<SUPPLEMENT-III>

# ENGINE CONTROL SYSTEM

SECTION EC

**MODIFICATION NOTICE:**

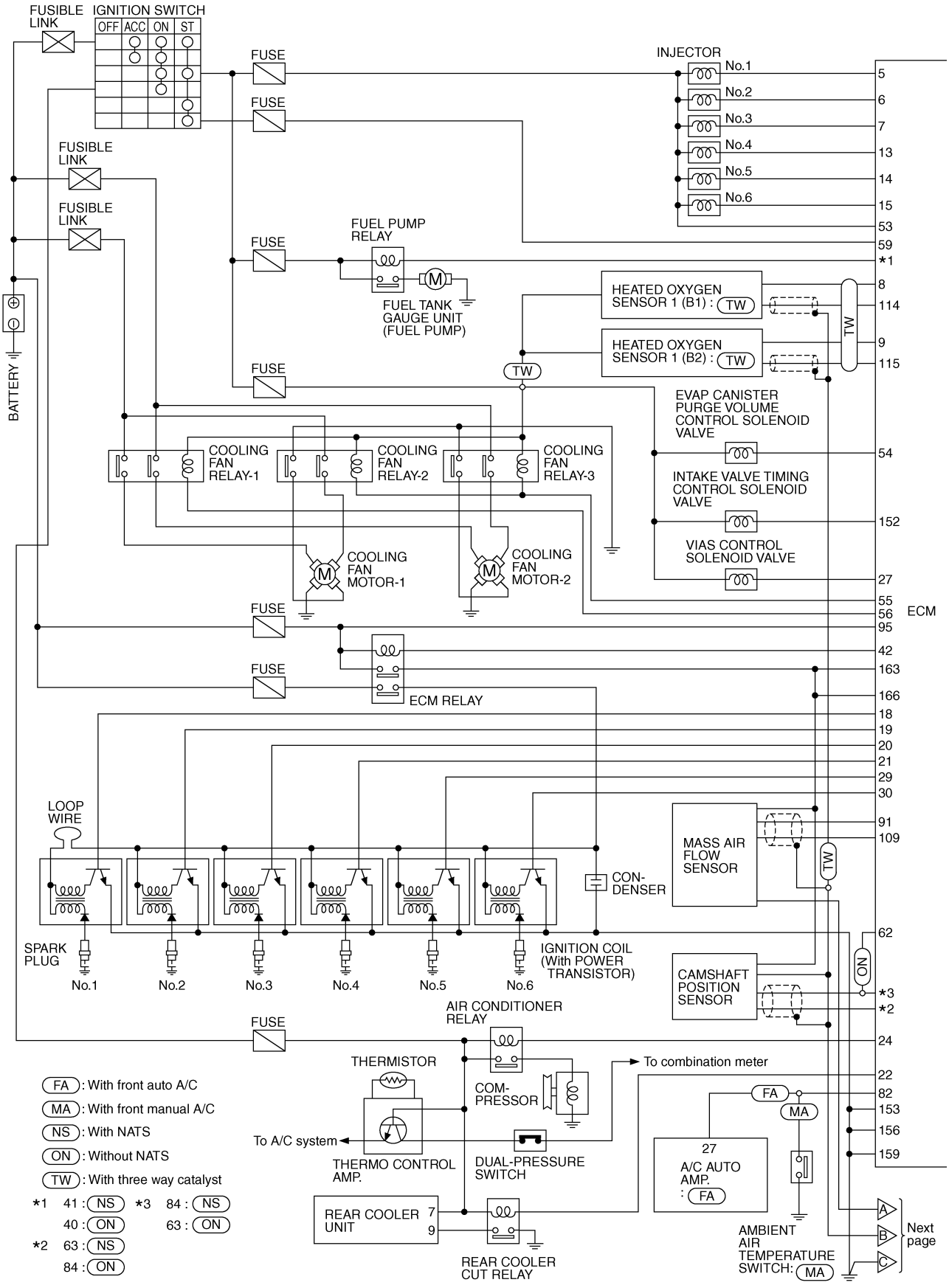
- TB48DE engine models have been applied to Europe.

# CONTENTS

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

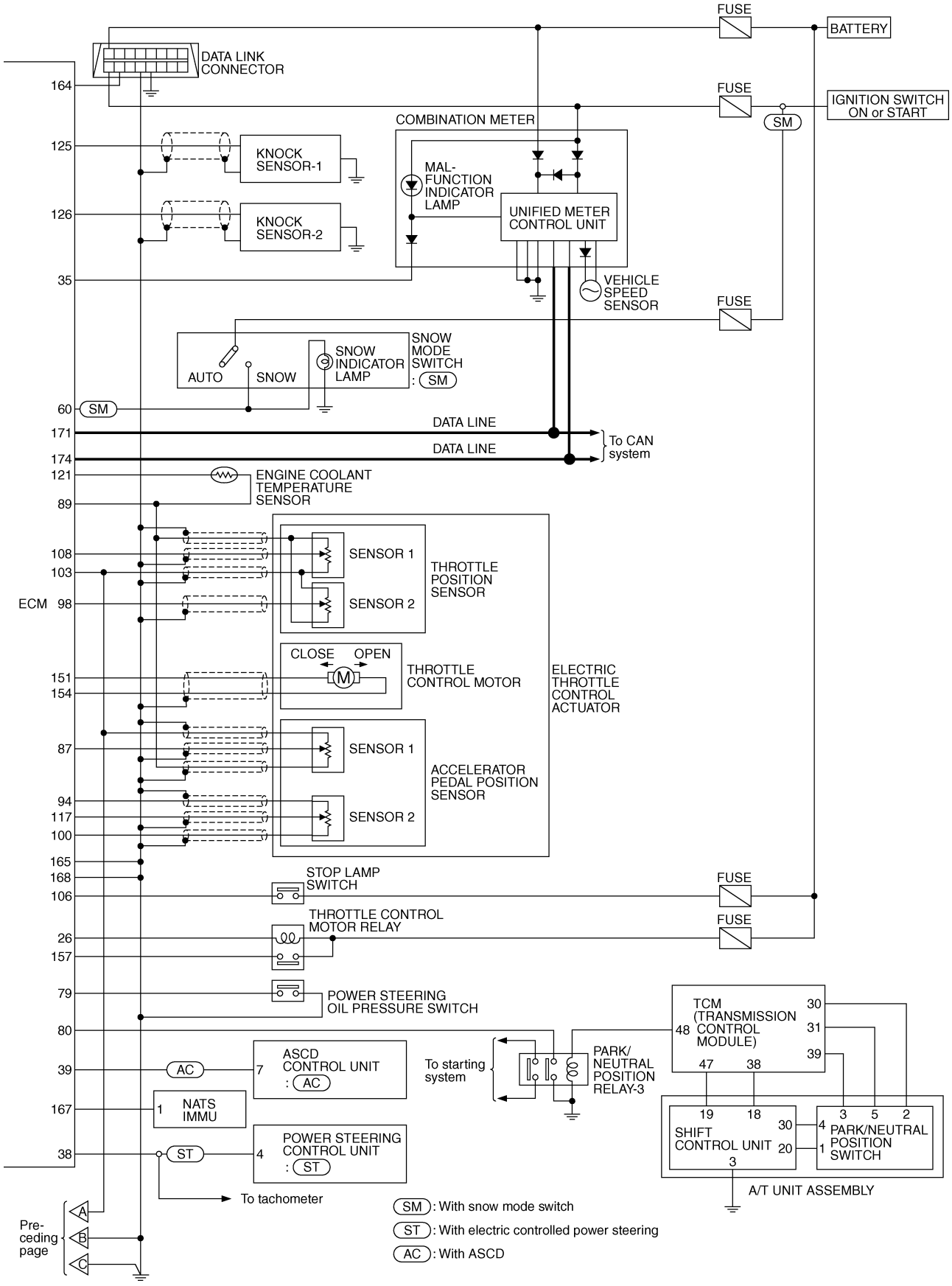
**When you perform trouble diagnoses, read GI section, “HOW TO FOLLOW FLOW CHART IN TROUBLE DIAGNOSES” and “HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT”.**

## Circuit Diagram




TEC241M

## Circuit Diagram (Cont'd)




TEC372M

## Alphabetical Index

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI section.

**NOTE:**
**If DTC U1000 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000. Refer to EC-121, “DTC U1000 CAN COMMUNICATION LINE”.**

x: Applicable —: Not applicable

| Items (CONSULT-II screen terms) | DTC*1 | | Trip | MI lighting up | Reference page |
|---|---|---|---|---|---|
| | CONSULT-II GST*2 | ECM*3 | | | |
| APP SEN 1/CIRC | P2122 | 2122 | 1 | x | EC-401 |
| APP SEN 1/CIRC | P2123 | 2123 | 1 | x | EC-401 |
| APP SEN 2/CIRC | P2127 | 2127 | 1 | x | EC-408 |
| APP SEN 2/CIRC | P2128 | 2128 | 1 | x | EC-408 |
| APP SENSOR | P2138 | 2138 | 1 | x | EC-421 |
| BRAKE SW/CIRCUIT | P1805 | 1805 | 2 | — | EC-395 |
| CAN COMM CIRCUIT | U1000 | 1000*5 | 1 | x | EC-121 |
| CKP SEN/CIRCUIT | P0335 | 0335 | 2 | x | EC-251 |
| CKP SENSOR (COG) | P1336 | 1336 | 2 | x | EC-381 |
| CMP SEN/CIRC-B1 | P0340 | 0340 | 2 | x | EC-257 |
| CTP LEARNING | P1225 | 1225 | 2 | — | EC-372 |
| CTP LEARNING | P1226 | 1226 | 2 | — | EC-374 |
| CYL 1 MISFIRE | P0301 | 0301 | 2 | x | EC-241 |
| CYL 2 MISFIRE | P0302 | 0302 | 2 | x | EC-241 |
| CYL 3 MISFIRE | P0303 | 0303 | 2 | x | EC-241 |
| CYL 4 MISFIRE | P0304 | 0304 | 2 | x | EC-241 |
| CYL 5 MISFIRE | P0305 | 0305 | 2 | x | EC-241 |
| CYL 6 MISFIRE | P0306 | 0306 | 2 | x | EC-241 |
| ECM | P0605 | 0605 | 1 or 2 | x or — | EC-283 |
| ECM BACK UP/CIRC | P1065 | 1065 | 2 | x | EC-290 |
| ECT SEN/CIRCUIT | P0117 | 0117 | 1 | x | EC-152 |
| ECT SEN/CIRCUIT | P0118 | 0118 | 1 | x | EC-152 |
| ENG OVER TEMP | P1217 | 1217 | 1 | x | EC-361 |
| ETC ACTR | P1121 | 1121 | 1 or 2 | x | EC-299 |
| ETC FUNCTION/CIRC | P1122 | 1122 | 1 | x | EC-301 |
| ETC MOT | P1128 | 1128 | 1 | x | EC-315 |
| ETC MOT PWR | P1124 | 1124 | 1 | x | EC-309 |
| ETC MOT PWR | P1126 | 1126 | 1 | x | EC-309 |
| FUEL SYS-LEAN-B1 | P0171 | 0171 | 2 | x | EC-218 |
| FUEL SYS-LEAN-B2 | P0174 | 0174 | 2 | x | EC-218 |
| FUEL SYS-RICH-B1 | P0172 | 0172 | 2 | x | EC-227 |
| FUEL SYS-RICH-B2 | P0175 | 0175 | 2 | x | EC-227 |
| HO2S1 (B1) | P0132 | 0132 | 2 | x | EC-163 |
| HO2S1 (B1) | P0133 | 0133 | 2 | x | EC-172 |
| HO2S1 (B1) | P0134 | 0134 | 2 | x | EC-172 |

## Alphabetical Index (Cont'd)

| Items (CONSULT-II screen terms) | DTC*1 | | Trip | MI lighting up | Reference page |
|---|---|---|---|---|---|
| | CONSULT-II GST*2 | ECM*3 | | | |
| HO2S1 (B1) | P1143 | 1143 | 2 | x | EC-320 |
| HO2S1 (B1) | P1144 | 1144 | 2 | x | EC-327 |
| HO2S1 (B2) | P0152 | 0152 | 2 | x | EC-163 |
| HO2S1 (B2) | P0153 | 0153 | 2 | x | EC-172 |
| HO2S1 (B2) | P0154 | 0154 | 2 | x | EC-172 |
| HO2S1 (B2) | P1163 | 1163 | 2 | x | EC-320 |
| HO2S1 (B2) | P1164 | 1164 | 2 | x | EC-327 |
| HO2S1 HTR (B1) | P0031 | 0031 | 2 | x | EC-124 |
| HO2S1 HTR (B1) | P0032 | 0032 | 2 | x | EC-124 |
| HO2S1 HTR (B2) | P0051 | 0051 | 2 | x | EC-124 |
| HO2S1 HTR (B2) | P0052 | 0052 | 2 | x | EC-124 |
| HO2S2 (B1) | P0138 | 0138 | 2 | x | EC-195 |
| HO2S2 (B1) | P0139 | 0139 | 2 | x | EC-205 |
| HO2S2 (B1) | P1146 | 1146 | 2 | x | EC-335 |
| HO2S2 (B1) | P1147 | 1147 | 2 | x | EC-348 |
| HO2S2 (B2) | P0158 | 0158 | 2 | x | EC-195 |
| HO2S2 (B2) | P0159 | 0159 | 2 | x | EC-205 |
| HO2S2 (B2) | P1166 | 1166 | 2 | x | EC-335 |
| HO2S2 (B2) | P1167 | 1167 | 2 | x | EC-348 |
| HO2S2 HTR (B1) | P0037 | 0037 | 2 | x | EC-132 |
| HO2S2 HTR (B1) | P0038 | 0038 | 2 | x | EC-132 |
| HO2S2 HTR (B2) | P0057 | 0057 | 2 | x | EC-132 |
| HO2S2 HTR (B2) | P0058 | 0058 | 2 | x | EC-132 |
| IAT SEN/CIRCUIT | P0112 | 0112 | 2 | x | EC-147 |
| IAT SEN/CIRCUIT | P0113 | 0113 | 2 | x | EC-147 |
| INT/V TIM V/CIR-B1 | P1111 | 1111 | 2 | x | EC-294 |
| KNOCK SEN/CIRC-B1 | P0327 | 0327 | 2 | — | EC-247 |
| KNOCK SEN/CIRC-B1 | P0328 | 0328 | 2 | — | EC-247 |
| KNOCK SEN/CIRC-B2 | P0332 | 0332 | 2 | — | EC-247 |
| KNOCK SEN/CIRC-B2 | P0333 | 0333 | 2 | — | EC-247 |
| L/PRESS SOL/CIRC | P0745 | 0745 | 2 | x | AT section |
| MAF SEN/CIRCUIT | P0102 | 0102 | 1 | x | EC-140 |
| MAF SEN/CIRCUIT | P0103 | 0103 | 1 | x | EC-140 |
| MIL/CIRC | P0650 | 0650 | 2 | — | EC-286 |
| MULTI CYL MISFIRE | P0300 | 0300 | 2 | x | EC-241 |
| NATS MALFUNCTION | P1610 - P1615 | 1610 - 1615 | 2 | — | EC-50 |
| NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | No DTC | Flashing*4 | — | Flashing*4 | EC-51 |
| **NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.** | **P0000** | **0000** | **—** | **—** | **—** |

## Alphabetical Index (Cont'd)

| Items (CONSULT-II screen terms) | DTC*1 | | Trip | MI lighting up | Reference page |
|---|---|---|---|---|---|
| | CONSULT-II GST*2 | ECM*3 | | | |
| P-N POS SW/CIRCUIT | P1706 | 1706 | 2 | x | EC-388 |
| PURG VOLUME CONT/V | P0444 | 0444 | 2 | x | EC-269 |
| PURG VOLUME CONT/V | P0445 | 0445 | 2 | x | EC-269 |
| PW ST P SEN/CIRC | P0550 | 0550 | 2 | — | EC-401 |
| SENSOR POWER/CIRC | P1229 | 1229 | 1 | x | EC-376 |
| TCC SOLENOID/CIRC | P0740 | 0740 | 2 | x | AT section |
| TP SEN 1/CIRC | P0222 | 0222 | 1 | x | EC-235 |
| TP SEN 1/CIRC | P0223 | 0223 | 1 | x | EC-235 |
| TP SEN 2/CIRC | P0122 | 0122 | 1 | x | EC-157 |
| TP SEN 2/CIRC | P0123 | 0123 | 1 | x | EC-157 |
| TP SENSOR | P2135 | 2135 | 1 | x | EC-415 |
| TW CATALYST SYS-B1 | P0420 | 0420 | 2 | x | EC-264 |
| TW CATALYST SYS-B2 | P0430 | 0430 | 2 | x | EC-264 |
| VEH SPEED SEN/CIRC | P0500 | 0500 | 2 | x | EC-276 |

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: In Diagnostic Test Mode II (Self-diagnostic results), these numbers are controlled by NISSAN.
*4: When engine is running.
*5: The trouble shooting for these DTCs needs CONSULT-II.

**NOTE:**
**Regarding Y61 models with TB48DE engine, "B1" indicates bank 1 (cylinders number 1, 2 and 3), "B2" indicates bank 2 (cylinders number 4, 5 and 6).**

# DTC No. Index

Check if the vehicle is a model with Euro-OBD (E-OBD) system or not by the “Type approval number” on the identification plate. Refer to GI section.

