      | Piston   |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            | 3                         |                             |                           |      |
|                      | Piston ring  | 6                                | 6            | 6                            | 6                      | 6                               |                    | 6                  | 6                |                        |                                  | 6                          |                           |                             |                           | P    |
|                      | Connecting rod   |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | 5M 40 5M 07               | A    |
|                      | Bearing  |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EM-18, EM-27<br>and EM-46 | /=\/ |
|                      | Crankshaft   |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           | SI   |
| Valve<br>mecha-      | Timing chain   |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           | (O)  |
| nism                 | Camshaft   | 6                                |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           | B    |
|                      | Intake valve   |                                  | 6            | 6                            | 6                      | 6                               |                    | 6                  | 6                |                        |                                  | 6                          | 2                         |                             |                           |      |
|                      | Exhaust valve  |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           | S    |
|                      | Hydraulic lash adjuster                                  |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           |      |
| Exhaust              | Exhaust manifold/Tube/Muffler/Gasket                     | 6                                | 6            | 6                            | 6                      | 6                               |                    | 6                  | 6                |                        |                                  | 6                          |                           |                             | FE-8                      | R    |
|                      | Three way catalyst                                       |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           |      |
| Lubrica-<br>tion     | Oil pan/Oil strainer/Oil pump/Oil filter/<br>Oil gallery | 6                                | 6            | 6                            | 6                      | 6                               |                    | 6                  | 6                |                        |                                  | 6                          | 2                         |                             | MA-17,<br>EM-15, LC-4     | В    |
|                      | Oil level (Low)/Filthy oil                               |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | MA-18                     | K    |
| Cooling              | Radiator/Hose/Radiator filler cap                        |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             |                           | ш    |
|                      | Thermostat   |                                  |              |                              |                        |                                 | 5                  |                    |                  | 5                      |                                  |                            |                           |                             |                           | 8    |
|                      | Water pump   |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | LC-8                      |      |
|                      | Water gallery  | 6                                | 6            | 6                            | 6                      | 6                               |                    | 6                  | 6                |                        | 2                                | 6                          |                           |                             |                           |      |
|                      | Cooling fan  |                                  |              |                              |                        |                                 | 5                  |                    |                  | 5                      |                                  |                            |                           |                             |                           |      |
|                      | Coolant level (low)/Contaminated coolant                 |                                  |              |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | MA-14                     |      |
| IVIS (Infin<br>NATS) | iti Vehicle Immobilizer System —                         | 1                                | 1            |                              |                        |                                 |                    |                    |                  |                        |                                  |                            |                           |                             | EC-74 or<br>EL-284        |      |

<sup>1 - 6:</sup> The numbers refer to the order of the inspection.





NBEC0041

# **CONSULT Reference Value in Data Monitor Mode**

#### Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  - \* Specification data may not be directly related to their components signals/values/operations.

i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

• If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

| MONITOR ITEM                   | CON  | IDITION   | SPECIFICATION   |  |  |
|--------------------------------|--|---|---|--|--|
| CMPS·RPM (REF)                 | Tachometer: Connect     Run engine and compare tachom value.   | eter indication with the CONSULT                    | Almost the same speed as the CONSULT value.                     |  |  |
| MAS AIR/FL SE                  | Engine: After warming up     Air conditioner switch: "OFF"   | Idle  | 1.0 - 1.7V  |  |  |
| WAS AIIVI L SL                 | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>   | 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   |  |   | 0 - 0.3V ←→ Approx. 0.6 - 1.0V                                  |  |  |
| FR O2 MNTR-B2<br>FR O2 MNTR-B1 | Engine: After warming up   | Maintaining engine speed at 2,000 rpm               | LEAN ←→ RICH<br>Changes more than 5 times<br>during 10 seconds. |  |  |
| RR O2 SEN-B1<br>RR O2 SEN-B2   | - Engine After warming up  | Maintaining engine speed at 2,000                   | 0 - 0.3V ←→ Approx. 0.6 - 1.0V                                  |  |  |
| RR O2 MNTR-B1<br>RR O2 MNTR-B2 | Engine: After warming up   | rpm   | LEAN ←→ RICH  |  |  |
| VHCL SPEED SE                  | Turn drive wheels and compare s<br>SULT value  | peedometer indication with the CON-                 | Almost the same speed as the CONSULT value                      |  |  |
| BATTERY VOLT                   | Ignition switch: ON (Engine stopp)   | ed)   | 11 - 14V  |  |  |
| THRTL POS SEN                  | <ul> <li>Engine: After warming up</li> <li>More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener</li> </ul> | Throttle valve: fully closed                        | 0.15 - 0.85V  |  |  |
| THINTE FOO SEN                 | with a handy vacuum pump.  Ignition switch: ON (Engine stopped)  | Throttle valve: fully opened                        | 3.5 - 4.7V  |  |  |
| EGR TEMP SEN                   | Engine: After warming up   |   | Less than 4.5V  |  |  |
| START SIGNAL                   | ullet Ignition switch: ON $	o$ START $	o$  | ON  | $OFF \to ON \to OFF$  |  |  |
| CLSD THL/P SW                  | <ul> <li>Engine: After warming up</li> <li>More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener</li> </ul> | Throttle valve: Idle position                       | ON  |  |  |
| CLOS IIIBI OW                  | with a handy vacuum pump.  Ignition switch: ON (Engine stopped)  | Throttle valve: Slightly open                       | OFF   |  |  |
|                                | - Engine: After warming up idle  | Air conditioner switch: "OFF"                       | OFF   |  |  |
| AIR COND SIG                   | Engine: After warming up, idle<br>the engine   | Air conditioner switch: "ON" (Compressor operates.) | ON  |  |  |

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

| MONITOR ITEM                 |  |   | e in Data Monitor Mode (Cont | É              |
|------------------------------|--|---|------------------------------|----------------|
| MONITOR ITEM                 | CON  | DITION  | SPECIFICATION                |                |
| P/N POSI SW                  | Ignition switch: ON  | Shift lever: "P" or "N"                                 | ON                           | _ GI           |
|                              |  | Except above  | OFF                          | _ MA           |
| PW/ST SIGNAL                 | Engine: After warming up, idle<br>the engine   | Steering wheel in neutral position (forward direction)  | OFF                          | UVU <i>L</i> = |
|                              | the engine   | The steering wheel is turned                            | ON                           | _ EN           |
| AMB TEMP SW                  | <ul><li>Ignition switch: ON</li><li>Compare ambient temperature</li></ul>                | Below 23.5°C (74°F)                                     | OFF                          |                |
| AINID TEINIP SW              | with the following:  | Above 23.5°C (74°F)                                     | ON                           | LC             |
| IGNITION SW                  | Ignition switch: ON → OFF → ON   | l   | $ON \to OFF \to ON$          |                |
| INJ PULSE-B2                 | <ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul>         | Idle  | 2.4 - 3.7 msec               | EC             |
| INJ PULSE-B1                 | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>                                       | 2,000 rpm   | 1.9 - 3.3 msec               | FE             |
| B/FUEL SCHDL                 | ditto  | Idle  | 1.0 - 1.6 msec               |                |
| B/FUEL SCHUL                 | ditto  | 2,000 rpm   | 0.7 - 1.4 msec               |                |
| IGN TIMING                   | ditto  | Idle  | 10° BTDC                     |                |
| IGN TIMING                   | ditto  | 2,000 rpm   | More than 25° BTDC           | TF             |
| IACV-AAC/V                   | ditto  | Idle  | 10 - 20%                     |                |
| IAC V-AAC/V                  | ditto  | 2,000 rpm   | _                            | — PD<br>—      |
| PURG VOL C/V                 | ditto  | Idle  | 0%                           | ^\             |
| FORG VOL C/V                 | ditto  | 2,000 rpm   | _                            | — AX           |
| A/F ALPHA-B2<br>A/F ALPHA-B1 | Engine: After warming up   | Maintaining engine speed at 2,000 rpm                   | 54 - 155%                    | SU             |
| EVAP SYS PRES                | Ignition switch: ON  |   | Approx. 3.4V                 |                |
| AIR COND RLY                 | Air conditioner switch: OFF → ON   | I   | $OFF \to ON$                 | BR             |
| FUEL PUMP RLY                | Ignition switch is turned to ON (O     Engine running and cranking                       | perates for 5 seconds)                                  | ON                           | –<br>ST        |
|                              | Except as shown above  |   | OFF                          | _              |
|                              | Engine: After warming up   | Idle  | OFF (CUT)                    | —<br>RS        |
| EGRC SOL/V                   | <ul><li>Air conditioner switch: "OFF"</li><li>Shift lever: "N"</li><li>No-load</li></ul> | Engine speed: Revving from idle up to 3,000 rpm quickly | ON (FLOW)                    | –<br>BT        |
| VENT CONT/V                  | Ignition switch: ON  |   | OFF                          |                |
| FR O2 HTR-B1                 | Engine speed: Below 3,200 rpm  |   | ON                           |                |
| FR O2 HTR-B2                 | Engine speed: Above 3,200 rpm  |   | OFF                          |                |
| RR O2 HTR-B1                 | Ignition switch: ON (Engine stopp     Engine speed: Above 3,200 rpm                      | ed)   | OFF                          | SC             |
| RR O2 HTR-B2                 | Engine speed: Below 3,200 rpm [<br>of 70 km/h (43 MPH) or more]                          | After driving for 2 minutes at a speed                  | ON                           | EL             |
| VC/V BYPASS/V                | Ignition switch: ON  |   | OFF                          |                |
| CAL // D \/ALL:5             | Engine: After warming up     Air conditioner switch: "OFF"                               | Idle  | 18.5 - 26.0%                 | — [D]          |
| CAL/LD VALUE                 | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>                                       | 2,500 rpm   | 18.0 - 21.0%                 | _              |
|                              |  |   |                              |                |

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

| MONITOR ITEM                           | CON  | IDITION                                   | SPECIFICATION     |
|--|--|---|-------------------|
| ABSOL TH-P/S                           | <ul> <li>Engine: After warming up</li> <li>More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump.</li> </ul> | Throttle valve: fully closed              | 0.0%              |
|  | <ul><li>Engine: After warming up</li><li>Ignition switch: ON<br/>(Engine stopped)</li></ul>  | Throttle valve: fully opened              | Approx. 80%       |
|  | Engine: After warming up     Air conditioner switch: "OFF"   | Idle                                      | 3.3 - 4.8 g·m/s   |
| MASS AIRFLOW                           | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>   | 2,500 rpm                                 | 12.0 - 14.9 g·m/s |
|  | Ignition switch: ON (Engine stopp)   | MAP                                       |                   |
| MAP/BARO SW/V                          |  | For 5 seconds after starting engine       | BARO              |
| ······································ | Engine speed: Idle   | More than 5 seconds after starting engine | MAP               |
|  | Ignition switch: ON (Engine stopp)   | ed)                                       | Approx. 4.4V      |
| ABSOL PRES/SE                          |  | For 5 seconds after starting engine       | Approx. 4.4V      |
|  | Engine speed: Idle   | More than 5 seconds after starting engine | Approx. 1.3V      |

# **Major Sensor Reference Graph in Data Monitor** Mode

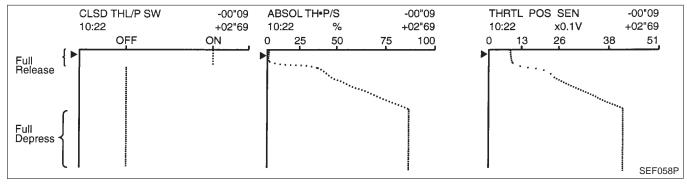
NREC0042

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

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

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

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

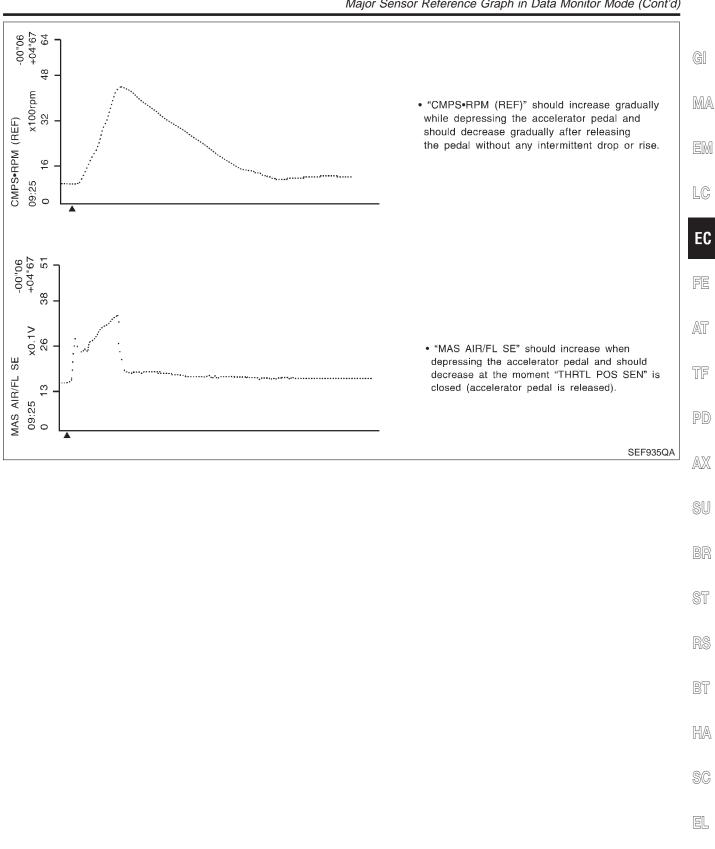


## CMPS-RPM (REF), MAS AIR/FL SE, THRTL POS SEN, RR O2 SEN-B1, FR O2 SEN-B1, INJ PULSE-B1

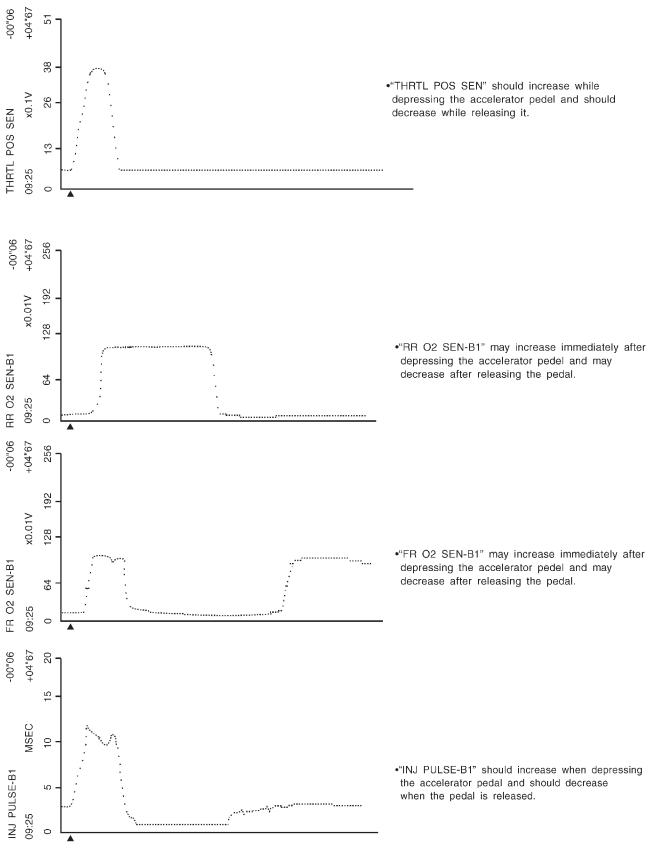
Below is the data for "CMPS-RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SEN-B1", "FR O2 SEN-B1" and "INJ PULSE-B1" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.

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

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







SEF936Q

ECM Terminals and Reference Value

View with instrument lower cover removed Lower steering column cover ECM harness connector 0 SEF981R

ECM harness protector

Tester probe

105 106 107 108

| 113 | 114 | 115 | 116

122 123 124

Thin wire

101 102 103 104

118 119 120

112

121

109|110|111

117

AEC913

MEC486B

1 2 3

10

19

5 6 7 8 9

11 12 13 14

15 16 17 18

# **ECM Terminals and Reference Value PREPARATION**

NBEC0043

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

NBEC0043S01

Remove instrument lower cover.

MA

LC

Remove ECM harness protector.



AT

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.

AX

ST

# ECM HARNESS CONNECTOR TERMINAL LAYOUT

24 25

31 32

42 43

64 65 66 67 48 49 50 51 52 53 68 69 70 71

72

80

77 78 79

HA

SC

SFF533P

#### **ECM INSPECTION TABLE**

20 21 22

38 39

26 27 28 29 30

40 41

33 34 35 36 37

Specification data are reference values and are measured between each terminal and ground.

44 45 46 47

59 60 61 62 63

54 55 56 57 58 73 74 75 76



### **CAUTION:**

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM            | CONDITION  | DATA (DC Voltage)                                    |
|----------------------|---------------|-----------------|--|--|
| 1                    |               |                 | [Engine is running]  ● Idle speed                      | 0.7V  (V) 4 2 0 20 ms  SEF988U                       |
| '                    | W/B           | Ignition signal | [Engine is running]  ● Engine speed is 2,000 rpm       | 1.1 - 1.5V<br>(V)<br>4<br>2<br>0<br>20 ms<br>SEF989U |
|                      | W/G           | Ignition check  | [Engine is running]  • Warm-up condition  • Idle speed | Approximately 12V  (V) 40 20 0  20 ms  SEF990U       |
| 2                    |               |                 | [Engine is running]  ● Engine speed is 2,000 rpm       | Approximately 11V  (V) 40 20 0  20 ms  SEF991U       |
|                      | w             | V Tachometer    | [Engine is running]  • Warm-up condition  • Idle speed | Approximately 2V  (V) 10 5 0 20 ms  SEF992U          |
| 3                    |               |                 | [Engine is running]  ◆ Engine speed is 2,000 rpm       | 4 - 5V  (V) 10 5 0  20 ms  SEF993U                   |

|                      |               |  |   | als and Reference Value (Cont'd)  |                               |
|----------------------|---------------|--|---|---|-------------------------------|
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                                     | CONDITION   | DATA (DC Voltage)   |                               |
| 4 L/B                | L/B           | ECCS relay (Self-shut-                   | [Engine is running] [Ignition switch "OFF"]  • For a few seconds after turning ignition switch "OFF"  | [Ignition switch "OFF"]  • For a few seconds after turning ignition switch          | 0 - 1.5V                      |
|                      |               | off)                                     | [Ignition switch "OFF"]  ● A few seconds passed after turning ignition switch "OFF"   | BATTERY VOLTAGE<br>(11 - 14V)   |                               |
|                      |               |  |   | BATTERY VOLTAGE (11 - 14V) (V) 40   |                               |
|                      |               | EVAD agrictor average                    | [Engine is running]  ● Idle speed   | 20<br>0<br>50 ms  |                               |
| 5                    | LG/B          | EVAP canister purge volume control sole- |   | SEF994U   |                               |
|                      |               | noid valve                               | [Engine is running]   | BATTERY VOLTAGE<br>(11 - 14V)<br>(V)  |                               |
|                      |               |  | <ul> <li>Engine speed is 2,000 rpm<br/>(More than 100 seconds after starting engine)</li> </ul>   | 20<br>0<br>50 ms  |                               |
|                      |               |  |   | SEF995U   |                               |
| 7                    | Y/G           | A/T check signal                         | [Ignition switch "ON"]<br>[Engine is running]   | 0 - 3.0V  |                               |
|                      |               | OR Ambient air temperature switch        | <ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Ambient air temperature is above 23.5°C</li> <li>Air conditioner is operating</li> </ul>            | <ul><li>Idle speed</li><li>Ambient air temperature is above 23.5°C (74°F)</li></ul> | ov                            |
| 9                    | G/OR          |  | <ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Ambient air temperature is below 23.5°C (74°F)</li> <li>Air conditioner is operating</li> </ul>     | BATTERY VOLTAGE<br>(11 - 14V)   |                               |
|                      |               |  | <ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Ambient air temperature is below 23.5°C (74°F)</li> <li>Air conditioner is not operating</li> </ul> | Approximately 5V  |                               |
| 10                   | В             | ECM ground                               | [Engine is running]  • Idle speed   | Engine ground   |                               |
| 44                   | D/I           | Fuel nurse sale                          | [Ignition switch "ON"]  • For 5 seconds after turning ignition switch "ON"  [Engine is running]   | 0 - 1V  |                               |
| 11                   | R/L           | R/L Fuel pump relay                      | [Ignition switch "ON"]  ■ More than 5 seconds after turning ignition switch "ON"  | BATTERY VOLTAGE<br>(11 - 14V)   |                               |
|                      | 0/5           | A. Dec                                   | [Engine is running]  • Both A/C switch and blower switch are "ON"*  | 0 - 1V  |                               |
| 12                   | G/R           | G/R                                      | Air conditioner relay   | [Engine is running]  • A/C switch is "OFF"  | BATTERY VOLTAGE<br>(11 - 14V) |

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                                       | CONDITION  | DATA (DC Voltage)                |
|----------------------|---------------|--|--|----------------------------------|
|                      |               | Malford Control Product                    | [Ignition switch "ON"]   | 0 - 1V                           |
| 18                   | lamp          |  | [Engine is running]  • Idle speed  | BATTERY VOLTAGE<br>(11 - 14V)    |
| 19                   | В             | ECM ground                                 | [Engine is running]  • Idle speed  | Engine ground                    |
|                      |               |  | [Ignition switch "ON"]   | Approximately 0V                 |
| 20                   | B/Y           | Start signal                               | [Ignition switch "START"]  | BATTERY VOLTAGE<br>(11 - 14V)    |
| 21                   | B/W           | Air conditioner switch                     | <ul> <li>[Engine is running]</li> <li>Both A/C switch and blower switch are "ON" (Compressor operates)*</li> </ul>   | Approximately 0V                 |
|                      |               |  | [Engine is running]  ■ A/C switch is "OFF"   | Approximately 5V                 |
| 22                   | L/B           | Park/neutral position                      | [Ignition switch "ON"] • Gear position is "N" or "P"   | Approximately 0V                 |
| 22                   | L/B           | (PNP) switch                               | [Ignition switch "ON"] • Except the above gear position  | BATTERY VOLTAGE<br>(11 - 14V)    |
| 23                   | W             | Throttle position sensor                   | [Ignition switch "ON"]  • Warm-up condition  • More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump  • Accelerator pedal fully released | 0.15 - 0.85V                     |
|                      |               |  | [Ignition switch "ON"]  • Accelerator pedal fully depressed  | 3.5 - 4.7V                       |
| 25                   | В             | ECM ground                                 | [Engine is running]  • Idle speed  | Engine ground                    |
| 26                   | PU/W          | A/T signal No. 1                           | [Ignition switch "ON"] [Engine is running]  • Idle speed   | 6 - 8V                           |
| 27                   | P/B           | A/T signal No. 2                           | [Ignition switch "ON"] [Engine is running]  • Idle speed   | 6 - 8V                           |
| 28                   | OR/W          | Throttle position switch (Closed position) | [Ignition switch "ON"]  • Warm-up condition  • More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump  • Accelerator pedal fully released | BATTERY VOLTAGE<br>(11 - 14V)    |
|                      |               |  | [Ignition switch "ON"]  • Accelerator pedal depressed  | Approximately 0V                 |
| 29                   | W/L           | Vehicle speed sensor                       | <ul><li>[Engine is running]</li><li>Lift up the vehicle.</li><li>In 2nd gear position</li><li>Vehicle speed is 40 km/h</li></ul>   | 2 - 3V  (V) 10 5 0 50 ms  SEF996 |

EL

|                      | ı                     | l  |  | I  |
|----------------------|-----------------------|--|--|--|
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR         | ITEM   | CONDITION  | DATA (DC Voltage)  |
|                      |                       |  | [Ignition switch "OFF"]  | ov   |
| 31                   | B/W                   | Ignition switch  | [Ignition switch "ON"]   | BATTERY VOLTAGE<br>(11 - 14V)  |
| 32                   | В                     | ECM ground   | [Engine is running]  ■ Idle speed  | Engine ground<br>(Probe this terminal with (–)<br>tester probe when measuring) |
| 35                   | Р                     | A/T signal No. 3   | [Ignition switch "ON"]   | ov   |
| 37                   | Р                     | Throttle position sensor signal to TCM (Transmission control module) | [Ignition switch "ON"]  • Warm-up condition  • More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump  • Accelerator pedal fully released | 0.15 - 0.85V   |
|                      |                       |  | [Ignition switch "ON"]  • Accelerator pedal fully depressed  | 3.5 - 4.7V   |
| 20                   | Power steering oil    | - (-   | [Engine is running]  ■ Steering wheel is being fully turned  | Approximately 0V   |
| 39                   | R/B                   | pressure switch  | [Engine is running] • Steering wheel is not being turned   | Approximately 5V   |
| 42                   | P/B                   | Sensors' power supply  | [Ignition switch "ON"]   | Approximately 5V   |
| 43                   | В                     | Sensors' ground  | [Engine is running]  • Warm-up condition  • Idle speed   | Approximately 0V   |
|                      | BAM                   | Camshaft position sen-   | [Engine is running]  • Warm-up condition  • Idle speed   | Approximately 2.5V  (V) 10 5 0.2 ms  SEF999U                                   |
| 44                   | sor (Position signal) | B/W  | [Engine is running] • Engine speed is 2,000 rpm  | Approximately 2.5V  (V) 10 5 0.2 ms  SEF001V                                   |



|                      |               | ı   |   |   |
|----------------------|---------------|---|---|---|
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM  | CONDITION   | DATA (DC Voltage)   |
| 49                   | L             | Camshaft position sensor (Reference signal) | [Engine is running]  ● Idle speed   | 0.3 - 0.5V  (V) 10 5 0 20 ms  SEF997U                       |
| 53                   | L             |   | [Engine is running]  ● Engine speed is 2,000 rpm  | 0.3 - 0.5V<br>(V)<br>10<br>5<br>0<br>20 ms<br>SEF998U       |
|                      | W             | Absolute pressure sensor                    | [Ignition switch "ON"]  • Engine is not running  • For 5 seconds after ignition switch is turned "ON"  [Engine is running]  • Idle (for 5 seconds after engine start)             | Approximately 4.4V  |
| 45                   |               |   | [Ignition switch "ON"]  • Engine is not running  • More than 5 seconds after ignition switch is turned "ON"  [Engine is running]  • Idle (More than 5 seconds after engine start) | Approximately 1.3V  |
| 47                   | L             | Crankshaft position sensor (OBD)            | [Engine is running]  • Warm-up condition  • Idle speed  | 1 - 2V<br>(AC range)<br>(V)<br>10<br>5<br>0.2 ms<br>SEF690W |
| 47                   |               |   | [Engine is running] • Engine speed is 2,000 rpm   | 2 - 4V<br>(AC range)<br>(V)<br>10<br>5<br>0.2 ms<br>SEF691W |

|                      |               |                                     | ECM Termina   | als and Reference Value (Cont'd)   |
|----------------------|---------------|-------------------------------------|---|--|
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                                | CONDITION   | DATA (DC Voltage)  |
| 50                   | W             | Front heated oxygen sensor RH       | [Engine is running]  • Warm-up condition  • Engine speed is 2,000 rpm                                 | 0 - Approximately 1.0V (V) 2 1 0.5 ms SEF002V                                |
| 51                   | W             | Front heated oxygen sensor LH       | <ul><li>[Engine is running]</li><li>• Warm-up condition</li><li>• Engine speed is 2,000 rpm</li></ul> | 0 - Approximately 1.0V (V) 2 1 0.5 ms SEF002V                                |
| 54                   | w             | Mass air flow sensor                | [Engine is running]  • Warm-up condition  • Idle speed  | 1.0 - 1.7V   |
| 54                   | VV            | Mass air now sensor                 | [Engine is running]  • Warm-up condition  • Engine speed is 2,500 rpm                                 | 1.7 - 2.3V   |
| 55                   | В             | Mass air flow sensor ground         | [Engine is running]  • Warm-up condition  • Idle speed  | Approximately 0V   |
| 56                   | L/W           | Rear heated oxygen sensor RH        | <ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed is 2,000 rpm</li></ul>     | 0 - Approximately 1.0V   |
| 57                   | W             | Rear heated oxygen sensor LH        | <ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed is 2,000 rpm</li></ul>     | 0 - Approximately 1.0V   |
| 59                   | LG/R          | Engine coolant temperature sensor   | [Engine is running]   | Approximately 0 - 4.8V Output voltage varies with engine coolant temperature |
| 60                   | LG/B          | Fuel tank temperature sensor        | [Engine is running]   | Approximately 0 - 4.8V Output voltage varies with fuel temperature           |
| 61                   | Y/L           | Intake air temperature sensor       | [Engine is running]   | Approximately 0 - 4.8V Output voltage varies with intake air temperature.    |
| 62                   | G/B           | EVAP control system pressure sensor | [Ignition switch "ON"]  | Approximately 3.4V   |
|                      |               |                                     | [Ignition switch "ON"]  | Less than 4.5V   |
| 63                   | P/G           | EGR temperature sensor              | <ul><li>[Engine is running]</li><li>Warm-up condition</li><li>EGR system is operating</li></ul>       | 0 - 1.5V   |
| 64                   | W             | Knock sensor                        | [Engine is running]  • Idle speed   | Approximately 2.5V   |
| 67                   | B/W           | Power supply for ECM                | [Ignition switch "ON"]  | BATTERY VOLTAGE<br>(11 - 14V)  |

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR                      | ITEM   | CONDITION   | DATA (DC Voltage)                                  |
|----------------------|------------------------------------|--|---|--|
| 69                   | LG/R                               | Data link connector for GST  | [Engine is running] • 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  | [Engine is running]   | 0 - 4V   |
| 76                   | L                                  | CONSULT  | Idle speed (Connect CONSULT and turned on.)   | 3 - 9V   |
| 80                   | W/R                                | Power supply (Back-up)   | [Ignition switch "OFF"]   | BATTERY VOLTAGE<br>(11 - 14V)                      |
|                      |                                    |  | [Engine is running]  • Warm-up condition  • Idle speed  | 8 - 11V<br>(V)<br>20<br>10<br>0<br>5 ms<br>SEF005V |
| 101                  | OR                                 | IACV-AAC valve   | [Engine is running]  • Warm-up condition  • Engine speed is 3,000 rpm   | 2 - 3V<br>(V)<br>20<br>10<br>0<br>5 ms<br>SEF692W  |
| 102<br>104<br>106    | W<br>Y/R<br>W/G<br>Y<br>W/L<br>W/B | /R Injector No. 3<br>I//G Injector No. 5<br>Injector No. 2<br>I/L Injector No. 4 | [Engine is running]  • Warm-up condition  • Idle speed  | BATTERY VOLTAGE (11 - 14V)  (V) 40 20 0 50 ms      |
| 109<br>111<br>113    |                                    |  | <ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed is 2,000 rpm</li></ul>                                     | BATTERY VOLTAGE (11 - 14V)  (V) 40 20 0 50 ms      |
|                      |                                    |  | [Engine is running]  • Warm-up condition  • Idle speed  | BATTERY VOLTAGE<br>(11 - 14V)                      |
| 103                  | L/W                                | _/W EGRC-solenoid valve  | <ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Engine speed is revving from idle up to 3,000 rpm quickly</li> </ul> | 0 - 1.5V   |

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM   | CONDITION   | DATA (DC Voltage)                                     |                    |
|----------------------|---------------|--|---|---|--------------------|
| 108                  | G/R           | EVAP canister vent control valve   | [Ignition switch "ON"]  | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 116                  | В             | ECM ground   | [Engine is running]  • Idle speed   | Engine ground   |                    |
| 117                  | B/W           | Current return   | [Engine is running]  • Idle speed   | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
|                      |               | MAD/BARO switch  | [Ignition switch "ON"]  • Engine is not running  • For 5 seconds after ignition switch is turned "ON"  [Engine is running]  • Idle (for 5 seconds after engine start) | 0 - 1V  |                    |
| 118                  | 118   G/OR    | <ul> <li>Engine is not running</li> <li>More than 5 seconds after ignition switch is tu "ON"</li> <li>[Engine is running]</li> </ul> | <ul> <li>Engine is not running</li> <li>More than 5 seconds after ignition switch is turned "ON"</li> </ul>   | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 440                  |               |  | Front heated oxygen   | [Engine is running] • Engine speed is below 3,200 rpm | Approximately 0.4V |
| 119                  | PU            | sensor heater RH   | [Engine is running]  ● Engine speed is above 3,200 rpm  | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 120                  | G/W           | Vacuum cut valve bypass valve  | [Ignition switch "ON"]  | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 404                  | DILIAA        | Front heated oxygen sensor heater LH   | [Engine is running] • Engine speed is below 3,200 rpm   | Approximately 0.4V                                    |                    |
| 121                  | PU/W          |  | [Engine is running] • Engine speed is above 3,200 rpm   | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 122                  | PU/G          | Rear heated oxygen   | <ul> <li>[Engine is running]</li> <li>Engine speed is below 3,200 rpm</li> <li>After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more</li> </ul>          | Approximately 0.4V                                    |                    |
| 122                  | F0/G          | sensor heater RH   | [Ignition switch "ON"]  ■ Engine stopped [Engine is running]  ■ Engine speed is above 3,200 rpm   | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 400                  | DLI/D         | Rear heated oxygen   | <ul> <li>[Engine is running]</li> <li>Engine speed is below 3,200 rpm</li> <li>After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more</li> </ul>          | Approximately 0.4V                                    |                    |
| 123                  | PU/R          | sensor heater LH   | [Ignition switch "ON"]  • Engine stopped [Engine is running]  • Engine speed is above 3,200 rpm   | BATTERY VOLTAGE<br>(11 - 14V)                         |                    |
| 124                  | В             | ECM ground   | [Engine is running]  • Idle speed   | Engine ground   |                    |

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



# **Description**

Intermittent incidents (I/I) may occur. In many cases, the problem resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (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**

VIRECO28

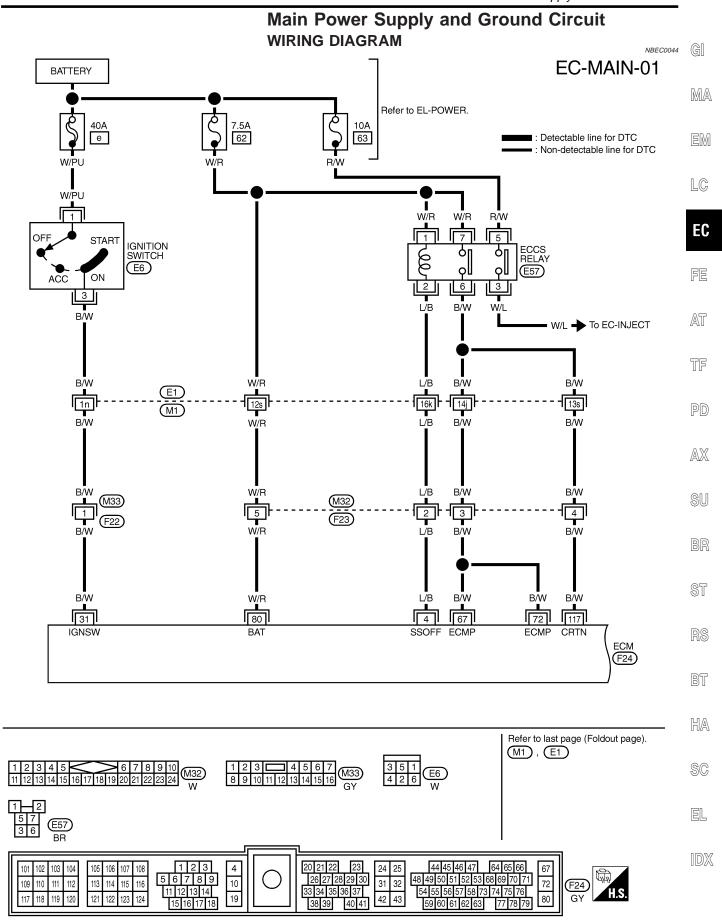
| 1     | INSPECTION START  |          |  |
|-------|---|----------|--|
| Erase | Erase (1st trip) DTCs. Refer to "HOW TO ERASE EMISSION — RELATED INFORMATION", EC-68. |          |  |
|       | <b>&gt;</b>   | GO TO 2. |  |

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

| 3      | SEARCH FOR ELECTRICAL INCIDENT                     |                    |  |  |  |  |
|--------|--|--------------------|--|--|--|--|
| Perfor | Perform "Incident Simulation Tests" in GI section. |                    |  |  |  |  |
|        |  | OK or NG           |  |  |  |  |
| OK     | OK ▶ GO TO 4.                                      |                    |  |  |  |  |
| NG     | <b>&gt;</b>  | Repair or replace. |  |  |  |  |

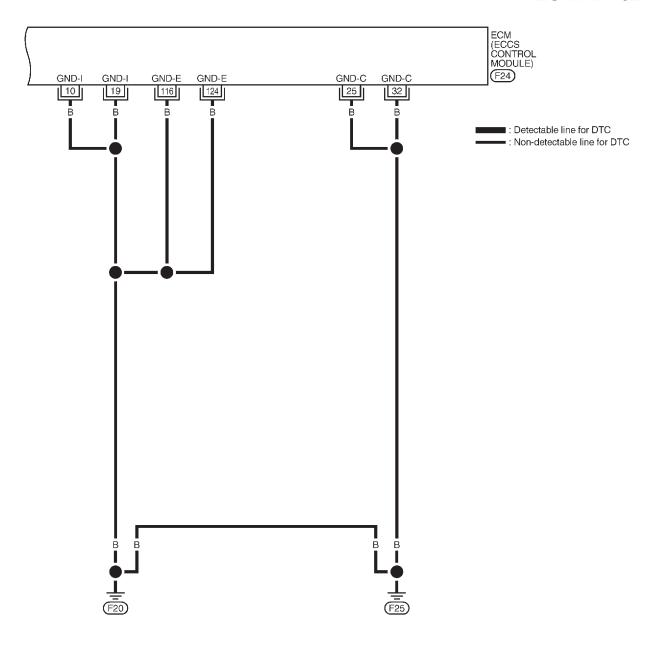
| 4  | CHECK CONNECTOR TERMINALS |                              |  |
|--|---------------------------|------------------------------|--|
| Refer to "How to Check Enlarged Contact Spring of Terminal" in GI section. |                           |                              |  |
| OK or NG   |                           |                              |  |
| OK   | <b>&gt;</b>               | INSPECTION END               |  |
| NG   | <b>&gt;</b>               | Repair or replace connector. |  |

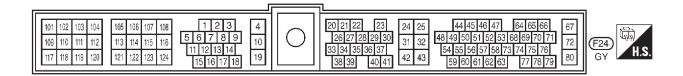
Main Power Supply and Ground Circuit





# EC-MAIN-02





MEC138C



Main Power Supply and Ground Circuit (Cont'd)

#### **ECM TERMINALS AND REFERENCE VALUE**

Specification data are reference values and are measured between each terminal and ground.

NBEC0045

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| (611 |
|------|
| Cuu  |
|      |

| ige to th            | ne ECIVI'S    | s transistor. Use a gre   | ound other than ECM terminals, such as t   | ne grouna.  | _ |
|----------------------|---------------|---------------------------|--|---|---|
| TERMI-<br>NAL<br>NO. | WIRE<br>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<br>(11 - 14V)   |   |
| 10                   | В             | ECM ground                | [Engine is running]  • Idle speed  | Engine ground   | _ |
| 19                   | В             | ECM ground                | [Engine is running]  • Idle speed  | Engine ground   | _ |
| 25                   | В             | ECM ground                | [Engine is running]  • Idle speed  | Engine ground   | _ |
| 31                   | B/W           | Ignition switch           | [Ignition switch "OFF"]  | ov  | _ |
|                      |               |                           | [Ignition switch "ON"]   | BATTERY VOLTAGE<br>(11 - 14V)   | _ |
| 32                   | В             | ECM ground                | [Engine is running]  • Idle speed  | Engine ground<br>(Probe this terminal with<br>(–) tester probe when<br>measuring) |   |
| 67                   | B/W           | Davida analy for FOM      | Florida or suital "ON"   | BATTERY VOLTAGE   | _ |
| 72                   | B/W           | Power supply for ECM      | [Ignition switch "ON"]   | (11 - 14V)  |   |
| 80                   | W/R           | Power supply (Back-up)    | [Ignition switch "OFF"]  | BATTERY VOLTAGE<br>(11 - 14V)   |   |
| 116                  | В             | ECM ground                | [Engine is running]  • Idle speed  | Engine ground   |   |
| 117                  | B/W           | Current return            | [Engine is running]  • Idle speed  | BATTERY VOLTAGE<br>(11 - 14V)   | _ |
| 124                  | В             | ECM ground                | [Engine is running]  • Idle speed  | Engine ground   | _ |

#### **DIAGNOSTIC PROCEDURE**

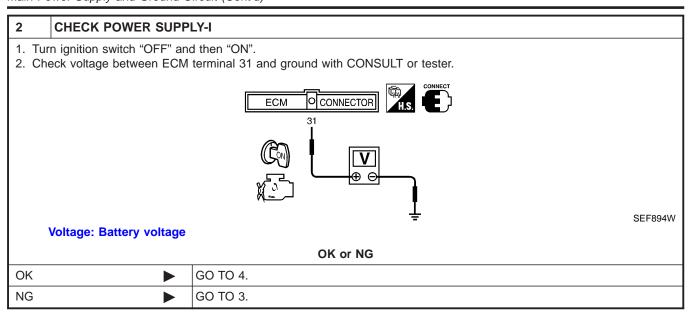
NBEC0046

| 1                                | INSPECTION START |          |  |  |  |
|----------------------------------|------------------|----------|--|--|--|
| Start engine. Is engine running? |                  |          |  |  |  |
|                                  | Yes or No        |          |  |  |  |
| Yes                              | <b>&gt;</b>      | GO TO 9. |  |  |  |
| No                               | <b>&gt;</b>      | GO TO 2. |  |  |  |

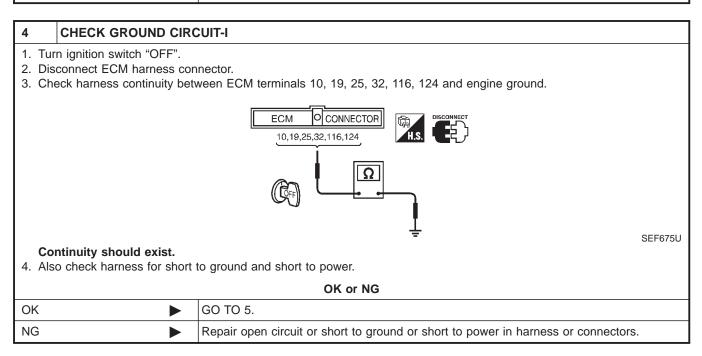
SC

EL

Main Power Supply and Ground Circuit (Cont'd)

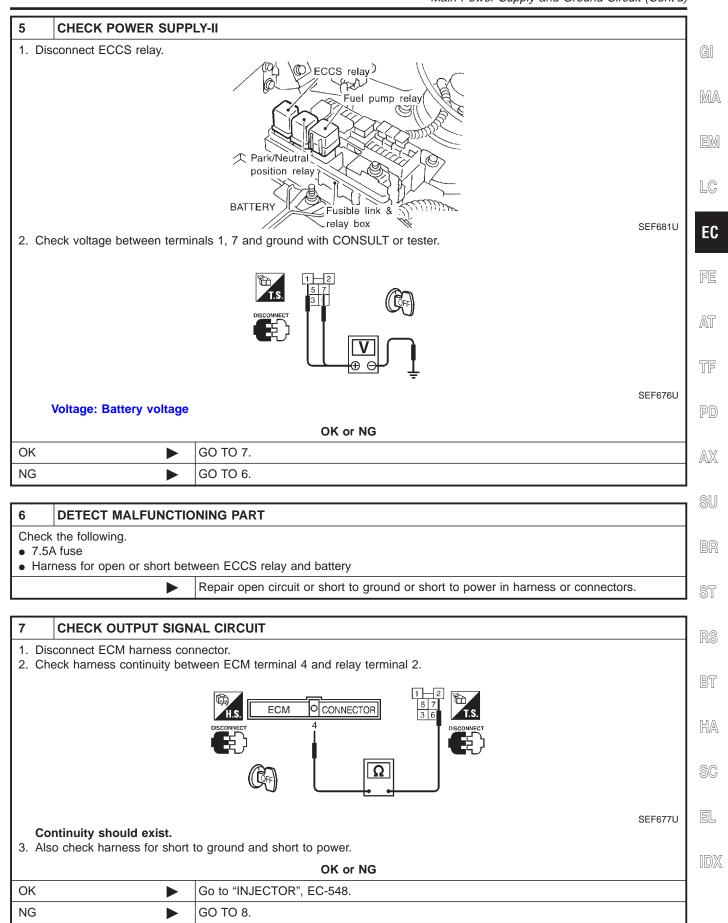


# 3 DETECT MALFUNCTIONING PART Check the following. • Harness connectors E1, M1 • Harness connectors M33, F22 • Harness for open or short between ECM and ignition switch Repair harness or connectors.





Main Power Supply and Ground Circuit (Cont'd)





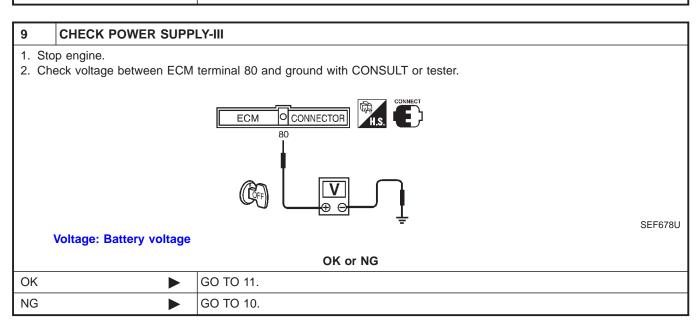
Main Power Supply and Ground Circuit (Cont'd)

#### 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

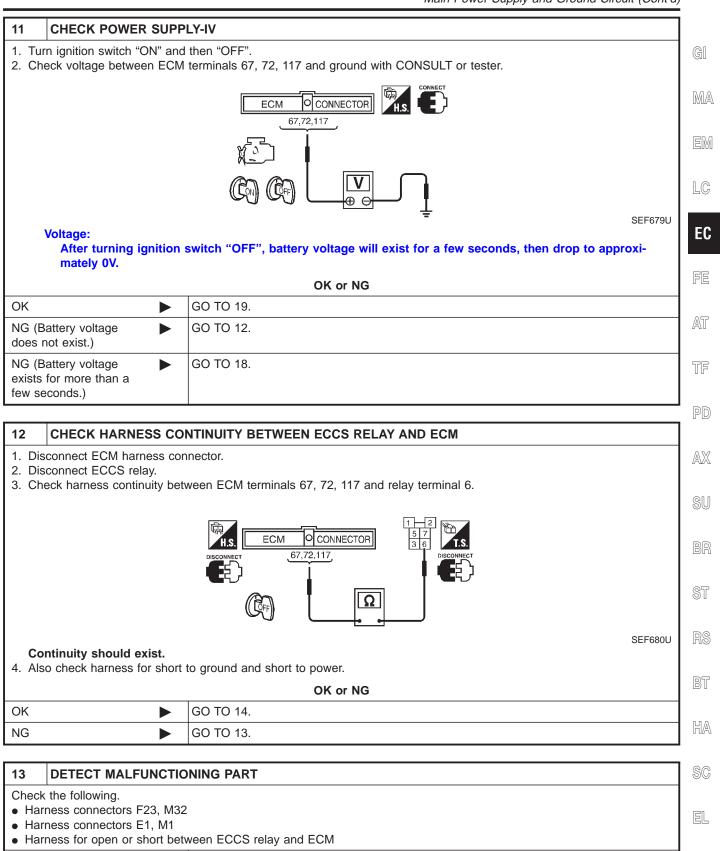
Repair open circuit or short to ground or short to power in harness or connectors.



# 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.



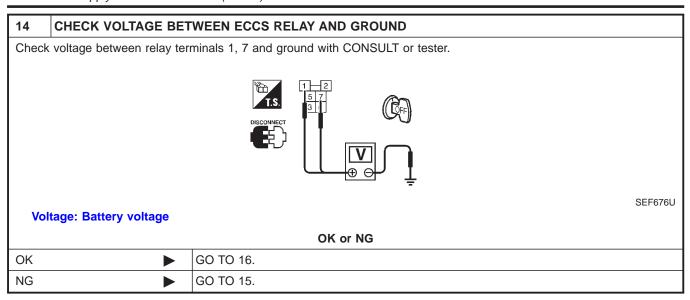
Main Power Supply and Ground Circuit (Cont'd)



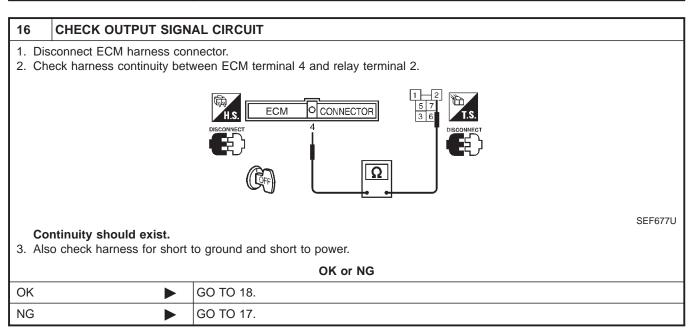
Repair open circuit or short to ground or short to power in harness or connectors.



Main Power Supply and Ground Circuit (Cont'd)



| 15 | DETECT MALFUNCTIONING PART   |                               |  |  |  |
|----|--|-------------------------------|--|--|--|
|    | Check the following.  • Harness for open or short between ECCS relay and 7.5A fuse |                               |  |  |  |
|    | <b>•</b>   | Repair harness or connectors. |  |  |  |



# 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.

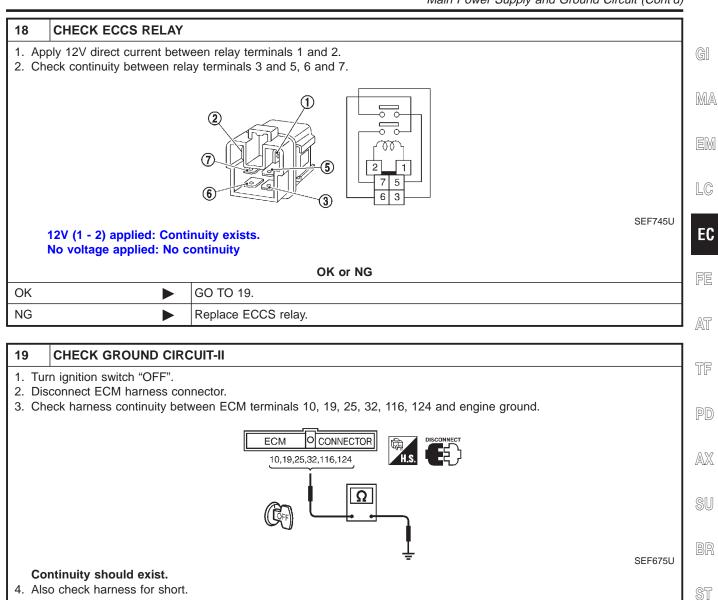
# TROUBLE DIAGNOSIS FOR POWER SUPPLY



SC

EL

Main Power Supply and Ground Circuit (Cont'd)



|   | •                           | INSPECTION END                |         |  |
|---|-----------------------------|-------------------------------|---------|--|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                             |                               | HA      |  |
| 20  | CHECK INTERMITTENT INCIDENT |                               |         |  |
|   |                             |                               | r<br>BT |  |
| NG  | <b>&gt;</b>                 | Repair harness or connectors. |         |  |
| OK  | ■ GO 10 20.                 |                               |         |  |

OK or NG

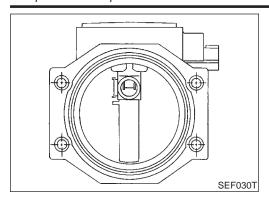
GO TO 20.

OK

**EC-145** 

Component Description





# **Component Description**

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

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

# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0048

| MONITOR ITEM  | CONDITION  |           | SPECIFICATION     |
|---------------|--|-----------|-------------------|
| MAS AIR/FL SE | Engine: After warming up     Air conditioner switch: "OFF" | Idle      | 1.0 - 1.7V        |
| MAS AIR/FL SE | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>         | 2,500 rpm | 1.7 - 2.3V        |
| CAL/LD VALUE  | 4:440  | Idle      | 18.5 - 26.0%      |
| CAL/LD VALUE  | ditto  | 2,500 rpm | 18.0 - 21.0%      |
| MASS AIRFLOW  | ditto  | Idle      | 3.3 - 4.8 g·m/s   |
| WASS AIRFLOW  | unto   | 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 ground.

#### CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                        | CONDITION   | DATA (DC Voltage) |
|----------------------|---------------|-----------------------------|---|-------------------|
| E 4                  | W             | Mass air flow sensor        | [Engine is running]  ■ Warm-up condition  ■ Idle speed  | 1.0 - 1.7V        |
| 54                   |               |                             | <ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed is 2,500 rpm</li></ul> | 1.7 - 2.3V        |
| 55                   | В             | Mass air flow sensor ground | [Engine is running]  • Warm-up condition  • Idle speed  | Approximately 0V  |



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NBFC0051S01

On Board Diagnosis Logic

| NBEC0050 | osis Logic   | On Board Diagn   | (                                |            |                 |
|----------|--|--|----------------------------------|------------|-----------------|
|          | Check Items (Possible Cause)                                       | Malfunction is detected when   | Malfunction is detect            |            | DTC No.         |
|          | (The sensor circuit is open or shorted.)                           | An excessively high voltage from the sensor is sent to ECM when engine is not running. | , , ,                            | A)         | P0100<br>0102   |
|          | Mass air flow sensor   | A high voltage from the sensor is sent to ECM under light load driving condition.      |                                  | C)         |                 |
|          | Harness or connectors     (The sensor circuit is open or shorted.) | An excessively low voltage from the sensor is sent to ECM when engine is running.*     |                                  | B)         |                 |
|          | <ul><li>Intake air leaks</li><li>Mass air flow sensor</li></ul>    | D) A law yeltone from the concer is cont to FCM  |                                  |            |                 |
|          | L lights up.   | is detected, the ECM enters fail-safe mode and the MI                                  | tion is detected, the ECM enters | function i | : When this mal |
|          | Detected items Engine operating condition in fail-safe mode        |  |                                  |            |                 |

# **DTC Confirmation Procedure**

Perform "PROCEDURE FOR MALFUNCTION A" first. If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B". If there is no problem on "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE FOR MAL-FUNCTION C". If there is no problem on "PROCEDURE FOR MALFUNCTION C", perform "PROCEDURE FOR MALFUNC-TION D".

Engine speed will not rise more than 2,400 rpm due to the fuel cut.

#### 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.

2 ☆ MONITOR ☆ NO FAIL [ CMPS•RPM(REF) 0rpm RECORD SEF360VA

Mass air flow sensor circuit

#### PROCEDURE FOR MALFUNCTION A

(P) With CONSULT

1) Turn ignition switch "ON".

Select "DATA MONITOR" mode with CONSULT.

Wait at least 6 seconds.

If 1st trip DTC is detected, go to "Diagnostic Procedure", IDX EC-152.

With GST

1) Turn ignition switch "ON", and wait at least 6 seconds.

Select "MODE 7" with GST.

DTC Confirmation Procedure (Cont'd)

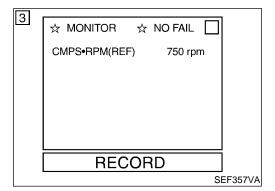
# DTC P0100 MASS AIR FLOW SENSOR (MAFS)



3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.

## No Tools

- 1) Turn ignition switch "ON", and wait at least 6 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.



#### PROCEDURE FOR MALFUNCTION B

NBFC0051S02

- (P) With CONSULT
- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait 5 seconds at most.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.

# **With GST**

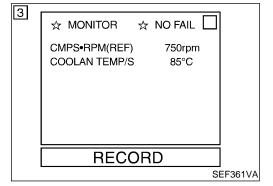
- Start engine and wait 5 seconds at most. 1)
- Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.

#### No Tools

- Start engine and wait 5 seconds at most.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", 4) EC-152.

#### NOTE:

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



#### PROCEDURE FOR MALFUNCTION C

NBFC0051S03

#### NOTE:

If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch "ON") instead of running engine at idle speed.

#### (P) With CONSULT

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

# DTC P0100 MAS

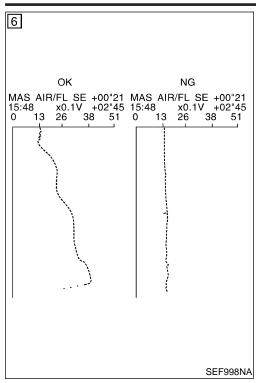


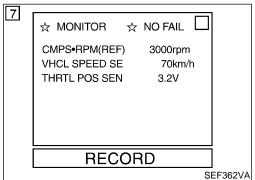
| AS:      | S AIR FLOW SENSOR (MAFS)  | <b>\$</b> (            |
|----------|---|------------------------|
|          | DTC Confirmation Procedure (Cont'd)   |                        |
| 5)       | If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.  |                        |
| (ST)     | With GST  | G[                     |
| 1)       | Start engine and warm it up to normal operating temperature. Run engine for at least 10 seconds at idle speed.  | MA                     |
| 3)<br>4) | Select "MODE 7" with GST.  If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.                   | EM                     |
| NO       | No Tools  |                        |
| 1)       | Start engine and warm it up to normal operating temperature.  Run engine for at least 10 seconds at idle speed. | LG                     |
| 3)       | Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".   | EC                     |
| 4)       | Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.   | EC                     |
| 5)       | If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.  | FE                     |
|          |   | AT                     |
|          |   | TF                     |
|          |   | PD                     |
|          |   | $\mathbb{A}\mathbb{X}$ |
|          |   | SU                     |
|          |   | BR                     |
|          |   | ST                     |
|          |   | RS                     |
|          |   | BT                     |
|          |   | HA                     |
|          |   | SC                     |
|          |   | EL                     |

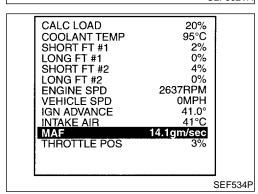
DTC Confirmation Procedure (Cont'd)

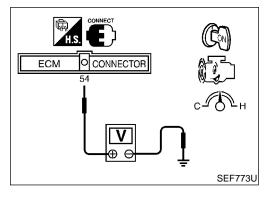


NBEC0051S04









## PROCEDURE FOR MALFUNCTION D

**CAUTION:** 

Always drive vehicle at a safe speed.

#### (P) With CONSULT

- 1) Turn ignition switch "ON".
- Start engine and warm it up to normal operating temperature. If engine cannot be started, go to "Diagnostic Procedure", EC-152.
- Select "DATA MONITOR" mode with CONSULT. 3)
- Check the voltage of MAS AIR/FL SE with "DATA MONITOR".
- Increases engine speed to about 4,000 rpm.
- Monitor the linear voltage rise in response to engine speed increases.
  - If NG, go to "Diagnostic Procedure", EC-152. If OK, go to following step.
- 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. |

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-152.

#### Overall Function Check

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

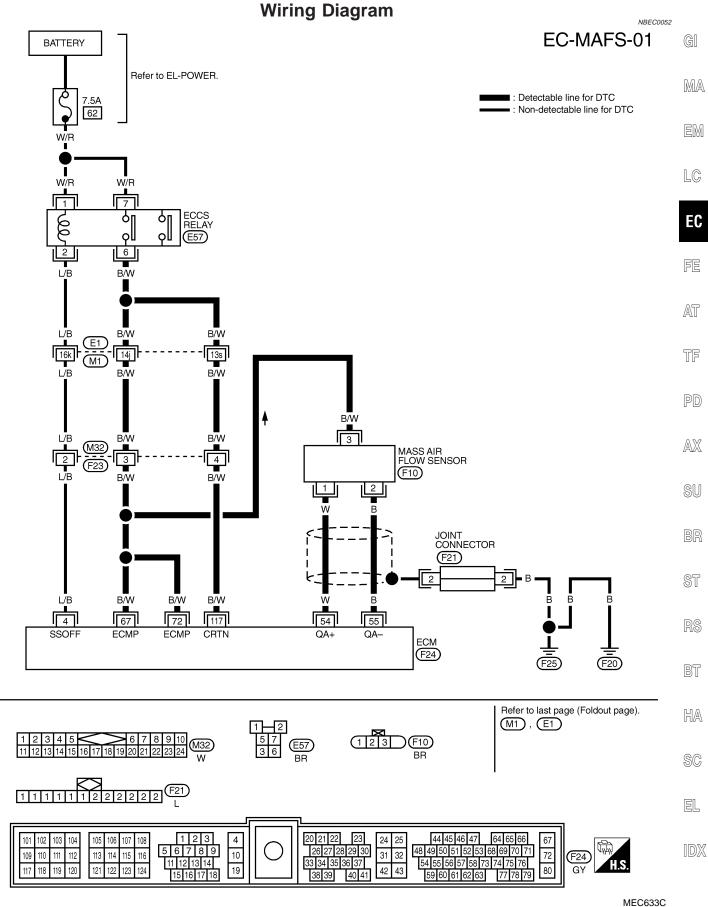
#### With GST

- Start engine and warm it up to normal operating temperature.
- Select "MODE 1" with GST.
- Check the mass air flow sensor signal with "MODE 1".
- Check for linear mass air flow sensor signal value rise in response to increases to about 4,000 rpm in engine speed.
- If NG, go to "Diagnostic Procedure", EC-152.

## No Tools

- 1) Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM terminal 54 (Mass air flow sensor signal) and ground.
- Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.
- If NG, go to "Diagnostic Procedure", EC-152.





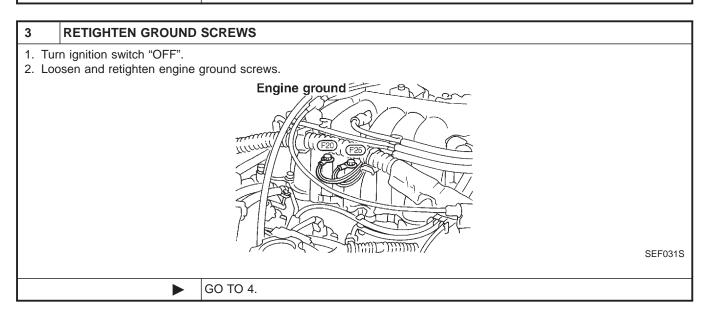




# **Diagnostic Procedure**

|       |                              | 2.4900         | J 1 1000ddi 0 | NBEC0053 |
|-------|------------------------------|----------------|---------------|----------|
| 1     | INSPECTION START             |                |               |          |
| Whicl | h malfunction (A, B, C or D) | is duplicated? |               |          |
|       |                              | MALFUNCTION    | Туре          |          |
|       |                              | A and/or C     | I             |          |
|       |                              | B and/or D     | II            |          |
|       |                              |                |               | MTBL0063 |
|       |                              | Type I or      | Гуре II       |          |
| Туре  | 1                            | GO TO 3.       |               |          |
| Туре  |                              | GO TO 2.       |               |          |

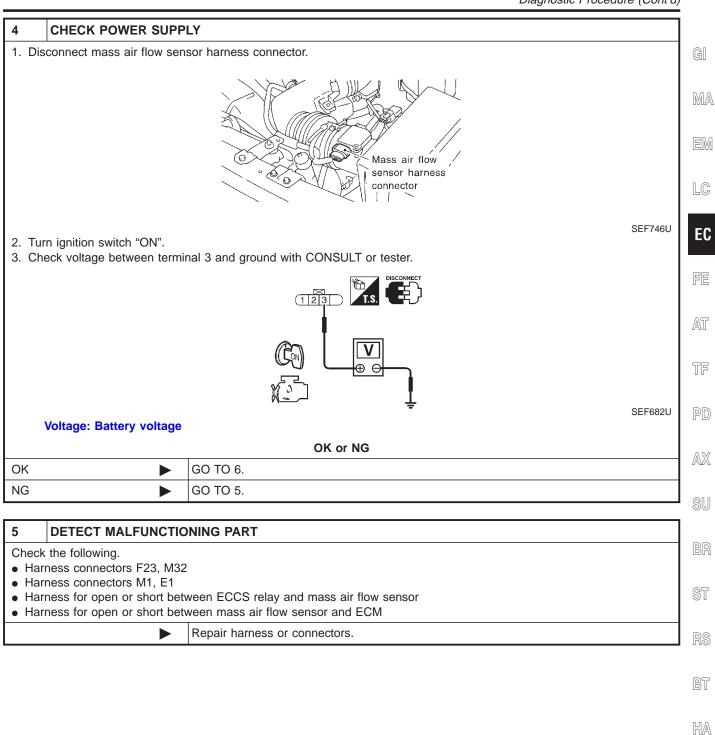
| 2                                 | CHECK INTAKE SYSTEM   |  |  |  |  |
|-----------------------------------|---|--|--|--|--|
| <ul><li>Air</li><li>Vac</li></ul> | Check the following for connection.  Air duct  Vacuum hoses  Intake air passage between air duct to intake manifold collector |  |  |  |  |
|                                   | OK or NG  |  |  |  |  |
| OK ▶ GO TO 3.                     |   |  |  |  |  |
| NG                                | NG Reconnect the parts.   |  |  |  |  |





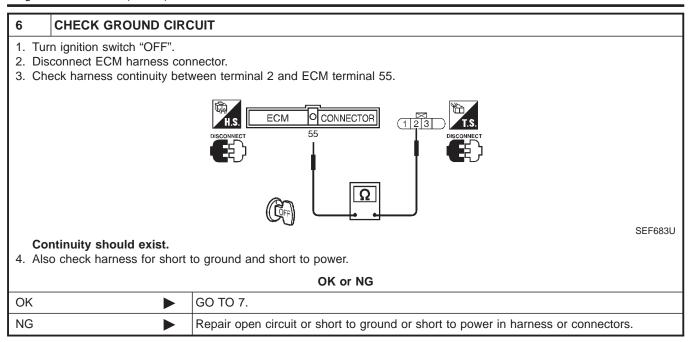
SC

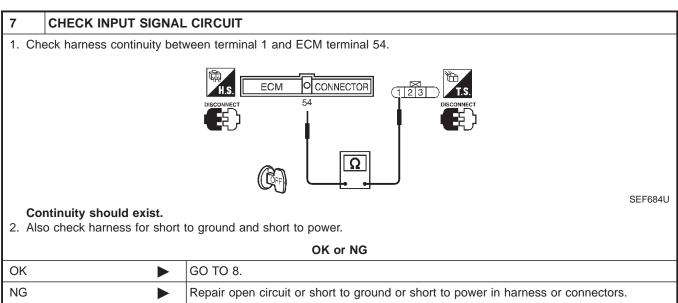
Diagnostic Procedure (Cont'd)





Diagnostic Procedure (Cont'd)





| 8     | CHECK MASS AIR FLOW SENSOR              |                               |  |  |  |
|-------|---|-------------------------------|--|--|--|
| Refer | Refer to "Component Inspection" EC-155. |                               |  |  |  |
|       | OK or NG                                |                               |  |  |  |
| OK    | OK ▶ GO TO 9.                           |                               |  |  |  |
| NG    | <b>&gt;</b>                             | Replace mass air flow sensor. |  |  |  |

MA

LC

EC

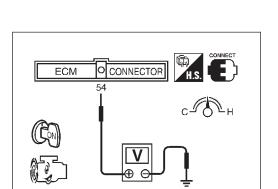
FE

AT

TF

Diagnostic Procedure (Cont'd)

| 9   | CHECK SHIELD CIRC              | CUIT                            |  |  |  |
|---|--------------------------------|---------------------------------|--|--|--|
| 1. Tu   | 1. Turn ignition switch "OFF". |                                 |  |  |  |
| 2. D  | isconnect joint connector I    | <del>-</del> 21.                |  |  |  |
| 3. C  | heck the following.            |                                 |  |  |  |
| • Co  | ontinuity between joint con    | nector terminal and ground      |  |  |  |
| <ul><li>Jo</li></ul>  | int connector                  |                                 |  |  |  |
|   | efer to "HARNESS LAYOU         | JT" in EL section.)             |  |  |  |
| Co  | ontinuity should exist.        |                                 |  |  |  |
|   |                                | t to ground and short to power. |  |  |  |
| 5. Th   | nen reconnect joint conne      | ctor.                           |  |  |  |
|   | OK or NG                       |                                 |  |  |  |
| OK ▶ GO TO 10.  |                                |                                 |  |  |  |
| NG Repair open circuit or short to ground or short to power in harness or connectors. |                                |                                 |  |  |  |
|   |                                |                                 |  |  |  |

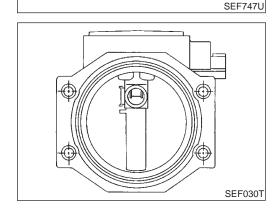


**CHECK INTERMITTENT INCIDENT** 

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136.

**INSPECTION END** 

10



# Component Inspection MASS AIR FLOW SENSOR

NBEC0054

<sup>54</sup> PC

SU

ST

. Reconnect harness connectors disconnected.

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

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.

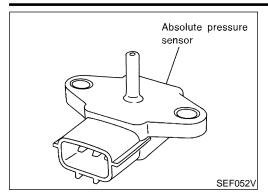
 If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Then repeat above check.

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

SC

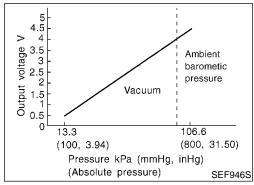
EL





# **Component Description**

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



# On Board Diagnosis Logic

NBEC0056

| DTC No.       | 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     (Absolute pressure sensor circuit is open or shorted.)     Absolute pressure sensor  |
|               | В)                                   | A high voltage from the sensor is sent to ECM under light load driving conditions. | <ul> <li>Hoses         (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.)     </li> <li>Intake air leaks</li> <li>MAP/BARO switch solenoid valve</li> <li>Absolute pressure sensor</li> </ul> |
|               | C)                                   | A low voltage from the sensor is sent to ECM under heavy load driving conditions.  | Absolute pressure sensor   |

# **DTC Confirmation Procedure**

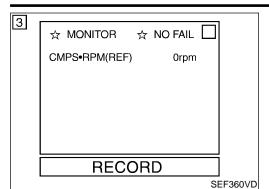
Perform "PROCEDURE FOR MALFUNCTION A" first. If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".

If the 1st trip DTC is not confirmed on "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE FOR MALFUNCTION C".

#### 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.

DTC Confirmation Procedure (Cont'd



# PROCEDURE FOR MALFUNCTION A

(P) With CONSULT

NBEC0057S01

Turn ignition switch "ON".

GI

Select "DATA MONITOR" mode with CONSULT.

Wait at least 6 seconds.

MA

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

EM

Turn ignition switch "ON" and wait at least 6 seconds.

Select "MODE 7" with GST.

LC

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

No Tools

EC

1) Turn ignition switch "ON" and wait at least 6 seconds.

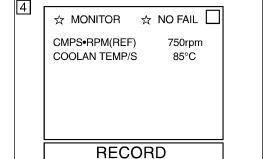
Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

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

AT

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

TF



#### PROCEDURE FOR MALFUNCTION B

(P) With CONSULT

NREC0057502

PD

Start engine and warm it up to normal operating temperature. 1)

Turn ignition switch "OFF" and wait at least 5 seconds. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.

Start engine and let it idle.

SU

5) Wait at least 15 seconds.

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

**With GST** 

SEF361VB

Start engine and warm it up to normal operating temperature.

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

3) Start engine.

Let engine idle and wait at least 15 seconds.

Select "MODE 7" with GST.

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

No Tools

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

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

3) Start engine. Let engine idle and wait at least 15 seconds.

SC

Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

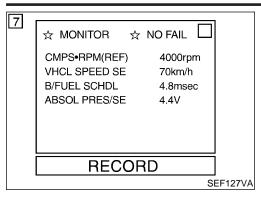
EL

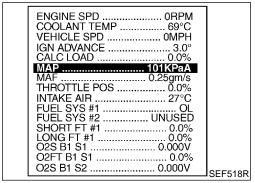
Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

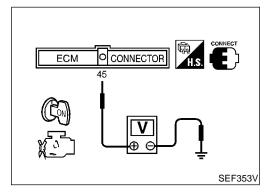
If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

NBEC0057S04

DTC Confirmation Procedure (Cont'd)







#### PROCEDURE FOR MALFUNCTION C

**CAUTION:** 

Always drive vehicle at a safe speed.

- (P) With CONSULT
- 1) Turn ignition switch "ON".
- 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-160.

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.
- 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 msec   |
| Selector lever   | Suitable position  |
| Driving location | Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test. |

 If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-160.

# Overall Function Check PROCEDURE FOR MALFUNCTION C

NBEC0522

NBEC0522S01

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.

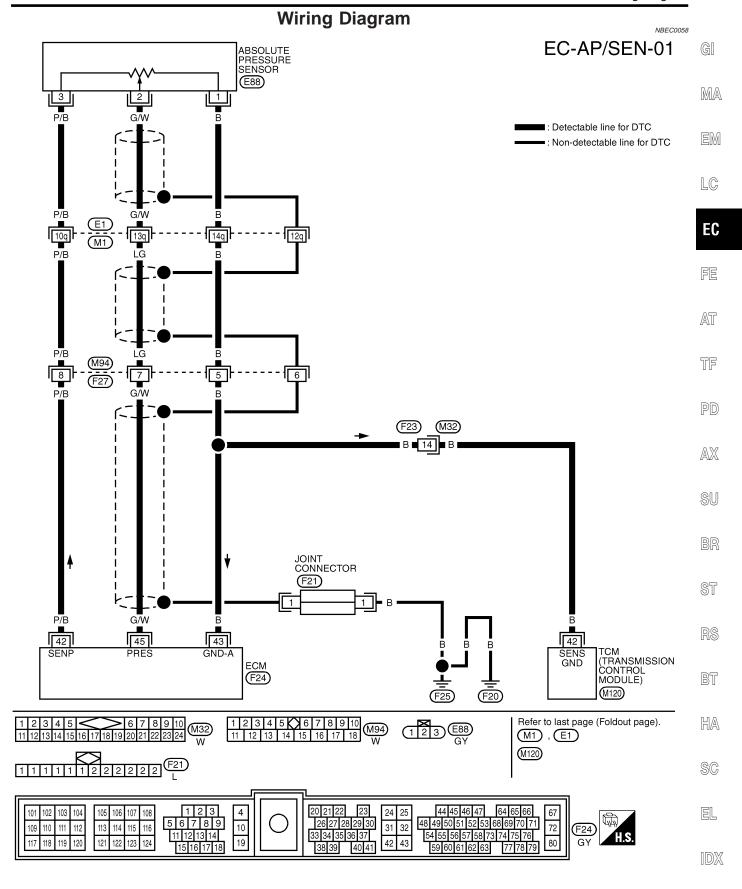
## **With GST**

- 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<sup>2</sup>, 6.7 psi).
- 4) If NG, go to "Diagnostic Procedure", EC-160.

#### 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].
- 3) If NG, go to "Diagnostic Procedure", EC-160.





MEC634C

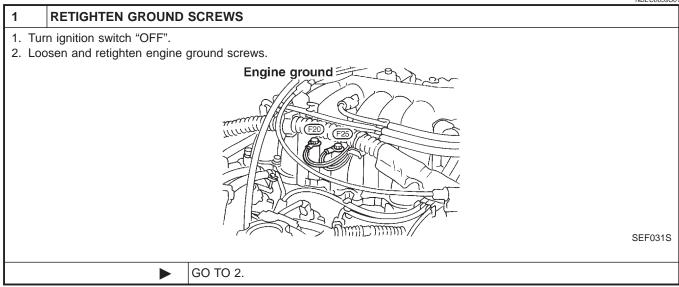


# **Diagnostic Procedure**

If the trouble is duplicated after "PROCEDURE FOR MAL-FUNCTION A or C", perform "PROCEDURE A" below. If the trouble is duplicated after "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE B", EC-163.

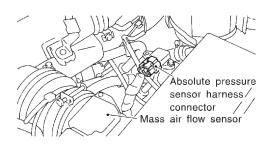
#### **PROCEDURE A**

NBEC0059S01



# 2 CHECK CONNECTOR

1. Disconnect absolute pressure sensor harness connector.



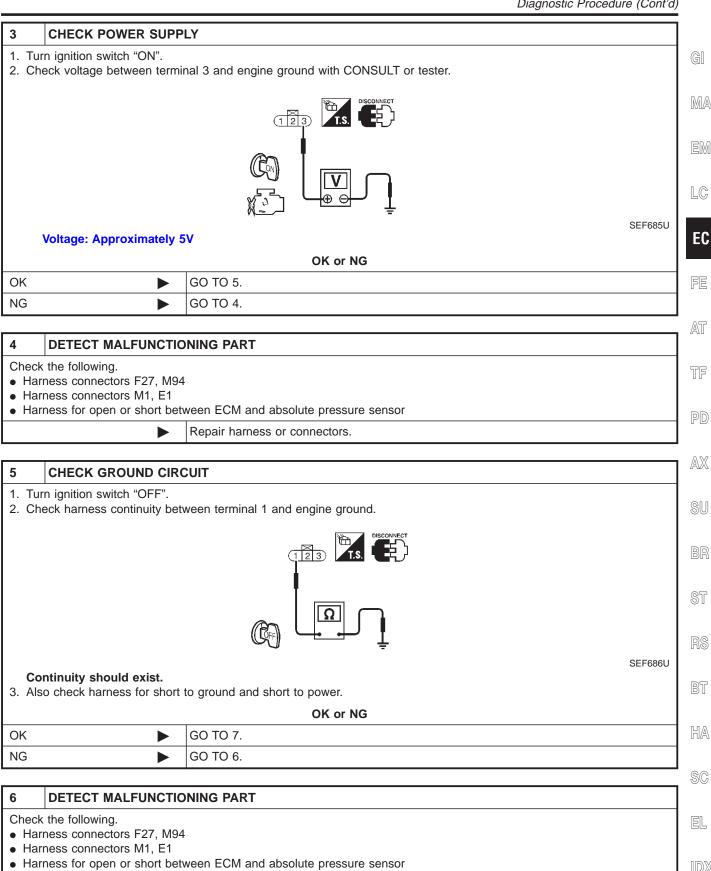
SEF748U

Check sensor harness connector for water. Water should not exist.

OK or NG

| OK ► | GO TO 3.                             |
|------|--------------------------------------|
| NG ► | Repair or replace harness connector. |

Diagnostic Procedure (Cont'd,



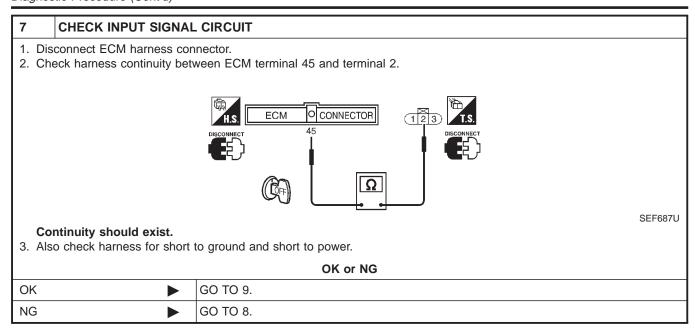
Harness for open or short between TCM (Transmission control module) and absolute pressure sensor

Harness connectors F23, M32

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



Diagnostic Procedure (Cont'd)



| 8                    | DETECT MALFUNCTIONING PART   |  |  |
|----------------------|--|--|--|
| Check the following. |  |  |  |
| Hari                 | Harness connectors F27, M94  |  |  |
| Hari                 | Harness connectors M1, E1  |  |  |
| Hari                 | <ul> <li>Harness for open or short between ECM and absolute pressure sensor</li> </ul> |  |  |
|                      | <b>•</b>   | Repair open circuit or short to ground or short to power in harness or connectors. |  |

| 9     | CHECK ABSOLUTE PRESSURE SENSOR           |                                   |  |
|-------|--|-----------------------------------|--|
| Refer | Refer to "Component Inspection", EC-166. |                                   |  |
|       | OK or NG                                 |                                   |  |
| OK    | <b>•</b>                                 | GO TO 10.                         |  |
| NG    | <b>•</b>                                 | Replace absolute pressure sensor. |  |

| 10                     | CHECK SHIELD CIRC           | UIT  |
|------------------------|-----------------------------|--|
| 1. Tu                  | rn ignition switch "OFF".   |  |
| 2. Di                  | sconnect joint connector.   |  |
| 3. Ch                  | neck the following.         |  |
| <ul> <li>Co</li> </ul> | ntinuity between joint conr | nector terminal and ground   |
| <ul><li>Joi</li></ul>  | nt connector                |  |
| (Re                    | efer to EL-350, "HARNESS    | S LAYOUT".)  |
| Co                     | ntinuity should exist.      |  |
| 4. Als                 | so check harness for shor   | to ground and short to power.  |
|                        | en reconnect joint connec   | tor.   |
| Wate                   | r should not exist.         |  |
|                        |                             | OK or NG   |
| OK                     | <b>•</b>                    | GO TO 11.  |
| NG                     |                             | Repair open circuit or short to ground or short to power in harness or connectors. |

| 11    | CHECK INTERMITTENT INCIDENT                                     |  |
|-------|---|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |
|       | ► INSPECTION END  |  |

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Diagnostic Procedure (Cont'd)

# PROCEDURE B

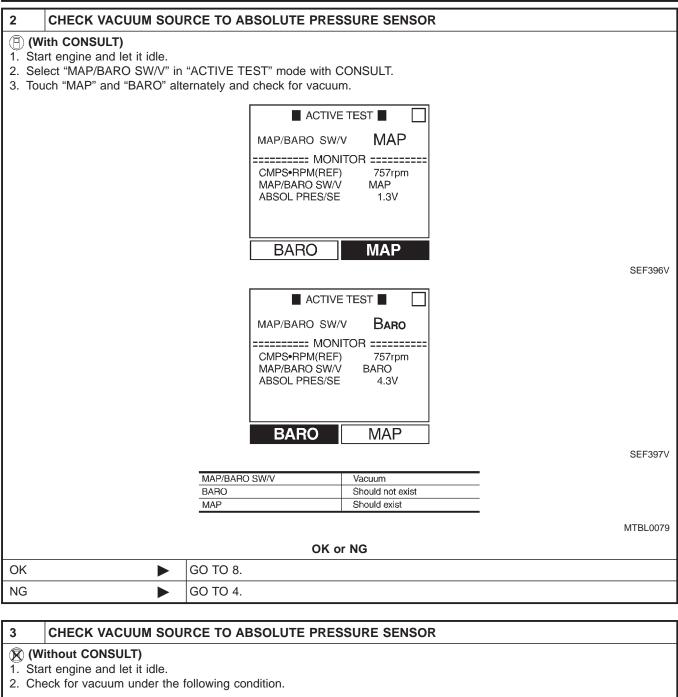
|                                     | 111001101111   | =NBEC0059S02 |
|-------------------------------------|--|--------------|
| 1                                   | INSPECTION START   |              |
| <ol> <li>Tu</li> <li>Att</li> </ol> | art engine and warm it up to normal operating temperature.  Irn ignition switch "OFF".  tach the vacuum gauge between the absolute pressure sensor and the rubber tube connected to the MAP/B  vitch solenoid valve. | ARO          |
|                                     | Absolute pressure sensor harness/connector  Mass air flow sensor   |              |
|                                     |  | SEF748U      |
|                                     | Absolute pressure sensor   |              |
|                                     | C → Vacuum gauge   |              |
|                                     |  |              |
|                                     |  |              |
|                                     | 3-way connector  | SEF385U      |
| Mode                                | ole with CONSULT   |              |

|                         | 3EI 3630 |
|-------------------------|----------|
| Models with CONSULT     | GO TO 2. |
| Models without CON-SULT | GO TO 3. |

**EC-163** 



Diagnostic Procedure (Cont'd)



# 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 More than 5 seconds after Should exist OK or NG OK GO TO 8. NG GO TO 4.

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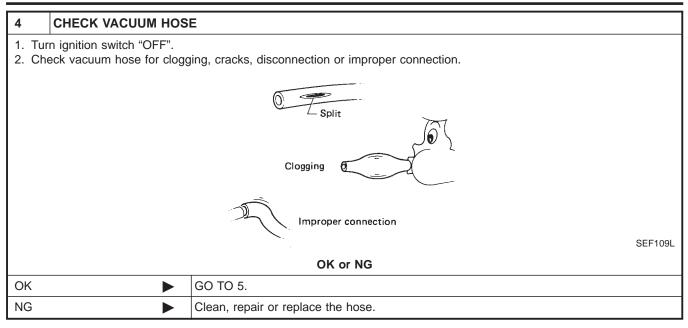
BT

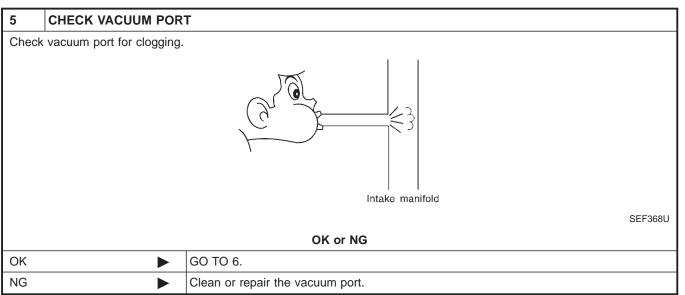
HA

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Diagnostic Procedure (Cont'd)



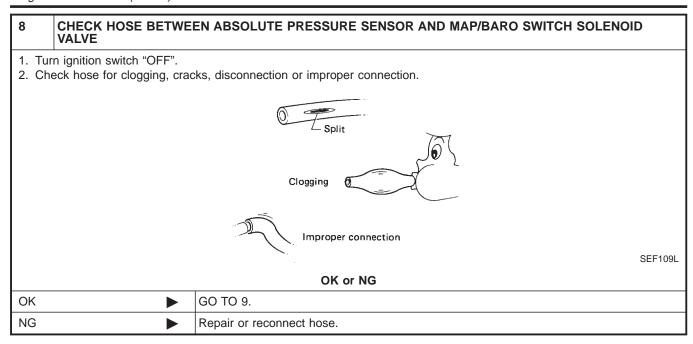


| 6     | CHECK MAP/BARO SWITCH SOLENOID VALVE    |   |  |
|-------|---|---|--|
| Refer | Refer to "Component Inspection" EC-447. |   |  |
|       | OK or NG                                |   |  |
| OK    | <b>•</b>                                | GO TO 7.                                |  |
| NG    | <b>•</b>                                | Replace MAP/BARO switch solenoid valve. |  |

| 7                                  | CHECK INTAKE SYSTE | M          |   |
|------------------------------------|--------------------|------------|---|
| Check intake system for air leaks. |                    |            |   |
|                                    | OK or NG           |            |   |
| OK                                 | <b>•</b>           | GO TO 11.  | 1 |
| NG                                 | <b>•</b>           | Repair it. |   |



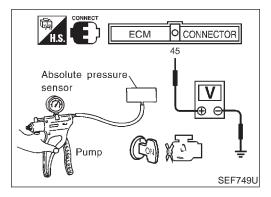
Diagnostic Procedure (Cont'd)



| 9      | CHECK HARNESS CONNECTOR   |                                      |  |
|--------|---|--------------------------------------|--|
| 2. Che | Disconnect absolute pressure sensor harness connector.     Check sensor harness connector for water.  Water should not exist.  OK or NG |                                      |  |
| OK     | <b>&gt;</b>   | GO TO 10.                            |  |
| NG     | <b>•</b>  | Repair or replace harness connector. |  |

| 10                                      | 0 CHECK ABSOLUTE PRESSURE SENSOR |                                   |  |
|---|----------------------------------|-----------------------------------|--|
| Refer to "Component Inspection" EC-166. |                                  |                                   |  |
|   | OK or NG                         |                                   |  |
| OK                                      | <b>&gt;</b>                      | GO TO 11.                         |  |
| NG                                      | <b>&gt;</b>                      | Replace absolute pressure sensor. |  |

| 11    | CHECK INTERMITTENT INCIDENT                                     |  |  |  |
|-------|---|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |  |
|       | ► INSPECTION END  |  |  |  |



# Component Inspection ABSOLUTE PRESSURE SENSOR

NBEC0060 NBEC0060S01

- Remove absolute pressure sensor with its harness connector connected.
- 2. Remove hose from absolute pressure sensor.
- 3. Turn ignition switch "ON" and check output voltage between ECM terminal 45 and engine ground.

# The voltage should be 3.2 to 4.8 V.

4. Use pump to apply vacuum of -26.7 kPa (-200 mmHg, -7.87 inHg) to absolute pressure sensor as shown in figure and check the output voltage.

Component Inspection (Cont'd)



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.

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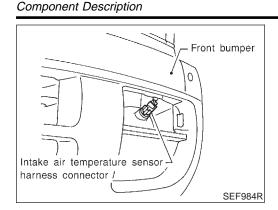
HA

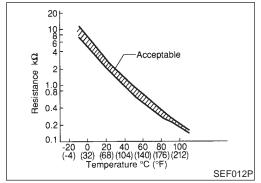
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# Component Description

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

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

#### <Reference data>

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

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 61 (Intake air temperature sensor) and ground.

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

# On Board Diagnosis Logic

NREC0062

| 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.  | (The sensor circuit is open or shorted.) |  |
|               | B)                           | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor. | Intake air temperature sensor            |  |

#### **DTC Confirmation Procedure**

Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MAL-FUNCTION 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.