**NOTE:**
**If DTC U1000 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000. Refer to EC-121, “DTC U1000 CAN COMMUNICATION LINE”.**

x: Applicable —: Not applicable

| DTC*1 | | Items (CONSULT-II screen terms) | Trip | MI lighting up | Reference page |
|---|---|---|---|---|---|
| CONSULT-II GST*2 | ECM*3 | | | | |
| No DTC | Flashing*4 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | — | Flashing*4 | EC-51 |
| U1000 | 1000*5 | CAN COMM CIRCUIT | 1 | x | EC-121 |
| **P0000** | **0000** | **NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.** | **—** | **—** | **—** |
| P0031 | 0031 | HO2S1 HTR (B1) | 2 | x | EC-124 |
| P0032 | 0032 | HO2S1 HTR (B1) | 2 | x | EC-124 |
| P0037 | 0037 | HO2S2 HTR (B1) | 2 | x | EC-132 |
| P0038 | 0038 | HO2S2 HTR (B1) | 2 | x | EC-132 |
| P0051 | 0051 | HO2S1 HTR (B2) | 2 | x | EC-124 |
| P0052 | 0052 | HO2S1 HTR (B2) | 2 | x | EC-124 |
| P0057 | 0057 | HO2S2 HTR (B2) | 2 | x | EC-132 |
| P0058 | 0058 | HO2S2 HTR (B2) | 2 | x | EC-132 |
| P0102 | 0102 | MAF SEN/CIRCUIT | 1 | x | EC-140 |
| P0103 | 0103 | MAF SEN/CIRCUIT | 1 | x | EC-140 |
| P0112 | 0112 | IAT SEN/CIRCUIT | 2 | x | EC-147 |
| P0113 | 0113 | IAT SEN/CIRCUIT | 2 | x | EC-147 |
| P0117 | 0117 | ECT SEN/CIRCUIT | 1 | x | EC-152 |
| P0118 | 0118 | ECT SEN/CIRCUIT | 1 | x | EC-152 |
| P0122 | 0122 | TP SEN 2/CIRC | 1 | x | EC-157 |
| P0123 | 0123 | TP SEN 2/CIRC | 1 | x | EC-157 |
| P0132 | 0132 | HO2S1 (B1) | 2 | x | EC-163 |
| P0133 | 0133 | HO2S1 (B1) | 2 | x | EC-172 |
| P0134 | 0134 | HO2S1 (B1) | 2 | x | EC-172 |
| P0138 | 0138 | HO2S2 (B1) | 2 | x | EC-195 |
| P0139 | 0139 | HO2S2 (B1) | 2 | x | EC-205 |
| P0152 | 0152 | HO2S1 (B2) | 2 | x | EC-163 |
| P0153 | 0153 | HO2S1 (B2) | 2 | x | EC-172 |
| P0154 | 0154 | HO2S1 (B2) | 2 | x | EC-172 |
| P0158 | 0158 | HO2S2 (B2) | 2 | x | EC-195 |
| P0159 | 0159 | HO2S2 (B2) | 2 | x | EC-205 |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | 2 | x | EC-218 |
| P0172 | 0172 | FUEL SYS-RICH-B1 | 2 | x | EC-227 |
| P0174 | 0174 | FUEL SYS-LEAN-B2 | 2 | x | EC-218 |

## DTC No. Index (Cont'd)

| DTC*1 | | Items (CONSULT-II screen terms) | Trip | MI lighting up | Reference page |
|---|---|---|---|---|---|
| CONSULT-II GST*2 | ECM*3 | | | | |
| P0175 | 0175 | FUEL SYS-RICH-B2 | 2 | x | EC-227 |
| P0222 | 0222 | TP SEN 1/CIRC | 1 | x | EC-235 |
| P0223 | 0223 | TP SEN 1/CIRC | 1 | x | EC-235 |
| P0300 | 0300 | MULTI CYL MISFIRE | 2 | x | EC-241 |
| P0301 | 0301 | CYL 1 MISFIRE | 2 | x | EC-241 |
| P0302 | 0302 | CYL 2 MISFIRE | 2 | x | EC-241 |
| P0303 | 0303 | CYL 3 MISFIRE | 2 | x | EC-241 |
| P0304 | 0304 | CYL 4 MISFIRE | 2 | x | EC-241 |
| P0305 | 0305 | CYL 5 MISFIRE | 2 | x | EC-241 |
| P0306 | 0306 | CYL 6 MISFIRE | 2 | x | EC-241 |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | 2 | — | EC-247 |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | 2 | — | EC-247 |
| P0332 | 0332 | KNOCK SEN/CIRC-B2 | 2 | — | EC-247 |
| P0333 | 0333 | KNOCK SEN/CIRC-B2 | 2 | — | EC-247 |
| P0335 | 0335 | CKP SEN/CIRCUIT | 2 | x | EC-251 |
| P0340 | 0340 | CMP SEN/CIRC-B1 | 2 | x | EC-257 |
| P0420 | 0420 | TW CATALYST SYS-B1 | 2 | x | EC-264 |
| P0430 | 0430 | TW CATALYST SYS-B2 | 2 | x | EC-264 |
| P0444 | 0444 | PURG VOLUME CONT/V | 2 | x | EC-269 |
| P0445 | 0445 | PURG VOLUME CONT/V | 2 | x | EC-269 |
| P0500 | 0500 | VEH SPEED SEN/CIRC | 2 | x | EC-276 |
| P0550 | 0550 | PW ST P SEN/CIRC | 2 | — | EC-278 |
| P0605 | 0605 | ECM | 1 or 2 | x or — | EC-283 |
| P0650 | 0650 | MIL/CIRC | 2 | — | EC-286 |
| P0740 | 0740 | TCC SOLENOID/CIRC | 2 | x | AT section |
| P0745 | 0745 | L/PRESS SOL/CIRC | 2 | x | AT section |
| P1065 | 1065 | ECM BACK UP/CIRC | 2 | x | EC-290 |
| P1111 | 1111 | INT/V TIM V/CIR-B1 | 2 | x | EC-294 |
| P1121 | 1121 | ETC ACTR | 1 or 2 | x | EC-299 |
| P1122 | 1122 | ETC FUNCTION/CIRC | 1 | x | EC-301 |
| P1124 | 1124 | ETC MOT PWR | 1 | x | EC-309 |
| P1126 | 1126 | ETC MOT PWR | 1 | x | EC-309 |
| P1128 | 1128 | ETC MOT | 1 | x | EC-315 |
| P1143 | 1143 | HO2S1 (B1) | 2 | x | EC-320 |
| P1144 | 1144 | HO2S1 (B1) | 2 | x | EC-327 |
| P1146 | 1146 | HO2S2 (B1) | 2 | x | EC-335 |
| P1147 | 1147 | HO2S2 (B1) | 2 | x | EC-348 |
| P1163 | 1163 | HO2S1 (B2) | 2 | x | EC-320 |
| P1164 | 1164 | HO2S1 (B2) | 2 | x | EC-327 |
| P1166 | 1166 | HO2S2 (B2) | 2 | x | EC-335 |
| P1167 | 1167 | HO2S2 (B2) | 2 | x | EC-348 |

## DTC No. Index (Cont'd)

| DTC*1 | | Items (CONSULT-II screen terms) | Trip | MI lighting up | Reference page |
|---|---|---|---|---|---|
| CONSULT-II GST*2 | ECM*3 | | | | |
| P1217 | 1217 | ENG OVER TEMP | 1 | x | EC-361 |
| P1225 | 1225 | CTP LEARNING | 2 | — | EC-372 |
| P1226 | 1226 | CTP LEARNING | 2 | — | EC-374 |
| P1229 | 1229 | SENSOR POWER/CIRC | 1 | x | EC-376 |
| P1336 | 1336 | CKP SENSOR (COG) | 2 | x | EC-381 |
| P1610 - P1615 | 1610 - 1615 | NATS MALFUNCTION | 2 | — | EC-50 |
| P1706 | 1706 | P-N POS SW/CIRCUIT | 2 | x | EC-388 |
| P1805 | 1805 | BRAKE SW/CIRCUIT | 2 | — | EC-395 |
| P2122 | 2122 | APP SEN 1/CIRC | 1 | x | EC-401 |
| P2123 | 2123 | APP SEN 1/CIRC | 1 | x | EC-401 |
| P2127 | 2127 | APP SEN 2/CIRC | 1 | x | EC-408 |
| P2128 | 2128 | APP SEN 2/CIRC | 1 | x | EC-408 |
| P2135 | 2135 | TP SENSOR | 1 | x | EC-415 |
| P2138 | 2138 | APP SENSOR | 1 | x | EC-421 |

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*4: When engine is running.
*5: The trouble shooting for these DTCs need CONSULT-II.

**NOTE:**
**Regarding Y61 models with TB48DE engine, "B1" indicates bank 1 (cylinders number 1, 2 and 3), "B2" indicates bank 2 (cylinders number 4, 5 and 6).**

## Precautions for Supplemental Restraint System (SRS) “AIR BAG” and “SEAT BELT PRE-TENSIONER”

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 NISSAN MODEL Y61 is as follows (The composition varies according to the destination and optional equipment.):

- 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 front 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:**

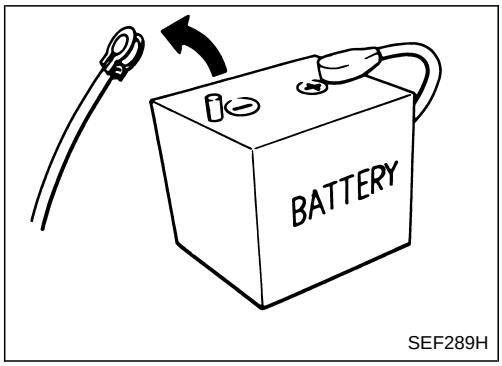
- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see the RS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow harness connector.**

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

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

**CAUTION:**

- **Be sure to turn the ignition switch OFF and disconnect the battery ground cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to EL section.**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI 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 MI to light up due to the malfunction of the 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.**



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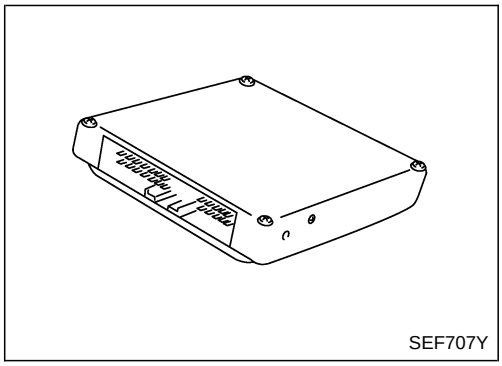
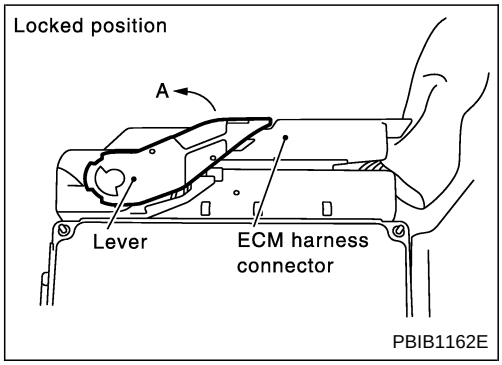
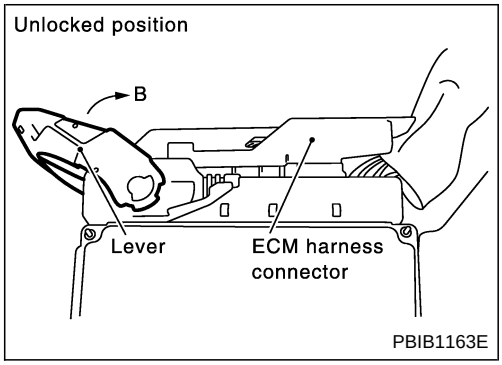

SEF707Y



PBIB1162E



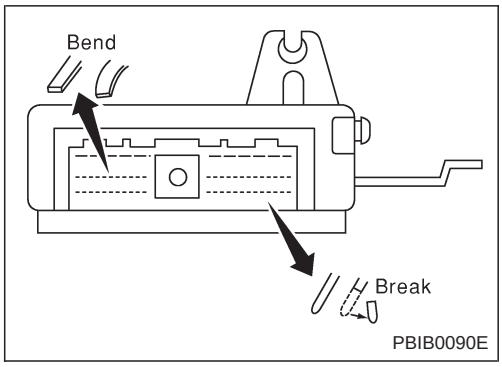
PBIB1163E

## Precaution

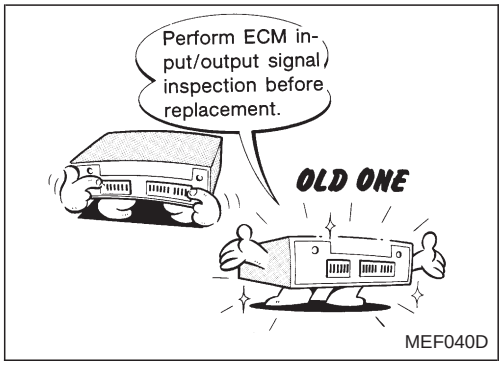
- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect battery ground cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**
- **Do not disassemble ECM.**
- **If battery cable is disconnected, the memory will return to the initial ECM values.**
  **The ECM will now start to self-control at its initial values. Engine operation can vary slightly when the cable is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.**

- **When connecting ECM harness connector, fasten it securely with levers as far as they will go as shown at right.**

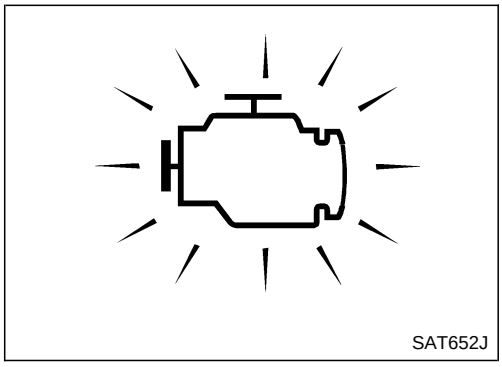
## Precaution (Cont'd)




- **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.**
- **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 engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**

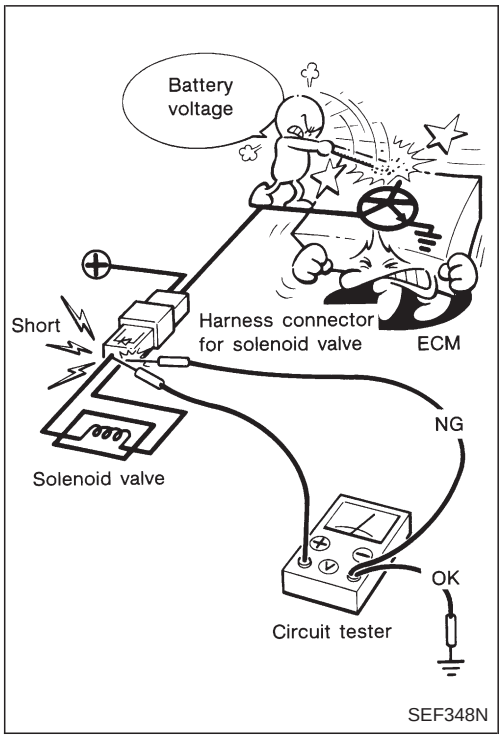



- **Before replacing ECM, perform "ECM Terminals and Reference Value" inspection and make sure ECM functions properly. Refer to EC-80, "ECM Terminals and Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not disassemble mass air flow sensor.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor, crankshaft position sensor (OBD).**



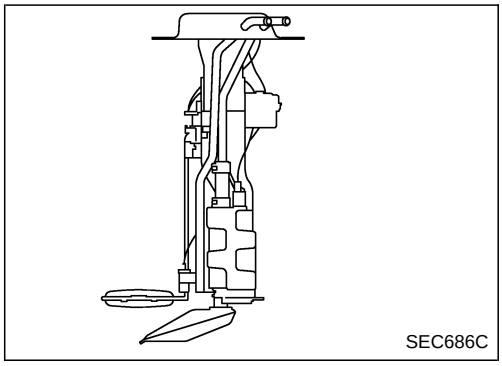

- **After performing each TROUBLE DIAGNOSIS, perform "DTC Confirmation Procedure" or "Overall Function Check".**
  **The DTC should not be displayed in the "DTC Confirmation Procedure" if the repair is completed. The "Overall Function Check" should be a good result if the repair is completed.**

## Precaution (Cont'd)

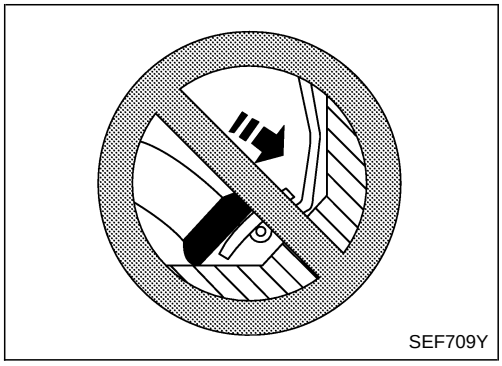


SEF348N

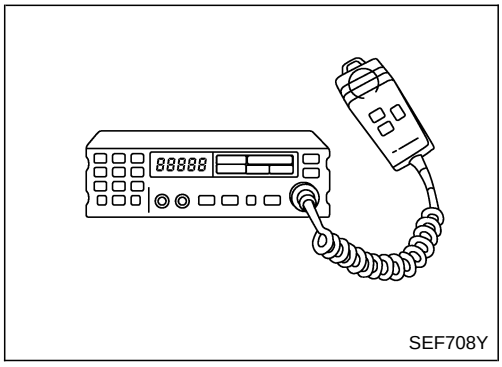
- **When measuring ECM signals with a circuit tester, connect a break-out box (SST) and Y-cable adapter (SST) between the ECM and ECM harness connector.**
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  **Accidental contact of probes will cause a short circuit and damage the ECM power transistor.**
- **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.**


SEC686C

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


SEF709Y

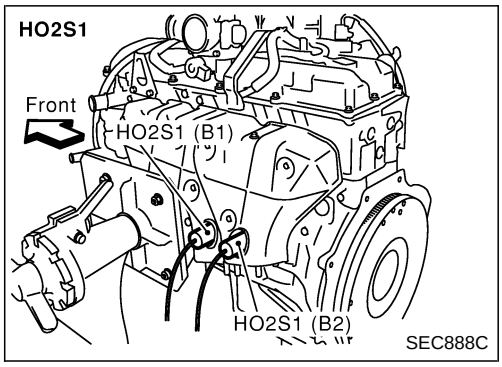
- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**

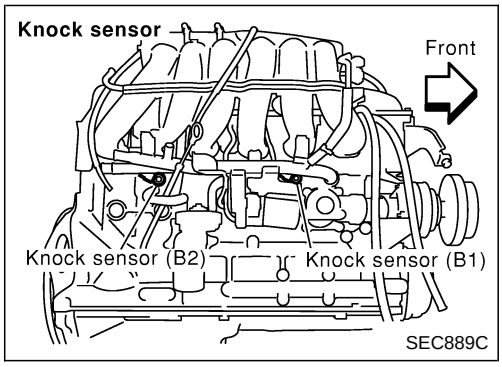


SEF708Y

- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    **Do not let them run parallel for a long distance.**
  - **Adjust the antenna and feeder line so that the standing-wave radio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**

## Precaution (Cont'd)




- **Regarding Y61 models with TB48DE engine, "B1" indicates bank 1 (cylinders number 1, 2, 3), "B2" indicates bank 2 (cylinders number 4, 5, 6).**

## Wiring Diagrams and Trouble Diagnosis

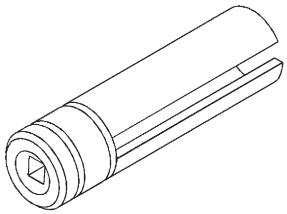
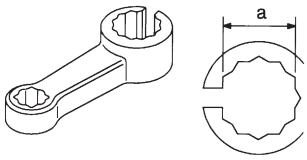
When you read wiring diagrams, refer to the following:

- "How to Read Wiring Diagrams" in GI section
- "POWER SUPPLY ROUTING" for power distribution circuit in EL section

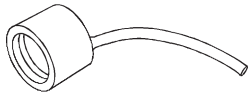
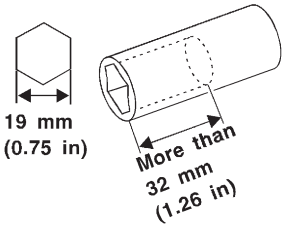
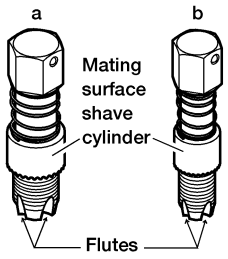
When you perform trouble diagnosis, refer to the following:

- "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES" in GI section
- "How to Perform Efficient Diagnosis for an Electrical Incident" in GI section

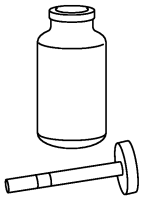
## Special Service Tools

| Tool number<br>Tool name | Description | |
|---|---|---|
| KV10117100<br>Heated oxygen sensor wrench |  <br>NT379 | Loosening or tightening heated oxygen sensors with 22 mm (0.87 in) hexagon nut |
| KV10114400<br>Heated oxygen sensor wrench |  <br>NT636 | Loosening or tightening heated oxygen sensors<br>**a: 22 mm (0.87 in)** |

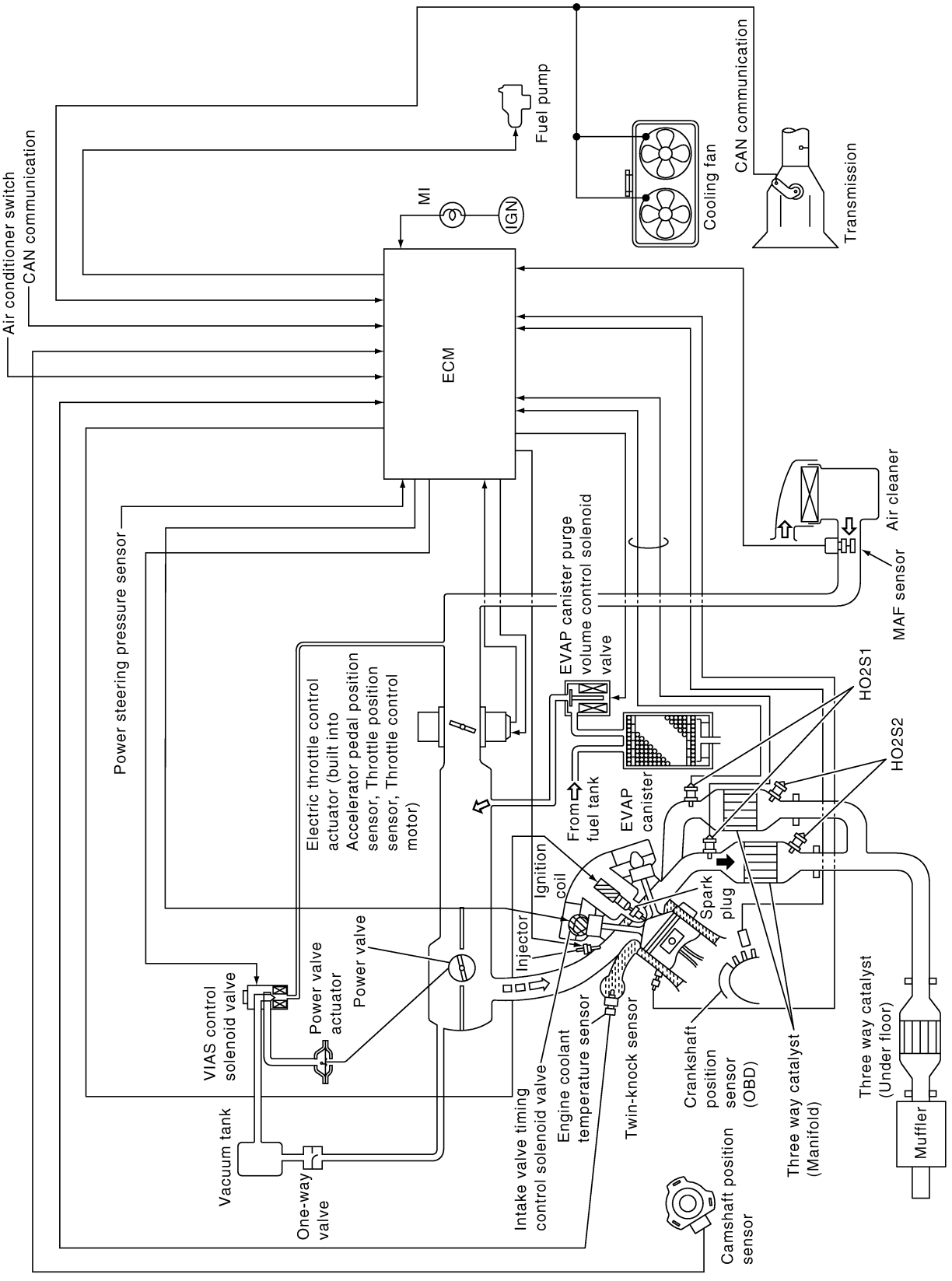
## Commercial Service Tools

| Tool name | Description | |
|---|---|---|
| Fuel filler cap adapter |  <br>NT653 | Checking fuel tank vacuum relief valve opening pressure |
| Socket wrench |  <br>NT705 | Removing and installing engine coolant temperature sensor |
| Oxygen sensor thread cleaner<br>ie: (J-43897-18)<br>(J-43897-12) |  <br>AEM488 | Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below.<br>**a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor**<br>**b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor** |

## Commercial Service Tools (Cont'd)

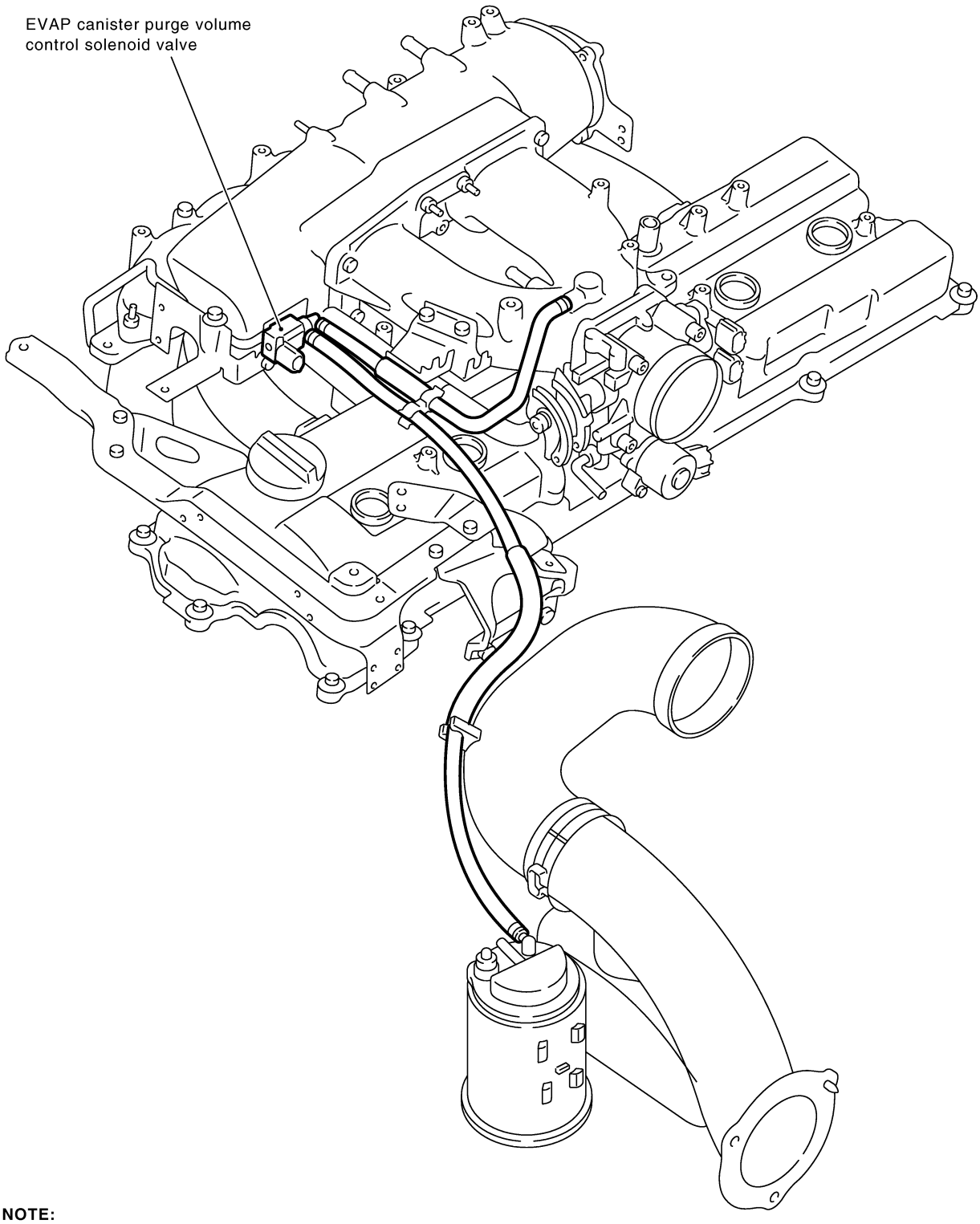
| Tool name | Description | |
|---|---|---|
| Anti-seize lubricant ie: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907) |  NT779 | Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads. |

## System Diagram




SEC745D

## Vacuum Hose Drawing




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

**Refer to EC-22, “System Diagram” for Vacuum Control System.**

SEC665D

## System Chart

| Input (Sensor) | ECM Function | Output (Actuator) |
|---|---|---|
| ● Camshaft position sensor<br>● Crankshaft position sensor (OBD)<br>● Mass air flow sensor<br>● Engine coolant temperature sensor<br>● Heated oxygen sensor 1<br>● Throttle position sensor<br>● Accelerator pedal position sensor<br>● Park/neutral position (PNP) switch<br>● Intake air temperature sensor<br>● Power steering pressure sensor<br>● Ignition switch<br>● Stop lamp switch<br>● Battery voltage<br>● Knock sensor<br>● Refrigerant pressure sensor<br>● Heated oxygen sensor 2*1<br>● TCM (Transmission control module)*2<br>● Air conditioner switch*2<br>● Vehicle speed sensor*2<br>● Electrical load signal*2 | Fuel injection & mixture ratio control | Fuel injectors |
| | Electronic ignition system | Power transistor |
| | Fuel pump control | Fuel pump relay |
| | On board diagnostic system | MI (On the instrument panel) |
| | Intake valve timing control | Intake valve timing control solenoid valve |
| | Heated oxygen sensor 1 heater control | Heated oxygen sensor 1 heater |
| | Heated oxygen sensor 2 heater control | Heated oxygen sensor 2 heater |
| | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| | Air conditioning cut control | Air conditioner relay |
| | Power valve control | VIAS control solenoid valve |
| | Cooling fan control | Cooling fan relay |

*1: This sensor is not used to control the engine system under normal conditions.
*2: The signals are sent to the ECM through CAN communication line.

## Multiport Fuel Injection (MFI) System

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed and piston position | Fuel injection & mixture ratio control | Fuel injectors |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Heated oxygen sensor 1 | Density of oxygen in exhaust gas | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Park/neutral position (PNP) switch | Gear position | | |
| Knock sensor | Engine knocking condition | | |
| Battery | Battery voltage | | |
| Power steering pressure sensor | Power steering operation | | |
| Heated oxygen sensor 2*1 | Density of oxygen in exhaust gas | | |
| Vehicle speed sensor*2 | Vehicle speed | | |
| Air conditioner switch*2 | Air conditioner operation | | |
| Ignition switch | Start signal | | |

*1: Under normal conditions, this sensor is not for engine control operation.
*2: This signal is sent to the ECM through CAN communication line.

## SYSTEM DESCRIPTION — Multiport Fuel Injection (MFI) System (Cont'd)

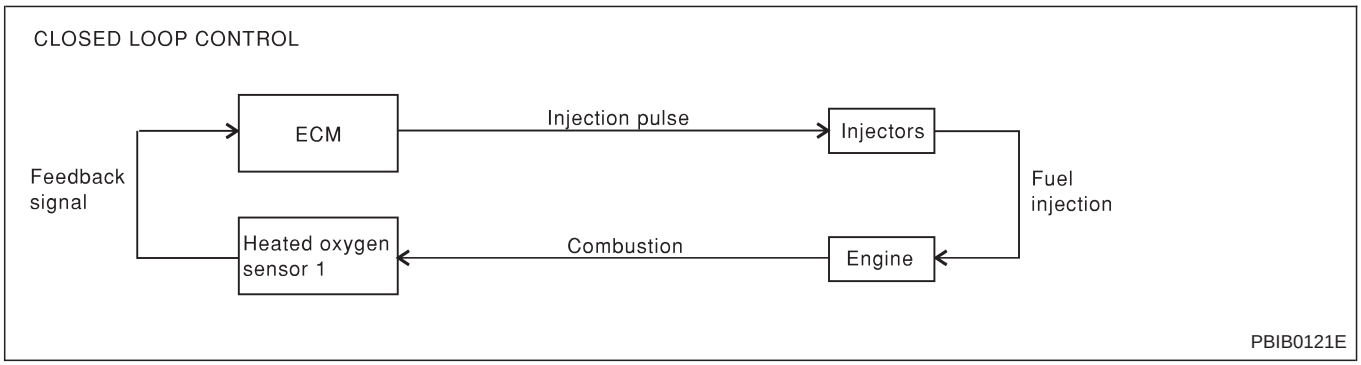
The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions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

### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.
<Fuel increase>
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from "N" to "D"
- High-load, high-speed operation

<Fuel decrease>
- During deceleration
- During high engine speed operation

### MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)




The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen sensor 1 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 heated oxygen sensor 1, refer to EC-163. 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.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of heated oxygen sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

#### Open loop control

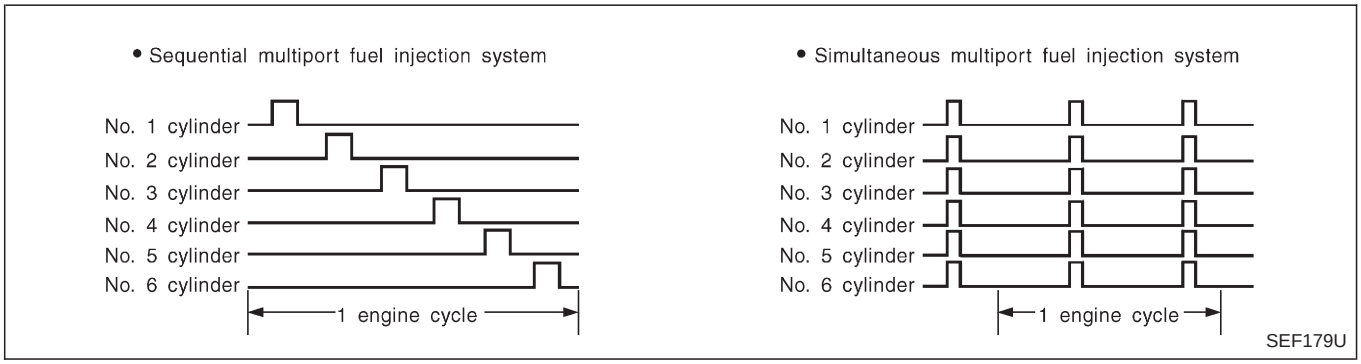
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.
- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated oxygen sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from "N" to "D"
- When starting the engine

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

## MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. 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 film) 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 heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

## FUEL INJECTION TIMING




Two types of systems are used.

### Sequential multiport fuel injection system

Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

### Simultaneous multiport fuel injection system

Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The six injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

## FUEL SHUT-OFF

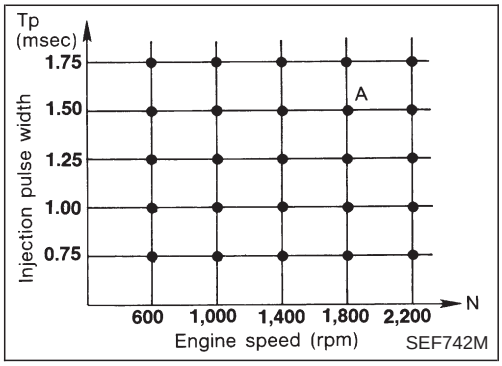
Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

# Electronic Ignition (EI) System

## INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed and piston position | Ignition timing control | Power transistor |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Knock sensor | Engine knocking | | |
| Park/neutral position (PNP) switch | Gear position | | |
| Battery | Battery voltage | | |
| Vehicle speed sensor*1 | Vehicle speed | | |
| Ignition switch | Start signal | | |

*1: This signal is sent to the ECM through CAN communication line.




## SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.

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

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

A °BTDC

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

- At starting
- During warm-up
- At idle
- 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

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Air conditioner switch*1 | Air conditioner “ON” signal | Air conditioner cut control | Air conditioner relay |
| Throttle position sensor | Throttle valve opening angle | | |
| Camshaft position sensor | Engine speed | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Battery | Battery voltage | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Power steering pressure sensor | Power steering operation | | |
| Vehicle speed sensor*1 | Vehicle speed | | |
| Ignition switch | Start signal | | |

*1: These signals are sent to the ECM through CAN communication line.

### SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- 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.
- When refrigerant pressure is excessively low or high.

## Fuel Cut Control (at No Load and High Engine Speed)

### INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Park/neutral position (PNP) switch | Neutral position | Fuel cut control | Fuel injectors |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Camshaft position sensor | Engine speed | | |
| Vehicle speed sensor*1 | Vehicle speed | | |

*1: This signal is sent to the ECM through CAN communication line.

### SYSTEM DESCRIPTION

If the engine speed is above 3,950 rpm with no load (for example, in neutral and engine speed over 3,950 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

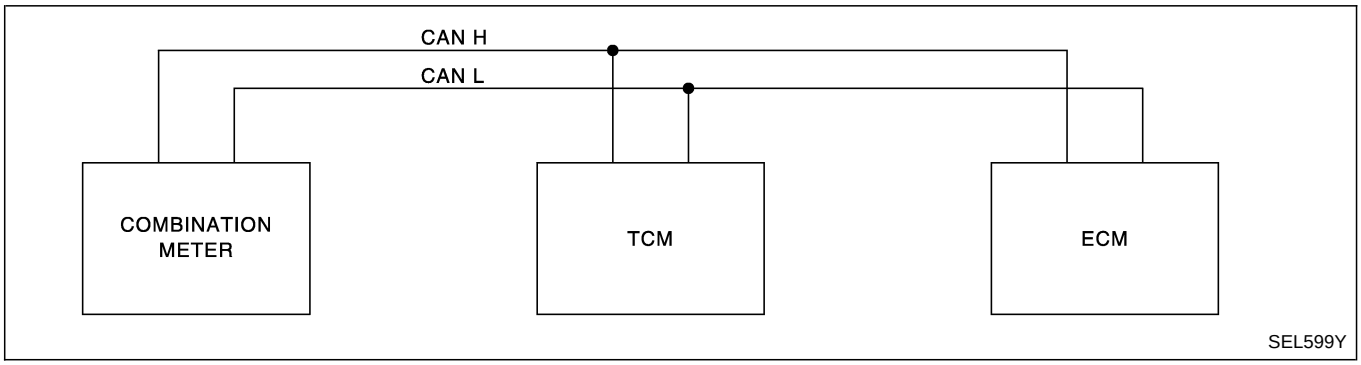
**NOTE:**
**This function is different from deceleration control listed under “Multiport Fuel Injection (MFI) System”, EC-24.**

# CAN Communication

## SYSTEM DESCRIPTION

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

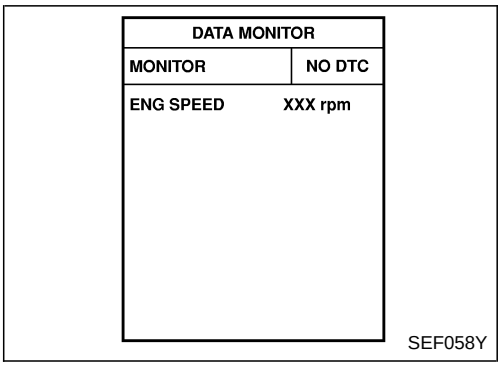
## SYSTEM DIAGRAM




### Input/output signal chart

T: Transmit R: Receive

| Signals | Combination meter | TCM | ECM |
|---|---|---|---|
| Engine speed signal | R | R | T |
| Engine coolant temperature signal | R | R | T |
| Accelerator pedal position signal | | R | T |
| Closed throttle position signal | | R | T |
| Wide open throttle position signal | | R | T |
| A/T fluid temperature warning lamp signal | R | T | R |
| Current gear position signal | R | T | R |
| Shift change signal | | T | R |
| Air conditioner switch signal | T | | R |
| Headlamp switch signal | T | | R |
| Rear window defogger switch signal | T | | R |
| Brake switch signal | T | R | |
| Vehicle speed signal | T | R | R |
| A/T self diagnosis signal | | T | R |
| Manual mode signal | T | R | |




## Idle Speed and Ignition Timing Check

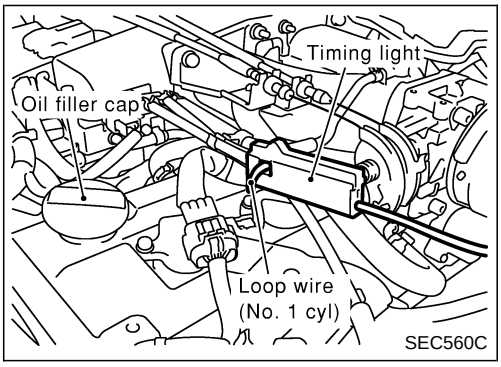
### IDLE SPEED

**With CONSULT-II**

Check idle speed in “DATA MONITOR” mode with CONSULT-II.

**With GST**

Check idle speed with GST.

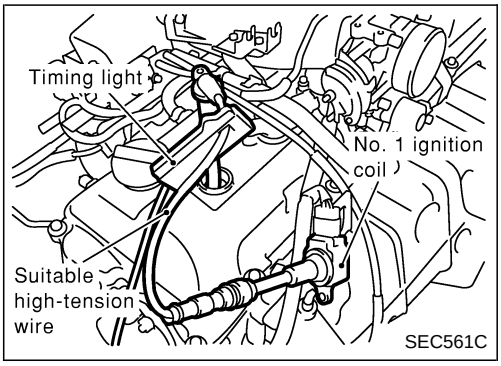



### IGNITION TIMING

Any of following two methods may be used.

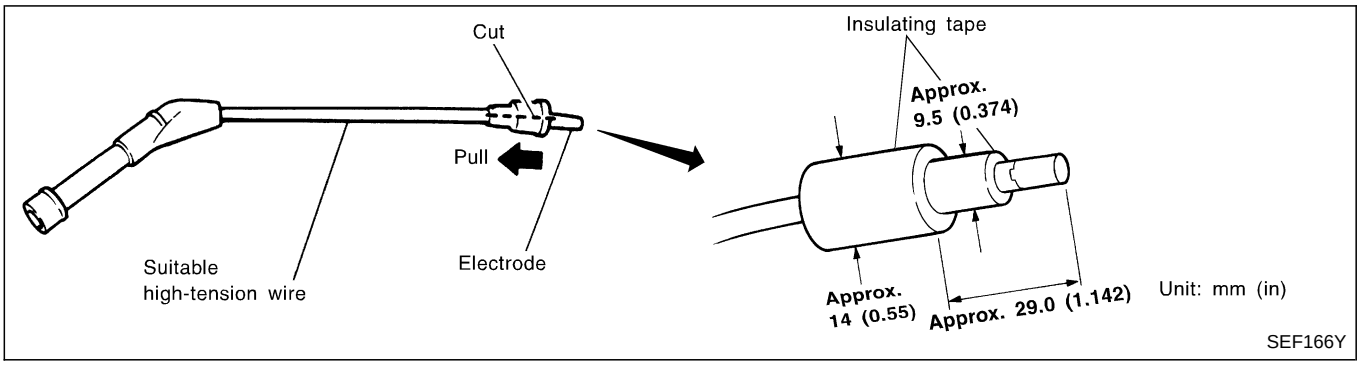
### Method A

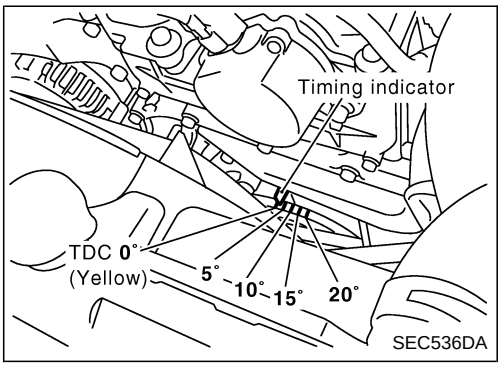
1. Slide the harness protector of ignition coil No. 1 to clear the wires.
2. Attach timing light to the wires as shown.
3. Check ignition timing.




### Method B

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




3. Check ignition timing.

## Accelerator Pedal Released Position Learning

### DESCRIPTION

"Accelerator Pedal Released Position Learning" is an operation to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time harness connector of accelerator pedal position sensor or ECM is disconnected.

### OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON" and wait at least 2 seconds.
3. Turn ignition switch "OFF" wait at least 10 seconds.
4. Turn ignition switch "ON" and wait at least 2 seconds.
5. Turn ignition switch "OFF" wait at least 10 seconds.

## Throttle Valve Closed Position Learning

### DESCRIPTION

"Throttle Valve Closed Position Learning" is an operation to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected.

### OPERATION PROCEDURE

1. Make sure that accelerator pedal is fully released.
2. Turn ignition switch "ON".
3. Turn ignition switch "OFF" wait at least 10 seconds.
   Make sure that throttle valve moves during above 10 seconds by confirming the operating sound.

## Idle Air Volume Learning

### DESCRIPTION

"Idle Air Volume Learning" is an operation to learn the idle air volume that keeps each engine within the specific range. It must be performed under any of the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

### PREPARATION

Before performing "Idle Air Volume Learning", make sure that all of the following conditions are satisfied. Learning will be cancelled if any of the following conditions are missed for even a moment.

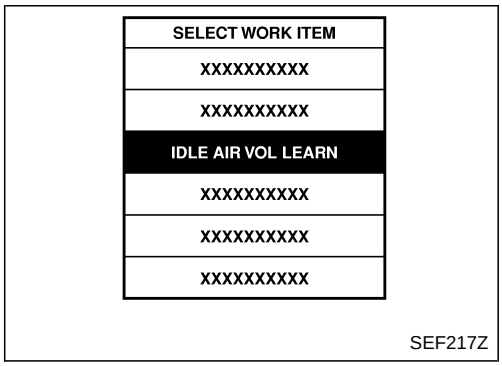
- Battery voltage: More than 12.9V (At idle)
- Engine coolant temperature: 70 - 95°C (158 - 203°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  **On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.**
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For models with CONSULT-II, drive vehicle until "FLUID TEMP SE" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
  For A/T models without CONSULT-II, drive vehicle for 10 minutes.

# Idle Air Volume Learning (Cont'd)

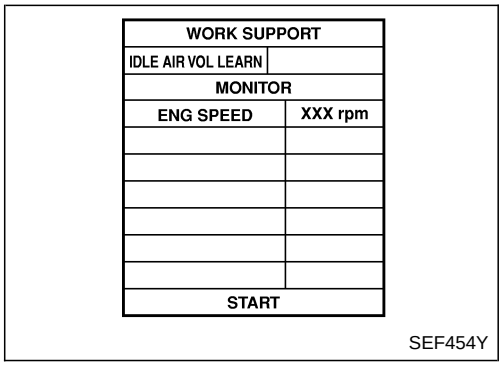
## OPERATION PROCEDURE

### With CONSULT-II

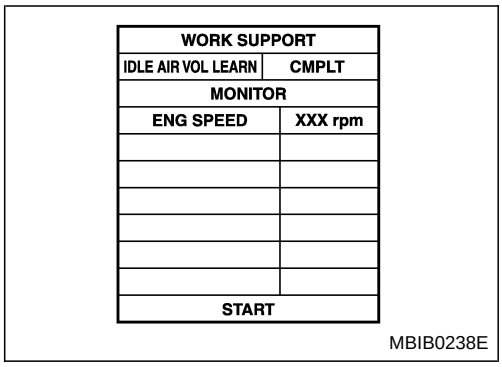
1. Perform EC-31, "Accelerator Pedal Released Position Learning".
2. Perform EC-31, "Throttle Valve Closed Position Learning".
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic "PREPARATION" (previously mentioned) are in good order.




5. Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.




6. Touch "START" and wait 20 seconds.




7. Make sure that "CMPLT" is displayed on CONSULT-II screen. If "CMPLT" is not displayed, "Idle Air Volume Learning" will not be carried out successfully. In this case, find the cause of the incident by referring to the "Diagnostic Procedure" below.
8. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

| ITEM | SPECIFICATION |
|---|---|
| Idle speed | 675±50 rpm (in "P" or "N" position) |
| Ignition timing | 10±5° BTDC (in "P" or "N" position) |

## Idle Air Volume Learning (Cont'd)

### ⊗ Without CONSULT-II

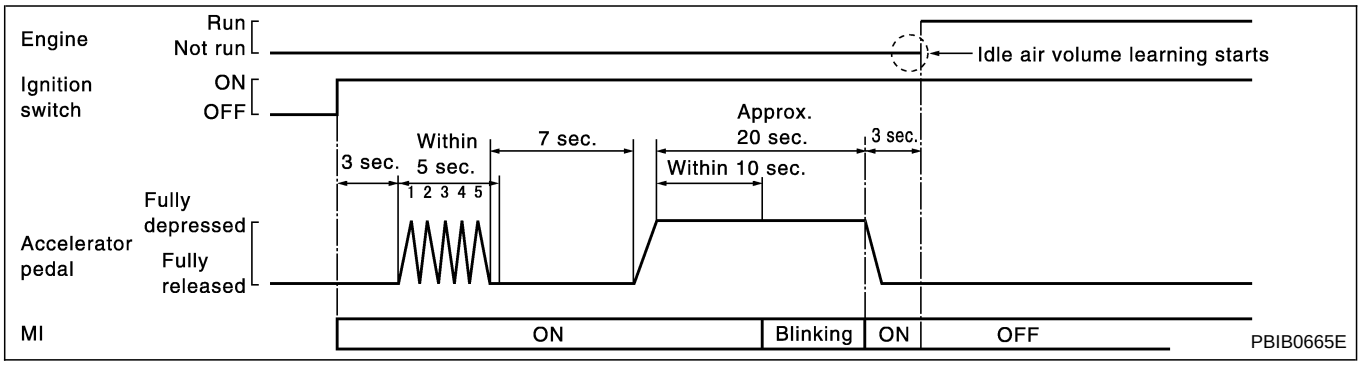
**NOTE:**

- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-31, "Accelerator Pedal Released Position Learning".
2. Perform EC-31, "Throttle Valve Closed Position Learning".
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic "PREPARATION" (previously mentioned) are in good order.
5. Turn ignition switch "OFF" and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch "ON" and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

8. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 20 seconds until the MI stops blinking and turned ON.
9. Fully release the accelerator pedal within 3 seconds after the MI turned ON.
10. Start engine and let it idle.
11. Wait 20 seconds.




12. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.

| ITEM | SPECIFICATION |
|---|---|
| Idle speed | 675±50 rpm (in "P" or "N" position) |
| Ignition timing | 10±5° BTDC (in "P" or "N" position) |

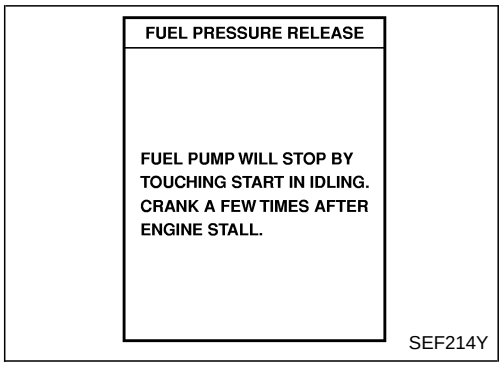
13. If idle speed and ignition timing are not within the specification, "Idle Air Volume Learning" will not be carried out successfully. In this case, find the cause of the incident by referring to the "Diagnostic Procedure" below.

### DIAGNOSTIC PROCEDURE

**If idle air volume learning cannot be performed successfully, proceed as follows:**

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   **It is useful to perform EC-108, "TROUBLE DIAGNOSIS — SPECIFICATION VALUE".**
5. **If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform "Idle air volume learning" all over again:**

— **Engine stalls.**
— **Erroneous idle.**



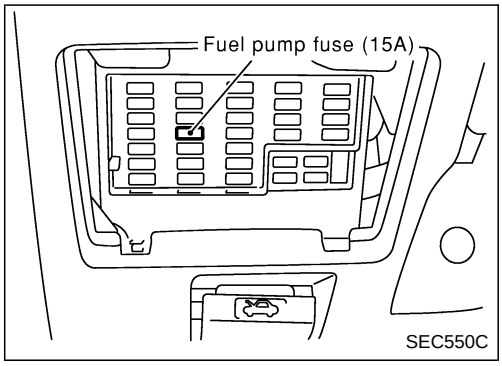

## Fuel Pressure Check

### FUEL PRESSURE RELEASE

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

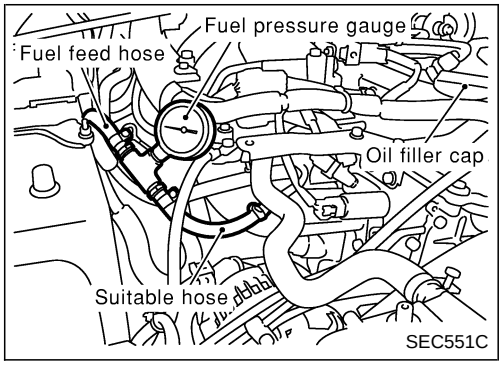
#### With CONSULT-II

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




#### Without CONSULT-II

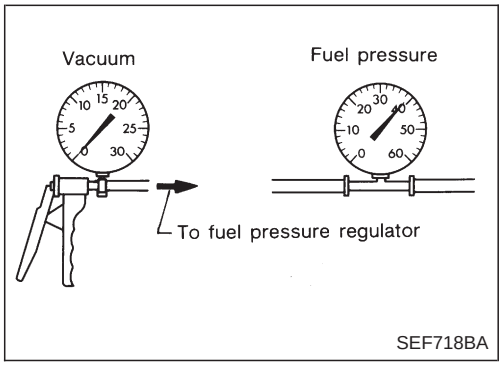
1. Remove fuel pump fuse located in fuse box.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch “OFF”.
5. Reinstall fuel pump fuse after servicing fuel system.