# 3 ☆ MONITOR ☆ NO FAIL CMPS•RPM(REF) 0rpm RECORD SEF360VD

#### PROCEDURE FOR MALFUNCTION A

NBEC0063S01

- (P) With CONSULT
- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-172.
- **With GST**
- Turn ignition switch "ON" and wait at least 5 seconds.
- Select MODE 7 with GST.

DTC Confirmation Procedure (Cont'd)

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-172.

## No Tools

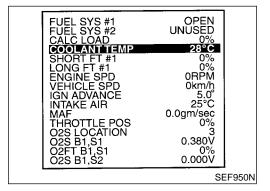
Turn ignition switch "ON" and wait at least 5 seconds.

Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

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

If 1st trip DTC is detected, go to "Diagnostic Procedure", 4) EC-172.

# 5 ☆ MONITOR ☆ NO FAIL COOLAN TEMP/S 30°C VHCL SPEED SE 75km/h RECORD SEF233UA



## PROCEDURE FOR MALFUNCTION B

CAUTION:

Always drive vehicle at a safe speed.

#### **TESTING CONDITION:**

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

# (I) With CONSULT

Wait until engine coolant temperature is less than 90°C (194°F).

- Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Check the engine coolant temperature. c)
- 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".
- Select "DATA MONITOR" mode with CONSULT. 3)
- Start engine.
- Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-172.

#### With GST

- Wait until engine coolant temperature is less than 90°C (194°F).
- Turn ignition switch "ON".
- Select MODE 1 with GST.
- Check the engine coolant temperature.
- 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).
- Start engine.
- Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
- Select MODE 7 with GST.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-172.

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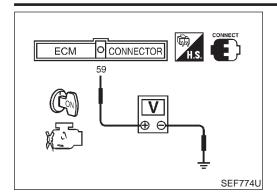
EL

NBFC0063S02

**EC-169** 



DTC Confirmation Procedure (Cont'd)



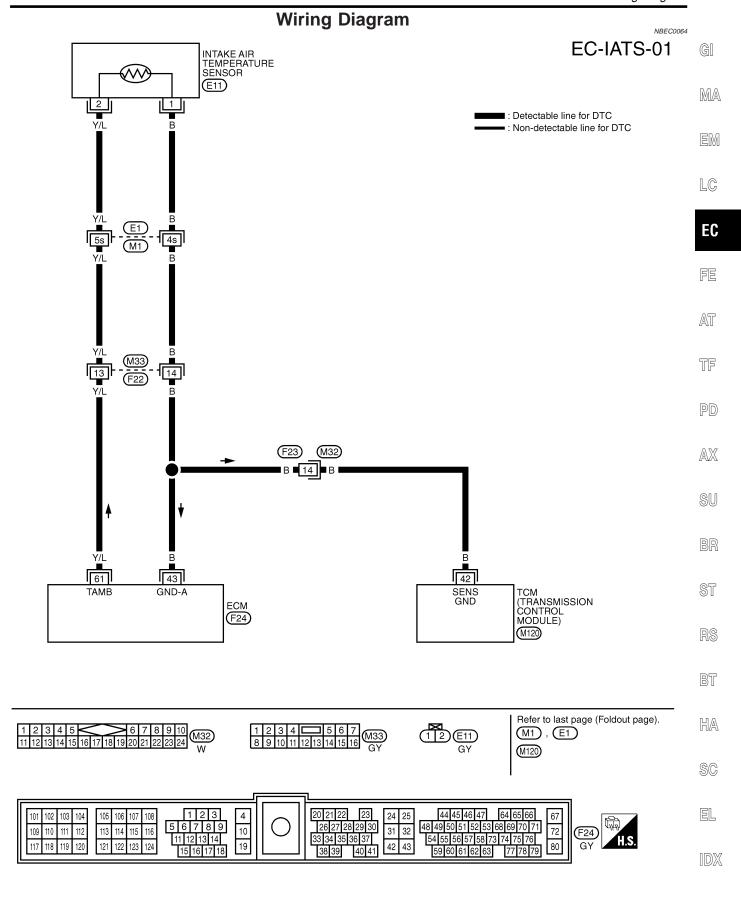
## No Tools

- 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.
- Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-172.





MEC635C



NBEC0065

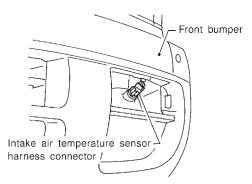
SEF984R

SEF688U



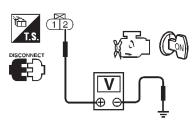
CHECK POWER SUPPLY
 Turn ignition switch "OFF".

2. Disconnect intake air temperature sensor harness connector.



3. Turn ignition switch "ON".

4. Check voltage between terminal 2 and ground.



Voltage: Approximately 5V

OK or NG

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

# 2 DETECT MALFUNCTIONING PART

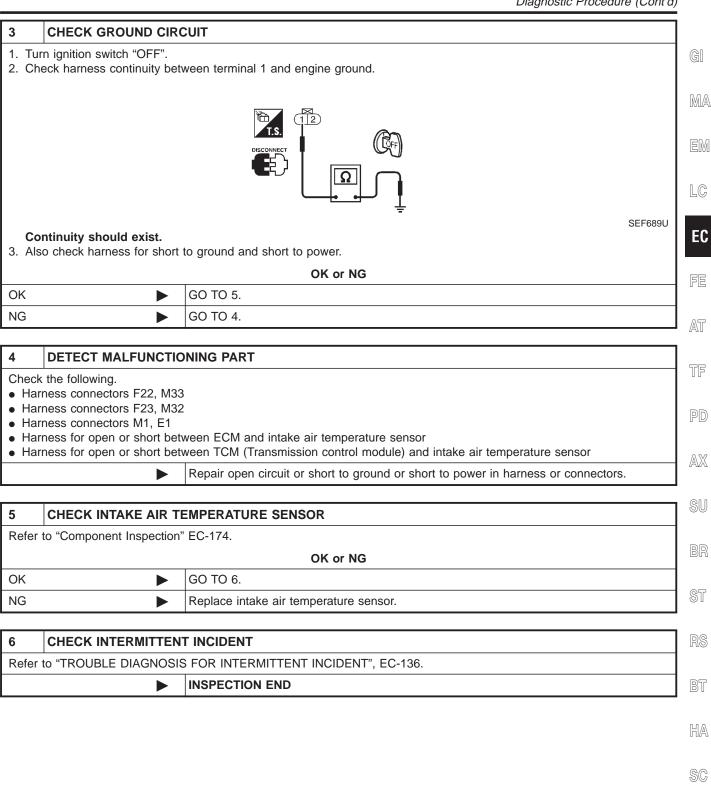
Check the following.

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

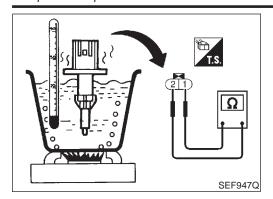
Repair harness or connectors.



Diagnostic Procedure (Cont'd,



Component Inspection



# **Component Inspection INTAKE AIR TEMPERATURE SENSOR**

=NBEC0066 NBEC0066S01

Check resistance as shown in the figure.

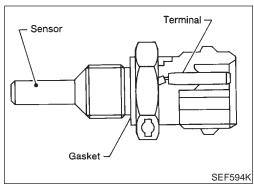
# 

#### <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



# 10 6 4 ĝ Acceptable 1.0 0.4 0.2 20 40 60 80 100 (68) (104) (140) (176) (212)

Γempérature °C (°F)

# **Component Description**

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

MA

LC

#### <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 ground.

# EC FE

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#### **CAUTION:**

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



AX

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# On Board Diagnosis Logic

| N | В | E | C | U | U | bč |
|---|---|---|---|---|---|----|
|   |   |   |   |   |   |    |
|   |   |   |   |   |   |    |

| DTC No.       | Malfunction is detected when | Check Items (Possible Cause)  |
|---------------|------------------------------|---|
| P0115<br>0103 | sent to ECM.*                | <ul> <li>Harness or connectors<br/>(The sensor circuit is open or shorted.)</li> <li>Engine coolant temperature sensor</li> </ul> |

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

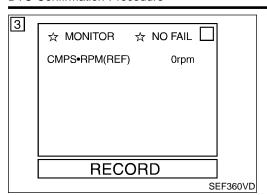
SEF012P

| Detected items | Engine operating condition in fail-safe mode   |
|----------------|--|
|                | Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".  CONSULT displays the engine coolant temperature decided by ECM. |

| Engine coolant tempera- |
|-------------------------|
| ture sensor circuit     |

| CONSULT displays the engine coolant temperatur         | e decided by ECM.                                    |  |
|--|--|--|
| Condition  | Engine coolant temperature decided (CONSULT display) |  |
| Just as ignition switch is turned ON or Start          | 40°C (104°F)<br>80°C (176°F)                         |  |
| More than approx. 4 minutes after ignition ON or Start |  |  |
| Except as shown above                                  | 40 - 80°C (104 - 176°F)<br>(Depends on the time)     |  |

DTC Confirmation Procedure



# **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.

#### (P) With CONSULT

- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- 3) Wait at least 5 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-178.

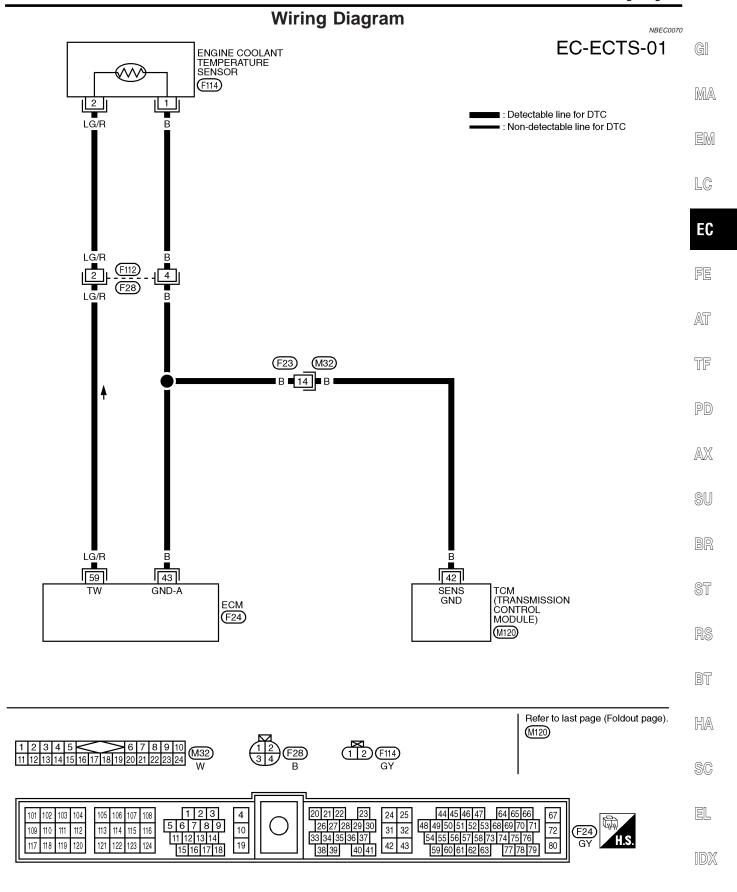
#### With GST

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-178.

#### No Tools

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-178.

Wiring Diagram



MEC636C

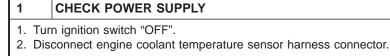
Diagnostic Procedure

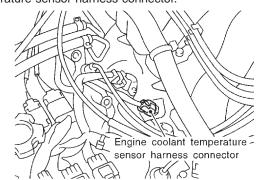
# **Diagnostic Procedure**

NBEC0071

SEF750U

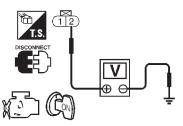
SEF690U





3. Turn ignition switch "ON".

4. Check voltage between terminal 2 and ground with CONSULT or tester.



Voltage: Approximately 5V

OK or NG

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

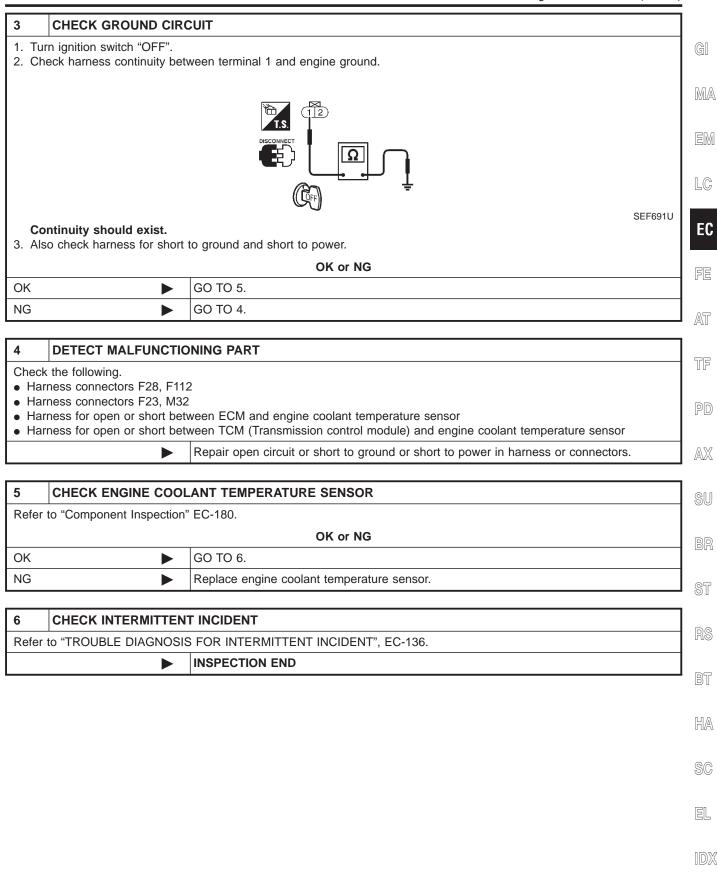
## **DETECT MALFUNCTIONING PART**

Check the following.

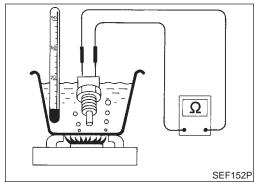
- Harness connectors F28, F112
- Harness for open or short between ECM and engine coolant temperature sensor

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

Diagnostic Procedure (Cont'd)







# 

SEF012P

# Component Inspection ENGINE COOLANT TEMPERATURE SENSOR

NBEC0072 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.



NBEC0073

### **Description**

### NOTE:

If DTC P0120 (0403) is displayed with DTC P0510 (0203), first perform "DTC P0510 CLOSED THROTTLE POSITION SWITCH", EC-421.

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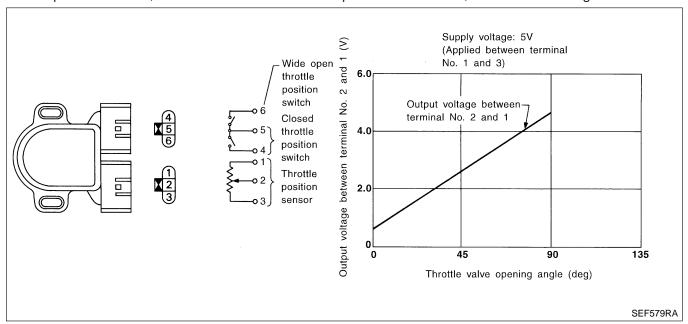
ST

NBEC0074

### COMPONENT DESCRIPTION

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

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



### **CONSULT Reference Value in Data Monitor** Mode

Specification data are reference values

| MONITOR ITEM  | CONDITION   |                              | SPECIFICATION | <b>D</b> 6     |
|---------------|---|------------------------------|---------------|----------------|
| THRTL POS SEN | Engine: After warming up     More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum   | Throttle valve: fully closed | 0.15 - 0.85V  | — R9<br>BT     |
|               | is applied to the throttle opener with a handy vacuum pump.  • Ignition switch: ON (Engine stopped)   | Throttle valve: fully opened | 3.5 - 4.7V    | —<br>HA        |
| ABSOL TH-P/S  | Engine: After warming up     More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump. | Throttle valve: fully closed | 0.0%          | —<br>\$0<br>EL |
|               | <ul> <li>Engine: After warming up</li> <li>Ignition switch: ON<br/>(Engine stopped)</li> </ul>  | Throttle valve: fully opened | Approx. 80%   |                |





### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

=NBEC0075

### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR                       | ITEM   | CONDITION  | DATA (DC Voltage) |
|----------------------|-------------------------------------|--|--|-------------------|
| 23 W                 | Throttle position sensor            | [Ignition switch "ON"]  • Warm-up condition  • More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump  • Accelerator pedal fully released | 0.15 - 0.85V   |                   |
|                      |                                     | [Ignition switch "ON"]  • Accelerator pedal fully depressed  | 3.5 - 4.7V   |                   |
| 37                   | P Throttle position s signal to TCM | Throttle position sensor signal to TCM   | [Ignition switch "ON"]  • Warm-up condition  • More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump  • Accelerator pedal fully released | 0.15V - 0.85V     |
|                      |                                     |  | [Ignition switch "ON"]  • Accelerator pedal fully depressed  | 3.5V - 4.7V       |
| 42                   | P/B                                 | Sensors' power supply  | [Ignition switch "ON"]   | Approximately 5V  |
| 43                   | В                                   | Sensors' ground  | [Engine is running]  • Warm-up condition  • 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     (The throttle position sensor circuit is open or shorted.)     Throttle position sensor   |
|               | В) | A high voltage from the sensor is sent to ECM under light load driving conditions. | <ul> <li>Harness or connectors (The throttle position sensor circuit is open or shorted.)</li> <li>Throttle position sensor</li> <li>Fuel injector</li> <li>Camshaft position sensor</li> <li>Mass air flow sensor</li> </ul> |
|               | C) | A low voltage from the sensor is sent to ECM under heavy load driving conditions.  | Harness or connectors     (The throttle position sensor circuit is open or shorted.)     Intake air leaks     Throttle position sensor  |

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

On Board Diagnosis Logic (Cont'd)

| Detected items                   | Engine operating condition in fail-safe mode   |  |        |
|----------------------------------|--|--|--------|
|                                  | Throttle position will be determined based on the ir Therefore, acceleration will be poor. | jected fuel amount and the engine speed. | GI     |
| Throttle position sensor circuit | Condition  | Driving condition                        | <br>M/ |
|                                  | When engine is idling  | Normal                                   |        |
|                                  | When accelerating  | Poor acceleration                        | <br>EM |

LC

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### **DTC Confirmation Procedure**

NOTE:

NBEC0077

 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 "PRO-CEDURE FOR MALFUNCTION B", perform "PROCEDURE FOR MALFUNCTION C".

E

• 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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### PROCEDURE FOR MALFUNCTION A

**CAUTION:** 

NBEC0077S01

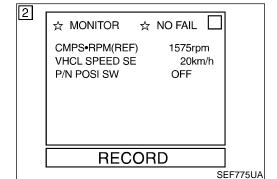
Always drive vehicle at a safe speed.

**TESTING CONDITION:** 

onfirm that

 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.



(II) With CONSULT

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

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

RS

| Vehicle speed  | More than 4 km/h (2 MPH)                     |
|----------------|--|
| Selector lever | Suitable position except "P" or "N" position |

BT

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

,

### With GST

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

EL

SC

| Vehicle speed  | More than 4 km/h (2 MPH)                     |
|----------------|--|
| Selector lever | Suitable position except "P" or "N" position |

- ) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.
- No Tools



 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.
- Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

# 3 ☆ MONITOR ☆ NO FAIL CMPS•RPM(REF) 750 rpm RECORD SEF357VA

### PROCEDURE FOR MALFUNCTION B

NBFC0077S02

- (P) With CONSULT
- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 10 seconds. If idle speed is over 1,000 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,000 rpm.

| Selector lever | Suitable position except "P" or "N" |
|----------------|-------------------------------------|
| Brake pedal    | Depressed                           |
| Vehicle speed  | 0 km/h (0 MPH)                      |

4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

### **With GST**

Start engine and let it idle for at least 10 seconds.
 If idle speed is over 1,000 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,000 rpm.

| Selector lever | Suitable position except "P" or "N" |
|----------------|-------------------------------------|
| Brake pedal    | Depressed                           |
| Vehicle speed  | 0 km/h (0 MPH)                      |

- 2) Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

### No Tools

Start engine and let it idle for at least 10 seconds.
 If idle speed is over 1,000 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,000 rpm.

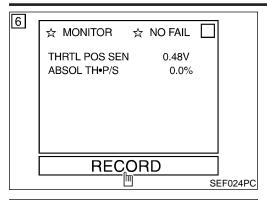
| Selector lever | Suitable position except "P" or "N" |
|----------------|-------------------------------------|
| Brake pedal    | Depressed                           |
| Vehicle speed  | 0 km/h (0 MPH)                      |

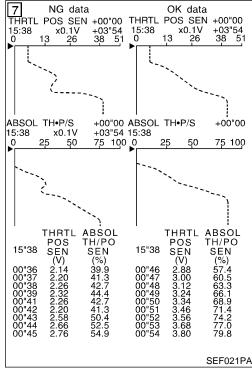
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

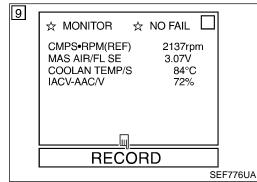
DTC Confirmation Procedure (Cont'd)



NBEC0077S03







### PROCEDURE FOR MALFUNCTION C

**CAUTION:** 

Always drive vehicle at a safe speed.

(P) 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.
- 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-188.
  - If OK, go to following step.
- 8) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT.
- 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. |

10) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

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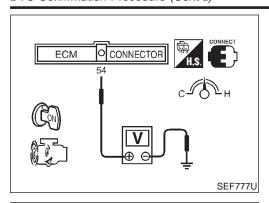
HA

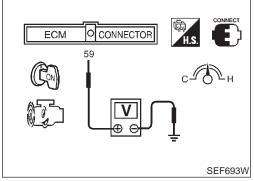
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DTC Confirmation Procedure (Cont'd)





### **With GST**

- Start engine and warm it up to normal operating temperature.
- Maintain the following conditions for at least 10 consecutive seconds.

| Gear position  | Suitable position      |
|--|------------------------|
| Engine speed   | More than 2,000 rpm    |
| Engine coolant temperature   | More than 70°C (158°F) |
| Voltage between ECM terminal 54 (Mass air flow sensor signal) and ground | More than 3V           |

- 3) Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.

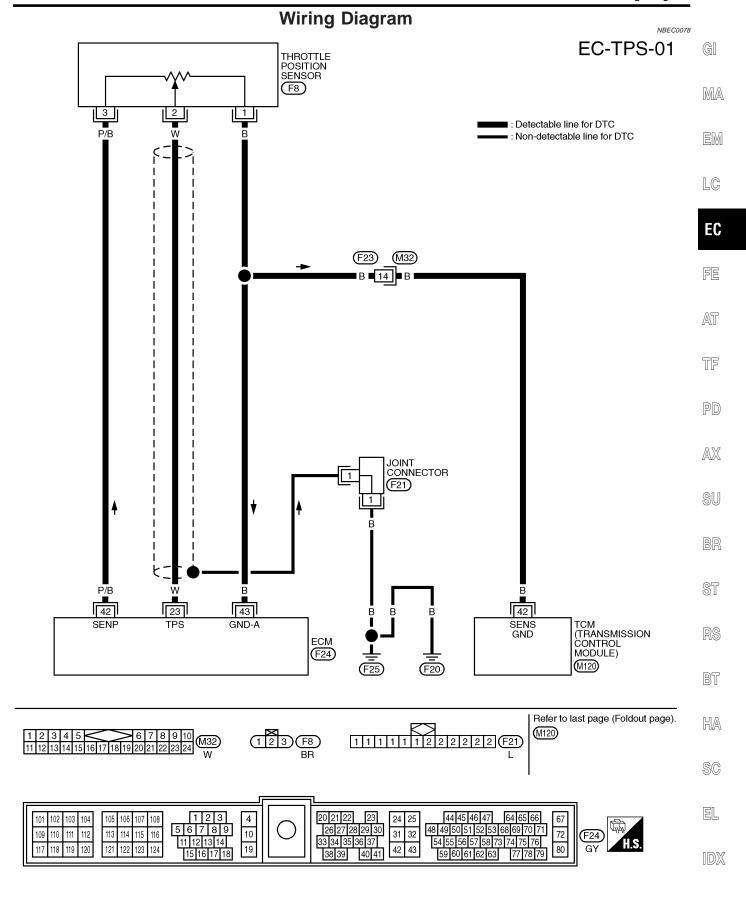
### NO Tools

- 1) Start engine and warm it up to normal operating temperature.
- 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 59 (Engine coolant temperature sensor signal) and ground | Less than 1.5V      |

- 3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-188.





MEC637C

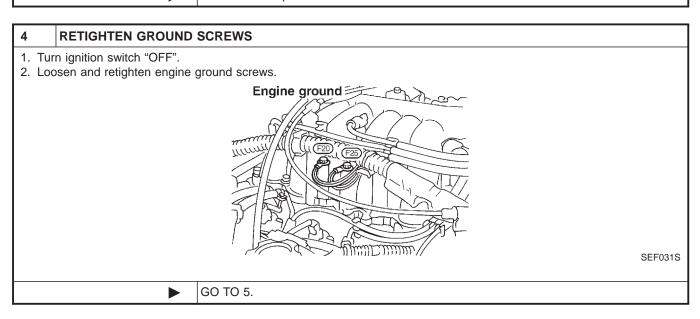


### **Diagnostic Procedure**

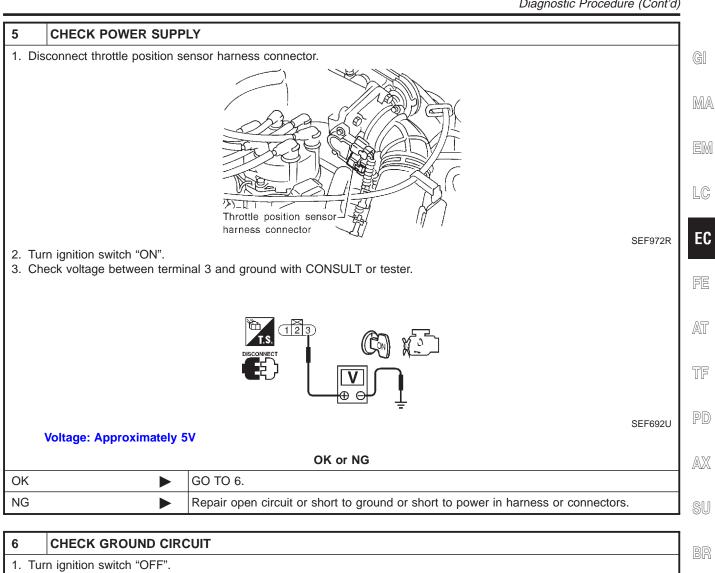
NBEC0079 **INSPECTION START** Which malfunction A, B or C is duplicated? MALFUNCTION Туре Α В В С С MTBL0066 Type A, B or C GO TO 4. Type A or B GO TO 2. Type C

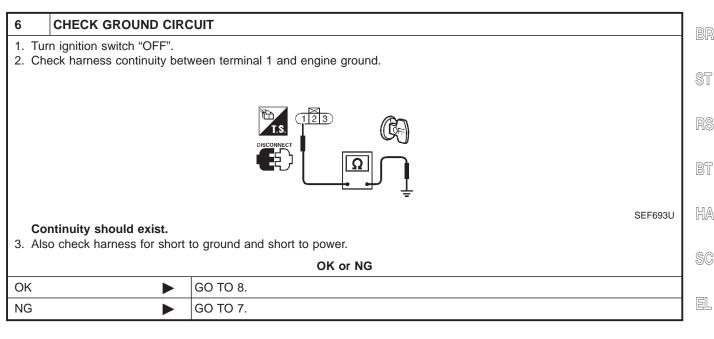
| 2      | ADJUST THROTTLE POSITION SENSOR    |  |  |  |
|--------|------------------------------------|--|--|--|
| Perfor | Perform "Basic Inspection", EC-99. |  |  |  |
|        | <b>▶</b> GO TO 3.                  |  |  |  |

# 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 Reconnect the parts.



Diagnostic Procedure (Cont'd)







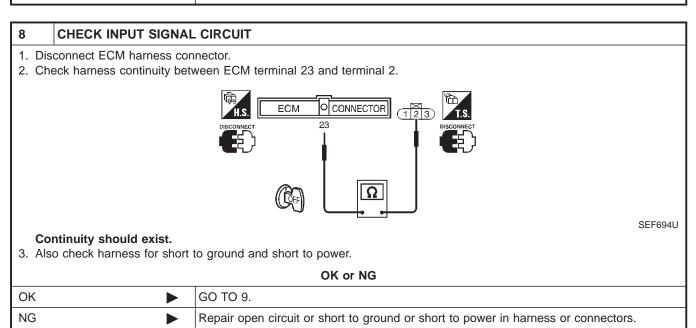
Diagnostic Procedure (Cont'd)

### 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.



| 9     | CHECK THROTTLE POSITION SENSOR          |  |
|-------|---|--|
| Refer | Refer to "Component Inspection" EC-192. |  |
|       | OK or NG                                |  |
| OK    | <b>&gt;</b>                             | GO TO 10.  |
| NG    | <b>&gt;</b>                             | Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-99. |

| 10    | 0 CHECK MASS AIR FLOW SENSOR             |                               |  |
|-------|--|-------------------------------|--|
| Refer | Refer to "Component Inspection", EC-155. |                               |  |
|       | OK or NG                                 |                               |  |
| OK    | <b>&gt;</b>                              | GO TO 11.                     |  |
| NG    | <b>&gt;</b>                              | Replace mass air flow sensor. |  |

| 11    | 11 CHECK CAMSHAFT POSITION SENSOR        |                                   |  |
|-------|--|-----------------------------------|--|
| Refer | Refer to "Component Inspection", EC-342. |                                   |  |
|       | OK or NG                                 |                                   |  |
| OK    | <b>&gt;</b>                              | GO TO 12.                         |  |
| NG    | <b>&gt;</b>                              | Replace camshaft position sensor. |  |

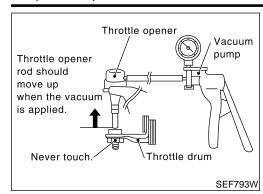


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|                               |  | Diagnostic Procedure (Cont'd) |
|-------------------------------|--|-------------------------------|
| 12 CHECK                      | FUEL INJECTOR  |                               |
| Refer to "Comp                | onent Inspection", EC-556.                                     |                               |
|                               | OK or NG   |                               |
| OK                            | <b>▶</b> GO TO 13.   |                               |
| IG                            | Replace fuel injector.   |                               |
|                               |  | 1                             |
|                               | SHIELD CIRCUIT   |                               |
|                               | switch "OFF".  |                               |
| . Check the fo                | ollowing.  |                               |
| Joint connect                 | etween joint connector terminal and ground tor                 |                               |
| (Refer to EL-<br>Continuity s | 350, "HARNESS LAYOUT".)  |                               |
| Also check h                  | narness for short to ground and short to power.                |                               |
| Then reconn                   | nect joint connector.  |                               |
|                               | OK or NG   |                               |
| K                             | ▶ GO TO 14.  |                               |
| <u> </u>                      | Repair open circuit or short to ground or short to power in ha | arness or connectors.         |
| 4 CHECK                       | INTERMITTENT INCIDENT  |                               |
| tefer to "TROU                | JBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136.             |                               |
|                               | INSPECTION END   |                               |
|                               |  |                               |
|                               |  |                               |
|                               |  |                               |
|                               |  |                               |
|                               |  |                               |
|                               |  |                               |
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|                               |  |                               |
|                               |  |                               |
|                               |  |                               |
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|                               |  |                               |



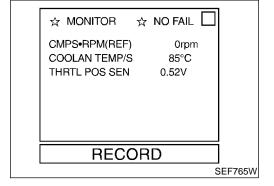


## Component Inspection THROTTLE POSITION SENSOR

=NBEC0080 NBEC0080S01

(P) With CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine (ignition switch OFF).
- 3) Remove the vacuum hose connected to the throttle opener.
- 4) Connect suitable vacuum hose to the vacuum pump and the opener.
- 5) Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
- 6) Turn ignition switch ON.

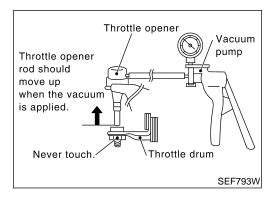


- 7) Select "DATA MONITOR" mode with CONSULT.
- Check voltage of "THRTL POS SEN".
   Voltage measurement must be made with throttle position sensor installed in vehicle.

| Throttle valve conditions | THRTL POS SEN       |
|---------------------------|---------------------|
| Completely closed (a)     | 0.15 - 0.85V        |
| Partially open            | Between (a) and (b) |
| Completely open (b)       | 3.5 - 4.7V          |

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

9) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace throttle position sensor.



### (R) Without CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 2) Stop engine (ignition switch OFF).
- 3) Remove the vacuum hose connected to the throttle opener.
- 4) Connect suitable vacuum hose to the vacuum pump and the opener.
- 5) Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
- 6) Turn ignition switch ON.
- 7) Check voltage between ECM terminal 23 (Throttle position



Component Inspection (Cont'd)

sensor signal) and ground.

Voltage measurement must be made with throttle position sensor installed in vehicle.

| Throttle valve conditions | Voltage             |
|---------------------------|---------------------|
| Completely closed (a)     | 0.15 - 0.85V        |
| Partially open            | Between (a) and (b) |
| Completely open (b)       | 3.5 - 4.7V          |

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

8) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace throttle position sensor.

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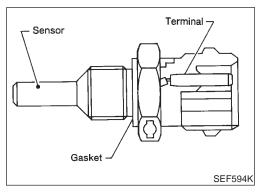


### **Description**

NOTE:

NBEC0081

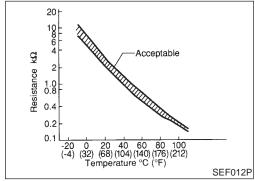
 If DTC P0125 (0908) is displayed with P0115 (0103), first perform "DTC P0115 ENGINE COOLANT TEMPERATURE (ECTS) SENSOR", EC-175.



### **COMPONENT DESCRIPTION**

NBFC0081S01

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        | 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 |

<sup>\*:</sup> These data are reference values and are measured between ECM terminal 59 (Engine coolant temperature sensor) and ground.

### **CAUTION:**

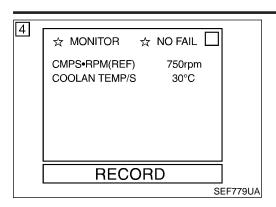
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

### On Board Diagnosis Logic

NBEC008

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

DTC Confirmation Procedure



### **DTC Confirmation Procedure**

### **CAUTION:**

Be careful not to overheat engine.

### 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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NBEC0083

### (P) With CONSULT

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

5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-197.

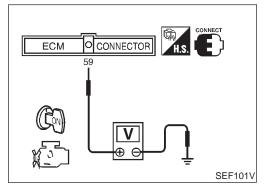
If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.

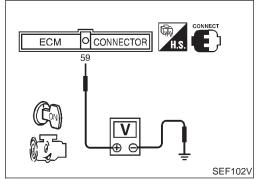
### With GST

- 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.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-197.

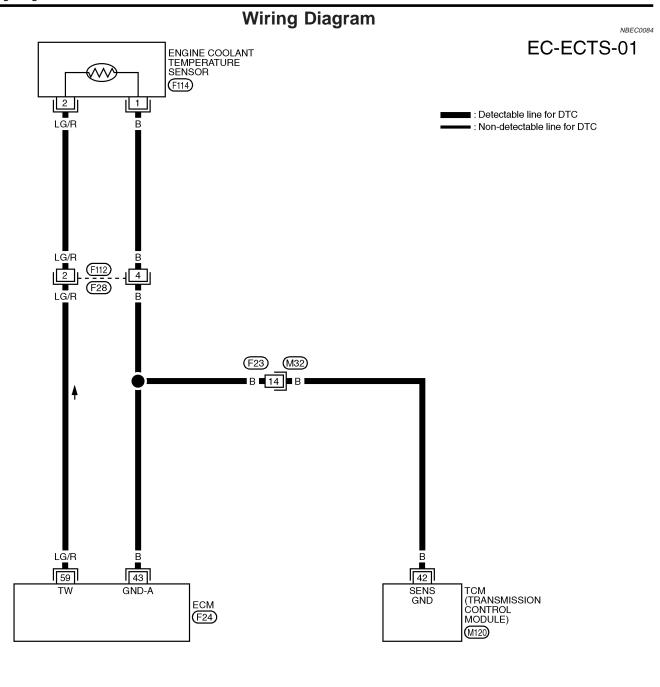
### No Tools

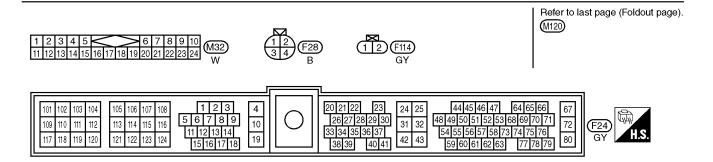
- 1) Turn ignition switch "ON".
  - ) Check that voltage between ECN terminal 59 (Engine coolant temperature sensor signal) and ground is less than 3.8V. If it is less than 3.8V, the test result will be OK. If it is over 3.8V, go to following step.
- Start engine and run it for 65 minutes at idle speed 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.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-197.





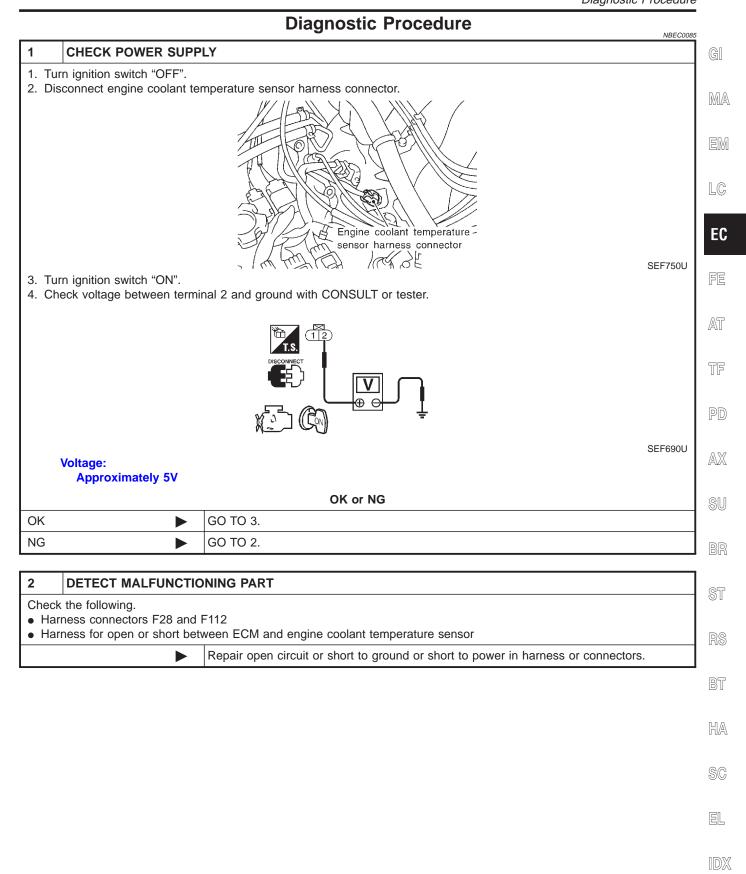






MEC636C

Diagnostic Procedure





Diagnostic Procedure (Cont'd)

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

| l | 4 | DETECT MALFUNCTIONING PART |  |
|---|---|----------------------------|--|
| Г |   |                            |  |

Check the following.

OK

NG

- Harness connectors F28, F112
- Harness connectors F23, M32
- Harness for open or short between ECM and engine coolant temperature sensor

GO TO 5.

GO TO 4.

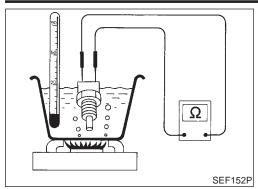
- Harness for open or short between TCM (Transmission control module) and engine coolant temperature sensor
  - Repair open circuit or short to ground or short to power in harness or connectors.

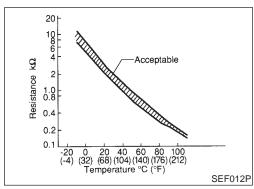
| 5     | CHECK ENGINE COOLANT TEMPERATURE SENSOR |  |
|-------|---|--|
| Refer | Refer to "Component Inspection" EC-199. |  |
|       | OK or NG                                |  |
| OK    | <b>&gt;</b>                             | GO TO 6.                                   |
| NG    | <b>&gt;</b>                             | Replace engine coolant temperature sensor. |

| 6  | CHECK THERMOSTAT   | OPERATION   |  |  |  |
|----|--|---|--|--|--|
|    | the engine is cold [lower the thick the color of the colo | nan 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant |  |  |  |
|    | OK or NG   |   |  |  |  |
| OK | <b>•</b>   | GO TO 7.  |  |  |  |
| NG | <b>&gt;</b>  | Repair or replace thermostat. Refer to LC-10, "Thermostat", "ENGINE COOLING SYSTEM".  |  |  |  |

| 7     | 7 CHECK INTERMITTENT INCIDENT                                   |                |  |  |  |
|-------|---|----------------|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |  |  |
|       | <b>•</b>  | INSPECTION END |  |  |  |

Component Inspection





### **Component Inspection ENGINE COOLANT TEMPERATURE SENSOR**

NBEC0086

NBEC0086S01

Check resistance as shown in the figure.

### <Reference data>

| Temperature °C (°F) | Resistance $k\Omega$ |
|---------------------|----------------------|
| 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.

EC

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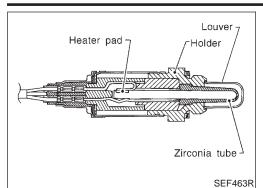
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Component Description





# Nixture ratio SEF288D

### **Component Description**

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 airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

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

### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

### **CAUTION:**

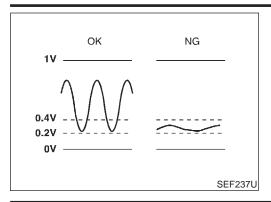
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION   | DATA (DC Voltage)      |
|----------------------|---------------|-------------------------------|---|------------------------|
| 50                   | W             | Front heated oxygen sensor RH | [Engine is running]  • After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V |
| 51                   | W             | Front heated oxygen sensor LH |   | 0.5 ms                 |

NBEC0091

NBEC0092

On Board Diagnosis Logic



### On Board Diagnosis Logic

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

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| 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     (The sensor circuit is open or shorted.)     Front heated oxygen sensor |   |
| P0150<br>0303<br>(Left bank)  |   |   | A |

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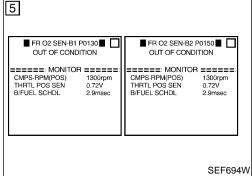
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NREC0390



5

TESTING

0.90V

CMPS-RPM(POS) THRTL POS SEN

B/FUEL SCHDL

■ FR O2 SEN-B1 P0130 ■ ■ FR O2 SEN-B2 P0150 ■ TESTING ==: MONITOR ===== : MONITOR : 1862rpm 1862rpm CMPS-RPM(POS) THRTL POS SEN

SEF695W

### 5 ■ FR O2 SEN-B1 P0130 ■ ■ FR O2 SEN-B2 P0150 ■ COMPLETED COMPLETED SELF-DIAG RESULTS SELF-DIAG RESULTS SEF526UB

### **DTC Confirmation Procedure**

### 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.
- With CONSULT
- 1) Start engine and warm it up to normal operating temperature.
- Select "FR O2 SEN-B1 (-B2) P0130 (P0150)" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START". 3)
- 4) Let it idle for at least 3.5 minutes.
- When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 10 to 60 seconds.)

| CMPS-RPM (REF) | 1,800 - 2,600 rpm           |
|----------------|-----------------------------|
| Vehicle speed  | 70 - 120 km/h (43 - 75 MPH) |
| B/FUEL SCHDL   | 1.7 - 6.5 msec              |
| Selector lever | Suitable position           |

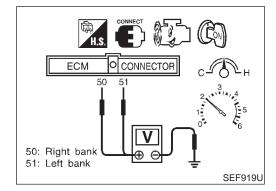
### If "TESTING" is not displayed after 5 minutes, retry from step 2.

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



Procedure", EC-205.

During this test, P1148 may be stored in ECM.



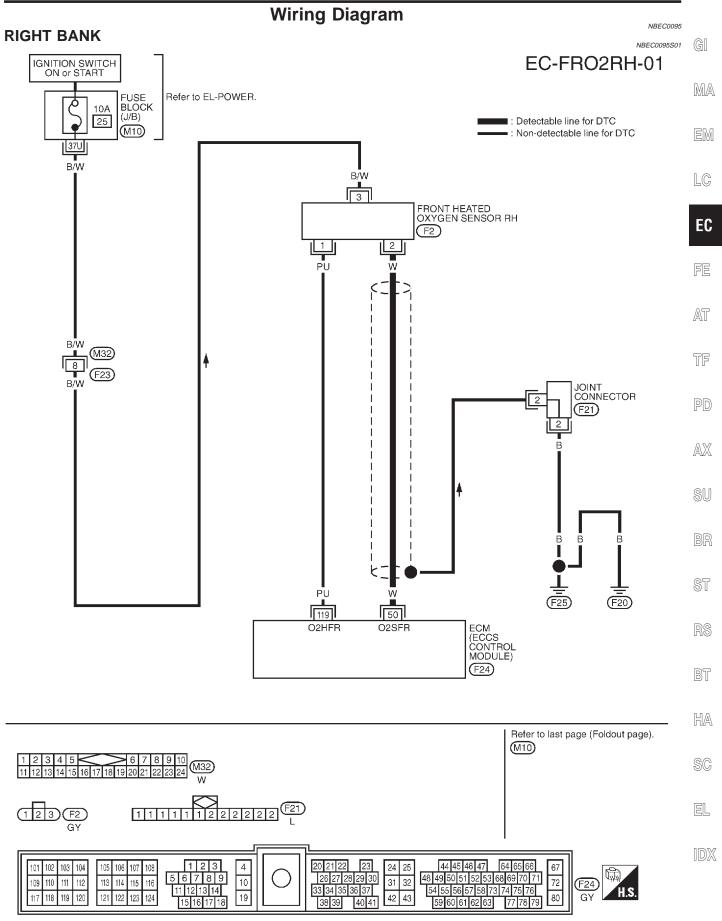
### **Overall Function Check**

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

### **Without CONSULT**

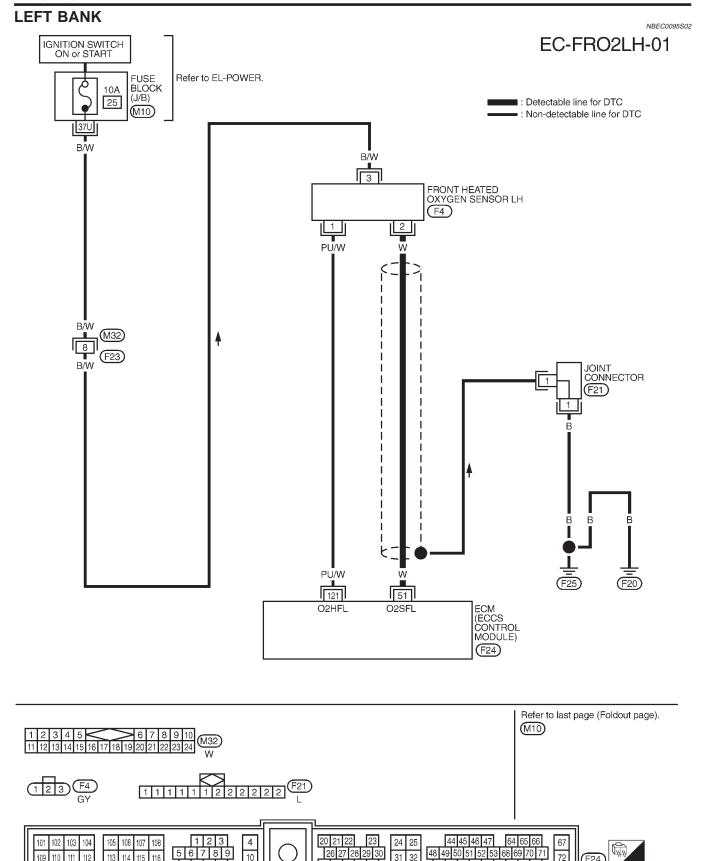
be confirmed.

- 1) Start engine and warm it up to normal operating temperature.
- 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.
- 4) If NG, go to "Diagnostic Procedure", EC-205.



Wiring Diagram (Cont'd)





MEC147C

26 27 28 29 30

38 39 40 41

33 34 35 36 37

31 32

42 43

10

19

11 12 13 14

111 112 113

120

110

114 115 116

48 49 50 51 52 53 68 69 70 71

54 55 56 57 58 73 74 75 76

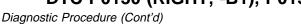
59 60 61 62 63

72

(F24)

Diagnostic Procedure

### **Diagnostic Procedure** NBEC0096 **INSPECTION START** G[ 1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws. MA Engine ground LC EC SEF031S FE 3. Disconnect corresponding front heated oxygen sensor harness connector. Front heated oxygen sensor harness connector LH AT TF PD Front heated oxygen sensor harness connector RH \\' $\mathbb{A}\mathbb{X}$ SEF870W GO TO 2. SU BR ST RS BT HA SC EL



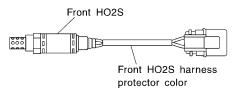




### CHECK INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.

2. Check harness continuity between ECM terminal and sensor terminal as follows.

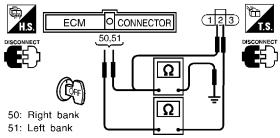


P0130 (-B1) Right bank: Black P0150 (-B2) Left bank: Blue

SEF871W

| DTC   | Terminals |        | Bank                      |
|-------|-----------|--------|---------------------------|
| DIC   | ECM       | Sensor | (Harness protector color) |
| P0130 | 50        | 2      | Right (Black)             |
| P0150 | 51        | 2      | Left (Blue)               |

SEF872W



### Continuity should exist.

3. Check harness continuity between ECM terminal or sensor terminal and ground as follows.

| DTC   | Terminals     |        | Bank                    |  |
|-------|---------------|--------|-------------------------|--|
| DIC   | ECM or sensor | Ground | (Harness protector colo |  |
| P0130 | 50 or 2       | Ground | Right (Black)           |  |
| P0150 | 51 or 2       | Ground | Left (Blue)             |  |

### SEF873W

SEF695U

### Continuity should not exist.

4. Also check harness for short to power.

### OK or NG

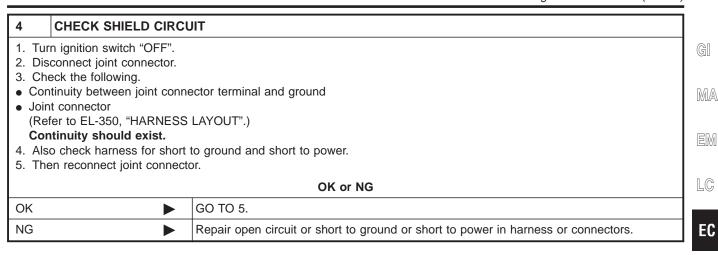
| OK ▶ | GO TO 3.   |
|------|--|
| NG ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3     | CHECK FRONT HEATE         | D OXYGEN SENSOR  |
|-------|---------------------------|--|
| Refer | to "Component Inspection" | , EC-207.  |
|       |                           | OK or NG   |
| ОК    | <b>&gt;</b>               | GO TO 4.   |
| NG    | , and the second second   | Check harness protector color. Black; Right bank (-B1) Blue; Left bank (-B2) Replace front heated oxygen sensor. |

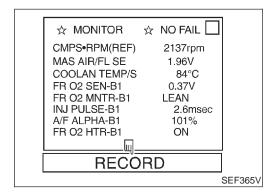
EC

AT

Diagnostic Procedure (Cont'd)



| 5     | 5 CHECK INTERMITTENT INCIDENT                                   |                |  |  |  |
|-------|---|----------------|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |  |  |
|       | <b>•</b>  | INSPECTION END |  |  |  |



Right bank cycle 1 2 3 4 5 FR O2 MNTR-B1 R-L-R-L-R-L-R-L-R Left bank cvcle | 1 | 2 | 3 | 4 | 5 | FR O2 MNTR-B2 R-L-R-L-R-L-R-L-R R means FR O2 MNTR-B1(-B2) indicates RICH L means FR O2 MNTR-B1(-B2) indicates LEAN SEF702W

### Component Inspection FRONT HEATED OXYGEN SENSOR

NBEC0391

(P) With CONSULT

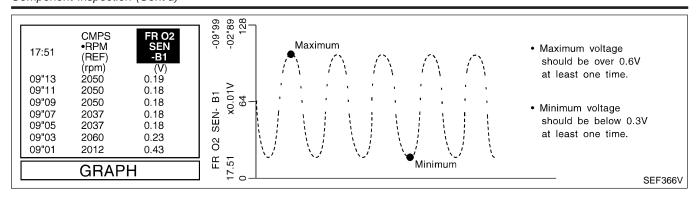
- Start engine and warm it up to normal operating temperature.
- Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on CONSULT screen.
- Check the following. 5)
- "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:
- "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.

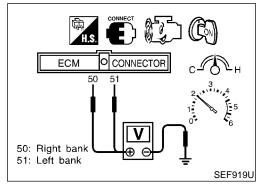
### **CAUTION:**

- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

EL

Component Inspection (Cont'd)





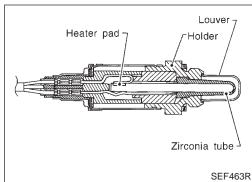
### **⋈** Without CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

Component Description



SEF288D

### **Component Description**

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 airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



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### **CONSULT Reference Value in Data Monitor** Mode

NBEC0393

Specification data are reference values.

Ideal ratio Mixture ratio

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

### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

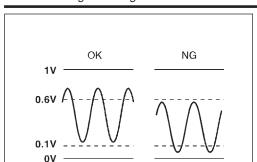
### **CAUTION:**

Output voltage V<sub>s</sub> [v]

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL | WIRE | ITEM                          | CONDITION   | DATA (DC Voltage)      |
|---------------|------|-------------------------------|---|------------------------|
| NO.           |      |                               |   |                        |
| 50            | w    | Front heated oxygen sensor RH | <ul> <li>[Engine is running]</li> <li>After warming up to normal operating temperature and engine speed is 2,000 rpm</li> </ul> | 0 - Approximately 1.0V |
| 51            | W    | Front heated oxygen sensor LH |   | 0.5 ms                 |

On Board Diagnosis Logic



### On Board Diagnosis Logic

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

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

### **DTC Confirmation Procedure**

NRFC0396

### **CAUTION:**

Always drive vehicle at a safe speed.

### NOTE:

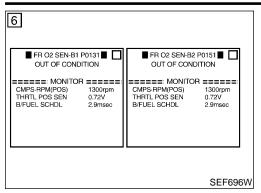
SEF300U

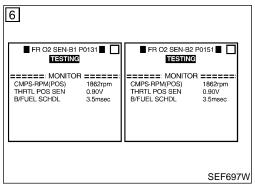
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

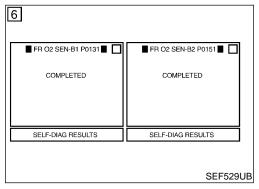
### **TESTING CONDITION:**

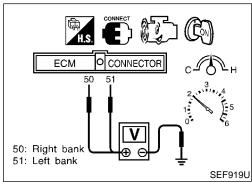
- Always perform at a temperature above -10°C (14°F).
- Before performing following procedure, confirm that battery voltage is more than 11V at idle.

DTC Confirmation Procedure (Cont'd)









### (P) With CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 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.

### NOTE:

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 5.

When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 50 seconds or more.)

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

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

 Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-212.

### **Overall Function Check**

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

### **(R)** Without CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
- 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.
- 4) If NG, go to "Diagnostic Procedure", EC-212.

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Diagnostic Procedure

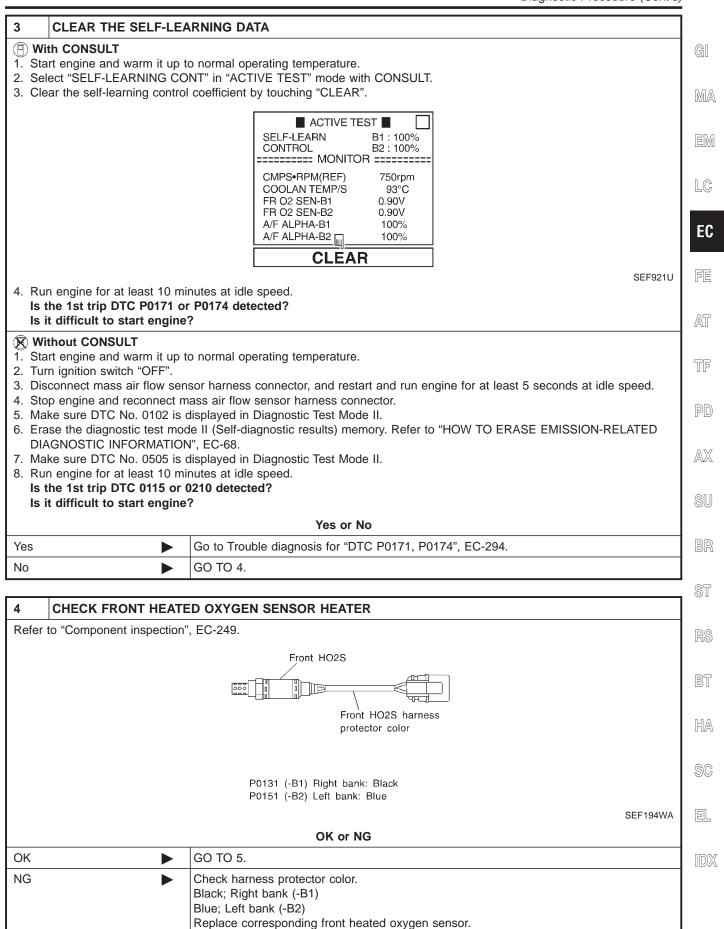
# 1 RETIGHTEN GROUND SCREWS 1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws. Engine ground

# 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.

GO TO 2.

SEF031S

Diagnostic Procedure (Cont'd)



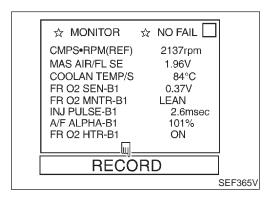
Diagnostic Procedure (Cont'd)



| 5     | CHECK FRONT HEATED OXYGEN SENSOR |  |  |  |  |
|-------|----------------------------------|--|--|--|--|
| Refer | to "Component Inspection"        | , EC-214.  |  |  |  |
|       | OK or NG                         |  |  |  |  |
| OK    | <b>•</b>                         | GO TO 6.   |  |  |  |
| NG    | <b>•</b>                         | Check harness protector color. Black; Right bank (-B1) Blue; Left bank (-B2) Replace corresponding front heated oxygen sensor. |  |  |  |

| 6      | CHECK SHIELD CIRCU   | JIT  |  |
|--------|--|--|--|
| 1. Tur | rn ignition switch "OFF".  |  |  |
| 2. Dis | sconnect joint connector.  |  |  |
|        | r circuit, refer to "DTC P01:<br>RONT HO2S) (CIRCUIT)",                        | 30 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR            |  |
| ,      | eck the following.   | EC-200.  |  |
|        | eck the following.<br>ntinuity between joint conne                             | poter terminal and ground  |  |
|        | nt connector   | ector terminar and ground  |  |
|        |  | I AVOLIT" \  |  |
| `      | (Refer to EL-350, "HARNESS LAYOUT".)  Continuity should exist.                 |  |  |
|        | <ol> <li>Also check harness for short to ground and short to power.</li> </ol> |  |  |
|        | 6. Then reconnect joint connector.   |  |  |
| 0. 111 | o. Then reconnect joint connector.   |  |  |
|        | OK or NG   |  |  |
| ОК     | <b>•</b>   | GO TO 7.   |  |
| NG     | <b>•</b>   | 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-136. For circuit, refer to "DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR (FRONT HO2S) (CIRCUIT)", EC-200. |                             |                |  |
|  | <b>•</b>                    | INSPECTION END |  |



| Right bank  cycle   1   2   3   4   5    FR 02 MNTR-B1 R-L-B-L-B-L-B-L-B |
|--|
| FN OZ WINTN-DI N-L-N-L-N-L-N-L-N   |
| Left bank  |
| cycle   1   2   3   4   5  |
| FR O2 MNTR-B2 R-L-R-L-R-L-R-L-R  |
| R means FR O2 MNTR-B1(-B2) indicates RICH                                |
| L means FR O2 MNTR-B1(-B2) indicates LEAN                                |
|  |
| SEF702W  |
|  |

### Component Inspection FRONT HEATED OXYGEN SENSOR

(P) With CONSULT

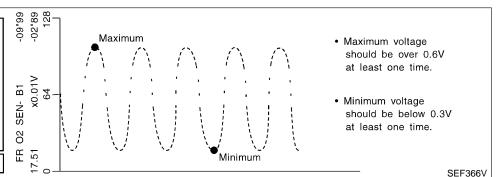
- Start engine and warm it up to normal operating temperature.
- Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- Touch "RECORD" on CONSULT 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:
- "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.

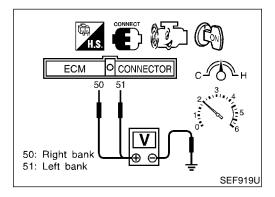
### **CAUTION:**

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.

Component Inspection (Cont'd)

 Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.





CMPS •RPM

(REF)

(rpm)

2050

2050

2050

2037

2037

2060

2012

GRAPH

0.19

0.18

0.18

0.18

0.18

0.23

0.43

17:51

09"13

09"11

09"09

09"07

09"05

09"03

09"01

### Nithout CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.





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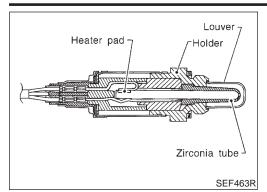
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Component Description





# Output voltage V<sub>s</sub> [v] Ideal ratio Mixture ratio SEF288D

### **Component Description**

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 airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

### **CONSULT Reference Value in Data Monitor** Mode

Specification data are reference values.

| MONITOR ITEM                   | CONE                     | 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<br>10 seconds. |

### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

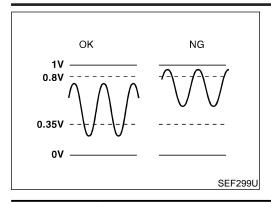
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION   | DATA (DC Voltage)      |
|----------------------|---------------|-------------------------------|---|------------------------|
| 50                   | W             | Front heated oxygen sensor RH | [Engine is running]  ■ After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V |
| 51                   | w             | Front heated oxygen sensor LH |   | 0.5 ms                 |

NBEC0402

NBEC0403

#### DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT **MONITORING**)

On Board Diagnosis Logic



#### On Board Diagnosis Logic

To judge the malfunction, the output from the front heated oxyger 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.

| <i>J</i> 4 |            |
|------------|------------|
| n          | $\bigcirc$ |
| -          | (S         |

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|  | tected when Check Items (Poss | sible Cause) |
|--|-------------------------------|--------------|
| P0132 0414 (Right bank)  P0152 0410 (Left bank)  • The maximum and minim are beyond the specified of the spe | 7,0                           |              |



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NBEC0405

#### **DTC Confirmation Procedure**

#### **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.

AX

#### **TESTING CONDITION:**

- Always perform at a temperature above -10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.





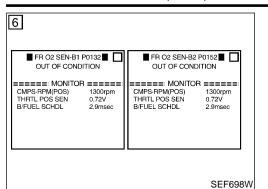
HA

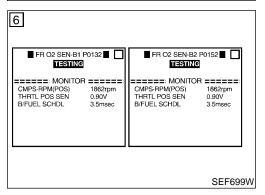
SC

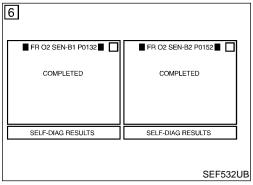
EL

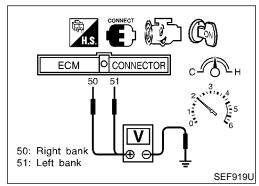
# DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT MONITORING)

DTC Confirmation Procedure (Cont'd)









#### (P) With CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "FR O2 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.

#### NOTE:

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 5.

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 or more.)

| CMPS-RPM (REF) | 1,800 - 2,800 rpm           |
|----------------|-----------------------------|
| Vehicle speed  | 80 - 100 km/h (50 - 62 MPH) |
| B/FUEL SCHDL   | 1.7 - 6.5 msec              |
| 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-219.

#### **Overall Function Check**

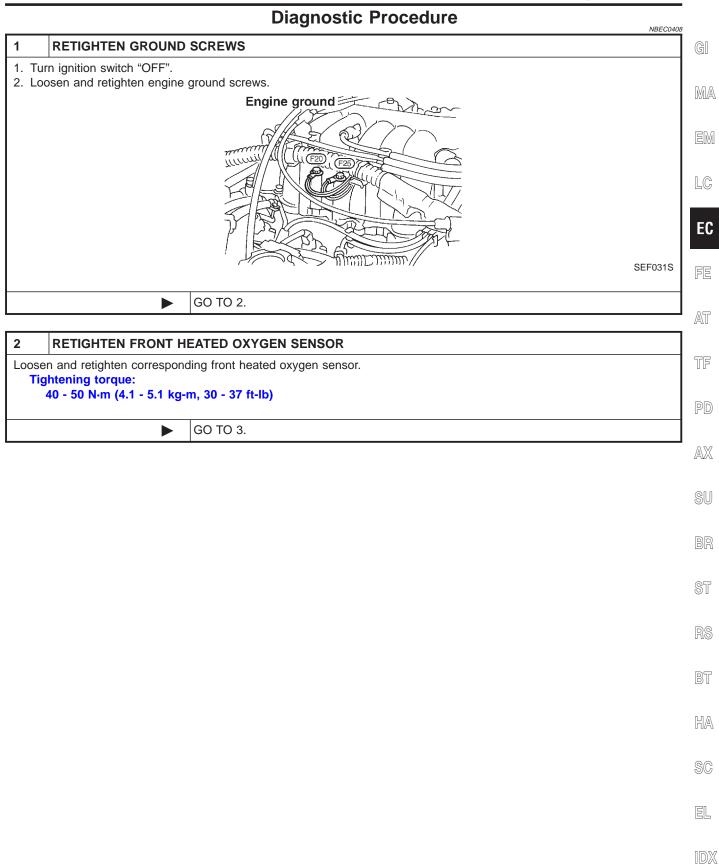
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

#### 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.
- 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.
- 4) If NG, go to "Diagnostic Procedure", EC-219.

# DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT MONITORING)

Diagnostic Procedure



#### DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT MONITORING)

Diagnostic Procedure (Cont'd)

SEF921U

#### **CLEAR THE SELF-LEARNING DATA**

#### (P) 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".

ACTIVE TEST SELF-LEARN B1:100% CONTROL B2:100% ======= MONITOR ======= CMPS•RPM(REF) 750rpm COOLAN TEMP/S 93°C FR O2 SEN-B1 0.90V FR O2 SEN-B2 0.90V A/F ALPHA-B1 100% A/F ALPHA-B2 [ 100% CLEAR

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?

#### (R) Without CONSULT

NG

- 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. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-68.
- 7. Make sure DTC No. 0505 is displayed in Diagnostic Test Mode II.
- 8. 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-303. |
|------|---|
| No • | GO TO 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.

Repair or replace harness or connectors.

# DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT MONITORING)

Diagnostic Procedure (Cont'd)

| E OUTOK   | EDONT UEAT                              | Diagnostic Procedure (Contra  | i<br>I |
|---|---|---|--------|
| 5 CHECK Refer to "Compo                               |   | FC-249  | . (    |
| receive compe   | mont mopeoution                         |   |        |
|   |   | Front HO2S  Front HO2S harness protector color  | [      |
|   |   | protector color   |        |
|   |   | P0132 (-B1) Right bank: Black<br>P0152 (-B2) Left bank: Blue<br>SEF194WD  |        |
|   |   | OK or NG  |        |
| OK  | <b>&gt;</b>                             | GO TO 6.  |        |
| NG  | •                                       | Check harness protector color.  Black; Right bank (-B1)  Blue; Left bank (-B2)  Replace corresponding front heated oxygen sensor. |        |
|   |   | replace corresponding from fleated oxygen sensor.   | ]      |
| CHECK   | FRONT HEATE                             | ED OXYGEN SENSOR  |        |
| Refer to "Compo                                       | nent Inspection'                        | ', EC-222.  |        |
|   |   | OK or NG  |        |
| )K  | <b>•</b>                                | GO TO 7.  |        |
| NG  | •                                       | Check harness protector color. Black; Right bank (-B1) Blue; Left bank (-B2) Replace corresponding front heated oxygen sensor.    |        |
| CHECK   | CHIELD CIDCL                            | IIT   | 1      |
| . Turn ignition                                       | SHIELD CIRCL                            | וונ   |        |
| <ol> <li>Disconnect jo<br/>For circuit, re</li> </ol> | int connector.                          | 30 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR   |        |
| . Check the fol                                       | lowing.<br>ween joint conne             | ector terminal and ground   |        |
| (Refer to EL-3<br>Continuity shalls). Also check ha   | 350, "HARNESS<br>nould exist.           | to ground and short to power.   |        |
|   | oor journ confident                     | OK or NG  |        |
| OK .  | <b>•</b>                                | GO TO 8.  |        |
| IG  | <b>&gt;</b>                             | Repair open circuit or short to ground or short to power in harness or connectors.  |        |
| 011=011   | 111777111111111111111111111111111111111 | TIMOIDENT   | 1      |
|   | INTERMITTEN'                            |   |        |
| For circuit, refer                                    |   | S FOR INTERMITTENT INCIDENT", EC-136.<br>(RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) FRONT HEATED OXYGEN SENSOR                     |        |
| (FRONT HO2S)  | (CIRCUIT)", EC                          | -200.   |        |

#### DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT MONITORING)

Component Inspection

FR O2 MNTR-B1

INJ PULSE-B1

A/F ALPHA-B1

FR O2 HTR-B1

cycle

cycle

Right bank

Left bank

RECORD

FR O2 MNTR-B1 R-L-R-L-R-L-R-L-R

FR O2 MNTR-B2 R-L-R-L-R-L-R-L-R

R means FR O2 MNTR-B1(-B2) indicates RICH

L means FR O2 MNTR-B1(-B2) indicates LEAN

LEAN

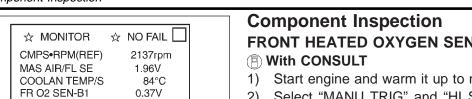
2.6msec

101%

ON

1 2 3 4 5

| 1 | 2 | 3 | 4 | 5 |



SEF365V

SEF702W

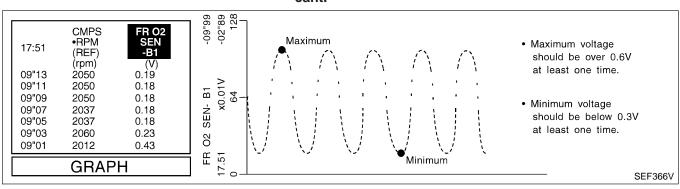
FRONT HEATED OXYGEN SENSOR

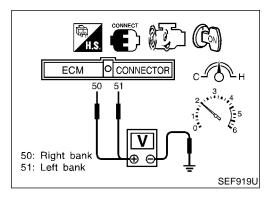
NBEC0409S01

- Start engine and warm it up to normal operating temperature.
- 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)".
- Hold engine speed at 2,000 rpm under no load during the following steps.
- Touch "RECORD" on CONSULT screen. 4)
- 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:
- "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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.





#### (R) Without CONSULT

- Start engine and warm it up to normal operating temperature.
- Set voltmeter probes between ECM terminal 50 (right bank sensor signal) or 51 (left bank sensor signal) and engine ground.
- 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 MONI-
- The maximum voltage is over 0.6V at least one time.

# DTC P0132 (RIGHT, -B1), P0152 (LEFT, -B2) FRONT HO2S (RICH SHIFT MONITORING)

Component Inspection (Cont'd)

- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.



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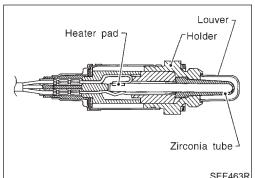
EL

Component Description



NBEC0411

NBEC0412



# SEF463R Output voltage V<sub>s</sub> [v]

#### **Component Description**

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 airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.

#### **CONSULT Reference Value in Data Monitor** Mode

Specification data are reference values.

Ideal ratio Mixture ratio

SEF288D

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

#### **ECM Terminals and Reference Value**

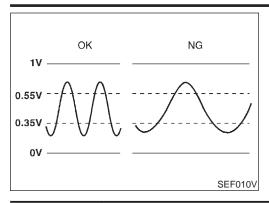
Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION   | DATA (DC Voltage)      |
|----------------------|---------------|-------------------------------|---|------------------------|
| 50                   | W             | Front heated oxygen sensor RH | <ul> <li>[Engine is running]</li> <li>After warming up to normal operating temperature and engine speed is 2,000 rpm</li> </ul> | 0 - Approximately 1.0V |
| 51                   | w             | Front heated oxygen sensor LH |   | 0.5 ms                 |

On Board Diagnosis Logic



#### On Board Diagnosis Logic

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



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| 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. | <ul> <li>Harness or connectors (The sensor circuit is open or shorted.)</li> <li>Front heated oxygen sensor</li> <li>Front heated oxygen sensor heater</li> <li>Fuel pressure</li> </ul> |          |
| P0153<br>0409<br>(Left bank)  |  | <ul> <li>Injectors</li> <li>Intake air leaks</li> <li>Exhaust gas leaks</li> <li>PCV valve</li> <li>Mass air flow sensor</li> </ul>  | <u> </u> |

EC

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NBFC0414

#### **DTC Confirmation Procedure**

#### **CAUTION:**

Always drive vehicle at a safe speed.

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

BT

#### **TESTING CONDITION:**

- Always perform at a temperature above -10°C (14°F).
- Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

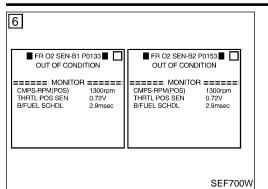
HA

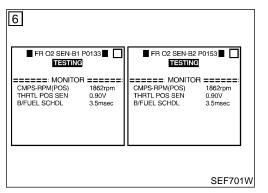
SC

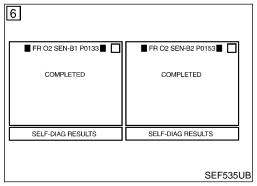
EL

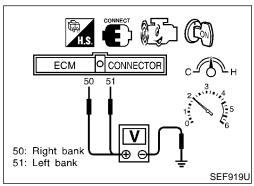
[DX

DTC Confirmation Procedure (Cont'd)









#### (P) With CONSULT

- Start engine and warm it up to normal operating temperature.
- 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.

#### NOTE

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 5.

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 - 120 km/h (50 - 75 MPH) |
| B/FUEL SCHDL   | 1.7 - 6.5 msec              |
| 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-229.

#### **Overall Function Check**

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

#### 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.
- 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).
- 4) If NG, go to "Diagnostic Procedure", EC-229.

DTC P0133 (RIGHT, -B1), P0153 (LEFT, -B2) FRONT HO2S (RESPONSE MONITORING)

Wiring Diagram

Wiring Diagram

SHT BANK

NBEC0416

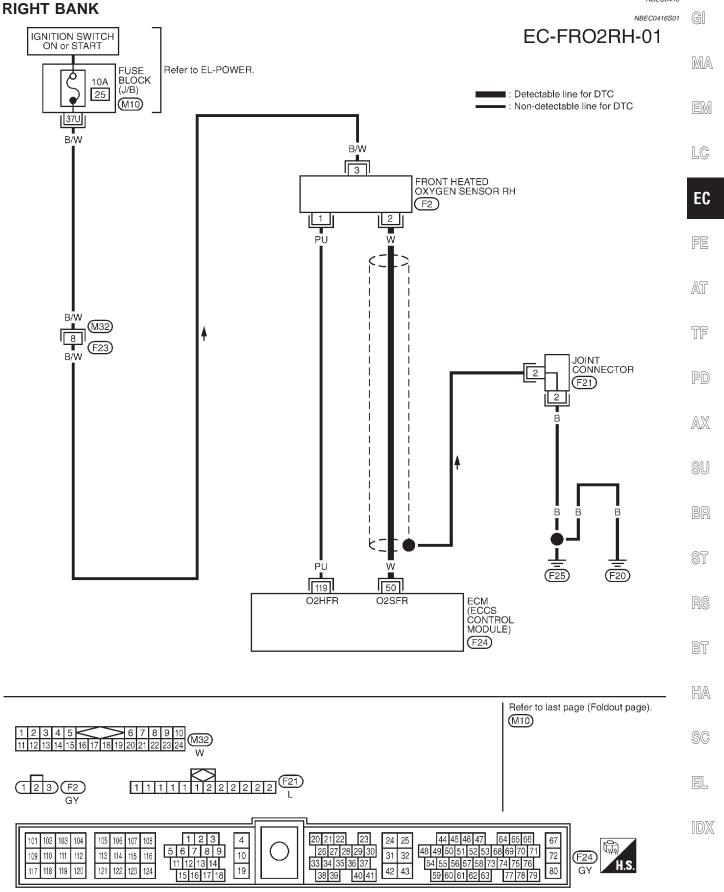
NBEC0416S01

GI

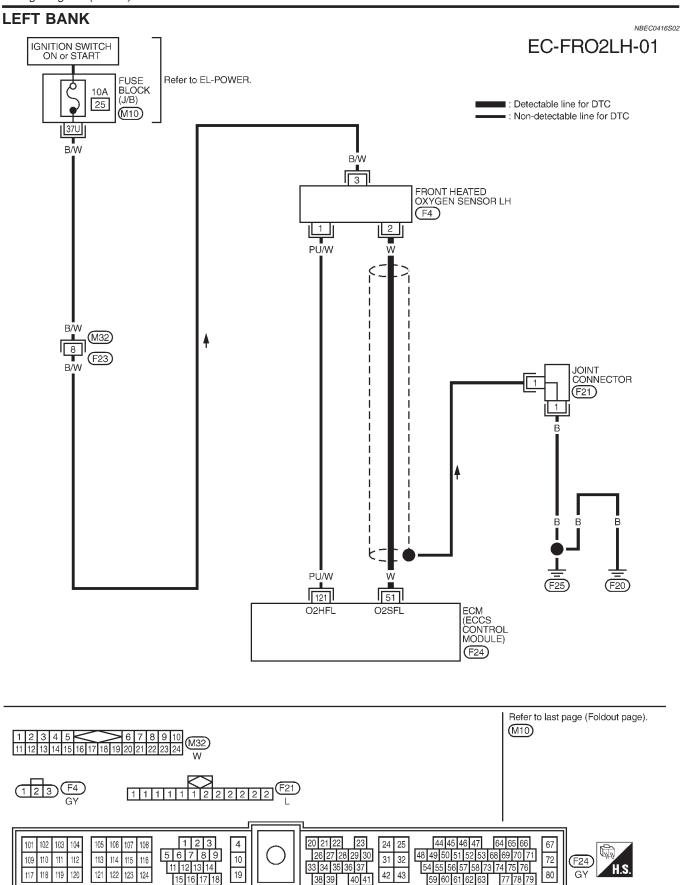
GI

GI

FUSE Refer to EL-POWER.

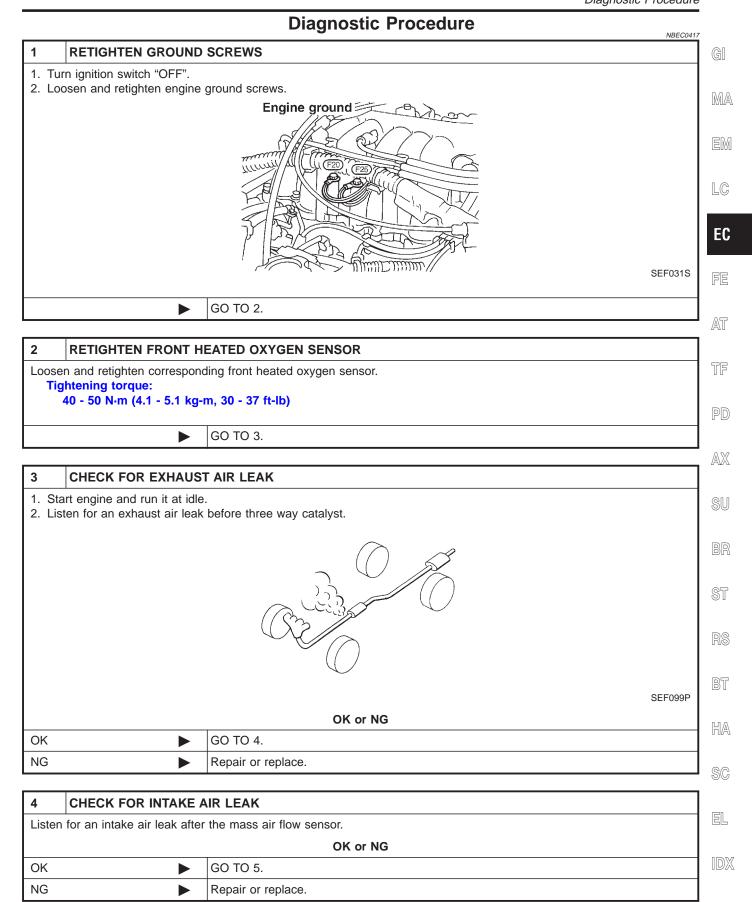


Wiring Diagram (Cont'd)



MEC147C

Diagnostic Procedure





SEF921U

Diagnostic Procedure (Cont'd)

#### **CLEAR THE SELF-LEARNING DATA**

- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
- 3. Clear the self-learning control coefficient by touching "CLEAR".

ACTIVE TEST SELF-LEARN B1:100% CONTROL B2:100% ======= MONITOR ======= CMPS•RPM(REF) 750rpm COOLAN TEMP/S 93°C FR O2 SEN-B1 0.90V FR O2 SEN-B2 0.90V A/F ALPHA-B1 100% A/F ALPHA-B2 [ 100%

CLEAR

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?

#### (R) Without CONSULT

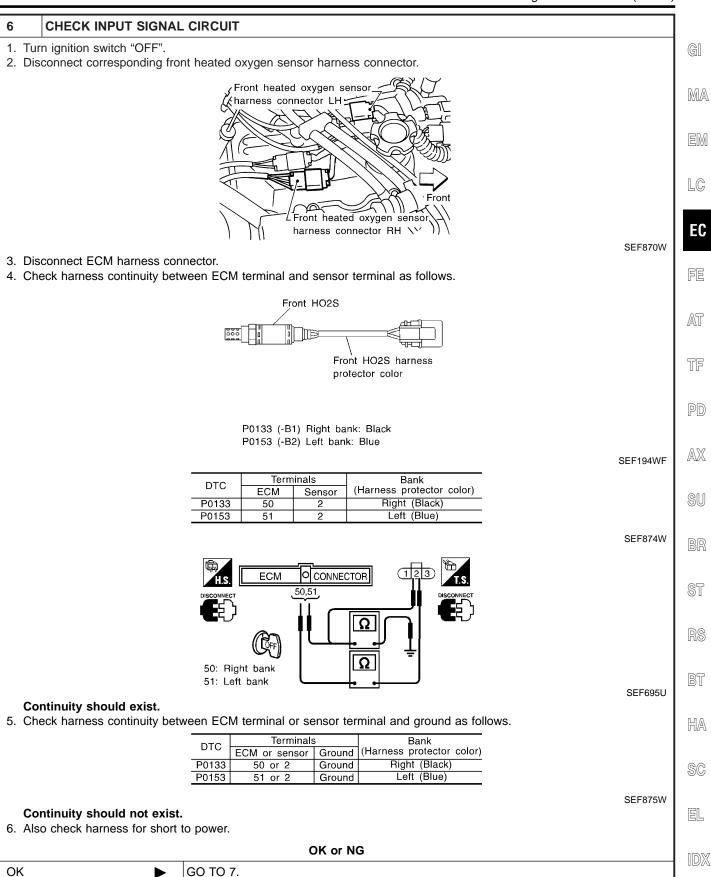
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure DTC No. 0102 is displayed in Diagnostic Test Mode II.
- 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-68.
- 7. Make sure DTC No. 0505 is displayed in Diagnostic Test Mode II.
- 8. 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 | <b></b> | Go to Trouble Diagnosis for "DTC P0171, P0174" or "P0172, P0175", EC-294, 303. |
|-----|---------|--|
| No  |         | GO TO 6.   |

Diagnostic Procedure (Cont'd)



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

NG

Diagnostic Procedure (Cont'd)

NG

| 7     | CHECK FRONT HEATE                        | D OXYGEN SENSOR HEATER   |  |  |
|-------|--|--|--|--|
| Refer | Refer to "Component Inspection", EC-249. |  |  |  |
|       | OK or NG                                 |  |  |  |
| ОК    | <b>•</b>                                 | GO TO 8.   |  |  |
| NG    | <b>•</b>                                 | Check harness protector color. Black; Right bank (-B1) Blue; Left bank (-B2) Replace corresponding front heated oxygen sensor. |  |  |

| 8  | CHECK MASS AIR FLO | DW SENSOR                     |  |  |
|--|--------------------|-------------------------------|--|--|
| Refer to "Component Inspection", EC-155. |                    |                               |  |  |
|  | OK or NG           |                               |  |  |
| OK                                       | <b>&gt;</b>        | GO TO 9.                      |  |  |
| NG                                       | <b>•</b>           | Replace mass air flow sensor. |  |  |

| 9     | CHECK PCV VALVE                                   |                    |  |  |  |
|-------|---|--------------------|--|--|--|
| Refer | Refer to "Positive Crankcase Ventilation", EC-36. |                    |  |  |  |
|       | OK or NG  |                    |  |  |  |
| OK    | <b>&gt;</b>                                       | GO TO 10.          |  |  |  |
| NG    | <b>&gt;</b>                                       | Replace PCV valve. |  |  |  |

| 10    | CHECK FRONT HEATED OXYGEN SENSOR  |  |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "Component Inspection", EC-233.  |  |  |  |  |
|       | OK or NG  |  |  |  |  |
| OK    | K   |  |  |  |  |
| NG    | Check harness protector color.  Black; Right bank (-B1)  Blue; Left bank (-B2)  Replace corresponding front heated oxygen sensor. |  |  |  |  |

| 11                     | CHECK SHIELD CIRCU  | IT                       |  |
|------------------------|---|--------------------------|--|
| 1. Tur                 | n ignition switch "OFF".                                      |                          |  |
| 2. Dis                 | connect joint connector.                                      |                          |  |
| 3. Ch                  | eck the following.  |                          |  |
| <ul><li>Con</li></ul>  | tinuity between joint conne                                   | ctor terminal and ground |  |
| <ul><li>Join</li></ul> | t connector   |                          |  |
| (Ref                   | (Refer to EL-350, "HARNESS LAYOUT".)                          |                          |  |
| Cor                    | Continuity should exist.                                      |                          |  |
| 4. Als                 | 4. Also check harness for short to ground and short to power. |                          |  |
| 5. The                 | 5. Then reconnect joint connector.                            |                          |  |
|                        | OK or NG  |                          |  |
| OK                     | OK <b>▶</b> GO TO 12.   |                          |  |

| 12    | CHECK INTERMITTENT INCIDENT                                     |  |  |  |
|-------|---|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |  |
|       | ► INSPECTION END  |  |  |  |

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

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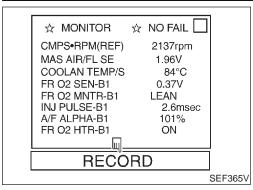
BT

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Component Inspection



Right bank

cycle | 1 | 2 | 3 | 4 | 5 |

FR O2 MNTR-B1 R-L-R-L-R-L-R-L-R

Left bank

cycle | 1 | 2 | 3 | 4 | 5 |

FR O2 MNTR-B2 R-L-R-L-R-L-R-L-R-L-R

R means FR O2 MNTR-B1(-B2) indicates RICH
L means FR O2 MNTR-B1(-B2) indicates LEAN

SEF702W

# Component Inspection FRONT HEATED OXYGEN SENSOR

NBEC0418

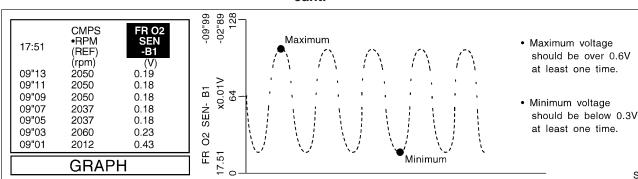
NBEC0418S01

NBEC0418501

- With CONSULT
- 1) Start engine and warm it up to normal operating temperature.
- 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)".
- 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:
- "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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.



# ECM OCONNECTOR C H 50 51 So: Right bank 51: Left bank SEF919U

#### (R) 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.
  - 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.