### FUEL PRESSURE CHECK

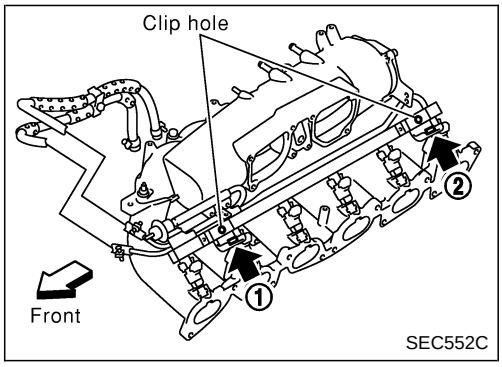
- **When reconnecting fuel line, always use new clamps.**
- **Make sure that clamp screw does not contact adjacent parts.**
- **Use a torque driver to tighten clamps.**
- **Use Pressure Gauge to check fuel pressure.**

1. Release fuel pressure to zero, refer to above.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.
   **At idling:**
   **Approximately 245 kPa (2.45 bar, 2.5 kg/cm$^2$, 36 psi)**
   **A few seconds after ignition switch is turned OFF to ON:**
   **Approximately 294 kPa (2.94 bar, 3.0 kg/cm$^2$, 43 psi)**
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.



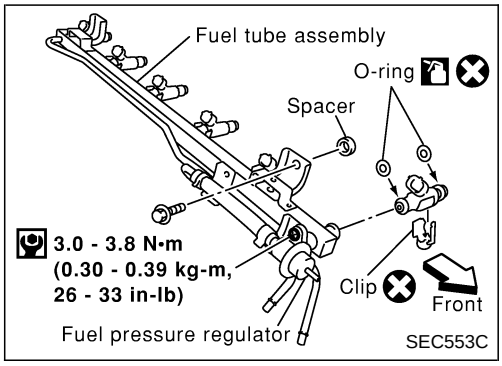
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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



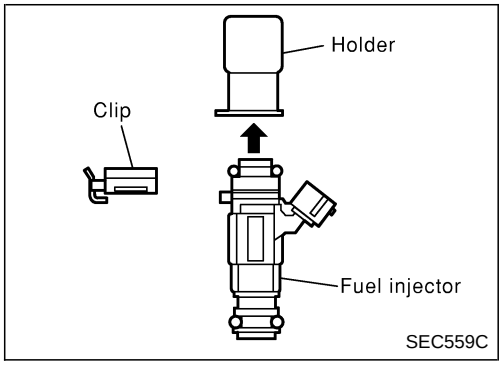

## Injector Removal and Installation

1. Release fuel pressure to zero.
2. Disconnect harness connector clip.
3. Disconnect injector harness connectors.
4. Disconnect fuel hoses from fuel tube assembly.
5. Remove fuel tube assemblies in reverse numerical sequence of that shown in the figure at left.




6. Expand and remove clips securing fuel injectors.
7. Extract fuel injectors straight from fuel tubes.

- **Do not extract injector by pinching connector.**
- **Be careful not to damage injector nozzles during removal.**
- **Do not bump or drop fuel injectors.**



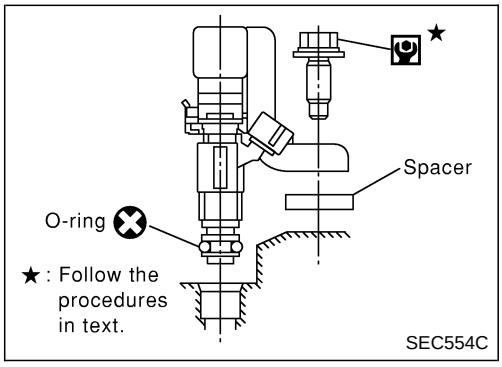

8. Install injector to fuel tube assembly.

- **Lubricate O-rings with a smear of silicone oil.**
- **Be careful not to damage O-rings with service tools, finger nails or clips. Do not expand or twist O-rings.**
- **Discard old clips, replace with new ones.**

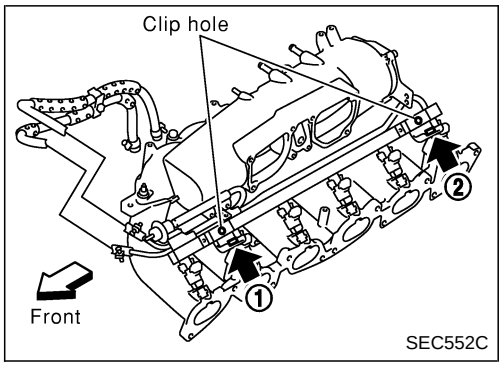
9. Position clips in grooves on fuel injectors.

- **Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.**

10. Align protrusions of fuel tubes with those of fuel injectors. Insert fuel injectors straight into fuel tubes.
11. After properly inserting fuel injectors, check to make sure that fuel tube protrusions are engaged with those of fuel injectors, and that flanges of fuel tube are engaged with clips.



## Injector Removal and Installation (Cont'd)




12. Tighten fuel tube assembly mounting nuts in numerical sequence (indicated in the figure at left) and in two stages.
    **: Tightening torque N·m (kg-m, ft-lb)**
    **1st stage:**
    **9 - 20 (0.9 - 2.1, 7 - 15)**
    **2nd stage:**
    **21 - 26 (2.1 - 2.7, 16 - 19)**
13. Insert fuel hoses into fuel tubes so that ends of fuel hoses butt up against fuel tubes; fasten with clamps, avoiding bulges.

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

## Introduction

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

| Emission-related diagnostic information | ISO Standard |
|---|---|
| Diagnostic Trouble Code (DTC) | Mode 3 of ISO 15031-5 |
| Freeze Frame data | Mode 2 of ISO 15031-5 |
| System Readiness Test (SRT) code | Mode 1 of ISO 15031-5 |
| 1st Trip Diagnostic Trouble Code (1st Trip DTC) | Mode 7 of ISO 15031-5 |
| 1st Trip Freeze Frame data | |
| Test values and Test limits | Mode 6 of ISO 15031-5 |
| Calibration ID | Mode 9 of ISO 15031-5 |

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 Frame data | SRT code | Test value |
|---|---|---|---|---|---|---|
| CONSULT-II | x | x | x | x | x | — |
| GST | x | x*1 | x | — | x | x |
| ECM | x | x*2 | — | — | — | — |

*1: 1st trip DTCs for self-diagnoses concerning SRT items cannot be shown on the GST display.
*2: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) 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-65.)

## Two Trip Detection Logic

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MI 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 MI lights up. The MI 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 MI, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

x: Applicable —: Not applicable

| Items | MI | | | | DTC | | 1st trip DTC | |
|---|---|---|---|---|---|---|---|---|
| | 1st trip | | 2nd trip | | 1st trip displaying | 2nd trip displaying | 1st trip displaying | 2nd trip displaying |
| | Blinking | Lighting up | Blinking | Lighting up | | | | |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected | x | — | — | — | — | — | x | — |
| Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected | — | — | x | — | — | x | — | — |
| One trip detection diagnoses (Refer to EC-9.) | — | x | — | — | x | — | x | — |
| Except above | — | — | — | x | — | x | x | — |

## Emission-related Diagnostic Information

### EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

| Items (CONSULT-II screen terms) | DTC*1 | | SRT code | Test Value/ Test Limit (GST only) | 1st trip DTC | Reference page |
|---|---|---|---|---|---|---|
| | CONSULT-II GST*2 | ECM | | | | |
| CAN COMM CIRCUIT | U1000 | 1000*3 | — | — | — | EC-121 |
| **NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.** | **P0000** | **0000** | **—** | **—** | **—** | **—** |
| HO2S1 HTR (B1) | P0031 | 0031 | x | x | x*4 | EC-124 |
| HO2S1 HTR (B1) | P0032 | 0032 | x | x | x*4 | EC-124 |
| HO2S2 HTR (B1) | P0037 | 0037 | x | x | x*4 | EC-132 |
| HO2S2 HTR (B1) | P0038 | 0038 | x | x | x*4 | EC-132 |
| HO2S1 HTR (B2) | P0051 | 0051 | x | x | x*4 | EC-124 |
| HO2S1 HTR (B2) | P0052 | 0052 | x | x | x*4 | EC-124 |
| HO2S2 HTR (B2) | P0057 | 0057 | x | x | x*4 | EC-132 |
| HO2S2 HTR (B2) | P0058 | 0058 | x | x | x*4 | EC-132 |
| MAF SEN/CIRCUIT | P0102 | 0102 | — | — | — | EC-140 |
| MAF SEN/CIRCUIT | P0103 | 0103 | — | — | — | EC-140 |
| IAT SEN/CIRCUIT | P0112 | 0112 | — | — | x | EC-147 |
| IAT SEN/CIRCUIT | P0113 | 0113 | — | — | x | EC-147 |
| ECT SEN/CIRCUIT | P0117 | 0117 | — | — | — | EC-152 |
| ECT SEN/CIRCUIT | P0118 | 0118 | — | — | — | EC-152 |
| TP SEN 2/CIRC | P0122 | 0122 | — | — | — | EC-157 |
| TP SEN 2/CIRC | P0123 | 0123 | — | — | — | EC-157 |
| HO2S1 (B1) | P0132 | 0132 | x | x | x*4 | EC-163 |
| HO2S1 (B1) | P0133 | 0133 | x | x | x*4 | EC-172 |
| HO2S1 (B1) | P0134 | 0134 | x | x | x*4 | EC-172 |
| HO2S2 (B1) | P0138 | 0138 | x | x | x*4 | EC-195 |
| HO2S2 (B1) | P0139 | 0139 | x | x | x*4 | EC-205 |
| HO2S1 (B2) | P0152 | 0152 | x | x | x*4 | EC-163 |
| HO2S1 (B2) | P0153 | 0153 | x | x | x*4 | EC-172 |
| HO2S1 (B2) | P0154 | 0154 | x | x | x*4 | EC-172 |
| HO2S2 (B2) | P0158 | 0158 | x | x | x*4 | EC-195 |
| HO2S2 (B2) | P0159 | 0159 | x | x | x*4 | EC-205 |
| FUEL SYS-LEAN-B1 | P0171 | 0171 | — | — | x | EC-218 |
| FUEL SYS-RICH-B1 | P0172 | 0172 | — | — | x | EC-227 |
| FUEL SYS-LEAN-B2 | P0174 | 0174 | — | — | x | EC-218 |
| FUEL SYS-RICH-B2 | P0175 | 0175 | — | — | x | EC-227 |
| TP SEN 1/CIRC | P0222 | 0222 | — | — | — | EC-235 |
| TP SEN 1/CIRC | P0223 | 0223 | — | — | — | EC-235 |
| MULTI CYL MISFIRE | P0300 | 0300 | — | — | x | EC-241 |
| CYL 1 MISFIRE | P0301 | 0301 | — | — | x | EC-241 |
| CYL 2 MISFIRE | P0302 | 0302 | — | — | x | EC-241 |

## Emission-related Diagnostic Information (Cont'd)

| Items (CONSULT-II screen terms) | DTC*1 | | SRT code | Test Value/ Test Limit (GST only) | 1st trip DTC | Reference page |
|---|---|---|---|---|---|---|
| | CONSULT-II GST*2 | ECM | | | | |
| CYL 3 MISFIRE | P0303 | 0303 | — | — | x | EC-241 |
| CYL 4 MISFIRE | P0304 | 0304 | — | — | x | EC-241 |
| CYL 5 MISFIRE | P0305 | 0305 | — | — | x | EC-241 |
| CYL 6 MISFIRE | P0306 | 0306 | — | — | x | EC-241 |
| KNOCK SEN/CIRC-B1 | P0327 | 0327 | — | — | x | EC-247 |
| KNOCK SEN/CIRC-B1 | P0328 | 0328 | — | — | x | EC-247 |
| KNOCK SEN/CIRC-B2 | P0332 | 0332 | — | — | x | EC-247 |
| KNOCK SEN/CIRC-B2 | P0333 | 0333 | — | — | x | EC-247 |
| CKP SEN/CIRCUIT | P0335 | 0335 | — | — | x | EC-251 |
| CMP SEN/CIRC-B1 | P0340 | 0340 | — | — | x | EC-257 |
| TW CATALYST SYS-B1 | P0420 | 0420 | x | x | x*4 | EC-264 |
| TW CATALYST SYS-B2 | P0430 | 0430 | x | x | x*4 | EC-264 |
| PURG VOLUME CONT/V | P0444 | 0444 | — | — | x | EC-269 |
| PURG VOLUME CONT/V | P0445 | 0445 | — | — | x | EC-269 |
| VEH SPEED SEN/CIRC | P0500 | 0500 | — | — | x | EC-276 |
| PW ST P SEN/CIRC | P0550 | 0550 | — | — | x | EC-278 |
| ECM | P0605 | 0605 | — | — | x | EC-283 |
| MIL/CIRC | P0650 | 0650 | — | — | x | EC-286 |
| TCC SOLENOID/CIRC | P0740 | 0740 | — | — | x | AT section |
| L/PRESS SOL/CIRC | P0745 | 0745 | — | — | x | AT section |
| ECM BACK UP/CIRC | P1065 | 1065 | — | — | x | EC-290 |
| INT/V TIM V/CIR-B1 | P1111 | 1111 | — | — | x | EC-294 |
| ETC ACTR | P1121 | 1121 | — | — | x | EC-299 |
| ETC FUNCTION/CIRC | P1122 | 1122 | — | — | — | EC-301 |
| ETC MOT PWR | P1124 | 1124 | — | — | — | EC-309 |
| ETC MOT PWR | P1126 | 1126 | — | — | — | EC-309 |
| ETC MOT | P1128 | 1128 | — | — | — | EC-315 |
| HO2S1 (B1) | P1143 | 1143 | x | x | x*4 | EC-320 |
| HO2S1 (B1) | P1144 | 1144 | x | x | x*4 | EC-327 |
| HO2S2 (B1) | P1146 | 1146 | x | x | x*4 | EC-335 |
| HO2S2 (B1) | P1147 | 1147 | x | x | x*4 | EC-348 |
| HO2S1 (B2) | P1163 | 1163 | x | x | x*4 | EC-320 |
| HO2S1 (B2) | P1164 | 1164 | x | x | x*4 | EC-327 |
| HO2S2 (B2) | P1166 | 1166 | x | x | x*4 | EC-335 |
| HO2S2 (B2) | P1167 | 1167 | x | x | x*4 | EC-348 |
| ENG OVER TEMP | P1217 | 1217 | — | — | — | EC-361 |
| CTP LEARNING | P1225 | 1225 | — | — | x | EC-372 |
| CTP LEARNING | P1226 | 1226 | — | — | x | EC-374 |
| SENSOR POWER/CIRC | P1229 | 1229 | — | — | — | EC-376 |
| CKP SENSOR (COG) | P1336 | 1336 | — | — | x | EC-381 |

## Emission-related Diagnostic Information (Cont'd)

| Items (CONSULT-II screen terms) | DTC*1 | | SRT code | Test Value/ Test Limit (GST only) | 1st trip DTC | Reference page |
|---|---|---|---|---|---|---|
| | CONSULT-II GST*2 | ECM | | | | |
| NATS MALFUNCTION | P1610 - P1615 | 1610 - 1615 | — | — | x | EC-50 |
| P-N POS SW/CIRCUIT | P1706 | 1706 | — | — | x | EC-388 |
| BRAKE SW/CIRCUIT | P1805 | 1805 | — | — | x | EC-395 |
| APP SEN 1/CIRC | P2122 | 2122 | — | — | — | EC-401 |
| APP SEN 1/CIRC | P2123 | 2123 | — | — | — | EC-401 |
| APP SEN 2/CIRC | P2127 | 2127 | — | — | — | EC-408 |
| APP SEN 2/CIRC | P2128 | 2128 | — | — | — | EC-408 |
| TP SENSOR | P2135 | 2135 | — | — | — | EC-415 |
| APP SENSOR | P2138 | 2138 | — | — | — | EC-421 |

*1: 1st trip DTC No. is the same as DTC No.
*2: These numbers are prescribed by ISO 15031-5.
*3: The trouble shooting for these DTCs need CONSULT-II.
*4: These are not displayed with GST.
**NOTE:**
**Regarding Y61 models with TB48DE engine, "B1" indicates bank 1 (cylinders number 1, 2 and 3), "B2" indicates bank 2 (cylinders number 4, 5 and 6).**

### DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MI 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 MI lights up. In other words, the DTC is stored in the ECM memory and the MI 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 MI 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 EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
For malfunctions in which 1st trip DTCs are displayed, refer to EC-38, "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS. 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-II.
1st trip DTC is specified in Mode 7 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI 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-60, "WORK FLOW". Then perform "DTC Confirmation Procedure" or "Overall Function Check" to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

### How to read DTC and 1st trip DTC

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

**With CONSULT-II**

**With GST**

CONSULT-II or GST (Generic Scan Tool) Examples: P0340, P0705, P0750, etc.
These DTCs are prescribed by ISO 15031-5.
(CONSULT-II also displays the malfunctioning component or system.)

## Emission-related Diagnostic Information (Cont'd)

### No Tools

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0102, 0340 etc.
These DTCs are controlled by NISSAN.

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

A sample of CONSULT-II 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-II. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be "0".
If a 1st trip DTC is stored in the ECM, the time data will be "[1t]".

DTC display

| SELF DIAG RESULTS | |
|---|---|
| DTC RESULTS | TIME |
| CKP SEN/CIRCUIT [P0335 ] | 0 |
| | |
| | |

1st trip DTC display

| SELF DIAG RESULTS | |
|---|---|
| DTC RESULTS | TIME |
| CKP SEN/CIRCUIT [P0335] | 1t |
| | |
| | |

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

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, base fuel schedule and intake air temperature 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-II or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-II screen, not on the GST. For details, see EC-92, "Freeze Frame Data and 1st Trip Freeze Frame Data".
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/MI 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<br>Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175 |
| 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.

## Emission-related Diagnostic Information (Cont'd)

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 EC-52, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

### SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of ISO 15031-5.
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.

**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.**
- **If MI 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.**

### SRT item

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

| SRT item (CONSULT-II indication) | Performance Priority*1 | Required self-diagnostic items to set the SRT to "CMPLT" | Corresponding DTC No. |
|---|---|---|---|
| CATALYST | 2 | Three way catalyst function | P0420, P0430 |
| HO2S | 1 | Heated oxygen sensor 1 | P0132, P0152 |
| | | Heated oxygen sensor 1 | P0133, P0153 |
| | | Heated oxygen sensor 1 | P0134, P0154 |
| | | Heated oxygen sensor 1 | P1143, P1163 |
| | | Heated oxygen sensor 1 | P1144, P1164 |
| | | Heated oxygen sensor 2 | P0138, P0158 |
| | | Heated oxygen sensor 2 | P0139, P0159 |
| | | Heated oxygen sensor 2 | P1146, P1166 |
| | | Heated oxygen sensor 2 | P1147, P1167 |
| HO2S HTR | 1 | Heated oxygen sensor 1 heater | P0031, P0032, P0051, P0052 |
| | | Heated oxygen sensor 2 heater | P0037, P0038, P0057, P0058 |

*1: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT-II.