EC-233



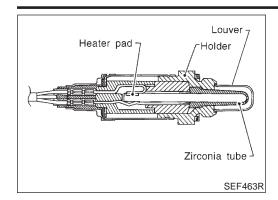
Component Inspection (Cont'd)

- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

Component Description



#### **Component Description**

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 airfuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



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| Specification dat | a ale | reference | values. |
|-------------------|-------|-----------|---------|
| MONITOR ITEM      |       |           |         |

Ideal ratio Mixture ratio 1 ean

SEF288D

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

#### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Output voltage V<sub>s</sub> [v]

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

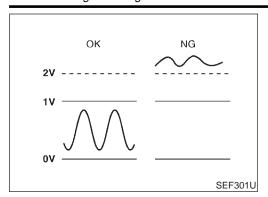
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION   | DATA (DC Voltage)      |
|----------------------|---------------|-------------------------------|---|------------------------|
| 50                   | W             | Front heated oxygen sensor RH | [Engine is running]  ■ After warming up to normal operating temperature and engine speed is 2,000 rpm | 0 - Approximately 1.0V |
| 51                   | W             | Front heated oxygen sensor LH |   | 0.5 ms SEF002V         |

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

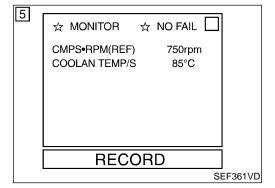
On Board Diagnosis Logic



#### On Board Diagnosis Logic

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     (The sensor circuit is open or shorted.)     Front heated oxygen sensor |
| P0154<br>0412<br>(Left bank)  |   |   |



#### **DTC Confirmation Procedure**

NBFC0423

#### 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.

#### (P) With CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Restart engine and let it idle for 20 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-240.

#### 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) Restart engine and let it idle for 20 seconds.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Restart engine and let it idle for 20 seconds.
- 6) Select "MODE 3" with GST.
- 7) If DTC is detected, go to "Diagnostic Procedure", EC-240.

#### No Tools

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- Restart engine and let it idle for 20 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.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-240.
- When using GST, "DTC Confirmation Procedure" should EC-236

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

DTC Confirmation Procedure (Cont'd)

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

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Wiring Diagram

103

110 111 112 113 114 115 116

107 108

1 2 3

10

19

5 6 7 8 9

11 12 13 14

#### **Wiring Diagram** NBEC0424 **RIGHT BANK** NBEC0424S01 IGNITION SWITCH ON or START EC-FRO2RH-01 FUSE BLOCK (J/B) Refer to EL-POWER. 10A 25 : Detectable line for DTC (M10) : Non-detectable line for DTC 37U B/W B/W 3 FRONT HEATED OXYGEN SENSOR RH (F2) PU (M32) (F23) JOINT CONNECTOR (F21) 2 ΡU W 119 50 ECM (ECCS CONTROL MODULE) (F24) Refer to last page (Foldout page). M<sub>10</sub> 111111222222 F21 L 123 F2



26 27 28 29 30

33 34 35 36 37

23

24

31 32

42

44 45 46 47

59 60 61 62 63

48 49 50 51 52 53 68 69 70 71

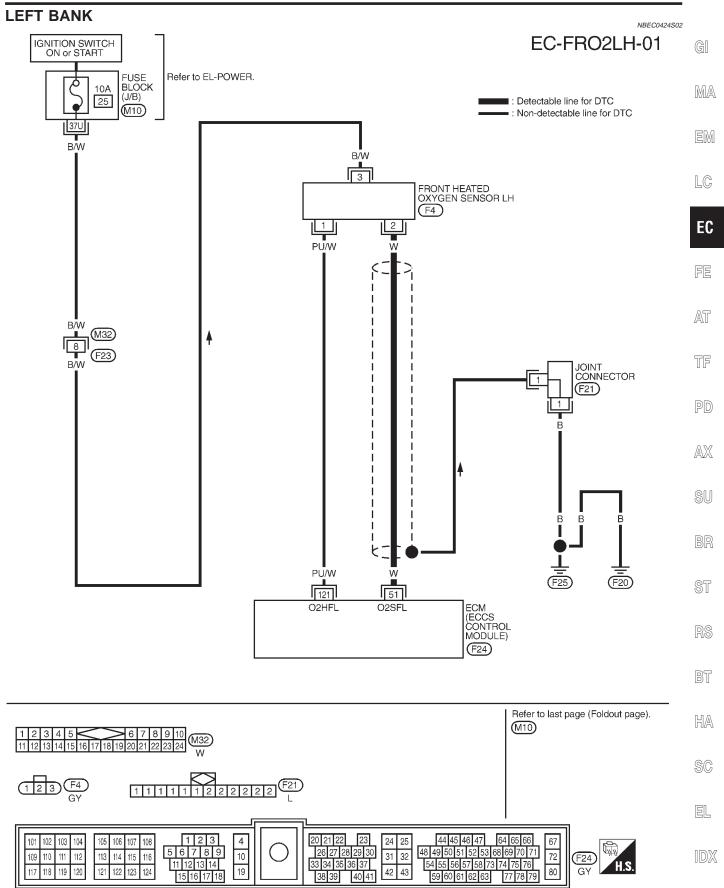
54 55 56 57 58 73 74 75 76

64 65 66

72

(F24)

Wiring Diagram (Cont'd)





#### **Diagnostic Procedure**

NBEC0425 **INSPECTION START** 1. Turn ignition switch "OFF". 2. Disconnect corresponding front heated oxygen sensor harness connector. Front heated oxygen sensor

harness connector LH Front heated oxygen sensor harness connector RH \\'

SEF870W

GO TO 2.

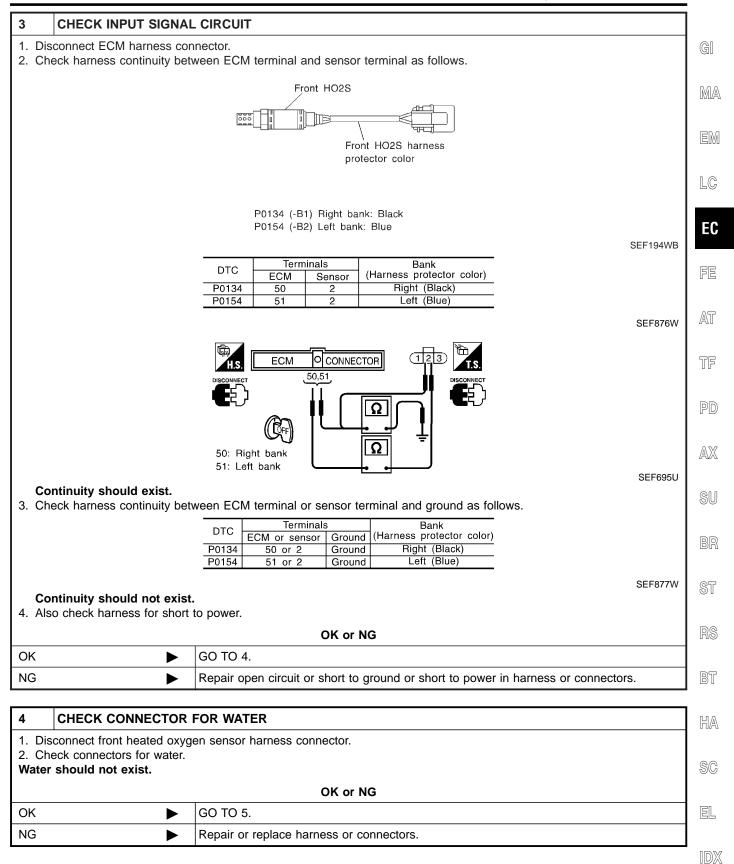
#### RETIGHTEN FRONT HEATED OXYGEN SENSOR

1. 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.

Diagnostic Procedure (Cont'd)

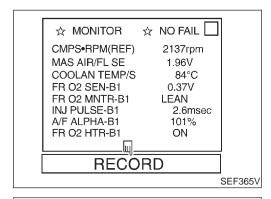


#### DTC P0134 (RIGHT, -B1), P0154 (LEFT, -B2) FRONT HO2S (HIGH VOLTAGE)

Diagnostic Procedure (Cont'd)

| 5     | CHECK FRONT HEATED OXYGEN SENSOR         |          |  |  |
|-------|--|----------|--|--|
| Refer | Refer to "Component Inspection", EC-242. |          |  |  |
|       | OK or NG                                 |          |  |  |
| ОК    | <b>&gt;</b>                              | GO TO 6. |  |  |
| NG    |  |          |  |  |

| 6     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |



Right bank

cycle | 1 | 2 | 3 | 4 | 5 |

FR O2 MNTR-B1 R-L-R-L-R-L-R-L-R

Left bank

cycle | 1 | 2 | 3 | 4 | 5 |

FR O2 MNTR-B2 R-L-R-L-R-L-R-L-R

R means FR O2 MNTR-B1(-B2) indicates RICH

L means FR O2 MNTR-B1(-B2) indicates LEAN

SEF702W

# Component Inspection FRONT HEATED OXYGEN SENSOR

NBEC0426

NBEC0426S01

(P) With CONSULT

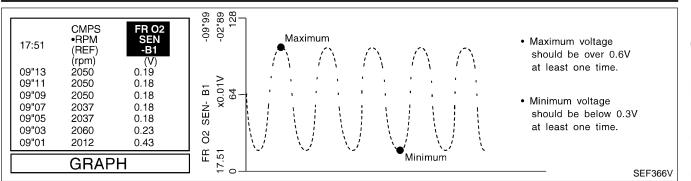
- 1) Start engine and warm it up to normal operating temperature.
- 2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1 (-B2)" and "FR O2 MNTR-B1 (-B2)".
- 3) Hold engine speed at 2,000 rpm under no load during the following steps.
- 4) Touch "RECORD" on 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:
- "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.

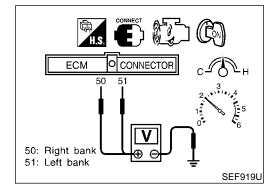
#### **CAUTION:**

- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

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

Component Inspection (Cont'd)





#### **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.
- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

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EL





#### **Description**

#### SYSTEM DESCRIPTION

NBEC0427

|                          |                     |  | NBEC0427S01                        |
|--------------------------|---------------------|--|------------------------------------|
| Sensor                   | Input Signal to ECM | ECM func-<br>tion  | Actuator                           |
| Camshaft position sensor | Engine speed        | Front<br>heated<br>oxygen<br>sensor<br>heater<br>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

Specification data are reference values.

NBEC0428

| MONITOR ITEM | CONDITION                     | SPECIFICATION |
|--------------|-------------------------------|---------------|
| FR O2 HTR-B1 | Engine speed: Idle            | ON            |
| FR O2 HTR-B2 | 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 ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

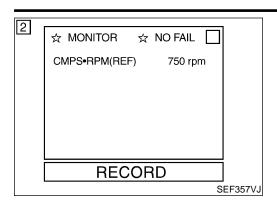
| TERMI-<br>NAL<br>NO.   | WIRE<br>COLOR | ITEM                              | CONDITION   | DATA (DC Voltage)             |
|------------------------|---------------|-----------------------------------|---|-------------------------------|
| 119<br>(Right<br>bank) | PU            | Front heated oxygen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

#### On Board Diagnosis Logic

NBEC0430

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

DTC Confirmation Procedure



#### **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.

MA

(P) With CONSULT

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

Start engine and run it for at least 6 seconds at idle speed.

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-248.

LC

EC

FE

AT

TF

With GST

Start engine and run it for at least 6 seconds at idle speed.

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

Start engine and run it for at least 6 seconds at idle speed.

Select "MODE 3" with GST.

5) If DTC is detected, go to "Diagnostic Procedure", EC-248.

No Tools

Start engine and run it for at least 6 seconds at idle speed.

Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

PD

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

AX

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-248.

When using GST, "DTC Confirmation Procedure" should SU 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.

ST

BT

HA

SC

EL

102 103 104

109 110 111 112 113 114 115 116

107 108

1 2 3

10

19

56789

11 12 13 14

15 16 17 18



#### **Wiring Diagram** NBEC0432 **RIGHT BANK** NBEC0432S01 IGNITION SWITCH ON or START EC-FO2H-R-01 FUSE BLOCK Refer to EL-POWER. 10A (J/B) 25 : Detectable line for DTC (M10) : Non-detectable line for DTC 37U B/W B/W 3 FRONT HEATED OXYGEN SENSOR RH (F2) PU (M32) (F23) JOINT CONNECTOR (F21) 2 PU W 119 50 O2SFR ECM (ECCS CONTROL MODULE) (F24) Refer to last page (Foldout page). M<sub>10</sub> 11111112222221 L 123 F2

H.S.

26 27 28 29 30

33 34 35 36 37

24

31 32

42

44 45 46 47

48 49 50 51 52 53 68 69 70 71

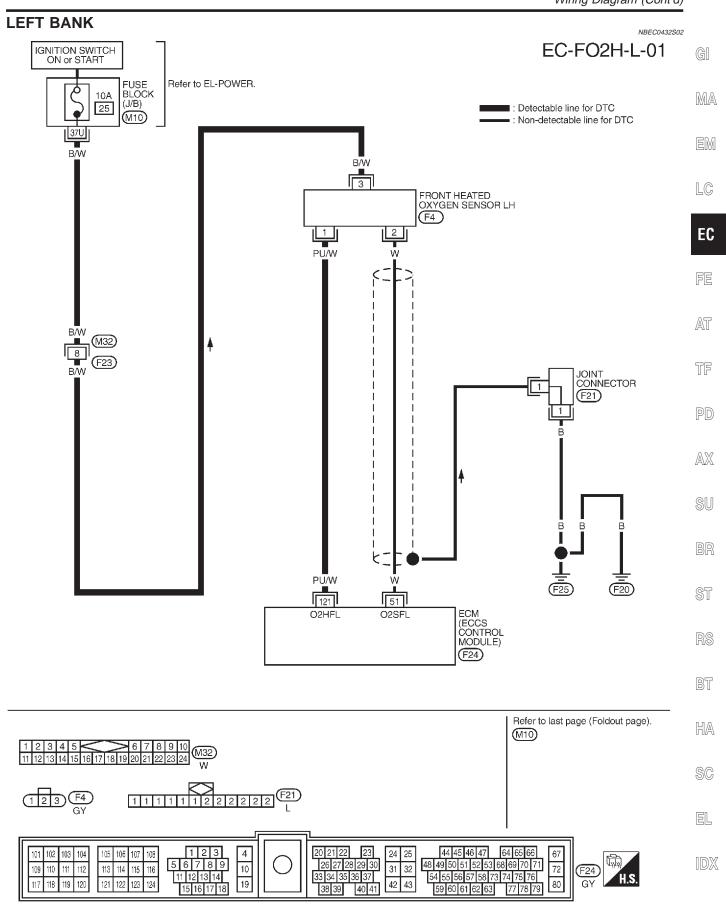
54 55 56 57 58 73 74 75 76

59 60 61 62 63 77 78 79

64 65 66

72

Wiring Diagram (Cont'd)



Diagnostic Procedure





NBEC0433 **CHECK POWER SUPPLY** 1. Turn ignition switch "OFF". 2. Disconnect corresponding front heated oxygen sensor harness connector. Front heated oxygen sensor harness connector LH Front heated oxygen senso harness connector RH \\' SEF870W 3. Turn ignition switch "ON". 4. Check voltage between terminal 3 and ground with CONSULT or tester. Front HO2S Front HO2S harness protector color P0135 (-B1) Right bank: Black P0155 (-B2) Left bank: Blue SEF194WC SEF696U Voltage: Battery voltage

OK or NG

| OK • | GO TO 3. |
|------|----------|
| NG ► | GO TO 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.

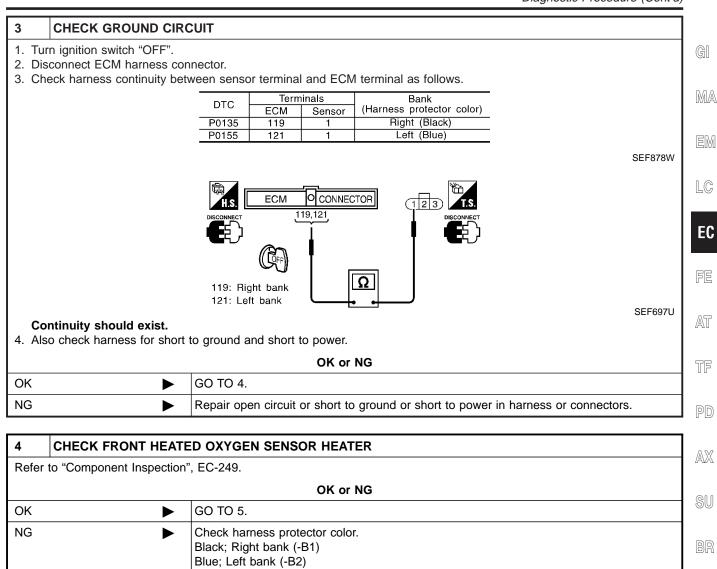
Diagnostic Procedure (Cont'd)

HA

SC

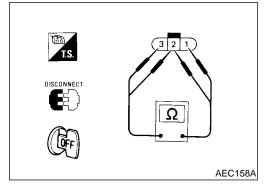
EL

NBFC0434S01



| 5   | CHECK INTERMITTENT INCIDENT |  |  |
|---|-----------------------------|--|--|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                             |  |  |
|   | ► INSPECTION END            |  |  |

Replace corresponding front heated oxygen sensor.



# Component Inspection FRONT HEATED OXYGEN SENSOR HEATER

Check resistance between terminals 3 and 1.

Resistance: 2.3 - 4.3 $\Omega$  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

**EC-249** 



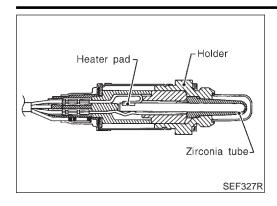
Component Inspection (Cont'd)

hard surface such as a concrete floor; use a new one.

 Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

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

Component Description



#### Component Description

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**

Specification data are reference values.

Mode

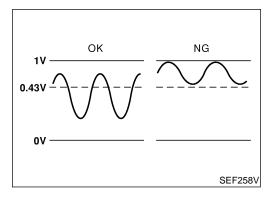
| MONITOR ITEM                   | CONDITION                  |  | SPECIFICATION                  |
|--------------------------------|----------------------------|--|--------------------------------|
| RR O2 SEN-B1<br>RR O2 SEN-B2   | ● Engine: After warming up | Revving engine from idle up to 2,000 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**

Specification data are reference values and are measured between each terminal and ground.

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

|                       |               |                         | <del>-</del>  |                        | L |
|-----------------------|---------------|-------------------------|---|------------------------|---|
| TERMI-<br>NAL<br>NO.  | WIRE<br>COLOR | ITEM                    | CONDITION   | DATA (DC Voltage)      | ( |
| 56<br>(Right<br>bank) | L/W           | Rear heated oxygen sen- | [Engine is running]   | 0. Approximately 4.0V  | [ |
| 57<br>(Left<br>bank)  | W             |                         | <ul> <li>Warm-up condition</li> <li>Revving engine from idle up to 2,000 rpm</li> </ul> | 0 - Approximately 1.0V | ( |



#### On Board Diagnosis Logic

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge 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.

MA

LC

EC

NBEC0106

FE

AT

TF

PD

AX

SU

ST

BT

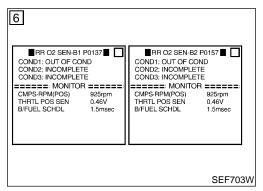
HA

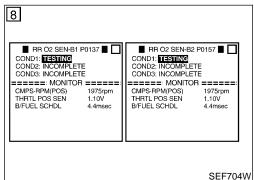
SC

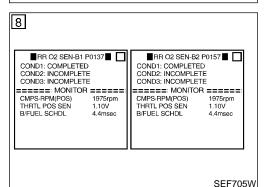
# DTC P0137 (RIGHT, -B1), P0157 (LEFT, -B2) REAR HO2S (MIN. VOLTAGE MONITORING)

On Board Diagnosis Logic (Cont'd)

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







#### **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".

#### 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.
- (P) With CONSULT

#### **Procedure for COND1**

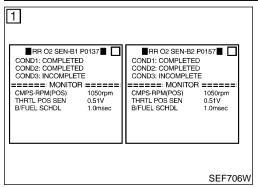
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "RR O2 SEN-B1 (-B2) P0137 (P0157)" of "REAR O2 SENSOR" in "DTC WORK SUP-PORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine 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
  - If "COMPLETED" does not appear on CONSULT screen, go to the following step.
- 7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) 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.)

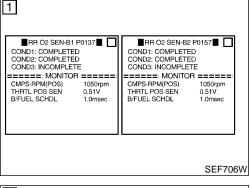
| CMPS-RPM (POS) | 1,300 - 3,100 rpm           |
|----------------|-----------------------------|
| Vehicle speed  | 64 - 130 km/h (40 - 81 MPH) |
| B/FUEL SCHDL   | 0.5 - 6.4 msec              |
| Selector lever | Suitable position           |

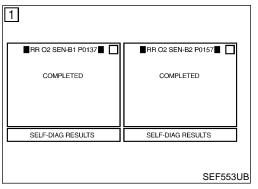
#### NOTE:

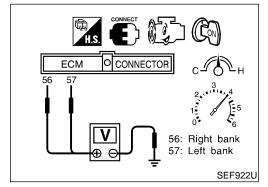
- If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".
- If "COMPLETED" already appears at "COND2" on CON-SULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct "Procedure for COND2".

DTC Confirmation Procedure (Cont'd)









#### **Procedure for COND2**

While driving, release accelerator pedal completely with "OD" OFF from the above condition (step 8) until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". (It will take approximately 4 seconds.)



MA

EM

LC

#### **Procedure for COND3**

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.)



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



AT

TF

#### Overall Function Check

PD

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.

AX

#### **N** Without CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.

Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.

SU

Check the voltage when racing up to 4,000 rpm under no load

ST

at least 10 times. (depress and release accelerator pedal as soon as possible) The voltage should be below 0.54V at least once during

this procedure. If the voltage can be confirmed in step 4, step 5 is not necessarv.

5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.

HA

The voltage should be below 0.54V at least once during this procedure.

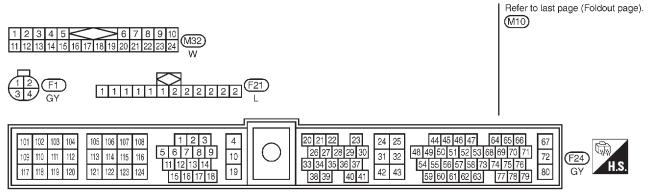
6) If NG, go to "Diagnostic Procedure", EC-256.

SC

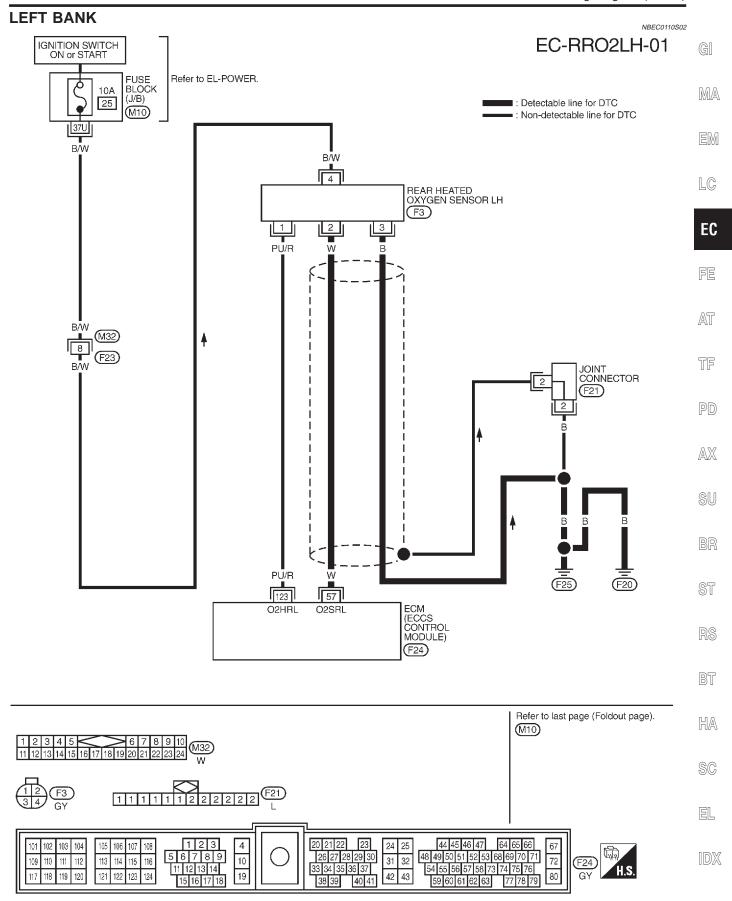
EL

Wiring Diagram

#### **Wiring Diagram** NBEC0110 **RIGHT BANK** NBEC0110S01 IGNITION SWITCH ON or START EC-RRO2RH-01 FUSE BLOCK Refer to EL-POWER. 10A (J/B) 25 : Detectable line for DTC (M10) : Non-detectable line for DTC B/W B/W 4 REAR HEATED OXYGEN SENSOR RH (F1) 2 PU/G I /W (M32) (F23) JOINT CONNECTOR PŪ/G L/W 122 56 ECM (ECCS CONTROL MODULE) (F24)



Wiring Diagram (Cont'd)



Diagnostic Procedure

## **Diagnostic Procedure**

NBEC0111 **RETIGHTEN GROUND SCREWS** 1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws. Engine ground = SEF031S GO TO 2.

#### 2 **CLEAR THE SELF-LEARNING DATA**

#### (P) 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".

ACTIVE TEST SELF-LEARN B1:100% CONTROL B2:100% ======= MONITOR ======= CMPS•RPM(REF) 750rpm COOLAN TEMP/S 93°C FR O2 SEN-B1 0.90V FR O2 SEN-B2 0.90V A/F ALPHA-B1 100% A/F ALPHA-B2 100% 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

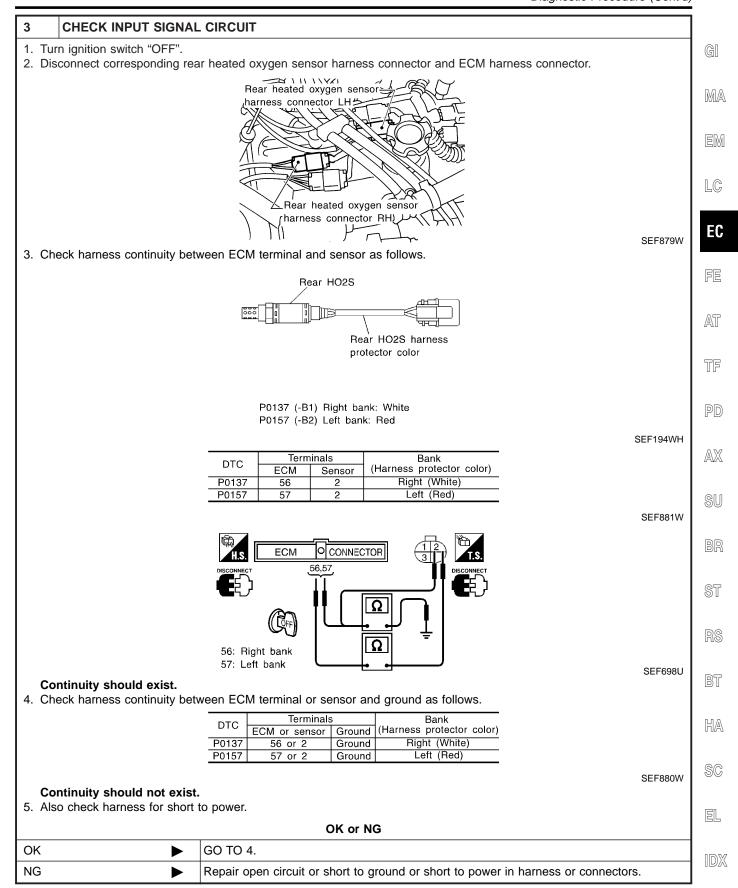
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make 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?

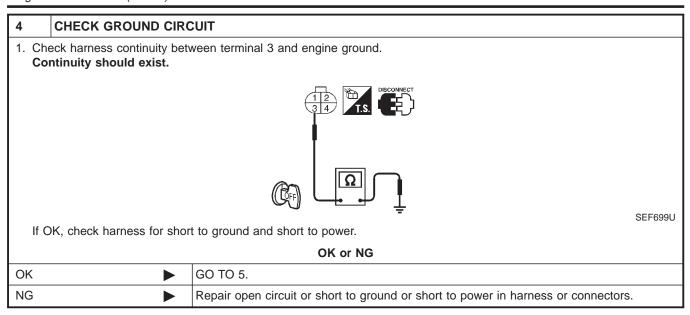
#### Yes or No

| Yes | Go to Trouble Diagnosis for "DTC P0172, P0175", EC-303. |
|-----|---|
| No  | GO TO 3.  |

Diagnostic Procedure (Cont'd)



Diagnostic Procedure (Cont'd)

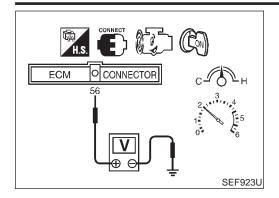


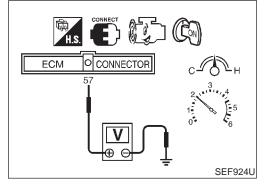
| 5     | CHECK REAR HEATED         | OXYGEN SENSOR   |  |
|-------|---------------------------|---|--|
| Refer | to "Component Inspection" | , EC-259.   |  |
|       | OK or NG                  |   |  |
| OK    | OK ▶ GO TO 6.             |   |  |
| NG    | <b>&gt;</b>               | Check harness protector color. White; Right bank (-B1) Red; Left bank (-B2) Replace corresponding rear front heated sensor. |  |

| 6                     | CHECK SHIELD CIRCU           | JIT  |  |
|-----------------------|------------------------------|--|--|
| 1. Tu                 | rn ignition switch "OFF".    |  |  |
| 2. Di                 | sconnect joint connector.    |  |  |
| 3. Ch                 | eck the following.           |  |  |
| • Co                  | ntinuity between joint conne | ector terminal and ground  |  |
| <ul><li>Joi</li></ul> | nt connector                 |  |  |
| (Re                   | efer to EL-350, "HARNESS     | LAYOUT".)  |  |
| Co                    | ntinuity should exist.       |  |  |
|                       |                              | to ground and short to power.  |  |
| 5. Th                 | en reconnect joint connecto  | or.  |  |
|                       | OK or NG                     |  |  |
| OK                    | <b>&gt;</b>                  | GO TO 7.   |  |
| NG                    | •                            | Repair open circuit or short to ground or short to power in harness or connectors. |  |

| 7     | 7 CHECK INTERMITTENT INCIDENT                                   |                |  |
|-------|---|----------------|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |
|       | <b>&gt;</b>   | INSPECTION END |  |

Component Inspection





## Component Inspection REAR HEATED OXYGEN SENSOR

NBEC0436

NBEC0436S01

(II) With CONSULT

Start engine and drive vehicle at a speed of more than 70 km/h
 MPH) for 2 consecutive minutes.

MA

Stop vehicle with engine running.

 Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CON-SULT.

FM

4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

LG

"RR O2 SEN-B1 (-B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

50

"RR O2 SEN-B1 (-B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

EC

#### **⋈** Without CONSULT

FE

Start engine and drive vehicle at a speed of more than 70 km/h
 MPH) for 2 consecutive minutes.

AT

Stop vehicle with engine running.

77.11

Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) engine ground.

TF

4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.

PD

(depress and release accelerator pedal as soon as possible)

The voltage should be above 0.56V at least once during this procedure.

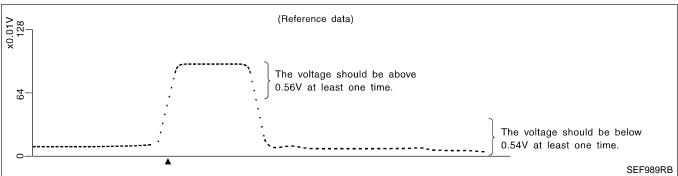
If the voltage is above 0.56V at step 4, step 5 is not necessary.

AX

5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.

The voltage should be below 0.54V at least once during this procedure.



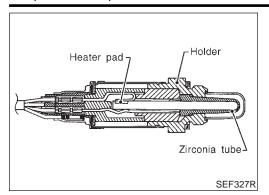


#### **CAUTION:**

- 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

HA

Component Description



#### **Component Description**

NBEC043

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**

Specification data are reference values.

NBEC0438

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

#### **ECM Terminals and Reference Value**

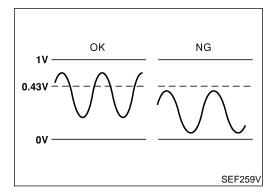
NRFC0430

Specification data are reference values and are measured between each terminal and ground.

#### CAUTION

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO.  | WIRE<br>COLOR | ITEM                    | CONDITION   | DATA (DC Voltage)      |
|-----------------------|---------------|-------------------------|---|------------------------|
| 56<br>(Right<br>bank) | L/W           | Real healed oxygen sen- | Engine is running]  | O Approximately 1.0V   |
| 57<br>(Left<br>bank)  | W             |                         | <ul> <li>Warm-up condition</li> <li>Revving engine from idle up to 2,000 rpm</li> </ul> | 0 - Approximately 1.0V |



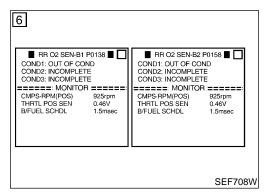
#### On Board Diagnosis Logic

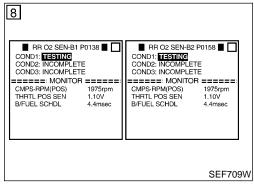
The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors whether the maximum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

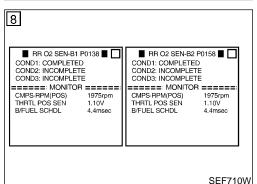
as fuel-cut.

On Board Diagnosis Logic (Cont'd)

| 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. | <ul> <li>Harness or connectors (The sensor circuit is open or shorted.)</li> <li>Rear heated oxygen sensor</li> <li>Fuel pressure</li> </ul> | GI |
| P0158<br>0313<br>(Left bank)  |  | <ul><li>Injectors</li><li>Intake air leaks</li></ul>   | EN |







#### **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".

(P) 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.
- Turn ignition switch "ON" and select "RR O2 SEN-B1 (-B2) P0138 (P0158)" of "RR O2 SENSOR" in "DTC WORK SUP-PORT" 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.

- Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) 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 (POS) | 1,300 - 3,100 rpm           |
|----------------|-----------------------------|
| Vehicle speed  | 64 - 130 km/h (40 - 81 MPH) |
| B/FUEL SCHDL   | 0.5 - 6.4 msec              |
| 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 CON-SULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct "Procedure for COND2".

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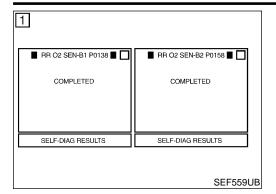
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DTC Confirmation Procedure (Cont'd)



#### **Procedure for COND2**

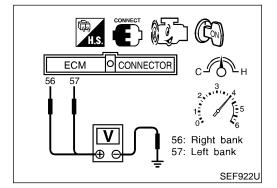
 While driving, release accelerator pedal completely with "OD" OFF from the above condition (step 8) until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

#### NOTE:

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**

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



#### **Overall Function Check**

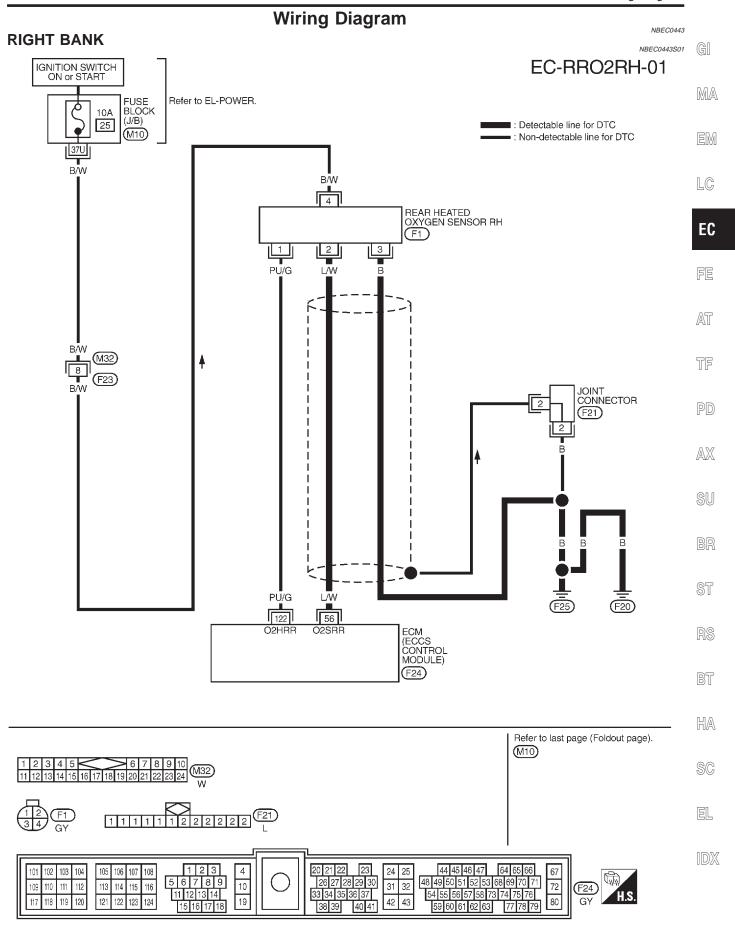
Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

#### Without CONSULT

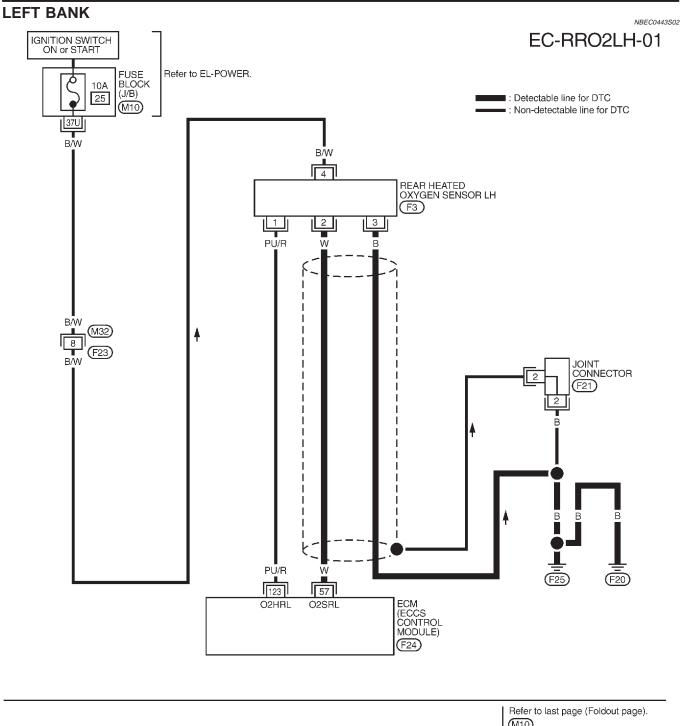
- Start engine and drive vehicle at a speed of more than 70 km/h
   MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
- Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (depress and release accelerator pedal as soon as possible)

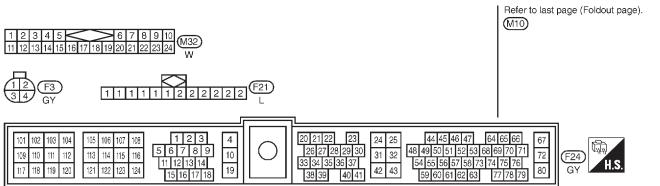
    The voltage should be above 0.56V at least once during this procedure.
  - If the voltage can be confirmed in step 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
  - The voltage should be above 0.56V at least once during this procedure.
- 6) If NG, go to "Diagnostic Procedure".

Wiring Diagram



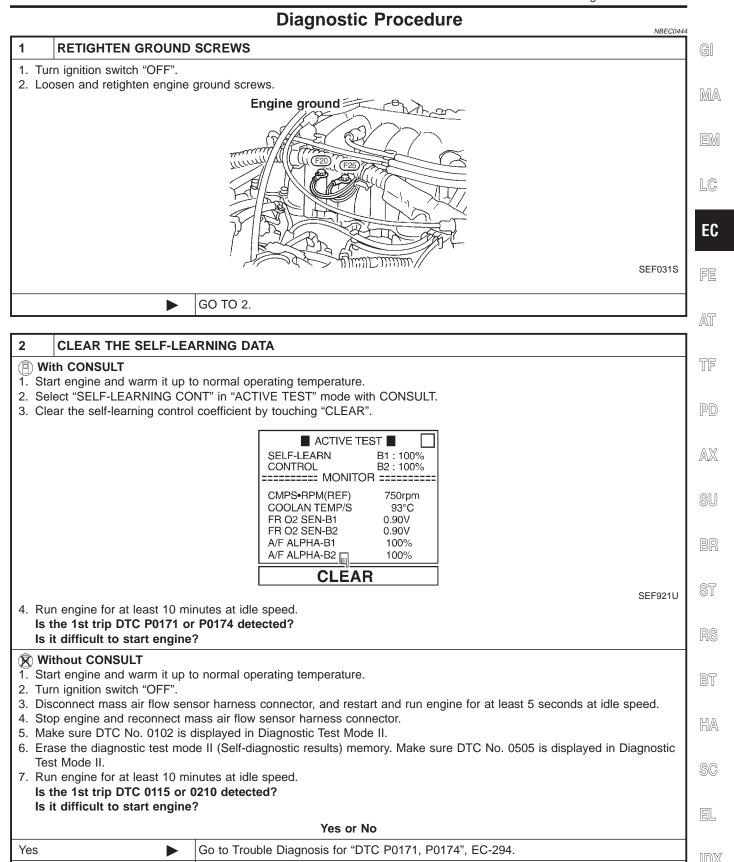
Wiring Diagram (Cont'd)





MEC149C

Diagnostic Procedure



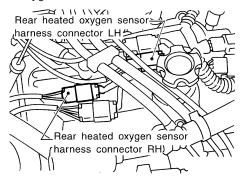
GO TO 3.

No

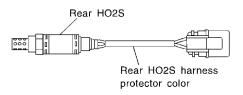
Diagnostic Procedure (Cont'd)

#### CHECK INPUT SIGNAL CIRCUIT

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



3. Check harness continuity between ECM terminal and sensor terminal as follows.



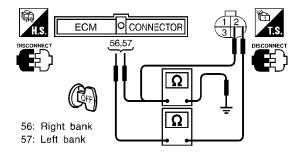
P0138 (-B1) Right bank: White P0158 (-B2) Left bank: Red

SEF194WI

SEF879W

| DTC   | Terminals |        | Bank                      |
|-------|-----------|--------|---------------------------|
| DIC   | ECM       | Sensor | (Harness protector color) |
| P0138 | 56        | 2      | Right (White)             |
| P0158 | 57        | 2      | Left (Red)                |

SEF883W



SEF698U

#### Continuity should exist.

4. Check harness continuity between ECM terminal or sensor terminal and ground as follows.

| DTC   | Terminals     |        | Bank                      |
|-------|---------------|--------|---------------------------|
|       | ECM or sensor | Ground | (Harness protector color) |
| P0138 | 56 or 2       | Ground | Right (White)             |
| P0158 | 57 or 2       | Ground | Left (Red)                |

SEF882W

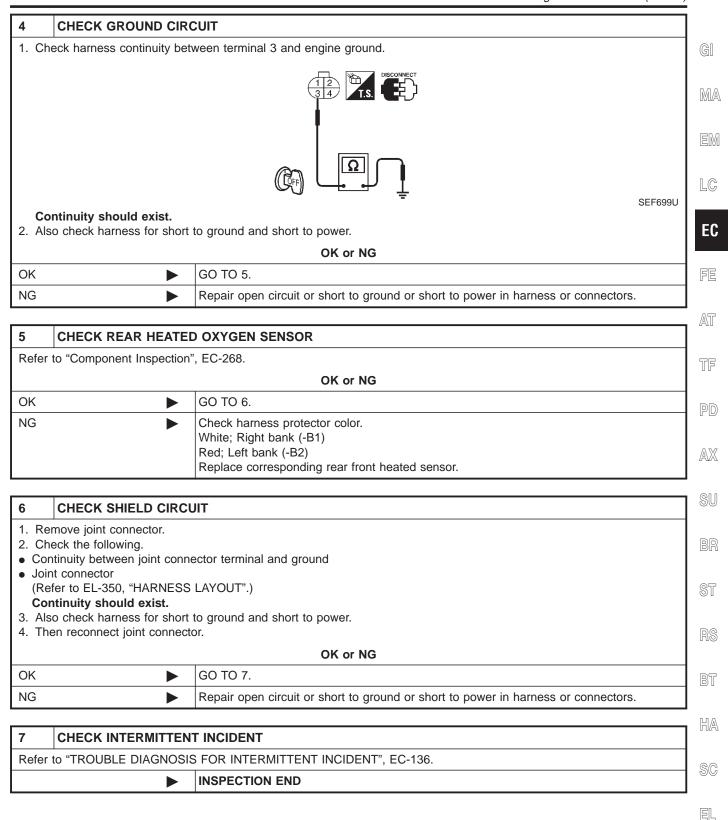
#### Continuity should not exist.

5. Also check harness for short to power.

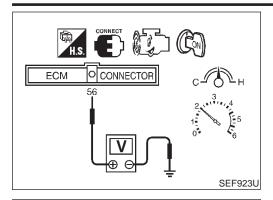
#### OK or NG

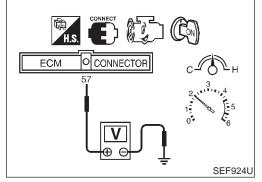
| OK ▶ | GO TO 4.   |
|------|--|
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

Diagnostic Procedure (Cont'd)



Component Inspection





## Component Inspection REAR HEATED OXYGEN SENSOR

NBEC0445

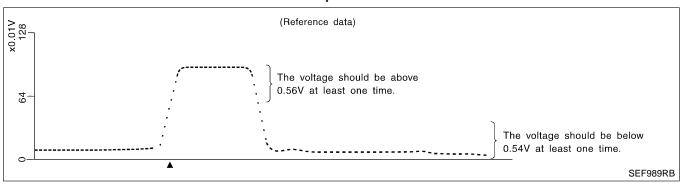
NBEC0445S01

- (P) With CONSULT
- Start engine and drive vehicle at a speed of more than 70 km/h
   MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CON-SULT.
- 4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
  - "RR O2 SEN-B1 (-B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
  - "RR O2 SEN-B1 (-B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

#### **⋈** Without CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h
   MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (depress and release accelerator pedal as soon as possible)

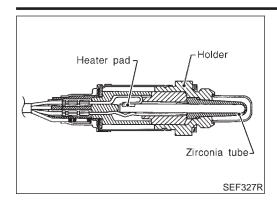
    The voltage should be above 0.56V at least once during this procedure.
  - If the voltage is above 0.56V at step 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
  - The voltage should be below 0.54V 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

Component Description



#### **Component Description**

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**

Specification data are reference values.

· Engine: After warming up

CONDITION SPECIFICATION

Revving engine from idle up to 2,000 rpm  $0 - 0.3V \longleftrightarrow \text{Approx. } 0.6 - 1.0V$ 

 $\mathsf{LEAN} \longleftrightarrow \mathsf{RICH}$ 

#### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

#### CAUTION:

MONITOR ITEM

RR O2 SEN-B1

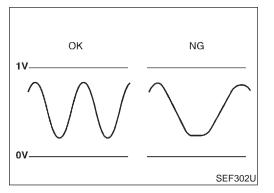
RR O2 SEN-B2

RR O2 MNTR-B1

RR O2 MNTR-B2

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

|                       |               |      | •  |                        | . <i>L</i> |
|-----------------------|---------------|------|--|------------------------|------------|
| TERMI-<br>NAL<br>NO.  | WIRE<br>COLOR | ITEM | CONDITION                                | DATA (DC Voltage)      | -<br>@     |
| 56<br>(Right<br>bank) | L/W           |      | [Engine is running]                      | 0. Arranimatali 4.01/  |            |
| 57<br>(Left<br>bank)  | w             |      | Revving engine from idle up to 2,000 rpm | 0 - Approximately 1.0V | (9)        |



#### On Board Diagnosis Logic

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge 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.

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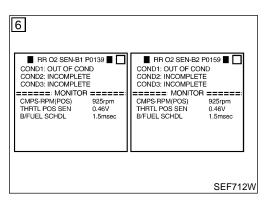
RS

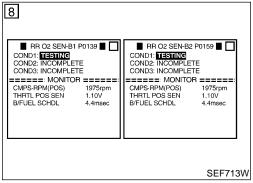
HA

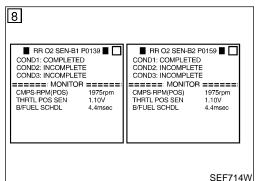
SC

On Board Diagnosis Logic (Cont'd)

| 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. | <ul> <li>Harness or connectors<br/>(The sensor circuit is open or shorted.)</li> <li>Rear heated oxygen sensor</li> </ul> |
| P0159<br>0708<br>(Left bank)  |   | <ul><li>Fuel pressure</li><li>Injectors</li><li>Intake air leaks</li></ul>  |







#### **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 "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.

(P) With CONSULT

#### **Procedure for COND1**

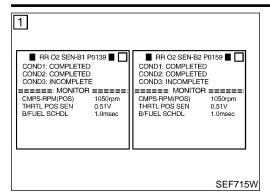
- 1) Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "RR O2 SEN-B1 (-B2) P0139 (P0159)" of "REAR O2 SENSOR" in "DTC WORK SUP-PORT" mode with CONSULT.
- 4) Touch "START".
- 5) Start engine and 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.
- Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 8) 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.)

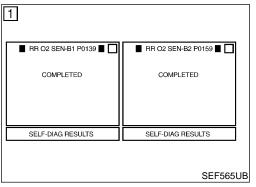
| CMPS·RPM (POS) | 1,300 - 3,100 rpm           |  |
|----------------|-----------------------------|--|
| Vehicle speed  | 64 - 130 km/h (40 - 81 MPH) |  |
| B/FUEL SCHDL   | 0.5 - 6.4 msec              |  |
| Selector lever | Suitable position           |  |

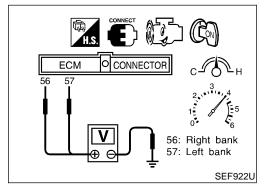
#### NOTE:

- If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".
- If "COMPLETED" already appears at "COND2" on CON-SULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct "Procedure for COND2".

DTC Confirmation Procedure (Cont'd)







#### **Procedure for COND2**

 While driving, release accelerator pedal completely with "OD" OFF from the above condition (step 8) until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". (It will take approximately 4 seconds.)

## GI

NOTE:

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".



EM

#### LC

#### **Procedure for COND3**

- 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.)
- Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".

If "NG" is displayed, refer to "Diagnostic Procedure".



AT

TF

#### **Overall Function Check**

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

### AX

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#### **N** Without CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h
   MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
  - BR

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- 4) 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 4, step 5 is not necessary.
- Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.

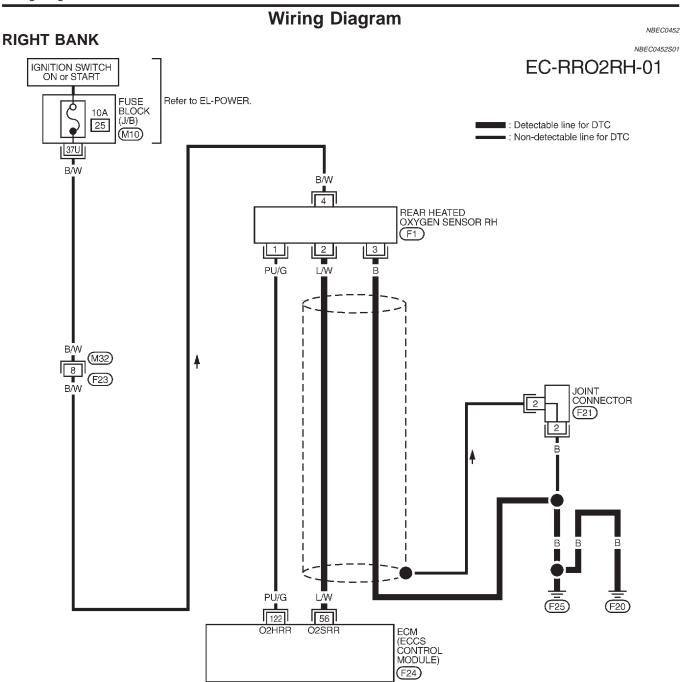
The voltage should change at more than 0.06V for 1 second during this procedure.

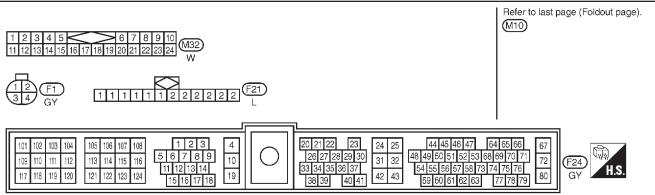
6) If NG, go to "Diagnostic Procedure".

HA

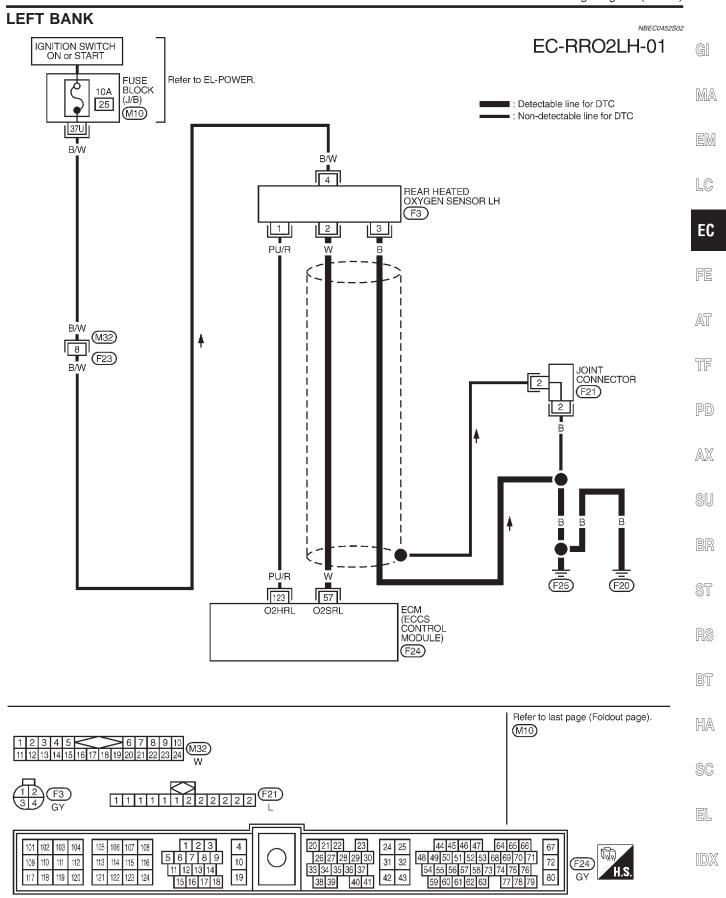
SC

Wiring Diagram





Wiring Diagram (Cont'd)

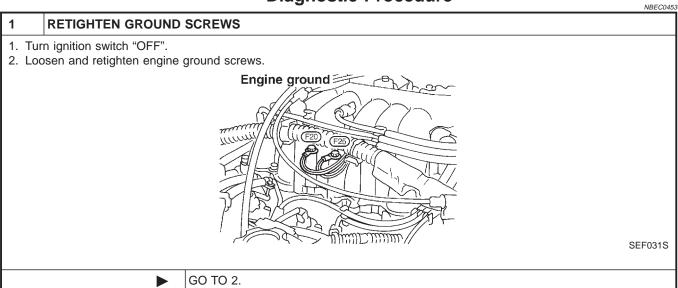


MEC149C

Diagnostic Procedure



#### **Diagnostic Procedure**



#### 2 CLEAR THE SELF-LEARNING DATA

#### (P) 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".

ACTIVE TEST SELF-LEARN B1:100% CONTROL B2:100% ======= MONITOR ======= CMPS•RPM(REF) 750rpm COOLAN TEMP/S 93°C FR O2 SEN-B1 0.90V FR O2 SEN-B2 0.90V A/F ALPHA-B1 100% A/F ALPHA-B2 100% 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?

#### (R) Without CONSULT

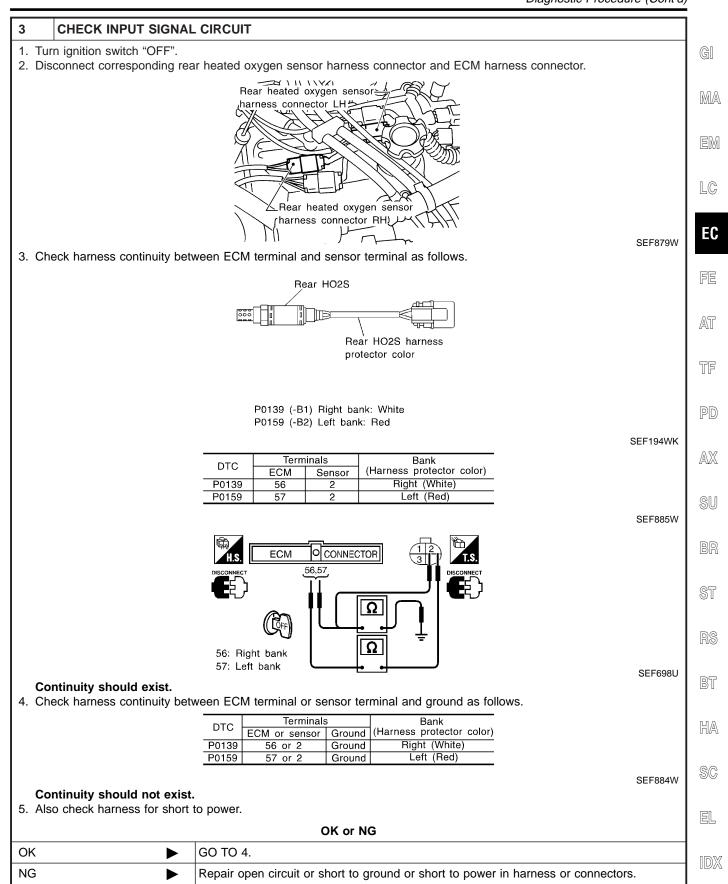
- 1. Start engine and warm it up to normal operating temperature.
- 2. Turn ignition switch "OFF".
- 3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
- 4. Stop engine and reconnect mass air flow sensor harness connector.
- 5. Make sure 1st trip DTC No. 0102 is displayed in Diagnostic Test Mode II.
- 6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-68.
- 7. Make sure DTC No. 0505 is displayed in Diagnostic Test Mode II.
- 8. 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

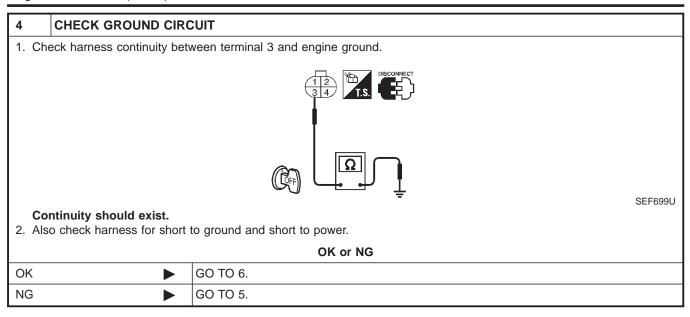
| Yes |          | Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-294, 303. |
|-----|----------|---|
| No  | <b>•</b> | GO TO 3.  |

Diagnostic Procedure (Cont'd)





Diagnostic Procedure (Cont'd)



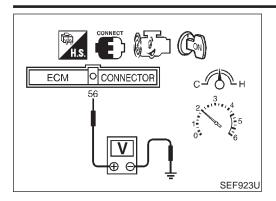
| 5                      | DETECT MALFUNCTIONING PART  |  |  |  |
|------------------------|---|--|--|--|
| <ul><li>Join</li></ul> | Check the following.  • Joint connector  • Harness for open or short between rear heated oxygen sensor and engine ground. |  |  |  |
|                        | Repair open circuit or short ground or short to power in harness or connectors.   |  |  |  |

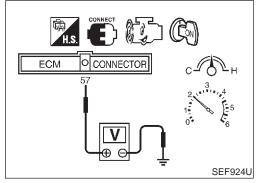
| 6     | CHECK REAR HEATED OXYGEN SENSOR  |                   |  |  |
|-------|--|-------------------|--|--|
| Refer | Refer to "Component Inspection", EC-277.   |                   |  |  |
|       | OK or NG   |                   |  |  |
| OK    | <b>&gt;</b>  | <b>▶</b> GO TO 7. |  |  |
| NG    | Check harness protector color. White; Right bank (-B1) Red; Left bank (-B2) Replace corresponding rear heated oxygen sensor. |                   |  |  |

#### 7 **CHECK SHIELD CIRCUIT** 1. Turn ignition switch "OFF". 2. Remove joint connector. 3. Check the following. · Continuity between joint connector terminal and ground Joint connector (Refer to EL-350, "HARNESS LAYOUT".) Continuity should exist. 4. Also check harness for short to ground and short to power. 5. Then reconnect joint connector. OK or NG GO TO 8. OK NG Repair open circuit or short to ground or short to power in harness or connectors.

| 8     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |

Component Inspection





#### Component Inspection REAR HEATED OXYGEN SENSOR

NBEC0454S01

- (P) With CONSULT
- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.

MA

- Stop vehicle with engine running.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CON-SULT.

Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

LC

"RR O2 SEN-B1 (-B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.

"RR O2 SEN-B1 (-B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

EC

#### **⋈** Without CONSULT

Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.

AT

Stop vehicle with engine running. 2)

TF

Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and ECM terminal 32 (engine ground).

Check the voltage when racing up to 4,000 rpm under no load at least 10 times.

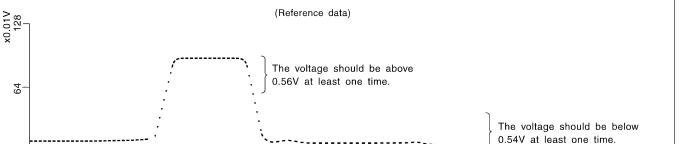
(depress and release accelerator pedal as soon as possible) The voltage should be above 0.56V at least once during this procedure.

AX

If the voltage is above 0.56V at step 4, step 5 is not necessary.

5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.

The voltage should be below 0.54V at least once during this procedure.



HA

SEF989RB

#### **CAUTION:**

SC

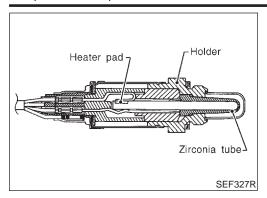
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

EL

Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

Component Description





#### **Component Description**

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**

Specification data are reference values.

NBEC0456

| MONITOR ITEM                   | CONE                         | 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**

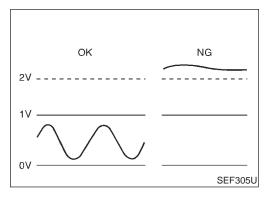
NBEC045

Specification data are reference values and are measured between each terminal and ground.

#### CALITION

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO.  | WIRE<br>COLOR | ITEM                    | CONDITION   | DATA (DC Voltage)      |
|-----------------------|---------------|-------------------------|---|------------------------|
| 56<br>(Right<br>bank) | L/W           | Rear nealen nxvnen sen- | [Engine is running]   | 0 Approximately 1.0V   |
| 57<br>(Left<br>bank)  | W             | sor                     | <ul> <li>Warm-up condition</li> <li>Revving engine from idle up to 2,000 rpm</li> </ul> | 0 - Approximately 1.0V |

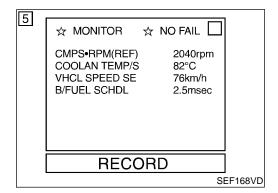


#### On Board Diagnosis Logic

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

On Board Diagnosis Logic (Cont'd)

| 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     (The sensor circuit is open or shorted.)     Rear heated oxygen sensor |           |
| P0160<br>0315<br>(Left bank)  |   |  | M.A<br>EM |



#### **DTC Confirmation Procedure**

NBEC0459

**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.

(P) With CONSULT

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- Let engine idle for 1 minute.
- Maintain the following conditions for at least 5 consecutive seconds.

| CMPS-RPM (REF) | 1,300 - 3,100 rpm           |
|----------------|-----------------------------|
| VHCL SPEED SE  | 64 - 130 km/h (40 - 81 MPH) |
| B/FUEL SCHDL   | 0.5 - 6.4 msec              |
| COOLAN TEMP/S  | More than 70°C (158°F)      |
| Selector lever | Suitable position           |

6) If 1st trip DTC is detected, go to "Diagnostic Procedure".

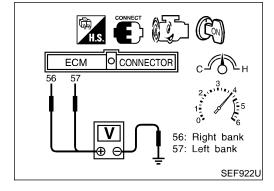
BT

**Overall Function Check** 

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

Without CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.





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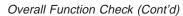
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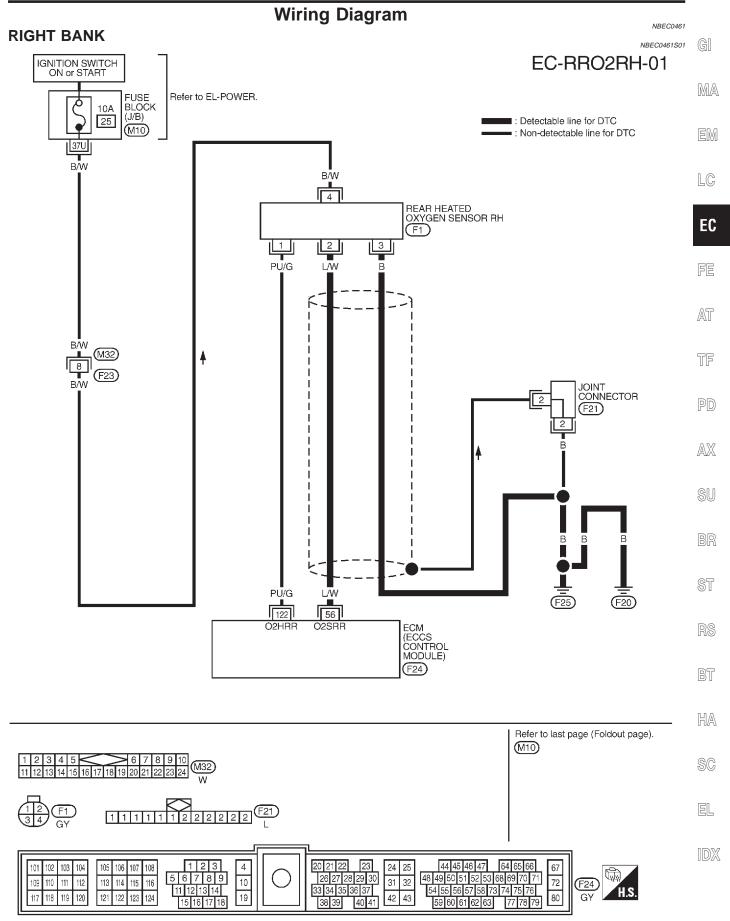
EL





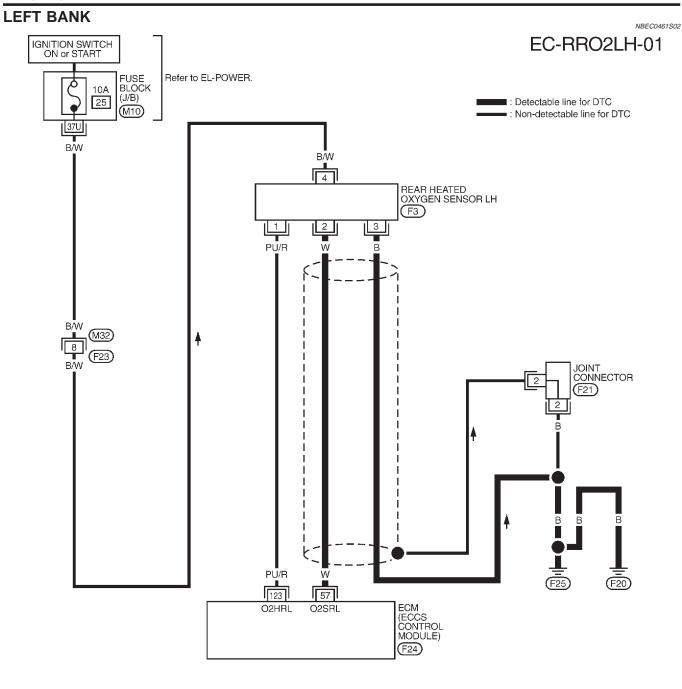
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times. (depress and release accelerator pedal as soon as possible) The voltage should be below 2V during this procedure.
- 5) If NG, go to "Diagnostic Procedure".

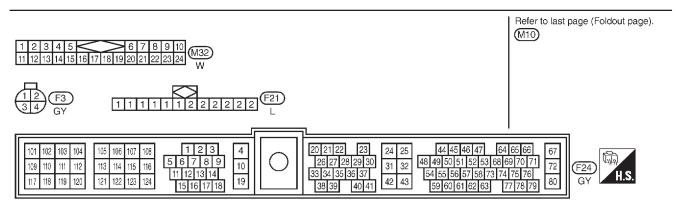
Wiring Diagram



Wiring Diagram (Cont'd)







MEC149C

Diagnostic Procedure

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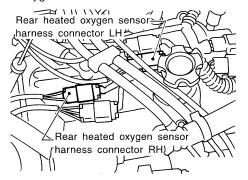
# Diagnostic Procedure 1 RETIGHTEN GROUND SCREWS 1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws. Engine ground SEF031S GO TO 2.

Diagnostic Procedure (Cont'd)

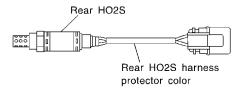
## DTC P0140 (RIGHT, -B1), P0160 (LEFT, -B2) REAR HO2S (HIGH VOLTAGE)

#### **CHECK INPUT SIGNAL CIRCUIT**

1. Disconnect corresponding rear heated oxygen sensor harness connector and ECM harness connector.



2. Check harness continuity between ECM terminal and sensor terminal as follows.



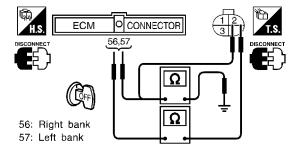
P0140 (-B1) Right bank: White P0160 (-B2) Left bank: Red

SEF194WL

SEF879W

| DTC   | Terminals |        | Bank                      |
|-------|-----------|--------|---------------------------|
| DIC   | ECM       | Sensor | (Harness protector color) |
| P0140 | 56        | 2      | Right (White)             |
| P0160 | 57        | 2      | Left (Red)                |

SEF886W



SEF698U

#### Continuity should exist.

3. Check harness continuity between ECM terminal or sensor terminal and ground as follows.

| DTC   | Terminals     |        | Bank                      |
|-------|---------------|--------|---------------------------|
|       | ECM or sensor | Ground | (Harness protector color) |
| P0140 | 56 or 2       | Ground | Right (White)             |
| P0160 | 57 or 2       | Ground | Left (Red)                |

SEF887W

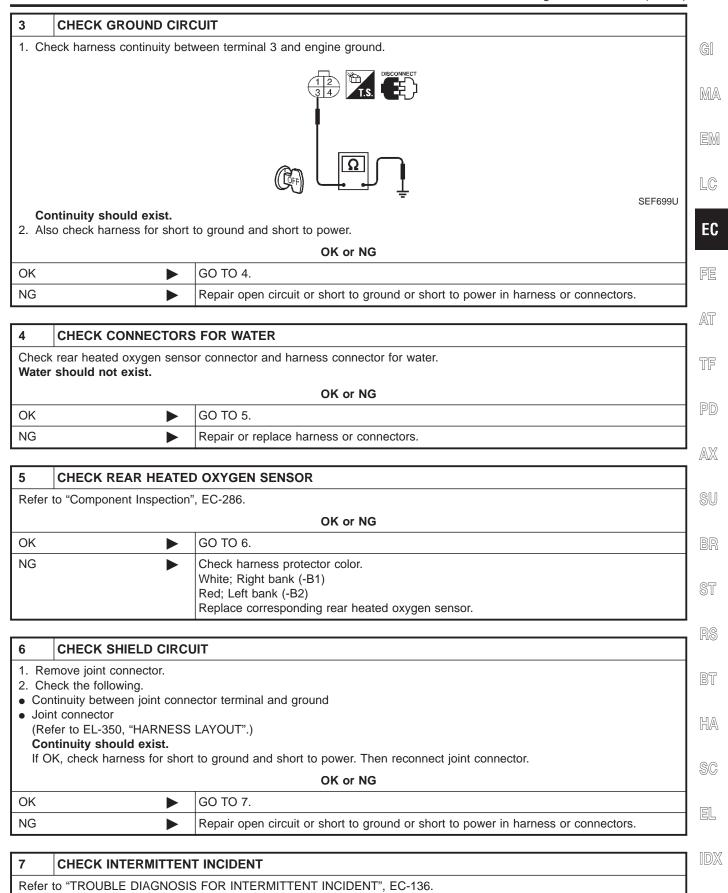
#### Continuity should not exist.

4. Also check harness for 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. |

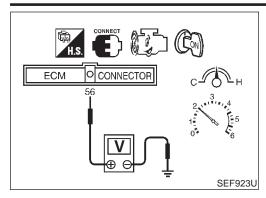
Diagnostic Procedure (Cont'd)

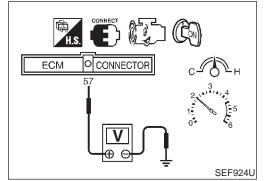


**INSPECTION END** 

Component Inspection







## Component Inspection REAR HEATED OXYGEN SENSOR

NBEC0463 NBEC0463S01

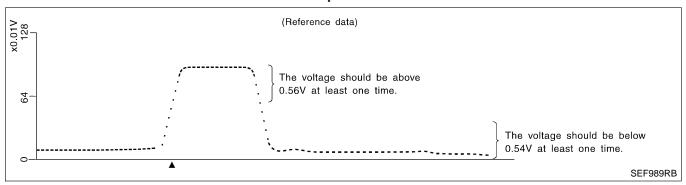
(P) With CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h
   MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SEN-B1 (-B2)" as the monitor item with CON-SULT.
- 4) Check "RR O2 SEN-B1 (-B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.
  - "RR O2 SEN-B1 (-B2)" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
  - "RR O2 SEN-B1 (-B2)" should be below 0.54V at least once when the "FUEL INJECTION" is -25%.

#### **⋈** Without CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h
   MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- Set voltmeter probes between ECM terminal 56 (right bank sensor signal) or 57 (left bank sensor signal) and engine ground.
- 4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
  - (depress and release accelerator pedal as soon as possible)

    The voltage should be above 0.56V at least once during this procedure.
  - If the voltage is above 0.56V at step 4, step 5 is not necessary.
- 5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
  - The voltage should be below 0.54V 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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.

#### DTC P0141 (RIGHT, -B1), P0161 (LEFT, -B2) REAR HO2S HEATER

Description **Description** NBEC0112 SYSTEM DESCRIPTION NBEC0112S01 ECM func-Sensor Input Signal to ECM Actuator tion MA Rear heated oxygen Rear heated oxygen sensor

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

Engine speed

EC

LC

EM

#### **OPERATION**

Camshaft position sensor

|                  | 1152511250                        |
|------------------|-----------------------------------|
| Engine speed rpm | Rear heated oxygen sensor heaters |
| Above 3,200      | OFF                               |
| Below 3,200      | ON                                |

FE

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NBFC0112S02

#### **CONSULT Reference Value in Data Monitor** Mode

sensor

heater control

heaters

TF

Specification data are reference values.

| MONITOR ITEM | CONDITION   | SPECIFICATION |  |
|--------------|---|---------------|--|
| RR O2 HTR-B1 | <ul><li>Ignition switch: ON (Engine stopped)</li><li>Engine is running above 3,200 rpm.</li></ul>                             | OFF           |  |
| RR O2 HTR-B2 | <ul> <li>Engine is running below 3,200 rpm after driving for 2 minutes at a<br/>speed of 70 km/h (43 MPH) or more.</li> </ul> | ON            |  |

## AX

#### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

NBEC0114

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

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|-------|--|
| 11 (% |  |
|       |  |

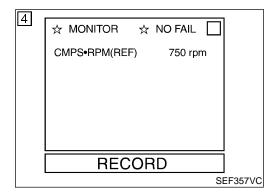
| TERMI-<br>NAL<br>NO.   | WIRE<br>COLOR | ITEM                             | CONDITION  | DATA (DC Voltage)             | RS         |
|------------------------|---------------|----------------------------------|--|-------------------------------|------------|
| 122<br>(Right<br>bank) | PU/G          | Rear heated oxygen sensor heater | [Ignition switch "ON"]  • Engine stopped [Engine is running]  • Engine speed is above 3,200 rpm  | BATTERY VOLTAGE<br>(11 - 14V) | BT         |
| 123<br>(Left<br>bank)  | PU/R          |                                  | <ul> <li>[Engine is running]</li> <li>Engine speed is below 3,200 rpm</li> <li>After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more</li> </ul> | Approximately 0.4V            | · HA<br>SC |

#### DTC P0141 (RIGHT, -B1), P0161 (LEFT, -B2) REAR HO2S HEATER



On Board Diagnosis Logic

|   | On Board Diagnosis Logic   |   |  |  |
|---|--|---|--|--|
| DTC No.   | Malfunction is detected when   | Check Items (Possible Cause)  |  |  |
| P0141<br>0902<br>(Right bank)<br>P0161<br>1002<br>(Left bank) | The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range.  (An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.) | Harness or connectors     (The rear heated oxygen sensor heater circuit is open or shorted.)     Rear heated oxygen sensor heater |  |  |



#### **DTC Confirmation Procedure**

NREC0116

#### NOTF:

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.

#### (P) With CONSULT

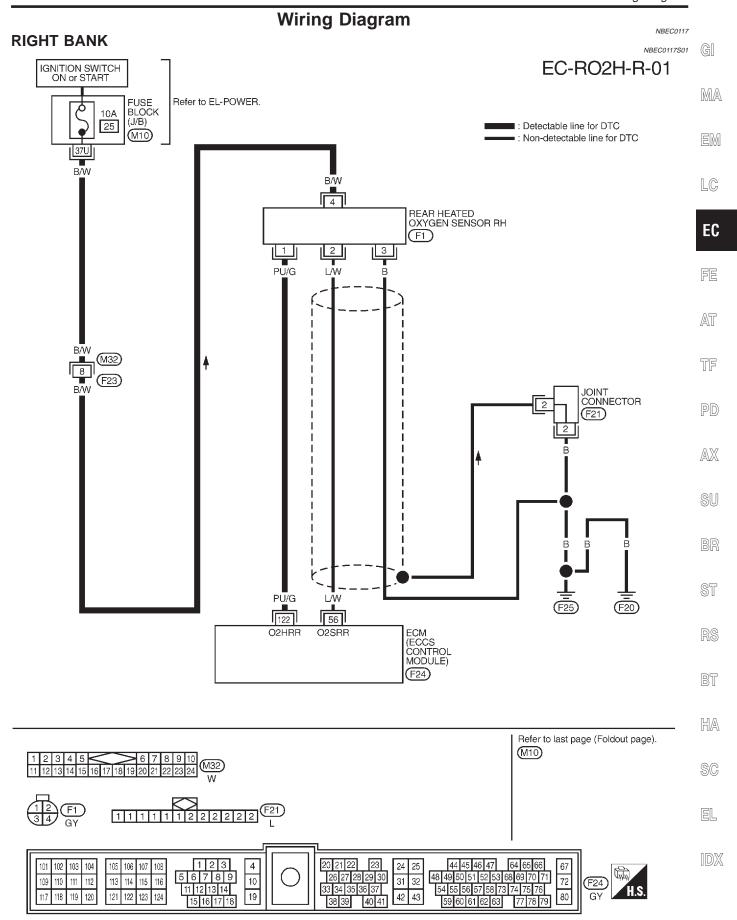
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine.
- 3) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 4) Stop vehicle and let engine idle for at least 6 seconds.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure".

#### **With GST**

- 1) Start engine.
- Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 3) Stop vehicle and let engine idle for at least 6 seconds.
- 4) Turn ignition switch "OFF" and wait at least 5 seconds.
- 5) Start engine.
- 6) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle and let engine idle for at least 6 seconds.
- 8) Select "MODE 3" with GST.
- 9) If DTC is detected, go to "Diagnostic Procedure".

#### No Tools

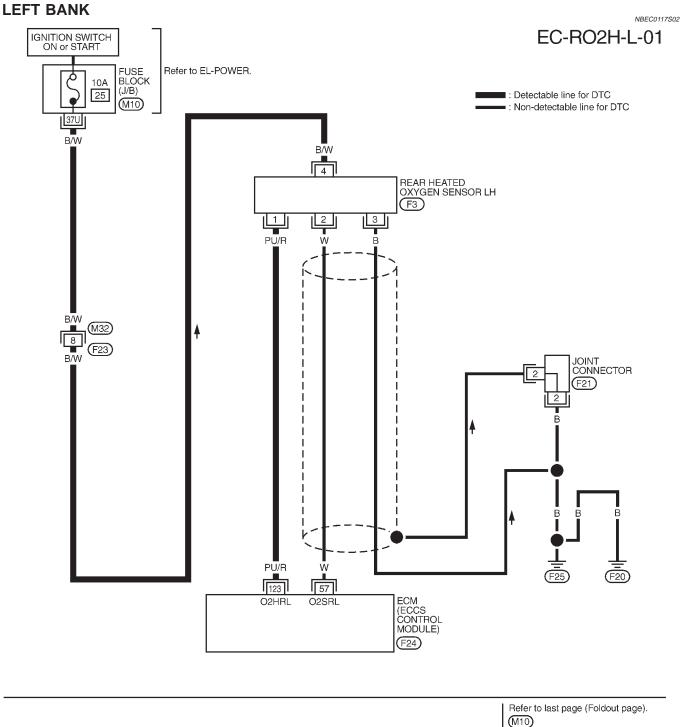
- 1) Start engine.
- 2) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle and let engine idle for at least 6 seconds.
- 4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure".
- 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.

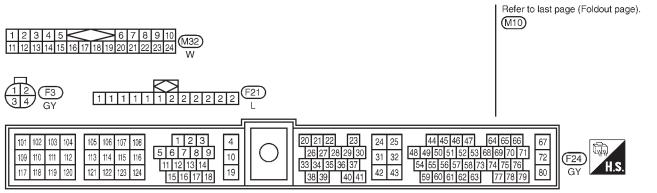


## DTC P0141 (RIGHT, -B1), P0161 (LEFT, -B2) REAR HO2S HEATER

Wiring Diagram (Cont'd)

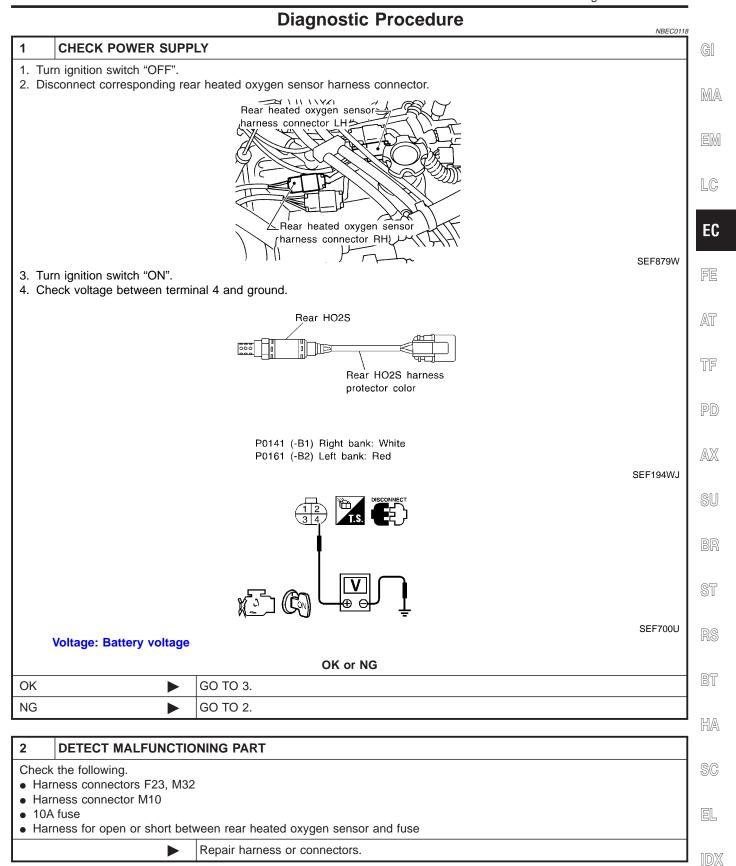






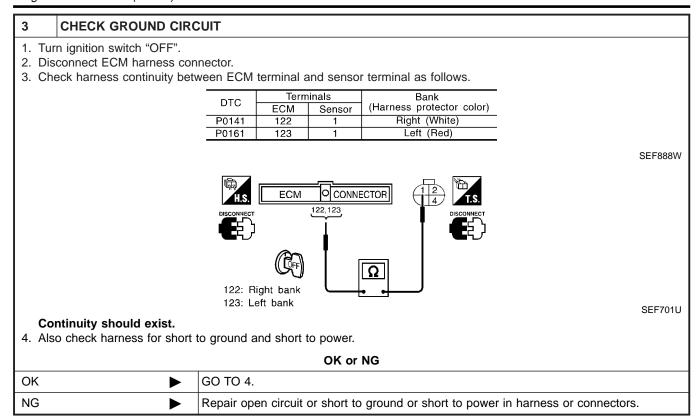
MEC150C





## DTC P0141 (RIGHT, -B1), P0161 (LEFT, -B2) REAR HO2S HEATER





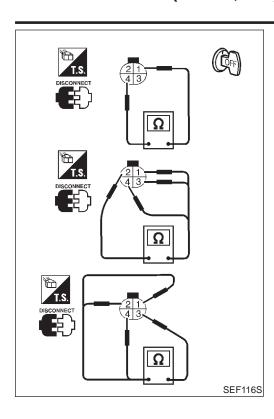
| 4     | CHECK REAR HEATED    | OXYGEN SENSOR HEATER  |
|-------|----------------------|---|
| Refer | to "COMPONENT INSPEC | TION", EC-293.  |
|       |                      | OK or NG  |
| ОК    | <b>&gt;</b>          | GO TO 5.  |
| NG    |                      | Check harness protector color. White; Right bank (-B1) Red; Left bank (-B2) Replace rear heated oxygen sensor |

| 5       | CHECK INTERMITTENT INCIDENT                                     |                |  |
|---------|---|----------------|--|
| Refer t | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |
|         | <b>&gt;</b>   | INSPECTION END |  |

## DTC P0141 (RIGHT, -B1), P0161 (LEFT, -B2) REAR HO2S HEATER

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Component Inspection



## Component Inspection REAR HEATED OXYGEN SENSOR HEATER

NBEC0119

745200770

NBEC0119S01

Check the following.

1. Check resistance between terminals 4 and 1.

Resistance: 2.3 - 4.3 $\Omega$  at 25°C (77°F)

. Check continuity.

| Terminal No.  | Continuity |
|---------------|------------|
| 2 and 1, 3, 4 | No         |
| 3 and 1, 2, 4 | INO        |

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.
- Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner Tool J-43897-18 or J43897-12 and approved anti-seize lubricant.



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On Board Diagnosis Logic

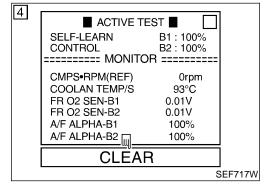


### On Board Diagnosis Logic

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen 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 func-<br>tion      | 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>P0174<br>0210<br>(Left bank) | <ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large.<br/>(The mixture ratio is too lean.)</li> </ul> | <ul> <li>Intake air leaks</li> <li>Front heated oxygen sensor</li> <li>Injectors</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Lack of fuel</li> <li>Mass air flow sensor</li> </ul> |



### **DTC Confirmation Procedure**

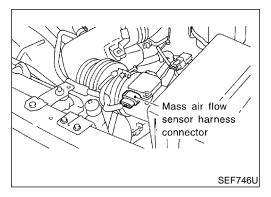
NRFC0151

#### 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.

#### (P) With CONSULT

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "SELF-LEARN CON-TROL" 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. If so, go to "Diagnostic Procedure", EC-298.
- 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-298. If engine does not start, check exhaust and intake air leak visually.



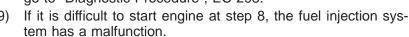
#### With GST

- 1) Start engine and warm it up to normal operating temperature.
- 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.
- Stop engine and reconnect mass air flow sensor harness connector.
- 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.

**√**-**/** 

DTC Confirmation Procedure (Cont'd)

8) Select "MODE 7" with GST. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-298.



10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-298. 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.
- 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. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-68.
- 8) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
- 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.
- If it is difficult to start engine at step 9, the fuel injection system also has a malfunction. If so, go to "Diagnostic Procedure", EC-298.
- 11) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-298. If engine does not start, check exhaust and intake air leak visually.