# Emission-related Diagnostic Information (Cont'd)

## SRT set timing

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.

| Self-diagnosis result | | Example | | | | |
|---|---|---|---|---|---|---|
| | | Diagnosis | Ignition cycle ← ON → | OFF ← ON → | OFF ← ON → | OFF ← ON → |
| 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) |
| | | 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 | OK | OK | — | — |
| | | P0402 | — | — | — | — |
| | | P1402 | NG | — | NG | NG (Consecutive NG) |
| | | (1st trip) DTC | 1st trip DTC | — | 1st trip DTC | DTC (= MI "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.
—: Self-diagnosis is not carried out.

When all SRT related self-diagnoses showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT". → 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. → Case 2 above
If one or more SRT related self-diagnoses showed NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT". → 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 for each self-diagnosis to be executed twice (Case 3) for the following reasons:

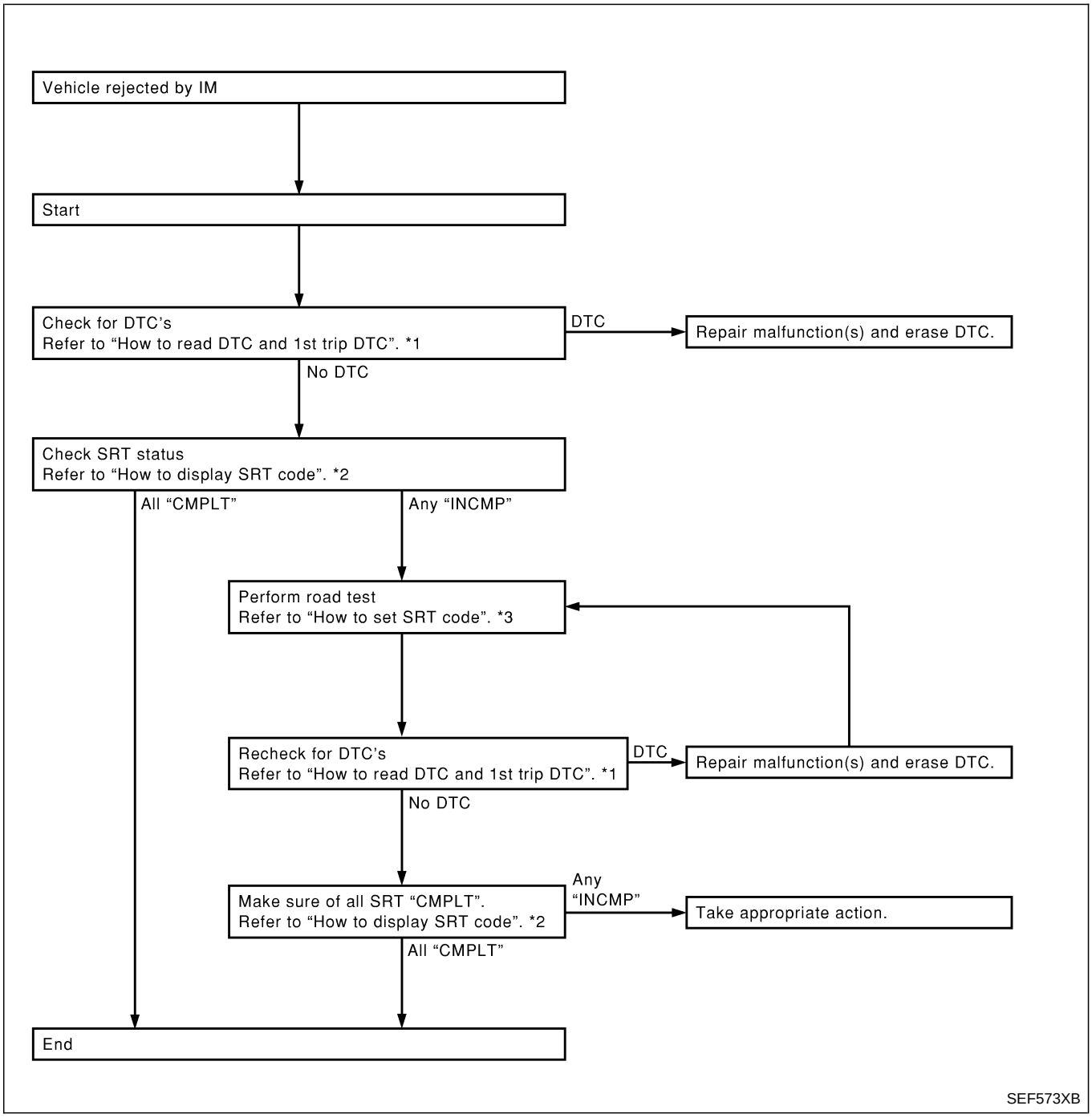
- The SRT will indicate "CMPLT" at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires "CMPLT" of the SRT only with OK self-diagnosis results.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to "CMPLT" of SRT, the self-diagnosis memory 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".**

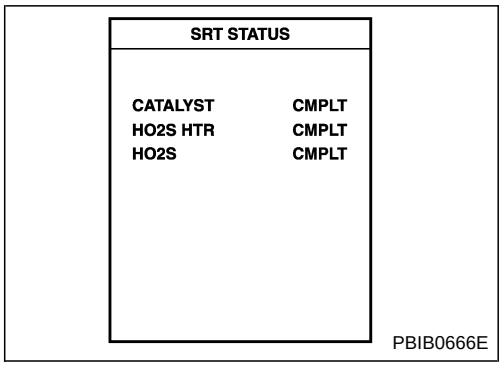
## SRT service procedure

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.

## Emission-related Diagnostic Information (Cont'd)




*1EC-40 *2EC-45 *3EC-45




## Emission-related Diagnostic Information (Cont'd)

### How to display SRT code

**WITH CONSULT-II**

Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.
For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.
A sample of CONSULT-II display for SRT code is shown at right. "INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

**WITH GST**

Selecting Mode 1 with GST (Generic Scan Tool)

### How to set SRT code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

**WITH CONSULT-II**

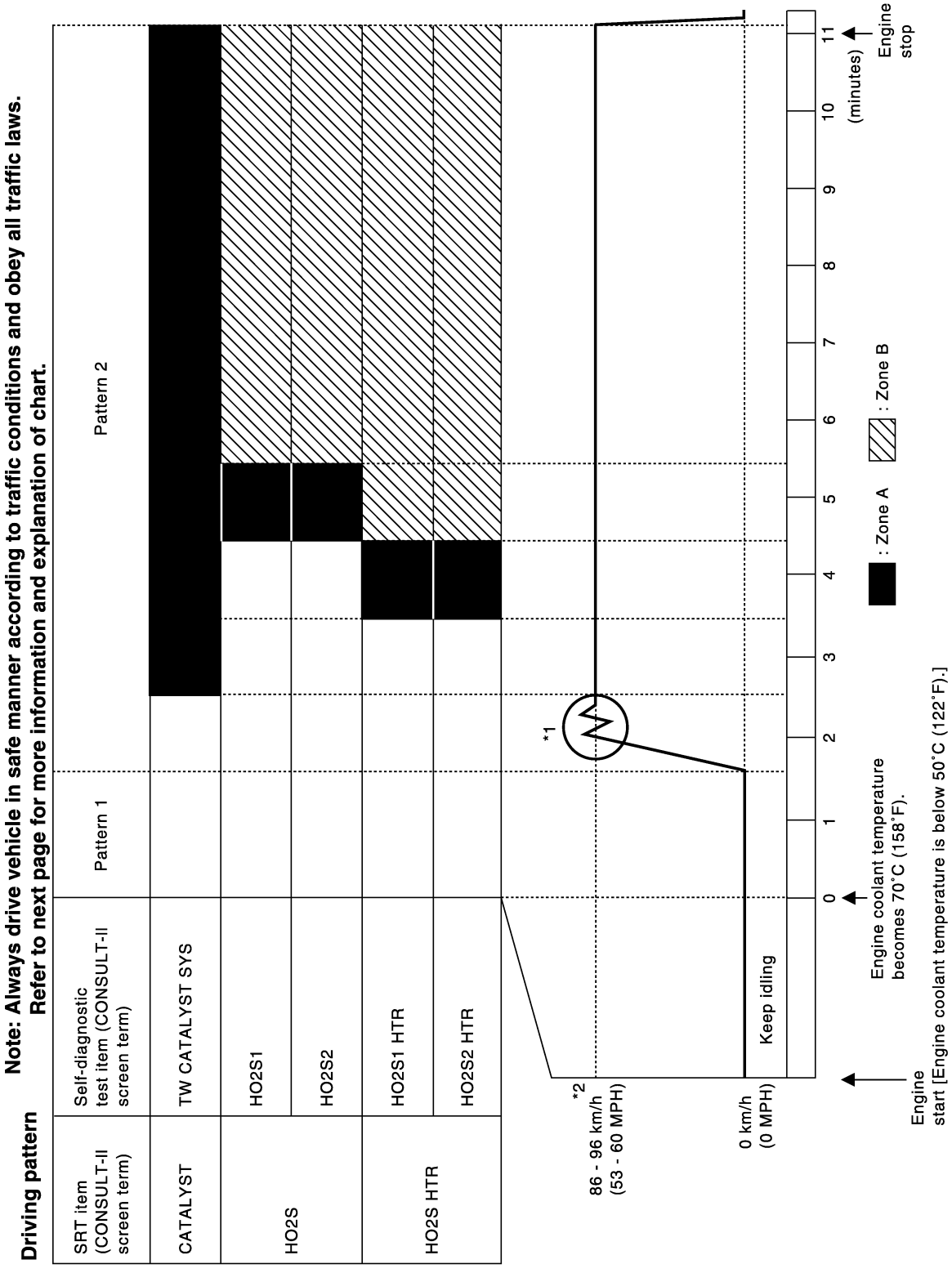
Perform corresponding DTC Confirmation Procedure one by one based on "Performance Priority" in the table on EC-42, "SRT Item".

**WITHOUT CONSULT-II**

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.

## Emission-related Diagnostic Information (Cont'd)

**Driving pattern**

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## 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 terminal 121 and ground 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 terminal 121 and ground is lower than 1.4V).**

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.

*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: Checking the vehicle speed with GST is advised.

**Suggested Transmission Gear Position**

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

## Emission-related Diagnostic Information (Cont'd)

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

The following is the information specified in Mode 6 of ISO 15031-5.
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.
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

x: Applicable —: Not applicable

| SRT item | Self-diagnostic test item | Test value (GST display) | | Test limit | Application |
|---|---|---|---|---|---|
| | | TID | CID | | |
| CATALYST | Three way catalyst function (Bank1) | 01H | 01H | Max. | x |
| | | 02H | 81H | Min. | x |
| | Three way catalyst function (Bank2) | 03H | 02H | Max. | x |
| | | 04H | 82H | Min. | x |
| HO2S | Heated oxygen sensor 1 (Bank 1) | 09H | 04H | Max. | x |
| | | 0AH | 84H | Min. | x |
| | | 0BH | 04H | Max. | x |
| | | 0CH | 04H | Max. | x |
| | | 0DH | 04H | Max. | x |
| | Heated oxygen sensor 1 (Bank 2) | 11H | 05H | Max. | x |
| | | 12H | 85H | Min. | x |
| | | 13H | 05H | Max. | x |
| | | 14H | 05H | Max. | x |
| | | 15H | 05H | Max. | x |
| | Heated oxygen sensor 2 (Bank 1) | 19H | 86H | Min. | x |
| | | 1AH | 86H | Min. | x |
| | | 1BH | 06H | Max. | x |
| | | 1CH | 06H | Max. | x |
| | Heated oxygen sensor 2 (Bank 2) | 21H | 87H | Min. | x |
| | | 22H | 87H | Min. | x |
| | | 23H | 07H | Max. | x |
| | | 24H | 07H | Max. | x |
| HO2S HTR | Heated oxygen sensor 1 heater (Bank 1) | 29H | 08H | Max. | x |
| | | 2AH | 88H | Min. | x |
| | Heated oxygen sensor 1 heater (Bank 2) | 2BH | 09H | Max. | x |
| | | 2CH | 89H | Min. | x |
| | Heated oxygen sensor 2 heater (Bank 1) | 2DH | 0AH | Max. | x |
| | | 2EH | 8AH | Min. | x |
| | Heated oxygen sensor 2 heater (Bank 2) | 2FH | 0BH | Max. | x |
| | | 30H | 8BH | Min. | x |

# Emission-related Diagnostic Information (Cont'd)

## HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

### How to Erase DTC (With CONSULT-II)

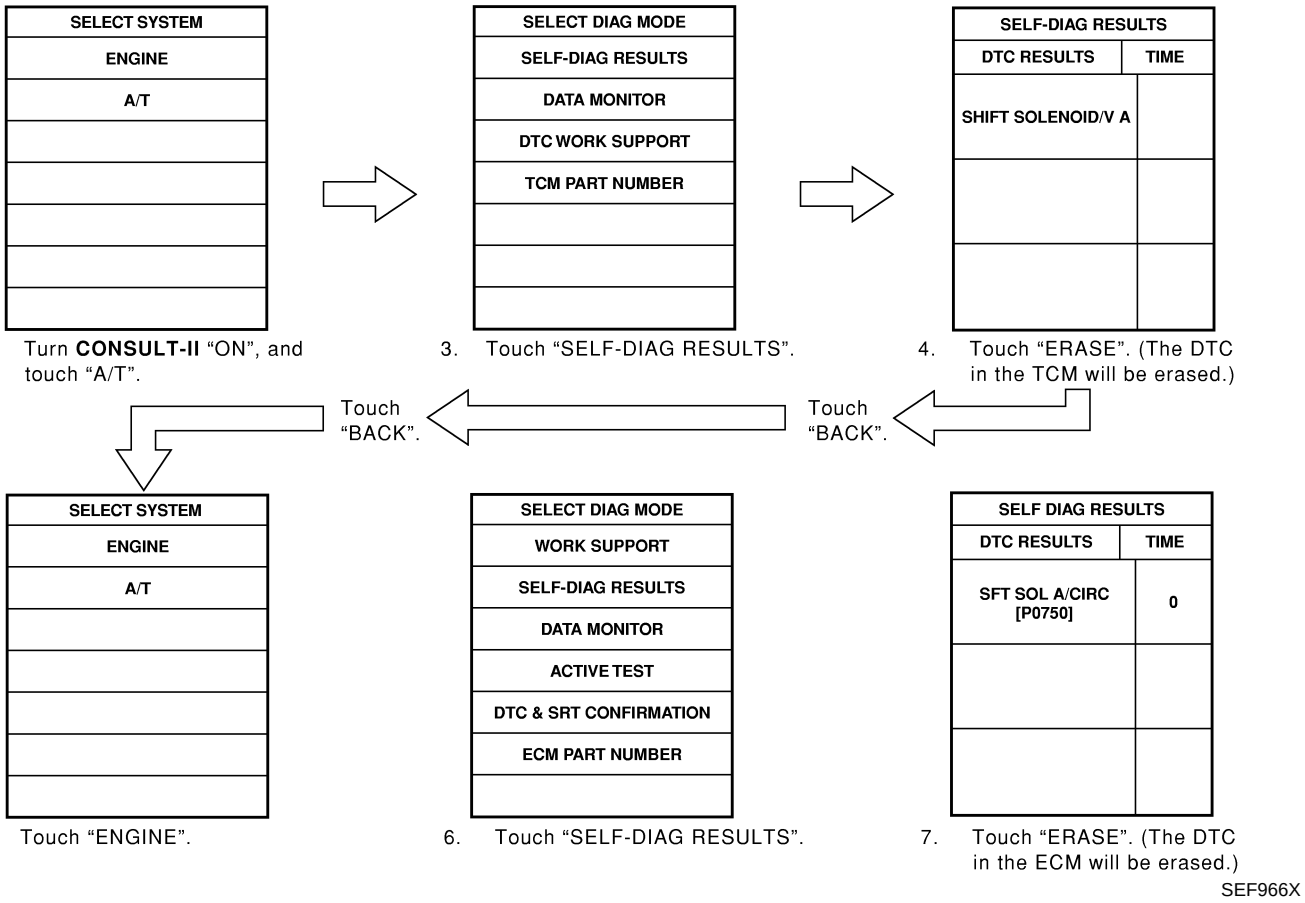
The emission related diagnostic information in the ECM can be erased by selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT-II.
If DTCs are displayed for both ECM and TCM (Transmission control module), they need to be erased individually from the ECM and TCM (Transmission control module).

**NOTE:**
**If the DTC is not for A/T related items (see EC-9, "INDEX FOR DTC"), 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 10 seconds and then turn it "ON" (engine stopped) again.
2. Turn CONSULT-II "ON" and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". [The DTC in the TCM (Transmission control module) will be erased.] Then touch "BACK" twice.
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)

**How to erase DTC (With CONSULT-II)**

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.

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## Emission-related Diagnostic Information (Cont'd)

### How to erase DTC (With GST)

The emission related diagnostic information in the ECM can be erased by selecting Mode 4 with GST.

**NOTE:**
**If the DTC is not for A/T related items (see EC-9, "INDEX FOR DTC"), skip step 2.**

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT-II)" 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).

### How to erase DTC (No Tools)

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch OFF" once.
2. Wait at least 10 seconds and then turn it "ON" (engine stopped) again.
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal. Refer to EC-52, "HOW TO SWITCH DIAGNOSTIC TEST MODE".

- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **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.

| SELF DIAG RESULTS | |
|---|---|
| DTC RESULTS | TIME |
| NATS MALFUNCTION [P1610] | 0 |
| | |
| | |

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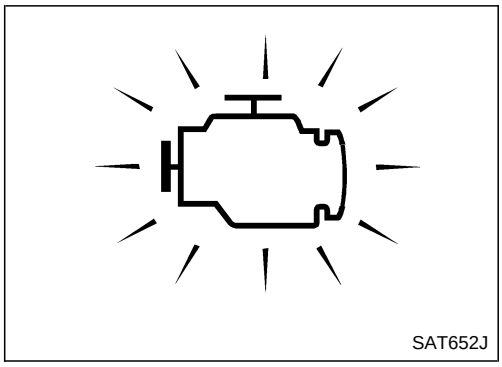
## NATS (Nissan Anti-theft System)

- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT-II using NATS program card. Refer to EL section, "NATS (NISSAN ANTI-THEFT SYSTEM)".**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT-II using NATS program card.**
  **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-II operation manual, NATS.**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## Malfunction Indicator (MI)

### DESCRIPTION

The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   - If the MI does not light up, refer to EL section “WARNING LAMPS”, or see EC-286.
2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.

### ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

| Diagnostic Test Mode | KEY and ENG. Status | Function | Explanation of Function |
|---|---|---|---|
| Mode I | Ignition switch in “ON” position  Engine stopped  | BULB CHECK | This function checks the MI bulb for damage (blown, open circuit, etc.).<br>If the MI does not come on, check MI circuit. |
| | Engine running  | MALFUNCTION WARNING | This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected.<br>The following malfunctions will light up or blink the MI in the 1st trip.<br>● “Misfire (Possible three way catalyst damage)”<br>● “One trip detection diagnoses” |
| Mode II | Ignition switch in “ON” position  Engine stopped  | SELF-DIAGNOSTIC RESULTS | This function allows DTCs and 1st trip DTCs to be read. |
| | Engine running  | HEATED OXYGEN SENSOR 1 MONITOR | This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read. |

### MI flashing without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode, EC-52 “HOW TO SWITCH DIAGNOSTIC TEST MODE”.
How to switch the diagnostic test (function) modes, and details of the above functions are described later, EC-52 “HOW TO SWITCH DIAGNOSTIC TEST MODE”.
The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

## Malfunction Indicator (MI) (Cont'd)

### HOW TO SWITCH DIAGNOSTIC TEST MODE

**NOTE:**

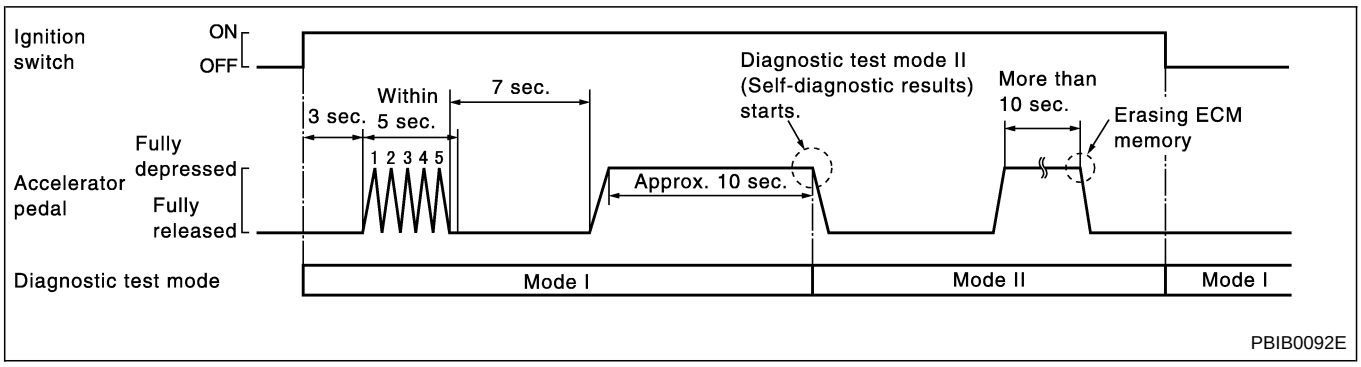
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned "OFF".**

#### How to set diagnostic test mode II (Self-diagnostic results)

1. Confirm that accelerator pedal is fully released, turn ignition switch "ON" and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).

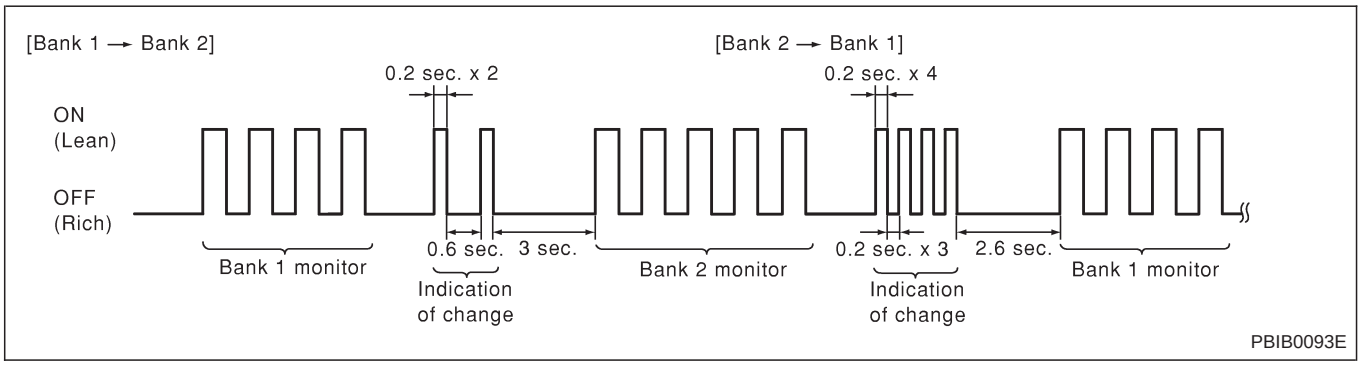



#### How to set diagnostic test mode II (Heated oxygen sensor 1 monitor)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-52, "How to set diagnostic test mode II (Self-diagnostic results)".
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).
   ECM will start heated oxygen sensor 1 monitoring from the bank 1 sensor.

#### How to switch monitored sensor from bank 1 to bank 2 or vice versa

1. Fully depress the accelerator pedal quickly and then release it immediately.
2. Make sure that monitoring sensor has changed by MI blinking as follows.




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

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to EC-52, "How to set diagnostic test mode II (Self-diagnostic results)".
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

## Malfunction Indicator (MI) (Cont'd)

### DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section or see EC-286.

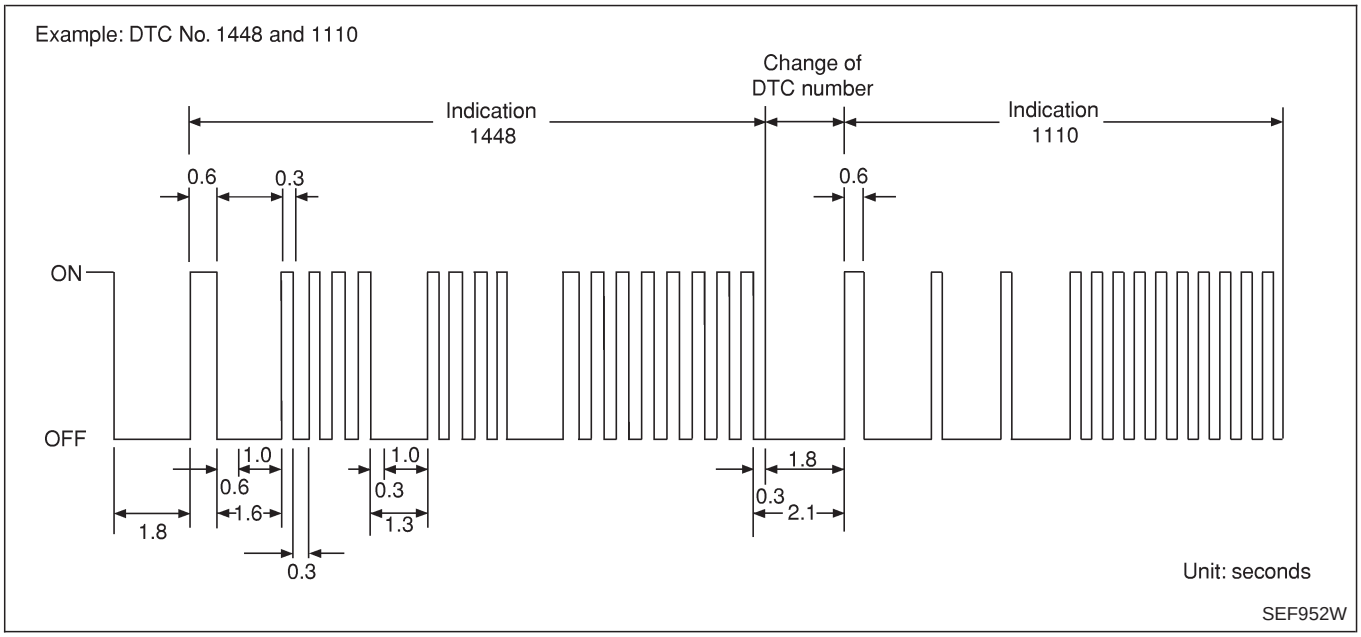
### DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

| MI | Condition |
|---|---|
| ON | When the malfunction is detected. |
| OFF | No malfunction. |

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

### DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

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




A particular trouble code can be identified by the number of four-digit numeral flashes. The "zero" is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second OFF cycle.
A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.
A change from one trouble code to another occurs at an interval of 1.8-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC "0000" refers to no malfunction. (See EC-9.)

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

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to EC-52, "HOW TO SWITCH DIAGNOSTIC TEST MODE".

- **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 (MI) (Cont'd)

### DIAGNOSTIC TEST MODE II — HEATED OXYGEN SENSOR 1 MONITOR

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

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

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 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 MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

## OBD System Operation Chart

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

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MI will come on. For details, refer to EC-37, "Two Trip Detection Logic".
- The MI 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-II will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in "OK" for the 2nd trip.

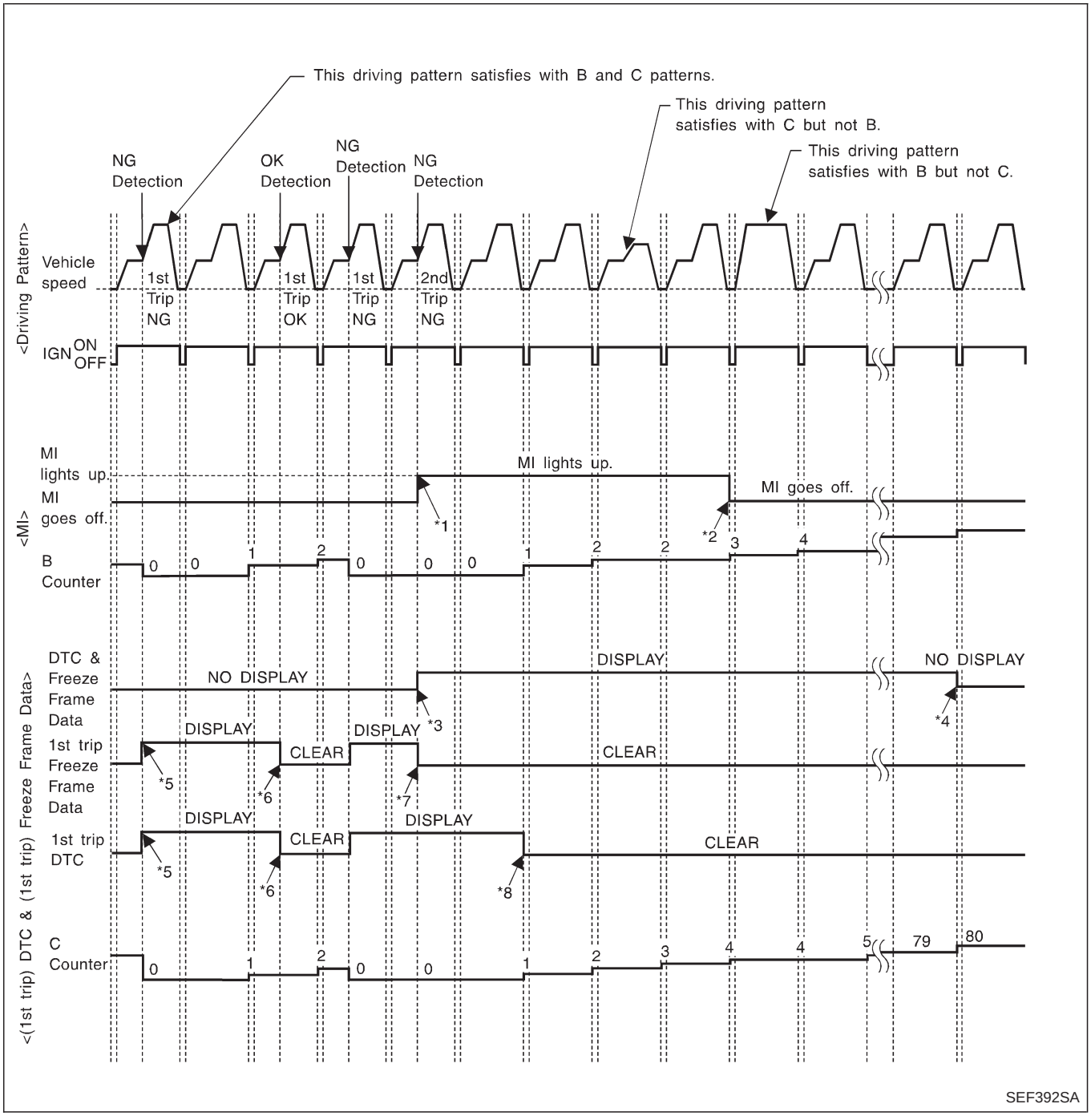
### SUMMARY CHART

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

For details about patterns "B" and "C" under "Fuel Injection System" and "Misfire", see EC-56.
For details about patterns "A" and "B" under "Other", see EC-58.
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

## OBD System Operation Chart (Cont'd)

### RELATIONSHIP BETWEEN MI, 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, MI will light up.

*2:MI 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>

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

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

#### <Driving pattern C>

Driving pattern C means the vehicle operation as follows:

1. The following conditions should be satisfied at the same time:
   Engine speed: (Engine speed in the freeze frame data) ±375 rpm
   Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
   Engine coolant temperature (T) condition:

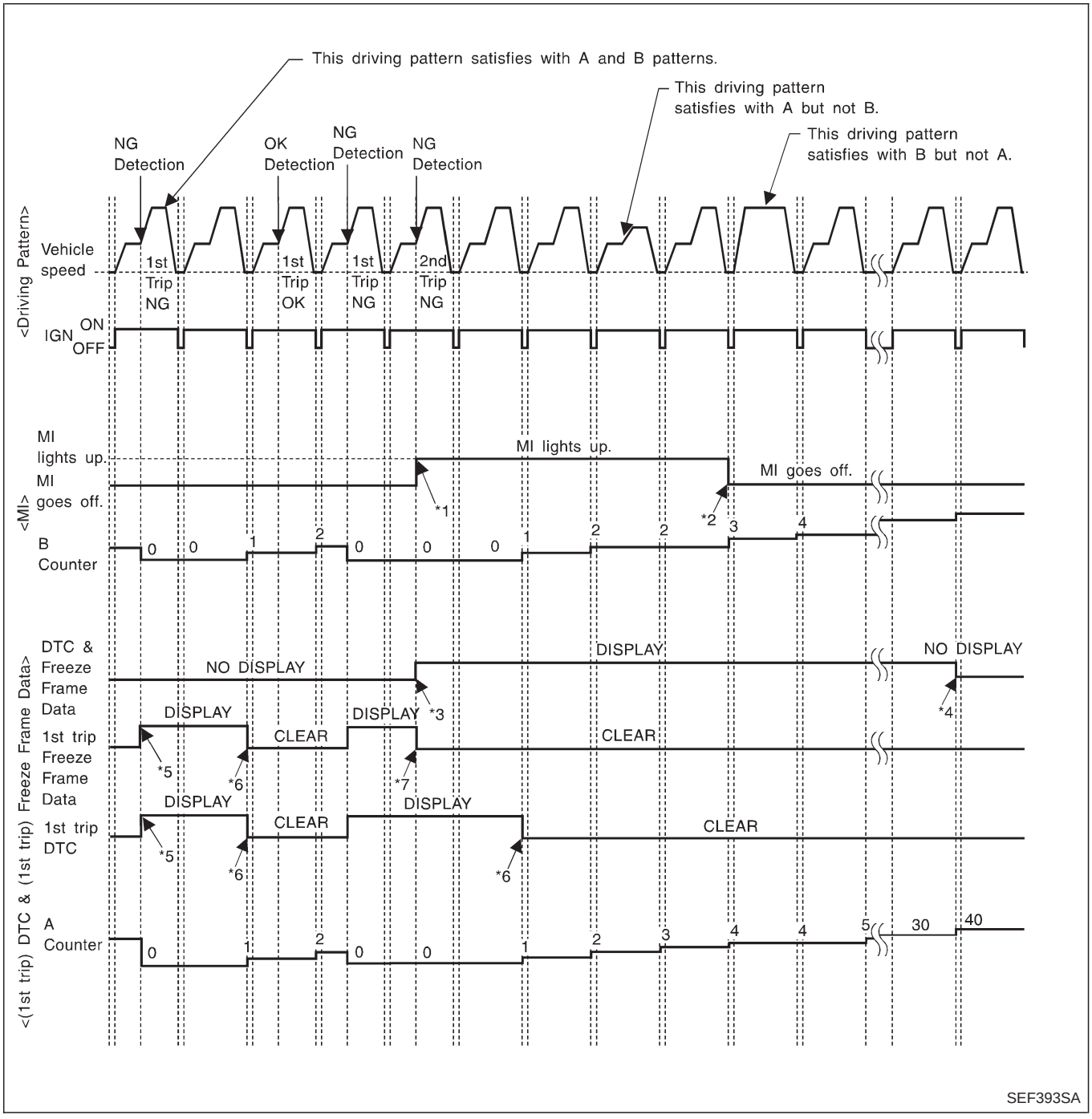
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

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

## OBD System Operation Chart (Cont'd)

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




*1:When the same malfunction is detected in two consecutive trips, MI will light up.

*2:MI 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.