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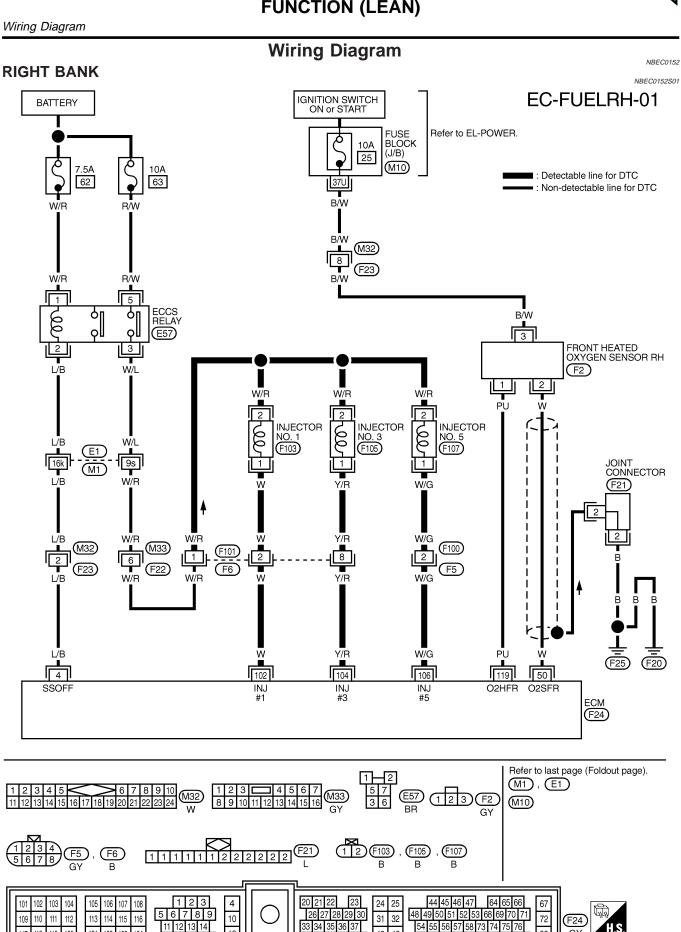
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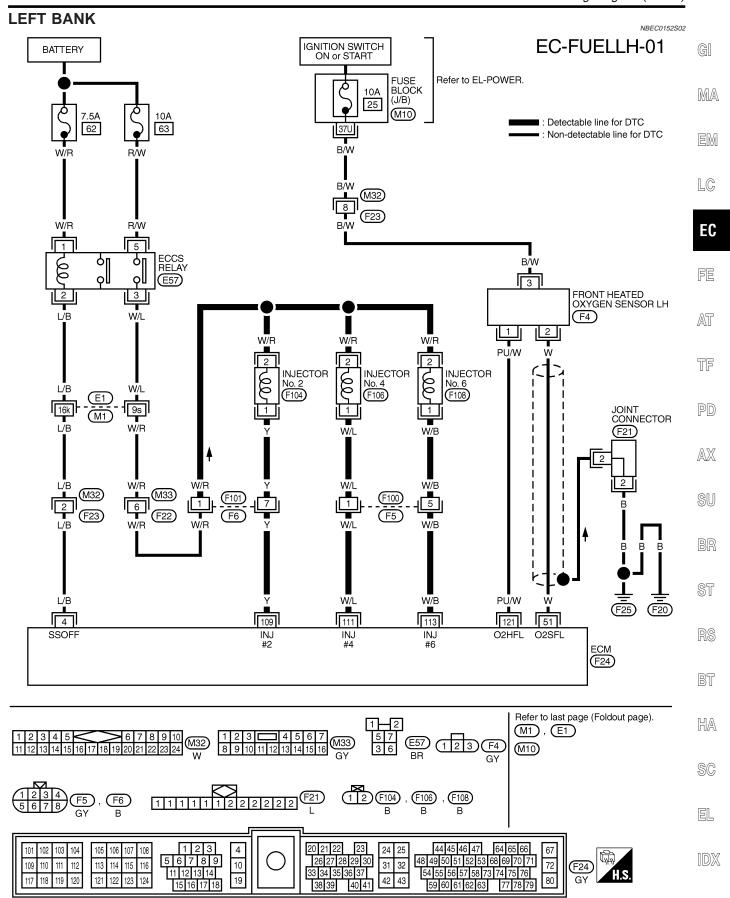
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Wiring Diagram (Cont'd)



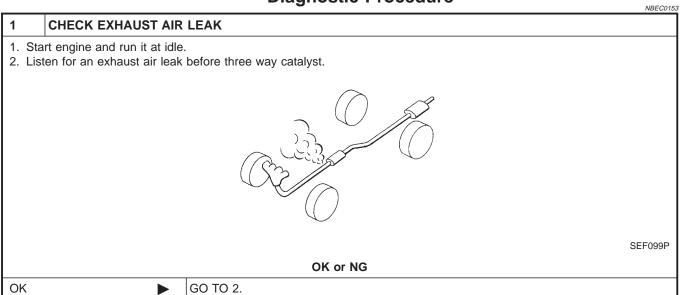
Diagnostic Procedure

NG

DTC P0171 (RIGHT, -B1), P0174 (LEFT, -B2) FUEL INJECTION SYSTEM FUNCTION (LEAN)



## **Diagnostic Procedure**

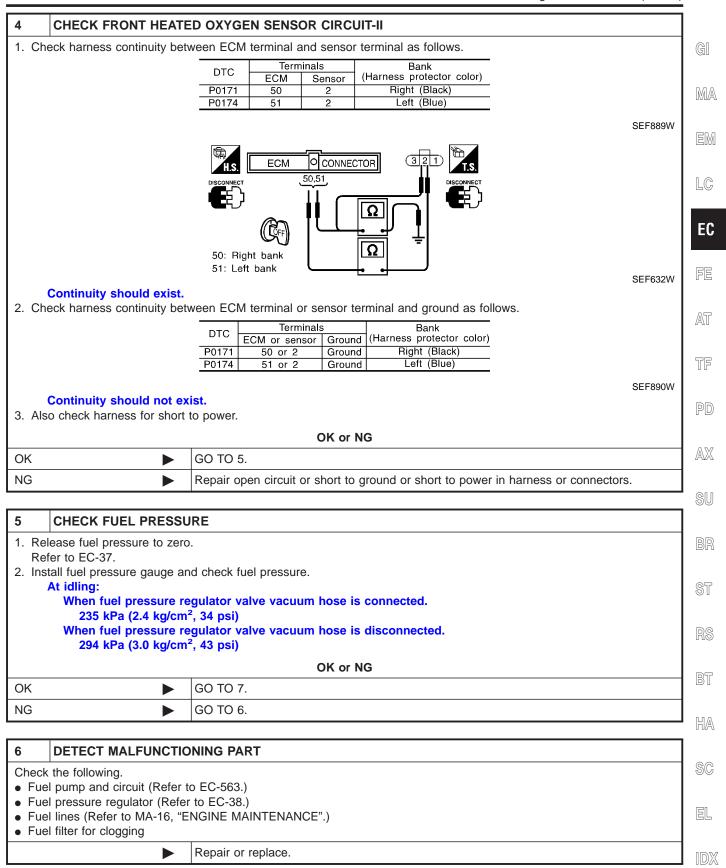


| 2      | CHECK FOR INTAKE A  | IR LEAK            |  |
|--------|---|--------------------|--|
| Listen | Listen for an intake air leak after the mass air flow sensor. |                    |  |
|        | OK or NG  |                    |  |
| ОК     | <b>•</b>  | GO TO 3.           |  |
| NG     | <b>•</b>  | Repair or replace. |  |

Repair or replace.

| 3  | CHECK FRONT HEATE | D OXYGEN SENSOR CIRCUIT-I |
|--|-------------------|---------------------------|
| Turn ignition switch "OFF".     Disconnect corresponding front heated oxygen sensor harness connector.     Disconnect ECM harness connector. |                   |                           |
|  | <b>&gt;</b>       | GO TO 4.                  |

V ←⇒wi



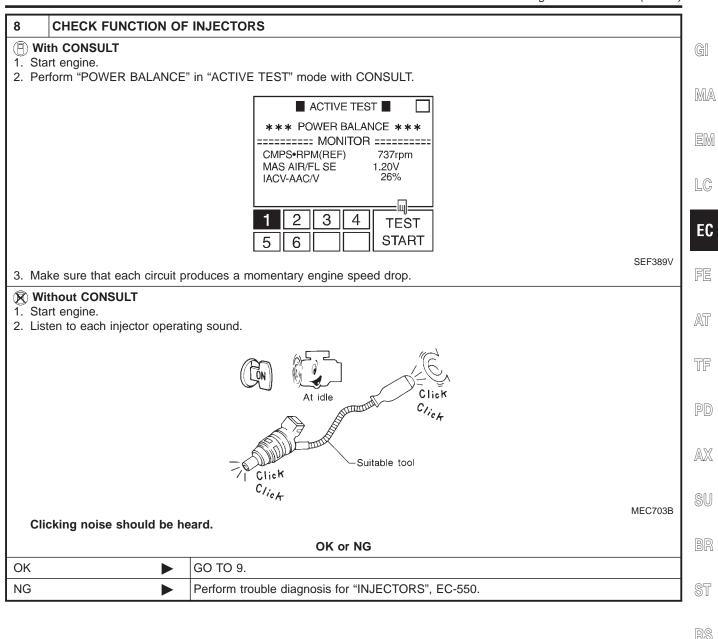


| 7 CHECK MASS AIR FLO  | DW SENSOR  |  |  |
|---|--|--|--|
| <ul> <li>With CONSULT</li> <li>1. Install all parts removed.</li> <li>2. Check "MASS AIR FLOW" in 3.3 - 4.8 g·m/sec: at idling 12.0 - 14.9 g·m/sec: at 2,500</li> </ul> | "DATA MONITOR" mode with CONSULT.  |  |  |
| 3.3 - 4.8 g-m/sec: at idling  | <ol> <li>Install all parts removed.</li> <li>Check "MASS AIR FLOW" in MODE 1 with GST.</li> </ol>                                  |  |  |
| 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 8.   |  |  |
| NG •  | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-146. |  |  |

BT

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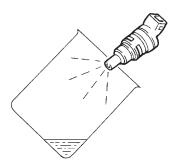
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Diagnostic Procedure (Cont'd)

### 9 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-38.
  - 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.



SEF595Q

Fuel should be sprayed evenly for each injector.

OK or NG

| OK |   | GO TO 10.  |
|----|---|--|
| NG | - | Replace injectors from which fuel does not spray out. Always replace O-ring with new ones. |

| 10    | 10 CHECK INTERMITTENT INCIDENT                                  |                |  |
|-------|---|----------------|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |
|       | <b>•</b>  | INSPECTION END |  |

On Board Diagnosis Logic

## On Board Diagnosis Logic

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. T 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).

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|----|---|
| he | G |

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| Input Signal to ECM  | ECM func-<br>tion      | Actuator  | EN  |
|--|------------------------|-----------|-----|
| Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Injectors | П ( |

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| П  |      |
|----|------|
| ΙL | -(U7 |

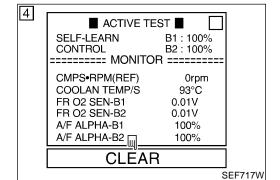
| DTC No.   | Malfunction is detected when  | Check Items (Possible Cause)  |
|---|---|---|
| P0172<br>0114<br>(Right bank)<br>P0175<br>0209<br>(Left bank) | <ul> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large.<br/>(The mixture ratio is too rich.)</li> </ul> | <ul> <li>Front heated oxygen sensor</li> <li>Injectors</li> <li>Exhaust gas leaks</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul> |

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Sensor

Front heated oxygen sensors

### **DTC Confirmation Procedure**

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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NBEC0155

#### (P) With CONSULT

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" and select "SELF-LEARN CON-TROL" in "ACTIVE TEST" mode with CONSULT.
- Clear the self-learning control coefficient by touching "CLEAR".
- Select "DATA MONITOR" mode with CONSULT.
- 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. If so, go to "Diagnostic Procedure", EC-307.



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- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
- Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-307. If engine does not start, remove ignition plugs and check for fouling, etc.



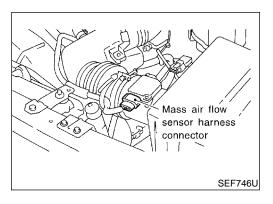
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#### With GST

- 1) Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
- Stop engine and reconnect mass air flow sensor harness connector.
- Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
- Select "MODE 4" with GST and erase the 1st trip DTC P0100.
- Start engine again and let it idle for at least 10 minutes.



DTC Confirmation Procedure (Cont'd)

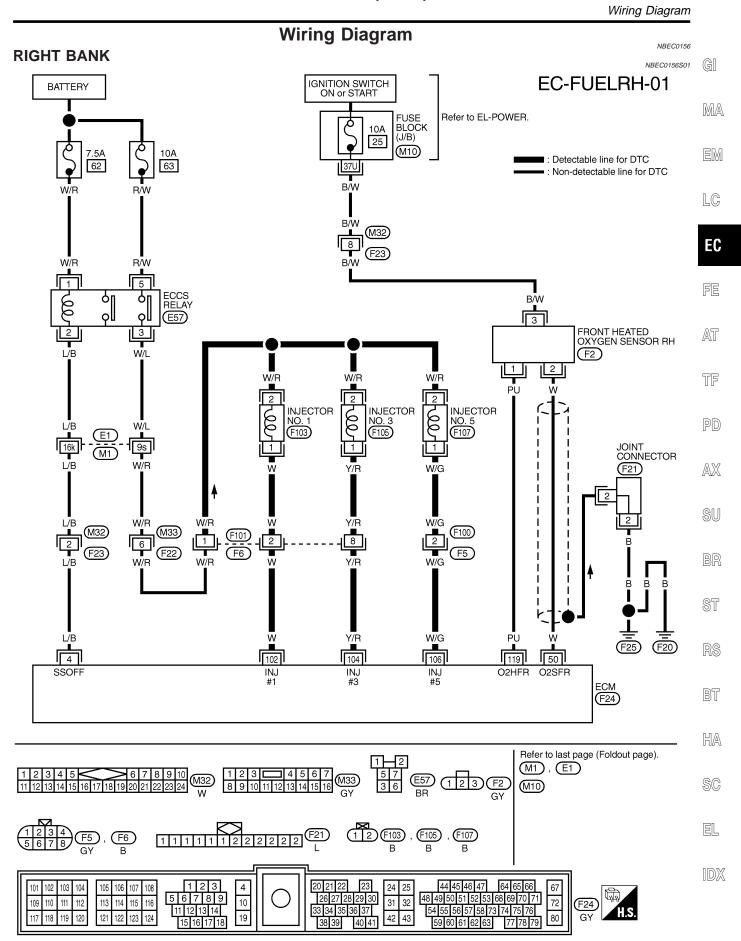


- Select "MODE 7" with GST. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-307.
- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
- 10) Crank engine while depressing accelerator pedal. If engine starts, go to "Diagnostic Procedure", EC-307. If engine does not start, check exhaust and intake air leak visually.

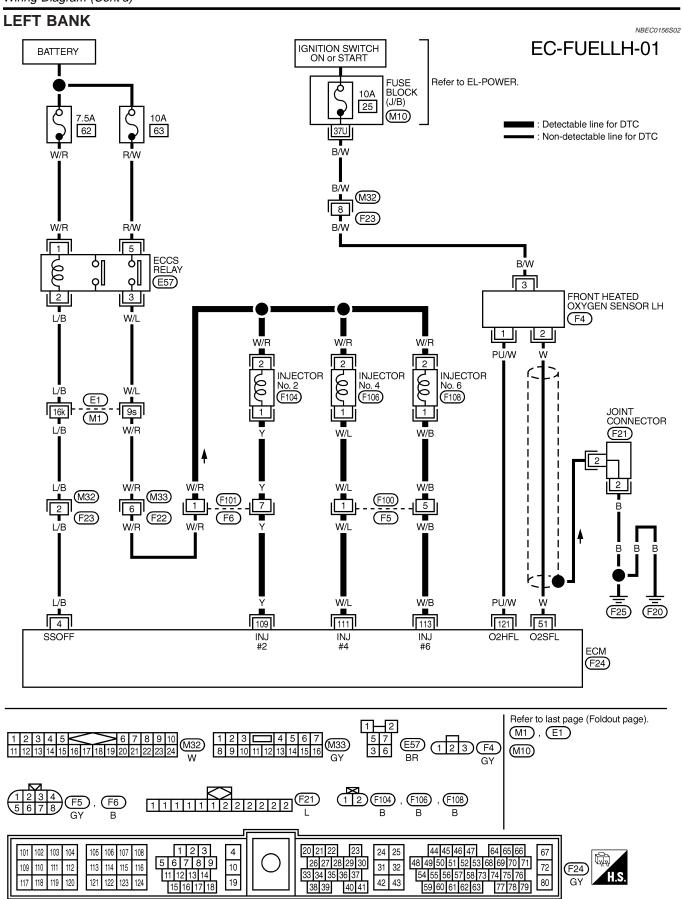
### **⋈** Without CONSULT

- 1) Disconnect mass air flow sensor harness connector.
- 2) Start engine and run it for at least 5 seconds at idle speed.
- 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. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-68.
- 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. If so, go to "Diagnostic Procedure", EC-307.
- 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-307. If engine does not start, remove ignition plugs and check for fouling, etc.

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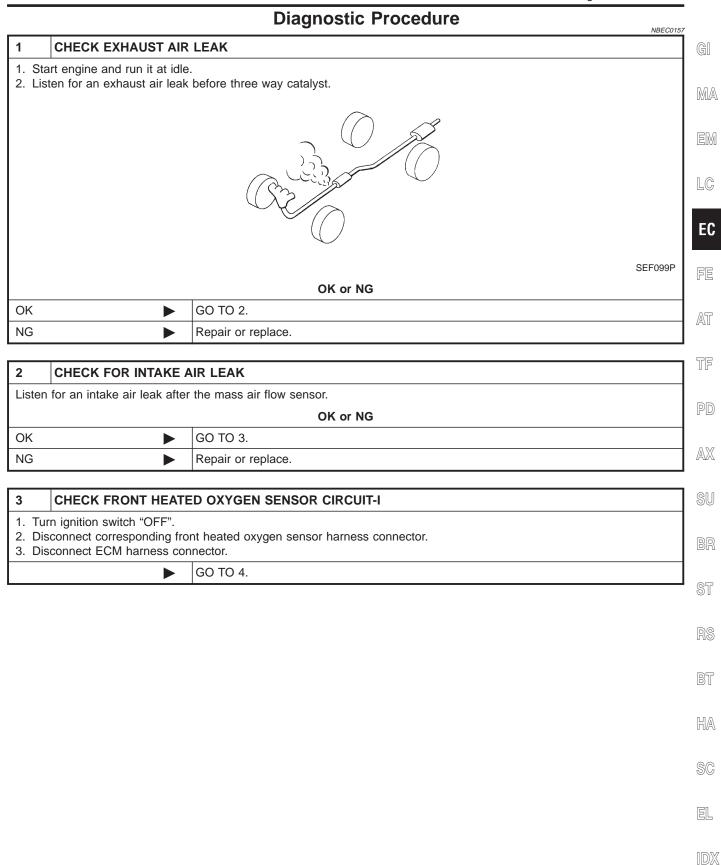


Wiring Diagram (Cont'd)



MEC638C

Diagnostic Procedure





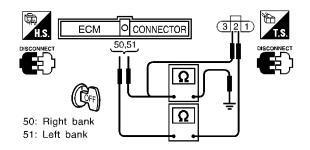
Diagnostic Procedure (Cont'd)

### 4 CHECK FRONT HEATED OXYGEN SENSOR CIRCUIT-II

1. Check harness continuity between ECM terminal and sensor terminal as follows.

| DTC   | Terminals |        | Bank                      |
|-------|-----------|--------|---------------------------|
| DIC   | ECM       | Sensor | (Harness protector color) |
| P0172 | 50        | 2      | Right (Black)             |
| P0175 | 51        | 2      | Left (Blue)               |

SEF891W



SEF632W

#### Continuity should exist.

2. Check harness continuity between ECM terminal or sensor terminal and ground as follows.

| DTC   | Terminals     |        | Bank                      |
|-------|---------------|--------|---------------------------|
| DIC   | ECM or sensor | Ground | (Harness protector color) |
| P0172 | 50 or 2       | Ground | Right (Black)             |
| P0175 | 51 or 2       | Ground | Left (Blue)               |

SEF892W

#### Continuity should not exist.

3. Also check harness for 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 FUEL PRESSURE

1. Release fuel pressure to zero.

Refer to EC-37.

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<sup>2</sup>, 34 psi)

When fuel pressure regulator valve vacuum hose is disconnected.

294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)

#### OK or NG

| OK • | GO TO 7. |
|------|----------|
| NG ► | GO TO 6. |

#### 6 DETECT MALFUNCTIONING PART

Check the following.

- Fuel pump and circuit (Refer to EC-563.)
- Fuel pressure regulator (Refer to EC-38.)

Repair or replace.

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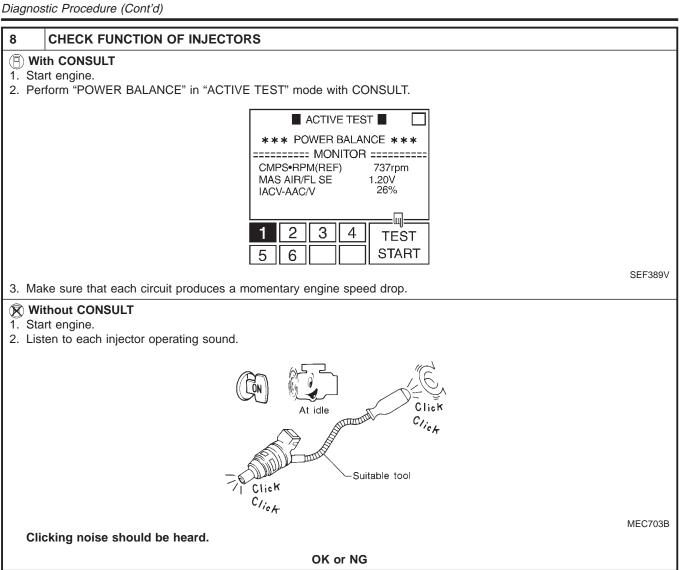
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|  | Diagnostic Procedure (Cont'd)  | )          |
|--|--|------------|
| 7 CHECK  | MASS AIR FLOW SENSOR   |            |
| With CONSU   | LT<br>s removed.   | G          |
| 2. Check "MASS 3.3 - 4.8 g-m/  | AIR FLOW" in "DATA MONITOR" mode with CONSULT.   | M          |
| With GST   |  | E          |
| 3.3 - 4.8 g·m/   | AIR FLOW" in MODE 1 with GST.  | <u>[</u> ( |
| No Tools  1. Install all part 2. Check voltage 1.0 - 1.7V: at 1.7 - 2.3V: at | between ECM terminal 54 and ground.<br>idling  |            |
|  | OK or NG   | A          |
| OK   | <b>▶</b> GO TO 8.  |            |
| NG   | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-146. | T          |
|  |  | P          |
|  |  | A          |
|  |  | S          |
|  |  | 00         |
|  |  | 8          |
|  |  | R          |

OK NG



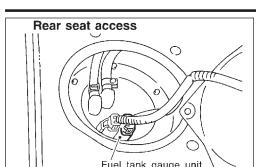
| 9      | CHECK INJECTOR  |  |  |
|--------|---|--|--|
|        | move injector assembly. Re  |  |  |
|        |   | rs connected to injector gallery.  |  |
| 2. Cor | nfirm that the engine is coc  | led down and there are no fire hazards near the vehicle.                               |  |
| 3. Dis | connect injector harness co   | onnectors left bank (for DTC P0172), right bank (for P0175).                           |  |
| The    | The injector harness connectors on right bank (for P0172), left bank (for P0175) should remain connected. |  |  |
| 4. Dis | 4. Disconnect all ignition coil harness connectors.   |  |  |
| 5. Pre | 5. Prepare pans or saucers under each injectors.  |  |  |
| 6. Cra | 6. Crank engine for about 3 seconds.  |  |  |
| Mal    | Make sure fuel does not drip from injector.   |  |  |
|        | OK or NG  |  |  |
| OK     | <b>•</b>  | GO TO 10.  |  |
| NG     | <b>•</b>  | Replace the injectors from which fuel is dripping. Always replace O-ring with new one. |  |

Perform trouble diagnosis for "INJECTORS", EC-550.

GO TO 9.

| 10    | CHECK INTERMITTENT INCIDENT                                     |  |
|-------|---|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |
|       | ► INSPECTION END  |  |

Component Description



# Fuel tank gauge unit harness connector SEF751U

## 10 8 6 ĝ Acceptable 1.0 0.4 0.2 20 40 60 80 100 (68) (104) (140) (176) (212) empérature °C (°F) SEF012P

## **Component Description**

The fuel tank 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.

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#### <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 (Fuel tank temperature sensor) and ground.



#### **CAUTION:**

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



AX

## On Board Diagnosis Logic

NBEC0167

DTC No. Malfunction is detected when ... P0180 An excessively high or low voltage is sent to ECM. • Rationally incorrect voltage is sent to ECM, compared 0402 with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.

 Harness or connectors (The sensor circuit is open or shorted.)

Fuel tank temperature sensor

Check Items (Possible Cause)

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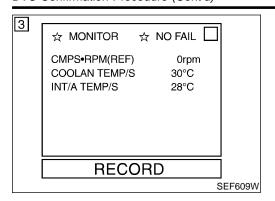
## **DTC Confirmation Procedure**

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.



DTC Confirmation Procedure (Cont'd)

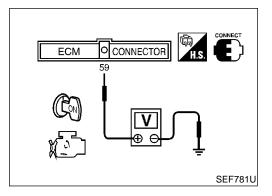


### (P) With CONSULT

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- Wait at least 10 seconds.
   If the result is NG, go to "Diagnostic Procedure", EC-315.
   If the result is OK, go to following step.
- 4) Check "COOLAN TEMP/S" value. If "COOLAN TEMP/S" is less than 60°C (140°F), the result will be OK. If "COOLAN TEMP/S" is above 60°C (140°F), go to the following step.
- Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
- 6) Wait at least 10 seconds.
- 7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-315.

### **With GST**

- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- Select "MODE 7" with GST.
   If the result is NG, go to "Diagnostic Procedure", EC-315.
   If the result is OK, go to following step.
- 3) Select "MODE 1" with GST and check for the engine coolant temperature.
  - If the temperature is less than 60°C (140°F), the result will be OK.
  - If the temperature is above 60°C (140°F), go to the following step.
- 4) Cool engine down until the engine coolant temperature is less than 60°C (140°F).
- 5) Wait at least 10 seconds.
- 6) Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-315.



#### 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-315. If the result is OK, go to following step.
- 4) Check voltage between ECM terminal 59 (Engine coolant temperature sensor signal) and ground.
  If the voltage is more than 1.0V, the result will be OK.

DTC Confirmation Procedure (Cont'd)

If the voltage is less than 1.9V, go to the following step.

- 5) Cool engine down until the voltage becomes more than 1.9V.
- 6) Wait at least 10 seconds.
- 7) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-315.

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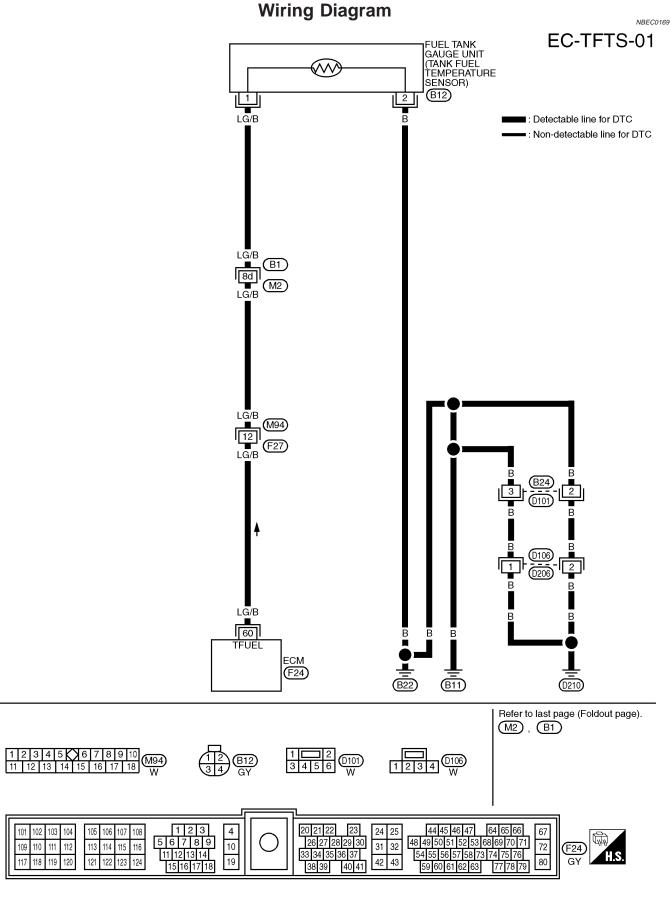
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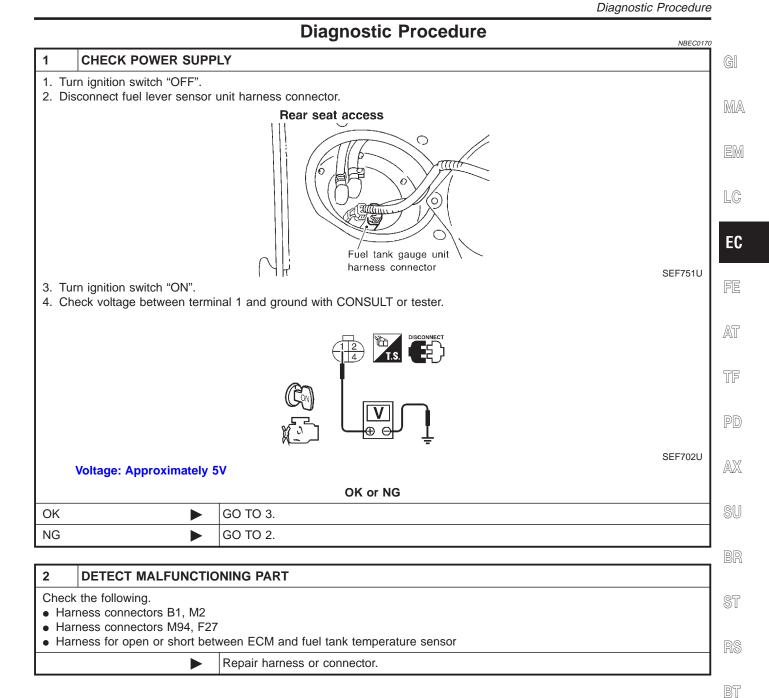


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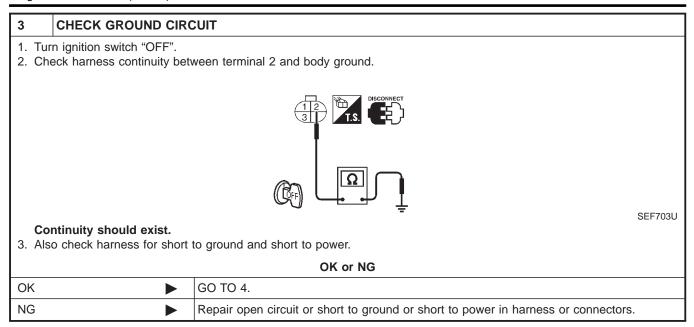




**EC-315** 

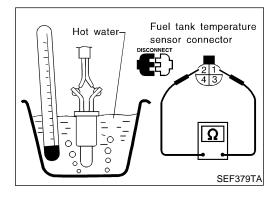


Diagnostic Procedure (Cont'd)



| 4  | CHECK FUEL TANK TEMPERATURE SENSOR |                                       |  |
|--|------------------------------------|---------------------------------------|--|
| Refer to "Component Inspection", EC-316. |                                    |                                       |  |
|  | OK or NG                           |                                       |  |
| OK                                       | <b>&gt;</b>                        | GO TO 5.                              |  |
| NG                                       | <b>&gt;</b>                        | Replace fuel tank temperature sensor. |  |

| 5     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |



## **Component Inspection FUEL TANK TEMPERATURE SENSOR**

NBEC0171

NBEC0171S01

Check resistance by heating with hot water or heat gun as shown in the figure.

| Temperature °C (°F) | Resistance k $\Omega$ |
|---------------------|-----------------------|
| 20 (68)             | 2.3 - 2.7             |
| 50 (122)            | 0.79 - 0.90           |

If NG, replace fuel tank temperature sensor.

On Board Diagnosis Logic

### On Board Diagnosis Logic

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the CKP sensor signal to vary, ECM can determine that a misfire is occurring.

| Sensor                           | Input Signal to ECM | ECM function                  | ПДΑ |
|----------------------------------|---------------------|-------------------------------|-----|
| Crankshaft position sensor (OBD) | Engine speed        | On board diagnosis of misfire | MA  |

The misfire detection logic consists of the following two conditions.

One Trip Detection Logic (Three Way Catalyst Damage)

On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.

When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.

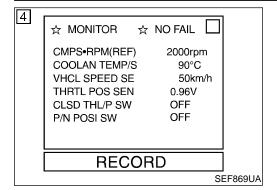
When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off. If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink. When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on. If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.

2. Two Trip Detection Logic (Exhaust quality deterioration)

For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.

A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

| DTC No.      | Malfunction is detected when | Check Items (Possible Cause)   |                        |
|--------------|------------------------------|--|------------------------|
| P0300 (0701) | Multiple cylinders misfire.  | Improper spark plug  | PD                     |
| P0301 (0608) | No. 1 cylinder misfires.     | <ul><li>Insufficient compression</li><li>Incorrect fuel pressure</li></ul> |                        |
| P0302 (0607) | No. 2 cylinder misfires.     | EGR valve     The injector circuit is open or shorted                      | $\mathbb{A}\mathbb{X}$ |
| P0303 (0606) | No. 3 cylinder misfires.     | Injectors     Intake air leak  |                        |
| P0304 (0605) | No. 4 cylinder misfires.     | The ignition secondary circuit is open or shorted     Lack of fuel         | SU                     |
| P0305 (0604) | No. 5 cylinder misfires.     | Drive plate/Flywheel   |                        |
| P0306 (0603) | No. 6 cylinder misfires.     | Front heated oxygen sensor     Incorrect distributor rotor                 | BR                     |



## **DTC Confirmation Procedure**

#### **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.

#### (P) With CONSULT

- 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.
- 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.

 If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-318.

#### With GST

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

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- 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.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-318.
- 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".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-318.

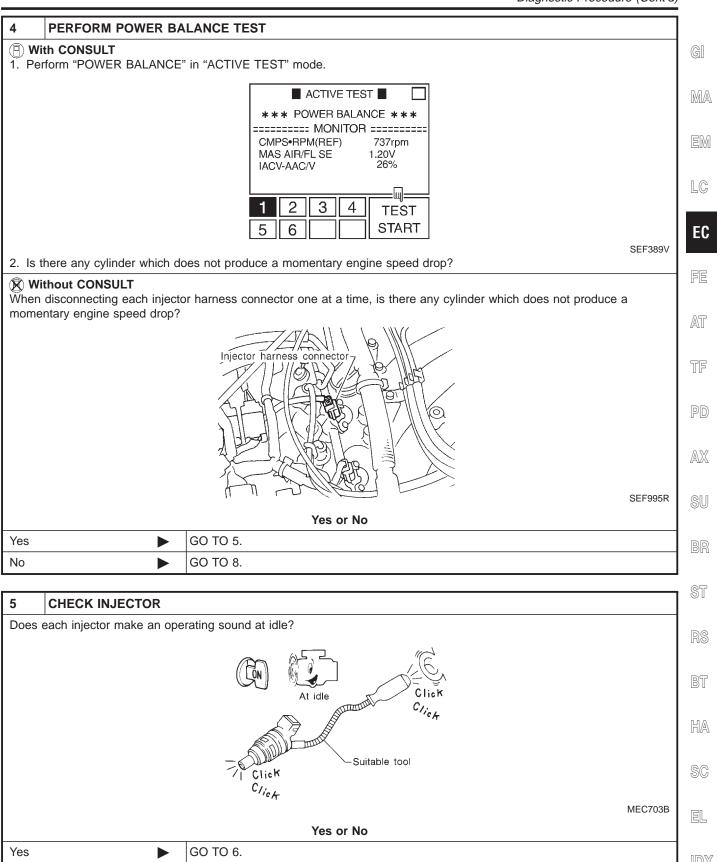
## **Diagnostic Procedure**

| 1   | CHECK FOR INTAKE A | IR LEAK                                |  |  |
|---|--------------------|--|--|--|
| Start engine and run it at idle speed. Listen for the sound of the intake air leak. |                    |  |  |  |
|   | OK or NG           |  |  |  |
| OK  | OK GO TO 2.        |  |  |  |
| NG  | <b>&gt;</b>        | 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   | <b>•</b>          | Repair or replace it. |

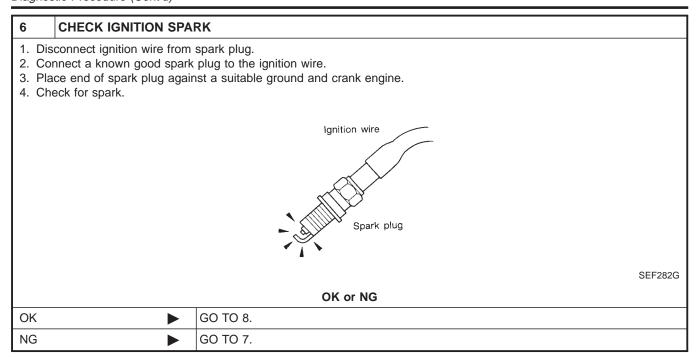
| 3  | CHECK EGR FUNCTIO   | N                  |  |  |
|----|---|--------------------|--|--|
|    | Perform "DTC Confirmation Procedure" of "DTC P1402 EGR FUNCTION (OPEN)". Refer to EC-476. |                    |  |  |
|    | OK or NG  |                    |  |  |
| OK | OK ▶ GO TO 4.   |                    |  |  |
| NG | <b>•</b>  | Repair EGR system. |  |  |

Diagnostic Procedure (Cont'd)

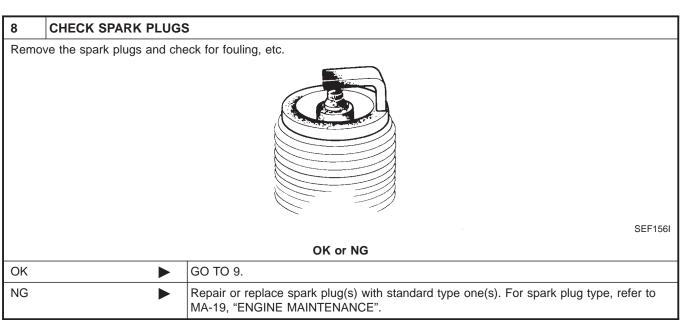


Check injector(s) and circuit(s). Refer to EC-550.

No



| 7     | CHECK IGNITION WIRE   | ES       |  |
|-------|---|----------|--|
| Refer | Refer to "Component Inspection", EC-323.                                      |          |  |
|       | OK or NG  |          |  |
| ОК    | OK Check ignition coil, power transistor and their circuits. Refer to EC-451. |          |  |
| NG    | <b>&gt;</b>   | Replace. |  |



|       |   | Diagnostic Procedure (Cont'd  | <u>'</u>   |
|-------|---|---|------------|
| 9     | CHECK COMPRESSIO  | N PRESSURE  | ]          |
| • Ch  | to EM section. eck compression pressure.  |   | GI         |
|       | Standard:<br>1,196 kPa (12.2 kg/cm <sup>2</sup><br>Minimum:                     | <sup>2</sup> , 173 psi)/300 rpm   | MA         |
|       | 883 kPa (9.0 kg/cm <sup>2</sup> , 1 Difference between each                     |   |            |
|       | 98 kPa (1.0 kg/cm <sup>2</sup> , 14   |   |            |
|       |   | OK or NG  |            |
| OK    | <b>&gt;</b>   | GO TO 10.   | l LC       |
| NG    | <b>•</b>  | Check pistons, piston rings, valves, valve seats and cylinder head gaskets. |            |
|       | T   |   | , E0       |
| 10    | CHECK FUEL PRESSU   | JRE   |            |
|       | stall any parts removed.<br>elease fuel pressure to zero                        | ).  | FE         |
| Re    | efer to EC-37.  |   | AT         |
| 3. In | stall fuel pressure gauge ar  |   | /A\I       |
|       |   | Fuel pressure gauge   | TF         |
|       |   | Return hose   | PC         |
|       |   | Feed hose,  |            |
|       |   | SEF964R   | SU         |
|       | At idle:<br>Approx. 235 kPa (2.4  | kalem² 34 nsi\  |            |
|       | Approx. 200 KFa (2.4)   | OK or NG  | BF         |
| OK    |   | GO TO 12.   | 1          |
| NG    |   | GO TO 11.   | ST         |
|       | <u> </u>  |   | _          |
| 11    | DETECT MALFUNCTIO   | NING PART   | RS         |
| • Fu  | k the following.<br>el pump and circuit (Refer t<br>el pressure regulator (Refe |   | Bī         |
| • Fu  | el lines (Refer to MA-16, "E<br>el filter for clogging                          |   |            |
|       | <b>&gt;</b>   | Repair or replace.  |            |
|       | T   |   | -<br>- \$0 |
| 12    | CHECK IGNITION TIME   |   | -          |
| Perfo | rm "Basic Inspection", EC-9   | 99.<br>OK or NG   | El         |
| OK    | •   | GO TO 13.   | 1          |
| NG    | <u> </u>  | Adjust ignition timing.   |            |
|       |   | 1   |            |



| 13    | CHECK FRONT HEATED OXYGEN SENSOR LH/RH   |                                     |  |  |
|-------|--|-------------------------------------|--|--|
| Refer | Refer to "Component Inspection", EC-207. |                                     |  |  |
|       | OK or NG                                 |                                     |  |  |
| OK    | OK 🕨 GO TO 14.                           |                                     |  |  |
| NG    | <b>&gt;</b>                              | Replace front heated oxygen sensor. |  |  |

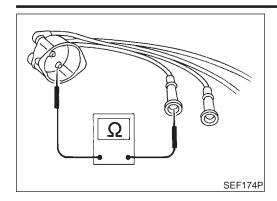
| 14           | CHECK MASS AIR FLO  | DW SENSOR  |  |
|--------------|---|--|--|
| Check<br>3.3 | th CONSULT  "MASS AIR FLOW" in "D/  - 4.8 g·m/sec: at idling 0 - 14.9 g·m/sec: at 2,500 | ATA MONITOR" mode with CONSULT.  |  |
| Check<br>3.3 | ith GST   |  |  |
| Check<br>1.0 | o Tools<br>c voltage between ECM ter<br>o - 1.7V: at idling<br>o - 2.3V: at 2,500 rpm   | minal 54 and ground.   |  |
|              | OK or NG  |  |  |
| ОК           | <b>•</b>  | GO TO 15.  |  |
| NG           | <b>&gt;</b>   | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-146. |  |

| 15   | 5 CHECK SYMPTOM MATRIX CHART |                    |  |
|--|------------------------------|--------------------|--|
| Check items on the rough idle symptom in "Symptom Matrix Chart", EC-118. |                              |                    |  |
|  | OK or NG                     |                    |  |
| OK   | OK 🕨 GO TO 16.               |                    |  |
| NG   | <b>•</b>                     | 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-68. |     |  |
|    | ▶ GO TO 17.  |     |  |

| 17  | CHECK INTERMITTENT INCIDENT |                |  |  |
|---|-----------------------------|----------------|--|--|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                             |                |  |  |
|   | <b>&gt;</b>                 | INSPECTION END |  |  |

Component Inspection



## **Component Inspection IGNITION WIRES**

NBEC0175

 Inspect wires for cracks, damage, burned terminals and for improper fit.

. G

2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

MA

#### Resistance:

LC

| 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             |  |

EC

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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.

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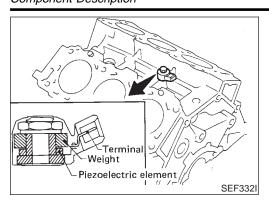
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## DTC P0325 KNOCK SENSOR (KS)





## **Component Description**

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM. Freeze frame data will not be stored in the ECM for the knock sensor. The MIL will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

### **ECM Terminals and Reference Value**

NBEC0177

Specification data are reference values and are measured between each terminal and ground.

#### CAUTION:

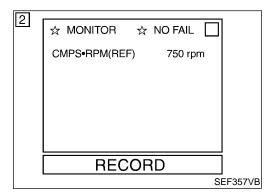
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM         | CONDITION                         | DATA (DC Voltage)  |
|----------------------|---------------|--------------|-----------------------------------|--------------------|
| 64                   | W             | Knock sensor | [Engine is running]  • Idle speed | Approximately 2.5V |

## On Board Diagnosis Logic

NBEC0178

| DTC No.       | Malfunction is detected when   | Check Items (Possible Cause)   |
|---------------|--|--|
| P0325<br>0304 | <ul> <li>An excessively low or high voltage from the knock sensor is sent to ECM.</li> </ul> | <ul> <li>Harness or connectors<br/>(The knock sensor circuit is open or shorted.)</li> <li>Knock sensor</li> </ul> |



### **DTC Confirmation Procedure**

NBEC0179

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.

### (I) With CONSULT

- 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.
- 3) If DTC is detected, go to "Diagnostic Procedure", EC-327.

#### **With GST**

NOTE:

- 1) Start engine and run it for at least 5 seconds at idle speed.
- 2) Select "MODE 3" with GST.
- 3) If DTC is detected, go to "Diagnostic Procedure", EC-327.

#### No Tools

- 1) Start engine and run it for at least 5 seconds at idle speed.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

# DTC P0325 KNOCK SENSOR (KS)



DTC Confirmation Procedure (Cont'd)

- Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-327.

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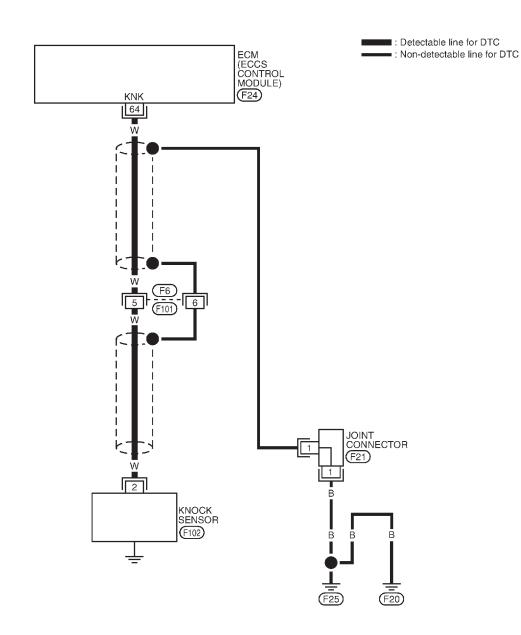
EL

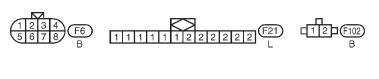


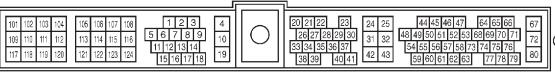
# **Wiring Diagram**

NBEC0180

EC-KS-01









MEC154C



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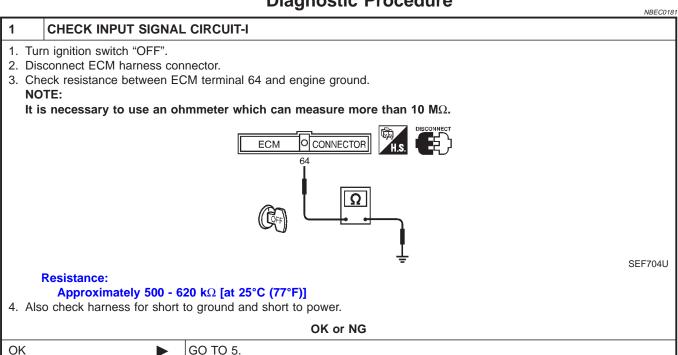
EC

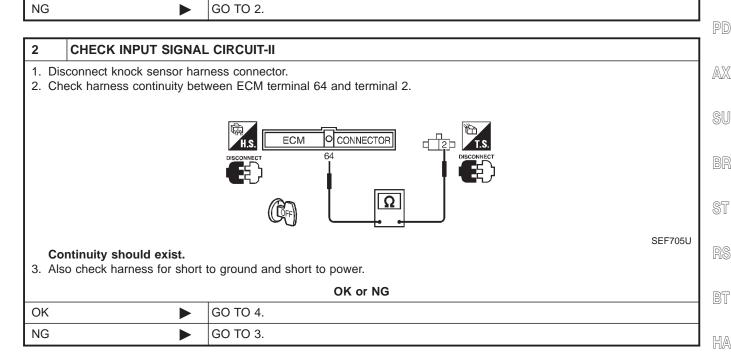
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| 3  | DETECT MALFUNCTIONING PART   |  |  |  |  |
|--|--|--|--|--|--|
| Check the following.  • Harness connector F6, F101  • Harness for open or short between ECM and knock sensor |  |  |  |  |  |
|  | Repair open circuit or short to ground or short to power in harness or connectors. |  |  |  |  |

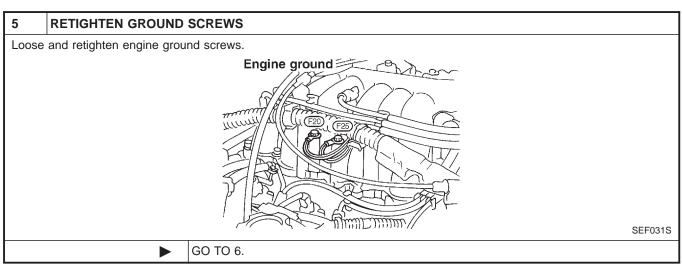
SC

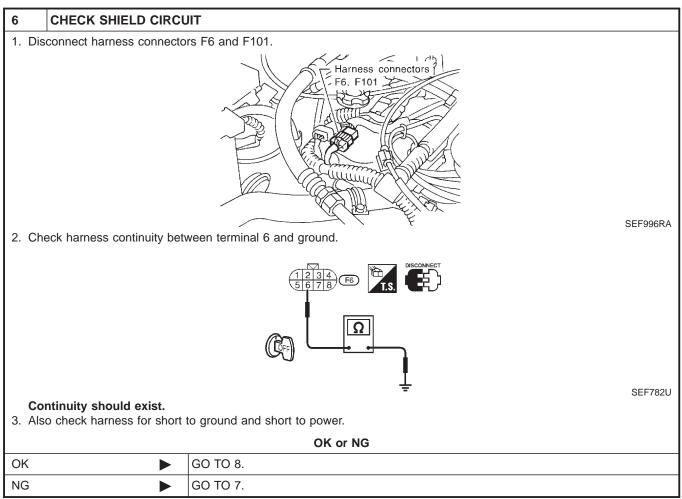
# DTC P0325 KNOCK SENSOR (KS)





| 4     | 4 CHECK KNOCK SENSOR                     |                       |  |  |  |
|-------|--|-----------------------|--|--|--|
| Refer | Refer to "Component Inspection", EC-329. |                       |  |  |  |
|       |  | OK or NG              |  |  |  |
| OK    | <b>•</b>                                 | GO TO 8.              |  |  |  |
| NG    | <b>&gt;</b>                              | Replace knock sensor. |  |  |  |





# DTC P0325 KNOCK SENSOR (KS)

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Diagnostic Procedure (Cont'd)

|     |                                     |  | Bragmoone i re |
|-----|-------------------------------------|--|----------------|
| - 1 |                                     |  |                |
|     | 7                                   | DETECT MALFUNCTIONING PART   |                |
|     | <ul><li>Harı</li><li>Join</li></ul> | the following. ness connectors F6 and F101 t connector F21 fer to EL-350, "HARNESS LAYOUT".) |                |

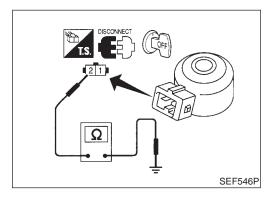
• Harness for open or short between harness connector F6 and engine ground

|   | •                 | Repair open circuit or short to ground or short to power in harness or connectors. |
|---|-------------------|--|
| • |                   |  |
|   | 8 CHECK INTERMITT | NT INCIDENT  |

8 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136.

INSPECTION END



# **Component Inspection KNOCK SENSOR**

NBEC0182

BEC0182501

Use an ohmmeter which can measure more than 10  $M\Omega$ .

1. Disconnect knock sensor harness connector.

Check resistance between terminal 2 and ground.

Resistance: 500 - 620 k $\Omega$  [at 25°C (77°F)]

#### **CAUTION:**

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

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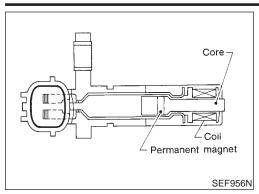
HA

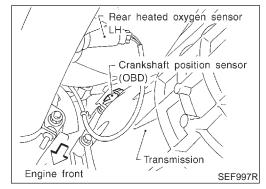
SC

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Component Description







# **Component Description**

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet, core and coil.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

This sensor is not used to control the engine system. It is used only for the on board diagnosis.

## **ECM Terminals and Reference Value**

NRFC0184

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| <u></u>              | s to the Lemi of annicition cook a ground officer than Lemi terminate, each acting ground. |                          |  |   |  |
|----------------------|--|--------------------------|--|---|--|
| TER-<br>MINAL<br>NO. | WIRE<br>COLOR  | ITEM                     | CONDITION  | DATA (DC Voltage)   |  |
|                      |  | Crankshaft position sen- | [Engine is running]  • Warm-up condition  • Idle speed | 1 - 2V<br>(AC range)<br>(V)<br>10<br>5<br>0.2 ms<br>SEF690W |  |
| 47                   | L  | sor (OBD)                | [Engine is running]  ● Engine speed is 2,000 rpm       | 2 - 4V<br>(AC range)<br>(V)<br>10<br>5<br>0.2 ms<br>SEF691W |  |

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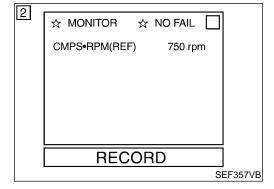
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On Board Diagnosis Logic

|               | On Board Diagn  | osis Logic                   |    |
|---------------|---|------------------------------|----|
| DTC No.       | Malfunction is detected when  | Check Items (Possible Cause) | GI |
| 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. |                              | MA |



# **DTC Confirmation Procedure**

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

#### (P) With CONSULT

NOTE:

- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Start engine and run it for at least 15 seconds at idle speed.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-333.

#### With GST

- Start engine and run it for at least 15 seconds at idle speed. 1)
- Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-333.

#### No Tools

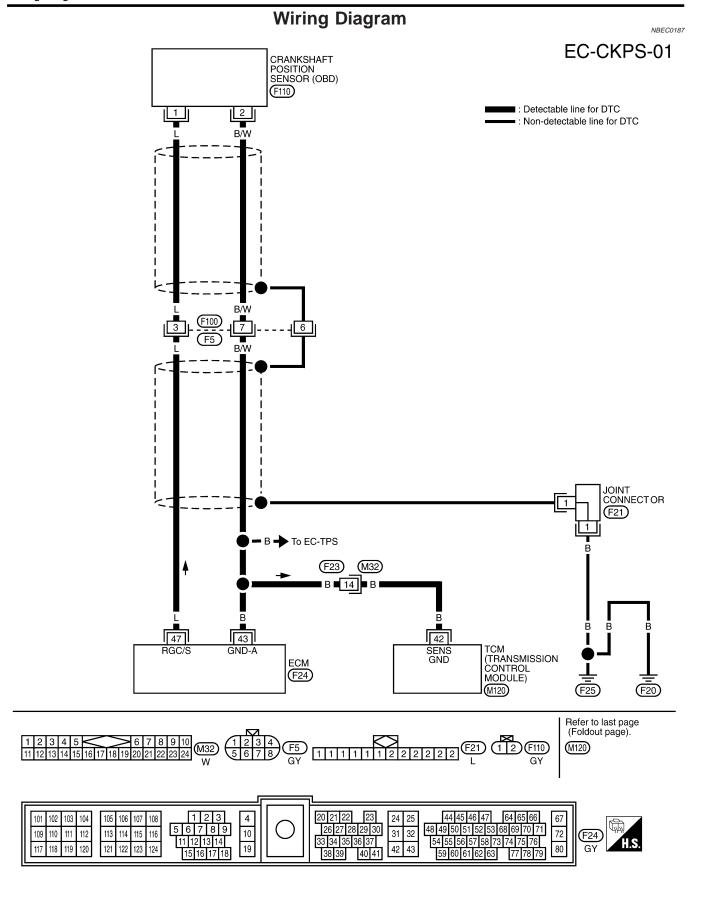
- Start engine and run it for at least 15 seconds at idle speed.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-333.

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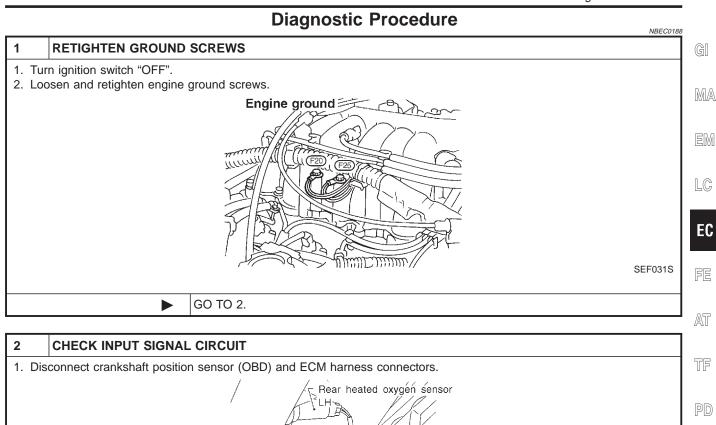
SC

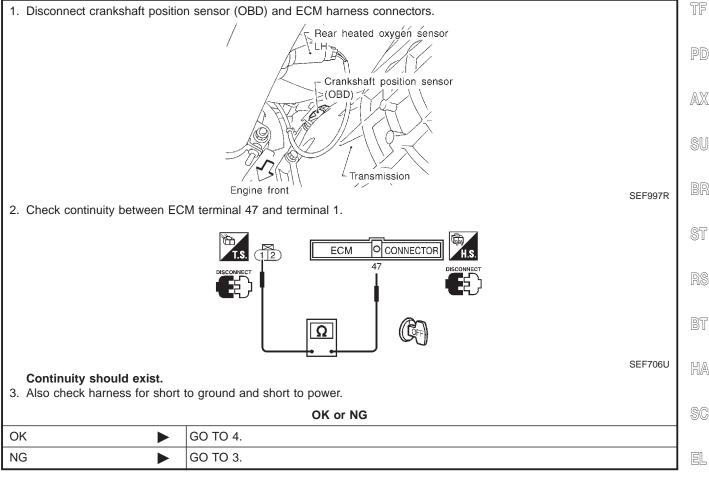


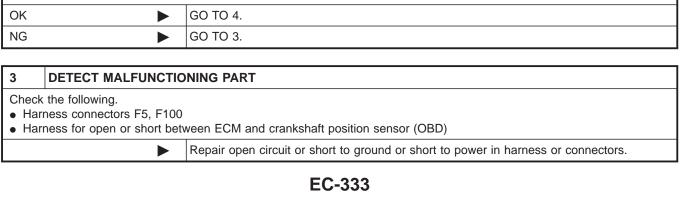


MEC640C

Diagnostic Procedure









Diagnostic Procedure (Cont'd)

# 4 CHECK GROUND CIRCUIT 1. Reconnect ECM harness connector. 2. Check harness continuity between terminal 2 and engine ground. Continuity should exist. 3. Also check harness for short to ground and short to power. OK or NG

| 5 DETECT MALFUNCTIONING PAR | ₹T |
|-----------------------------|----|
|-----------------------------|----|

Check the following.

OK NG

- Harness connectors F5, F100
- Harness connectors F23, M32
- Harness for open or short between crankshaft position sensor (OBD) and ECM

GO TO 6.

GO TO 5.

- 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 CRANKSHAFT POSITION SENSOR (OBD)   |   |  |  |  |
|-------|--|---|--|--|--|
| Refer | Refer to "Component Inspection", EC-335. |   |  |  |  |
|       |  | OK or NG                                  |  |  |  |
| OK    | <b>&gt;</b>                              | GO TO 7.                                  |  |  |  |
| NG    | <b>•</b>                                 | Replace crankshaft position sensor (OBD). |  |  |  |

| 7     | CHECK SHIELD CIRCUIT   |          |  |  |  |  |
|-------|--|----------|--|--|--|--|
| 2. Ch | Disconnect harness connectors F5, F100.     Check harness continuity between harness connector F5 and engine ground.     Continuity should exist.     Also check harness for short to ground and short to power. |          |  |  |  |  |
|       | OK or NG   |          |  |  |  |  |
| OK    | <b>&gt;</b>  | GO TO 9. |  |  |  |  |
| NG    | <b>•</b>   | GO TO 8. |  |  |  |  |

| 8  | DETECT MALFUNCTIONING PART |  |  |
|--|----------------------------|--|--|
| Check the following.  • Harness connectors F5, F102  • Joint connector  • Harness for open or short between harness connector F5 and engine ground |                            |  |  |
|  | •                          | Repair open circuit or short to ground or short to power in harness or connectors. |  |

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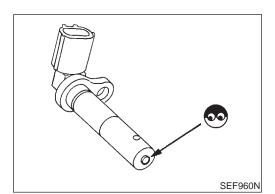
LC

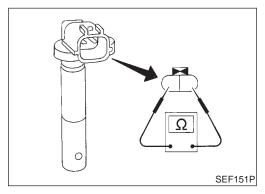
EC

FE

Diagnostic Procedure (Cont'd,

| 9     | 9 CHECK INTERMITTENT INCIDENT                                   |  |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |  |  |
|       | ► INSPECTION END  |  |  |  |  |





# **Component Inspection CRANKSHAFT POSITION SENSOR (OBD)**

NBEC0189

NBEC0189S01

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.

AT

TF

5. Check resistance as shown in the figure.

Resistance: Approximately 166.5 - 203.5 $\Omega$  [at 20°C (68°F)]

If NG, replace crankshaft position sensor (OBD).

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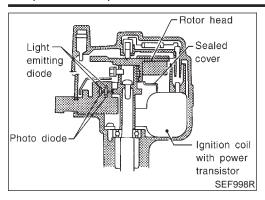
SC

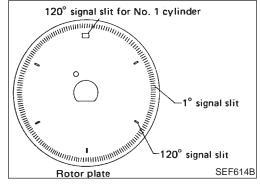
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Component Description







# **Component Description**

The camshaft position sensor is a basic component of the engine control system. 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 and rotor head.

#### NOTE:

The rotor screw which secures the distributor rotor to the distributor shaft must be torqued properly.

(37±3 kg-cm, 32±3 in-lb)

## **ECM Terminals and Reference Value**

NRFC0191

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| ago to               |   | o transloton oco a ;       | ground outlor than both torminals, saon  | do tilo gilodilai                            |
|----------------------|---|----------------------------|--|--|
| TER-<br>MINAL<br>NO. | WIRE<br>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<br>(11 - 14V)                |
| 44                   | [Engine is running]  Warm-up condition  Idle speed  Camshaft position sensor (Position signal)  [Engine is running]  Engine is running]  Engine is running]  Engine is running] | Camshaft position sen-     | Warm-up condition  | Approximately 2.5V  (V) 10 5 0.2 ms  SEF999U |
|                      |   |                            | Approximately 2.5V  (V) 10 5 0 0.2 ms  SEF001V   |  |



ECM Terminals and Reference Value (Cont'd)

|                      |               |   |  | and and reference value (Cent a)      |                |
|----------------------|---------------|---|--|---------------------------------------|----------------|
| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM  | CONDITION  | DATA (DC Voltage)                     | GI             |
| 49                   | L             | Camshaft position sensor (Reference signal) | [Engine is running]  ● Idle speed                | 0.3 - 0.5V  (V) 10 5 0 20 ms  SEF997U | MA<br>EM<br>LC |
| 53                   | L             |   | [Engine is running]  ● Engine speed is 2,000 rpm | 0.3 - 0.5V  (V) 10 5 0 20 ms  SEF998U | EC<br>FE       |
| 67                   | B/W           | Dower gupply for ECM                        | Hanitian quitab "ON"                             | BATTERY VOLTAGE                       | 52             |
| 72                   | B/W           | Power supply for ECM                        | [Ignition switch "ON"]                           | (11 - 14V)                            | TF             |
| 117                  | B/W           | Current return                              | [Engine is running]  ● Idle speed                | BATTERY VOLTAGE<br>(11 - 14V)         | PD             |

# On Board Diagnosis Logic

| C0192 | $\mathbb{A}\mathbb{X}$ |
|-------|------------------------|
|       |                        |

| DTC No.       | Malfunction is detected when |  | Check Items (Possible Cause)  |  |
|---------------|------------------------------|--|---|--|
| P0340<br>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  |  |
|               | B)                           | Either 1° or 120° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed. | <ul> <li>shorted.)</li> <li>Camshaft position sensor</li> <li>Starter motor (Refer to EL section.)</li> <li>Starting system circuit (Refer to EL section.)</li> </ul> |  |
|               | C)                           | The relation between 1° and 120° signal is not in the normal range during the specified engine speed.                      | Dead (Weak) battery   |  |

# **DTC Confirmation Procedure**

#### NPEC0103

NOTE:

Perform "PROCEDURE FOR MALFUNCTION A" first. If DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B AND C".

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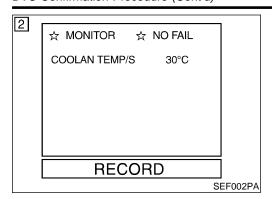
ST

 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 at idle.

DTC Confirmation Procedure (Cont'd)



#### PROCEDURE FOR MALFUNCTION A

NBFC0193S01

## (P) With CONSULT

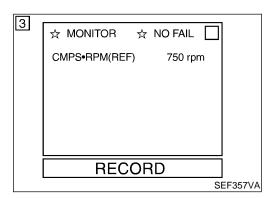
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Crank engine for at least 2 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.

#### **With GST**

- 1) Crank engine for at least 2 seconds.
- 2) Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.

#### No Tools

- 1) Crank engine for at least 2 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.



#### PROCEDURE FOR MALFUNCTION B AND C

NBEC0193S02

#### (P) 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.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.

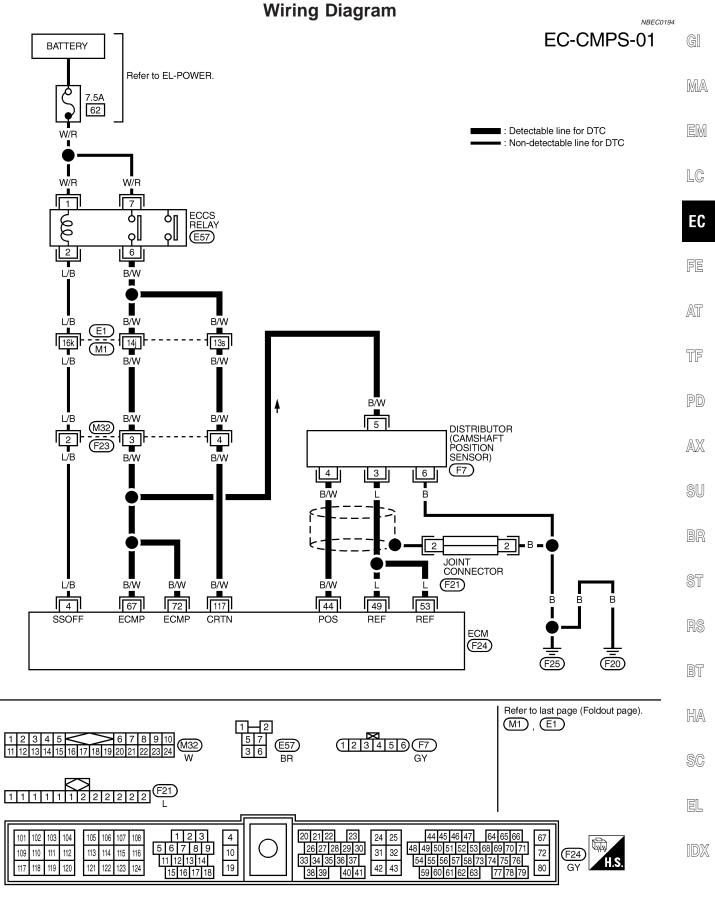
## **With GST**

- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.

#### 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".
- Perform "Diagnostic Test Mode II" (Self-diagnostic results) with FCM
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-340.



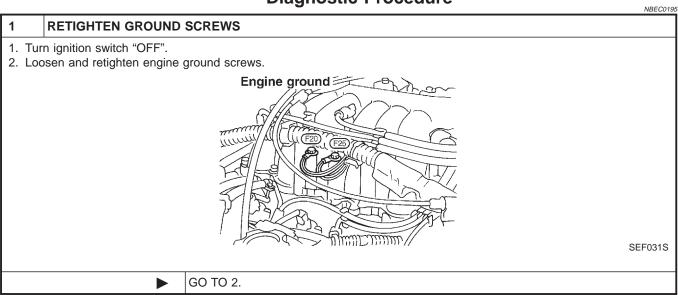


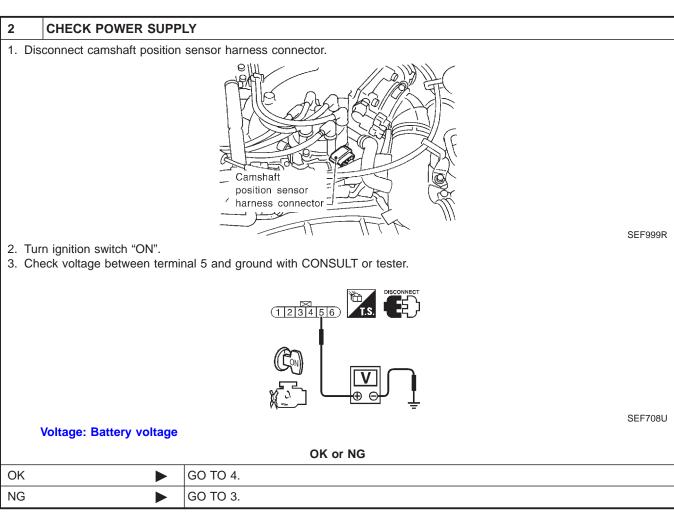
MEC641C

Diagnostic Procedure

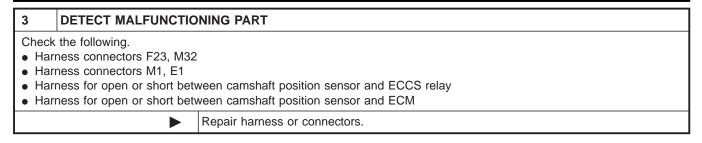


# **Diagnostic Procedure**





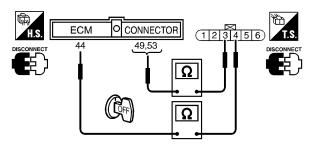
Diagnostic Procedure (Cont'd)



# 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 44, sensor terminal 3 and ECM terminals 49, 53.

#### Continuity should exist.



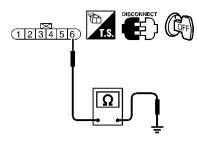
4. Also check harness for short to ground and short to power.

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 GROUND CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Check harness continuity between sensor terminal 6 and engine ground.



#### Continuity should exist.

3. Also 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. |

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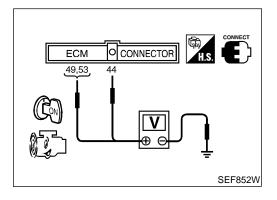


Diagnostic Procedure (Cont'd)

| 6  | CHECK CAMSHAFT POSITION SENSOR |                                   |  |  |  |
|--|--------------------------------|-----------------------------------|--|--|--|
| Refer to "Component Inspection", EC-342. |                                |                                   |  |  |  |
|  | OK or NG                       |                                   |  |  |  |
| OK                                       | OK 🕨 GO TO 7.                  |                                   |  |  |  |
| NG                                       | •                              | Replace camshaft position sensor. |  |  |  |

| 7                      | CHECK SHIELD CIRCU                 | JIT  |  |  |  |
|------------------------|------------------------------------|--|--|--|--|
| 1. Tu                  | urn ignition switch "OFF".         |  |  |  |  |
| 2. D                   | isconnect joint connector.         |  |  |  |  |
| 3. C                   | heck the following.                |  |  |  |  |
| <ul><li>Co</li></ul>   | ontinuity between joint conne      | ector terminal and ground  |  |  |  |
| <ul> <li>Jo</li> </ul> | int connector                      |  |  |  |  |
| (R                     | efer to EL-350, "HARNESS           | LAYOUT".)  |  |  |  |
| Co                     | ontinuity should exist.            |  |  |  |  |
| 4. A                   | Iso check harness for short        | to ground and short to power.  |  |  |  |
| 5. TI                  | 5. Then reconnect joint connector. |  |  |  |  |
|                        | OK or NG                           |  |  |  |  |
| ОК                     | <b>•</b>                           | GO TO 8.   |  |  |  |
| NG                     | <b>•</b>                           | Repair open circuit or short to ground or short to power in harness or connectors. |  |  |  |

| 8     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |



# **Component Inspection CAMSHAFT POSITION SENSOR**

NBEC0196

NBEC0196S01

- 1. Install any parts removed.
- 2. Start engine.
- 3. Check voltage between ECM terminals 49, 53 and ground, ECM terminal 44 and ground with DC range.

RS

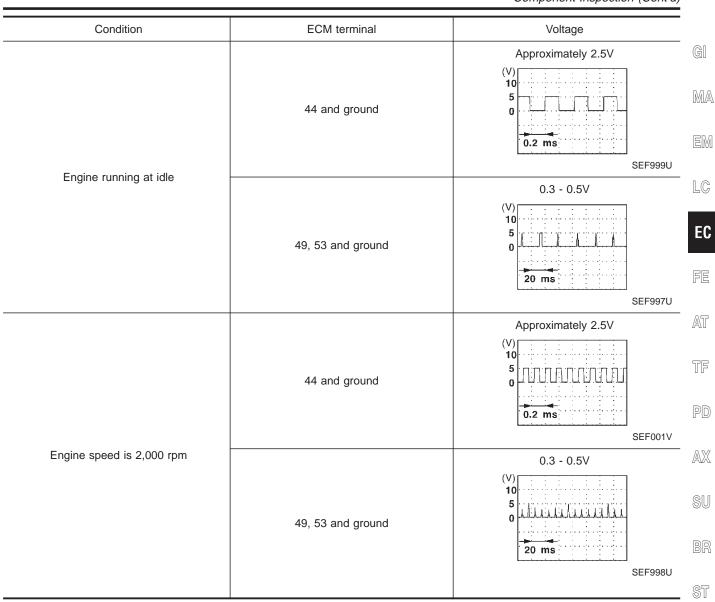
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Component Inspection (Cont'd)



If NG, replace distributor assembly with camshaft position sensor.



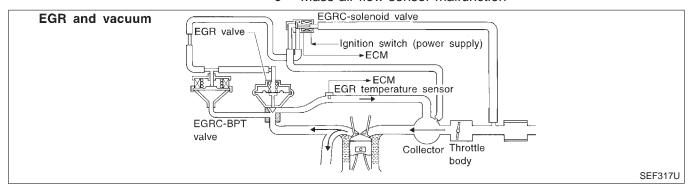
# Description SYSTEM DESCRIPTION

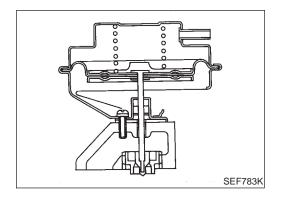
NBEC0197

| Sensor                            | Input Signal to ECM        | ECM func-<br>tion | Actuator            |
|-----------------------------------|----------------------------|-------------------|---------------------|
| Camshaft position sensor          | Engine speed               |                   |                     |
| Mass air flow sensor              | Amount of intake air       |                   |                     |
| Engine coolant temperature sensor | Engine coolant temperature | EGR con-<br>trol  | EGRC-solenoid valve |
| 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





# COMPONENT DESCRIPTION

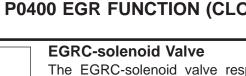
#### **Exhaust Gas Recirculation (EGR) Valve**

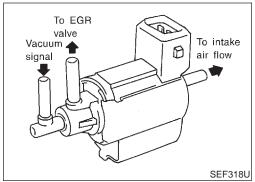
NBEC0197S02

NBEC0197S02

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening and EGRC-BPT valve operation. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

Description (Cont'd,





EGR temperature

**ECM** 

**EGR** 

temperature

SEF073P

sensor

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.



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# On Board Diagnosis Logic

If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction

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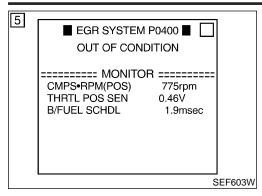
TF

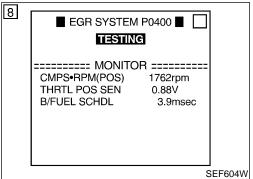
| DTC No.       | Malfunction is detected when                                | Check Items (Possible Cause)   | PD |
|---------------|---|--|----|
| P0400<br>0302 | No EGR flow is detected under condition that calls for EGR. | <ul> <li>EGR valve stuck closed</li> <li>EGRC-BPT valve</li> <li>Vacuum hoses</li> <li>EGRC-solenoid valve</li> <li>EGR passage</li> </ul> |    |
|               |   | <ul><li>EGR temperature sensor</li><li>Exhaust gas leaks</li></ul>   | SU |

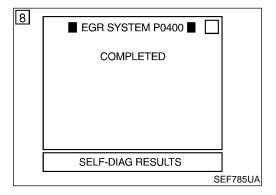
is diagnosed.

HA SC









## **DTC Confirmation Procedure**

NBEC046

#### **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.
- P0400 will not be displayed at "SELF-DIAG RESULTS" mode with CONSULT even though DTC work support test result is NG.

## **TESTING CONDITION:**

For best results, perform the test at a temperature of 5°C (41°F) or higher.

- (P) With CONSULT
- Turn ignition switch "ON".
- 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.

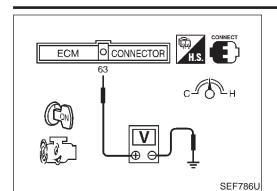
- Start engine and let it idle monitoring "COOLAN TEMP/S" value. When the "COOLAN TEMP/S" value reaches 70°C (158°F), immediately go to the next step.
- 4) Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START".
- 6) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running. If "COMPLETED" 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 60 seconds or more.)

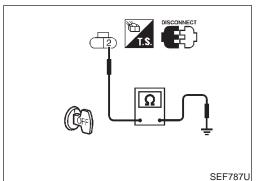
| CMPS-RPM (POS) | 1,600 - 2,400 rpm                                       |
|----------------|---|
| B/FUEL SCHDL   | 3.0 - 4.5 msec  |
| THRTL POS SEN  | X - (X + 0.7) V<br>X = Voltage value measured at step 7 |
| Selector lever | Suitable position                                       |

# 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-349.

Overall Function Check





## **Overall Function Check**

Use this procedure to check the overall EGR function. During this check, a 1st trip DTC might not be confirmed.

#### **Without CONSULT**

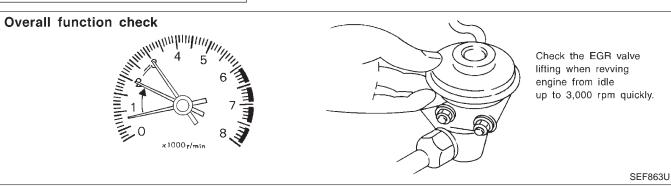
- 1) Start engine and warm it up to normal operating temperature.
- 2) Check the EGR valve lifting when revving engine from idle up to 3,000 rpm quickly under no load.

**EGR valve should lift up and down without sticking.** If NG, go to "Diagnostic Procedure", EC-349.

 Check voltage between ECM terminal 63 (EGR temperature sensor signal) and ground at idle speed.
 Less than 4.5V should exist.

If NG, go to the next step.

- 4) Turn ignition switch "OFF".
- 5) Disconnect EGR temperature sensor harness connector.
- Check harness continuity between EGR temperature sensor harness connector terminal 2 and ground.
   Continuity should exist.
- 7) Perform "EGR TEMPERATURE SENSOR", "Component Inspection", EC-474.





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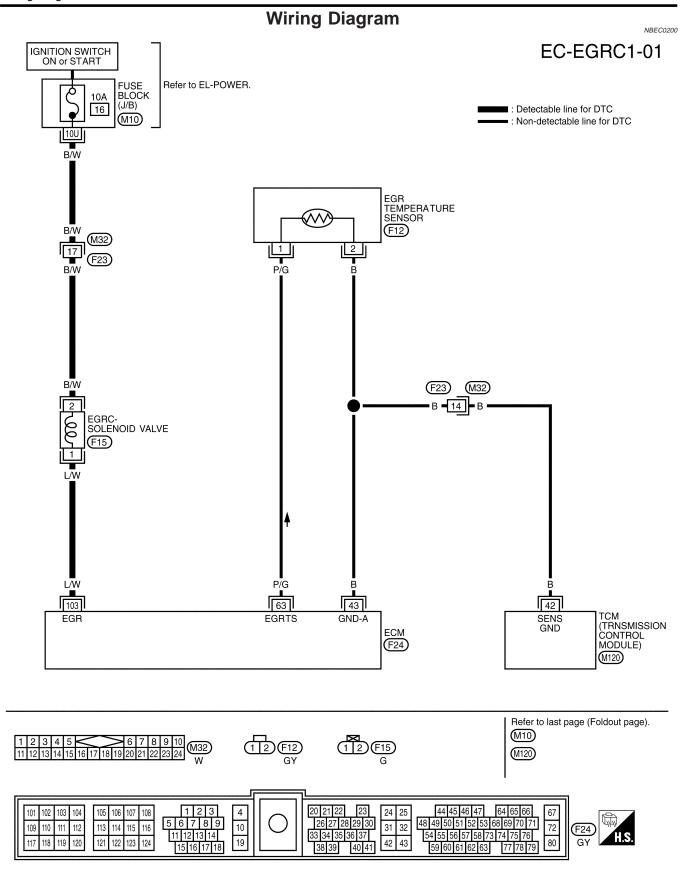
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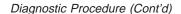
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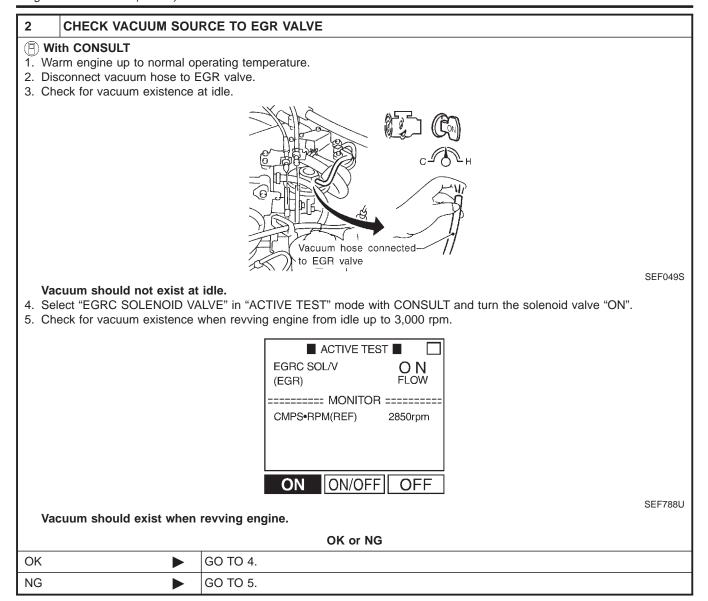
EL

# Diagnostic Procedure

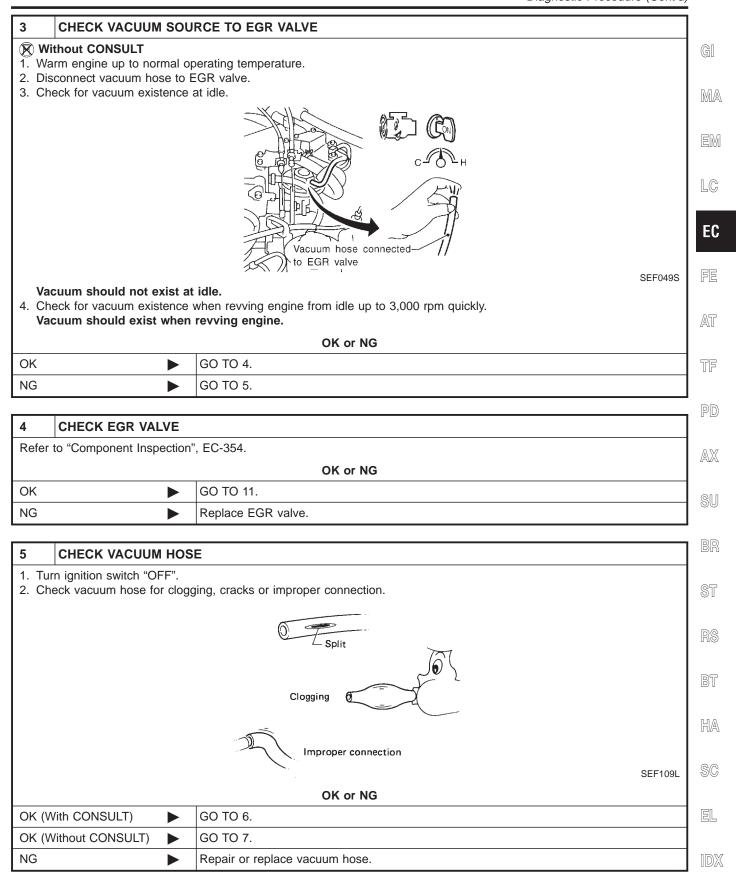
|       |  | Blagilootio i 1000aaio            | NBEC0201 |  |  |
|-------|--|-----------------------------------|----------|--|--|
| 1     | CHECK EXHAUST SYS  | STEM                              |          |  |  |
|       | Start engine.     Check exhaust pipes and muffler for leaks. |                                   |          |  |  |
|       |  |                                   |          |  |  |
|       |  |                                   | SEF099P  |  |  |
|       |  | OK or NG                          |          |  |  |
| OK (V | Vith CONSULT)  | GO TO 2.                          |          |  |  |
| OK (V | Vithout CONSULT)   | GO TO 3.                          |          |  |  |
| NG    | <b>•</b>   | Repair or replace exhaust system. |          |  |  |



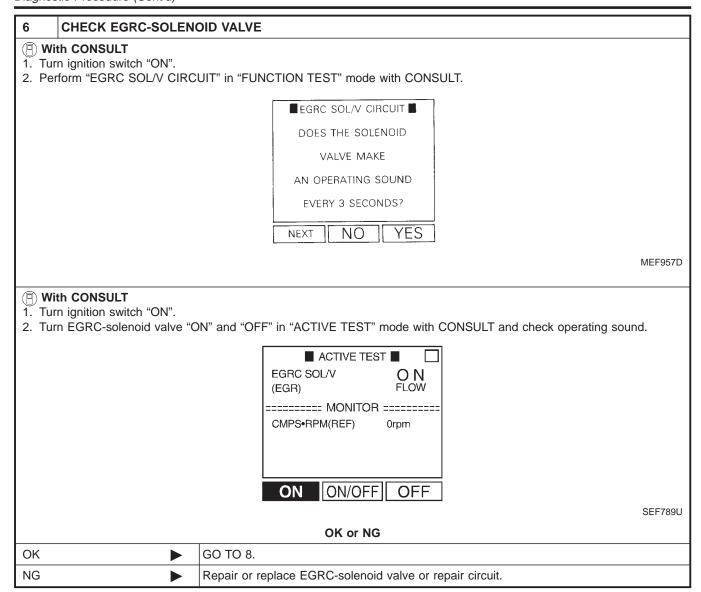




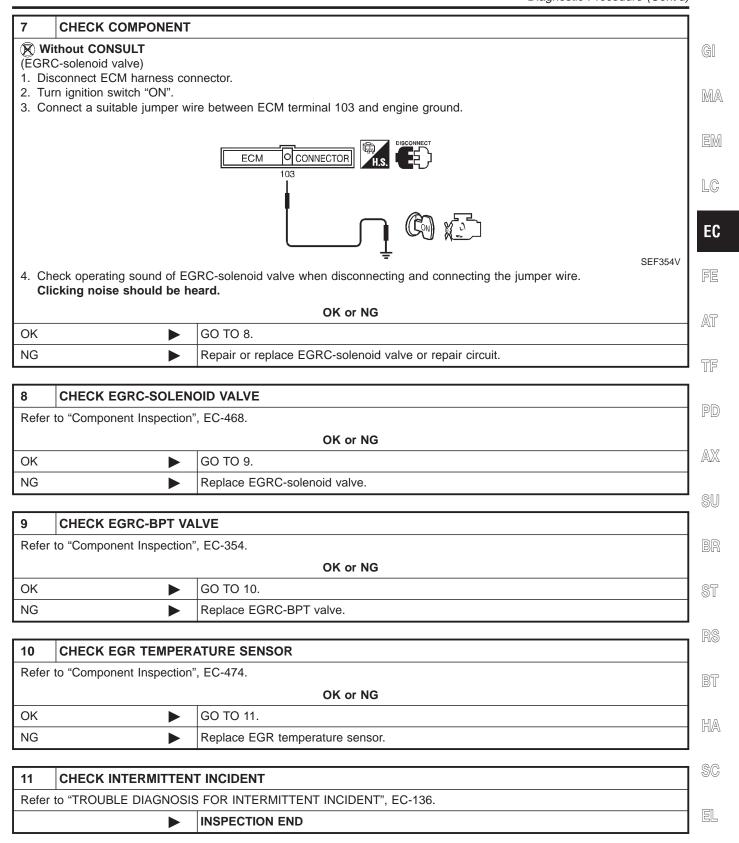
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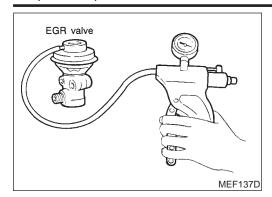












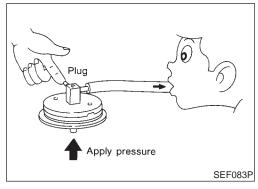
# Component Inspection EGR VALVE

NBEC0202

Apply vacuum to EGR vacuum port with a hand vacuum pump. **EGR valve spring should lift.** 

Check for sticking.

If NG, repair or replace EGR valve.



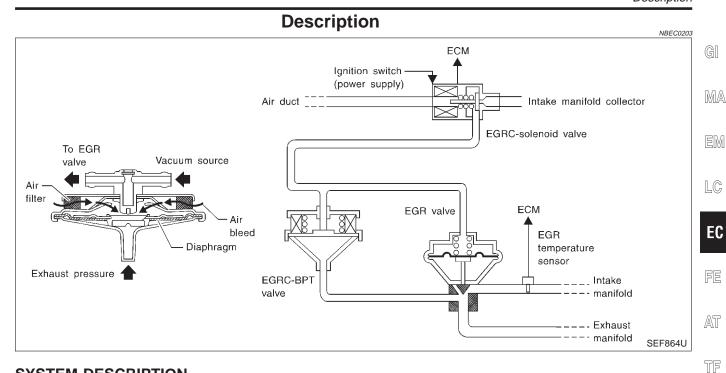
#### **EGRC-BPT VALVE**

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<sub>2</sub>O, 3.94 inH<sub>2</sub>O) from under EGRC-BPT valve.
- 3. If a leakage is noted, replace the valve.

Description





# 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

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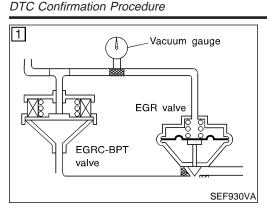
SC

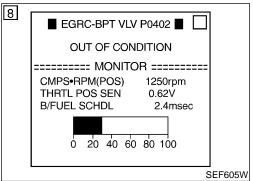
If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is large, then the vacuum to the EGR valve is interrupted through the EGRC-solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated.

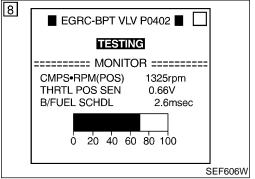
| If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated. |   | SU  |          |
|---|---|---|----------|
| DTC No.   | Malfunction is detected when                  | Check Items (Possible Cause)  |          |
| P0402<br>0306   | The EGRC-BPT valve does not operate properly. | <ul> <li>EGRC-BPT valve</li> <li>EGR valve</li> <li>Loose or disconnected rubber tube</li> <li>Blocked rubber tube</li> </ul> | BR<br>ST |
|   |   | Camshaft position sensor     Blocked exhaust system   | 91       |
|   |   | <ul><li> Orifice</li><li> Mass air flow sensor</li><li> EGRC-solenoid valve</li></ul>   | RS       |

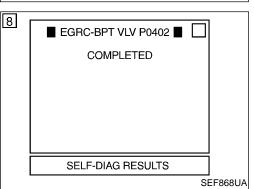
**EC-355** 

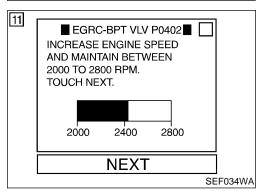












## **DTC Confirmation Procedure**

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**

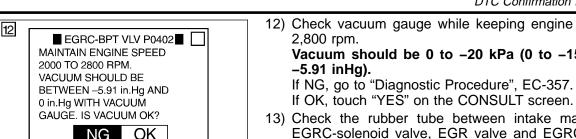
For best results, perform the test at a temperature of 5°C (41°F) or higher.

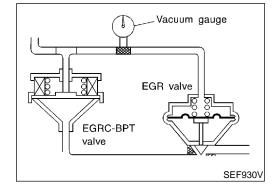
- (P) With CONSULT
- 1) Install vacuum gauge between EGRC-BPT valve and EGR valve as shown in the illustration.
- 2) Start engine and warm it up to normal operating temperature.
- 3) Stop engine and wait at least 5 seconds.
- Turn ignition switch "ON" and select "EGRC-BPT/V P0402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CON-SULT.
- 5) Start engine and let it idle.
- 6) Touch "START".
- 7) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
- B) 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 (POS) | 1,200 - 1,800 rpm  |
|----------------|--|
| Vehicle speed  | 30 - 60 km/h (19 - 37 MPH)                               |
| B/FUEL SCHDL   | 2.3 - 2.8 msec   |
| THRTL POS SEN  | X - (X + 0.88) V<br>X = Voltage value measured at step 7 |
| 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 3.
- If CONSULT instructs to carry out "OVERALL FUNCTION CHECK", go to next step. If "NG" is displayed, refer to "Diagnostic Procedure", EC-357.
- 10) Open engine hood.
- 11) Raise engine speed to 2,000 to 2,800 rpm under no-load and hold it. Then touch "NEXT" on CONSULT screen.

DTC Confirmation Procedure (Cont'd)





**-**5.91

YES

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NO

12) Check vacuum gauge while keeping engine speed 2,000 to

Vacuum should be 0 to -20 kPa (0 to -150 mmHg, 0 to

13) Check the rubber tube between intake manifold collector, EGRC-solenoid valve, EGR valve and EGRC-BPT valve for cracks, blockages or twist.

If NG, repair or replace.

If OK, touch "YES" on the CONSULT screen.

## **Overall Function Check**

Use this procedure to check the overall function of the EGRC-BPT valve. During this check, a 1st trip DTC might not be confirmed.

# **⋈** Without CONSULT

- Install vacuum gauge between EGRC-BPT valve and EGR FE valve as shown in the illustration.
- 2) Lift up vehicle.
- 3) Start engine and shift to "1st" gear or "1" position.
- Check vacuum gauge while keeping engine speed 2,000 to 2,800 rpm.

Vacuum should be 0 to -20 kPa (0 to -150 mmHg, 0 to -5.91 inHq).

If NG, go to "Diagnostic Procedure", EC-357.

If OK, go to next step.

5) Check rubber tube between intake manifold collector, EGRCsolenoid valve, EGR valve and EGRC-BPT valve for AX misconnections, cracks or blockages.

If NG, repair or replace.

# **Diagnostic Procedure**

| 1        | CHECK HOSE   |                                |  |
|----------|--|--------------------------------|--|
|          | <ol> <li>Turn ignition switch "OFF".</li> <li>Check vacuum hose for clogging and improper connection.</li> </ol> |                                |  |
| OK or NG |  |                                |  |
| OK       | <b>&gt;</b>  | GO TO 2.                       |  |
| NG       | <b>•</b>   | Repair or replace vacuum hose. |  |

| 2                                  | CHECK EXHAUST SYS | TEM                               |
|------------------------------------|-------------------|-----------------------------------|
| Check exhaust system for collapse. |                   |                                   |
| OK or NG                           |                   |                                   |
| ОК                                 | <b>•</b>          | GO TO 3.                          |
| NG                                 | <b>•</b>          | Repair or replace exhaust system. |

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| 3  | CHECK ORIFICE |                      |  |
|--|---------------|----------------------|--|
| Check if orifice is installed in vacuum hose between EGRC-BPT valve and EGRC-solenoid valve. |               |                      |  |
|  | OK or NG      |                      |  |
| OK   | OK ▶ GO TO 4. |                      |  |
| NG   | <b>&gt;</b>   | Replace vacuum hose. |  |

| 4  | CHECK EGRC-BPT VA | LVE                     |
|--|-------------------|-------------------------|
| Refer to "Component Inspection", EC-359. |                   |                         |
| OK or NG                                 |                   |                         |
| OK                                       | <b>&gt;</b>       | GO TO 5.                |
| NG                                       | <b>&gt;</b>       | Replace EGRC-BPT valve. |

| 5     | CHECK CAMSHAFT POSITION SENSOR           |                                   |  |
|-------|--|-----------------------------------|--|
| Refer | Refer to "Component inspection", EC-342. |                                   |  |
|       | OK or NG                                 |                                   |  |
| OK    | <b>&gt;</b>                              | GO TO 6.                          |  |
| NG    | <b>•</b>                                 | Replace camshaft position sensor. |  |

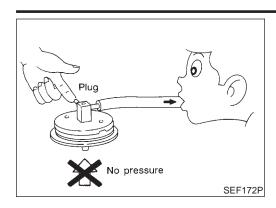
| 6  | CHECK MASS AIR FLO | DW SENSOR                     |  |
|--|--------------------|-------------------------------|--|
| Refer to "Component Inspection", EC-155. |                    |                               |  |
|  | OK or NG           |                               |  |
| OK                                       | <b>&gt;</b>        | GO TO 7.                      |  |
| NG                                       | <b>•</b>           | Replace mass air flow sensor. |  |

| 7  | 7 CHECK EGRC-SOLENOID VALVE |                              |  |
|--|-----------------------------|------------------------------|--|
| Refer to "Component Inspection", EC-468. |                             |                              |  |
|  | OK or NG                    |                              |  |
| OK                                       | OK ▶ GO TO 8.               |                              |  |
| NG                                       | •                           | Replace EGRC-solenoid valve. |  |

| 8  | CHECK EGR VALVE |                    |
|--|-----------------|--------------------|
| Refer to "Component Inspection", EC-354. |                 |                    |
| OK or NG                                 |                 |                    |
| OK                                       | <b>•</b>        | GO TO 9.           |
| NG                                       | •               | Replace EGR valve. |

| 9   | CHECK INTERMITTENT INCIDENT |  |  |
|---|-----------------------------|--|--|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                             |  |  |
|   | ► INSPECTION END            |  |  |

Component Inspection



# Component Inspection EGRC-BPT VALVE

NBEC0206

NDLOGZOO

NBEC0206S01

- I. Plug one of two ports of EGRC-BPT valve.
- Vacuum from the other port and check leakage without applying any pressure from under EGR-BPT valve.
   Leakage should exist.

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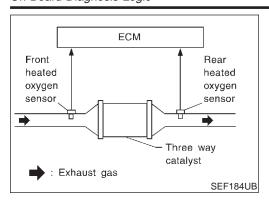
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# DTC P0420 (RIGHT BANK, -B1), P0430 (LEFT BANK, -B2) THREE WAY CATALYST FUNCTION

On Board Diagnosis Logic





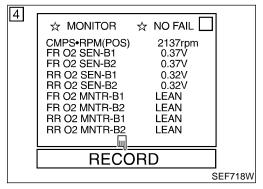
# On Board Diagnosis Logic

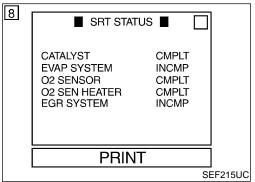
The ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.

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) | <ul> <li>Warm-up three way catalyst does not operate properly.</li> <li>Warm-up three way catalyst does not have enough oxygen storage capacity.</li> </ul> | Warm-up three way catalyst     Exhaust tube     Intake air leaks     Injectors       |
| P0430<br>0703<br>(left bank)  |   | <ul><li>Injector leaks</li><li>Spark plug</li><li>Improper ignition timing</li></ul> |





## **DTC Confirmation Procedure**

NREC0467

#### 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.

#### (P) With CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- 2) Stop vehicle with engine running.
- 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.
- 4) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constantly under no load.
- 5) 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 4, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-224.)

If the result is NG, go to "Diagnostic Procedure", EC-361. If the result is OK, go to following step.

Select "AUTO TRIG" in "DATA MONITOR" mode with CON-SULT.

#### DTC P0420 (RIGHT BANK, -B1), P0430 (LEFT BANK, -B2) THREE WAY CATALYST FUNCTION

DTC Confirmation Procedure (Cont'd)

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".

Select "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.

Verify that "CATALYST" is "CMPLT". If not "CMPLT", repeat the test from step 6.

#### **Overall Function Check**

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.

#### **(R)** Without CONSULT

- Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
- Stop vehicle with engine running.
- 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.
- Keep engine speed at 2,000 rpm constant under no load.
- 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 fre-

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. Go to "Diagnostic Procedure", EC-361.

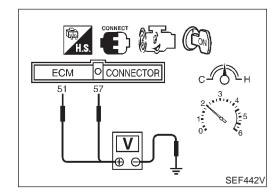
#### NOTE:

If the voltage at terminal 50 or 51 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-224.)

#### **Diagnostic Procedure**

|         | NBEC0209   |                       | 20209 |
|---------|--|-----------------------|-------|
| 1       | CHECK EXHAUST SYS                                  | TEM                   |       |
| Visuall | Visually check exhaust tubes and muffler for dent. |                       | EL    |
|         |  | OK or NG              |       |
| OK      | <b>&gt;</b>  | GO TO 2.              |       |
| NG      | •  | Repair or replace it. |       |

CONNECTOR **ECM** SFF441V



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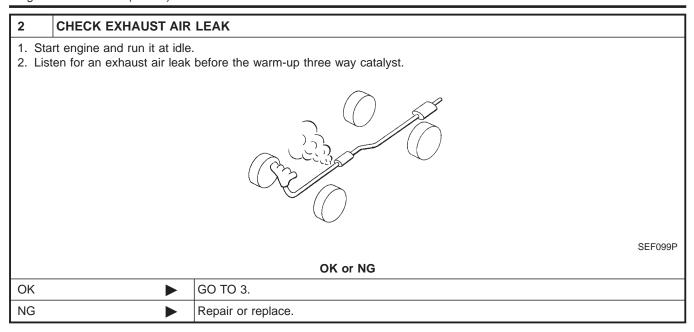




# DTC P0420 (RIGHT BANK, -B1), P0430 (LEFT BANK, -B2) THREE WAY CATALYST FUNCTION



Diagnostic Procedure (Cont'd)

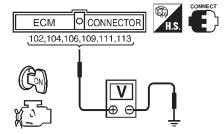


| 3      | CHECK INTAKE AIR LEAK   |                    |  |
|--------|---|--------------------|--|
| Listen | Listen for an intake air leak after the mass air flow sensor. |                    |  |
|        | OK or NG  |                    |  |
| OK     | <b>&gt;</b>   | GO TO 4.           |  |
| NG     | <b>&gt;</b>   | Repair or replace. |  |

| 4  | CHECK IGNITION TIMING  |                         |  |
|----|--|-------------------------|--|
|    | Check ignition timing. Refer to "TROUBLE DIAGNOSIS — BASIC INSPECTION", EC-99. |                         |  |
|    | OK or NG   |                         |  |
| OK | <b>&gt;</b>  | GO TO 5.                |  |
| NG | <b>&gt;</b>  | Adjust ignition timing. |  |

#### 5 CHECK INJECTORS

- 1. Refer to WIRING DIAGRAM for Injectors, EC-550.
- 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.



SEF711U

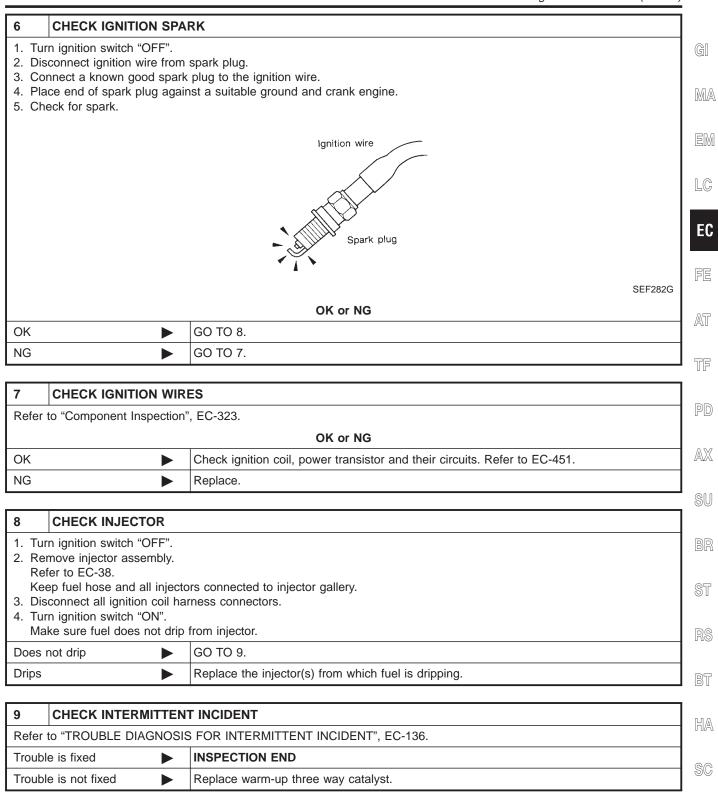
Battery voltage should exist.

OK or NG

| OK • | GO TO 6.  |
|------|---|
| NG • | Perform "Diagnostic Procedure", "INJECTOR", EC-551. |

# DTC P0420 (RIGHT BANK, -B1), P0430 (LEFT BANK, -B2) THREE WAY CATALYST FUNCTION

EL



On Board Diagnosis Logic

#### On Board Diagnosis Logic

NBEC0210

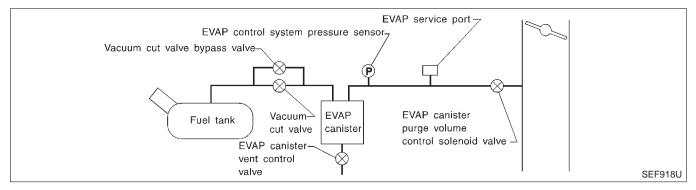
#### NOTE:

#### If DTC P0440 is displayed with P1448, perform trouble diagnosis for "DTC P1448" first. (See EC-515.)

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.     EVAP control system does not operate properly. | <ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent.</li> <li>Blocked or bent rubber tube to EVAP control system pressure sensor</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister purge volume control solenoid valve and the circuit</li> <li>Absolute pressure sensor</li> <li>Fuel tank temperature sensor</li> <li>MAP/BARO switch solenoid valve and the circuit</li> <li>Blocked or bent rubber tube to MAP/BARO switch solenoid valve</li> <li>O-ring of EVAP canister vent control valve is missing or damaged.</li> <li>Water separator</li> <li>EVAP canister is saturated with water.</li> <li>EVAP control system pressure sensor</li> </ul> |

#### **CAUTION:**

- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

DTC Confirmation Procedure

NBEC0211

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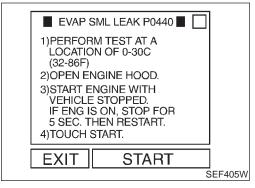
SU

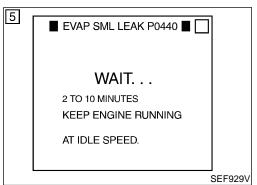
BT

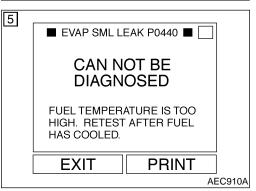
HA

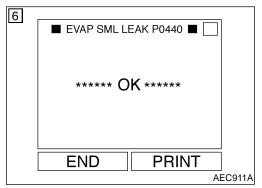
SC

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#### **DTC Confirmation Procedure**

#### NOTE:

If DTC P0440 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-515.)

• 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 and vehicle is placed on flat level surface.

 Always perform test at a temperature of 0 to 30°C (32 to 86°F).

It is better that the fuel level is low.

#### (F) With CONSULT

- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 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: 0 - 60°C (32 - 140°F)

5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.

#### NOTE:

 If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest.

(Use a fan to reduce the stabilization time.)

If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to "Basic Inspection", EC-99.

Make sure that "OK" is displayed.
If "NG" is displayed, refer to "Diagnostic Procedure", EC-366.

#### NOTE

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

#### With GST

#### NOTE:

 Be sure to read the explanation of "Driving Pattern" on EC-62 before driving vehicle.

• It is better that the fuel level is low.

- 1) Start engine.
- Drive vehicle according to "Driving Pattern", EC-62.
- 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.
- Start engine.It is not necessary to cool engine down before driving.
- Drive vehicle again according to the "Driving Pattern", EC-62.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.

#### EC-365

DTC Confirmation Procedure (Cont'd)

- If P0440 is displayed on the screen, go to "Diagnostic Procedure", EC-366.
- If P1440 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1440", EC-485.
- If P1447 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1447", EC-509.
- 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-62 before driving vehicle.
- It is better that the fuel level is low.
- 1) Start engine.
- 2) Drive vehicle according to "Driving Pattern", EC-62.
- 3) Stop vehicle.
- 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.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-366.

#### **Diagnostic Procedure**

1 CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch "OFF".
2. Check for genuine NISSAN fuel filler cap design.

NISSAN

OK or NG

OK 
Replace with genuine NISSAN fuel filler cap.

Diagnostic Procedure (Cont'd)

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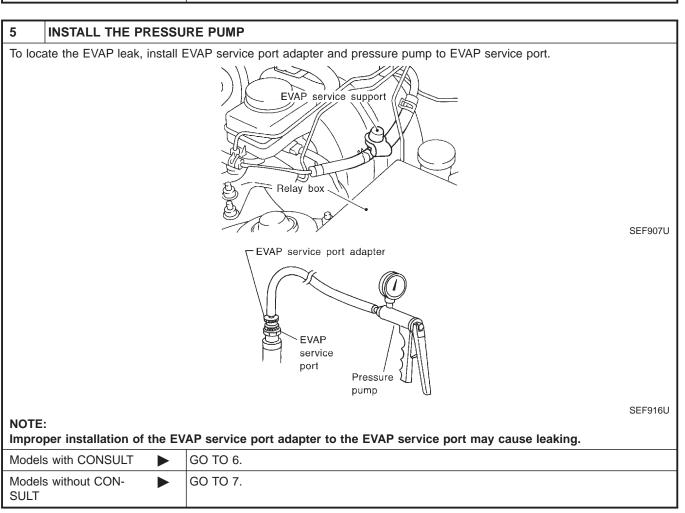
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IDX

| 2   | CHECK FUEL FILLER CAP INSTALLATION  |  |
|---|---|--|
| Check that the cap is tightened properly by rotating the cap clockwise. |   |  |
| OK or NG  |   |  |
| OK  | OK ▶ GO TO 3.   |  |
| NG  | NG  Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.  Retighten until ratcheting sound is heard. |  |

| 3  | 3 CHECK FUEL FILLER CAP FUNCTION |          |
|--|----------------------------------|----------|
| Check for air releasing sound while opening the fuel filler cap. |                                  |          |
| OK or NG   |                                  |          |
| OK   | <b>•</b>                         | GO TO 6. |
| NG   | <b>&gt;</b>                      | GO TO 4. |

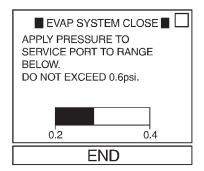
| 4   | CHECK FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP) |   |  |
|---|--|---|--|
| Refer to "Fuel Tank Vacuum Relief Valve (Built into fuel filler cap)", EC-31. |  |   |  |
|   | OK or NG   |   |  |
| OK  | <b>•</b>   | GO TO 5.                                    |  |
| NG  | <b>•</b>   | Replace fuel filler cap with a genuine one. |  |



Diagnostic Procedure (Cont'd)

#### **CHECK FOR EVAP LEAK**

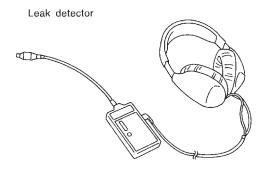
- (P) With CONSULT
- 1. Turn ignition switch "ON".
- 2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
- 3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph. **NOTE:**
- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm², 0.6 psi) of pressure in the system.



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-34.



SEF200U

OK or NG

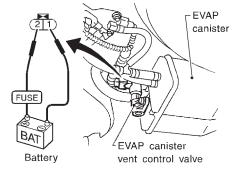
| OK • | GO TO 8.           |
|------|--------------------|
| NG • | Repair or replace. |

Diagnostic Procedure (Cont'd)

#### 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.)



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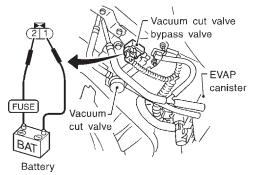
EC

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3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)

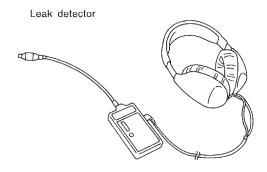


SEF599U

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.

#### NOTE:

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details about the leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-34.



SEF200U

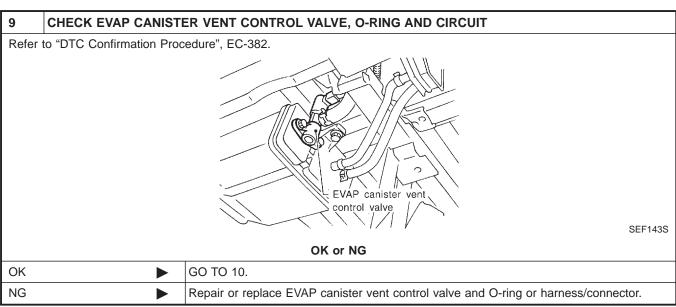
| OK | or | NG |
|----|----|----|
|----|----|----|

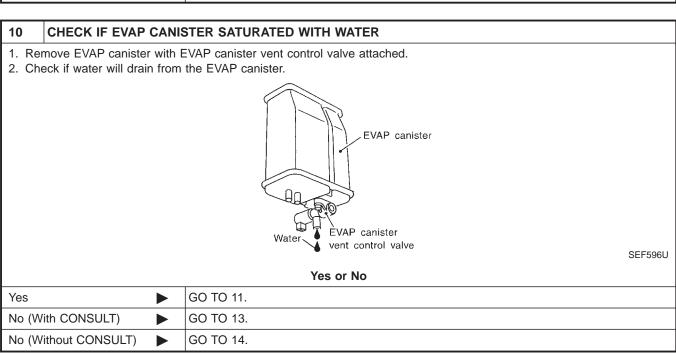
| OK • | GO TO 8.           |
|------|--------------------|
| NG ▶ | Repair or replace. |

HA

SC

| 8     | 8 CHECK WATER SEPARATOR                  |                          |  |
|-------|--|--------------------------|--|
| Refer | Refer to "Component Inspection", EC-506. |                          |  |
|       | OK or NG                                 |                          |  |
| OK    | <b>&gt;</b>                              | GO TO 9.                 |  |
| NG    | <b>&gt;</b>                              | Replace water separator. |  |

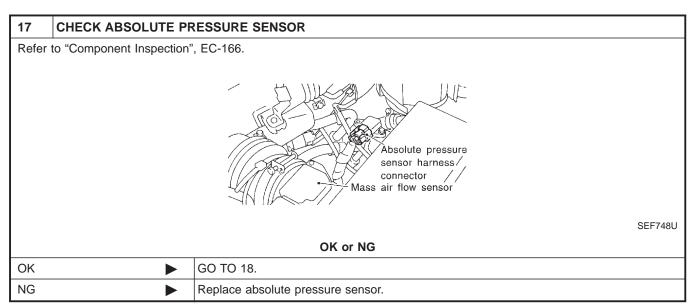


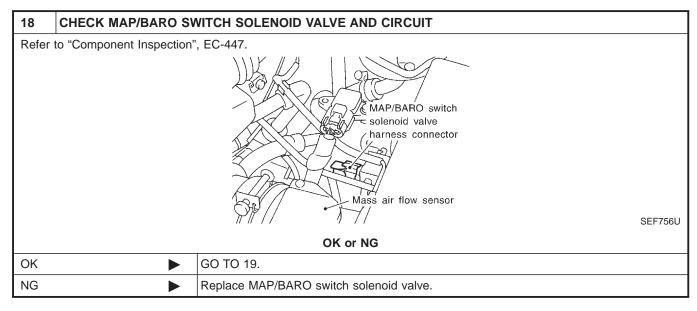


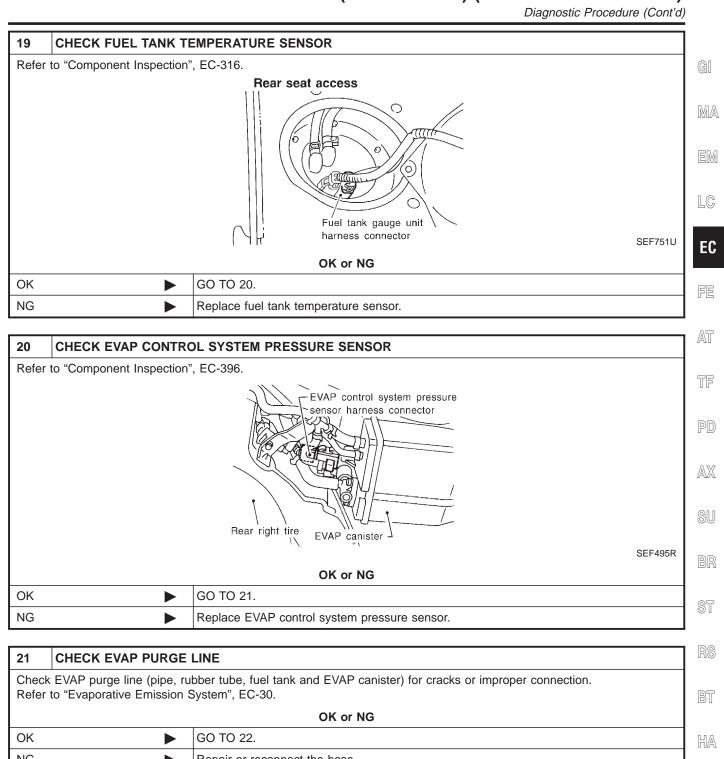
|  |               | Diagnostic Procedure (Contro  |            |
|--|---------------|---|------------|
| 11 CHECK EV  | AP CANIS      | TER   | 7          |
|  |               | he EVAP canister vent control valve attached.                                     | GI         |
| The weight should  | d be less th  |   |            |
|  |               | OK or NG  |            |
| OK (With CONSUL  |               | GO TO 13.   | 4          |
| OK (Without CONS   |               | GO TO 14.   |            |
| NG   | <u> </u>      | GO TO 12.   |            |
| 12 DETECT M  | AL ELINCTI    | ONING PART  | 7 LC       |
| Check the following  |               | UNING FACT  | ┨ <u></u>  |
| <ul> <li>EVAP canister fo</li> </ul>                       | r damage      |   | EC         |
| EVAP hose betw   | een EVAP o    | anister and water separator for clogging or poor connection                       |            |
|  |               | Repair hose or replace EVAP canister.   |            |
| 42 CUECK EV  | AD CANIC      | TER RUBOE VOLUME CONTROL COLENOIS VALVE OBERATION                                 | ٦          |
|  |               | TER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION                                 | AT         |
| <ul><li>With CONSULT</li><li>Disconnect vacu</li></ul>     |               | EVAP canister purge volume control solenoid valve at EVAP service port.           | 240        |
| 2. Start engine.   | VOL CONT      | 0.00 in (6.0 CT) /F TF CT) and a  |            |
|  |               | /V" in "ACTIVE TEST" mode. ereen to increase "PURG VOL CONT/V" opening to 100.0%. |            |
| <ol><li>Check vacuum h</li></ol>                           | nose for vac  | uum when revving engine up to 2,000 rpm.  | P          |
|  |               | ■ ACTIVE TEST ■   |            |
|  |               | PURG VOL CONT/V 0.0%  | Δ2         |
|  |               | ======== MONITOR =======  |            |
|  |               | CMPS•RPM(REF) 2187rpm<br>FR O2 MNTR-B2 LEAN                                       |            |
|  |               | FR O2 MNTR-B1 LEAN A/F ALPHA-B2 91%   |            |
|  |               | A/F ALPHA-B1 90%  | l          |
|  |               | Qu UP DWN Qd  | B          |
|  |               | Qu  UP   DWN  Qd  |            |
| Vacuum should  | l exist.      | SE1 3000  | Sī         |
|  |               | OK or NG  |            |
| OK   | <b>•</b>      | GO TO 17.   |            |
| NG   | <b>•</b>      | GO TO 15.   | ╛          |
|  |               |   | <b>B</b> 1 |
|  |               | TER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION                                 | 4          |
| Without CONS   |               | to normal operating temperature   | H          |
| <ol> <li>Start engine and</li> <li>Stop engine.</li> </ol> | ı wanın il up | to normal operating temperature.  |            |
| <ol><li>Disconnect vacu</li></ol>                          |               | EVAP canister purge volume control solenoid valve at EVAP service port.           | S          |
|  |               | r at least 80 seconds.<br>uum when revving engine up to 2,000 rpm.                |            |
| Vacuum should  |               | 0 - 0 1 ··· / 1   | E          |
|  |               | OK or NG  |            |
| OK   | <b>•</b>      | GO TO 17.   |            |
| NG   | <b>•</b>      | GO TO 15.   | 1          |

| 15   | 5 CHECK VACUUM HOSE |                               |  |  |
|--|---------------------|-------------------------------|--|--|
| Check vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-24. |                     |                               |  |  |
|  | OK or NG            |                               |  |  |
| OK   | OK 🕨 GO TO 14.      |                               |  |  |
| NG   | •                   | Repair or reconnect the hose. |  |  |

| 16    | CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE       |  |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "Component Inspection", EC-380.                      |  |  |  |  |
|       | OK or NG  |  |  |  |  |
| OK    | OK  |  |  |  |  |
| NG    | NG Replace EVAP canister purge volume control solenoid valve. |  |  |  |  |







| 21  | 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-30. |                                  |  |  |  |  |
|   | OK or NG                         |  |  |  |  |
| OK  | OK ▶ GO TO 22.                   |  |  |  |  |
| NG  | NG Repair or reconnect the hose. |  |  |  |  |

| 22    | CLEAN EVAP PURGE LINE  |  |  |  |
|-------|--|--|--|--|
| Clean | Clean EVAP purge line (pipe and rubber tube) using air blower. |  |  |  |
|       | ▶ GO TO 23.  |  |  |  |

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| 23    | CHECK INTERMITTENT INCIDENT                                     |  |  |  |
|-------|---|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |  |
|       | ► INSPECTION END  |  |  |  |

Description

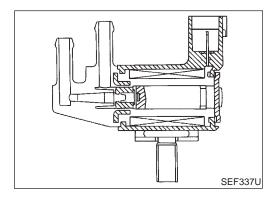
# Description SYSTEM DESCRIPTION

NBEC0214

NBEC0214S01

|                                   |  |                 | NDE-00214301               |  |
|-----------------------------------|--|-----------------|----------------------------|--|
| Sensor                            | Input Signal to ECM  | ECM<br>function | Actuator                   |  |
| Camshaft position sensor          | Engine speed   |                 |                            |  |
| Mass air flow sensor              | Amount of intake air   |                 |                            |  |
| Engine coolant temperature sensor | Engine coolant temperature                                       |                 |                            |  |
| Ignition switch                   | Start signal   |                 |                            |  |
| Throttle position sensor          | Throttle position  | ister hilitae i | EVAP canister purge volume |  |
| Throttle position switch          | Closed throttle position   | flow control    | control solenoid valve     |  |
| Front heated oxygen sensors       | Density of oxygen in exhaust gas (Mixture ratio feedback signal) |                 |                            |  |
| Fuel tank 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.



#### **COMPONENT DESCRIPTION**

NREC0214S0

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**

Specification data are reference values.

NBEC0215

| MONITOR ITEM | CONDITION   |                        | SPECIFICATION |
|--------------|---|------------------------|---------------|
| PURG VOL C/V | <ul><li>Engine: After warming up</li><li>Air conditioner switch "OFF"</li></ul> | Idle (Vehicle stopped) | 0%            |
|              | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>                              | 2,000 rpm              | _             |

ECM Terminals and Reference Value

#### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

NBEC0216

#### CAUTION

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| GI |
|----|
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| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM   | CONDITION  | DATA (DC Voltage)                                | EM       |    |
|----------------------|---------------|--|--|--|----------|----|
| 4                    | L/B           | ECCS relay (Self-shut-                                 | [Engine is running] [Ignition switch "OFF"]  ● For a few seconds after turning ignition switch "OFF" | 0 - 1.5V   | LC       |    |
|                      |               | off)   | [Ignition switch "OFF"]  ■ A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V)                    | EC       |    |
|                      |               |  | [Engine is running]  | BATTERY VOLTAGE<br>(11 - 14V)<br>(V)<br>40<br>20 | FE       |    |
|                      |               | ● Idle speed  EVAP canister purge volume control sole- |  | 50 ms SEF994U                                    | TF<br>PD |    |
| 5                    |               |  | BATTERY VOLTAGE<br>(11 - 14V)<br>(V)   |  |          |    |
|                      |               |  | • Engine speed is 2,000 rpm (More than 100 see   | Engine speed is 2,000 rpm (More than 100 sec-    | 0        | SU |
|                      |               |  |  | 50 ms SEF995U                                    | BR       |    |
| 67                   | B/W           | Power supply for ECM                                   | [Ignition switch "ON"]   | BATTERY VOLTAGE                                  | ST       |    |
| 72                   | B/W           | Fower supply for ECIVI                                 | lightion switch ON J   | (11 - 14V)                                       | <u> </u> |    |
| 117                  | B/W           | Current return   | [Engine is running]  • Idle speed  | BATTERY VOLTAGE<br>(11 - 14V)                    | RS       |    |

#### On Board Diagnosis Logic

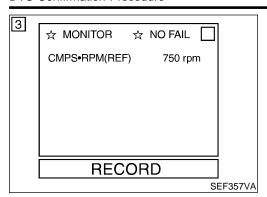
NBEC0217

| DTC No.       | Malfunction is detected when                                 | Check Items (Possible Cause)   |
|---------------|--|--|
| P0443<br>1008 | An improper voltage signal is sent to ECM through the valve. | <ul> <li>Harness or connectors<br/>(The valve circuit is open or shorted.)</li> <li>EVAP canister purge volume control solenoid<br/>valve</li> </ul> |

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DTC Confirmation Procedure



#### **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.

- (P) 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.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-378.

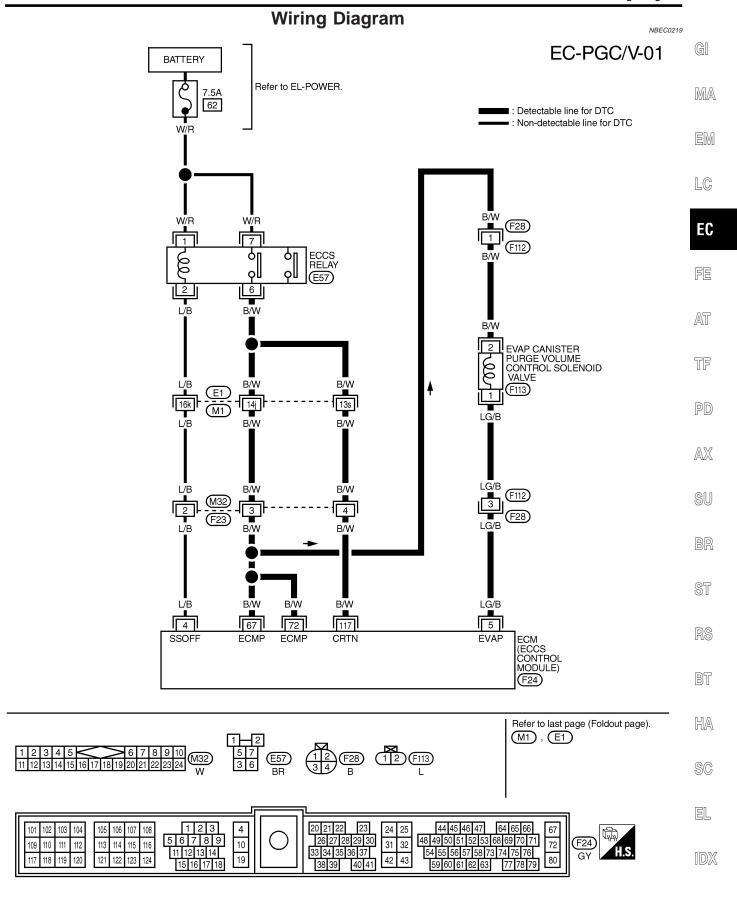
#### **With GST**

- 1) Start engine and let it idle for at least 13 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-378.

#### 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.
- Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-378.

Wiring Diagram



MEC061D

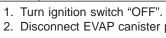
Diagnostic Procedure

#### **Diagnostic Procedure**

NBEC0220

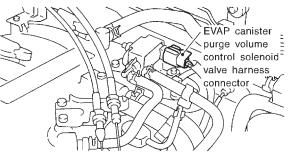
SEF879U

SEF880U



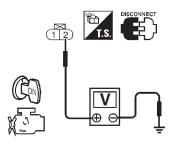
**CHECK POWER SUPPLY** 

2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



3. Turn ignition switch "ON".

4. Check voltage between terminal 2 and ground with CONSULT or tester.



Voltage: Battery voltage

OK or NG

| OK • | GO TO 3. |
|------|----------|
| NG ► | GO TO 2. |

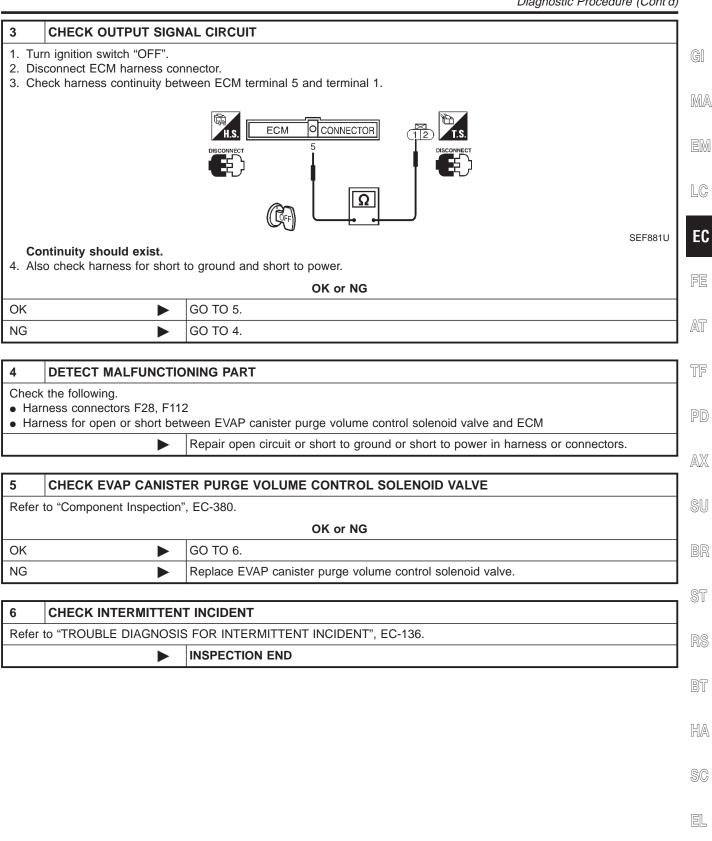
#### 2 DETECT MALFUNCTIONING PART

Check the following.

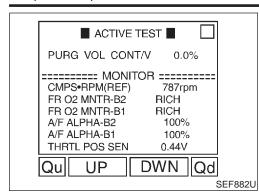
- Harness connectors E1, M1
- Harness connectors M32, F23
- Harness connectors F28, F112
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECCS relay
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

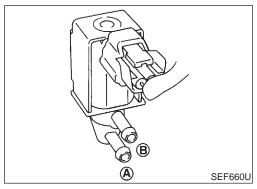
Repair harness or connectors.

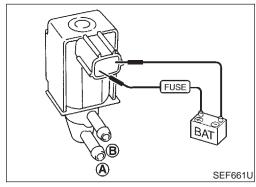
Diagnostic Procedure (Cont'd)



Component Inspection







#### **Component Inspection EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE**

NBEC0221

NBEC0221S01

(P) With CONSULT

- 1. Start engine.
- 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.
- Check air passage continuity.

| Condition PURG VOL CONT/V value | Air passage continuity between A and B |  |
|---------------------------------|--|--|
| 100.0%                          | Yes                                    |  |
| 0.0%                            | No                                     |  |

If NG, replace the EVAP canister purge volume control solenoid valve.

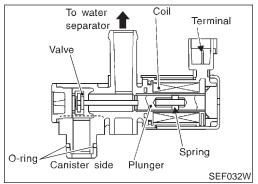
#### **⋈** Without CONSULT

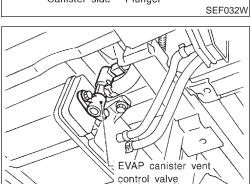
Check air passage continuity.

| Condition                                   | Air passage continuity<br>between A and B |  |
|---|---|--|
| 12V direct current supply between terminals | Yes                                       |  |
| No supply                                   | No  |  |

If NG or operation takes more than 1 second, replace solenoid valve.

Component Description





#### **Component Description**

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.

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# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

SEF143S

| MONITOR ITEM | CONDITION             | SPECIFICATION |
|--------------|-----------------------|---------------|
| VENT CONT/V  | • Ignition switch: ON | OFF           |

#### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

NBEC0224

NBEC0223

**CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION              | DATA (DC Voltage)             |
|----------------------|---------------|----------------------------------|------------------------|-------------------------------|
| 108                  | G/R           | EVAP canister vent control valve | [Ignition switch "ON"] | BATTERY VOLTAGE<br>(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     (The valve circuit is open or shorted.)     EVAP canister vent control valve |

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#### **DTC Confirmation Procedure**

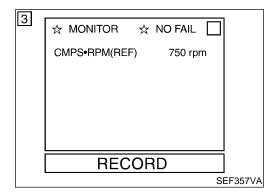
NBEC0226

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.



#### (P) With CONSULT

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 8 seconds.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

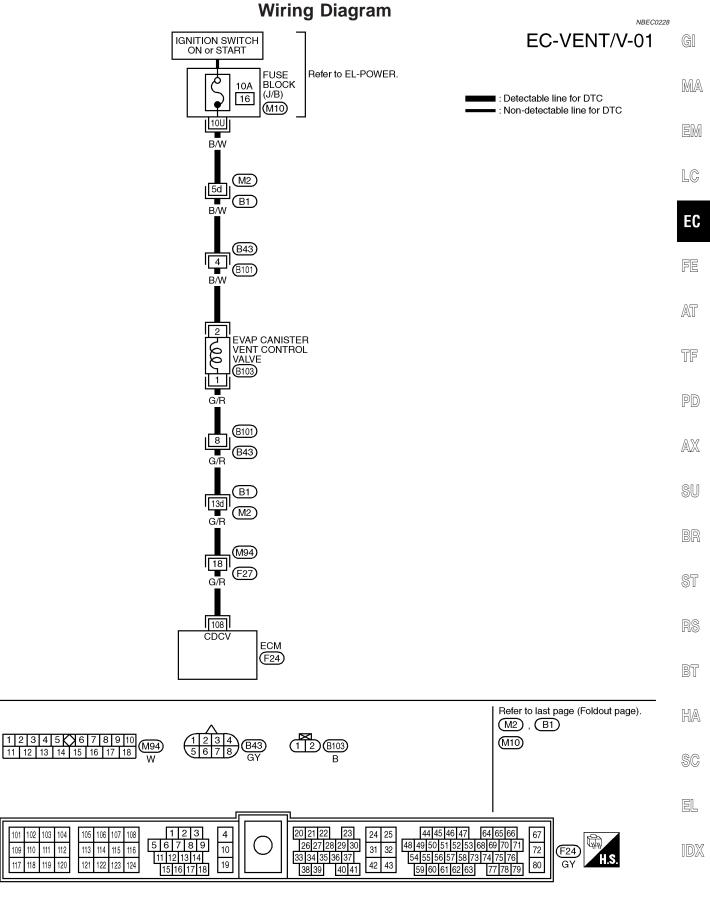
#### **With GST**

- 1) Start engine and wait at least 8 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

#### No Tools

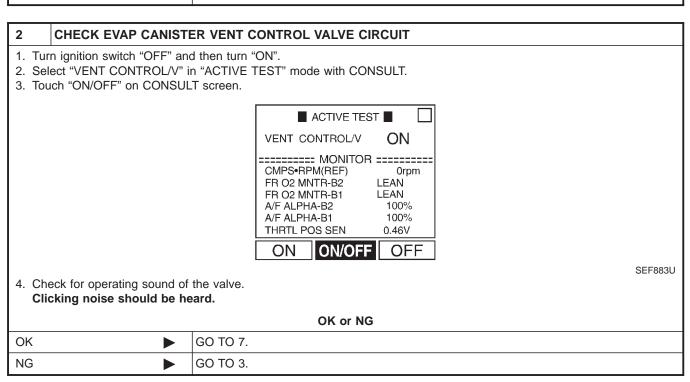
- 1) Start engine and wait at least 8 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

Wiring Diagram

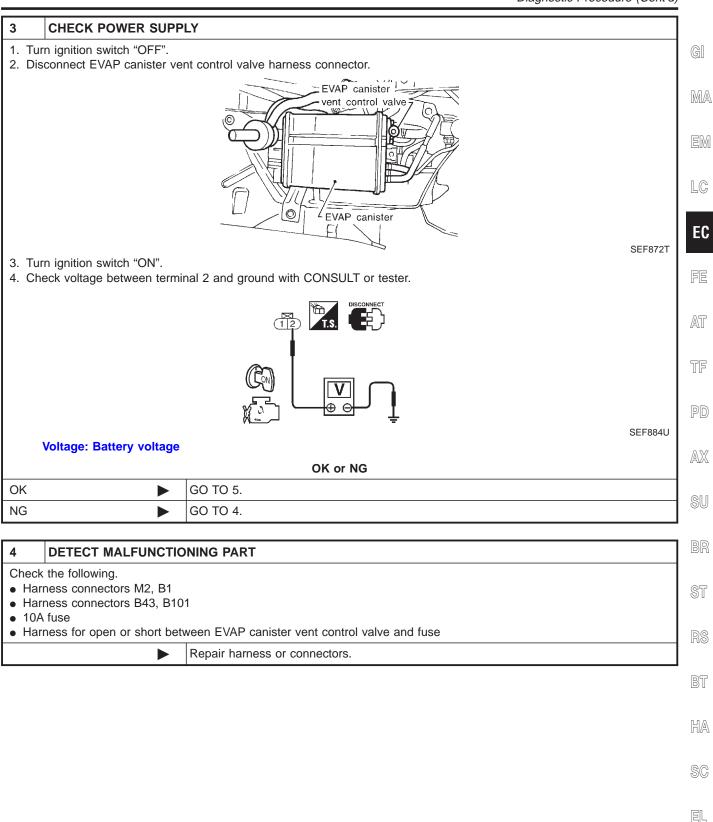


Diagnostic Procedure

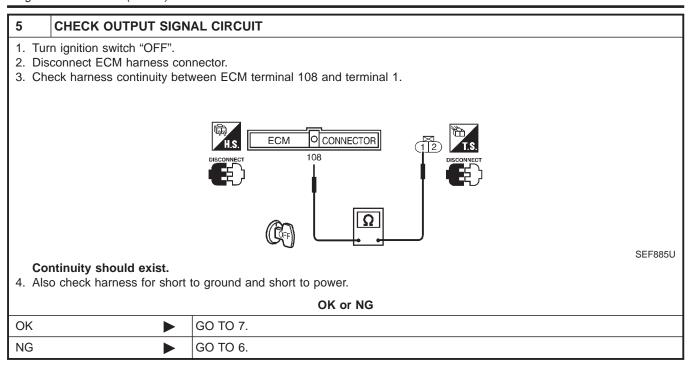
#### 



Diagnostic Procedure (Cont'd)



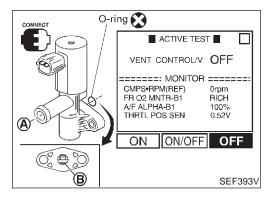
Diagnostic Procedure (Cont'd)



| 6  | DETECT MALFUNCTIONING PART |  |
|--|----------------------------|--|
| Check the following.  • Harness connectors B101, B43                               |                            |  |
| <ul> <li>Harness connectors B1, M2</li> <li>Harness connectors M94, F27</li> </ul> |                            |  |
| Harness for open or short between EVAP canister vent control valve and ECM         |                            |  |
|  | <b>•</b>                   | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7                                       | CHECK EVAP CANISTER VENT CONTROL VALVE |   |  |
|---|--|---|--|
| Refer to "Component Inspection" EC-386. |  |   |  |
| OK or NG                                |  |   |  |
| OK                                      | <b>&gt;</b>                            | GO TO 8.                                  |  |
| NG                                      | <b>•</b>                               | Replace EVAP canister vent control valve. |  |

| 8     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |



# **Component Inspection EVAP CANISTER VENT CONTROL VALVE**

NBEC0230

NBEC0230S01

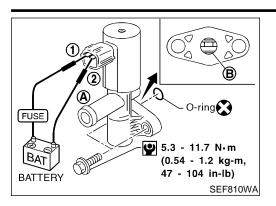
Check air passage continuity.

(P) With CONSULT

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

| Condition<br>VENT CONTROL/V | Air passage continuity between <b>A</b> and <b>B</b> |
|-----------------------------|--|
| ON                          | No   |
| OFF                         | Yes  |

Component Inspection (Cont'd)



| Without CONSULT                                     |  |  |
|---|--|--|
| Condition   | Air passage continuity between <b>A</b> and <b>B</b> |  |
| 12V direct current supply between terminals 1 and 2 | No   |  |
| No supply   | Yes  |  |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

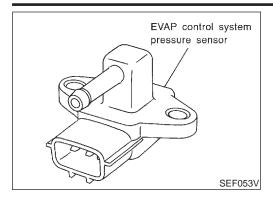
If portion B is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

G[ MA LC EC FE AT TF PD AXSU BR ST RS BT HA SC EL

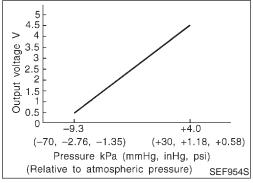
# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSURED SENSOR

Component Description



#### **Component Description**

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.



# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0232

| 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 ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                                | CONDITION  | DATA (DC Voltage)  |
|----------------------|---------------|-------------------------------------|--|--------------------|
| 42                   | P/B           | Sensors' power supply               | [Ignition switch "ON"]                                 | Approximately 5V   |
| 43                   | В             | Sensors' ground                     | [Engine is running]  • Warm-up condition  • Idle speed | Approximately 0V   |
| 62                   | G/B           | EVAP control system pressure sensor | [Ignition switch "ON"]                                 | Approximately 3.4V |

# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR SENSOR

On Board Diagnosis Logic

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NBEC0235

|               | On Board Diagnosis Logic  |   |   |  |  |
|---------------|---|---|---|--|--|
| 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. | <ul> <li>Harness or connectors         (The EVAP control system pressure sensor circuit is open or shorted.)</li> <li>Rubber hose to EVAP control system pressure sensor is clogged, vent, kinked, disconnected or improper connection.</li> <li>EVAP control system pressure sensor</li> </ul> |   |  |  |
|               |   | <ul> <li>EVAP canister vent control valve</li> <li>EVAP canister purge volume control solenoid valve</li> </ul>   |   |  |  |
|               |   | <ul> <li>EVAP canister</li> <li>Rubber hose from EVAP canister vent control<br/>valve to water separator</li> </ul>   |   |  |  |

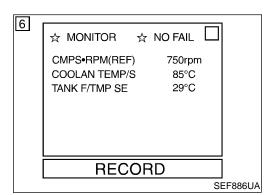
#### **DTC Confirmation Procedure**

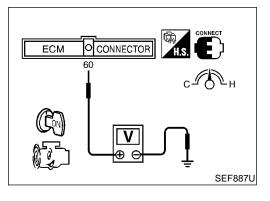
NOTF:

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.





#### (II) 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.
- 7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-392.

#### **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.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-392.

#### No Tools

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

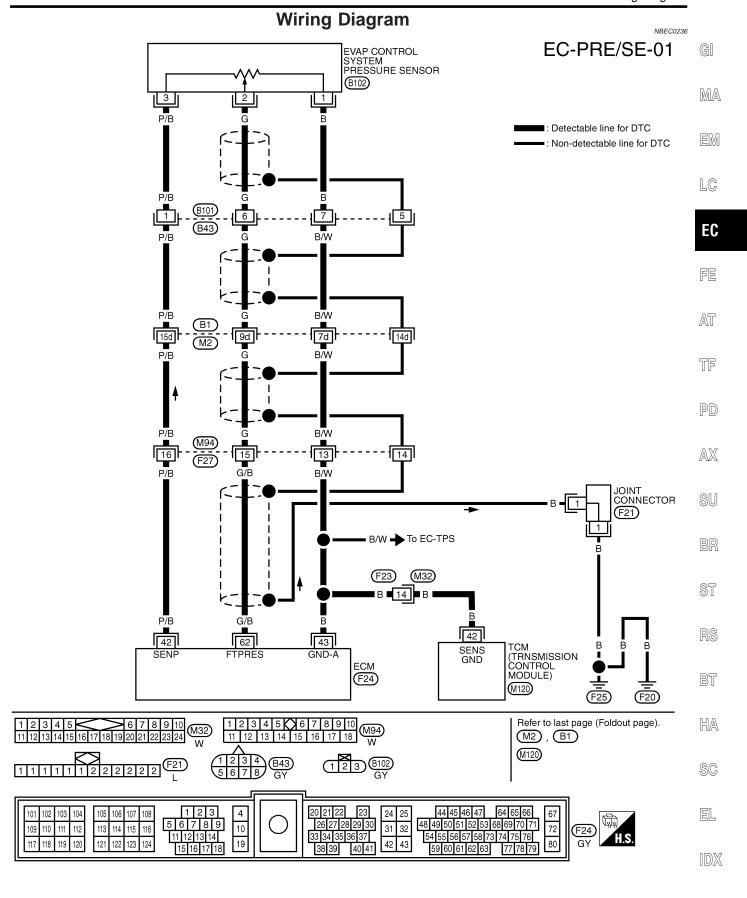
#### **EC-389**

# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR SENSOR

DTC Confirmation Procedure (Cont'd)

- 2) Check that voltage between ECM terminal 60 (Fuel tank 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.
- 7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-392.

Wiring Diagram



# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR SENSOR

Diagnostic Procedure

# 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. EVAP control system pressure sensor harness connector

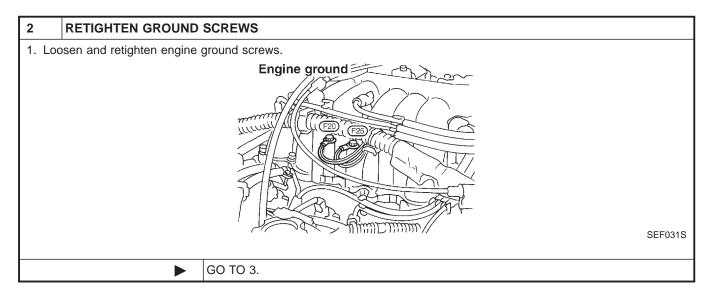
OK or NG

EVAP canister

SEF495R

| OK | <b></b> | GO TO 2.                      |
|----|---------|-------------------------------|
| NG | <b></b> | Reconnect, repair or replace. |

Rear right tire



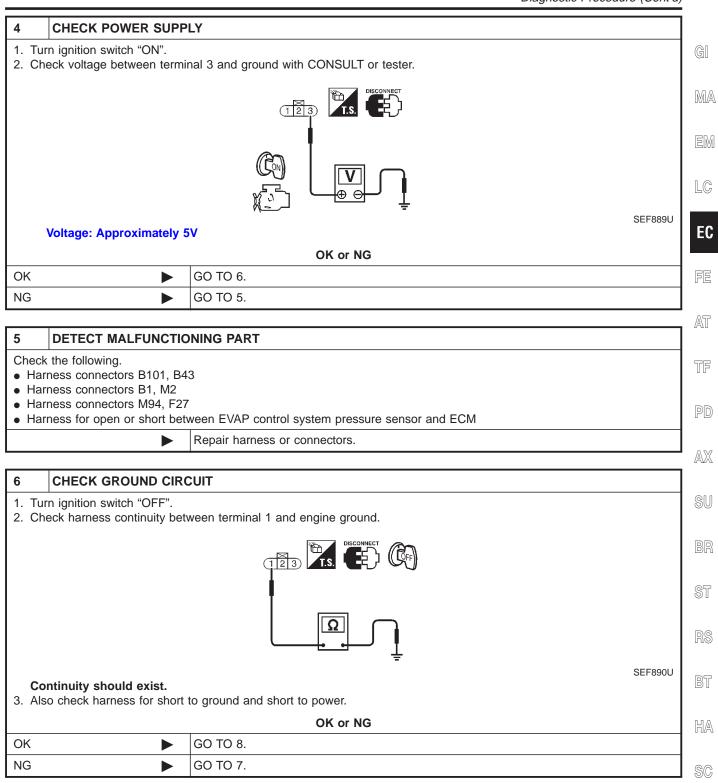
| 3      | CHECK CONNECTOR   |                                      |  |  |
|--------|---|--------------------------------------|--|--|
| 2. Che | Disconnect EVAP control system pressure sensor harness connector.     Check sensor harness connector for water.     Water should not exist. |                                      |  |  |
|        | OK or NG  |                                      |  |  |
| OK     | <b>•</b>  | GO TO 4.                             |  |  |
| NG     | <b>•</b>  | Repair or replace harness connector. |  |  |

# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR

Diagnostic Procedure (Cont'd)

EL

[DX



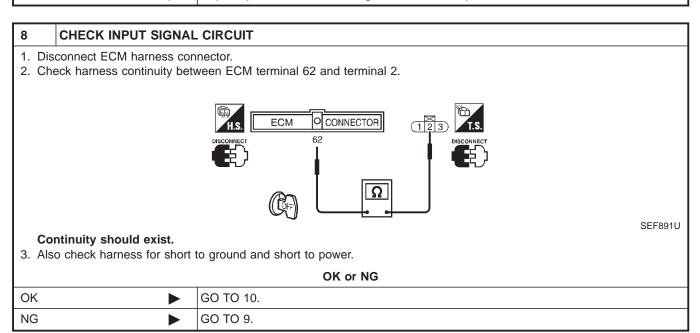
# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR

Diagnostic Procedure (Cont'd)

#### DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B101, B43
- Harness connectors B1, M2
- Harness connectors M94, F27
- Harness connectors F23, M32
- Harness for open or short between EVAP control system pressure sensor and ECM
- 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.



#### 9 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B101, B43
- Harness connectors B1, M2
- Harness connectors M94, F27
- 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    | 10 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE |  |  |  |
|-------|--|--|--|--|
| Refer | Refer to "Component Inspection", EC-380.                   |  |  |  |
|       | OK or NG   |  |  |  |
| OK    | <b>&gt;</b>  | GO TO 11.  |  |  |
| NG    | <b>•</b>   | Replace EVAP canister purge volume control solenoid valve. |  |  |

| 11    | 11 CHECK EVAP CANISTER VENT CONTROL VALVE |   |  |  |
|-------|---|---|--|--|
| Refer | Refer to "Component Inspection", EC-386.  |   |  |  |
|       | OK or NG                                  |   |  |  |
| OK    | <b>•</b>                                  | GO TO 12.                                 |  |  |
| NG    | <b>•</b>                                  | Replace EVAP canister vent control valve. |  |  |

# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR SENSOR

| Replace EVAP control system pressure sensor.    CHECK RUBBER TUBE   |   | onent Inspection   | ", EC-396.   |
|---|---|--|--|
| Replace EVAP control system pressure sensor.    CHECK RUBBER TUBE   |   |  | OK or NG   |
| 13 CHECK RUBBER TUBE  1. Check obstructed water separator and rubber tube connected to EVAP canister vent control valve. For water separator, refer to EC-506.  2. Clean the rubber tube using air blower.  OK or NG  OK  OK  OK  OK  OK  OK  OK  OK  OR  OK  OK  | OK  | <b>•</b>   | GO TO 13.  |
| 1. Check obstructed water separator and rubber tube connected to EVAP canister vent control valve. For water separator, refer to EC-506. 2. Clean the rubber tube using air blower.  OK or NG  OK   | NG  | <b>&gt;</b>  | Replace EVAP control system pressure sensor.   |
| 1. Check obstructed water separator and rubber tube connected to EVAP canister vent control valve. For water separator, refer to EC-506. 2. Clean the rubber tube using air blower.  OK or NG  OK   OK or NG  OK   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.  Yes or No  Yes   GO TO 15.  No   GO TO 17.  15 CHECK EVAP CANISTER  Weight the EVAP canister with the EVAP canister vent control valve attached.  OK or NG  OK   GO TO 17.  OK or NG  OK   GO TO 16.   |   |  |  |
| refer to EC-506. 2. Clean the rubber tube using air blower.  OK or NG  OK  OK  OK  OK  OK  OK  OK  OK  OK  O  |   |  |  |
| OK or NG  OK Sor 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.  EVAP canister  Vent control valve  SEF596U  Yes OR TO 15.  No Sor NO  CHECK EVAP CANISTER  Weight 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 Sor NG |   | -  | arator and rubber tube connected to EVAP canister vent control valve. For water separator,   |
| OK  |   |  | air blower.  |
| 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.  EVAP canister vent control valve  Yes or No  Yes  |   |  | OK or NG   |
| 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.  EVAP canister  vent control valve  Yes or No  Yes   | OK  | <b></b>  | GO TO 14.  |
| 1. Remove EVAP canister with EVAP canister vent control valve attached. 2. Check if water will drain from the EVAP canister.  EVAP canister  vent control valve  Yes or No  Yes OT 0 15.  No OT 0 17.  CHECK EVAP CANISTER  Weight 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 OK OT 0 17.  | NG  | <b>•</b>   | Clean, repair or replace rubber tube and/or water separator.   |
| 1. Remove EVAP canister with EVAP canister vent control valve attached. 2. Check if water will drain from the EVAP canister.  EVAP canister  vent control valve  Yes or No  Yes OT 0 15.  No OT 0 17.  CHECK EVAP CANISTER  Weight 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 OK OT 0 17.  |   |  | •  |
| 2. Check if water will drain from the EVAP canister.  EVAP canister  Water vent control valve  Yes or No  Yes OT 0 15.  No OT 0 17.  CHECK EVAP CANISTER  Weight 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 OK OT 0 17.  | 14 CHECK  | IF EVAP CANI   | STER SATURATED WITH WATER  |
| Yes or No  Yes or No  Yes Of TO 15.  No   |   |  | - · · · · · · · · · · · · · · · · · · ·  |
| Yes   | <ol><li>Check if wat</li></ol>  | ter will drain from  | the EVAP canister.   |
| Yes   |   |  |  |
| Yes   |   |  |  |
| Yes or No  Yes  |   |  | EVAP canister  |
| Yes or No  Yes  |   |  |  |
| Yes or No  Yes  |   |  |  |
| Yes or No  Yes  |   |  |  |
| Yes or No  Yes  |   |  | An A   |
| Yes or No  Yes  |   |  |  |
| Yes   |   |  | EVAP canister  |
| No  |   |  | Water vent control valve   |
| No  |   |  | Water Vent control valve SEF596U   |
| 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  | Yes   | <b>•</b>   | Water EVAP canister vent control valve  Yes or No  |
| 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  |   | <b>&gt;</b>  | Water EVAP canister vent control valve  Yes or No  GO TO 15.   |
| The weight should be less than 1.8 kg (4.0 lb).  OK or NG  OK  GO TO 17.  NG  GO TO 16.   | Yes<br>No   | <b>&gt;</b>  | Water EVAP canister vent control valve  Yes or No  GO TO 15.   |
| The weight should be less than 1.8 kg (4.0 lb).  OK or NG  OK  GO TO 17.  NG  GO TO 16.   | No  | EVAP CANIST  | Yes or No  GO TO 15.  GO TO 17.  |
| OK  | No CHECK  |  | Yes or No  GO TO 15. GO TO 17.  ERR  |
| NG GO TO 16.  | No  15 CHECK Weigh the EVA  | P canister with th   | Yes or No  GO TO 15. GO TO 17.  ER  TER  The EVAP canister vent control valve attached.  |
|   | No  15 CHECK Weigh the EVA  | P canister with th   | Yes or No  GO TO 15. GO TO 17.  ER  The EVAP canister vent control valve attached.  The EVAP canister vent control valve attached.  The EVAP canister vent control valve attached.  The Table 1.8 kg (4.0 lb).   |
| 16 DETECT MALEUNCTIONING PART   | 15 CHECK Weigh the EVA The weight sh  | P canister with th   | Yes or No  GO TO 15. GO TO 17.  EER  The EVAP canister vent control valve attached.  The Action of t |
| 16 DETECT MALEUNCTIONING PART   | No  15 CHECK Weigh the EVA  | P canister with th   | Yes or No  GO TO 15. GO TO 17.  ER  The EVAP canister vent control valve attached.  In 1.8 kg (4.0 lb).  OK or NG  GO TO 17.   |
| ID IDETECT WALFUNGTONING PART   | No  15 CHECK Weigh the EVA The weight sho   | P canister with th   | Yes or No  GO TO 15. GO TO 17.  ER  The EVAP canister vent control valve attached.  In 1.8 kg (4.0 lb).  OK or NG  GO TO 17.   |
|   | No  15 CHECK Weigh the EVA The weight shoot OK NG  16 DETEC                                 | P canister with the could be less that be le | Yes or No  GO TO 15.  GO TO 17.  ER  The EVAP canister vent control valve attached.  In 1.8 kg (4.0 lb).  OK or NG  GO TO 17.  GO TO 16.   |
| <ul> <li>EVAP canister for damage</li> <li>EVAP hose between EVAP canister and water separator for clogging or poor connection</li> </ul>   | No  15 CHECK Weigh the EVA The weight shoot OK NG  16 DETEC Check the follow • EVAP caniste | P canister with the could be less that T MALFUNCTION wing.   | Yes or No  GO TO 15. GO TO 17.  EER  DE EVAP canister vent control valve attached.  OK or NG  GO TO 17.  OK or NG  GO TO 16.   |

Repair hose or replace EVAP canister.

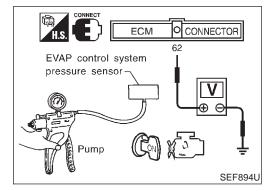
# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR SENSOR

Diagnostic Procedure (Cont'd)

# 1. Reconnect harness connectors disconnected. 2. Disconnect harness connectors B43, B101. 3. Check harness continuity between terminal 5 and engine ground. Continuity should exist. 4. Also 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 MALFUNCTIO  | NING PART  |  |
|------------------------|--|--|--|
| Check                  | the following.   |  |  |
| <ul><li>Harr</li></ul> | ness connectors F27, M94   |  |  |
| <ul><li>Harr</li></ul> | ness connectors M2, B1   |  |  |
| <ul><li>Harr</li></ul> | Harness connectors B43, B101   |  |  |
| <ul><li>Join</li></ul> | <ul> <li>Joint connector F21 (Refer to EL-350, "HARNESS LAYOUT".)</li> </ul> |  |  |
| <ul><li>Harr</li></ul> | ness for open or short betw  | veen harness connector B43 and engine ground                                       |  |
|                        | <b>&gt;</b>  | Repair open circuit or short to ground or short to power in harness or connectors. |  |

| 19      | 19 CHECK INTERMITTENT INCIDENT                                  |                |  |
|---------|---|----------------|--|
| Refer t | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |
|         | <b>&gt;</b>   | INSPECTION END |  |



# Component Inspection EVAP CONTROL SYSTEM PRESSURE SENSOR

NBEC0238

- 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.

# DTC P0450 EVAPORATIVE EMISSION (EVAP) CONTROL SYSTEM PRESSUR SENSOR

Component Inspection (Cont'd)

| 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 |

# - GI

## MA

#### **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.



LC

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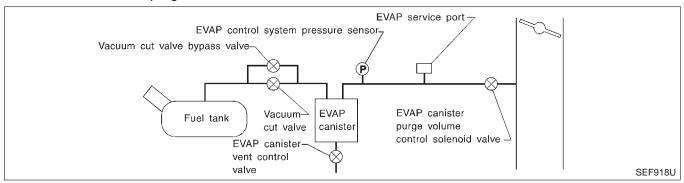
# On Board Diagnosis Logic

NBEC0526

#### NOTE:

## If DTC P0455 is displayed with P1448, perform trouble diagnosis for "DTC P1448" first. (See EC-515.)

This diagnosis detects very large leaks (fuel filler cap fell off, etc.) in the EVAP system between the fuel tank and the EVAP canister purge volume control solenoid valve.

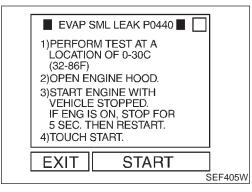


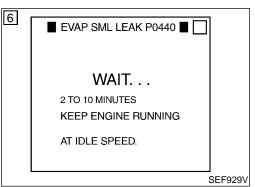
| DTC No.       | Malfunction is detected when  | Check Items (Possible Cause)   |
|---------------|---|--|
| P0455<br>0715 | <ul> <li>EVAP system has a very large leak such as when the fuel filler cap falls off.</li> <li>EVAP system does not operate properly.</li> </ul> | <ul> <li>Fuel filler cap remains open or fails to close.</li> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.</li> <li>Foreign matter caught in EVAP canister vent control valve.</li> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent.</li> <li>Blocked or bent rubber tube to EVAP control system pressure sensor</li> <li>Loose or disconnected rubber tube</li> <li>EVAP canister vent control valve and the circuit</li> <li>EVAP canister purge volume control solenoid valve and the circuit</li> <li>Absolute pressure sensor</li> <li>Fuel tank temperature sensor</li> <li>O-ring of EVAP canister vent control valve is missing or damaged.</li> <li>EVAP control system pressure sensor</li> </ul> |

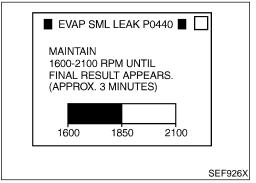
#### **CAUTION:**

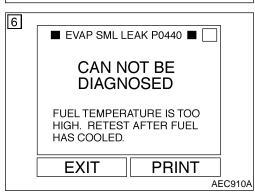
- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

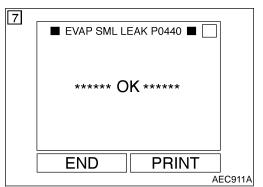
DTC Confirmation Procedure











#### **DTC Confirmation Procedure**

**CAUTION:** 

Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-515.)

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 and vehicle is placed on flat level surface.

Always perform test at a temperature of 0 to 30°C (32 to 86°F).

It is better that the fuel level is low.

With CONSULT

1) Tighten fuel filler cap securely until ratcheting sound is heard.

2) Turn ignition switch "ON".

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

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

Make sure that the following conditions are met. COOLAN TEMP/S: 0 - 70°C (32 - 158°F) INT/A TEMP SE: 0 - 60°C (32 - 140°F)

Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYS-TEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.

If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest.

(Use a fan to reduce the stabilization time.)

If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to "Basic Inspection", EC-99.

Make sure that "OK" is displayed. If "NG" is displayed, select "SELF-DIAG RESULTS" mode with CONSULT and make sure that "EVAP GROSS LEAK [P0455]" is displayed. If it is displayed, refer to "Diagnostic Procedure", EC-400.

If P0440 is displayed, perform "Diagnostic Procedure" for DTC P0440.

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

With GST

NOTE:

Be sure to read the explanation of "Driving Pattern" on EC-62 before driving vehicle.

It is better that the fuel level is low.

1) Start engine.

2) Drive vehicle according to "Driving Pattern", EC-62.

3) Stop vehicle.

Select "MODE 1" with GST.

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EC-399



- 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-62.
- 8) Stop vehicle.
- Select "MODE 3" with GST.
- If P0455 is displayed on the screen, go to "Diagnostic Procedure", EC-400.
- If P0440 or P1440 is displayed on the screen, go to "Diagnostic Procedure", for DTC P0440, EC-366.
- If P1447 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1447", EC-509.
- If P0440, P0455, 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-62 before driving vehicle.
- It is better that the fuel level is low.
- 1) Start engine.
- 2) Drive vehicle according to "Driving Pattern", EC-62.
- 3) Stop vehicle.
- 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.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-400.

# **Diagnostic Procedure**

1 CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch "OFF".
2. Check for genuine NISSAN fuel filler cap design.

NISSAN

OK or NG

OK

Replace with genuine NISSAN fuel filler cap.

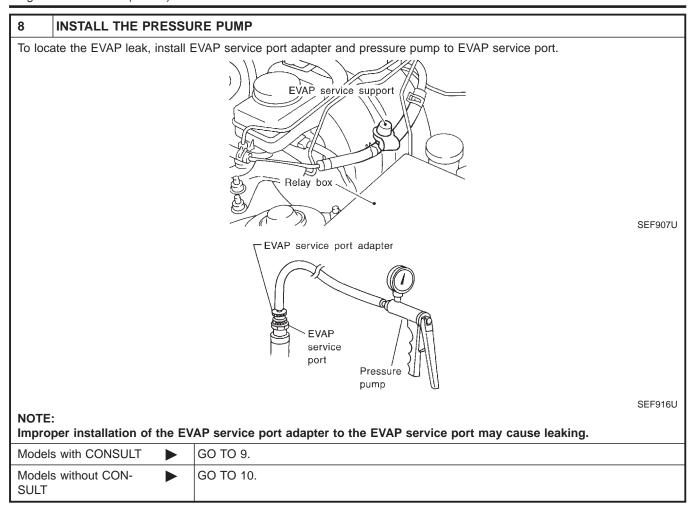
|                  |   | Diagnostic Procedure (Cont  | 'd)      |
|------------------|---|---|----------|
| 2 CHECK          | FUEL FILLER                               | CAP INSTALLATION  | ٦        |
| Check that the   | cap is tightened                          | properly by rotating the cap clockwise.   | 7        |
|                  |   | OK or NG  | 1        |
| OK               | <b>•</b>                                  | GO TO 3.  | 7        |
| NG               | <b>&gt;</b>                               | <ul> <li>Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.</li> <li>Retighten until ratcheting sound is heard.</li> </ul> |          |
| 3 CHECK          | FUEL FILLER                               | CAP FUNCTION  | ٦        |
| Check for air re | eleasing sound wl                         | hile opening the fuel filler cap.   | 1        |
|                  |   | OK or NG  | 1        |
| OK               | <b>•</b>                                  | GO TO 5.  | 7        |
| NG               | <b>•</b>                                  | GO TO 4.  | 7        |
|                  |   |   | _        |
| 4 CHECK          | FUEL TANK V                               | ACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)   | ╛        |
| Refer to "Fuel 7 | Tank Vacuum Rel                           | ief Valve (Built into fuel filler cap)", EC-31.   | 1        |
|                  |   | OK or NG  | ╛        |
| OK               | <b>•</b>                                  | GO TO 5.  | ╛        |
| NG               | <b>•</b>                                  | Replace fuel filler cap with a genuine one.   |          |
|                  |   |   | _        |
|                  | EVAP PURGE                                |   | 4        |
|                  | urge line (pipe, ru<br>prative Emission ( | ubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection. System", EC-30.  |          |
| ·                |   | OK or NG  |          |
| OK               | <b>•</b>                                  | GO TO 6.  | 1        |
| NG               | <b></b>                                   | Repair or reconnect the hose.   | 1        |
|                  |   |   | _        |
| 6 CLEAN          | <b>EVAP PURGE</b>                         | LINE  | 1        |
| Clean EVAP pu    | irge line (pipe and                       | d rubber tube) using air blower.  |          |
|                  | <b>&gt;</b>                               | GO TO 7.  | ╛        |
| 1                |   |   | _        |
| 7 CHECK          | EVAP CANIST                               | ER VENT CONTROL VALVE, O-RING AND CIRCUIT   | ╛        |
| Refer to "DTC    | Confirmation Prod                         | cedure", EC-382.  | 1        |
|                  |   | TO A LANGE  | 1        |
|                  |   |   | 1        |
|                  |   |   | 1        |
|                  |   |   | 1        |
|                  |   |   |          |
|                  |   |   |          |
|                  |   | EVAP canister vent control valve  |          |
|                  |   | SEF143S   | , [      |
|                  |   | OK or NG  |          |
| OK               | <b>•</b>                                  | GO TO 8.  | $\dashv$ |
|                  |   |   | $\dashv$ |

Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

NG



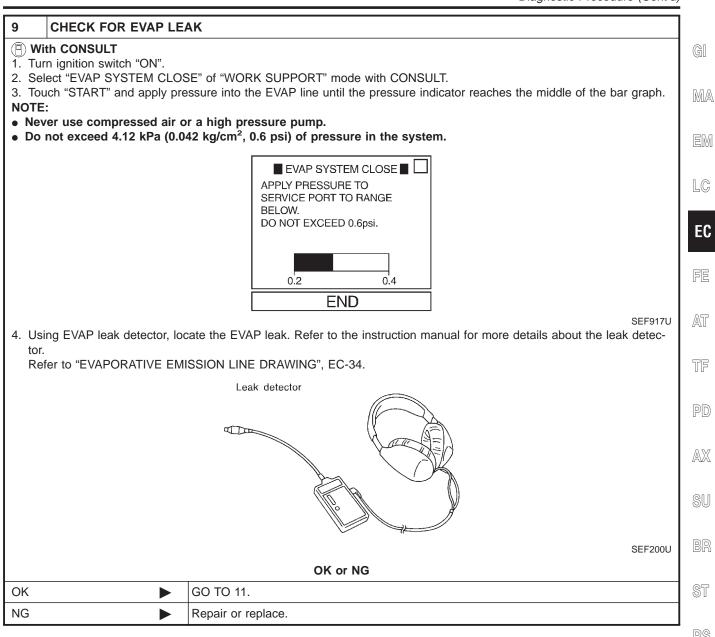
Diagnostic Procedure (Cont'd)



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SC

Diagnostic Procedure (Cont'd)



**EC-403** 

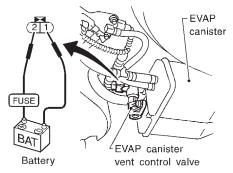


Diagnostic Procedure (Cont'd)

#### 10 CHECK FOR EVAP LEAK

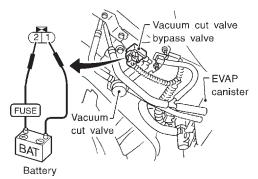
## **⋈** Without CONSULT

- 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.)



SFF598U

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)

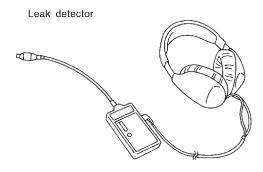


SEF5991

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.

#### NOTE:

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 0.6 psi) of pressure in the system.
- 5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details about the leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-34.

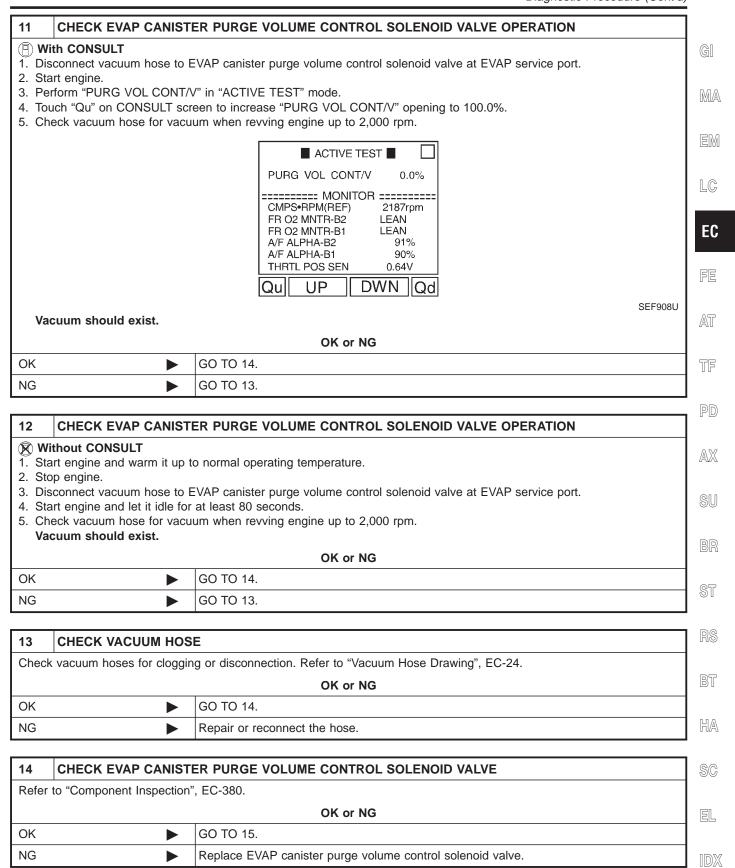


SEF200U

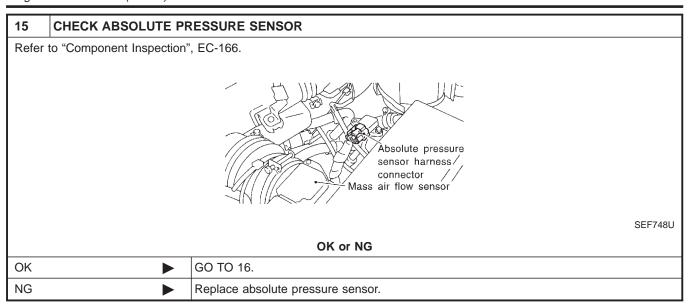
| OK    | or | NG |
|-------|----|----|
| • • • | •  |    |

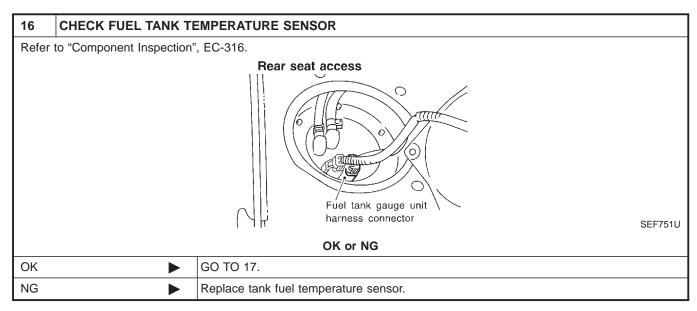
| OK ► | GO TO 12.          |
|------|--------------------|
| NG ► | Repair or replace. |

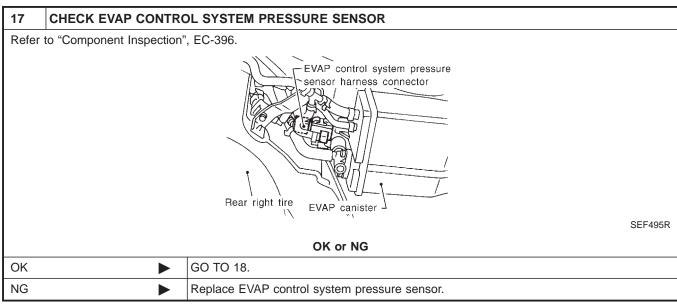
Diagnostic Procedure (Cont'd



Diagnostic Procedure (Cont'd)







Diagnostic Procedure (Cont'd)

|                                |   |                | - |
|--------------------------------|---|----------------|---|
| 18 CHECK INTERMITTENT INCIDENT |   |                |   |
| Refer                          | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |   |
|                                | <b>&gt;</b>   | INSPECTION END |   |
|                                |   |                | • |

GI

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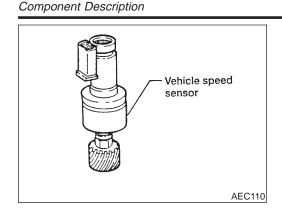
SC

EL

# DTC P0500 VEHICLE SPEED SENSOR (VSS)







#### Component Description

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

#### **ECM Terminals and Reference Value**

NBEC0240

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                 | CONDITION   | DATA (DC Voltage)                                 |
|----------------------|---------------|----------------------|---|---|
| 29                   | W/L           | Vehicle speed sensor | <ul> <li>[Engine is running]</li> <li>Lift up the vehicle</li> <li>In 2nd gear position</li> <li>Vehicle speed is 40 km/h (25 MPH)</li> </ul> | 2 - 3V<br>(V)<br>10<br>5<br>0<br>50 ms<br>SEF996U |

# On Board Diagnosis Logic

NBFC0241

| DTC No.       | Malfunction is detected when   | Check Items (Possible Cause)   |
|---------------|--|--|
| P0500<br>0104 | <ul> <li>The almost 0 km/h (0 MPH) signal from vehicle speed<br/>sensor is sent to ECM even when vehicle is being<br/>driven.</li> </ul> | Harness or connector     (The vehicle speed sensor circuit is open or shorted.)     Vehicle speed sensor |

#### **DTC Confirmation Procedure**

NBEC0242

#### **CAUTION:**

Always drive vehicle at a safe speed.

#### NOTE:

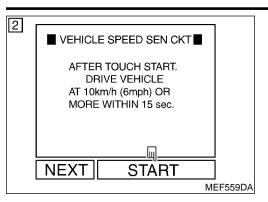
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

#### **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.

# DTC P0500 VEHICLE SPEED SENSOR (VSS)

DTC Confirmation Procedure (Cont'd



☆ NO FAIL

2000rpm

3.0msec

SEF199VD

88°C

OFF

56km/h

6

☆ MONITOR

CMPS•RPM(REF)

COOLAN TEMP/S

B/FUEL SCHDL

PW/ST SIGNAL

VHCL SPEED SE

RECORD

(P) With CONSULT

Start engine.

seconds.

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

If NG, go to "Diagnostic Procedure", EC-412. If OK, go to following step.

MA

EM

LC

Select "DATA MONITOR" mode with CONSULT.

Warm engine up to normal operating temperature.

Maintain the following conditions for at least 10 consecutive

EC

FE

AT

TF

| CMPS-RPM (REF) | 1,400 - 2,800 rpm      |
|----------------|------------------------|
| COOLAN TEMP/S  | More than 70°C (158°F) |
| B/FUEL SCHDL   | 2.3 - 4.5 msec         |
| Selector lever | Suitable position      |
| PW/ST SIGNAL   | OFF                    |

If 1st trip DTC is detected, go to "Diagnostic Procedure", PD EC-412.

AX

SU

ST

BT

SC

EL

5 ☆ MONITOR ☆ NO FAIL L CMPS•RPM(REF) 2000rpm COOLAN TEMP/S 88°C **B/FUEL SCHDL** 3.0msec PW/ST SIGNAL OFF VHCL SPEED SE 56km/h RECORD SEF199VA (II) With CONSULT

Start engine

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-412. If OK, go to following step.

Select "DATA MONITOR" mode with CONSULT.

- Warm engine up to normal operating temperature.
- Maintain the following conditions for at least 10 consecutive seconds.

CMPS-RPM (REF) 1,400 - 2,800 rpm COOLAN TEMP/S More than 70°C (158°F) B/FUEL SCHDL 2.3 - 4.5 msec Selector lever Suitable position PW/ST SIGNAL OFF

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-412.

# DTC P0500 VEHICLE SPEED SENSOR (VSS)

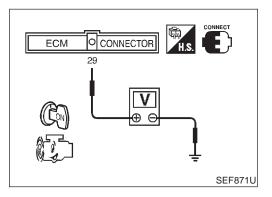


#### **Overall Function Check**

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

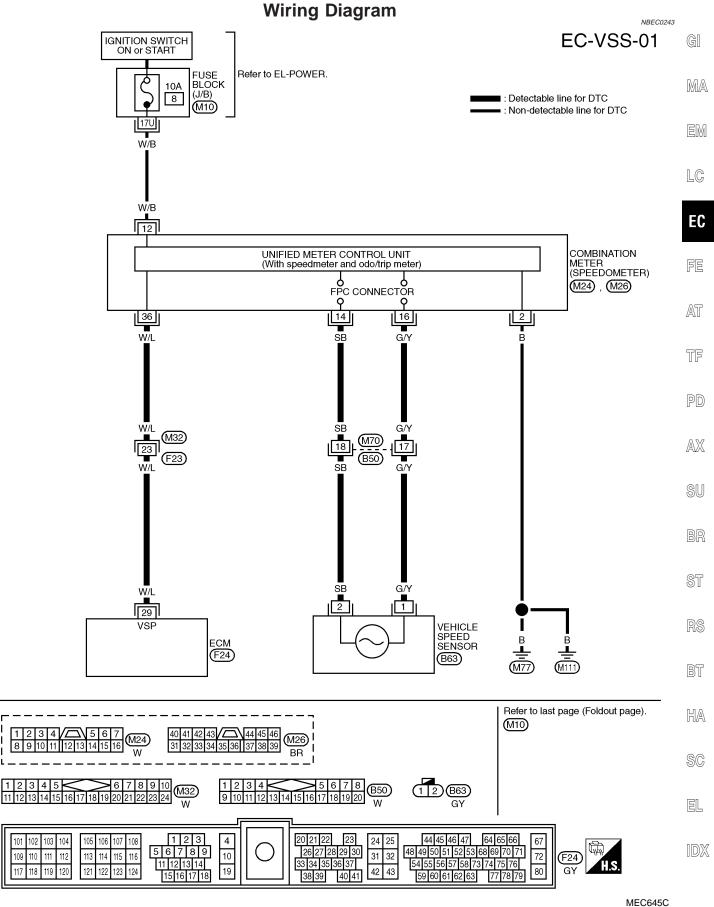
- 1) Lift up drive wheels.
- 2) Start engine.
- 3) Read vehicle speed sensor signal in "MODE 1" with GST. The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-412.



#### No Tools

- 1) Lift up drive wheels.
- 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.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-412.







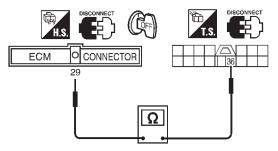
NBEC0244

SEF712U

# **Diagnostic Procedure**

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.

4. Also check harness for short to ground and short to power.

OK or NG

| ОК | • | 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 | Make sure that speedometer functions properly. |          |  |  |
|      | OK or NG                                       |          |  |  |
| OK   | OK ▶ GO TO 5.                                  |          |  |  |
| NG   | •  | GO TO 4. |  |  |

| 4     | CHECK SPEEDOMETER CIRCUIT   |  |  |
|-------|---|--|--|
| • Har | Check the following.  • Harness connectors M70, B50  • Harness for open or short between combination meter and vehicle speed sensor |  |  |
|       | OK or NG  |  |  |
| OK    | OK Check combination meter and vehicle speed sensor. Refer to EL section.   |  |  |
| NG    | NG Repair open circuit or short to ground or short to power in harness or connectors.   |  |  |

| 5     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |

# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL (AAC) VALVE

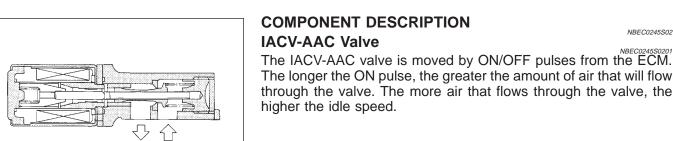
Description

## **Description** SYSTEM DESCRIPTION

NBEC0245 NBEC0245S01

|                                    |                            |                     |                | CIII |
|------------------------------------|----------------------------|---------------------|----------------|------|
| Sensor                             | Input Signal to ECM        | ECM func-<br>tion   | Actuator       | ПДΛ  |
| Camshaft position sensor           | Engine speed               |                     |                | MA   |
| Mass air flow sensor               | Amount of intake air       |                     |                | EM   |
| Engine coolant temperature sensor  | Engine coolant temperature |                     |                |      |
| Ignition switch                    | Start signal               |                     |                | LG   |
| Throttle position sensor           | Throttle position          |                     |                |      |
| Park/Neutral position switch       | Park/Neutral position      |                     |                | EC   |
| Air conditioner switch             | Air conditioner operation  | Idle air<br>control | IACV-AAC valve |      |
| Power steering oil pressure switch | Power steering load signal |                     |                | FE   |
| Battery                            | Battery voltage            |                     |                |      |
| Vehicle speed sensor               | Vehicle speed              |                     |                | AT   |
| Ambient air temperature switch     | Ambient air temperature    |                     |                |      |
| Intake air temperature sensor      | Intake air temperature     | 1                   |                | TF   |
| Absolute pressure sensor           | Ambient barometic pressure | 1                   |                |      |

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

PD

HA



EL

# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL (AAC) VALVE

CONSULT Reference Value in Data Monitor Mode

# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0246

| MONITOR ITEM | COND   | DITION    | SPECIFICATION |
|--------------|--|-----------|---------------|
| 1001/-000/   | <ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul> | Idle      | 10 - 20%      |
| • Shift      | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>                               | 2,000 rpm | _             |

#### **ECM Terminals and Reference Value**

NBEC0247

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM           | CONDITION   | DATA (DC Voltage)                 |
|----------------------|---------------|----------------|---|-----------------------------------|
|                      |               |                | [Engine is running]  • Warm-up condition  • Idle speed                | 8 - 11V  (V) 20 10 5 ms  SEF005V  |
| 101                  | OR            | IACV-AAC valve | [Engine is running]  • Warm-up condition  • Engine speed is 3,000 rpm | 2 - 3V  (V) 20 10 0 5 ms  SEF692W |

# 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     (The IACV-AAC valve circuit is open.)     IACV-AAC valve                             |
|               | B) | The IACV-AAC valve does not operate properly. | <ul> <li>Harness or connectors<br/>(The IACV-AAC valve circuit is shorted.)</li> <li>IACV-AAC valve</li> </ul> |

# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL (AAC) VALVE

DTC Confirmation Procedure

## **DTC Confirmation Procedure**

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.

MA

NBEC0249

NBFC0249S01

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

EM

LC

EC

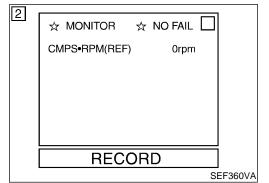
FE

AT

TF

PD

AX



#### PROCEDURE FOR MALFUNCTION A

**TESTING CONDITION:** 

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch "ON".

(P) With CONSULT

Turn ignition switch "ON".

- Select "DATA MONITOR" mode with CONSULT.
- Wait at least 2 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-418.

**With GST** 

- 1) Turn ignition switch "ON" and wait at least 2 seconds.
- Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-418.

No Tools

- Turn ignition switch "ON" and wait at least 2 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-418.

ST

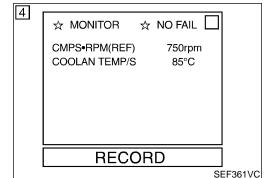
BR

BT

HA

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EL



#### PROCEDURE FOR MALFUNCTION B

**TESTING CONDITION:** 

Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

(F) With CONSULT

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- Start engine and run it for at least 1 minute at idle speed.

# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL (AAC) VALVE

DTC Confirmation Procedure (Cont'd)

5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-418.

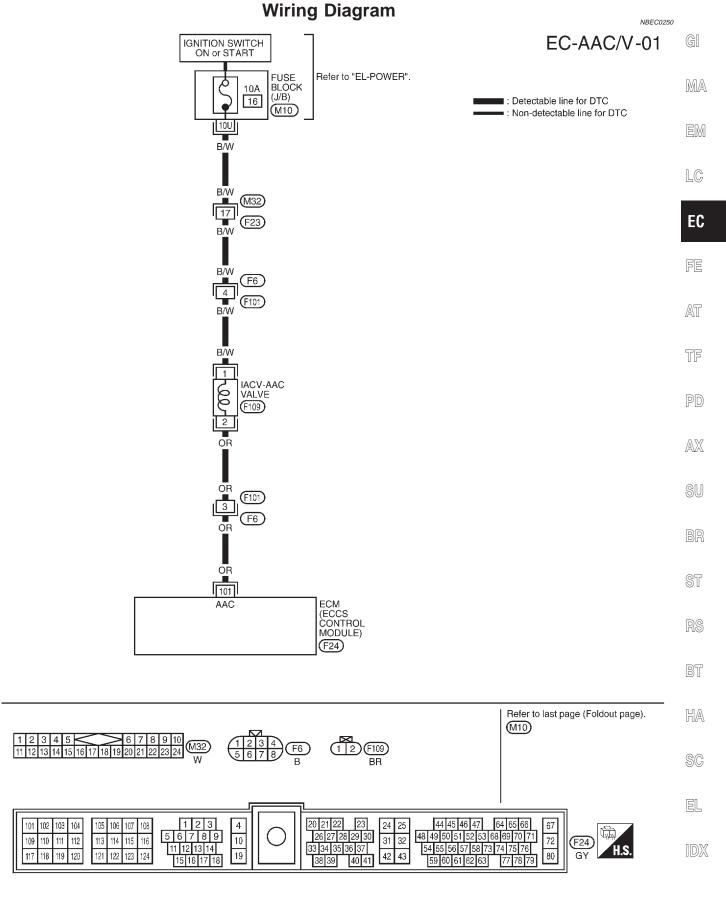
#### **With GST**

- 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.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-418.

#### 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.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-418.

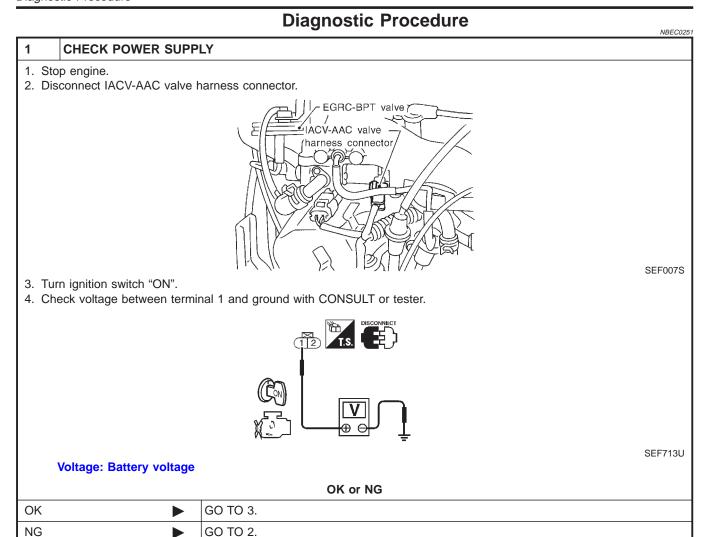
Wiring Diagram



MEC161C

# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL (AAC) VALVE

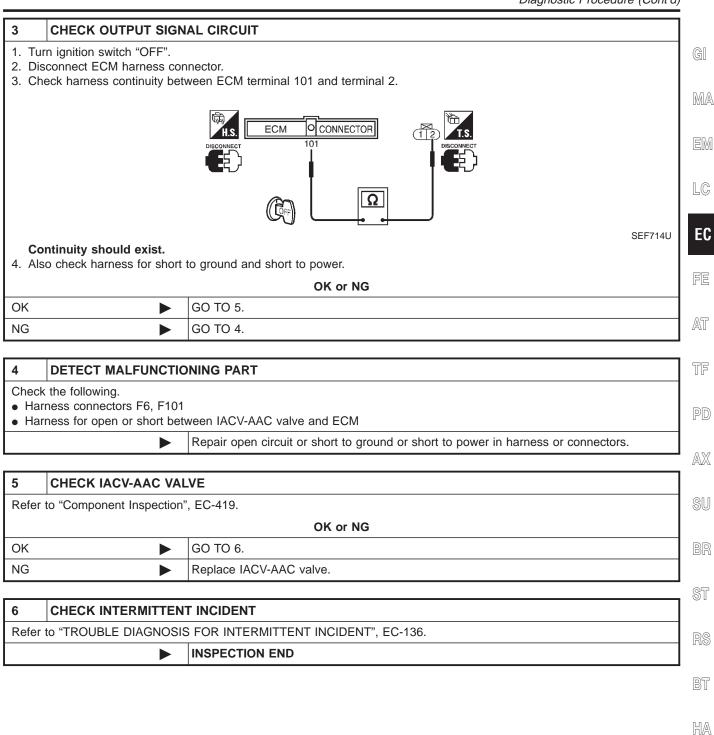
Diagnostic Procedure

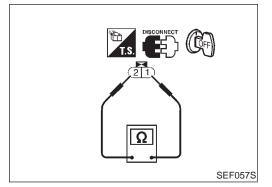


# 2 DETECT MALFUNCTIONING PART Check the following. • Harness connectors F101, F6 • Harness connectors F23, M32 • 10A fuse • Harness for open or short between IACV-AAC valve and fuse Repair harness or connectors.

# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL

Diagnostic Procedure (Cont'd)





# Component Inspection IACV-AAC VALVE

NBEC0252S01

SC

EL

1. Disconnect IACV-AAC valve harness connector.

Remove IACV-AAC valve.

Check IACV-AAC valve resistance.

#### Resistance:

#### Approximately $10\Omega$ [at $20^{\circ}$ C (68°F)]

- Check plunger for seizing or sticking.
- Check for broken spring.
- 3. Supply battery voltage between IACV-AAC valve connector

**EC-419** 

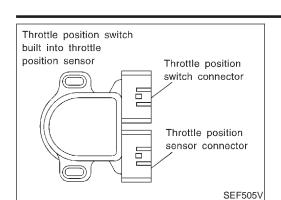
# DTC P0505 IDLE AIR CONTROL VALVE (IACV) — AUXILIARY AIR CONTROL (AAC) VALVE

Component Inspection (Cont'd)

terminals.

Plunger should move.

Component Description



# **Component Description**

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.

• . M/A

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.

 $\mathbb{M}\mathbb{A}$ 

FM

LC

EC

# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0523

| MONITOR ITEM    | CONE  | DITION                        | SPECIFICATION | F |
|-----------------|---|-------------------------------|---------------|---|
| CL CD THI /D CW | Engine: After warming up     More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the threattle appear. | Throttle valve: Idle position | ON            | A |
| CLSD THL/P SW   | is applied to the throttle opener with a handy vacuum pump.  • Ignition switch: ON (Engine stopped)                     | Throttle valve: Slightly open | OFF           | T |

#### **ECM Terminals and Reference Value**

P

Specification data are reference values and are measured between each terminal and ground.

**CAUTION:** 

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| ım- |             |  |
|-----|-------------|--|
|     | <b>6</b> 11 |  |

| TER-<br>MINAL<br>NO. | WIRE<br>COLOR | ITEM                                       | CONDITION   | DATA (DC Voltage)             |     |
|----------------------|---------------|--|---|-------------------------------|-----|
| 28                   | OR/W          | Throttle position switch (Closed position) | <ul> <li>[Ignition switch "ON"]</li> <li>Warm-up condition</li> <li>More than -40.0 kPa (-300 mmHg, -11.81 inHg) of vacuum is applied to the throttle opener with a handy vacuum pump.</li> <li>Accelerator pedal fully released</li> </ul> | BATTERY VOLTAGE<br>(11 - 14V) | (S) |
|                      |               |  | [Ignition switch "ON"]  • Accelerator pedal depressed   | Approximately 0V              | L.  |

# On Board Diagnosis Logic

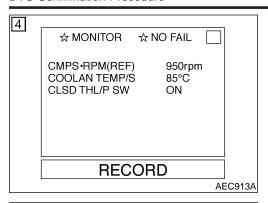
NBEC0256

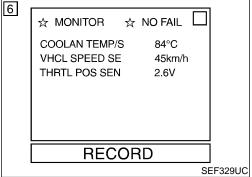
| DTC No.       | Malfunction is detected when  | Check Items (Possible Cause)   | HA |
|---------------|---|--|----|
| P0510<br>0203 | Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened. | <ul> <li>Harness or connectors         (The closed throttle position switch circuit is shorted.)</li> <li>Closed throttle position switch</li> <li>Throttle position sensor</li> </ul> | SC |

DX.

NBEC0257

DTC Confirmation Procedure







**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.

(P) With CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF", wait at least 5 seconds and then start engine.
- 3) Select "CLSD THL/P SW" in "DATA MONITOR" mode.
- 4) Check the signal under the following conditions.

| Condition                     | Signal indication |
|-------------------------------|-------------------|
| Throttle valve: Idle position | ON                |
| Throttle valve: Slightly open | OFF               |

If the result is NG, go to "Diagnostic Procedure", EC-424. If OK, go to following step.

- 5) Select "DATA MONITOR" mode with CONSULT.
- 6) 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 location | Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test. |

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-424.

#### **Overall Function Check**

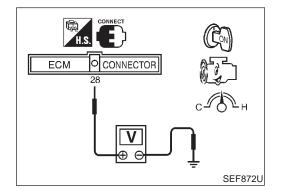
Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.

#### **Without CONSULT**

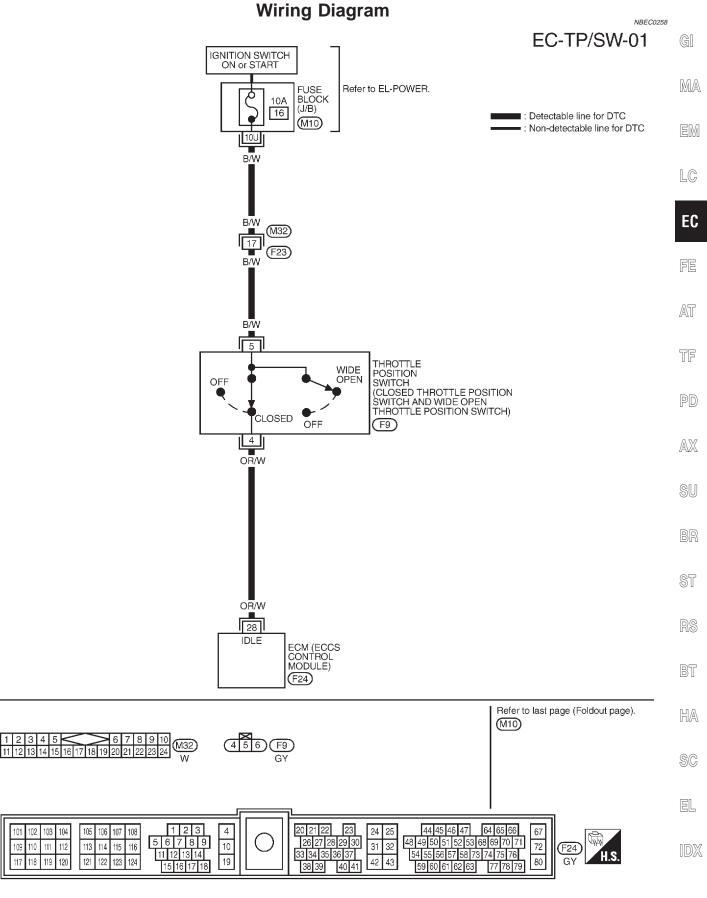
- 1) Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM terminal 28 (Closed throttle position switch signal) and ground under the following conditions.

At idle: Battery voltage
At 2,000 rpm: Approximately 0V

3) If NG, go to "Diagnostic Procedure", EC-424.



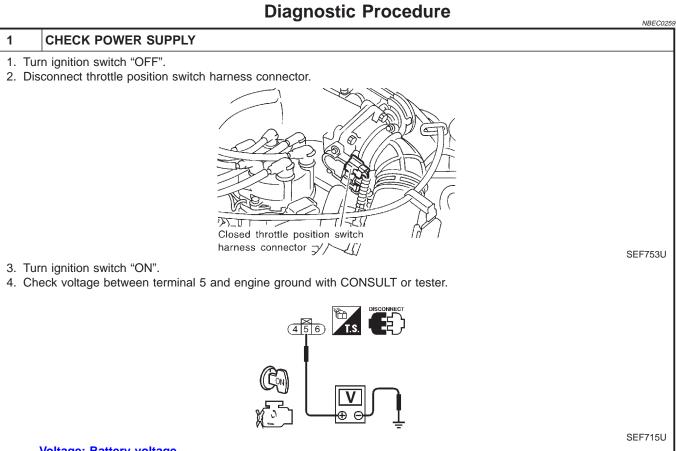




MEC162C



Diagnostic Procedure



Voltage: Battery voltage

OK or NG

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

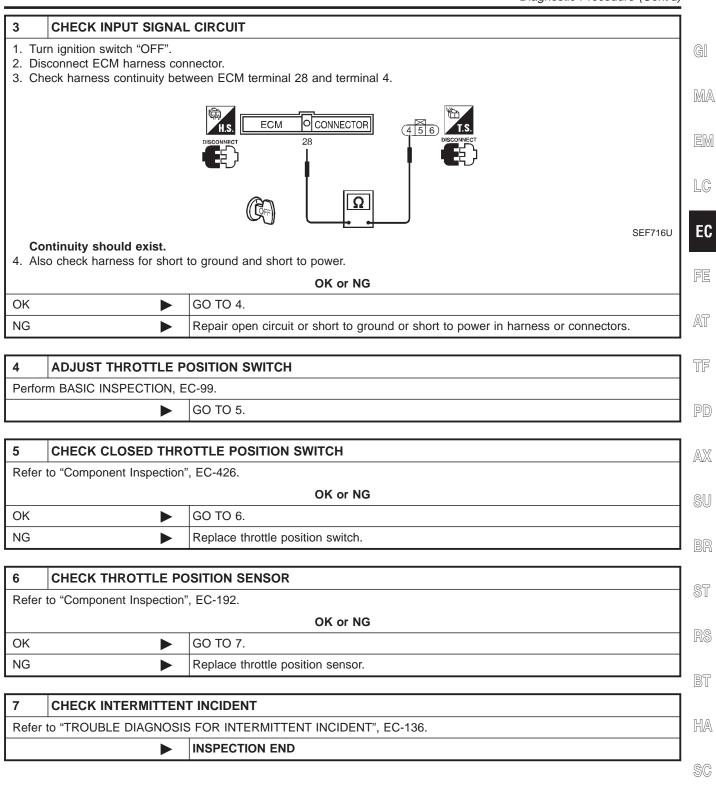
## 2 DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M32, F23
- 10A fuse
- · Harness for open or short between throttle position switch and fuse
  - Repair harness or connectors.

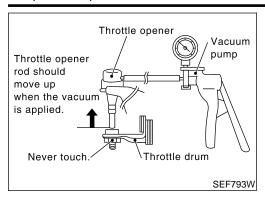
EL

Diagnostic Procedure (Cont'd)

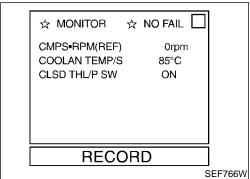


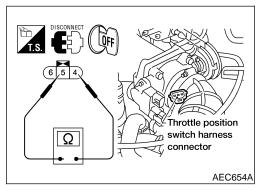
DIC POSTO CLOSED

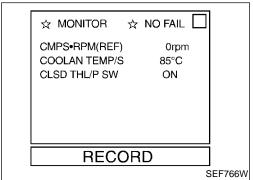


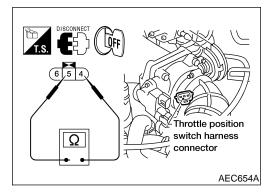


Component Inspection









# Component Inspection CLOSED THROTTLE POSITION SWITCH

NBEC0260

NBEC0260S01

- (P) With CONSULT
- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF".
- 3) Remove vacuum hose connected to throttle opener.
- 4) Connect suitable vacuum hose to vacuum pump and the throttle opener.
- 5) Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
- 6) Turn ignition switch "ON".
- 7) Select "DATA MONITOR" mode with CONSULT.
- Check indication of "CLSD THL/P SW".
   Measurement must be made with closed throttle position switch installed in vehicle.

| Throttle valve conditions         | CLSD THL/P SW |
|-----------------------------------|---------------|
| Completely closed                 | ON            |
| Partially open or completely open | OFF           |

- If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.
- 9) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

#### **♥** Without CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 2) Turn ignition switch "OFF".
- 3) Remove vacuum hose connected to throttle opener.
- 4) Connect suitable vacuum hose to vacuum pump and the throttle opener.
- 5) Apply vacuum [more than -40.0 kPa (-300 mmHg, -11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.
- 6) Disconnect closed throttle position switch harness connector.



Component Inspection (Cont'd)

7) Check continuity between closed throttle position switch terminals 4 and 5.

Resistance measurement must be made with closed throttle position switch installed in vehicle.

| Throttle valve conditions         | Continuity | -<br>MA |
|-----------------------------------|------------|---------|
| Completely closed                 | Yes        | _       |
| Partially open or completely open | No         | EM      |

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-99.

8) If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

LC

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## **System Description**

NBEC026

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 ground.

#### CALITION

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM             | CONDITION  | DATA (DC Voltage) |
|----------------------|---------------|------------------|--|-------------------|
| 26                   | PU/W          | A/T signal No. 1 | [Ignition switch "ON"] [Engine is running]  • Idle speed | 6 - 8V            |
| 27                   | P/B           | A/T signal No. 2 | [Ignition switch "ON"] [Engine is running]  • Idle speed | 6 - 8V            |
| 35                   | Р             | A/T signal No. 3 | [Ignition switch "ON"]                                   | OV                |

# 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 [The circuit between ECM and TCM (Transmission control module) is open or shorted.] |

<sup>\*:</sup> This DTC can be detected only by "DATA MONITOR (AUTO TRIG)" with CONSULT.



#### **DTC Confirmation Procedure**

NBEC0264

#### NOTE:

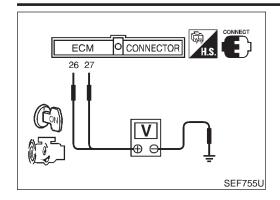
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

#### (P) With CONSULT

- 1) Turn ignition switch "ON".
- 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.
- 4) If DTC is detected, go to "Diagnostic Procedure", EC-431.

Overall Function Check





#### **Overall Function Check**

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.
- Check voltage between ECM terminal 26 and ground. ECM terminal 27 and ground.

Voltage: 6 - 8V

3) If NG, go to "Diagnostic Procedure", EC-431.



MA

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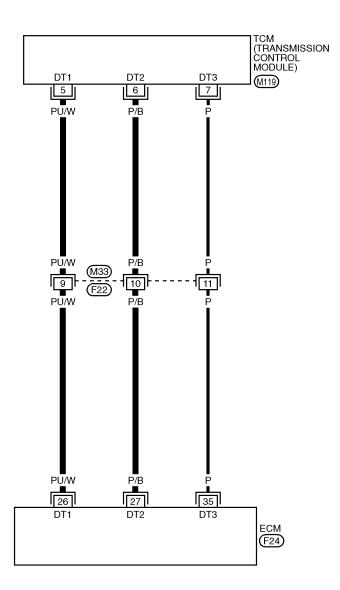
EL



# **Wiring Diagram**

NBEC0266

EC-AT/C-01



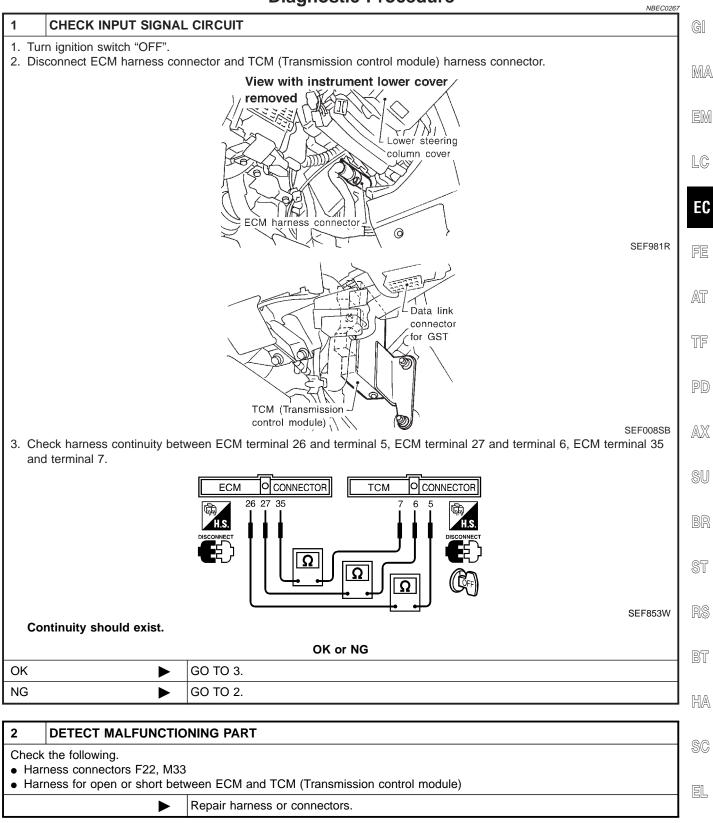
: Detectable line for DTC
: Non-detectable line for DTC

Refer to last page (Foldout page). (M119) 1 2 3 5 6 7 8 9 44 45 46 47 64 65 66 48 49 50 51 52 53 68 69 70 71 54 55 56 57 58 73 74 75 76 59 60 61 62 63 77 78 79 24 25 26 27 28 29 30 33 34 35 36 37 10 113 114 115 116 31 32 72 110 111 112 11 12 13 14 42 43 19 38 39 40 41 15 16 17 18

MEC646C





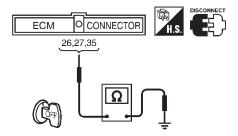






#### 3 CHECK INPUT SIGNAL CIRCUIT

1. Check harness continuity between ECM terminal 26 and ground, ECM terminal 27 and ground, ECM terminal 35 and ground.



SEF718U

#### Continuity should not exist.

OK

2. Also check harness for short to ground and short to power.

GO TO 5.

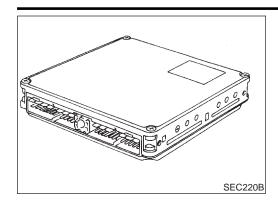
|    |    |   | _ |
|----|----|---|---|
| OK | or | Ν | G |

| NG | ▶ GO TO 4.                 |  |
|----|----------------------------|--|
|    |                            |  |
| 4  | DETECT MALFUNCTIONING PART |  |

| 4     | DETECT MALFUNCTIONING PART   |  |  |
|-------|--|--|--|
| Check | 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 | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |
|       | •   | INSPECTION END |  |





#### **Component Description**

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

MA

EM

LC

#### On Board Diagnosis Logic

NBEC0270

| DTC No.       | Malfunction is detected when                | Check Items (Possible Cause) |
|---------------|---|------------------------------|
| P0605<br>0301 | ECM calculation function is malfunctioning. | • ECM                        |

EC FE

AT TF

#### **DTC Confirmation Procedure**

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

AX

PD

SU

ST



SEF357VC

750 rpm

☆ NO FAIL

4

☆ MONITOR

CMPS•RPM(REF)

**RECORD** 

Start engine.

Run engine for at least 2 seconds at idle speed.

Select "DATA MONITOR" mode with CONSULT.

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-434.

(a) With GST

1) Turn ignition switch "ON".

Turn ignition switch "ON".

HA

Start engine.

(P) With CONSULT

Run engine for at least 2 seconds at idle speed.

SC

Select "Mode 7" with GST.

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-434.

No Tools

1) Turn ignition switch "ON".

Start engine and wait at least 2 seconds.

Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

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



#### DTC P0605 ECM



5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-434.

#### **Diagnostic Procedure**

NREC027

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

#### With CONSULT

- 1. Turn ignition switch "ON".
- 2. Select "SELF DIAG RESULTS" mode with CONSULT.
- 3. Touch "ERASE".
- 4. Perform "DTC Confirmation Procedure".

See EC-433.

5. Is the 1st trip DTC P0605 displayed again?

#### **With GST**

- 1. Turn ignition switch "ON".
- 2. Select MODE 4 with GST.
- 3. Touch "ERASE".
- 4. Perform "DTC Confirmation Procedure".

See EC-433.

5. Is the 1st trip DTC P0605 displayed again?

#### No Tools

- 1. Turn ignition switch "ON".
- 2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Refer to EC-68.
- 3. Perform "DTC Confirmation Procedure".

See EC-433.

4. Is the 1st trip DTC 0301 displayed again?

| Yes | or | No |
|-----|----|----|
|-----|----|----|

| Yes         | Replace ECM.   |
|-------------|----------------|
| No <b>•</b> | INSPECTION END |

Description

#### **Description** SYSTEM DESCRIPTION

NBEC0279

NBFC0279S01

|                          |                     |                   | 11520027000              |          |
|--------------------------|---------------------|-------------------|--------------------------|----------|
| Sensor                   | Input Signal to ECM | ECM func-<br>tion | Actuator                 | - MA     |
| Camshaft position sensor | Engine speed        |                   |                          | 11/11/27 |
| Ignition switch          | Start signal        | On board          | MAP/BARO switch solenoid | EM       |
| Throttle position sensor | Throttle position   | diagnosis         | valve                    | الالاكا  |
| Vehicle speed sensor     | Vehicle speed       |                   |                          |          |

LC

EC

This system allows the absolute pressure sensor to monitor either ambient barometric pressure or intake manifold pressure. The MAP/BARO switch solenoid valve switches between two passages by ON-OFF pulse signals from the ECM. (One passage is from the intake air duct, the other is from the intake manifold.) Either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

| Solenoid | Conditions  |  |  |
|----------|---|--|--|
| ON       | <ul> <li>For 5 seconds after turning ignition switch ON (Engine is not running.)         or</li> <li>For 5 seconds after starting engine         or</li> <li>More than 5 minutes after the solenoid valve shuts OFF.</li> </ul> |  |  |



AT

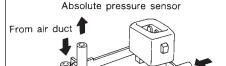












Intake

manifold

vacuum

SEF417Q

signal

#### **COMPONENT DESCRIPTION**

The MAP/BARO switch solenoid valve switches its air flow passage according to the voltage signal sent from the ECM. When voltage is supplied from the ECM, the MAP/BARO switch solenoid turns "ON". Then, the absolute pressure sensor can monitor the ambient barometric pressure. When voltage is not supplied from the ECM, the MAP/BARO switch solenoid valve turns "OFF". Then, the sensor monitors intake manifold pressure.

BT

HA

SC

EL

#### **CONSULT Reference Value in Data Monitor** Mode

NREC0280

Specification data are reference values.

| MONITOR ITEM | CONDITION                            |   | SPECIFICATION |
|--------------|--------------------------------------|---|---------------|
|              | Ignition switch: ON (Engine stopped) |   | MAP           |
| MAP/BARO     |                                      | For 5 seconds after starting engine       | BARO          |
| SW/V         | Engine speed: Idle                   | More than 5 seconds after starting engine | МАР           |





#### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

NBEC0281

#### CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                  | CONDITION   | DATA (DC Voltage)             |
|----------------------|---------------|-----------------------|---|-------------------------------|
|                      |               | MAP/BARO switch sole- | [Ignition switch "ON"]  • Engine is not running  • For 5 seconds after ignition switch is turned "ON" [Engine is running]  • Idle (for 5 seconds after engine start)              | 0 - 1V                        |
| 118                  | G/OR          | noid valve            | [Ignition switch "ON"]  ■ Engine is not running  ■ More than 5 seconds after ignition switch is turned "ON"  [Engine is running]  ■ 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)  |  |
|---|------------------------------|---|---|--|
| , |                              | MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve.                                       |   |  |
|   | В)                           | 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     (MAP/BARO switch solenoid valve circuit is open or shorted.)     Hoses     (Hoses are clogged, vent, kinked, disconnected or connected improperly.)     Absolute pressure sensor     MAP/BARO switch solenoid valve |  |

#### **DTC Confirmation Procedure**

NECOS

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

#### NOTF:

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

#### DTC Confirmation Procedure (Cont'd

#### PROCEDURE FOR MALFUNCTION A

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11V at ignition switch "ON".

MA

NBFC0283S01

EM

LC

EC

AT

PD

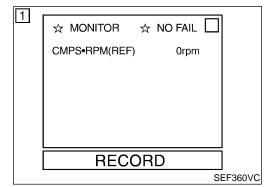
AX

BT

HA

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EL



#### With CONSULT

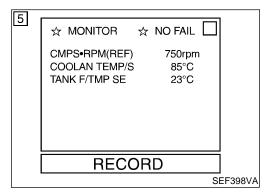
- Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- Wait at least 10 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-440.

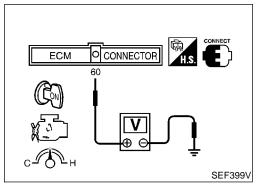
#### **With GST**

- 1) Turn ignition switch "ON" and wait at least 10 seconds.
- Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", TF EC-440.

#### No Tools

- Turn ignition switch "ON" and wait at least 10 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-440.





#### PROCEDURE FOR MALFUNCTION B

- (P) With CONSULT
- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- Make sure that "TANK F/TMP SE" is more than 0°C (32°F). 4)
- Start engine and let it idle for at least 10 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-442.

#### With GST

- 1) Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON".
- Check that voltage between ECM terminal 60 (Tank fuel temperature sensor signal) and ground is less than 4.2V.
- Start engine and let it idle for at least 10 seconds. 5)
- Select "MODE 7" with GST. 6)
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-442.

#### **EC-437**

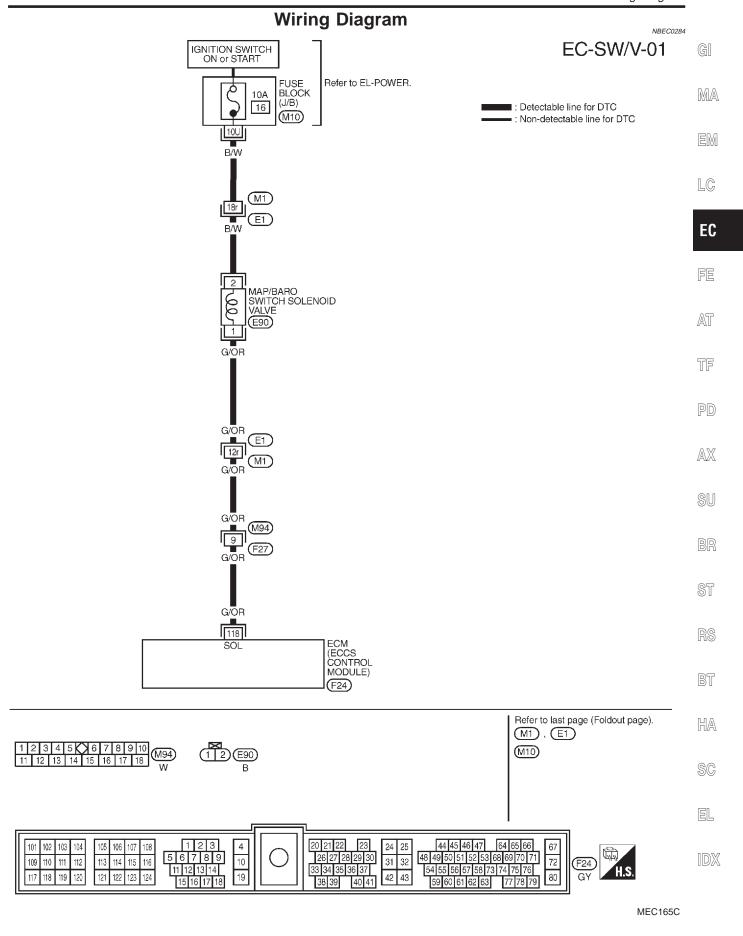


DTC Confirmation Procedure (Cont'd)

#### 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.
- 8) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-442.







#### **Diagnostic Procedure**

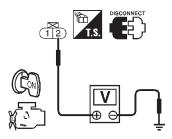
If the trouble is duplicated after "PROCEDURE FOR MAL-FUNCTION A", perform "PROCEDURE A" below. If the trouble is duplicated after "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE B" on next page.

#### **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.



OK or NG

Voltage: Battery voltage

SEF719U

| OK | <b>•</b> | GO TO 3. |
|----|----------|----------|
| NG | •        | GO TO 2. |

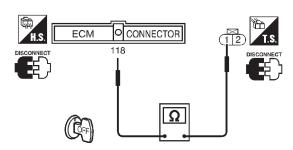
#### 2 DETECT MALFUNCTIONING PART

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.



SEF720U

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

| OK • | GO TO 5. |
|------|----------|
| NG ► | GO TO 4. |



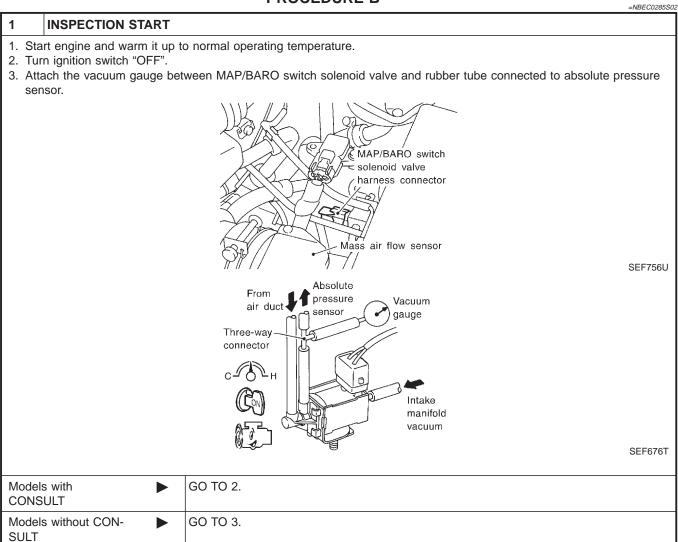
Diagnostic Procedure (Cont'd)

|               |                                      | Diagnostic Procedure (Co   | Jili u)                |
|---------------|--------------------------------------|--|------------------------|
| 4 DETE        | CT MALFUNCTIO                        | DNING PART   | $\neg$                 |
| Check the fol |                                      |  | GI                     |
|               | nnectors E1, M1<br>nnectors M94, F27 | ,  |                        |
| Harness fo    | r open or short bety                 | ween MAP/BARO switch solenoid valve and ECM  | MA                     |
|               | <u> </u>                             | Repair open circuit or short to ground or short to power in harness or connectors. |                        |
| 5 CHEC        | ·K MAP/RARO SV                       | WITCH SOLENOID VALVE   | EM                     |
|               | nponent Inspection"                  |  |                        |
|               |                                      | OK or NG   | LC                     |
| OK            | <b>•</b>                             | GO TO 6.   |                        |
| NG            | <b>&gt;</b>                          | Replace MAP/BARO switch solenoid valve.  | EC                     |
|               |                                      |  |                        |
|               | K INTERMITTEN                        |  |                        |
| Refer to "TRC | DUBLE DIAGNOSIS                      | FOR INTERMITTENT INCIDENT", EC-136.  INSPECTION END                                | — AT                   |
|               |                                      | INSPECTION END   |                        |
|               |                                      |  | TF                     |
|               |                                      |  |                        |
|               |                                      |  | PD                     |
|               |                                      |  |                        |
|               |                                      |  | $\mathbb{A}\mathbb{X}$ |
|               |                                      |  |                        |
|               |                                      |  | SU                     |
|               |                                      |  |                        |
|               |                                      |  | BR                     |
|               |                                      |  | ST                     |
|               |                                      |  | <b>⊘</b> I             |
|               |                                      |  | RS                     |
|               |                                      |  | 2 20                   |
|               |                                      |  | BT                     |
|               |                                      |  |                        |
|               |                                      |  | HA                     |
|               |                                      |  |                        |
|               |                                      |  | SC                     |
|               |                                      |  |                        |
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|               |                                      |  | IID04                  |
|               |                                      |  | IDX                    |

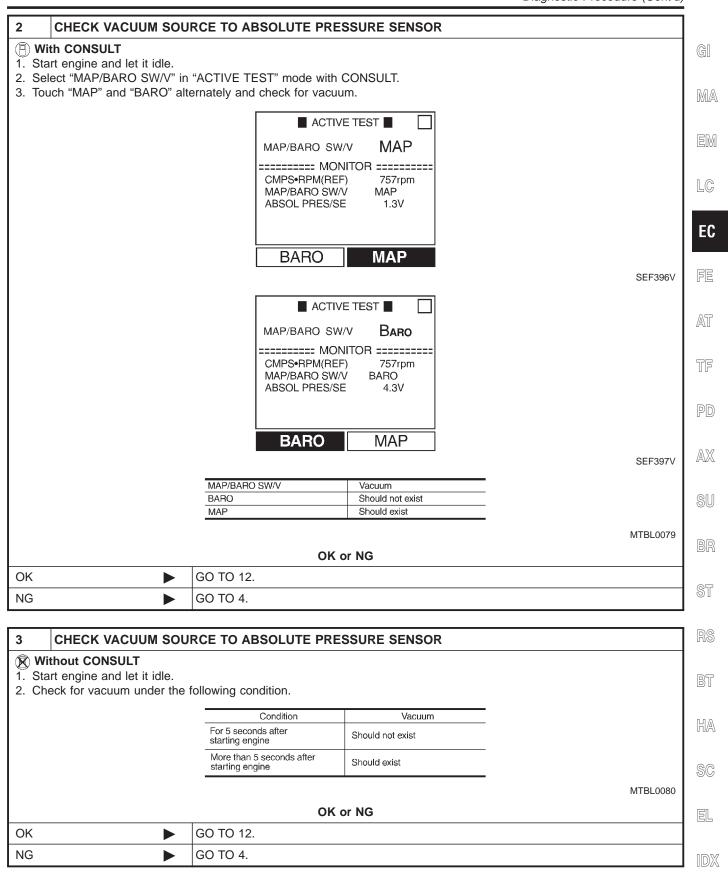


Diagnostic Procedure (Cont'd)

#### **PROCEDURE B**

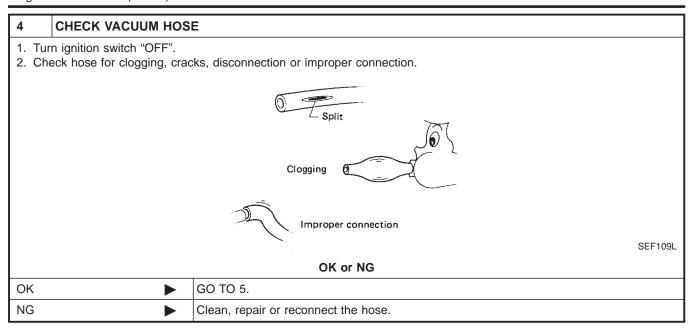


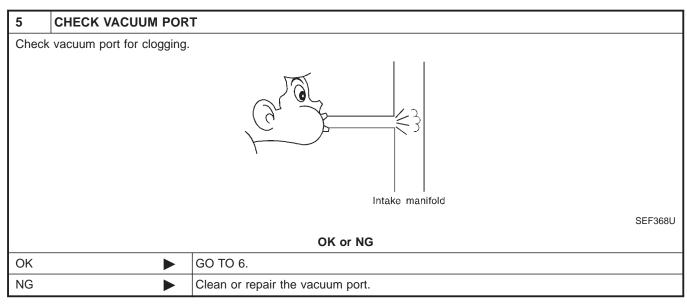
Diagnostic Procedure (Cont'd)





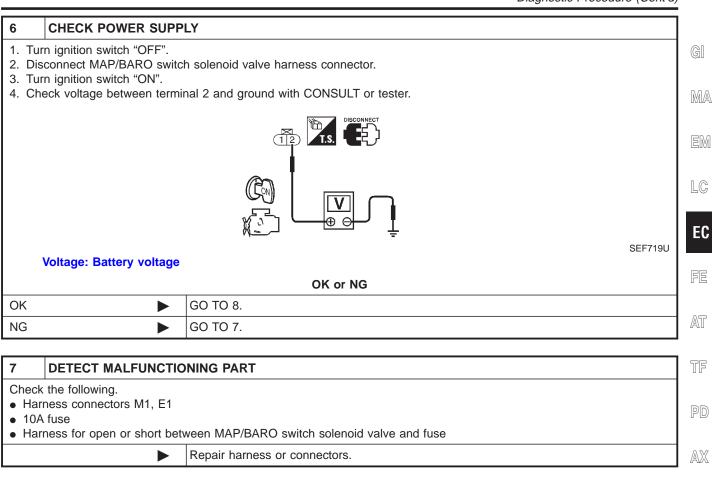
Diagnostic Procedure (Cont'd)

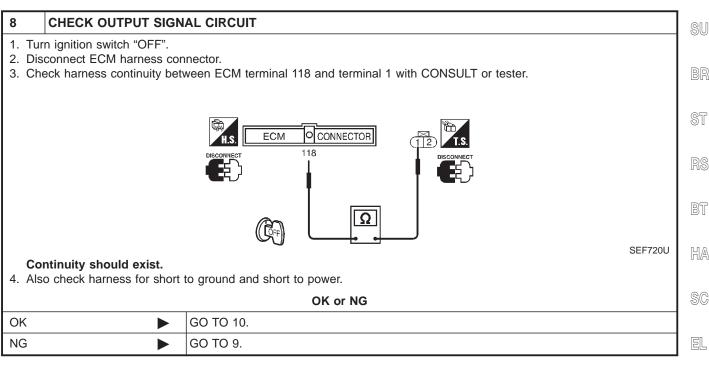






Diagnostic Procedure (Cont'd)







Diagnostic Procedure (Cont'd)

# 9 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.

| 10                                       | CHECK MAP/BARO SWITCH SOLENOID VALVE       |  |
|--|--|--|
| Refer to "Component Inspection", EC-447. |  |  |
| OK or NG                                 |  |  |
| OK                                       | OK ▶ GO TO 11.                             |  |
| NG                                       | NG Replace MAP/BARO switch solenoid valve. |  |

| 11                                 | CHECK INTAKE SYSTEM |            |  |
|------------------------------------|---------------------|------------|--|
| Check intake system for air leaks. |                     |            |  |
| OK or NG                           |                     |            |  |
| OK                                 | <b>&gt;</b>         | GO TO 15.  |  |
| NG                                 | <b>&gt;</b>         | Repair it. |  |

| 12  | CHECK HOSE BETWE VALVE        | EN ABSOLUTE PRESSURE SENSOR AND MAP/BARO SWITCH SOLENOID |
|-----|-------------------------------|--|
| Che | ck hose for clogging, cracks, | disconnection or improper connection.                    |
|     |                               | Clogging   |
|     |                               | Improper connection                                      |
|     |                               | SEF109   |
|     |                               | OK or NG   |
| OK  | <b>•</b>                      | GO TO 13.  |
| NG  | <b>•</b>                      | Repair or reconnect hose.                                |

| 13   | CHECK HARNESS CON | NNECTOR                              |
|--|-------------------|--------------------------------------|
| Disconnect absolute pressure sensor harness connector.     Check sensor harness connector for water.     Water should not exist. |                   |                                      |
| OK or NG   |                   |                                      |
| OK   | •                 | GO TO 14.                            |
| NG   | •                 | Repair or replace harness connector. |

**\$\dagger** 

EC

AT

TF

SU

ST

HA

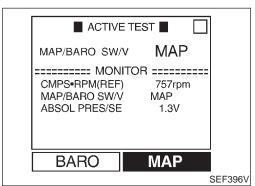
SC

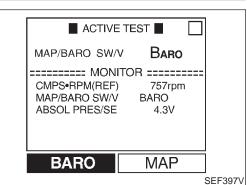
EL

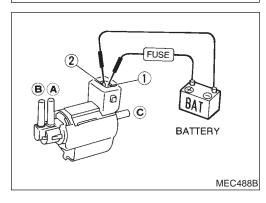
[DX

Diagnostic Procedure (Cont'd)

| 14                             | 4 CHECK ABSOLUTE PRESSURE SENSOR                                |                                   |           |
|--------------------------------|---|-----------------------------------|-----------|
| Refer                          | to "Component Inspection"                                       | , EC-166.                         | GI        |
|                                |   | OK or NG                          |           |
| OK                             | <b>•</b>  | GO TO 15.                         |           |
| NG                             | <b>&gt;</b>   | Replace absolute pressure sensor. | ]         |
|                                |   |                                   | -<br>• En |
| 15 CHECK INTERMITTENT INCIDENT |   |                                   |           |
| Refer                          | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                                   |           |
|                                | INSPECTION END  |                                   |           |







## Component Inspection MAP/BARO SWITCH SOLENOID VALVE

NBEC0286

(P) 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.
- Check the following.
- Condition: At idle under no-load
- CONSULT display

| MAP/BARO | ABSOL PRES/SE (Voltage)       |  |
|----------|-------------------------------|--|
| BARO     | More than 2.6V                |  |
| MAP      | Less than the voltage at BARO |  |

Time for voltage to change

| MAP/BARO SW/V | Time to switch     |  |
|---------------|--------------------|--|
| BARO to MAP   | Less than 1 second |  |
| MAP to BARO   |                    |  |

4) If NG, check solenoid valve as shown below.

#### **⋈** Without CONSULT

- 1) Remove MAP/BARO switch solenoid valve.
- 2) Check air passage continuity.

| Condition   | Air passage continuity between <b>A</b> and <b>B</b> | Air passage continuity between <b>A</b> and <b>C</b> |
|---|--|--|
| 12V direct current supply<br>between terminals 1 and<br>2 | Yes  | No   |
| No supply   | No   | Yes  |



Component Inspection (Cont'd)

3) If NG or operation takes more than 1 second, replace solenoid valve.

#### DTC P1148 (RIGHT BANK, -B1), P1168 (LEFT BANK, -B2) CLOSED LOOP CONTROL

On Board Diagnosis Logic

| On | <b>Board</b> | <b>Diagnosis</b> | Logic |
|----|--------------|------------------|-------|
|    |              |                  |       |

#### ★ The closed loop control has the one trip detection logic.

NBEC0470

|                               |   |   | (G11     |
|-------------------------------|---|---|----------|
| DTC No.                       | Malfunction is detected when  | Check Items (Possible Cause)  | SII.     |
| P1148<br>0307<br>(Right bank) | <ul> <li>The closed loop control function for right bank does not<br/>operate even when vehicle is driving in the specified con-<br/>dition.</li> </ul> | <ul> <li>The front heated oxygen sensor circuit is open or shorted.</li> <li>Front heated oxygen sensor</li> <li>Front heated oxygen sensor heater</li> </ul> | MA<br>EM |
| P1168<br>0308<br>(Left bank)  | <ul> <li>The closed loop control function for left bank does not<br/>operate even when vehicle is driving in the specified con-<br/>dition.</li> </ul>  | <ul> <li>The front heated oxygen sensor circuit is open or shorted.</li> <li>Front heated oxygen sensor</li> <li>Front heated oxygen sensor heater</li> </ul> | LC       |

EC

FE

AT

TF

PD

NBEC0471

#### **DTC Confirmation Procedure**

#### **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.

SU

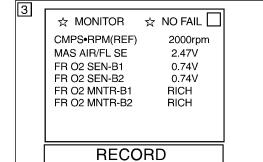
#### **TESTING CONDITION:**

- 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.

BT

HA

SC



#### (P) With CONSULT

- Start engine and warm it up to normal operating temperature.
- Select "DATA MONITOR" mode with CONSULT.
- Hold engine speed at 2,000 rpm and check one of the follow-
- "FR O2 SENSOR" voltage should go above 0.70V at least
- "FR O2 SENSOR" voltage should go below 0.21V at least once.

If the check result is NG, perform "Diagnosis Procedure", EC-450.

SEF392VA

## DTC P1148 (RIGHT BANK, -B1), P1168 (LEFT BANK, -B2) CLOSED LOOP CONTROL

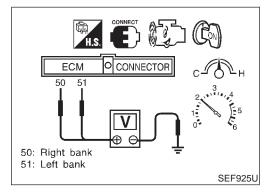
DTC Confirmation Procedure (Cont'd)

If the check result is OK, perform the following step.

- 4) Let engine idle at least 3 minutes.
- 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) |

6) If DTC is detected, go to "Diagnostic Procedure", EC-450.



#### **Overall Function Check**

NBEC0472

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.
- 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.
- 4) If NG, go to "Diagnostic Procedure", EC-450.

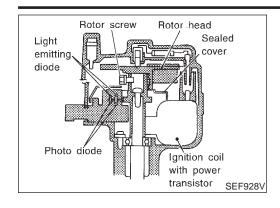
#### **Diagnostic Procedure**

Perform trouble diagnosis for "DTC P0133, P0153", EC-224.

#### **DTC P1320 IGNITION SIGNAL**

Component Description





#### **Component Description IGNITION COIL & POWER TRANSISTOR**

NBEC0287

NBEC0287S01 The power transistor switches on and off the ignition coil primary circuit according to the ECM signal. As the primary circuit is turned

MA

The rotor screw which secures the distributor rotor head to the distributor shaft must be torqued properly.

on and off, the proper high voltage is induced in the secondary cir-

cuit. The distributor is not repairable except for the distributor cap

LC

EC

(37±3 kg-cm, 32±3 in-lb)

#### **ECM Terminals and Reference Value**

NBEC0289

Specification data are reference values and are measured between each terminal and ground.

NOTE:

and rotor head.

#### **CAUTION:**

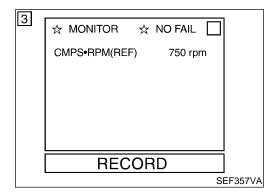
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the FCM's transistor. Use a ground other than FCM terminals, such as the ground

| ERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM               | CONDITION  | DATA (DC Voltage)                       |
|---------------------|---------------|--------------------|--|---|
|                     |               |                    | [Engine is running]  ● Idle speed                      | 0.7V (V) 4 2 0 20 ms SEF988U            |
| 1                   | W/B           | Ignition signal    | [Engine is running]  ● Engine speed is 2,000 rpm       | 1.1 - 1.5V  (V) 4 2 0  20 ms  SEF989U   |
|                     |               |                    | [Engine is running]  • Warm-up condition  • Idle speed | Approximately 12V  (V) 40 20 0  SEF990U |
| 2                   | W/G           | V/G Ignition check | [Engine is running]  ● Engine speed is 2,000 rpm.      | Approximately 11V  (V) 40 20 0  20 ms   |

#### **DTC P1320 IGNITION SIGNAL**



|               | On Board Diagnosis Logic   |  |  |  |
|---------------|--|--|--|--|
| 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. | <ul> <li>Harness or connectors (The ignition primary circuit is open or shorted.)</li> <li>Power transistor unit.</li> <li>Resistor</li> <li>Camshaft position sensor</li> <li>Camshaft position sensor circuit</li> </ul> |  |  |



#### **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 DTC P1320 (0201) is displayed with P0340 (0101), perform trouble diagnosis for DTC P0340 first. Refer to EC-336.
- (P) With CONSULT
- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-454.

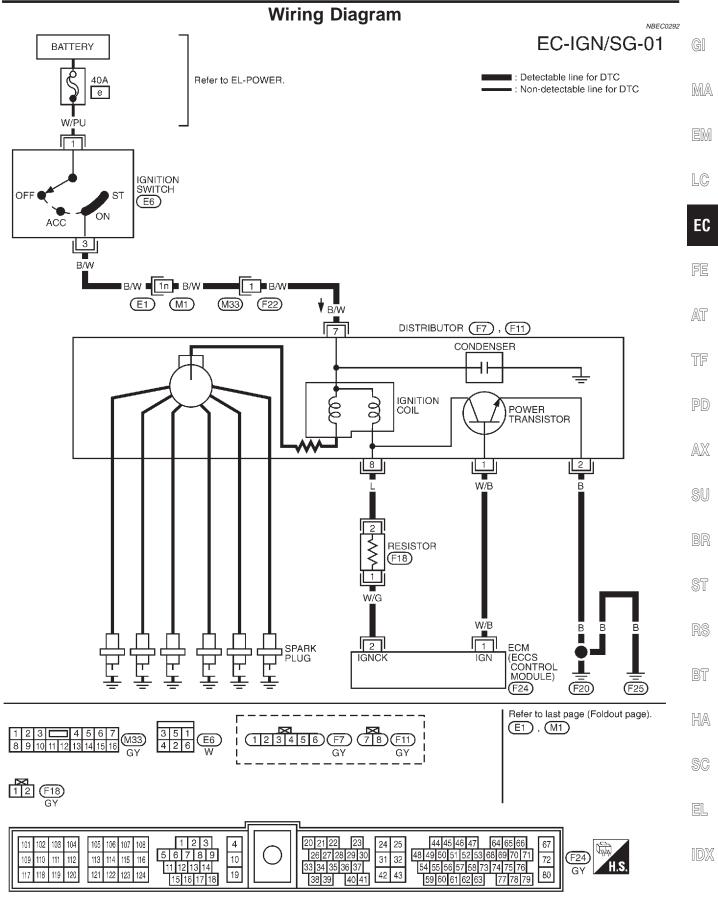
#### **With GST**

- Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- 2) Select MODE 7 with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-454.

#### No Tools

- Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
- Turn ignition switch "OFF" and wait at least 5 seconds, then turn "ON".
- Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-454.





MEC166C

#### **DTC P1320 IGNITION SIGNAL**



#### **Diagnostic Procedure**

Turn ignition switch "OFF", and restart engine.

Is engine running?

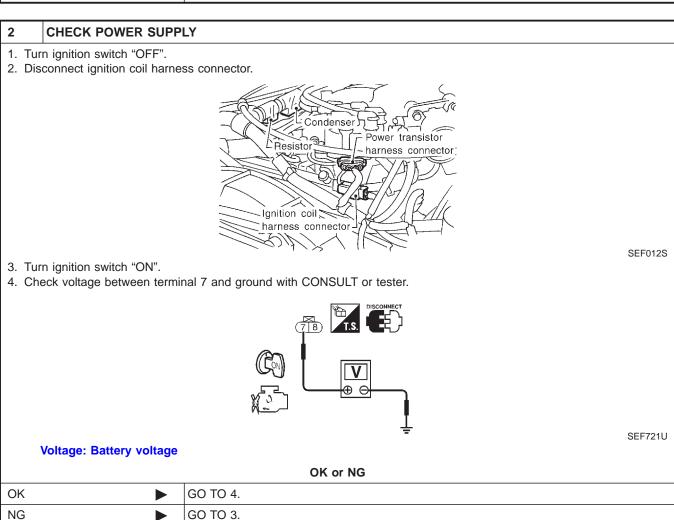
Yes or No

Yes

GO TO 7.

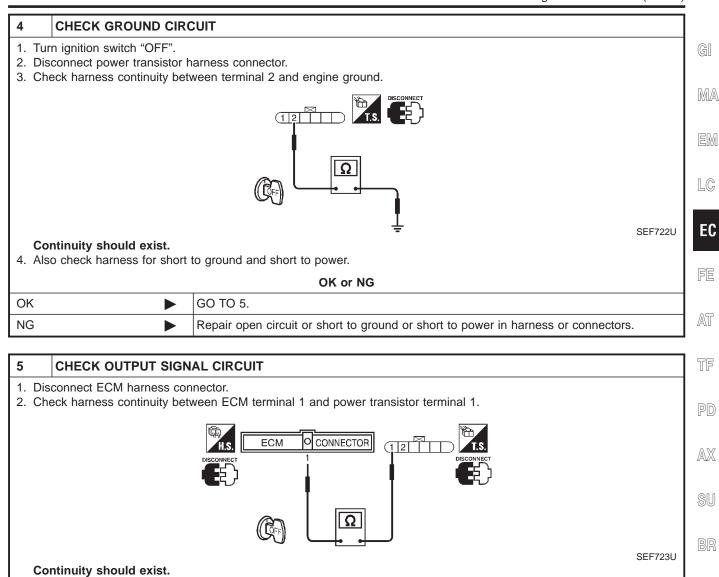
No

BEC0293



# 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.





| 6    | CHECK IGNITION COIL                      | AND POWER TRANSISTOR                 |  |  |
|------|--|--------------------------------------|--|--|
| Refe | Refer to "Component Inspection", EC-457. |                                      |  |  |
|      |  | OK or NG                             |  |  |
| OK   | <b>•</b>                                 | GO TO 9.                             |  |  |
| NG   | <b>•</b>                                 | Replace malfunctioning component(s). |  |  |

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

3. Also check harness for short to ground and short to power.

OK

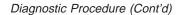
NG

GO TO 6.

HA

SC

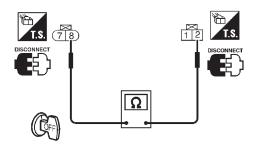
#### **DTC P1320 IGNITION SIGNAL**



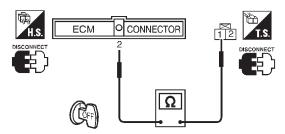


#### CHECK INPUT SIGNAL CIRCUIT

- 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.



SEF724U



SEF725U

#### Continuity should exist.

7. Also 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. |

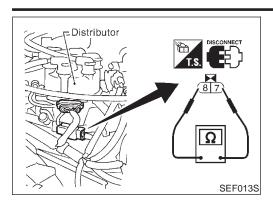
| 8     | CHECK RESISTOR                           |                   |  |
|-------|--|-------------------|--|
| Refer | Refer to "Component Inspection", EC-457. |                   |  |
|       | OK or NG                                 |                   |  |
| OK    | OK                                       |                   |  |
| NG    | <b>•</b>                                 | Replace resistor. |  |

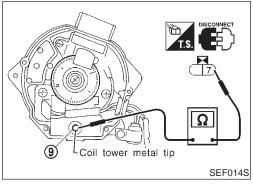
| 9     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | INSPECTION END  |  |  |

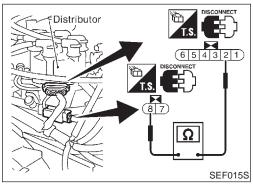
#### **DTC P1320 IGNITION SIGNAL**

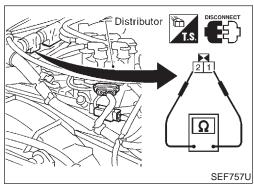
Component Inspection











#### **Component Inspection IGNITION COIL**

NBEC0294S01

- Disconnect ignition coil harness connector.
- 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.

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#### POWER TRANSISTOR

Disconnect camshaft position sensor & power transistor harness connector and ignition coil harness connector.

Check power transistor resistance between terminals 2 and 8.

| _ |  |
|---|--|
|   |  |
|   |  |

**Terminals** Result Resistance OK Except  $0\Omega$ 2 and 8  $\Omega$ 0 NG

If NG, replace distributor assembly.

#### **RESISTOR**

- Disconnect resistor harness connector.
- Check resistance between terminals 1 and 2.

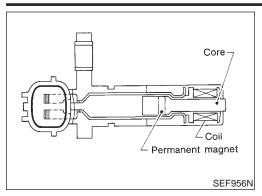
Resistance: Approximately 2.2 k $\Omega$  [at 25°C (77°F)] If NG, replace resistor.

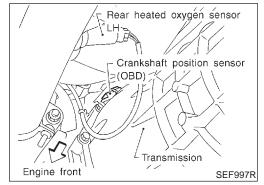
HA

SC

Component Description







#### **Component Description**

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet, core and coil.

When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

This sensor is not used to control the engine system.

It is used only for the on board diagnosis.

#### **ECM Terminals and Reference Value**

NREC0296

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION  | DATA (DC Voltage)  |
|----------------------|---------------|----------------------------------|--|--|
|                      |               | Crankshaft position sensor (OBD) | [Engine is running]  • Warm-up condition  • Idle speed | 1 - 2V<br>(AC range)<br>(V)<br>10<br>5<br>0.2 ms<br>SEF690W      |
| 47                   | L             |                                  | [Engine is running] • Engine speed is 2,000 rpm        | 2 - 4V<br>(AC range)<br>(V)<br>10<br>5<br>0<br>0.2 ms<br>SEF691W |

On Board Diagnosis Logic

|               | On Board Diagnosis Logic   |   |  |    |
|---------------|--|---|--|----|
| DTC No.       | Malfunction is detected when   | Check Items (Possible Cause)  |  | GI |
| P1336<br>0905 | A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM. | <ul> <li>Harness or connectors</li> <li>Crankshaft position sensor (OBD)</li> <li>Drive plate/Flywheel</li> </ul> |  | MA |

LC

#### **DTC Confirmation Procedure**

NOTE:

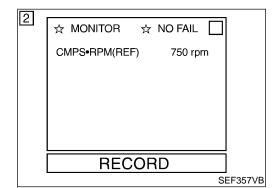
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

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(P) With CONSULT

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

Start engine and run it for at least 2 minutes at idle speed.

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-461.

SU

® With GST

1) Start engine and run it for at least 2 minutes at idle speed.

Select "MODE 7" with GST.

If 1st trip DTC is detected, go to "Diagnostic Procedure",

EC-461. No Tools

ST

Start engine and run it for at least 2 minutes at idle speed.

Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

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

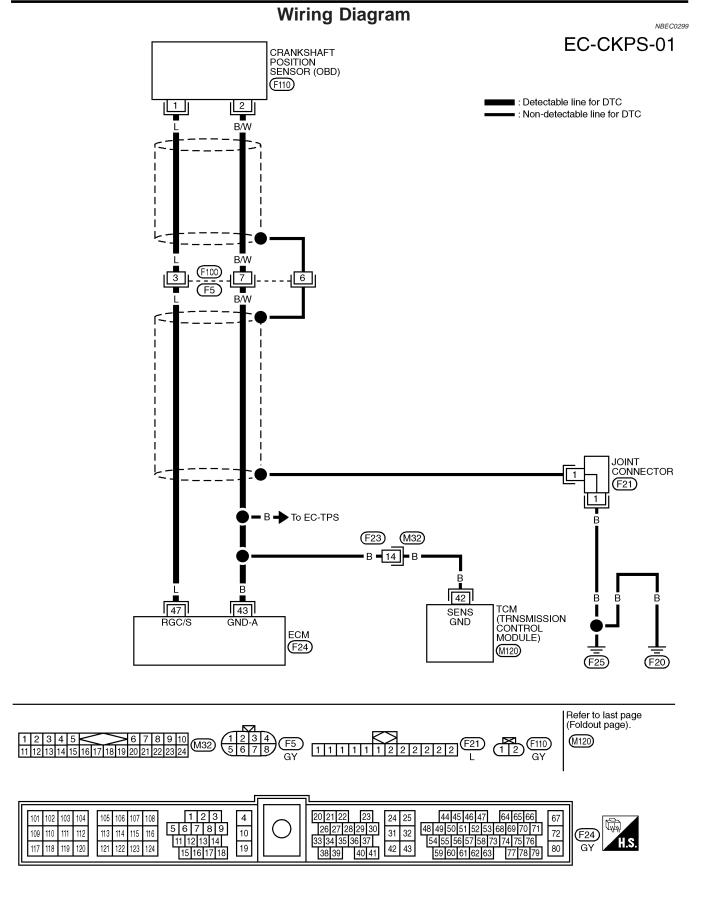
BT

4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-461.

HA

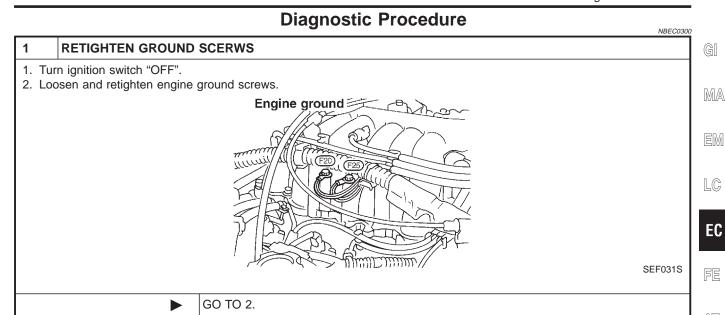
SC

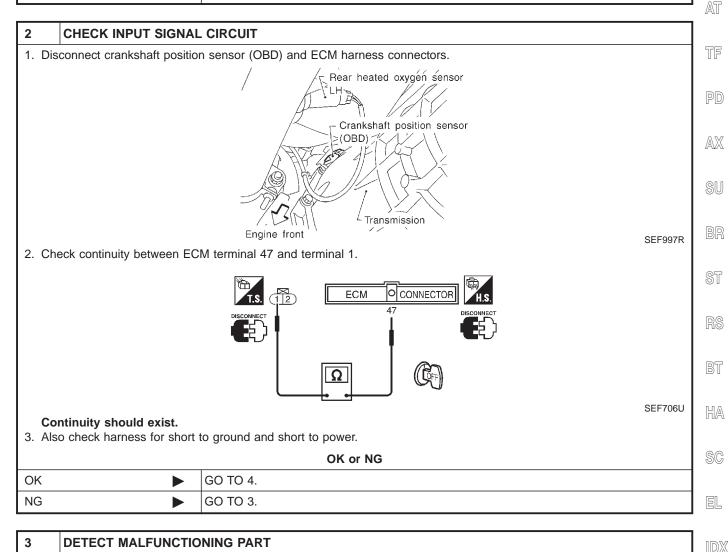




MEC647C

Diagnostic Procedure





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

• Harness for open or short between ECM and crankshaft position sensor (OBD)

Check the following.

Harness connectors F100, F5



Diagnostic Procedure (Cont'd)

NG

# 4 CHECK GROUND CIRCUIT 1. Reconnect ECM harness connectors. 2. Check harness continuity between terminal 2 and engine ground. Continuity should exist. 3. Also check harness for short to ground and short to power. OK or NG OK

| 5   | DETECT MALFUNCTIO  | NING PART  |  |
|---|--|--|--|
| <ul><li>Har</li><li>Har</li><li>Har</li></ul> | 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) |  |  |
|   | <b>&gt;</b>  | Repair open circuit or short to ground or short to power in harness or connectors. |  |

GO TO 5.

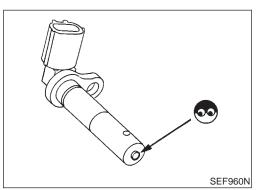
| 6   | CHECK IMPROPER INSTALLATION  |                |  |
|-----|--|----------------|--|
|     | <ol> <li>Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD).</li> <li>Perform "DTC Confirmation Procedure", EC-459 again.</li> </ol> |                |  |
|     | Is a 1st trip DTC P1336 (0905) detected?   |                |  |
| Yes | <b>&gt;</b>  | GO TO 7.       |  |
| No  | <b>&gt;</b>  | INSPECTION END |  |

| 7  | CHECK CRANKSHAFT POSITION SENSOR (OBD)       |  |  |  |
|--|--|--|--|--|
| Refer to "Component Inspection", EC-463. |  |  |  |  |
|  | OK or NG                                     |  |  |  |
| ОК                                       | OK <b>▶</b> GO TO 8.                         |  |  |  |
| NG                                       | NG Replace crankshaft position sensor (OBD). |  |  |  |

| 8  | CHECK SHIELD CIRCUIT |  |  |  |  |
|--|----------------------|--|--|--|--|
| Disconnect harness connectors F38, F102.     Check harness continuity between harness connector F38 and engine ground.     Continuity should exist.     Also check harness for short to ground and short to power. |                      |  |  |  |  |
|  | OK or NG             |  |  |  |  |
| OK   | OK ▶ GO TO 10.       |  |  |  |  |
| NG   | NG ► GO TO 9.        |  |  |  |  |

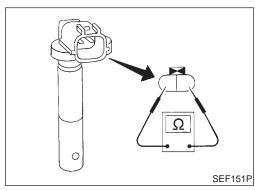
Diagnostic Procedure (Cont'd)

| 9 D                      | ETECT MALFUNCTION                                    | NING PART  |         |
|--------------------------|--|--|---------|
| <ul><li>Harnes</li></ul> | e following.<br>ss connectors F38, F10<br>onnector-1 | 2  | <u></u> |
|                          |  | ween harness connector F38 and engine ground                                       |         |
|                          | <b>•</b>   | Repair open circuit or short to ground or short to power in harness or connectors. |         |
|                          |  |  |         |
| 10 C                     |  |  |         |
| Visually o               | check for chipping flywh                             | eel or drive plate gear tooth (cog).   |         |
|                          |  | OK or NG   |         |
|                          |  |  | - 1     |
| OK                       | <b>&gt;</b>  | GO TO 11.  |         |



Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136.

**INSPECTION END** 



#### **Component Inspection CRANKSHAFT POSITION SENSOR (OBD)**

PD

Disconnect crankshaft position sensor (OBD) harness connec-

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2. Loosen the fixing bolt of the sensor.

3. Remove the sensor.

4. Visually check the sensor for chipping.

SU

BR

5. Check resistance as shown in the figure.

Resistance: Approximately 166.5 - 203.5 $\Omega$  [at 20°C (68°F)]

RS

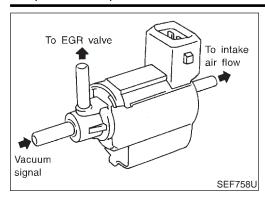
HA SC

BT

EL

#### DTC P1400 EGRC-SOLENOID VALVE





#### **Component Description**

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal (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**

Specification data are reference values.

NBEC0303

| MONITOR ITEM | COND   | DITION  | SPECIFICATION |
|--------------|--|---|---------------|
|              | <ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul> | Idle  | OFF           |
| EGRC SOL/V   | Shift lever: "N"   | 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 ground.

#### **CAUTION:**

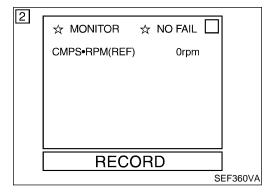
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR           | ITEM   | CONDITION  | DATA (DC Voltage)             |
|----------------------|-------------------------|--|--|-------------------------------|
| 103                  | L/W EGRC-solenoid valve | FORC aslantidusha  | [Engine is running]  • Warm-up condition  • Idle speed | BATTERY VOLTAGE<br>(11 - 14V) |
|                      |                         | <ul> <li>[Engine is running]</li> <li>Warm-up condition</li> <li>Revving engine from idle up to 3,000 rpm quickly</li> </ul> | 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     (The EGRC-solenoid valve circuit is open or shorted.)     EGRC-solenoid valve |



#### **DTC Confirmation Procedure**

NBEC0306

#### 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.

#### **DTC P1400 EGRC-SOLENOID VALVE**



DTC Confirmation Procedure (Cont'd)

#### (P) With CONSULT

- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT and wait at least 5 seconds.
  - .. D . . . .
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-467.

#### ' MA

#### **With GST**

- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-467.

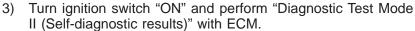


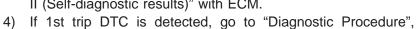
EM

#### No Tools

EC-467.

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





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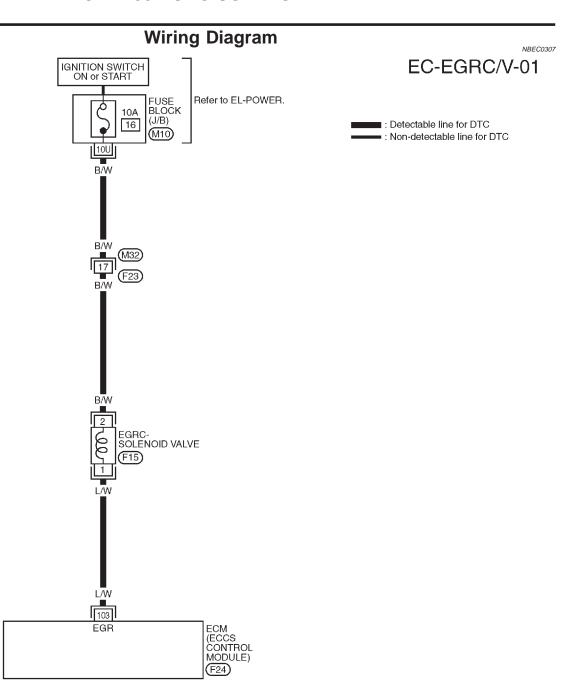
RS

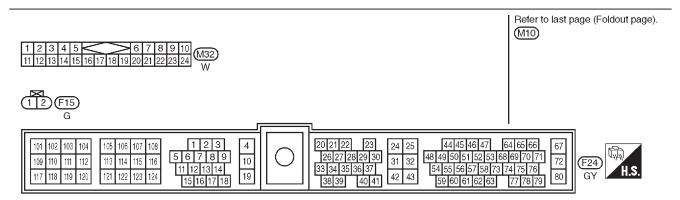
HA

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MEC168C

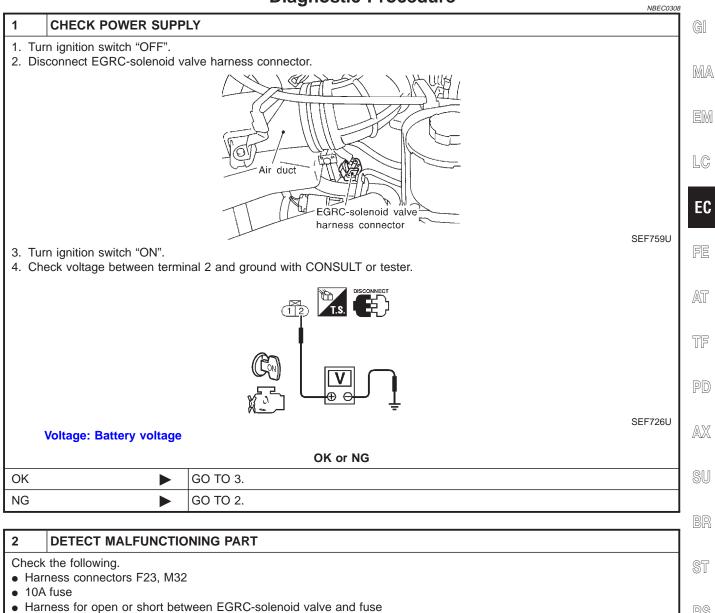


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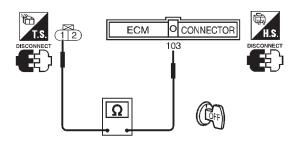


Repair harness or connectors.



#### 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.

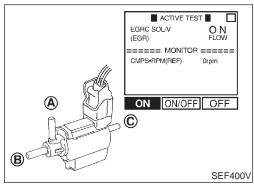
4. Also check harness for short to ground and short to power.

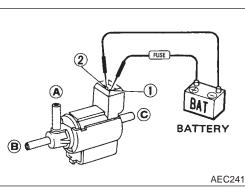
|    |    | NG  |
|----|----|-----|
| OK | or | NI. |
|    |    |     |

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

| 4  | CHECK EGRC-SOLENOID VALVE       |  |  |  |
|--|---------------------------------|--|--|--|
| Refer to "Component Inspection", EC-468. |                                 |  |  |  |
| OK or NG                                 |                                 |  |  |  |
| OK                                       | OK ▶ GO TO 5.                   |  |  |  |
| NG                                       | NG Replace EGRC-solenoid valve. |  |  |  |

| 5     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |





# **Component Inspection EGRC-SOLENOID VALVE**

NBEC0309

NBEC0309S01

SEF727U

Check air passage continuity.

(I) With CONSULT

Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

| Conditions | Air passage continuity between <b>A</b> and <b>B</b> | Air passage continuity between <b>A</b> and <b>C</b> |
|------------|--|--|
| ON         | Yes  | No   |
| OFF        | No   | Yes  |

#### **⋈** Without CONSULT

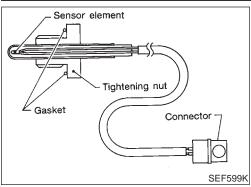
| Condition   | Air passage continuity between <b>A</b> and <b>B</b> | Air passage continuity between <b>A</b> and <b>C</b> |
|---|--|--|
| 12V direct current supply between terminals 1 and 2 | Yes  | No   |
| No supply   | No   | Yes  |

If NG or operation takes more than 1 second, replace solenoid valve.

# DTC P1401 EGR TEMPERATURE SENSOR

Component Description





10,000

1.000

Resistance 1

10

Acceptable range

100

Temperature °C (°F)

(212)

50

(122)

(32)

150

(302)

200

(392)

SEF526Q

# **Component Description**

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases.

This sensor is not used to control the engine system. It is used only for the on board diagnosis.

# 

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# LC

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# <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 ground.

When EGR system is operating.

Voltage: 0 - 1.5V

# **CAUTION:**

Do not use ECM ground terminals when measuring input/ output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



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# On Board Diagnosis Logic

NBEC0311

| RS |
|----|

| 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.   | <ul> <li>Harness or connectors         (The EGR temperature sensor circuit is shorted.)</li> <li>EGR temperature sensor</li> <li>Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve</li> </ul> | RS<br>BT |
|               | В) | An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high. | <ul> <li>Harness or connectors         (The EGR temperature sensor circuit is open.)</li> <li>EGR temperature sensor</li> <li>Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve</li> </ul>    | HA<br>SC |

EL

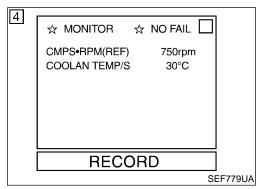


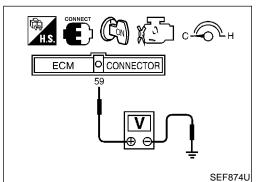
# **DTC Confirmation Procedure**

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.





# PROCEDURE FOR MALFUNCTION A

NBFC0474S01

- (P) With CONSULT
- 1) Turn ignition switch "ON".
- 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.
- Start engine and let it idle for at least 8 seconds.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-473.

# **With GST**

- 1) Turn ignition switch "ON".
- 2) Select "MODE 1" with GST.
- 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.

- Start engine and let it idle for at least 8 seconds.
- Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-473.

# 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.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-473.

# Lift up the EGR valve by hand.

# PROCEDURE FOR MALFUNCTION B

NBEC0474S02

# **CAUTION:**

Always drive vehicle at a safe speed.

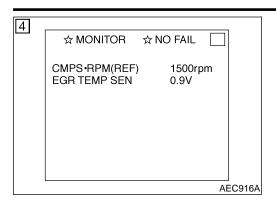
# **TESTING CONDITION:**

Always perform the test at a temperature of 5°C (41°F) or higher.

- (P) With CONSULT
- 1) Start engine and warm it up to normal operating temperature.
- Confirm that EGR valve is not lifting at idle.
   If the check result is NG, go to trouble diagnoses for "DTC P1402". (See page EC-475.)

# DTC P1401 EGR TEMPERATURE SENSOR

DTC Confirmation Procedure (Cont'd)



- Select "DATA MONITOR" mode with CONSULT.
- 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.

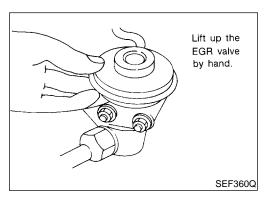
If the check result is NG, go to "Diagnostic Procedure", EC-473.

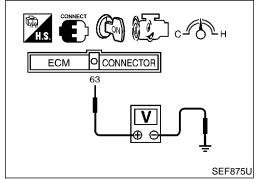
If the check result is OK, go to following step.

- 5) Turn ignition switch "OFF" and wait at least 5 seconds.
- 6) Turn ignition switch "ON".
- 7) Check the output voltage of "THRTL POS SEN" at closed throttle position and note it.
- 8) Start engine.
- 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 msec   |
| THRTL POS SEN  | X - (X + 0.70) V<br>X = Voltage value measured at step 7 |
| Selector lever | Suitable position  |

10) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-473.





# **Overall Function Check**

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

# PROCEDURE FOR MALFUNCTION B

# **⋈** Without CONSULT

- 1) Start engine and warm it up to normal operating temperature.
- 2) Confirm that EGR valve is not lifting. If NG, go to trouble diagnoses for DTC P0400 and P0402 (See pages EC-344 and 355).
- 3) 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.

4) If step 4 is OK, perform trouble diagnoses for "DTC P0400 and P1400" (See pages EC-344 and 464).

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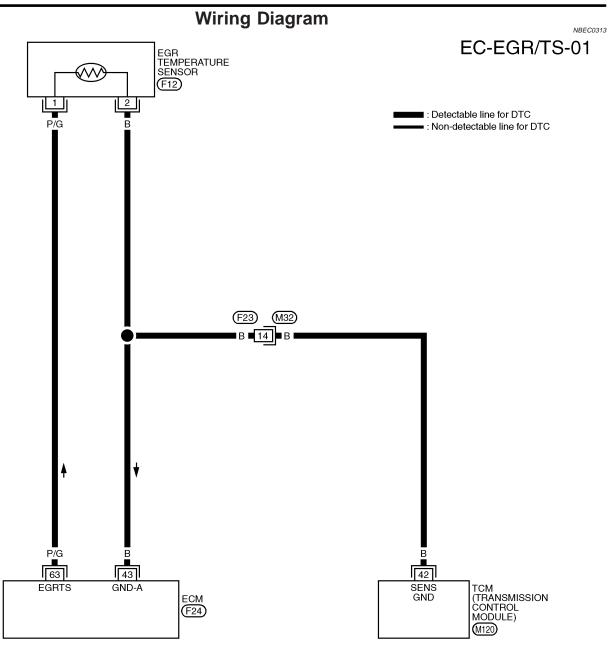
ппл

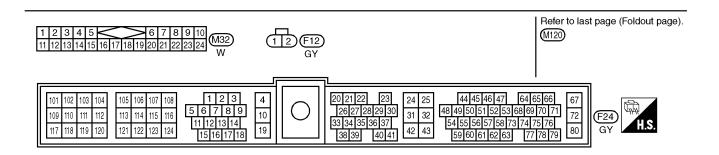
SC

90

EL



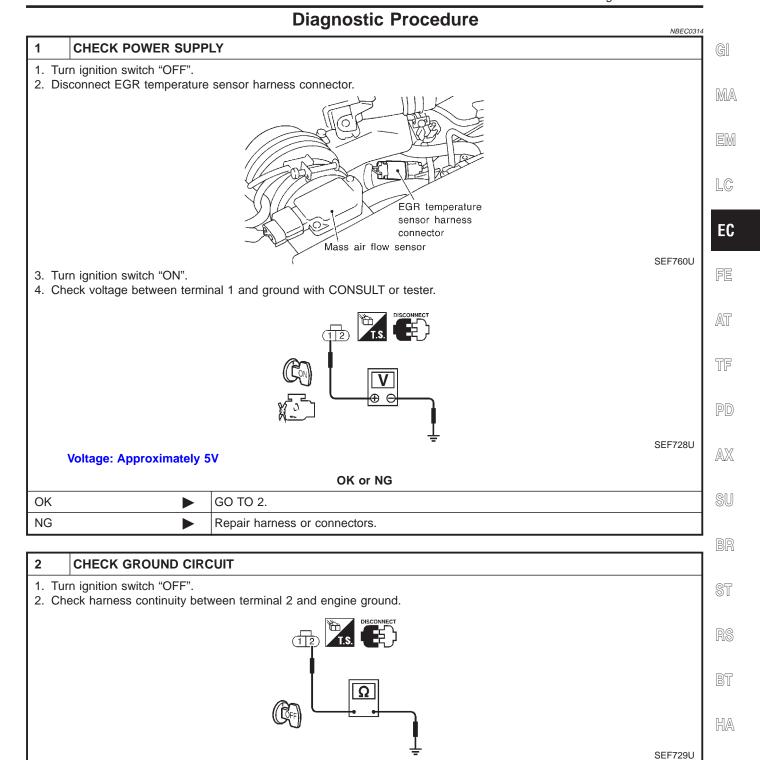




MEC648C



SC



OK or NG

Continuity should exist.

OK

NG

3. Also check harness for short to ground or short to power.

GO TO 4. GO TO 3.

# DTC P1401 EGR TEMPERATURE SENSOR



Diagnostic Procedure (Cont'd)

# **DETECT MALFUNCTIONING PART**

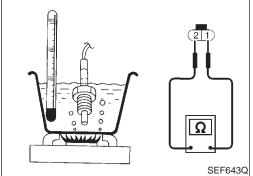
Check the following.

- 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 EGR TEMPERATURE SENSOR             |                                 |  |
|-------|--|---------------------------------|--|
| Refer | Refer to "Component Inspection", EC-474. |                                 |  |
|       | OK or NG                                 |                                 |  |
| OK    | <b>&gt;</b>                              | GO TO 5.                        |  |
| NG    | <b>•</b>                                 | Replace EGR temperature sensor. |  |

| 5     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |



# 10,000 1,000 Acceptable range Resistance kΩ O 10 100 200 150

(32)

(122)

(212)

Temperature °C (°F)

(302)

(392)

SEF526Q

# **Component Inspection EGR TEMPERATURE SENSOR**

NBEC0315

NBEC0315S01

Check resistance change and resistance value.

# <Reference data>

| EGR temperature °C (°F) | Voltage V | Resistance $M\Omega$ |
|-------------------------|-----------|----------------------|
| 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

# **Description** SYSTEM DESCRIPTION

NBEC0475

|                                   |                            |                   | NBEC0475S01         | GI     |
|-----------------------------------|----------------------------|-------------------|---------------------|--------|
| Sensor                            | Input Signal to ECM        | ECM func-<br>tion | Actuator            | MA     |
| Camshaft position sensor          | Engine speed               |                   |                     | UVU/=\ |
| Mass air flow sensor              | Amount of intake air       |                   |                     |        |
| Engine coolant temperature sensor | Engine coolant temperature | EGR con-<br>trol  | EGRC-solenoid valve | LSUVU  |
| Ignition switch                   | Start signal               |                   |                     | LC     |
| Throttle position sensor          | Throttle position          |                   |                     |        |

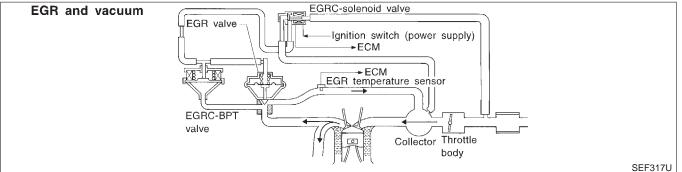
This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-solenoid valve. When the ECM detects any of the following conditions, current does not flow through the solenoid valve. This causes the intake manifold vacuum to be discharged into the atmosphere. The EGR valve remains closed.

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- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction

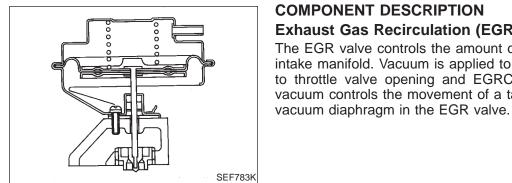




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SC



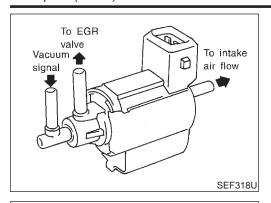
# **COMPONENT DESCRIPTION**

# **Exhaust Gas Recirculation (EGR) Valve**

NBFC0475S02

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening and EGRC-BPT valve operation. The vacuum controls the movement of a taper valve connected to the

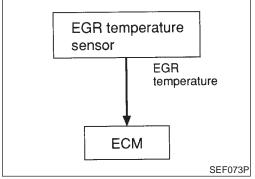




# **EGRC-solenoid Valve**

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal (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.



# On Board Diagnosis Logic

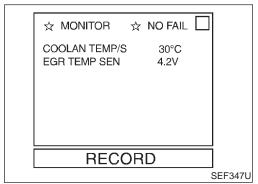
NREC0476

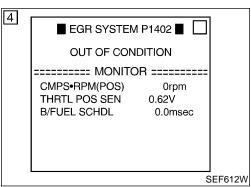
If the EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

#### NOTE:

Diagnosis for this DTC will end when engine coolant temperature is approx. 50 to 60°C (122 to 140°F). Ignition switch must be turned "ON" (engine start) with engine coolant temperature below 40°C (104°F) when starting DTC confirmation procedure.

| DTC No.       | Malfunction is detected when                                    | Check Items (Possible Cause)   |
|---------------|---|--|
| P1402<br>0514 | EGR flow is detected under conditions that do not call for EGR. | <ul> <li>EGRC-solenoid valve</li> <li>EGR valve leaking or stuck open</li> <li>EGR temperature sensor</li> <li>EGRC-BPT valve</li> </ul> |





# **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:**

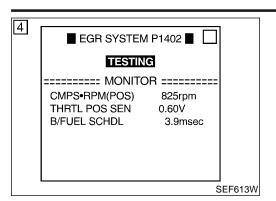
- Always perform the test at a temperature of -10°C (14°F) or higher.
- Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.

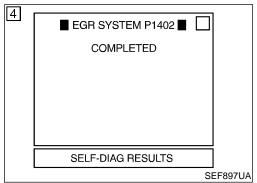
COOLAN TEMP/S: -10 to 30°C (14 to 86°F)\* EGR TEMP SEN: Less than 4.8V

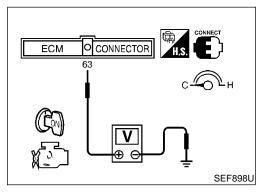
If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant temperature or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

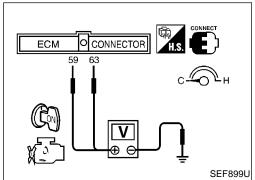
\*: Although CONSULT screen displays "-10 to 40°C (14 to 104°F)" as a range of engine coolant temperature, ignore it.

DTC Confirmation Procedure (Cont'd)









# (P) With CONSULT

- Turn ignition switch "OFF", and wait at least 5 seconds, and then turn "ON".
- Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Follow the CONSULT instructions.
- 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 30°C (14 to 86°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-479.

# **With GST**

- Turn ignition switch "ON" and select "MODE 1" with GST.
- Check that engine coolant temperature is within the range of -10 to 30°C (14 to 86°F).
- 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.
- Perform from step 1 to 4.
- 7) Select "MODE 3" with GST.
- If DTC is detected, go to "Diagnostic Procedure", EC-479.

# No Tools

- Turn ignition switch "ON".
- Check the following voltages.

ECM terminal 59 (engine coolant temperature sensor signal) and ground:

ECM terminal 63 (EGR temperature sensor signal) and ground:

# Less than 4.8V

- Start engine and let it idle for at least 60 seconds.
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with
- If NG, go to "Diagnostic Procedure", EC-479.
- 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.



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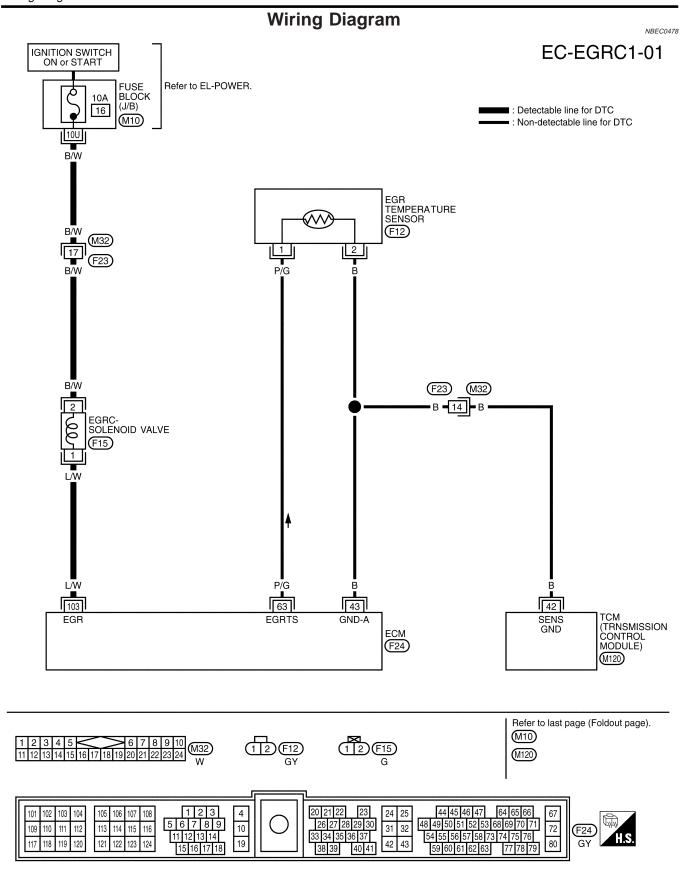
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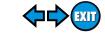
HA

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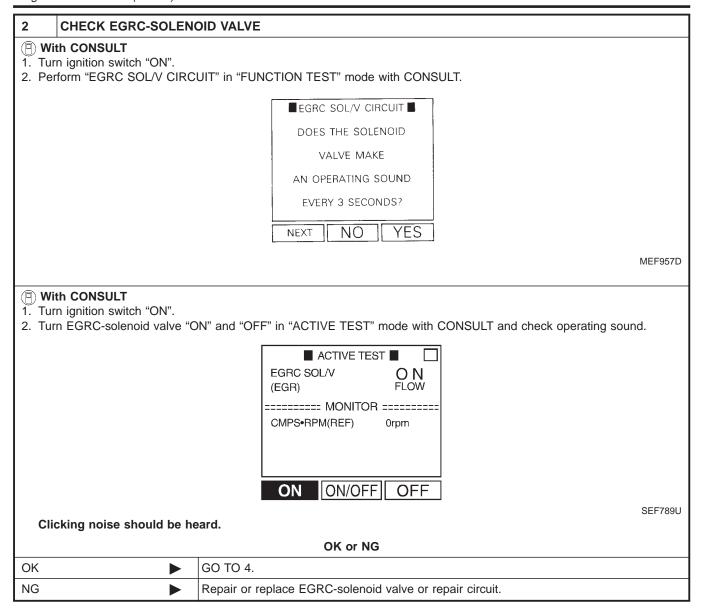
EL

# **Diagnostic Procedure**

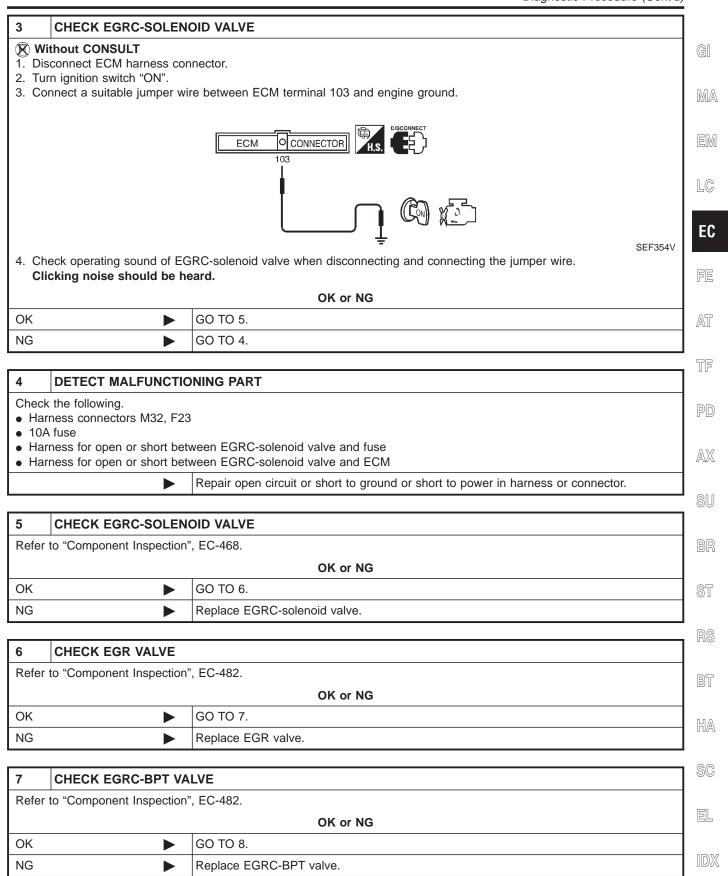
|      |  | Diagnostic Frocedure   | NBEC0479 |
|------|--|--|----------|
| 1    | CHECK VACUUM HO  | PSE The second s |          |
|      | urn ignition switch "OFF".<br>heck vacuum hose for clo | gging, cracks or improper connection. Refer to "Vacuum Hose Drawing", EC-24.   |          |
|      |  | Clogging   |          |
|      |  | Improper connection  |          |
|      |  |  | SEF109L  |
|      |  | OK or NG   |          |
| OK ( | with CONSULT)  | GO TO 2.   |          |
| OK ( | without CONSULT)                                       | GO TO 3.   |          |
| NG   | <b>•</b>   | Repair or replace vacuum hose.   |          |



Diagnostic Procedure (Cont'd)



Diagnostic Procedure (Cont'd)

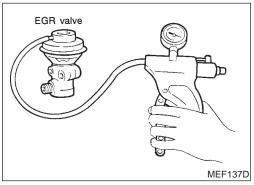




Diagnostic Procedure (Cont'd)

| 8     | CHECK EGR TEMPERATURE SENSOR             |                                 |  |  |
|-------|--|---------------------------------|--|--|
| Refer | Refer to "Component Inspection", EC-474. |                                 |  |  |
|       | OK or NG                                 |                                 |  |  |
| OK    | OK ▶ GO TO 9.                            |                                 |  |  |
| NG    | <b>•</b>                                 | Replace EGR temperature sensor. |  |  |

| 9     | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |



# **Component Inspection EGR VALVE**

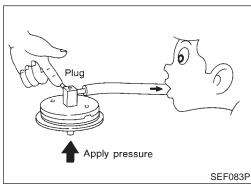
NBEC0480

NDLC0400

Apply vacuum to EGR vacuum port with a hand vacuum pump. **EGR valve spring should lift.** 

• Check for sticking.

If NG, repair or replace EGR valve.



# **EGRC-BPT VALVE**

NBEC0480S04

- 1. Plug one of two ports of EGRC-BPT valve.
- Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH<sub>2</sub>O, 3.94 inH<sub>2</sub>O) from under EGRC-BPT valve.
- 3. If a leakage is noted, replace the valve.

On Board Diagnosis Logic

NBEC0481

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# On Board Diagnosis Logic

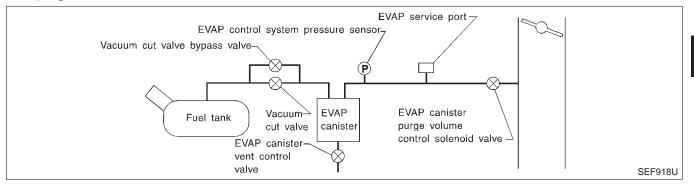
# NOTE:

If DTC P1440 is displayed with P1448, perform trouble diagnosis for "DTC P1448" first. (See EC-515.)

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.



| DTC No.       | Malfunction is detected when   | Check Items (Possible Cause)   | · TF |
|---------------|--|--|------|
| P1440<br>0213 | EVAP control system has a leak.     EVAP control system does not operate properly. | <ul> <li>Incorrect fuel tank vacuum relief valve</li> <li>Incorrect fuel filler cap used</li> <li>Fuel filler cap remains open or fails to close.</li> </ul>   | PD   |
|               |  | <ul> <li>Foreign matter caught in fuel filler cap.</li> <li>Leak is in line between intake manifold and<br/>EVAP canister purge volume control solenoid<br/>valve.</li> </ul>                              | AX   |
|               |  | Foreign matter caught in EVAP canister vent control valve.   | SU   |
|               |  | <ul> <li>EVAP canister or fuel tank leaks</li> <li>EVAP purge line (pipe and rubber tube) leaks</li> <li>EVAP purge line rubber tube bent.</li> <li>Blocked or bent rubber tube to EVAP control</li> </ul> | BR   |
|               |  | system pressure sensor  Loose or disconnected rubber tube  EVAP canister vent control valve and the circuit  | ST   |
|               |  | EVAP canister purge volume control solenoid valve     Absolute pressure sensor   | RS   |
|               |  | <ul> <li>Fuel tank temperature sensor</li> <li>MAP/BARO switch solenoid valve</li> <li>Blocked or bent rubber tube to MAP/BARO</li> </ul>  | BT   |
|               |  | <ul> <li>switch solenoid valve</li> <li>O-ring of EVAP canister vent control valve is missing or damaged.</li> </ul>   | HA   |
|               |  | <ul> <li>Water separator</li> <li>EVAP canister is saturated with water.</li> <li>EVAP control system pressure sensor</li> </ul>   | SC   |

# **CAUTION:**

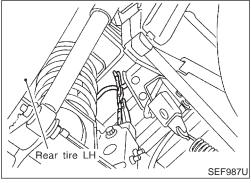
- Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine NISSAN rubber tube as a replacement.

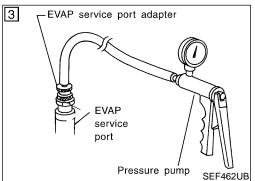
# **DTC Confirmation Procedure**

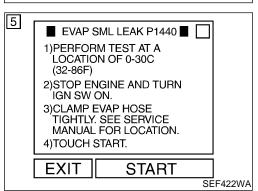
NBEC0482

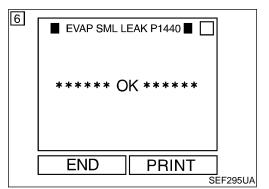
# NOTE:

- If DTC P1440 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-515.)
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.









# (P) 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/cm<sup>2</sup>, 0.6 psi) of pressure in EVAP system.
- Do not start engine.

#### NOTE:

- Always remove EVAP service port adapter from EVAP service port after 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 "OFF".
- 2) Clamp the EVAP hose as shown at left.
- Install EVAP service port adapter and pressure pump to EVAP service port securely.
- 4) Turn ignition switch "ON".
- 5) Select "EVAP SML LEAK P1440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.
- 6) Make sure that "OK" is displayed. If "NG" is displayed, refer to "Diagnostic Procedure", EC-485.

# With GST

# NOTE:

- Be sure to read the explanation of "Driving Pattern" on EC-62 before driving vehicle.
- It is better that fuel level is low.
- 1) Start engine.
- 2) Drive vehicle according to "Driving Pattern", EC-62.
- 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.
- Tarringinilori switch Off and wait at loast of
- 6) Start engine.

# It is not necessary to cool engine down before driving.

- 7) Drive vehicle again according to the "Driving Pattern", EC-62.
- 8) Stop vehicle.
- 9) Select "MODE 3" with GST.
- If P0440 is displayed on the screen, go to "Diagnostic Procedure", EC-366.
- If P1440 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1440", EC-485.

DTC Confirmation Procedure (Cont'd)

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If P1447 is displayed on the screen, go to "Diagnostic Procedure" for "DTC P1447", EC-509.

• If P0440, P1440 and P1447 are not displayed on the screen, go to the following step.

10) Select "MODE 1" with GST.

- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 5.

# No Tools

# NOTE:

- Be sure to read the explanation of "Driving Pattern" on EC-62 before driving vehicle.
- It is better that the fuel level is low.
- 1) Start engine.
- 2) Drive vehicle according to "Driving Pattern", EC-62.
- 3) Stop vehicle.
- 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.
- 6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-485.

# **Diagnostic Procedure**

1 CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch "OFF".
2. Check for genuine NISSAN fuel filler cap design.

SEF915U

OK or NG

OK

Replace with a genuine NISSAN fuel filler cap.

| 2     | CHECK FUEL FILLER   | CAP INSTALLATION  |  |  |  |
|-------|---|---|--|--|--|
| Check | Check that the cap is tightened properly by rotating the cap clockwise. |   |  |  |  |
|       | OK or NG  |   |  |  |  |
| OK    | <b>•</b>  | GO TO 3.  |  |  |  |
| NG    | <b>&gt;</b>   | <ul> <li>Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.</li> <li>Retighten until ratcheting sound is heard.</li> </ul> |  |  |  |

HA

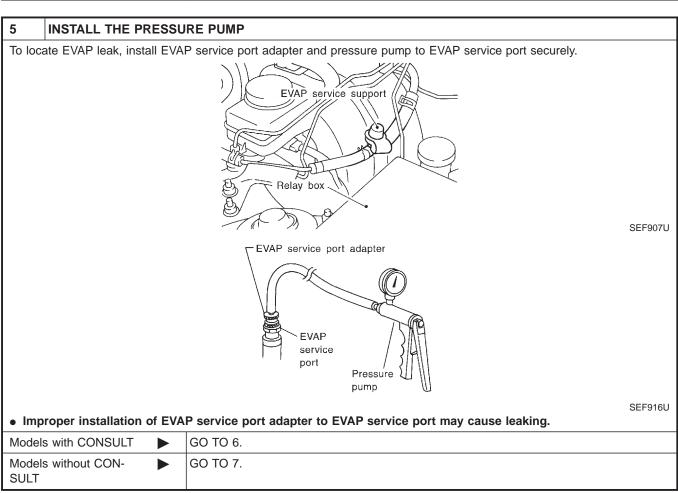
SC

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Diagnostic Procedure (Cont'd)

| 3  | 3 CHECK FUEL FILLER CAP FUNCTION |          |  |  |  |  |
|--|----------------------------------|----------|--|--|--|--|
| Check for air releasing sound while opening the fuel filler cap. |                                  |          |  |  |  |  |
|  | OK or NG                         |          |  |  |  |  |
| OK   | OK 🕨 GO TO 5.                    |          |  |  |  |  |
| NG   | <b>•</b>                         | GO TO 4. |  |  |  |  |

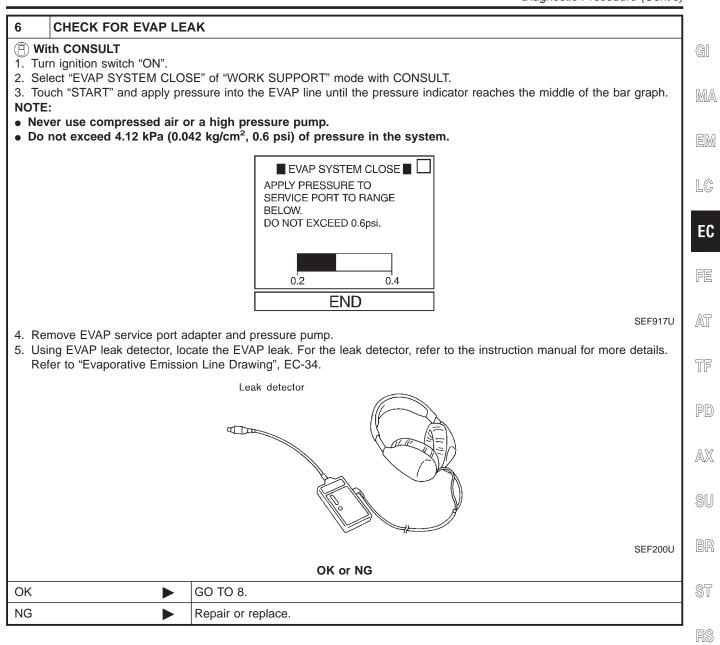
| 4     | CHECK FUEL TANK VA  | CUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP) |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "Fuel Tank Vacuum Relief Valve (Built into fuel filler cap)", EC-31. |  |  |  |  |
|       |   | OK or NG                                       |  |  |  |
| OK    | OK ▶ GO TO 5.   |  |  |  |  |
| NG    | <b>&gt;</b>   | Replace fuel filler cap with a genuine one.    |  |  |  |



Diagnostic Procedure (Cont'd)

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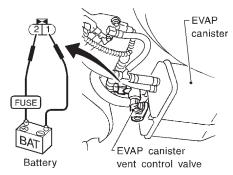


Diagnostic Procedure (Cont'd)

# **CHECK FOR EVAP LEAK**

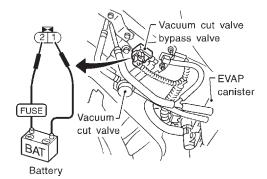
# Without CONSULT

- 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.)



SFF59811

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)

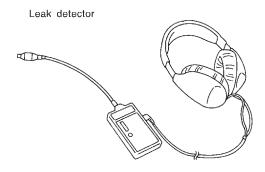


SEF599U

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).

#### NOTE:

- Never use compressed air or a high pressure pump.
- Do not exceed 4.12 kPa (0.042 kg/cm<sup>2</sup>, 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. For the leak detector, refer to the instruction manual for more details. Refer to "Evaporative Emission Line Drawing", EC-34.



SEF200U

| OK | or | NG |  |
|----|----|----|--|

| OK ► | GO TO 8.           |
|------|--------------------|
| NG • | Repair or replace. |

Diagnostic Procedure (Cont'd)

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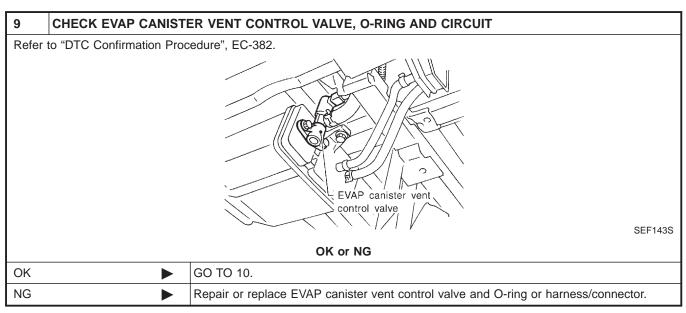
AX

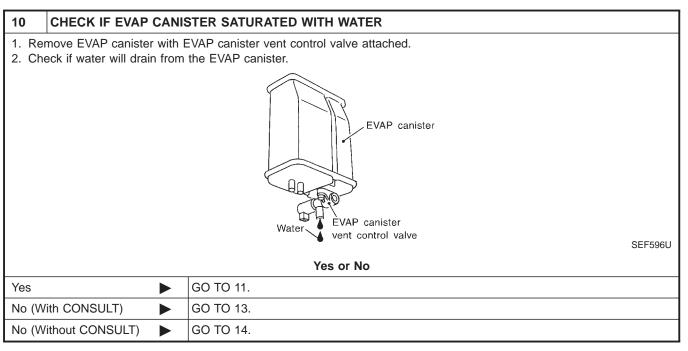
HA

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|       |  |                          | -    |
|-------|--|--------------------------|------|
| 8     | CHECK WATER SEPAR                        | RATOR                    |      |
| Refer | Refer to "Component Inspection", EC-506. |                          |      |
|       |  | OK or NG                 |      |
| OK    | <b>•</b>                                 | GO TO 9.                 | 1 m/ |
| NG    | <b>&gt;</b>                              | Replace water separator. |      |





**EC-489** 

Diagnostic Procedure (Cont'd)

| 11    | CHECK EVAP CA  | NIST    | ER        |  |  |
|-------|--|---------|-----------|--|--|
|       | 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 (W | OK (With CONSULT)   GO TO 13.  |         |           |  |  |
| OK (W | OK (Without CONSULT)   GO TO 14.   |         |           |  |  |
| NG    |  | <b></b> | GO TO 12. |  |  |

| 12    | DETECT MALFUNCTIONING PART  |                                       |  |
|-------|---|---------------------------------------|--|
| • EVA | Check the following.  EVAP canister for damage  EVAP hose between EVAP canister and water separator for clogging or poor connection |                                       |  |
|       | <b>•</b>  | Repair hose or replace EVAP canister. |  |

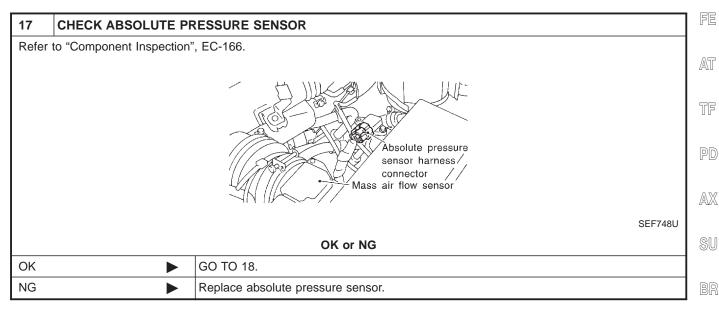
# CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE (P) With CONSULT 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port. 2. Start engine. 3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode. 4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0% 5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm. ■ ACTIVE TEST ■ PURG VOL CONT/V 100.0% CMPS•RPM(REF) 2187rpm FR O2 MNTR-B2 RICH FR O2 MNTR-B1 RICH A/F ALPHA-B2 100% A/F ALPHA-B1 100% THRTL POS SEN 0.64V UP DWN Qd AEC912A Vacuum should exist. OK or NG GO TO 17. OK NG GO TO 15.

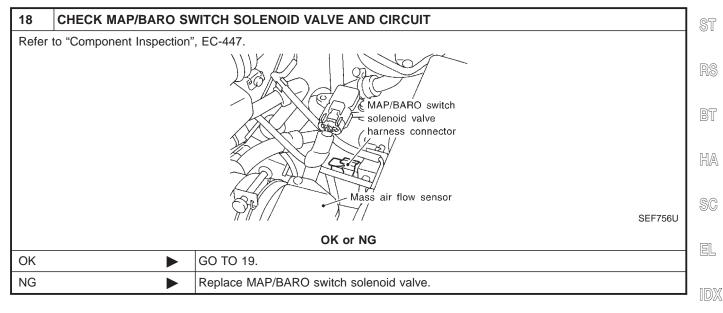
| 14     | CHECK EVAP CANIS              | TER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION                       |  |  |  |
|--------|-------------------------------|---|--|--|--|
| ® W    | ithout CONSULT                |   |  |  |  |
|        |                               | to normal operating temperature.  |  |  |  |
|        | op engine.                    |   |  |  |  |
|        |                               | EVAP canister purge volume control solenoid valve at EVAP service port. |  |  |  |
| 4. Sta | art engine and let it idle fo | or at least 80 seconds.   |  |  |  |
|        |                               | cuum when revving engine up to 2,000 rpm.                               |  |  |  |
| Va     | cuum should exist.            |   |  |  |  |
|        | OK or NG                      |   |  |  |  |
|        |                               |   |  |  |  |
| OK     | <b>&gt;</b>                   | GO TO 17.   |  |  |  |

Diagnostic Procedure (Cont'd)

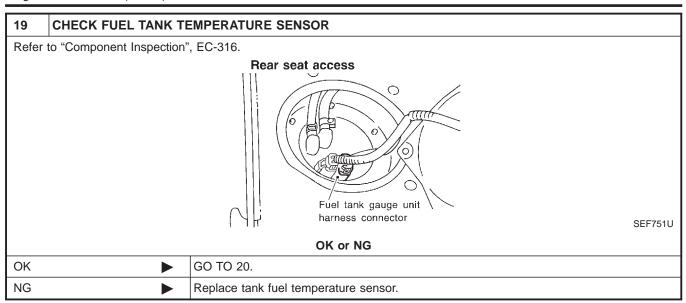
| 15    | CHECK VACUUM HOS         | E   | ]    |
|-------|--------------------------|---|------|
| Check | vacuum hoses for cloggir | ng or disconnection. Refer to "Vacuum Hose Drawing", EC-24. | GI   |
|       |                          | OK or NG  |      |
| OK    | <b>•</b>                 | GO TO 16.   | 1 mz |
| NG    | <b>•</b>                 | Repair or reconnect the hose.                               | 1    |

| 16    | CHECK EVAP CANISTI        | ER PURGE VOLUME CONTROL SOLENOID VALVE                     |    |
|-------|---------------------------|--|----|
| Refer | to "Component Inspection" | , EC-500.  | LG |
|       |                           | OK or NG   |    |
| OK    | <b>&gt;</b>               | GO TO 17.  | EC |
| NG    | <b>&gt;</b>               | Replace EVAP canister purge volume control solenoid valve. |    |





Diagnostic Procedure (Cont'd)



| 20    | 0 CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR |  |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "Component Inspection", EC-396.    |  |  |  |  |
|       | OK or NG                                    |  |  |  |  |
| OK    | OK ▶ GO TO 21.                              |  |  |  |  |
|       |   | Replace EVAP control system pressure sensor. |  |  |  |

| 21 | 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-30. |                               |  |  |  |
|    | OK or NG  |                               |  |  |  |
| OK | OK  |                               |  |  |  |
| NG | <b>•</b>  | Repair or reconnect the hose. |  |  |  |

| 22    | CLEAN EVAP PURGE LINE  |  |  |  |
|-------|--|--|--|--|
| Clean | Clean EVAP purge line (pipe and rubber tube) using air blower. |  |  |  |
|       | ▶ GO TO 23.  |  |  |  |

| 23    | CHECK INTERMITTENT INCIDENT                                    |  |  |
|-------|--|--|--|
| Refer | efer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END   |  |  |

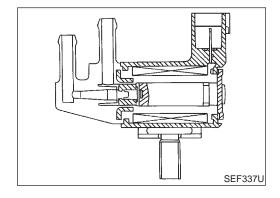
Description

# **Description** SYSTEM DESCRIPTION

NBEC0325

|                                   |  |                          | NBEC0325S01                | GI   |  |
|-----------------------------------|--|--------------------------|----------------------------|------|--|
| Sensor                            | Input Signal to ECM  | ECM<br>function          | Actuator                   | MA   |  |
| Camshaft position sensor          | Engine speed   |                          |                            | nan- |  |
| Mass air flow sensor              | Amount of intake air   |                          |                            | EM   |  |
| Engine coolant temperature sensor | Engine coolant temperature                                       |                          |                            |      |  |
| Ignition switch                   | Start signal   |                          |                            | LC   |  |
| Throttle position sensor          | Throttle position  | EVAP can-<br>ister purge | EVAP canister purge volume |      |  |
| Throttle position switch          | Closed throttle position   | flow control             | control solenoid valve     | EC   |  |
| Front heated oxygen sensors       | Density of oxygen in exhaust gas (Mixture ratio feedback signal) |                          |                            |      |  |
| Fuel tank temperature sensor      | Fuel temperature in fuel tank                                    |                          |                            |      |  |
| Vehicle speed sensor              | Vehicle speed  |                          |                            | AT   |  |

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



# COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

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**CONSULT Reference Value in Data Monitor** Mode

Specification data are reference values.

NBEC0326

| MONITOR ITEM | CONE  | SPECIFICATION          |    |
|--------------|---|------------------------|----|
| PURG VOL C/V | <ul><li>Engine: After warming up</li><li>Air conditioner switch "OFF"</li></ul> | Idle (Vehicle stopped) | 0% |
| PORG VOL C/V | <ul><li>Shift lever: "P" or "N"</li><li>No-load</li></ul>                       | 2,000 rpm              | _  |

ECM Terminals and Reference Value

# **ECM Terminals and Reference Value**

NBEC0327

Specification data are reference values and are measured between each terminal and ground.

# **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

|                      |               |   | · · · · · · · · · · · · · · · · · · ·  |   |
|----------------------|---------------|---|--|---|
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM  | CONDITION  | DATA (DC Voltage)                                       |
| 4                    | L/B           | ECCS relay (Self-shut-                            | [Engine is running] [Ignition switch "OFF"]  ● For a few seconds after turning ignition switch "OFF" | 0 - 1.5V  |
|                      |               | off)  | [Ignition switch "OFF"]  • A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V)                           |
|                      | 10.5          | EVAP canister purge volume control solenoid valve | [Engine is running]  • Idle speed  | BATTERY VOLTAGE (11 - 14V) (V) 40 20 0 50 ms            |
| 5                    | LG/B          |   | [Engine is running] • Engine speed is 2,000 rpm (More than 100 seconds after starting engine)        | BATTERY VOLTAGE (11 - 14V)  (V) 40 20 0  50 ms  SEF995U |
| 67                   | B/W           | Power supply for ECM                              | [Ignition switch "ON"]   | BATTERY VOLTAGE   |
| 72                   | B/W           | Power supply for ECM                              | Ingiliation Switch ON J  | (11 - 14V)  |
| 117                  | B/W           | Current return                                    | [Engine is running]  • 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. | <ul> <li>EVAP control system pressure sensor</li> <li>EVAP canister purge volume control solenoid valve (The valve is stuck open.)</li> <li>EVAP canister vent control valve</li> <li>EVAP canister</li> <li>Hoses (Hoses are connected incorrectly or clogged.)</li> </ul> |

DTC Confirmation Procedure

# **DTC Confirmation Procedure**

NOTE:

3)

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

NBFC0329

**TESTING CONDITION:** 

Always perform test at a temperature of 0°C (32°F) or more.

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With CONSULT

Start engine and warm it up to normal operating temperature.

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

Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYS-TEM" in "DTC WORK SUPPORT" mode with CONSULT.

Touch "START". 5) Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take for approximately 10 seconds.)

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

Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-497.

With GST

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

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

3) Start engine and let it idle for at least 20 seconds.

Select "MODE 7" with GST.

Turn ignition switch "ON".

If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-497.

No Tools

Start engine and warm it up to normal operating temperature.

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

3) Start engine and let it idle for at least 20 seconds.

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.

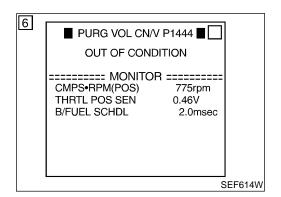
If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-497.

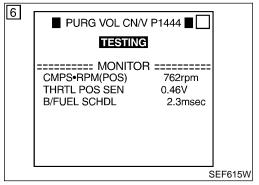
BT

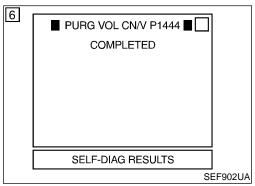
HA

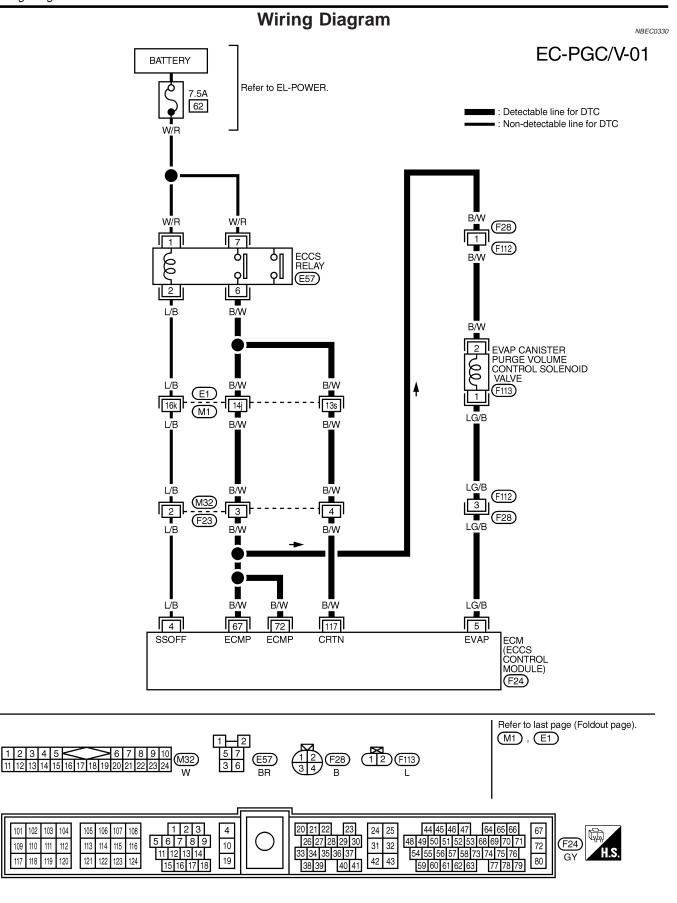
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EL









MEC061D

Diagnostic Procedure

AX

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ST

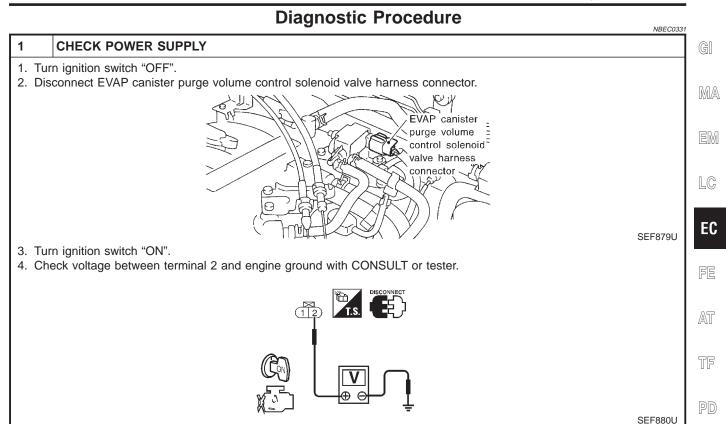
RS

BT

HA

SC

EL



| 2                      | DETECT MALFUNCTIO   | NING PART   |  |  |
|------------------------|---|---|--|--|
| Check the following.   |   |   |  |  |
| • Harı                 | ness connectors E1, M1  |   |  |  |
| <ul><li>Hari</li></ul> | ness connectors M32, F23  |   |  |  |
| • Harı                 | ness connectors F28, F112   |   |  |  |
| • Harı                 | ness for open or short bety   | ween EVAP canister purge volume control solenoid valve and ECCS relay |  |  |
| <ul><li>Hari</li></ul> | Harness for open or short between EVAP canister purge volume control solenoid valve and ECM |   |  |  |
|                        | Repair harness or connectors.   |   |  |  |
|                        |   |   |  |  |

OK or NG

Voltage: Battery voltage

OK

NG

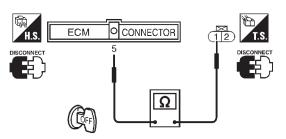
GO TO 3.

GO TO 2.

Diagnostic Procedure (Cont'd)

# **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.

4. Also check harness for short to ground and short to power.

|  | or | Ν |  |
|--|----|---|--|
|  |    |   |  |

| OK |          | GO TO 5. |
|----|----------|----------|
| NG | <b>•</b> | GO TO 4. |

# **DETECT MALFUNCTIONING PART**

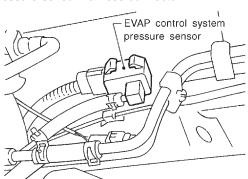
Check the following.

- 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 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 6. NG Repair it.

# **CHECK CONNECTOR**

1. Disconnect EVAP control system pressure sensor harness connector.



SEF190S

SEF881U

2. Check connectors for water. Water should not exist.

OK or NG

| OK • | GO TO 7.                                     |
|------|--|
| NG   | Replace EVAP control system pressure sensor. |

Diagnostic Procedure (Cont'd)

| 7 CHEC        |                                       |   |
|---------------|---------------------------------------|---|
|               | K EVAP CONTR                          | OL SYSTEM PRESSURE SENSOR   |
| Refer to "Com | ponent Inspection                     | ", EC-396.  |
|               |                                       | OK or NG  |
| OK            | <b>•</b>                              | GO TO 8.  |
| NG            | <b>•</b>                              | Replace EVAP control system pressure sensor.  |
|               |                                       |   |
| 8 CHEC        | K EVAP CANIST                         | ER PURGE VOLUME CONTROL SOLENOID VALVE  |
| Refer to "Com | ponent Inspection                     | ", EC-500.  |
|               |                                       | OK or NG  |
| OK            | <b>•</b>                              | GO TO 9.  |
| NG            | <u> </u>                              | Replace EVAP canister purge volume control solenoid valve.  |
|               |                                       |   |
|               |                                       | ER VENT CONTROL VALVE   |
| Refer to "Com | ponent Inspection                     | ", EC-506.  |
|               |                                       | OK or NG  |
| OK            | <b>•</b>                              | GO TO 10.   |
| NG            | <u> </u>                              | Replace EVAP canister vent control valve.   |
|               |                                       | arator and rubber tube connected to EVAP canister vent control valve and clean the rubber separator, refer to EC-506.  OK or NG   |
| OK            |                                       | UK OF NG  |
|               |                                       |   |
|               | <b>&gt;</b>                           | GO TO 11.   |
|               | <b>&gt;</b>                           |   |
| NG            | ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► ► | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.   |
| NG  11 CHEC   |                                       | GO TO 11.   |
| 11 CHEC       | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  |
| 11 CHEC       | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  |
| 11 CHEC       | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  |
| 11 CHEC       | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  |
| 11 CHEC       | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  In the EVAP canister.   |
| 11 CHEC       | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  The EVAP canister.  EVAP canister   |
| NG  11 CHEC   | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  In the EVAP canister.   |
| NG  11 CHEC   | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  STER SATURATED WITH WATER  EVAP canister vent control valve attached.  The EVAP canister.  EVAP canister   |
| NG  11 CHEC   | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  ISTER SATURATED WITH WATER  EVAP canister vent control valve attached.  The EVAP canister vent control valve attached.  EVAP canister vent control valve |
| NG  11 CHEC   | VAP canister with                     | GO TO 11.  Clean, repair or replace rubber tube and/or water separator.  ISTER SATURATED WITH WATER  EVAP canister vent control valve attached.  The EVAP canister.  EVAP canister  EVAP canister                                 |

GO TO 14.

No

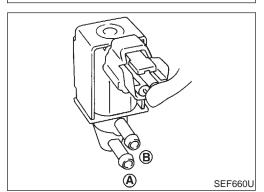
Diagnostic Procedure (Cont'd)

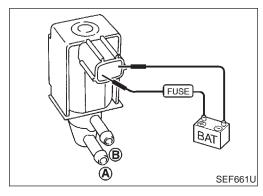
| 12   | 12 CHECK EVAP CANISTER |           |  |  |  |
|--|------------------------|-----------|--|--|--|
| Weigh the EVAP canister with the EVAP canister vent control valve attached.  The weight should be less than 1.8 kg (4.0 lb). |                        |           |  |  |  |
|  | OK or NG               |           |  |  |  |
| OK   | OK GO TO 14.           |           |  |  |  |
| NG   | <b>•</b>               | GO TO 13. |  |  |  |

| 13    | DETECT MALFUNCTIONING PART  |                                       |  |  |
|-------|---|---------------------------------------|--|--|
| • EVA | Check the following.  • EVAP canister for damage  • EVAP hose between EVAP canister and water separater for clogging or poor connection |                                       |  |  |
|       | <b>&gt;</b>   | Repair hose or replace EVAP canister. |  |  |

| 14    | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |

#### ■ ACTIVE TEST PURG VOL CONT/V ======= MONITOR ======= CMPS•RPM(REF) 787rpm FR O2 MNTR-B2 RICH FR O2 MNTR-B1 RICH A/F ALPHA-B2 100% A/F ALPHA-B1 100% THRTL POS SEN 0.44V UP DWN Qd Qu SEF882U





# **Component Inspection EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE**

NBEC0332

NBEC0332S01

(P) With CONSULT

Start engine.

- 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.
- Check air passage continuity.

| Condition PURG VOL CONT/V value | Air passage continuity<br>between <b>A</b> and <b>B</b> |
|---------------------------------|---|
| 100.0%                          | Yes   |
| 0.0%                            | No  |

If NG, replace the EVAP canister purge volume control solenoid valve.

# **⋈** Without CONSULT

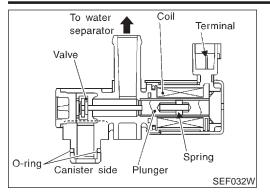
Check air passage continuity.

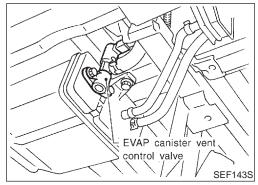
| Condition                                   | Air passage continuity between <b>A</b> and <b>B</b> |
|---|--|
| 12V direct current supply between terminals | Yes  |
| No supply                                   | No   |

If NG or operation takes more than 1 second, replace solenoid valve.

# DTC P1446 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (CLOSE)

Component Description





# Component Description

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.

MA

EC

AT

AX

NBEC0485

NBEC0486

# **CONSULT Reference Value in Data Monitor** Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION             | SPECIFICATION |  |
|--------------|-----------------------|---------------|--|
| VENT CONT/V  | • Ignition switch: ON | OFF           |  |

# **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

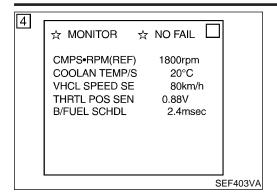
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                             | CONDITION              | DATA (DC Voltage)             |
|----------------------|---------------|----------------------------------|------------------------|-------------------------------|
| 108                  | G/R           | EVAP canister vent control valve | [Ignition switch "ON"] | BATTERY VOLTAGE<br>(11 - 14V) |

# On Board Diagnosis Logic

|               |   | NBECU487   | HA       |
|---------------|---|--|----------|
| DTC No.       | Malfunction is detected when  | Check Items (Possible Cause)   | INIA     |
| P1446<br>0215 | EVAP canister vent control valve remains closed under specified driving conditions. | <ul> <li>EVAP canister vent control valve</li> <li>EVAP control system pressure sensor and the circuit</li> <li>Blocked rubber tube to EVAP canister vent control valve</li> </ul> | SC<br>EL |
|               |   | Water separator     EVAP canister is saturated with water.   | IPA      |

# DTC P1446 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (CLOSE)

DTC Confirmation Procedure



# **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.

# (P) 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 be displayed quicker.

5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-504.

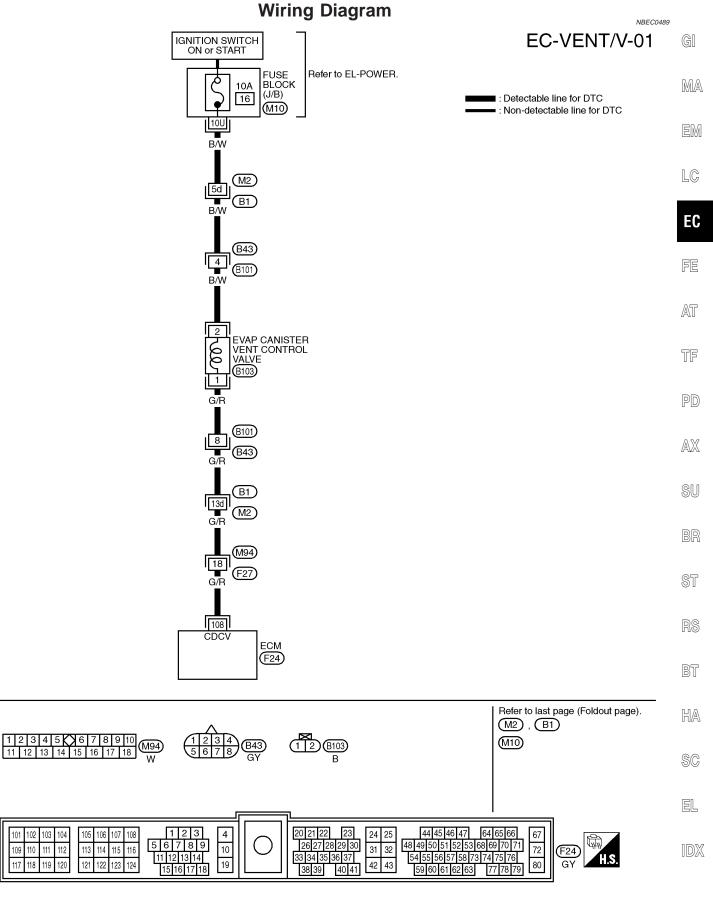
# With GST

- 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.
- 4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-504.

# No Tools

- 1) Start engine.
- 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.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-504.

Wiring Diagram



# DTC P1446 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (CLOSE)

Diagnostic Procedure

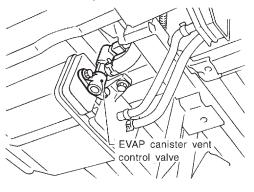
# **Diagnostic Procedure**

NBEC0490

SEF143S



- 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-506.



OK or NG

| OK | <b>•</b> | GO TO 2. |
|----|----------|----------|
|    |          |          |

NG Clean, repair or replace rubber tube and/or water separator.

# 

# 1. Remove EVAP canister with EVAP canister vent control valve attached. 2. Check if water will drain from the EVAP canister. EVAP canister Water vent control valve Yes OT No GO TO 4. No GO TO 6.

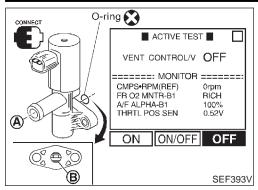
# DTC P1446 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (CLOSE)

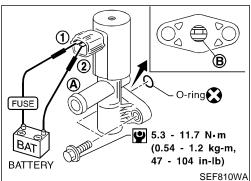
Diagnostic Procedure (Cont'd)

| 4 CHECK  | EVAP CAINIS  |   |   |
|--|--|---|---|
|  |  | ne EVAP canister vent control valve attached. an 1.8 kg (4.0 lb).   |   |
| -  |  | OK or NG  | 1 |
| OK   | <b>•</b>   | GO TO 6.  | 1 |
| NG   | <b>•</b>   | GO TO 5.  |   |
| DETEC  | T MALFUNCTION  | ONING PART  | ٦ |
| Check the follow   |  |   | 1 |
|  |  | anister and water separator for clogging or poor connection   |   |
|  | <b>&gt;</b>  | Repair hose or replace EVAP canister.   |   |
| CHECK  | EVAP CONTR   | OL SYSTEM PRESSURE SENSOR HOSE  | 7 |
| Check disconne   | ection or imprope  | er connection of hose connected to EVAP control system pressure sensor.   | 1 |
|  |  | OK or NG  |   |
| OK   | <b>•</b>   | GO TO 7.  |   |
| NG   | •  | Repair it.  |   |
|  |  |   | _ |
| CHECK  | CONNECTOR  |   |   |
|  |  | stem pressure sensor harness connector.   |   |
|  |  | stem pressure sensor harness connector.  EVAP control system pressure sensor  |   |
|  |  | EVAP control system   |   |
|  |  | EVAP control system   |   |
| 1. Disconnect E  | EVAP control sys   | EVAP control system pressure sensor  SEF190S  |   |
| 2. Check connect Water should  | ectors for water.  | EVAP control system pressure sensor  OK or NG   |   |
| 2. Check connect Water should  | EVAP control sys   | EVAP control system pressure sensor  OK or NG  GO TO 8.   |   |
| 2. Check connect Water should  | ectors for water.  | EVAP control system pressure sensor  OK or NG   |   |
| 2. Check conne<br>Water should   | ectors for water.  Id not exist.                               | EVAP control system pressure sensor  OK or NG  GO TO 8.   |   |
| 2. Check connect Water should DK   | ectors for water.  Id not exist.                               | OK or NG  GO TO 8.  Replace EVAP control system pressure sensor.  |   |
| 2. Check connect E Water shoul  OK NG  CHECK   | ectors for water.  Id not exist.                               | OK or NG  GO TO 8.  Replace EVAP control system pressure sensor.  OL SYSTEM PRESSURE SENSOR FUNCTION  |   |
| 2. Check connect E Water shoul  OK NG  CHECK Refer to "DTC (   | ectors for water.  Id not exist.                               | OK or NG  GO TO 8.  Replace EVAP control system pressure sensor.  OL SYSTEM PRESSURE SENSOR FUNCTION cedure" for DTC P0450, EC-389.   |   |
| 2. Check connect E Water shoul  OK NG  CHECK Refer to "DTC C   | ectors for water.  Id not exist.  EVAP CONTR  Confirmation Pro | OK or NG  GO TO 8.  Replace EVAP control system pressure sensor.  OL SYSTEM PRESSURE SENSOR FUNCTION  cedure" for DTC P0450, EC-389.  OK or NG  |   |
| 2. Check connect E Water shoul OK NG  8 CHECK Refer to "DTC OK NG  | ectors for water.  Id not exist.  EVAP CONTR Confirmation Pro  | OK or NG  GO TO 8.  Replace EVAP control system pressure sensor.  OL SYSTEM PRESSURE SENSOR FUNCTION cedure" for DTC P0450, EC-389.  OK or NG  GO TO 9.  Replace EVAP control system pressure sensor. |   |
| 2. Check connect E Water shoul  OK NG  8 CHECK  Refer to "DTC CO  OK NG  OK  NG  OK  OK  OK  OK  OK  OK  OK  OK  OK  O | ectors for water.  Id not exist.  EVAP CONTR Confirmation Pro  | OK or NG  GO TO 8.  Replace EVAP control system pressure sensor.  OL SYSTEM PRESSURE SENSOR FUNCTION cedure" for DTC P0450, EC-389.  OK or NG  GO TO 9.  Replace EVAP control system pressure sensor. |   |

## DTC P1446 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL CALVE (CLOSE)

Component Inspection





## Component Inspection EVAP CANISTER VENT CONTROL VALVE

NBEC0491

NBEC0491S01

Check air passage continuity.

(P) With CONSULT

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

| Condition<br>VENT CONTROL/V | Air passage continuity between <b>A</b> and <b>B</b> |
|-----------------------------|--|
| ON                          | No   |
| OFF                         | Yes  |

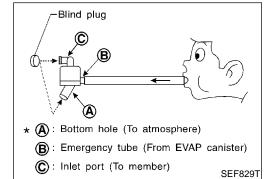
#### **N** Without CONSULT

| Condition   | Air passage continuity between <b>A</b> and <b>B</b> |
|---|--|
| 12V direct current supply between terminals 1 and 2 | No   |
| No supply   | Yes  |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If portion **B** is rusted, replace control valve.

Make sure new O-ring is installed properly.



#### 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.

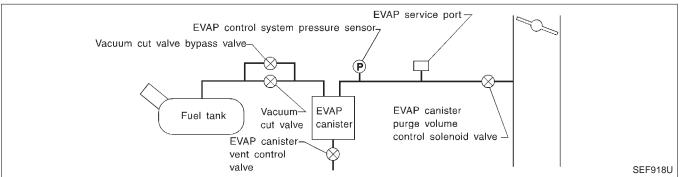
System Description

NBEC0333

#### **System Description**

NOTE:

If DTC P1447 is displayed with P0510, perform trouble diagnosis for "DTC P0510" first. (See EC-421.)



In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

#### On Board Diagnosis Logic

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

| DTC No.       | Malfunction is detected when   | Check Items (Possible Cause)  |
|---------------|--|---|
| P1447<br>0111 | EVAP control system does not operate properly.     EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. | <ul> <li>EVAP canister purge volume control solenoid valve stuck closed</li> <li>EVAP control system pressure sensor and the circuit</li> <li>Loose, disconnected or improper connection of rubber tube</li> <li>Blocked rubber tube</li> <li>Blocked or bent rubber tube to MAP/BARO switch solenoid valve</li> <li>Cracked EVAP canister</li> <li>EVAP canister purge volume control solenoid valve circuit</li> <li>Closed throttle position switch</li> <li>Blocked purge port</li> <li>EVAP canister vent control valve</li> </ul> |

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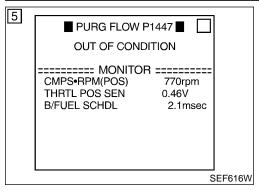
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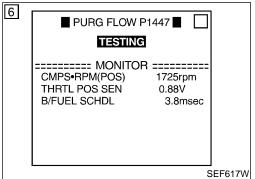
HA

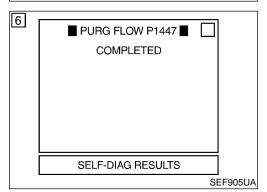
SC

EL

DTC Confirmation Procedure







#### **DTC Confirmation Procedure**

NBEC0335

#### **CAUTION:**

Always drive vehicle at a safe speed.

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:**

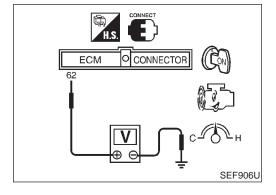
Always perform test at a temperature of 0°C (32°F) or more.

- (P) With CONSULT
- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF" and wait at least 5 seconds.
- Start engine and let it idle for at least 70 seconds.
- Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
- Touch "START". If "COMPLETED" is displayed, go to step 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 35 seconds.)

| Selector lever             | Suitable position           |
|----------------------------|-----------------------------|
| Vehicle speed              | 32 - 120 km/h (20 - 75 MPH) |
| CMPS-RPM (POS)             | 500 - 3,400 rpm             |
| B/FUEL SCHDL               | Less than 4 msec            |
| Engine coolant temperature | More than 70°C (158°F)      |

## If "TESTING" is not changed for a long time, retry from

Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-509.



#### **Overall Function Check**

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.

#### **Without CONSULT**

- 1) Lift up drive wheels.
- Start engine and warm it up to normal operating temperature.
- Turn ignition switch "OFF", wait at least 5 seconds. 3)
- Start engine and wait at least 70 seconds.
- Set voltmeter probes to ECM terminals 62 (EVAP control system pressure sensor signal) and ground.

Overall Function Check (Cont'd)

GI

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EL

| 6) | Check   | EVAP   | control | system | pressure | sensor | value | at | idle |
|----|---------|--------|---------|--------|----------|--------|-------|----|------|
|    | speed a | and no | te it.  |        |          |        |       |    |      |

| 7) | Establish | and | maintain | the | following | conditions | for a | at lea | ast | 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" |  |  |

8) 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.

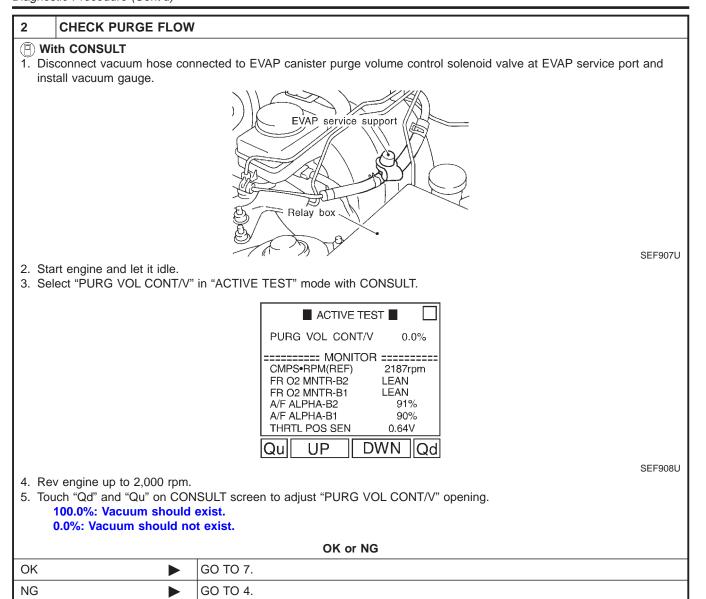
9) If NG, go to "Diagnostic Procedure", EC-509.

## **Diagnostic Procedure**

|       |   |          |                        | NBEC0336 | PD |  |
|-------|---|----------|------------------------|----------|----|--|
| 1     | CHECK EVAP CA   | NISTE    | R                      |          |    |  |
|       | Turn ignition switch "OFF".     Check EVAP canister for cracks. |          |                        |          |    |  |
|       |   |          | OK or NG               |          |    |  |
| OK (W | ith CONSULT)  | <b>•</b> | GO TO 2.               |          | SU |  |
| OK (W | ithout CONSULT)   | <b></b>  | GO TO 3.               |          |    |  |
| NG    |   | <b></b>  | Replace EVAP canister. |          | BR |  |

**EC-509** 

Diagnostic Procedure (Cont'd)



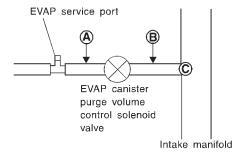
Diagnostic Procedure (Cont'd)

| 3        | CHECK PURGE FLOW  |  | Ī              |  |  |  |
|----------|---|--|----------------|--|--|--|
| 1. Sta   | Without CONSULT  1. Start engine and warm it up to normal operating temperature.  2. Stop engine. |  |                |  |  |  |
| 3. Dis   |   | nected to EVAP canister purge volume control solenoid valve at EVAP service port and | MA             |  |  |  |
|          |   | EVAP service support   | EM             |  |  |  |
|          |   |  | LG             |  |  |  |
|          |   | Relay box  | EC             |  |  |  |
|          |   | SEF907U  | FE             |  |  |  |
| 5. Ch    | cuum should exist.  | on when revving engine up to 2,000 rpm.  | AT             |  |  |  |
|          | lease the accelerator peda cuum should not exist.   | i fully and let idle.  | TF             |  |  |  |
|          |   | OK or NG   | _ "            |  |  |  |
| OK<br>NG | <u> </u>  | GO TO 7.<br>GO TO 4.   | PD             |  |  |  |
| NG       |   | 90 10 4.   | _              |  |  |  |
| 4        | CHECK EVAP PURGE  | LINE   |                |  |  |  |
|          |   | oper connection or disconnection. ION LINE DRAWING", EC-34.                          | SU             |  |  |  |
|          |   | OK or NG   | 1              |  |  |  |
| OK       | <u> </u>  | GO TO 5.   | BR             |  |  |  |
| NG       |   | Repair it.   | <b>J</b><br>ST |  |  |  |
|          |   |  | RS             |  |  |  |
|          |   |  |                |  |  |  |
|          |   |  | BT             |  |  |  |
|          |   |  | HA             |  |  |  |
|          |   |  | SC             |  |  |  |
|          |   |  |                |  |  |  |
|          |   |  | [DX            |  |  |  |

Diagnostic Procedure (Cont'd)

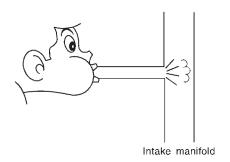
#### 5 CHECK EVAP PURGE HOSE AND PURGE PORT

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

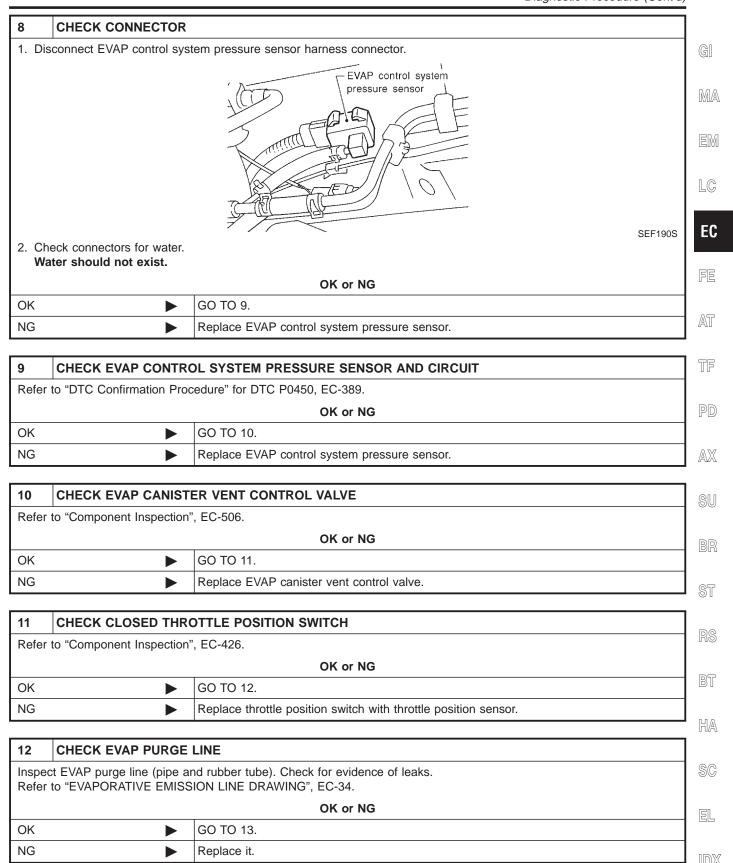
OK or NG

| OK ▶ | GO TO 6.                                 |
|------|--|
| NG • | Repair or clean hoses and/or purge port. |

| 6     | CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE |  |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "Component Inspection", EC-500.                |  |  |  |  |
|       | OK or NG  |  |  |  |  |
| OK    | OK 🕨 GO TO 7.   |  |  |  |  |
| NG    | •   | Replace EVAP canister purge volume control solenoid valve. |  |  |  |

| 7  | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE  |            |  |
|----|---|------------|--|
|    | <ol> <li>Turn ignition switch "OFF".</li> <li>Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.</li> </ol> |            |  |
|    | OK or NG  |            |  |
| OK | OK <b>▶</b> GO TO 8.  |            |  |
| NG | <b>&gt;</b>   | Repair it. |  |

Diagnostic Procedure (Cont'd)



Diagnostic Procedure (Cont'd)

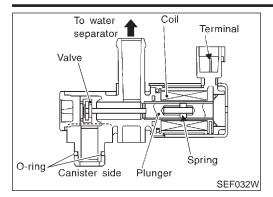
| 13    | 3 CLEAN EVAP PURGE LINE  |  |  |
|-------|--|--|--|
| Clean | Clean EVAP purge line (pipe and rubber tube) using air blower. |  |  |
|       | ▶ GO TO 14.  |  |  |

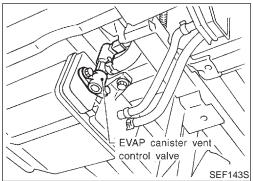
| 14    | 14 CHECK INTERMITTENT INCIDENT                                  |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |

#### DTC P1448 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (OPEN)

Component Description

NBEC0493





MONITOR ITEM

VENT CONT/V

TERMI-

NAL

NO.

108

WIRE

**COLOR** 

valve

G/R

#### Component Description

NOTE:

CONDITION

Specification data are reference values and are measured between each terminal and ground.

age to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

[Ignition switch "ON"]

If DTC P1448 is displayed with P0440, 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.

EC

MA

AT

#### **CONSULT Reference Value in Data Monitor** Mode

**ECM Terminals and Reference Value** 

Specification data are reference values.

ITEM

EVAP canister vent control

Ignition switch: ON

**SPECIFICATION** 

OFF

AX

NBEC0494

NBEC0495

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in dam-

CONDITION

DATA (DC Voltage)

**BATTERY VOLTAGE** 

(11 - 14V)

SC

HA

EL

| On Board | l Diagnosis | Logic |
|----------|-------------|-------|
|----------|-------------|-------|

|               |   | INDECU490   | Π  |
|---------------|---|---|----|
| DTC No.       | Malfunction is detected when  | Check Items (Possible Cause)  | Ц  |
| P1448<br>0309 | EVAP canister vent control valve remains opened under specified driving conditions. | <ul> <li>EVAP canister vent control valve</li> <li>EVAP control system pressure sensor and circuit</li> <li>Blocked rubber tube to EVAP canister vent control valve</li> <li>Water separator</li> <li>EVAP canister is saturated with water.</li> <li>Vacuum cut valve</li> </ul> | 00 |

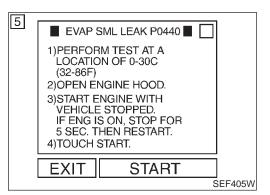
## DTC P1448 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (OPEN)

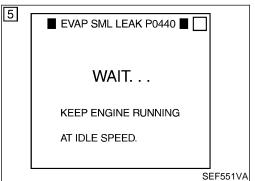
NBEC0497

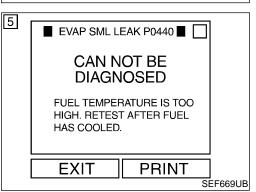
#### **DTC Confirmation Procedure**

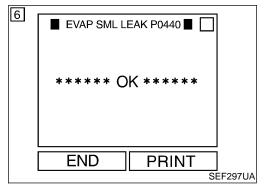
#### NOTE:

- If DTC P1448 is displayed with P0440 or P0455, 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.









## With CONSULT TESTING CONDITION:

- Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full and vehicle is placed on flat level surface.
- Always perform test at a temperature of 0 to 30°C (32 to 86°F).
- It is better that the fuel level is low.
- 1) Turn ignition switch "ON".
- 2) Turn ignition switch "OFF" and wait at least 5 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Make sure that the following conditions are met.

| COOLAN TEMP/S | 0 - 70°C (32 - 158°F) |
|---------------|-----------------------|
| INT/A TEMP SE | 0 - 60°C (32 - 140°F) |

5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT. Follow the instruction displayed.

#### NOTE:

 If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest.

(Use a fan to reduce the stabilization time.)

- If the engine speed cannot be maintained within the range displayed on the CONSULT screen, go to "Basic Inspection", EC-99.
- The engine idle portion of this test (See illustration at left.) will take approximately 5 minutes.
- 6) Make sure that "OK" is displayed. If "NG" is displayed, go to the following step.

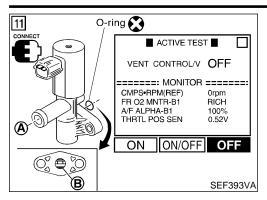
#### NOTE:

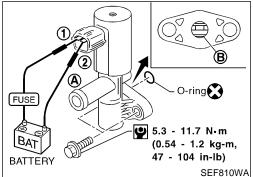
Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

- 7) Stop engine and wait at least 5 seconds, then turn "ON".
- 8) Disconnect hose from water separator.
- Select "VENT CONTROL/V" of "ACTIVE TEST" mode with CONSULT.
- 10) Touch "ON" and "OFF" alternately.

## DTC P1448 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (OPEN)

DTC Confirmation Procedure (Cont'd)





| 11) | Make | sure | the | fol | lowing. |  |
|-----|------|------|-----|-----|---------|--|
|-----|------|------|-----|-----|---------|--|

| Condition<br>VENT CONTROL/V | Air passage continuity between <b>A</b> and <b>B</b> |
|-----------------------------|--|
| ON                          | No   |
| OFF                         | Yes  |

If the result is NG, go to "Diagnostic Procedure", EC-519. If the result is OK, go to "Diagnostic Procedure" for DTC P0440, EC-366.

## MA

GI

EM

## LC

#### **Overall Function Check**

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

## EC

FE

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TF

#### **Without CONSULT**

- 1) Disconnect hose from water separator.
- 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-519. If the result is OK, go to "Diagnostic Procedure" for DTC P0440, EC-366.



SU

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EL

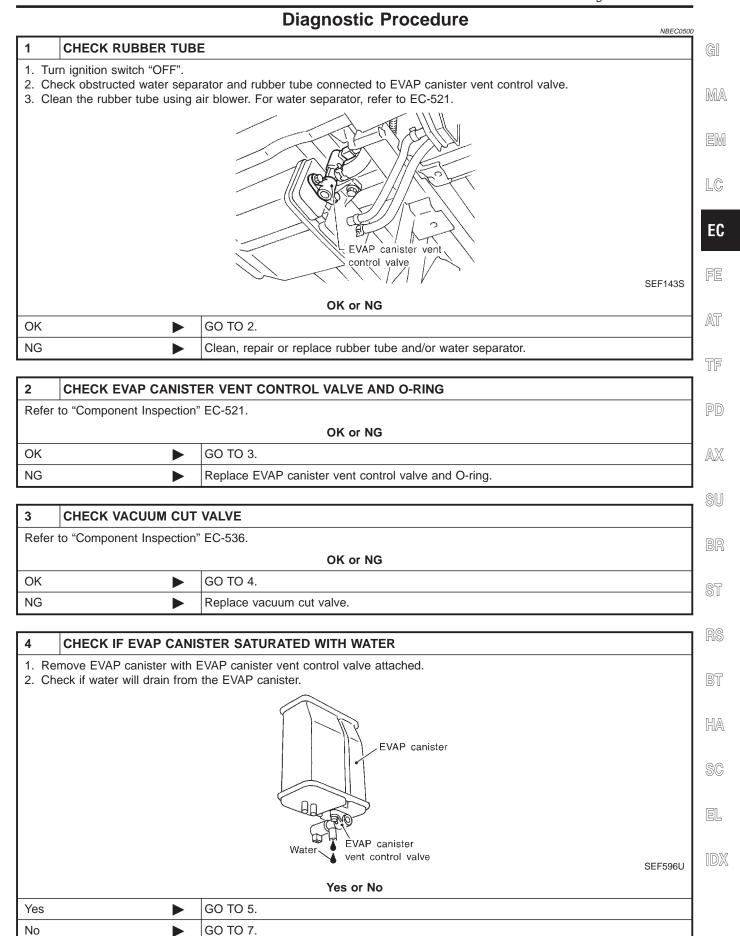
Wiring Diagram

#### **Wiring Diagram** NBEC0499 IGNITION SWITCH ON or START EC-VENT/V-01 Refer to EL-POWER. **FUSE** BLOCK 10A (J/B) 16 : Detectable line for DTC (M10) : Non-detectable line for DTC 10U (M2) 5d B/W **B**1) (B43) B/W (B101) EVAP CANISTER VENT CONTROL VALVE (B103) (B101) 8 G/R (B43) **B**1) 13d G/R (M2) (M94) 18 G/R (F27) 108 CDCV ECM (F24) Refer to last page (Foldout page). M2 , B1 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 (M10)20 21 22 23 26 27 28 29 30 1 2 3 5 6 7 8 9 44 45 46 47 102 103 104 106 107 108 4 67 48 49 50 51 52 53 68 69 70 71 112 113 114 115 116 10 31 32 72 109 110 33 34 35 36 37 11 12 13 14 54 55 56 57 58 73 74 75 76 19

MEC643C

## DTC P1448 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (OPEN)

Diagnostic Procedure



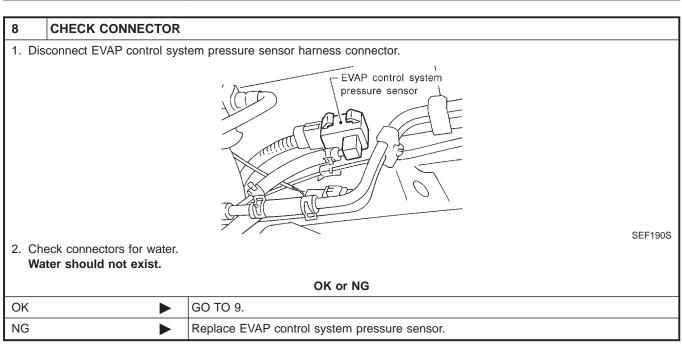
# DTC P1448 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (OPEN)

Diagnostic Procedure (Cont'd)

| 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 | OK ▶ GO TO 7.  |                            |  |  |
| NG | <b>•</b>   | Replace the EVAP canister. |  |  |

| 6     | DETECT MALFUNCTIONING PART  |                                       |
|-------|---|---------------------------------------|
| • EVA | Check the following.  • EVAP canister for damage  • EVAP hose between EVAP canister and water separator for clogging or poor connection |                                       |
|       | <b>&gt;</b>   | Repair hose or replace EVAP canister. |

| 7     | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE   |            |  |  |
|-------|--|------------|--|--|
| Check | Check disconnection or improper connection of hose connected to EVAP control system pressure sensor. |            |  |  |
|       | OK or NG   |            |  |  |
| OK    | OK ▶ GO TO 8.  |            |  |  |
| NG    | <b>•</b>   | Repair it. |  |  |

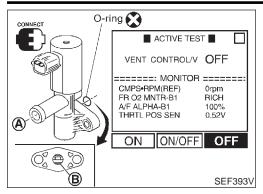


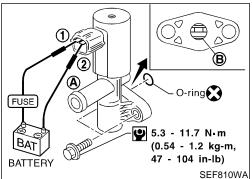
| 9     | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR AND CIRCUIT        |  |  |
|-------|--|--|--|
| Refer | Refer to "DTC Confirmation Procedure" for DTC P0450, EC-389. |  |  |
|       | OK or NG   |  |  |
| OK    | OK ▶ GO TO 10.   |  |  |
| NG    | <b>•</b>   | Replace EVAP control system pressure sensor. |  |

| 10    | CHECK INTERMITTENT INCIDENT                                     |  |  |
|-------|---|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |
|       | ► INSPECTION END  |  |  |

#### DTC P1448 EVAPORATIVE EMISSION (EVAP) CANISTER VENT CONTROL VALVE (OPEN)

Component Inspection





#### **Component Inspection EVAP CANISTER VENT CONTROL VALVE**

NBEC0501

NBEC0501S01

EC

FE

AT

TF

PD

AX

SU

ST

Check air passage continuity.

(P) With CONSULT

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

| Perform "VENT CONTROL/V" in "ACTIVE TEST" mode. |  |     |
|---|--|-----|
| Condition<br>VENT CONTROL/V                     | Air passage continuity between <b>A</b> and <b>B</b> | EM  |
| ON  | No   |     |
| OFF   | Yes  | I @ |

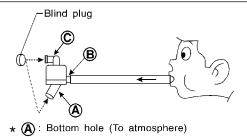
#### **Without CONSULT**

| Condition   | Air passage continuity<br>between <b>A</b> and <b>B</b> |
|---|---|
| 12V direct current supply between terminals 1 and 2 | No  |
| No supply   | Yes   |

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If portion **B** is rusted, replace control valve.

Make sure new O-ring is installed properly.



- (B): Emergency tube (From EVAP canister)
- (C): Inlet port (To member)

SEF829T

#### WATER SEPARATOR

- Check visually for insect nests in the water separator air inlet.
- Check visually for cracks or flaws in the appearance.
- Check visually for cracks or flaws in the hose. 3.
- Check that A and C are not clogged by blowing air into B with A, and then C plugged.
- In case of NG in items 2 4, replace the parts.

#### NOTE:

Do not disassemble water separator.

HA

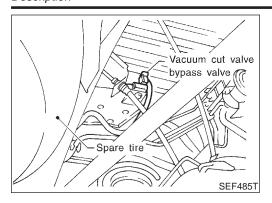
BT

SC

EL

Description





## Description COMPONENT DESCRIPTION

NREC0502

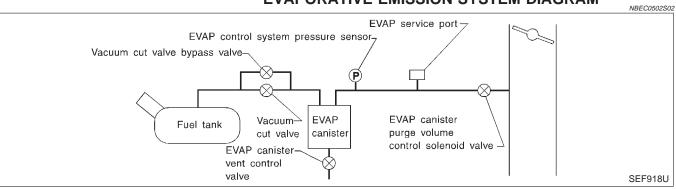
The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

#### **EVAPORATIVE EMISSION SYSTEM DIAGRAM**



## **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0503

| 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 ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION              | DATA (DC Voltage)             |
|----------------------|---------------|-------------------------------|------------------------|-------------------------------|
| 120                  | G/R           | Vacuum cut valve bypass valve | [Ignition switch "ON"] | BATTERY VOLTAGE<br>(11 - 14V) |

On Board Diagnosis Logic

| On Board Diagnosis Logic |  |  |    |  |
|--------------------------|--|--|----|--|
| DTC No.                  | Malfunction is detected when   | Check Items (Possible Cause)   | GI |  |
| P1490<br>0801            | An improper voltage signal is sent to ECM through vacuum cut valve bypass valve. | Harness or connectors     (The vacuum cut valve bypass valve circuit is open or shorted.)      Vacuum cut valve bypass valve | MA |  |

LC

EM

#### **DTC Confirmation Procedure**

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.

FE

EC

#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 11V at idle speed.

AT TF

PD

3 ☆ MONITOR ☆ NO FAIL 🗌 CMPS•RPM(REF) 750 rpm **RECORD** SEF357VA (P) With CONSULT

- Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Start engine and wait at least 5 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-525.



- **With GST**
- 1) Start engine and wait at least 5 seconds.
- Select "MODE 7" with GST.
- 3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-525.

#### No Tools

- Start engine and wait at least 5 seconds. 1)
- Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

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

BT

ST

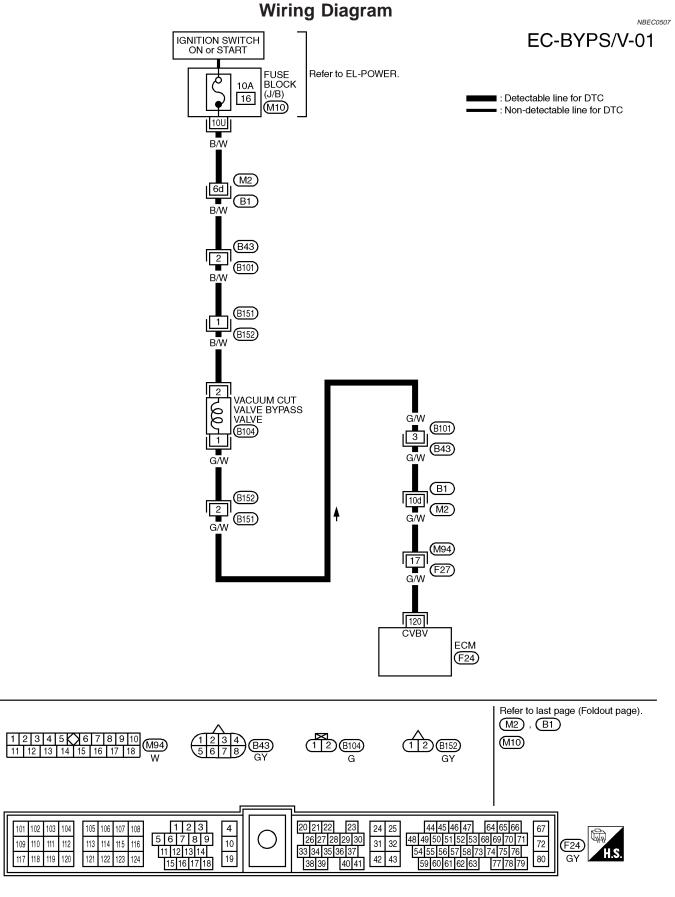
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-525.

HA

SC

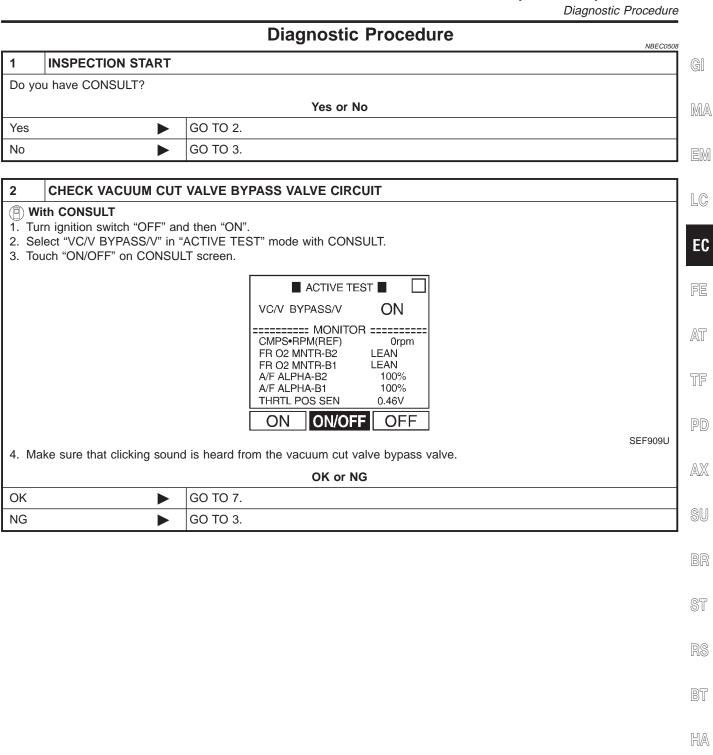
EL





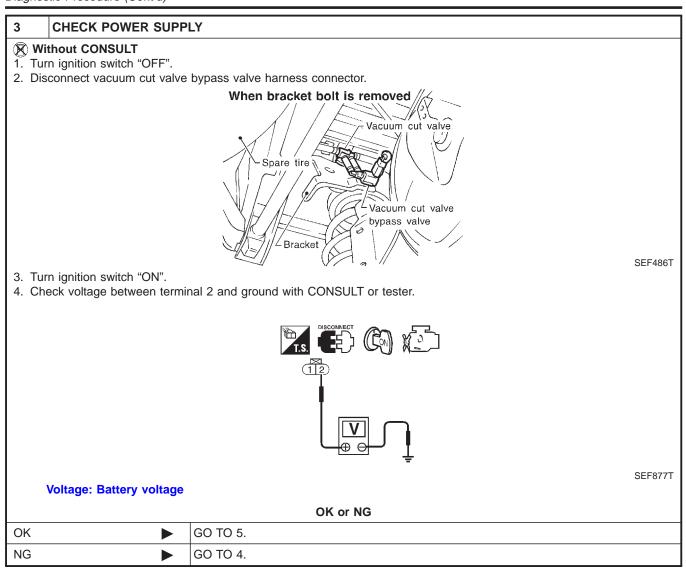
MEC649C

SC





Diagnostic Procedure (Cont'd)



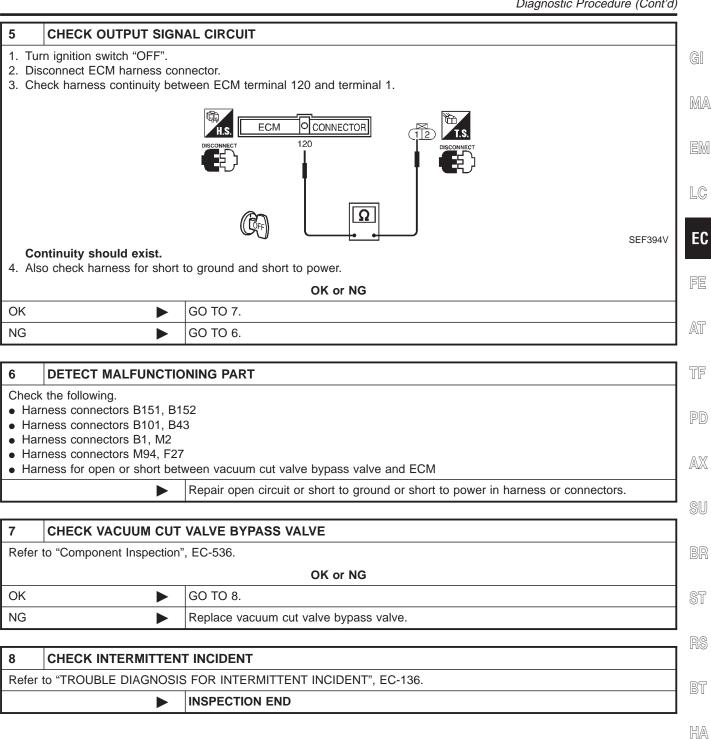
#### 4 DETECT MALFUNCTIONING PART

Check the following.

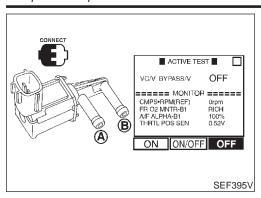
- Harness connectors M2, B1
- Harness connectors B43, B101
- Harness connectors B151, B152
- 10A fuse
- Harness for open or short between vacuum cut valve bypass valve and fuse
  - Repair harness or connectors.

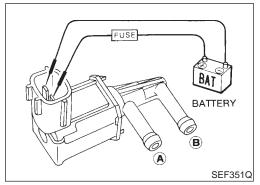
SC

Diagnostic Procedure (Cont'd,



Component Inspection





#### **Component Inspection VACUUM CUT VALVE BYPASS VALVE**

NBEC0509 NBEC0509S01

Check air passage continuity.

(a) With CONSULT
Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.

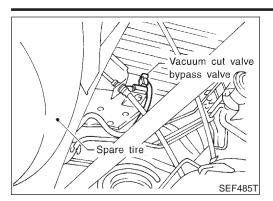
| Condition<br>VC/V BYPASS/V | Air passage continuity between <b>A</b> and <b>B</b> |
|----------------------------|--|
| ON                         | Yes  |
| OFF                        | No   |

#### **(R)** Without CONSULT

| Condition                                   | Air passage continuity between <b>A</b> and <b>B</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



#### **Description** COMPONENT DESCRIPTION

NBEC0510

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.

MA

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.

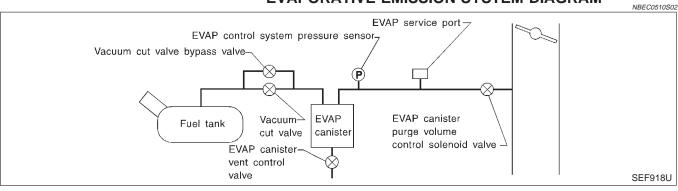
LC

EC

AT

AX

#### **EVAPORATIVE EMISSION SYSTEM DIAGRAM**



#### **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**

Specification data are reference values and are measured between each terminal and ground.

NBEC0512

SC

#### **CAUTION:**

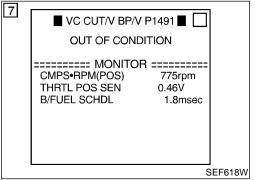
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

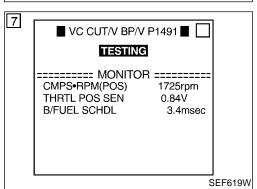
| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                          | CONDITION               | DATA (DC Voltage)             |  |
|----------------------|---------------|-------------------------------|-------------------------|-------------------------------|--|
| 120                  | G/R           | Vacuum cut valve bypass valve | Illanition switch "ON"I | BATTERY VOLTAGE<br>(11 - 14V) |  |

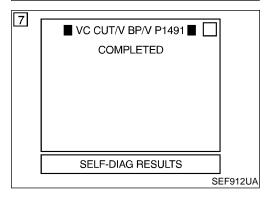
On Board Diagnosis Logic



|               | On Board Diagnosis Logic                                 |   |  |  |  |
|---------------|--|---|--|--|--|
| 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 Vacuum cut valve Bypass hoses for clogging EVAP control system pressure sensor and circuit EVAP canister vent control valve Hose between fuel tank and vacuum cut valve clogged Hose between vacuum cut valve and EVAP canister clogged EVAP canister EVAP purge port of fuel tank for clogging |  |  |  |







#### **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 0 to 30°C (32 to 86°F). 

(a) 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".
- 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.)

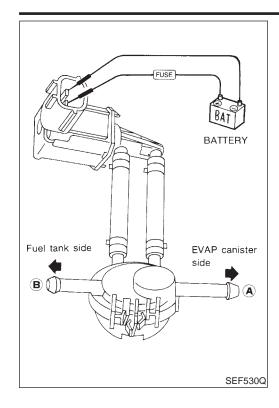
| CMPS-RPM (POS) | 500 - 3,000 rpm             |
|----------------|-----------------------------|
| Selector lever | Suitable position           |
| Vehicle speed  | 36 - 120 km/h (22 - 75 MPH) |
| B/FUEL SCHDL   | Less than 5 msec            |

## 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-533.

Overall Function Check





#### **Overall Function Check**

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

Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.

Apply vacuum to port **A** and check that there is no suction from port **B**.

MA

Apply vacuum to port B and check that there is suction from port A.

LC

Blow air in port B and check that there is a resistance to flow out of port A.

Supply battery voltage to the terminal.

EC

Blow air in port A and check that air flows freely out of port B.

Blow air in port **B** and check that air flows freely out of port **A**.

FE

If NG, go to "Diagnostic Procedure", EC-533.

AT

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ST

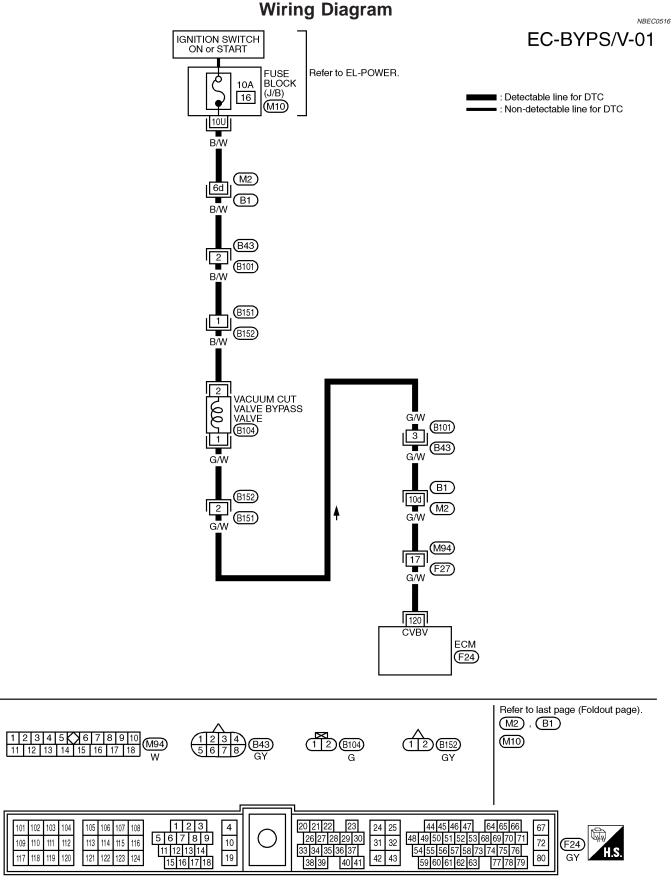
HA

SC

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[DX





MEC649C

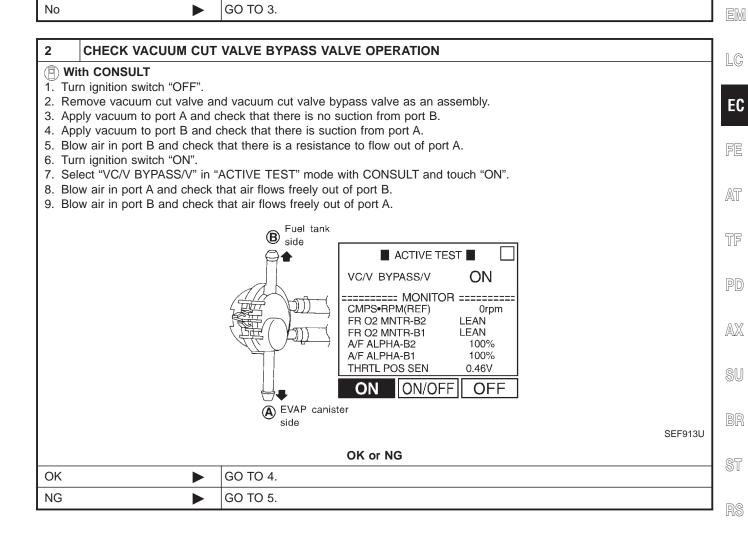
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Diagnostic Procedure

# Diagnostic Procedure 1 INSPECTION START Do you have CONSULT? Yes or No Yes GO TO 2.



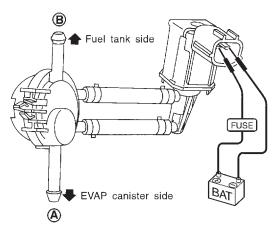


Diagnostic Procedure (Cont'd)

#### 3 CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION

#### 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

| $\circ$ | / |    | N.I |   |
|---------|---|----|-----|---|
|         | • | nr | N   | 6 |

| 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-31.

#### OK or NG

| OK ▶ GO TO 8.          |   | 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. |                   |                          |
| OK or NG                         |                   |                          |
| ОК                               | <b>•</b>          | GO TO 6.                 |
| NG                               | <b>•</b>          | Repair or replace hoses. |

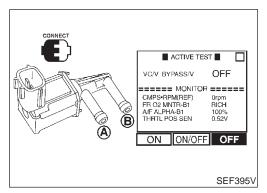
| 6  | CHECK VACUUM CUT | VALVE BYPASS VALVE                     |
|--|------------------|--|
| Refer to "Component Inspection", EC-536. |                  |  |
| OK or NG                                 |                  |  |
| OK                                       | <b>&gt;</b>      | GO TO 7.                               |
| NG                                       | <b>•</b>         | Replace vacuum cut valve bypass valve. |

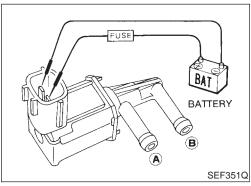
Diagnostic Procedure (Cont'd)

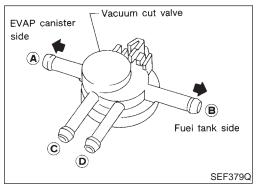
|       | Diagnostic Procedure (Cont'd)   |               |  |
|-------|---|---------------|--|
| 7     | CHECK VACUUM CUT VALVE  |               |  |
| Refer | "Component Inspection", EC-536.   | GI            |  |
|       | OK or NG  |               |  |
| OK    | OK ▶ GO TO 8.   |               |  |
| NG    | Replace vacuum cut valve.   | MA            |  |
|       |   | EM            |  |
| 8     | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE  |               |  |
|       | ignition switch "OFF".  ck disconnection or improper connection of hose connected to EVAP control system pressure sensor. | LC            |  |
| 2. 01 | OK or NG  |               |  |
| OK    | ■ GO TO 9.  | EC            |  |
| NG    | Repair it   |               |  |
| -110  | торин п   | FE            |  |
| 9     | CHECK CONNECTOR   | ت .           |  |
|       | onnect EVAP control system pressure sensor harness connector.   | AT            |  |
|       | EVAP control system   | <i>1</i> -7.1 |  |
|       | pressure sensor   | TF            |  |
|       |   |               |  |
|       |   |               |  |
|       |   | PD            |  |
|       |   | 0.5/4         |  |
|       |   | AX            |  |
|       |   |               |  |
| 2 Ch  | SEF190S ck connectors for water.  | SU            |  |
| _     | er should not exist.  |               |  |
|       | OK or NG  | BR            |  |
| OK    | ▶ GO TO 10.   |               |  |
| NG    | ► Replace EVAP control system pressure sensor.  | ST            |  |
|       |   |               |  |
| 10    | CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION  | RS            |  |
| Refer | o "DTC Confirmation Procedure" for DTC P0450, EC-389.   |               |  |
|       | OK or NG  | BT            |  |
| OK    | <b>▶</b> GO TO 11.  |               |  |
| NG    | Replace EVAP control system pressure sensor.  | HA            |  |
|       | 1   |               |  |
| 11    | CHECK EVAP CANISTER VENT CONTROL VALVE  | SC            |  |
| Refer | o "Component Inspection", EC-521.   |               |  |
|       | OK or NG  | EL            |  |
| OK    | ► GO TO 12.   |               |  |
| NG    | ► Replace EVAP canister vent control valve.   |               |  |

Diagnostic Procedure (Cont'd)

| 12    | 12 CHECK INTERMITTENT INCIDENT                                  |                |  |
|-------|---|----------------|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                |  |
|       | <b>&gt;</b>   | INSPECTION END |  |







## Component Inspection VACUUM CUT VALVE BYPASS VALVE

NBEC0518

NBEC0518S01

Check air passage continuity.

(I) With CONSULT

Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.

| Condition<br>VC/V BYPASS/V | Air passage continuity between <b>A</b> and <b>B</b> |
|----------------------------|--|
| ON                         | Yes  |
| OFF                        | No   |

#### **(R)** Without CONSULT

| Condition                                   | Air passage continuity between <b>A</b> and <b>B</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.
- Apply vacuum to port A and check that there is no suction from port B.
- 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**.

#### DTC P1605 A/T DIAGNOSIS COMMUNICATION LINE

Component Description



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**

Specification data are reference values and are measured between each terminal and ground.

#### MA NRFC0339

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM             | CONDITION                                     | DATA (DC Voltage) |
|----------------------|---------------|------------------|---|-------------------|
| 7                    | Y/G           | A/T check signal | [Ignition switch "ON"]<br>[Engine is running] | 0 - 3.0V          |

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#### 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 [The communication line circuit between ECM and TCM (Transmission control module) is open or shorted.]     Dead (Weak) battery     TCM (Transmission control module) | • |

AX

## 3 ☆ MONITOR ☆ NO FAIL CMPS•RPM(REF) 750 rpm RECORD SEF357VA

#### **DTC Confirmation Procedure**

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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#### **TESTING CONDITION:**

Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.

(P) With CONSULT

- 1) Turn ignition switch "ON".
- Select "DATA MONITOR" mode with CONSULT.
- Start engine and wait at least 40 seconds.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-540.

#### With GST

- 1) Turn ignition switch "ON".
- 2) Start engine and wait at least 40 seconds.
- Select "MODE 7" with GST.
- If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-540.
- No Tools

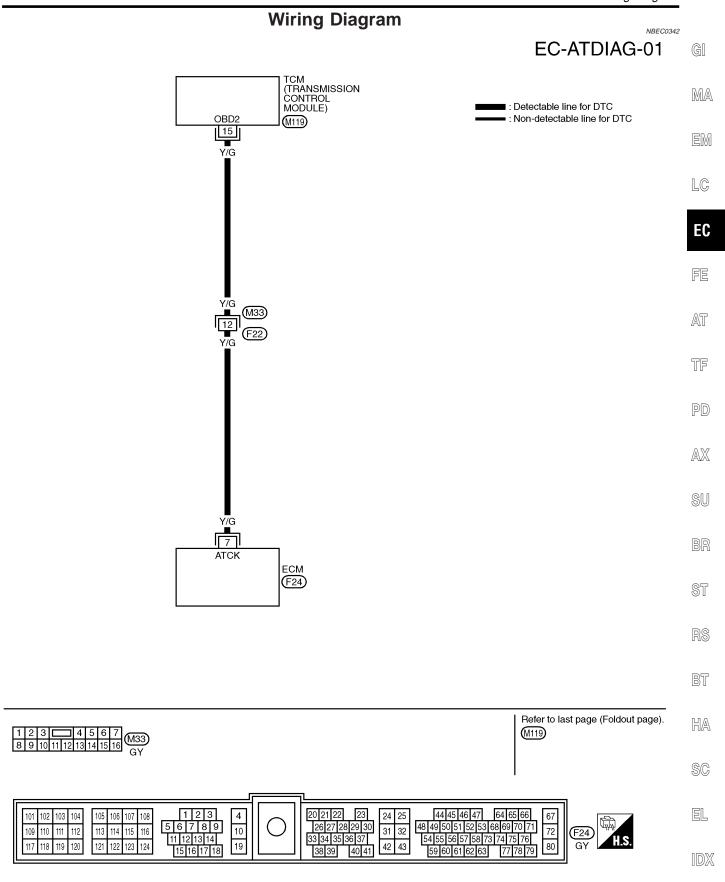
#### DTC P1605 A/T DIAGNOSIS COMMUNICATION LINE



DTC Confirmation Procedure (Cont'd)

- 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.
- 5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-540.





MEC650C

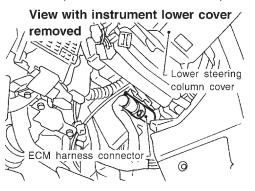


NBEC0343

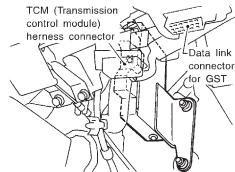
#### **Diagnostic Procedure**

CHECK INPUT SIGNAL CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECM harness connector and TCM (Transmission control module) harness connector.

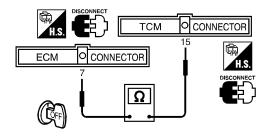


SEF981R



SEF017SA

3. Check harness continuity between ECM terminal 7 and TCM (Transmission control module) terminal 15.



SEF854W

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

#### OK or NG

| ОК | <b>&gt;</b> | GO TO 3. |
|----|-------------|----------|
| NG | <b>&gt;</b> | 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.

### DTC P1605 A/T DIAGNOSIS COMMUNICATION LINE



Diagnostic Procedure (Cont'd)

| 3   | CHECK INTERMITTENT | T INCIDENT |  |  |  |
|---|--------------------|------------|--|--|--|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                    |            |  |  |  |
|   | ► INSPECTION END   |            |  |  |  |

G[

MA

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 $\mathbb{A}\mathbb{X}$ 

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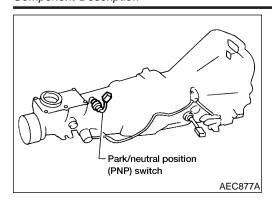
BT

HA

SC

EL

Component Description



### **Component Description**

When the gear position is "P" or "N", park/neutral position (PNP) switch is "ON".

ECM detects the position because the continuity of the line (the "ON" signal) exists.

For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

## **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0273

| MONITOR ITEM | CONDITION           |                         | SPECIFICATION |
|--------------|---------------------|-------------------------|---------------|
| P/N POSI SW  | Ignition switch: ON | Shift lever: "P" or "N" | ON            |
| P/N POSI SW  |                     | Except above            | OFF           |

### **ECM Terminals and Reference Value**

NBEC0274

Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                               | CONDITION  | DATA (DC Voltage)          |
|----------------------|---------------|------------------------------------|--|----------------------------|
| 22                   | L/B           | Park/neutral position (PNP) switch | [Ignition switch "ON"]  ● Gear position is "N" or "P"    | Approximately 0V           |
|                      |               |                                    | [Ignition switch "ON"]  • Except the above gear position | BATTERY VOLTAGE (11 - 14V) |

### 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 (PNP) switch is<br>not changed in the process of engine starting and driving. | Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.]     Park/neutral position (PNP) switch |  |

### **DTC Confirmation Procedure**

NBEC0276

#### **CAUTION:**

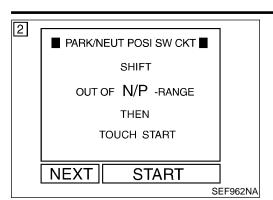
Always drive vehicle at a safe speed.

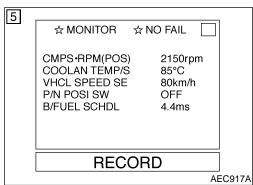
### NOTE:

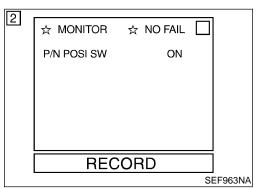
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

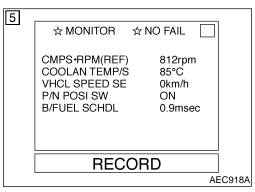
**4 7** 

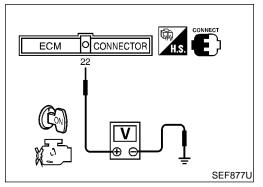
DTC Confirmation Procedure (Cont'd











### (P) With CONSULT

- Turn ignition switch "ON".
- 2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.
  - If NG, go to "Diagnostic Procedure", EC-546. 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 msec              |  |
| VHCL SPEED SE  | 70 - 100 km/h (43 - 62 MPH) |  |
| Selector lever | Suitable position           |  |

- 6) If 1st DTC is detected, go to "Diagnostic Procedure", EC-546.
- (P) With CONSULT
- 1) Turn ignition switch "ON".
- Select "P/N POSI SW" in "DATA MONITOR" mode with CON-SULT. 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-546. If OK, go to following step.

- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and warm it up to normal operating temperature.
- 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 msec              |  |
| VHCL SPEED SE  | 70 - 100 km/h (43 - 62 MPH) |  |
| Selector lever | Suitable position           |  |

6) If 1st DTC is detected, go to "Diagnostic Procedure", EC-546.

### **Overall Function Check**

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

### **N** Without CONSULT

- 1) Turn ignition switch "ON".
- 2) Check voltage between ECM terminal 22 and body ground under the following conditions.

MA

EM

LC



FE

















BT

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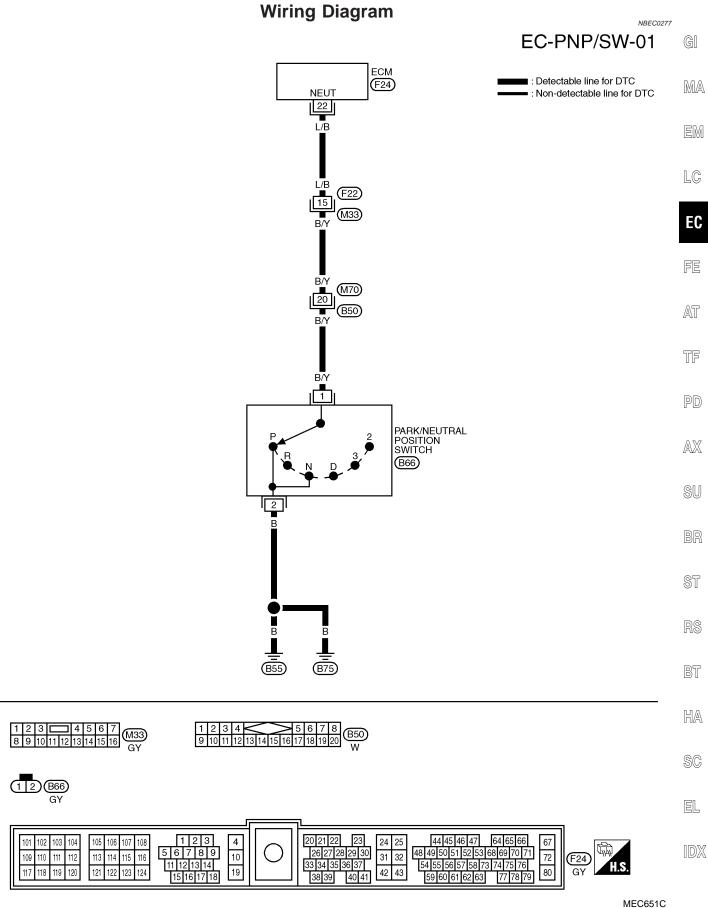


Overall Function Check (Cont'd)

| Condition (Gear position) | Voltage (V) (Known good data) |  |
|---------------------------|-------------------------------|--|
| "P" and "N" position      | Approx. 0                     |  |
| Except the above position | BATTERY VOLTAGE (11 - 14V)    |  |

<sup>3)</sup> If NG, go to "Diagnostic Procedure", EC-546.







NBEC0278

SEF010SA

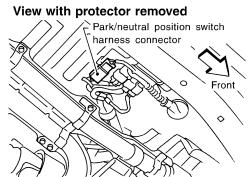
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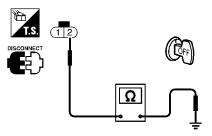
CHECK GROUND CIRCUIT

1. Turn ignition switch "OFF".

2. Disconnect park/neutral position switch harness connector.



3. Check harness continuity between terminal 2 and body ground.



Continuity should exist.

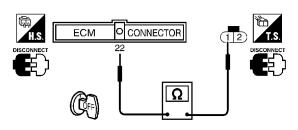
4. Also check harness for short to ground and short to power.

#### OK or NG

| OK | <b>&gt;</b> | GO TO 2.   |
|----|-------------|--|
| NG | <b></b>     | 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.



SEF763U

### Continuity should exist.

3. Also check harness for short to ground and short to power.

#### OK or NG

| OK • | GO TO 4. |
|------|----------|
| NG ► | GO TO 3. |

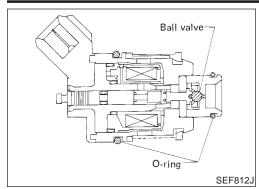


Diagnostic Procedure (Cont'd)

|                  | Diagnosiic Procedure (Cont   | . <i>u)</i> |
|------------------|--|-------------|
| 3 DETEC          | MALFUNCTIONING PART  | 7           |
| Check the follow |  | Gl          |
|                  | ectors F22, M33<br>ectors M70, B50   |             |
|                  | pen or short between ECM and park/neutral position (PNP) switch                    | MA          |
|                  | Repair open circuit or short to ground or short to power in harness or connectors. |             |
|                  |  | - EM        |
| L                | PARK/NEUTRAL POSITION (PNP) SWITCH   | _           |
| Refer to A1-99,  | DTC P0705 PARK/NEUTRAL POSITION (PNP) SWITCH".                                     | LC          |
| OK               | OK or NG  GO TO 5.   | _           |
| NG               | Replace park/neutral position (PNP) switch.  | - EC        |
| 110              | replace partireutial position (FNF) switch.  |             |
| 5 CHECK          | INTERMITTENT INCIDENT  | FE          |
| Refer to "TROU   | BLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136.                                  |             |
|                  | INSPECTION END   | AT          |
|                  | ·  | _           |
|                  |  | TF          |
|                  |  |             |
|                  |  | PD          |
|                  |  |             |
|                  |  | AX          |
|                  |  |             |
|                  |  | SU          |
|                  |  |             |
|                  |  | BR          |
|                  |  | @F          |
|                  |  | ST          |
|                  |  | RS          |
|                  |  | [1]         |
|                  |  | BT          |
|                  |  |             |
|                  |  | HA          |
|                  |  | ריחח ח      |
|                  |  | SC          |
|                  |  | 99          |
|                  |  | EL          |
|                  |  |             |
|                  |  |             |
|                  |  | 200         |

### **INJECTOR**

Component Description



### **Component Description**

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0525

| MONITOR ITEM | CONDITION  |           | SPECIFICATION  |
|--------------|--|-----------|----------------|
| INJ PULSE-B2 | <ul><li>Engine: After warming up</li><li>Air conditioner switch: "OFF"</li></ul> | Idle      | 2.4 - 3.7 msec |
| INJ PULSE-B1 | <ul><li>Shift lever: "N"</li><li>No-load</li></ul>                               | 2,000 rpm | 1.9 - 3.3 msec |
| B/FUEL SCHDL | ditto  | Idle      | 1.0 - 1.6 msec |
| D/FUEL SCHUL |  | 2,000 rpm | 0.7 - 1.4 msec |

### **ECM Terminals and Reference Value**

NRFC0346

Specification data are reference values and are measured between each terminal and ground.

### **CAUTION:**

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                   | CONDITION  | DATA (DC Voltage)             |
|----------------------|---------------|------------------------|--|-------------------------------|
| 4                    | L/B           | ECCS relay (Self-shut- | [Engine is running] [Ignition switch "OFF"]  ● For a few seconds after turning ignition switch "OFF" | 0 - 1.5V                      |
| 7                    |               | off)                   | [Ignition switch "OFF"]  • A few seconds passed after turning ignition switch "OFF"                  | BATTERY VOLTAGE<br>(11 - 14V) |





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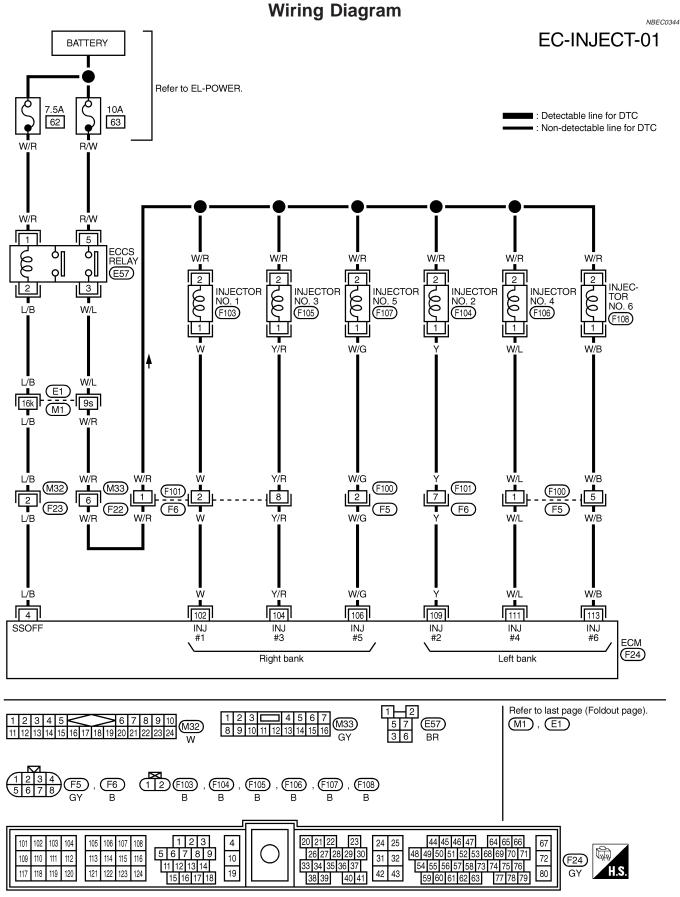
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| ΓERMI-<br>NAL<br>NO. | WIRE<br>COLOR   | ITEM   | CONDITION   | DATA (DC Voltage)                             |
|----------------------|-----------------|--|---|---|
| 102<br>104<br>106    | W<br>Y/R<br>W/G | Injector No. 1<br>Injector No. 3<br>Injector No. 5 | [Engine is running]  • Warm-up condition  • Idle speed  | BATTERY VOLTAGE (11 - 14V)  (V) 40 20 0 50 ms |
| 109<br>111<br>113    | Y<br>W/L<br>W/B | Injector No. 2<br>Injector No. 4<br>Injector No. 6 | <ul><li>[Engine is running]</li><li>Warm-up condition</li><li>Engine speed is 2,000 rpm</li></ul> | BATTERY VOLTAGE (11 - 14V)  (V) 40 20 0 50 ms |



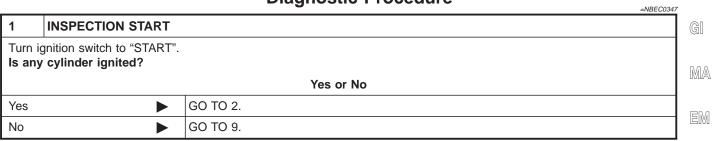


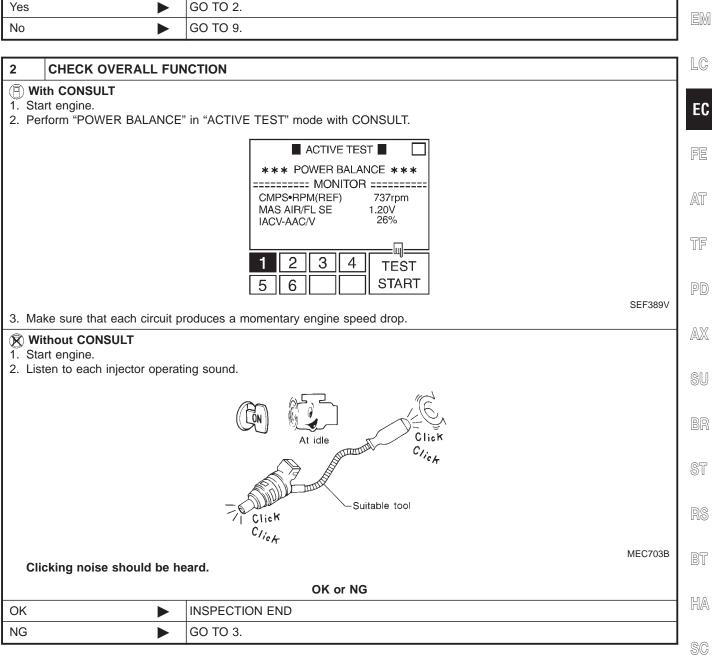
MEC704C



EL

### **Diagnostic Procedure**



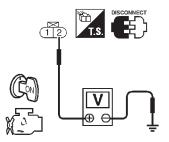


**EC-551** 



### 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

| $\circ$ | V | 0 r | NI |     |
|---------|---|-----|----|-----|
| u       | n | or  | N  | ( 7 |

| OK |         | GO TO 5. |
|----|---------|----------|
| NG | <b></b> | GO TO 4. |

### 4 DETECT MALFUNCTIONING PART

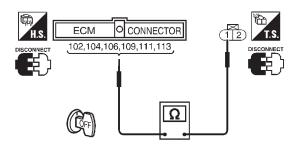
Check the following.

- Harness connectors F6, M101
- 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.



SEF732U

#### Continuity should exist.

4. Also check harness for short to ground and short to power.

### OK or NG

| OK | <b>&gt;</b> | GO TO 7. |
|----|-------------|----------|
| NG | <b>&gt;</b> | GO TO 6. |

#### 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.



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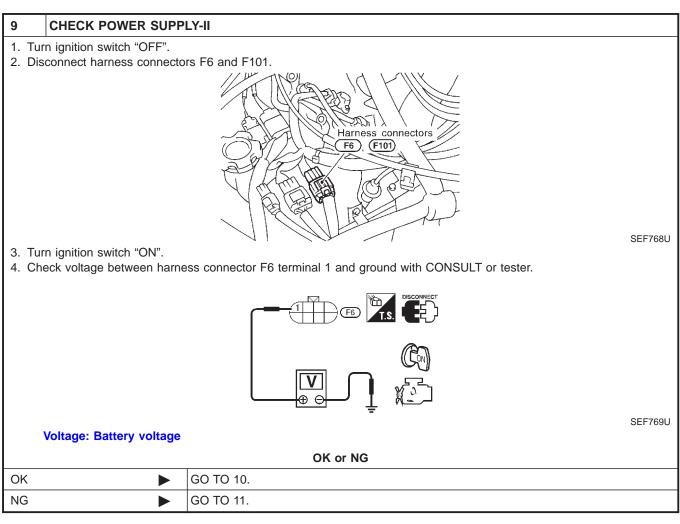
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| 7 CHECK         | INJECTOR          |                   |           |
|-----------------|-------------------|-------------------|-----------|
| Refer to "Compo | onent Inspection' | EC-556.           | G         |
|                 |                   | OK or NG          |           |
| OK              | <b>•</b>          | GO TO 8.          | M         |
| NG              | <b>•</b>          | Replace injector. | 1         |
|                 |                   |                   | ,<br>, [= |

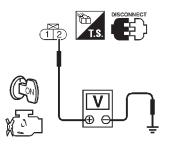
| 8   | CHECK INTERMITTENT INCIDENT |                |
|---|-----------------------------|----------------|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |                             |                |
|   | <b>&gt;</b>                 | INSPECTION END |





### 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.



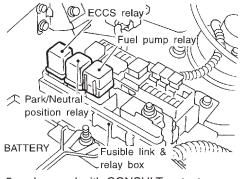
Voltage: Battery voltage

OK or NG

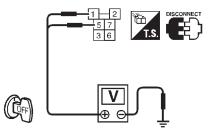
| OK | GO TO 5. |
|----|----------|
| NG | GO TO 4. |

### 11 CHECK POWER SUPPLY-IV

- 1. Turn ignition switch "OFF".
- 2. Disconnect ECCS relay.



3. Check voltage between terminals 1, 5 and ground with CONSULT or tester.



OK or NG

Voltage: Battery voltage

SEF770U

SEF681U

SEF731U

| ОК | <b>•</b> | GO TO 13. |
|----|----------|-----------|
| NG |          | CO TO 12  |

**EC-554** 



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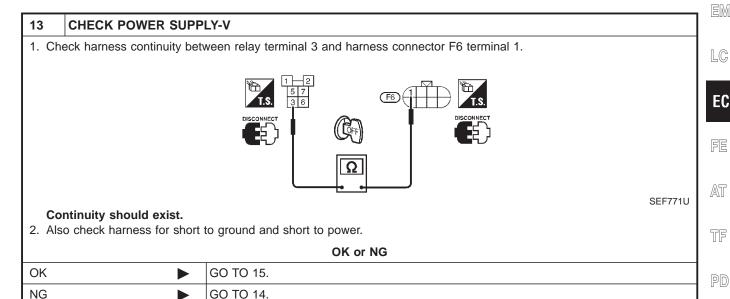
SC

### 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.



### 14 DETECT MALFUNCTIONING PART

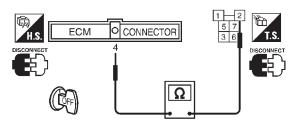
Check the following.

- 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.



SEF677U

#### Continuity should exist.

3. Also 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

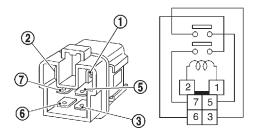
Check the following.

- 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.

### 17 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.

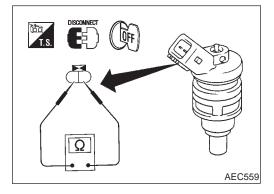


12V (1 - 2) applied: Continuity exists.

No voltage applied: No continuity

OK or NG

| OK ► | Go to "TROUBLE DIAGNOSIS FOR POWER SUPPLY", EC-137. |
|------|---|
| NG ► | Replace ECCS relay.                                 |



# **Component Inspection INJECTOR**

NBEC0348

SEF745U

NBEC0348S01

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

Resistance: 10 - 14 $\Omega$  [at 25°C (77°F)]

If NG, replace injector.

### **START SIGNAL**

CONSULT Reference Value in Data Monitor Mode

# **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0350

| SPECIFICATION | . MA |
|---------------|------|
|               |      |

 $\mathsf{OFF} \to \mathsf{ON} \to \mathsf{OFF}$ 

### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

CONDITION

Ignition switch: ON → START → ON

NBEC0351

#### **CAUTION:**

MONITOR ITEM

START SIGNAL

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR       | ITEM                      | CONDITION                     | DATA (DC Voltage) |
|----------------------|---------------------|---------------------------|-------------------------------|-------------------|
|                      | 20 B/Y Start signal | [Ignition switch "ON"]    | Approximately 0V              |                   |
| 20                   |                     | [Ignition switch "START"] | BATTERY VOLTAGE<br>(11 - 14V) |                   |



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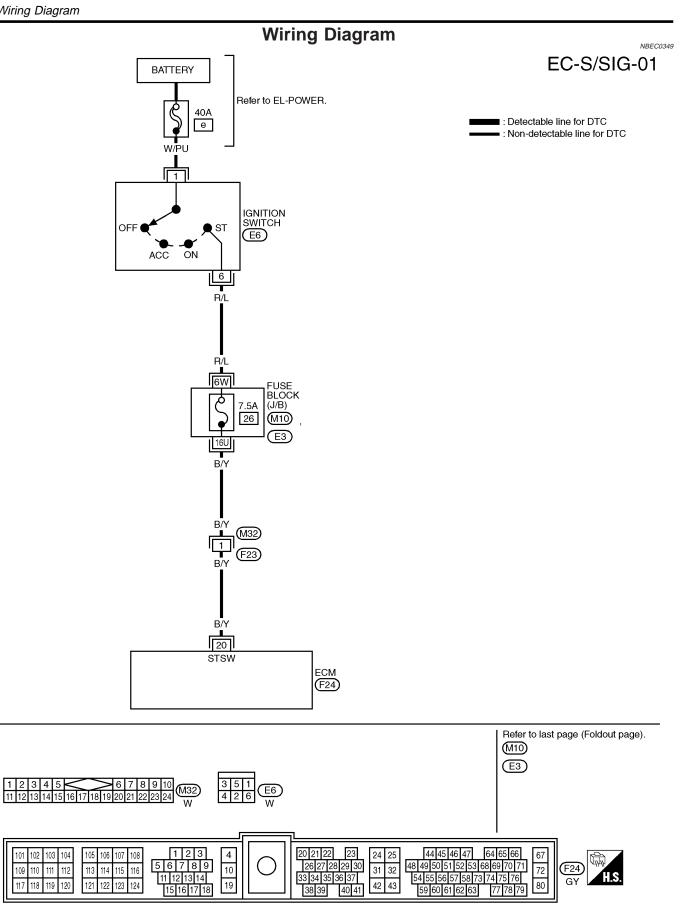
EL

109 110 111 112

119 120

### START SIGNAL

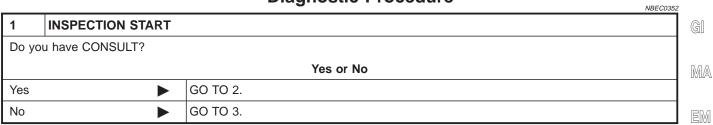


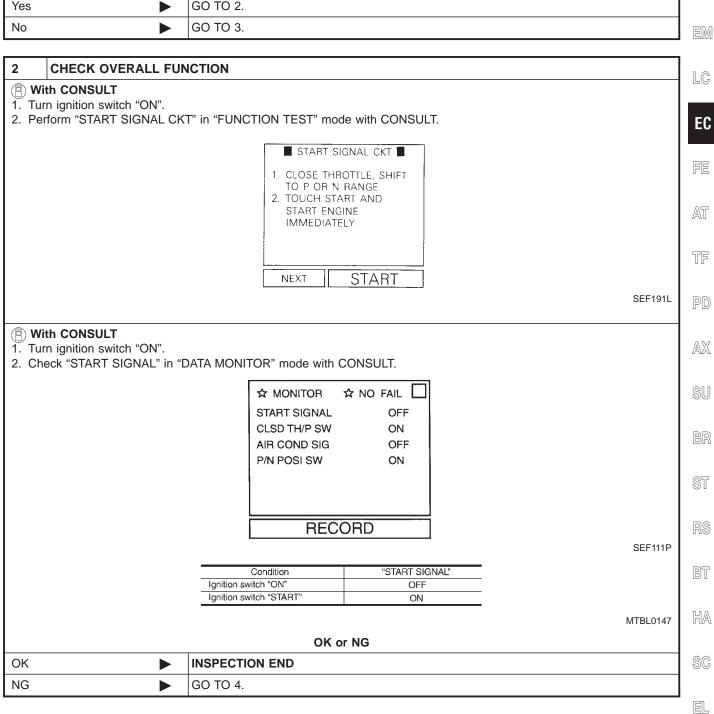


MEC655C

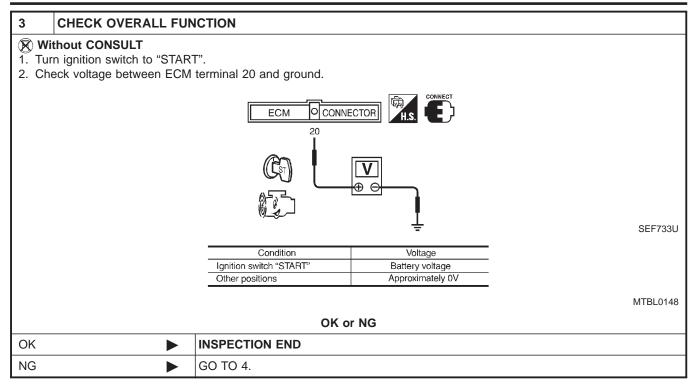


### **Diagnostic Procedure**





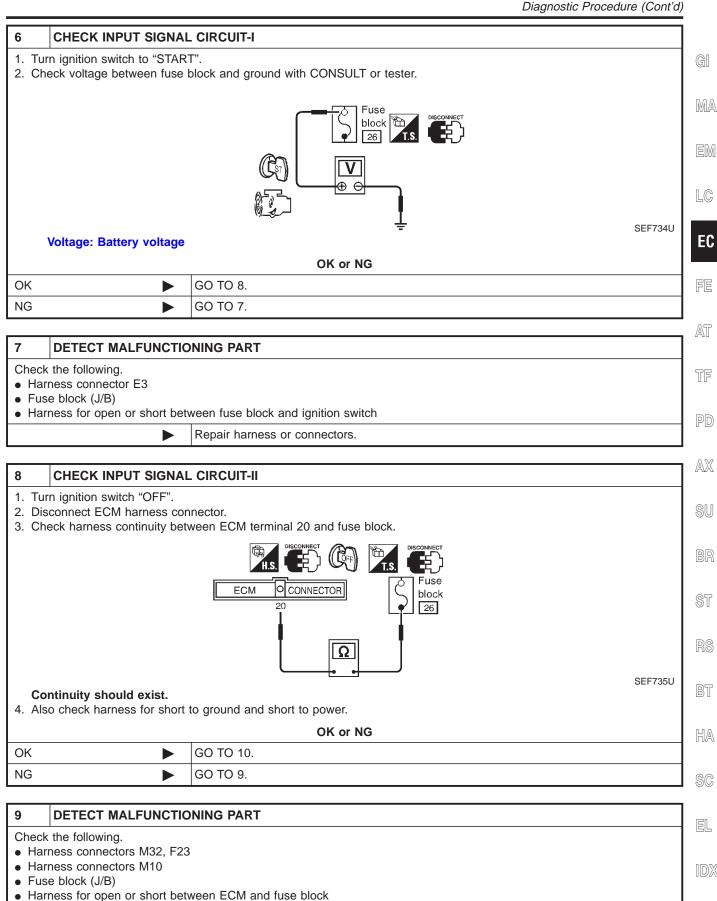




| 4   | CHECK STARTING SYSTEM   |  |  |  |
|-----|---|--|--|--|
|     | Turn ignition switch "OFF", then turn it to "START".  Does starter motor operate? |  |  |  |
|     | Yes or No   |  |  |  |
| Yes | <b>&gt;</b>   | GO TO 5.                               |  |  |
| No  | <b>•</b>  | Refer to EL section "STARTING SYSTEM". |  |  |

| 5  | CHECK FUSE   |                    |  |  |
|----|--|--------------------|--|--|
| _  | <ol> <li>Disconnect 7.5A fuse.</li> <li>Check if 7.5A fuse is OK.</li> </ol> |                    |  |  |
|    | OK or NG   |                    |  |  |
| OK | <b>•</b>   | GO TO 6.           |  |  |
| NG | <b>&gt;</b>  | Replace 7.5A fuse. |  |  |





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

## **START SIGNAL**



Diagnostic Procedure (Cont'd)

| 10    | 0 CHECK INTERMITTENT INCIDENT                                   |  |  |  |  |
|-------|---|--|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |  |  |
|       | ► INSPECTION END  |  |  |  |  |



## **System Description**

|                          |                     |                   | NDEC0000          |              |
|--------------------------|---------------------|-------------------|-------------------|--------------|
| Sensor                   | Input Signal to ECM | ECM func-<br>tion | Actuator          | G            |
| Camshaft position sensor | Engine speed        | Fuel pump         | Fuel pump relay   | $\mathbb{N}$ |
| Ignition switch          | Start signal        | control           | Fuel pullip relay |              |

MA

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.

EM

| _ | $\sim$ |  |
|---|--------|--|
|   |        |  |
|   |        |  |
|   |        |  |
|   |        |  |
|   |        |  |

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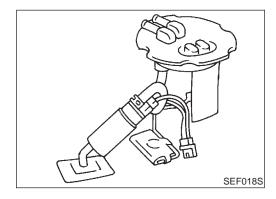
| Condition                        | Fuel pump operation    |  |
|----------------------------------|------------------------|--|
| Ignition switch is turned to ON. | Operates for 5 seconds |  |
| Engine running and cranking      | Operates               |  |
| When engine is stopped           | Stops in 1.5 seconds   |  |
| Except as shown above            | Stops                  |  |



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### **Component Description**

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



### **CONSULT Reference Value in Data Monitor** Mode

Specification data are reference values.

NBEC0354

| MONITOR ITEM | CONDITION   | SPECIFICATION |
|--------------|---|---------------|
|              | <ul> <li>Ignition switch is turned to ON. (Operates for 5 seconds.)</li> <li>Engine running and cranking</li> </ul> | ON            |
|              | Except as shown above   | OFF           |

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#### ECM Terminals and Reference Value

### **ECM Terminals and Reference Value**

Specification data are reference values and are measured between each terminal and ground.

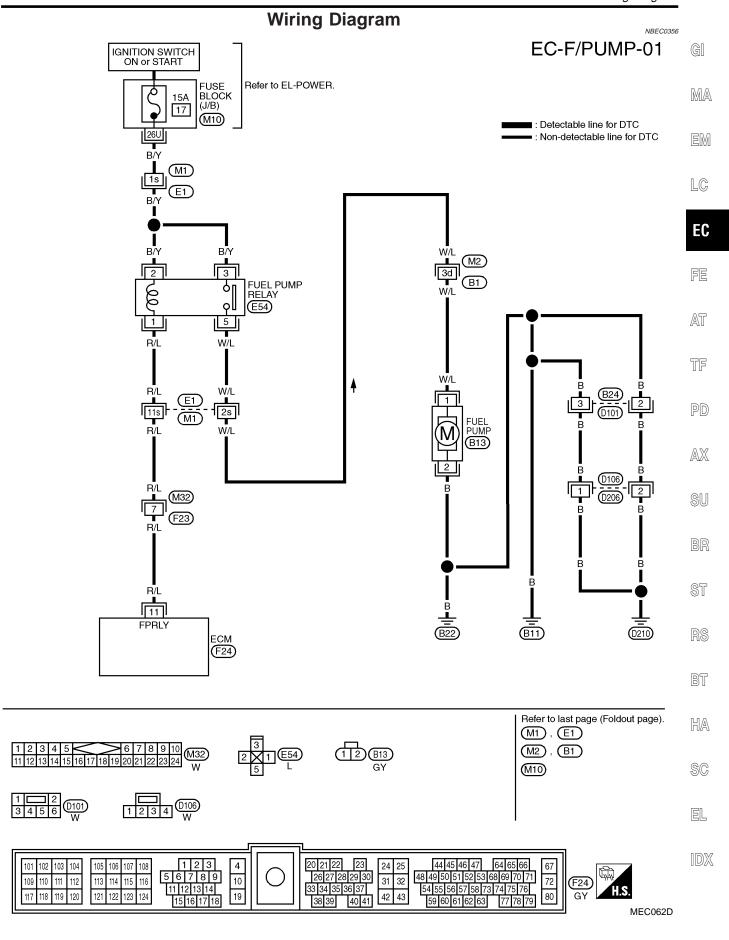
=NBEC0355

#### CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

**FUEL PUMP** 

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR          | ITEM   | CONDITION  | DATA (DC Voltage)             |
|----------------------|------------------------|--|--|-------------------------------|
| 44                   |                        | [Ignition switch "ON"]  ● For 5 seconds after turning ignition switch "ON" [Engine is running] | 0 - 1V   |                               |
| 11                   | 11 R/L Fuel pump relay |  | [Ignition switch "ON"]  ■ More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE<br>(11 - 14V) |



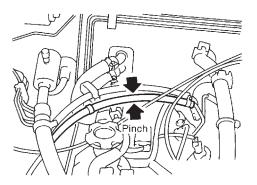


NBEC0357

## **Diagnostic Procedure**

CHECK OVERALL FUNCTION

- 1. Turn ignition switch "ON".
- 2. Pinch fuel feed hose with fingers.



SEF019S

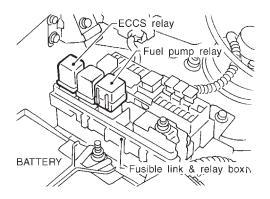
Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

#### OK or NG

| OK • | INSPECTION END |
|------|----------------|
| NG • | GO TO 2.       |

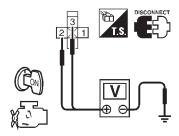
### CHECK POWER SUPPLY

- 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.



SEF736U

Voltage: Battery voltage

OK or NG

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



### 3 DETECT MALFUNCTIONING PART

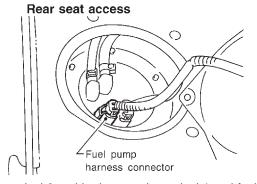
Check the following.

- Harness connectors E1, M1
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

Repair harness or connectors.

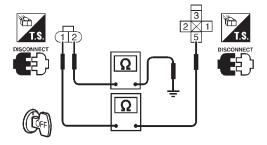
### 4 CHECK POWER AND GROUND CIRCUIT

- 1. Turn ignition switch "OFF".
- 2. Disconnect fuel pump harness connector.



SEF021S

3. Check harness continuity between terminal 2 and body ground, terminal 1 and fuel pump relay connector terminal 5.



SEF737U

### Continuity should exist.

4. Also 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.

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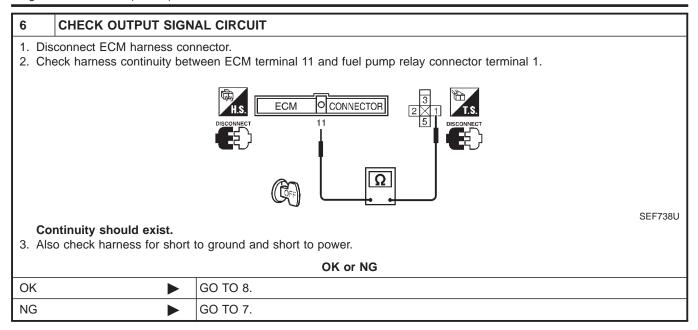
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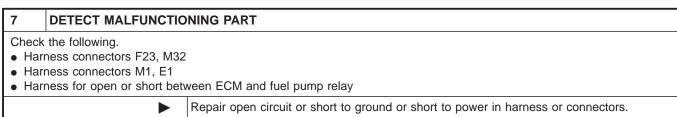
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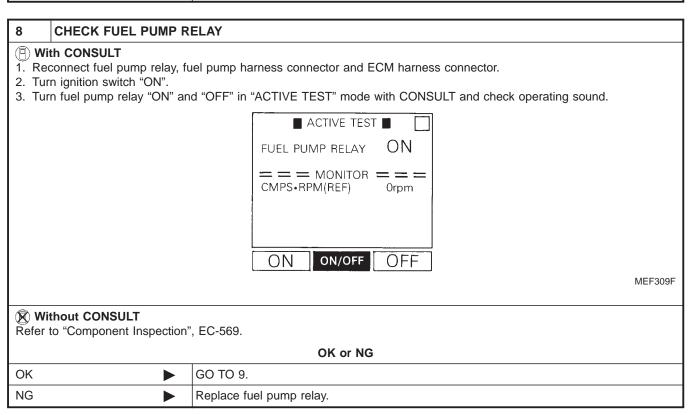
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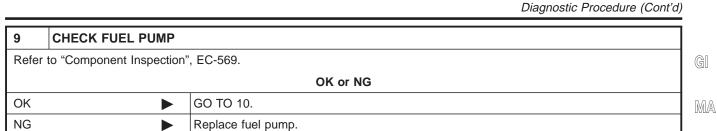




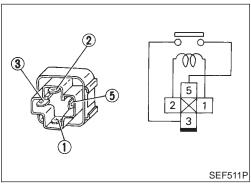


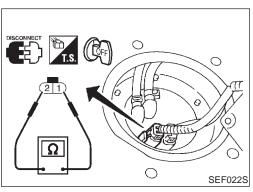
### **FUEL PUMP**





| 10 CHECK INTERMITTENT INCIDENT                                  |             |                |  |
|---|-------------|----------------|--|
| Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |             | 1 6            |  |
|   | <b>&gt;</b> | INSPECTION END |  |





### **Component Inspection FUEL PUMP RELAY**

Check continuity between terminals 3 and 5.

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

If NG, replace relay.

### **FUEL PUMP**

Disconnect fuel pump harness connector.

2. Check resistance between terminals 1 and 2.

Resistance: 0.2 - 5.0 $\Omega$  [at 25°C (77°F)] If NG, replace fuel pump.

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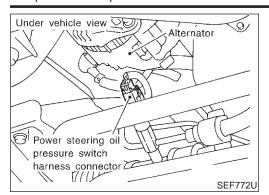
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Component Description



### **Component Description**

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

## **CONSULT Reference Value in Data Monitor Mode**

Specification data are reference values.

NBEC0361

| MONITOR ITEM | CONDITION                                    |  | SPECIFICATION |
|--------------|--|--|---------------|
| PW/ST SIGNAL | Engine: After warming up, idle<br>the engine | Steering wheel in neutral position (forward direction) | OFF           |
|              | the engine                                   | The steering wheel is fully turned.                    | ON            |

### **ECM Terminals and Reference Value**

NBEC0362

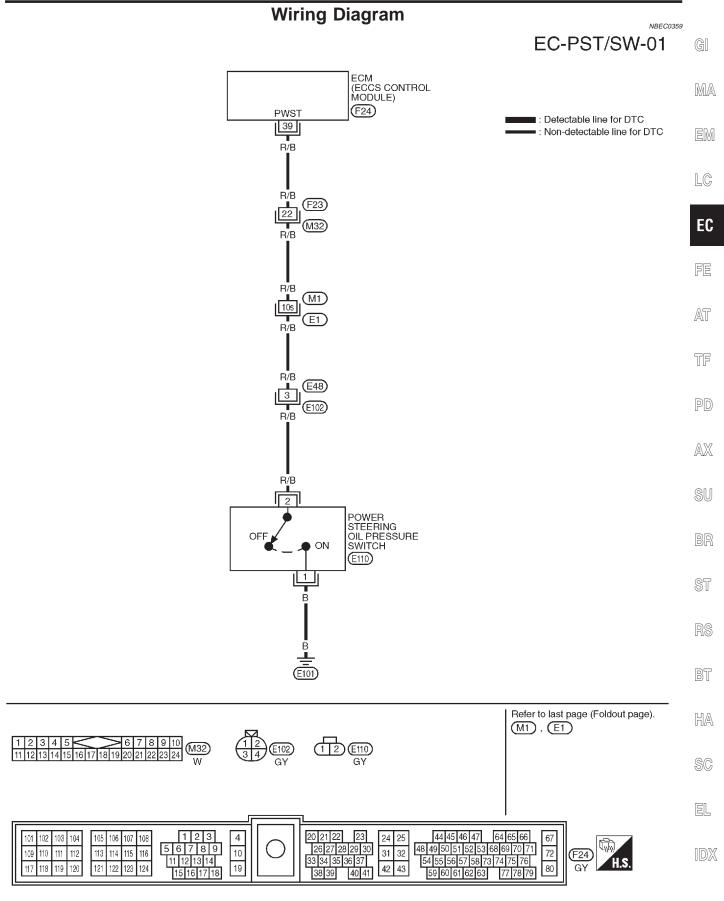
Specification data are reference values and are measured between each terminal and ground.

#### **CAUTION:**

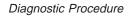
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                        | CONDITION  | DATA (DC Voltage) |
|----------------------|---------------|-----------------------------|--|-------------------|
| 20 P/P Power steer   |               | Power steering oil pressure | [Engine is running] • Steering wheel is being fully turned | 0V                |
| 39                   | switch        |                             | [Engine is running] • Steering wheel is not being turned   | Approximately 5V  |

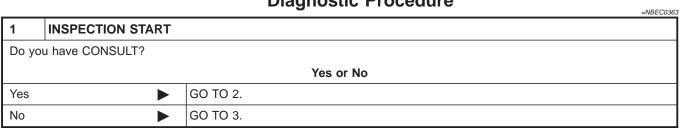








## **Diagnostic Procedure**



| 2 CHECK OVERALL FU  | INCTION                             |                    |          |
|---|-------------------------------------|--------------------|----------|
| <ul><li>With CONSULT</li><li>1. Turn ignition switch "ON".</li><li>2. Perform "PW/ST SIGNAL C</li></ul> | RCUIT" in "FUNCTION TEST" r         | mode with CONSULT. |          |
|   | PW/ST SIGNA                         | L CIRCUIT          |          |
|   | HOLD STEERII<br>IN A FI<br>LOCKED   | JLL                |          |
|   | THE!                                | N                  |          |
|   | NEXT                                | START              |          |
|   |                                     |                    | MEF023E  |
| <ul><li>With CONSULT</li><li>Start engine.</li><li>Check "PW/ST SIGNAL" in</li></ul>                    | 'DATA MONITOR" mode with C          | ONSULT.            |          |
|   | ☆MONITOR ☆                          | NO FAIL            |          |
|   | PW/ST SIGNAL                        | OFF                |          |
|   | REC                                 |                    |          |
|   | 11200                               |                    | SEF591I  |
|   | Condition                           | "PW/ST SIGNAL"     |          |
|   | Steering is neutral position        | OFF                |          |
|   | Steering is turned to full position | ON                 |          |
|   |                                     | _                  | MTBL0144 |
|   | OK or                               | NG                 |          |
| OK •  | INSPECTION END                      |                    |          |
| NG •  | GO TO 4.                            |                    |          |

| OK • | INSPECTION END |
|------|----------------|
| NG ► | GO TO 4.       |

EC

AX

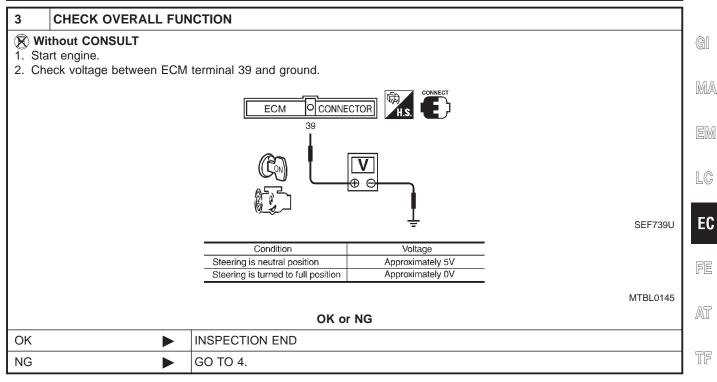
ST

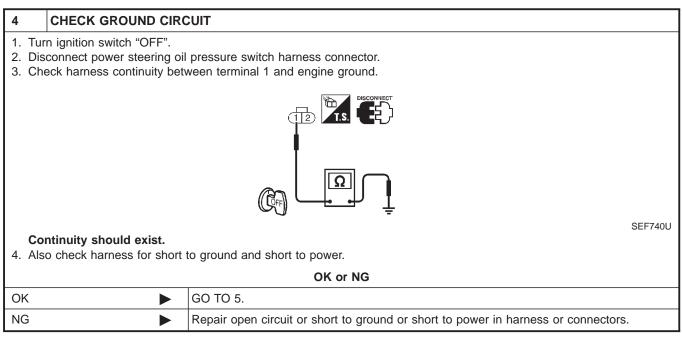
HA

SC

[DX

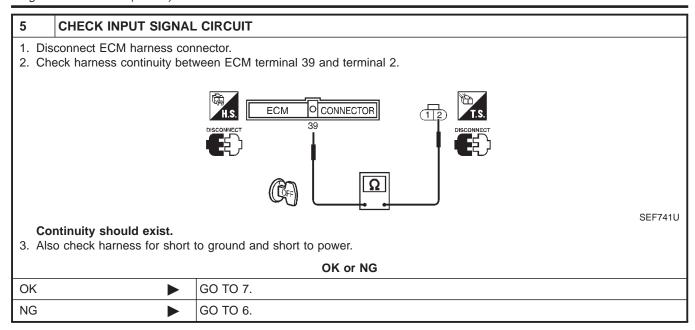
Diagnostic Procedure (Cont'd)







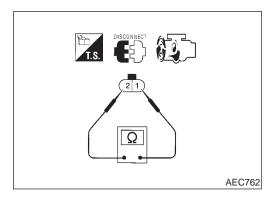
Diagnostic Procedure (Cont'd)



| 6  | DETECT MALFUNCTIO  | NING PART |
|--|--|-----------|
| Check the following.  • Harness connectors F23, M32  |  |           |
| Harness connectors M1, E1  |  |           |
| <ul> <li>Harness connectors E48, E102</li> <li>Harness for open or short between ECM and power steering oil pressure switch</li> </ul> |  |           |
|  | Repair open circuit or short to ground or short to power in harness or connectors. |           |

| 7     | CHECK POWER STEER                       | RING OIL PRESSURE SWITCH                    |  |
|-------|---|---|--|
| Refer | Refer to "Component Inspection" EC-574. |   |  |
|       | OK or NG                                |   |  |
| OK    | •                                       | GO TO 8.                                    |  |
| NG    | <b>•</b>                                | Replace power steering oil pressure switch. |  |

| 8     | CHECK INTERMITTENT INCIDENT                                    |  |
|-------|--|--|
| Refer | efer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |
|       | ► INSPECTION END   |  |



# Component Inspection POWER STEERING OIL PRESSURE SWITCH

NBEC0364

- 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         |

Component Inspection (Cont'd)

If NG, replace power steering oil pressure switch.

G[

MA

EM

LC

EC

FE

AT

TF

PD

 $\mathbb{A}\mathbb{X}$ 

SU

BR

ST

RS

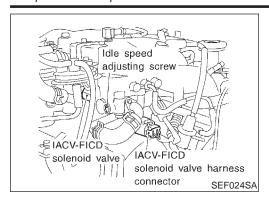
BT

HA

SC

EL





### **Component Description**

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load. For more information, refer to HA-18, "DESCRIPTION".

### **ECM Terminals and Reference Value**

NBEC0367

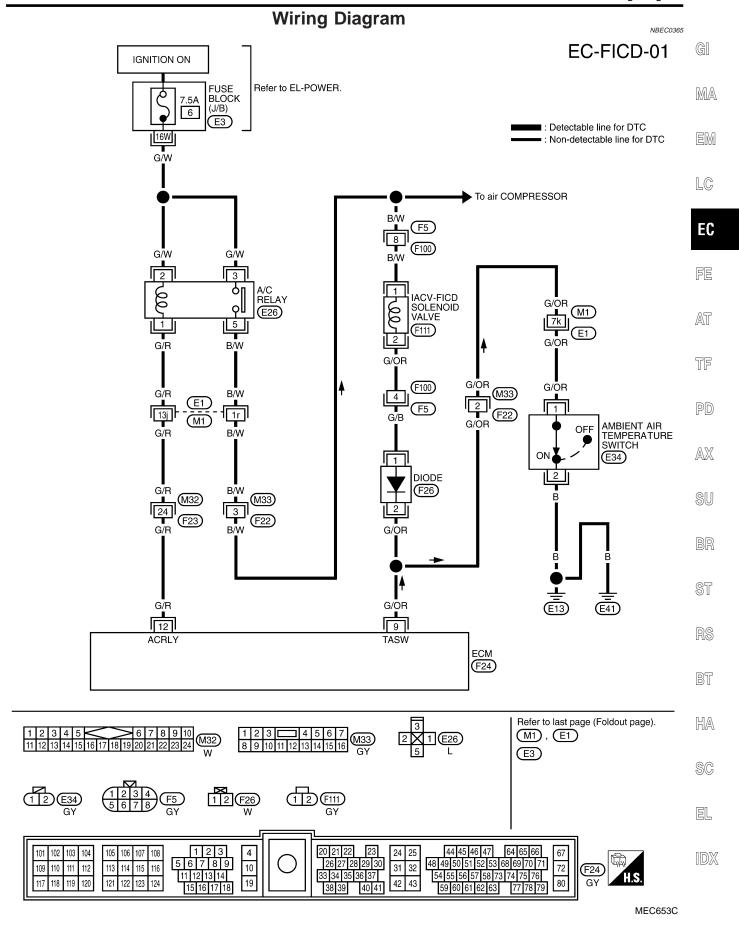
Specification data are reference values and are measured between each terminal and ground.

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

| TERMI-<br>NAL<br>NO. | WIRE<br>COLOR | ITEM                           | CONDITION   | DATA (DC Voltage)             |
|----------------------|---------------|--------------------------------|---|-------------------------------|
| 9                    | G/OR          | Ambient air temperature switch | <ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Ambient air temperature is above 23.5°C (74°F)</li> <li>Air conditioner is operating</li> </ul> |                               |
|                      |               |                                | <ul> <li>[Engine is running]</li> <li>Idle speed</li> <li>Ambient air temperature is below 23.5°C (74°F)</li> <li>Air conditioner is operating</li> </ul> | BATTERY VOLTAGE<br>(11 - 14V) |
|                      |               |                                | [Engine is running]  ■ Idle speed  ■ Ambient air temperature is below 23.5°C (74°F)  ■ Air conditioner is not operating                                   | Approximately 5V              |
| 40                   | C/D           | G/R Air conditioner relay      | [Engine is running]  • Both A/C switch and blower fan switch are "ON"*  | 0 - 1V                        |
| 12                   | G/K           |                                | [Engine is running] • A/C switch is "OFF"   | BATTERY VOLTAGE<br>(11 - 14V) |
| 21                   | B/W           | Air conditioner switch         | [Engine is running] ■ Both A/C switch and blower fan switch are "ON" (Compressor operates)*   | Approximately 0V              |
|                      |               |                                | [Engine is running]  • Air conditioner switch is "OFF"  | Approximately 5V              |

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







=NBEC0368

### **Diagnostic Procedure**

1 CHECK OVERALL FUNCTION

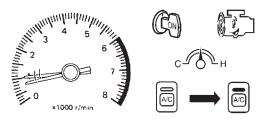
1. Start engine and warm it up to normal operating temperature.

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.



SEF742U

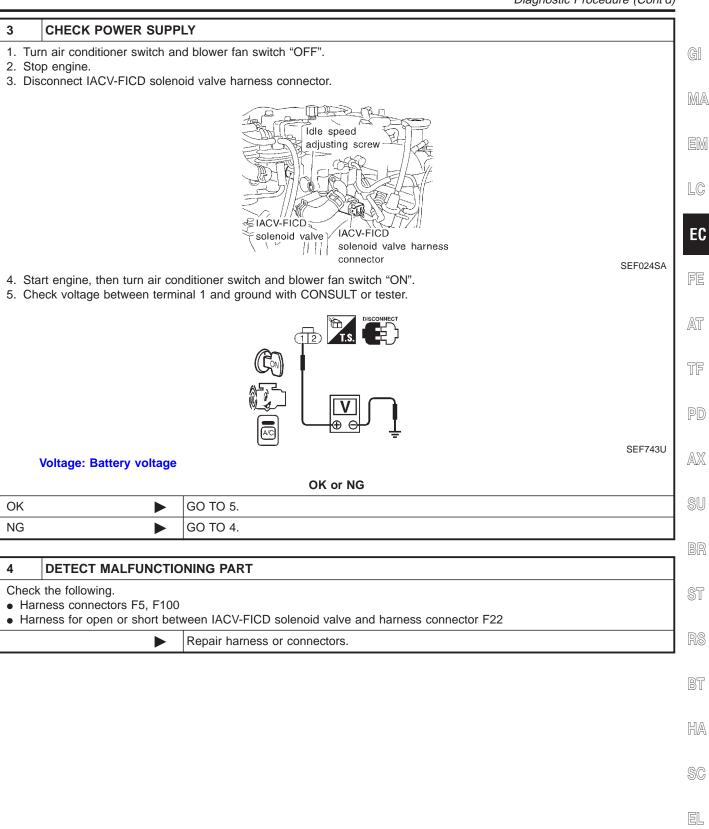
850 rpm or more (in "N" position)

OK or NG

| OK • | INSPECTION END |
|------|----------------|
| NG • | GO TO 2.       |

| 2     | CHECK AIR CONDITIONER FUNCTION                          |  |  |  |  |
|-------|---|--|--|--|--|
| Check | Check if air conditioner compressor functions normally. |  |  |  |  |
|       | OK or NG  |  |  |  |  |
| OK    | OK <b>▶</b> GO TO 3.                                    |  |  |  |  |
| NG    | NG Refer to HA-15, "TROUBLE DIAGNOSES".                 |  |  |  |  |

Diagnostic Procedure (Cont'd)

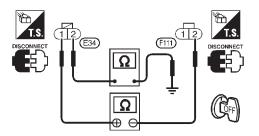




Diagnostic Procedure (Cont'd)

### 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.



SEF744U

### Continuity should exist.

4. Also check harness for short to ground and short to power.

| $\sim$ | 1/ |    | NO | • |
|--------|----|----|----|---|
|        | n  | or |    |   |
|        |    |    |    |   |

| 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.

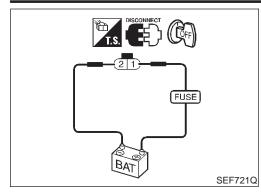
| 7   | CHECK AMBIENT AIR TEMPERATURE SWITCH |   |  |  |
|---|--------------------------------------|---|--|--|
| Refer to HA-96, "Ambient air temperature switch operation". |                                      |   |  |  |
| OK or NG  |                                      |   |  |  |
| OK  | OK ▶ GO TO 8.                        |   |  |  |
| NG  | •                                    | Replace Ambient air temperature switch. |  |  |

| 8                                       | 8 CHECK IACV-FICD SOLENOID VALVE |                                   |  |  |
|---|----------------------------------|-----------------------------------|--|--|
| Refer to "Component Inspection" EC-581. |                                  |                                   |  |  |
| OK or NG                                |                                  |                                   |  |  |
| OK                                      | OK <b>▶</b> GO TO 9.             |                                   |  |  |
| NG                                      | <b>•</b>                         | Replace IACV-FICD solenoid valve. |  |  |

| 9     | CHECK INTERMITTENT INCIDENT                                     |  |  |  |
|-------|---|--|--|--|
| Refer | Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-136. |  |  |  |
|       | ► INSPECTION END  |  |  |  |

Component Inspection





### **Component Inspection IACV-FICD SOLENOID VALVE**

NBEC0369

Disconnect IACV-FICD solenoid valve harness connector.

NBEC0369S01 GI

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

MA

LC

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























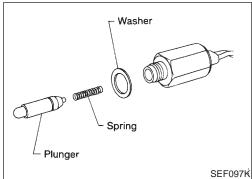




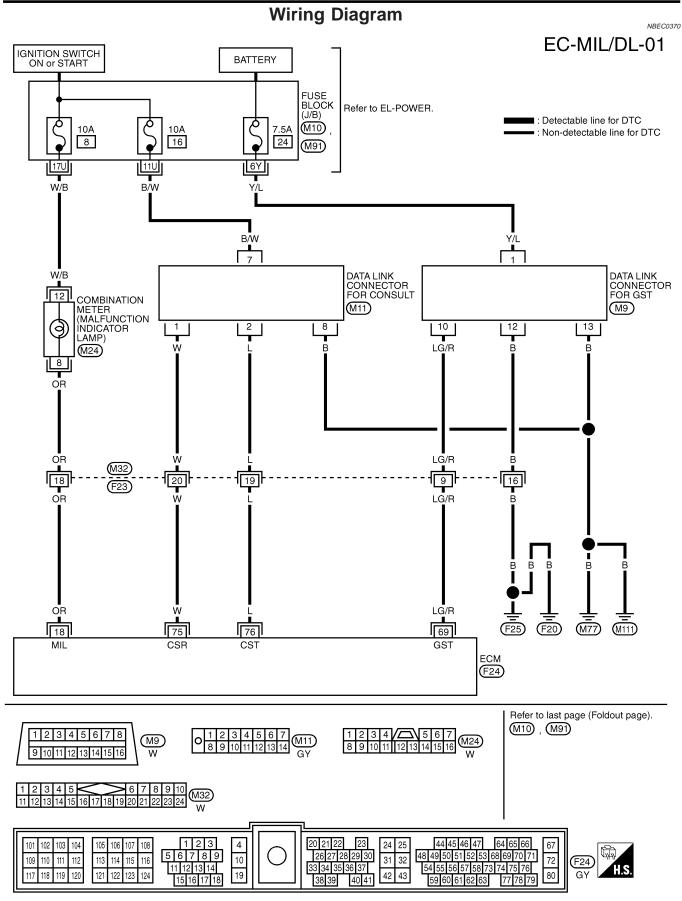












MEC654C

## SERVICE DATA AND SPECIFICATIONS (SDS)

| Base idle speed*1 No-load*4 (in "P" or N" position) 70±50 rpm  Target idle speed*2 No-load*4 (in "P" or N" position) 750±50 rpm  Air conditioner: ON In "P" or N" position 850 rpm or more  Ignition timing*3 In "P" or N" position 15°±2° BTDC  Throttle position sensor idle position 0.15 - 0.85V  **Timottle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT" mode  12: Throttle position sensor harness connector connected  3: Throttle position sensor harness connector disconnected  4: Under the following conditions:  Air conditioner switch: OFF  Electric load: OFF (Lights, heater fan & rear window defogger)  Steering wheel: Kept in straight-ahead position  Ignition Coil  Primary voltage 12 V  Primary resistance [at 20°C (68°F)] Approximately 1.0Ω  Secondary resistance [at 20°C (68°F)] Approximately 10 kΩ  Mass Air Flow Sensor  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* 12.0 - 14.9 g-m/sec at 2,500 rpm*  Engine Coolant Temperature Sensor  | IBEC0372 |
|--|----------|
| Vacuum hose is disconnected   Approximately 294 (3.0, 43)  | IBEC0372 |
| Idle Speed and Ignition Timing   | IBEC0372 |
| Base idle speed*1 No-load*4 (in "P" or N" position) 700±50 rpm  Target idle speed*2 No-load*4 (in "P" or N" position) 750±50 rpm  Air conditioner: ON In "P" or N" position 850 rpm or more  Ignition timing*3 In "P" or N" position 15°±2° BTDC  Throttle position sensor idle position 0.15 - 0.85V  1: Throttle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT" mode  2: Throttle position sensor harness connector connected  3: Throttle position sensor harness connector disconnected  4: Under the following conditions:  Air conditioner switch: OFF Electric load: OFF (Lights, heater fan & rear window defogger)  Steering wheel: Kept in straight-ahead position  Ignition Coil  Primary voltage 12 V  Primary resistance [at 20°C (68°F)] Approximately 1.0Ω  Secondary resistance [at 20°C (68°F)] Approximately 1.0 Ω  Mass Air Flow Sensor  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* 1.0 - 1.4 · 9 g-m/sec at 2.500 rpm*  Engine Coolant Temperature Sensor   | IBEC0372 |
| Rarget idle speed*2   No-load*4 (in "P" or N" position)   750±50 rpm   |          |
| Air conditioner: ON In "P" or N" position 850 rpm or more Ignition timing"3 In "P" or N" position 15°±2° BTDC  Throttle position sensor idle position 0.15 - 0.85V  1: Throttle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT" mode  2: Throttle position sensor harness connector disconnected 8: Throttle position sensor harness connector disconnected  3: Throttle position sensor harness connector disconnected  3: Throttle position sensor harness connector disconnected  3: Under the following conditions:  Air conditioner switch: OFF Electric load: OFF (Lights, heater fan & rear window defogger)  Steering wheel: Kept in straight-ahead position  Ignition Coil  Primary voltage 12 V  Primary resistance [at 20°C (68°F)] Approximately 1.0Ω  Secondary resistance [at 20°C (68°F)] Approximately 10 kΩ  Mass Air Flow Sensor  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* 1.0 - 1.4.9 g-m/sec at 2.500 rpm*  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor |          |
| Ignition timing*3  In "P" or N" position  15°±2° BTDC  Throttle position sensor idle position  0.15 - 0.85V  I: Throttle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT" mode  2: Throttle position sensor harness connector connected  3: Throttle position sensor harness connector disconnected  4: Under the following conditions:  Air conditioner switch: OFF  Electric load: OFF (Lights, heater fan & rear window defogger)  Steering wheel: Kept in straight-ahead position  Ignition Coil  Primary voltage  12 V  Primary resistance [at 20°C (68°F)]  Approximately 1.0Ω  Mass Air Flow Sensor  Supply voltage  Battery voltage (11 - 14) V  Output voltage at idle  1.0 - 1.7* V  Mass air flow (Using CONSULT or GST)  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor   |          |
| Throttle position sensor idle position  1: Throttle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT" mode  2: Throttle position sensor harness connector connected  3: Throttle position sensor harness connector disconnected  4: Under the following conditions:  Air conditioner switch: OFF  Electric load: OFF (Lights, heater fan & rear window defogger)  Steering wheel: Kept in straight-ahead position  Ignition Coil  Primary voltage  12 V  Primary resistance [at 20°C (68°F)]  Approximately 1.0Ω  Secondary resistance [at 20°C (68°F)]  Approximately 10 kΩ  Mass Air Flow Sensor  Supply voltage  Battery voltage (11 - 14) V  Output voltage at idle  1.0 - 1.7° V  Mass air flow (Using CONSULT or GST)  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  |          |
| 1: Throttle position sensor harness connector disconnected or using CONSULT "WORK SUPPORT" mode 2: Throttle position sensor harness connector connected 3: Throttle position sensor harness connector disconnected 4: Under the following conditions: Air conditioner switch: OFF Electric load: OFF (Lights, heater fan & rear window defogger) Steering wheel: Kept in straight-ahead position    Ignition Coil  |          |
| 2: Throttle position sensor harness connector connected 3: Throttle position sensor harness connector disconnected 4: Under the following conditions: Air conditioner switch: OFF Electric load: OFF (Lights, heater fan & rear window defogger) Steering wheel: Kept in straight-ahead position  Ignition Coil  Primary voltage  12 V  Primary resistance [at 20°C (68°F)]  Approximately 1.0Ω  Secondary resistance [at 20°C (68°F)]  Approximately 10 kΩ  Mass Air Flow Sensor  Supply voltage  Battery voltage (11 - 14) V  Output voltage at idle  1.0 - 1.7° V  Mass air flow (Using CONSULT or GST)  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  |          |
| Primary resistance [at 20°C (68°F)]  Secondary resistance [at 20°C (68°F)]  Mass Air Flow Sensor  Supply voltage  Battery voltage (11 - 14) V  Output voltage at idle  1.0 - 1.7* V  Mass air flow (Using CONSULT or GST)  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  Temperature °C (°F)  Resistance kΩ   | IBEC0373 |
| Mass Air Flow Sensor         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* 12.0 - 14.9 g·m/sec at 2,500 rpm*         Engine is warmed up to normal operating temperature and running under no-load.         Engine Coolant Temperature Sensor         Temperature °C (°F)       Resistance kΩ   |          |
| Mass Air Flow Sensor         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* 12.0 - 14.9 g·m/sec at 2,500 rpm*         Engine is warmed up to normal operating temperature and running under no-load.       Engine Coolant Temperature Sensor         Temperature °C (°F)       Resistance kΩ   |          |
| 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* 12.0 - 14.9 g·m/sec at 2,500 rpm*  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  Temperature °C (°F)  Resistance kΩ   |          |
| Output voltage at idle  Mass air flow (Using CONSULT or GST)  3.3 - 4.8 g·m/sec at idle* 12.0 - 14.9 g·m/sec at 2,500 rpm*  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  Temperature °C (°F)  Resistance kΩ  | IBEC0374 |
| Mass air flow (Using CONSULT or GST)  3.3 - 4.8 g·m/sec at idle* 12.0 - 14.9 g·m/sec at 2,500 rpm*  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  Temperature °C (°F)  Resistance kΩ  |          |
| Mass air flow (Using CONSULT or GST)  12.0 - 14.9 g·m/sec at 2,500 rpm*  Engine is warmed up to normal operating temperature and running under no-load.  Engine Coolant Temperature Sensor  Temperature °C (°F)  Resistance kΩ   |          |
| Engine Coolant Temperature Sensor  Temperature °C (°F)  Resistance kΩ  |          |
| Temperature °C (°F) Resistance kΩ  |          |
|  | IBEC0375 |
| 20 (68)  |          |
|  |          |
| 50 (122) 0.68 - 1.00   |          |
| 90 (194) 0.236 - 0.260   |          |
| EGR Temperature Sensor   | IBEC0376 |
| EGR temperature °C (°F) Voltage V Resistance $M\Omega$   |          |
| 0 (32) 4.81 7.9 - 9.7  |          |
| 50 (122) 2.82 0.57 - 0.70  |          |
| 100 (212) 0.8 0.08 - 0.10  |          |

## SERVICE DATA AND SPECIFICATIONS (SDS)

|                             | Fuel Pum   | p   | NBEC0378 |
|-----------------------------|------------|---|----------|
| Resistance [at 25°C (77°F)] |            | 0.2 - 5.0Ω  | 7,000    |
|                             | IACV-AAC   | : Valve   |          |
|                             |            |   | NBEC037  |
| Resistance [at 20°C (68°F)] |            | Approximately 10.0Ω   |          |
|                             | Injector   |   | NBEC038  |
| Resistance [at 25°C (77°F)] |            | 10 - 14Ω  |          |
|                             | Resistor   |   |          |
| Resistance [at 25°C (77°F)] |            | Approximately 2.2 kΩ  | NBEC038  |
| Nesistance [at 25 O (77 1)] |            |   |          |
|                             | Throttle P | osition Sensor  | NBEC038  |
| Throttle valve conditions   |            | Voltage (at normal operating temperature, engine off, ignition switch ON, throttle opener disengaged) |          |
| Completely closed (a)       |            | 0.15 - 0.85V  |          |
| Partially open              |            | Between (a) and (b)   |          |
| Completely open (b)         |            | 3.5 - 4.7V  |          |
|                             | Calculated | d Load Value  | NBEC038  |
|                             |            | 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  | NBEC038  |
| Temperature °C (°F)         |            | Resistance k $\Omega$   |          |
| 20 (68)                     |            | 2.1 - 2.9   |          |
| 80 (176)                    |            | 0.27 - 0.38   |          |
|                             | Rear Heat  | ed Oxygen Sensor Heater   | NBEC038  |
| Resistance [at 25°C (77°F)] |            | 2.3 - 4.3Ω  | 7422000  |
|                             | Cranksha   | ft Position Sensor (OBD)  | NBEC038  |
| Resistance [at 20°C (68°F)] |            | 166.5 - 203.5Ω  |          |
|                             | Fuel Tank  | Temperature Sensor  | NBEC052  |
| Temperature °C (°F)         |            | Resistance k $\Omega$   |          |
| 20 (68)                     |            | 2.3 - 2.7   |          |
| 50 (122)                    |            | 0.79 - 0.90   |          |