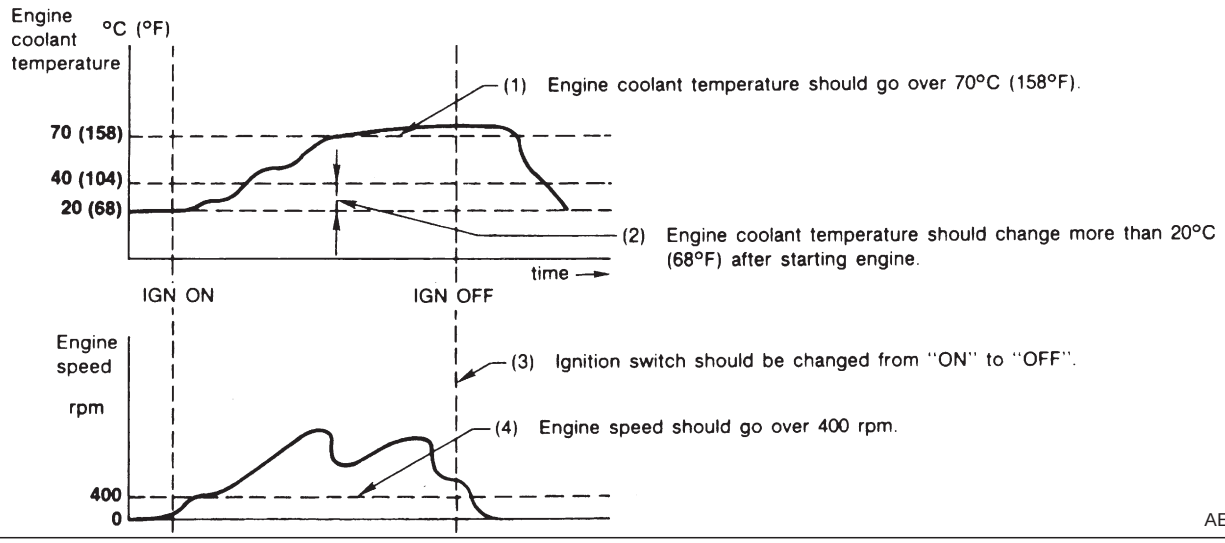
*6:1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

*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)

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

**<Driving pattern A>**

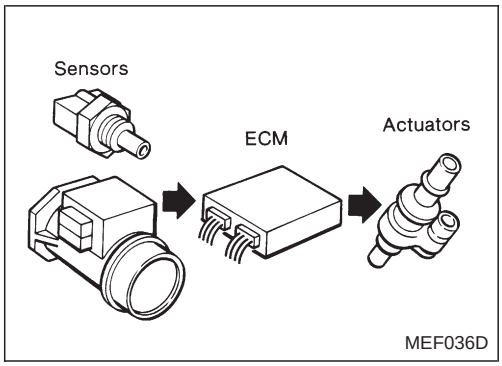



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

**<Driving pattern B>**

Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

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



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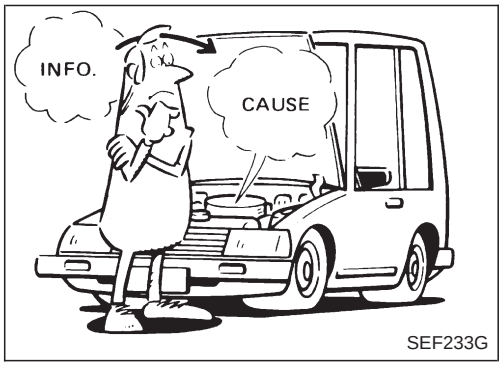

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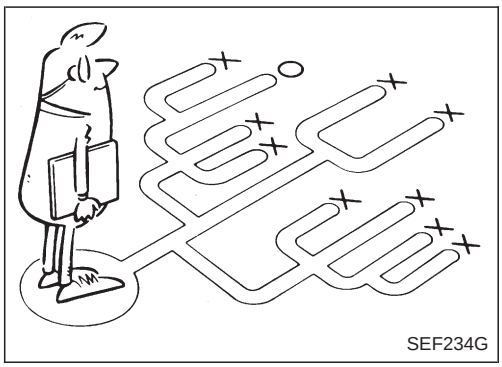
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## Trouble Diagnosis Introduction

### 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 malfunctions such as vacuum leaks, fouled spark plugs, or other malfunctions with the engine.

It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents 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.

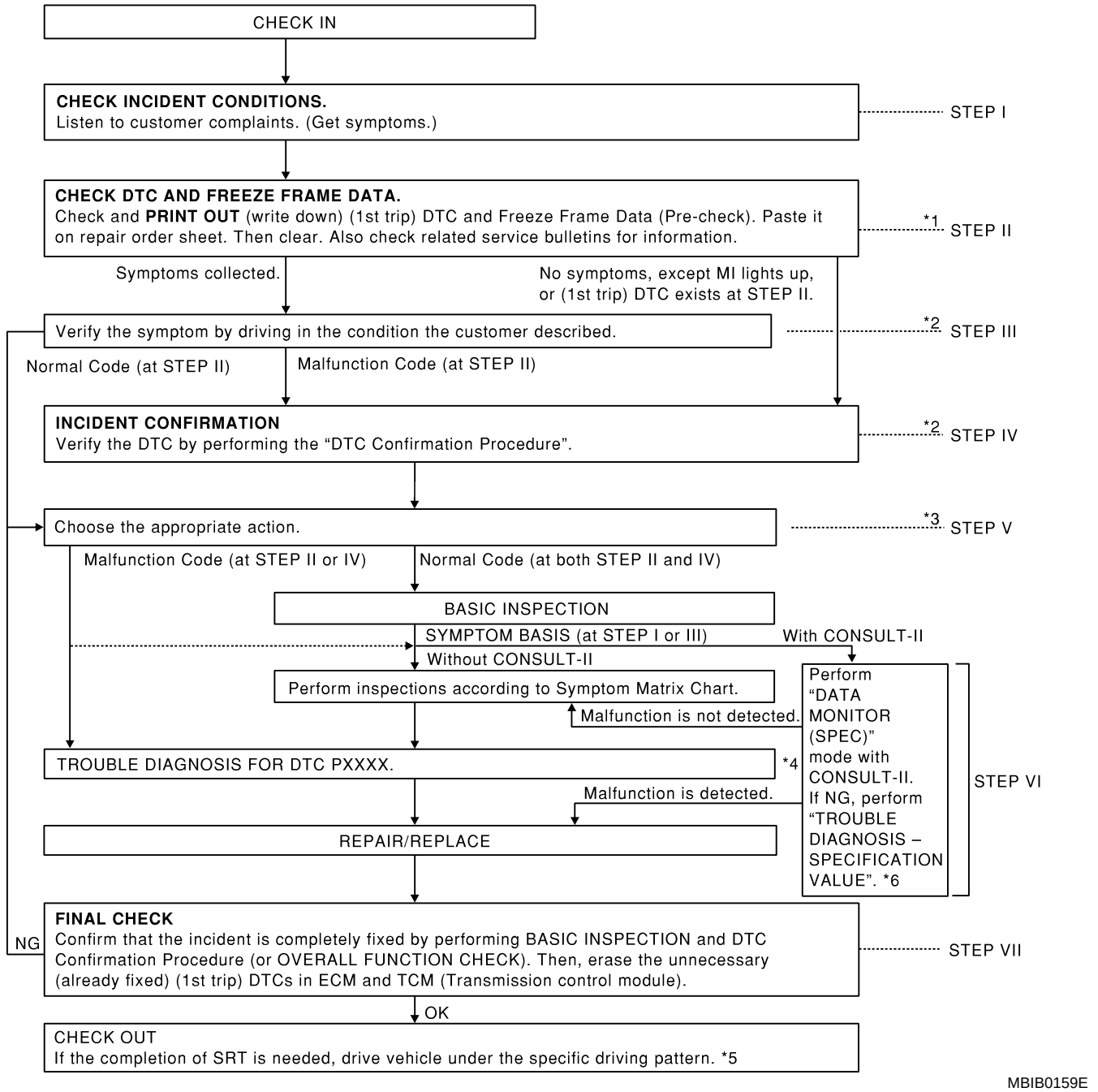
A visual check only may not find the cause of the incidents. A roadtest with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-60.

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 incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A “Diagnostic Worksheet” like the example on EC-63 should be used.

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

## WORK FLOW

### Flow chart

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*1:If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

*2:If time data of "SELF-DIAG RESULTS" is other than "0" or "[1t]", perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

*3:If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to EC-113, "POWER SUPPLY CIRCUIT FOR ECM".

*4:If malfunctioning part cannot be detected, perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

*5:EC-46, "Driving Pattern"

*6:EC-108, "TROUBLE DIAGNOSIS — SPECIFICATION VALUE"

# Trouble Diagnosis Introduction (Cont'd)

## Description for work flow

| STEP | DESCRIPTION |
|---|---|
| STEP I | Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-62. |
| STEP II | Before confirming the concern, check and write down (print out using CONSULT-II or GST) the (1st trip) DTC and the (1st trip) freeze frame data, then erase the DTC and the data. (Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV.<br>If the incident cannot be verified, perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".<br>Study the relationship between the cause, specified by (1st trip) DTC, and the symptom described by the customer. (The "Symptom Matrix Chart" will be useful. See EC-71.)<br>Also check related service bulletins for information. |
| STEP III | Try to confirm the symptom and under what conditions the incident occurs.<br>The "DIAGNOSTIC WORK SHEET" and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.<br>If the incident cannot be verified, perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".<br>If the malfunction code is detected, skip STEP IV and perform STEP V. |
| STEP IV | Try to detect the (1st trip) DTC by driving in (or performing) the "DTC Confirmation Procedure". Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT-II or GST.<br>During the (1st trip) DTC verification, be sure to connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results.<br>If the incident cannot be verified, perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".<br>In case the "DTC Confirmation Procedure" is not available, perform the "Overall Function Check" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative.<br>The "NG" result of the "Overall Function Check" is the same as the (1st trip) DTC detection. |
| STEP V | Take the appropriate action based on the results of STEP I through IV.<br>If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX.<br>If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-66.) If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TROUBLE DIAGNOSIS — SPECIFICATION VALUE". (Refer to EC-108) (If malfunction is detected, proceed to "PERAIR/REPLACE".) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-71.) |
| STEP VI | Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts".<br>Gently shake the related connectors, components or wiring harness with CONSULT-II set in "DATA MONITOR (AUTO TRIG)" mode.<br>Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-80, 103.<br>The "Diagnostic Procedure" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to "Circuit Inspection" in GI section.<br>Repair or replace the malfunction parts.<br>If malfunctioning part cannot be detected, perform EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". |
| STEP VII | Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint.<br>Perform the "DTC Confirmation Procedure" and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a method different from the previous one.<br>Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION" and AT section.) |

# Trouble Diagnosis Introduction (Cont'd)

## DIAGNOSTIC WORKSHEET

**KEY POINTS**

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

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### Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about an incident. 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 MI 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.

# Trouble Diagnosis Introduction (Cont'd)

## Worksheet sample

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

MTBL0017

## DTC Inspection Priority Chart

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

**NOTE:**
**If DTC U1000 is displayed with other DTC, first perform the trouble diagnosis for DTC U1000. Refer to EC-121, "DTC U1000 CAN COMMUNICATION LINE".**

| Priority | Detected items (DTC) |
|---|---|
| 1 | ● U1000 CAN communication line<br>● P0102 P0103 Mass air flow sensor<br>● P0112 P0113 Intake air temperature sensor<br>● P0117 P0118 Engine coolant temperature sensor<br>● P0122 P0123 P0222 P0223 P1225 P1226 P1229 P2135 Throttle position sensor<br>● P0327 P0328 P0332 P0333 Knock sensor<br>● P0335 P1336 Crankshaft position sensor (OBD)<br>● P0340 Camshaft position sensor<br>● P0500 Vehicle speed sensor<br>● P0605 ECM<br>● P0705 Park/Neutral position (PNP) switch<br>● P1610-P1615 NATS<br>● P1706 Park/Neutral position (PNP) switch<br>● P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor |
| 2 | ● P0031 P0032 P0051 P0052 Heated oxygen sensor 1 heater<br>● P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater<br>● P0132 P0133 P0134 P0152 P0153 P0154 P1143 P1144 P1163 P1164 Heated oxygen sensor 1<br>● P0138 P0139 P0158 P0159 P1146 P1147 P1166 P1167 Heated oxygen sensor 2<br>● P0550 Power steering pressure sensor<br>● P0740 P0745 A/T solenoid valves<br>● P1065 ECM power supply<br>● P1111 Intake valve timing control solenoid valve<br>● P1122 Electric throttle control function<br>● P1124 P1126 P1128 Electric throttle control actuator<br>● P1805 Brake switch |
| 3 | ● P0171 P0172 P0174 P0175 Fuel injection system function<br>● P0300 - P0306 Misfire<br>● P0420 P0430 Three way catalyst function<br>● P0444 P0445 EVAP canister purge volume control solenoid valve<br>● P1121 Electric throttle control actuator<br>● P1217 Engine over temperature (OVERHEAT) |

## Fail-safe Chart

●When the DTC listed below is detected, the ECM enters fail-safe mode and the MI lights up.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102<br>P0103</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="5">P0117<br>P0118</td><td rowspan="5">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the time after turning ignition switch “ON” or “START”.<br>CONSULT-II displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT-II display)</td></tr>
<tr><td>Just as ignition switch is turned ON or Start</td><td>40°C (104°F)</td></tr>
<tr><td>More than approx. 4 minutes after ignition ON or Start</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)<br>(Depends on the time)</td></tr>
<tr><td colspan="3">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122<br>P0123<br>P0222<br>P0223<br>P2135</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor.</td></tr>
<tr><td>P1121</td><td>Electric throttle control actuator (ECM detect the throttle valve is stuck open.)</td><td colspan="2">While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.<br>The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1122</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1124<br>P1126</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1128</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring</td></tr>
<tr><td>P1229</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P2122<br>P2123<br>P2127<br>P2128<br>P2138</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor.</td></tr>
</table>

# Basic Inspection

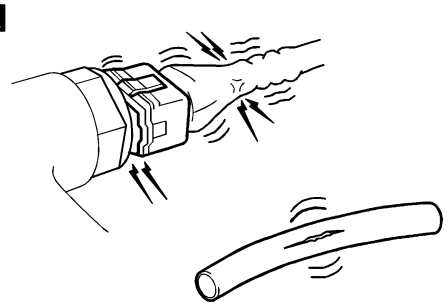
## Preparation

- **Make sure that the following parts are in good order.**

**(1) Battery**
**(2) Ignition system**
**(3) Engine oil and coolant levels**
**(4) Fuses**
**(5) ECM harness connector**
**(6) Vacuum hoses**
**(7) Air intake system**
**(Oil filler cap, oil level gauge, etc.)**
**(8) Fuel pressure**
**(9) Engine compression**
**(10) Throttle valve**

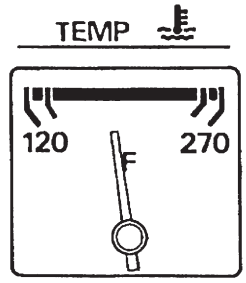
- **On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".**
- **When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.**
- **Turn off headlamps, heater blower, rear window defogger.**
- **Keep front wheels pointed straight ahead.**

A



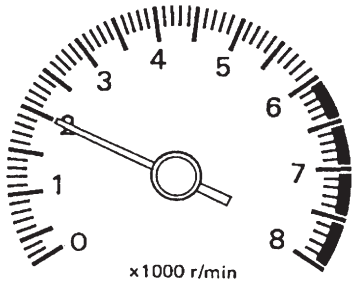
SEC297D

B




SEF976U

B




SEF977U

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

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

A

**BEFORE STARTING**
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches, and cuts
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket

B

1. Start engine and warm it up until engine coolant temperature indicator points the middle of gauge.
   Ensure engine stays below 1,000 rpm.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Make sure that no DTC is displayed with CONSULT-II.

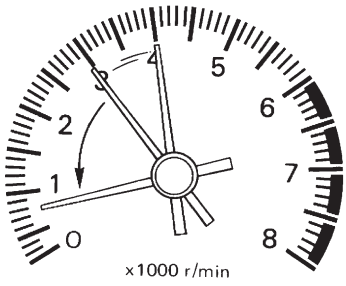
NG → Repair or replace components as necessary according to corresponding "Diagnostic Procedure".

OK → Ⓐ

Ⓐ

# Basic Inspection (Cont'd)

C



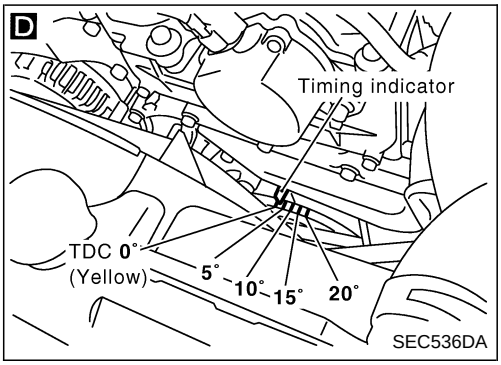

SEF978U

C

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| ENG SPEED | XXX rpm |

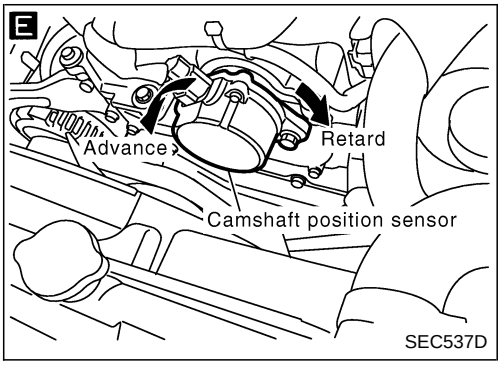
SEF058Y

D




SEC536DA

E




SEC537D

Ⓐ

C

**CHECK TARGET IDLE SPEED.**

**With CONSULT-II**

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Read idle speed in "DATA MONITOR" mode with CONSULT-II.
   **675±50 rpm (in "P" or "N" position)**

**Without CONSULT-II**

1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Rev engine (2,000 to 3,000 rpm) two or three times under no-load, then run engine at idle speed for about 1 minute.
3. Check idle speed.
   **675±50 rpm (in "P" or "N" position)**

NG → Ⓓ

OK

D

**CHECK IGNITION TIMING.**

1. Run engine at idle.
2. Check ignition timing with a timing light.
   **10±5° BTDC (in "P" or "N" position)**

NG → E

OK

Ⓚ

Ⓓ

**PERFORM THROTTLE VALVE CLOSED POSITION LEARNING.**

1. Stop engine.
2. Perform EC-31, "Throttle Valve Closed Position Learning".

OK

**PERFORM IDLE AIR VOLUME LEARNING.**

Refer to EC-31, "Idle Air Volume Learning".

**Is "Idle Air Volume Learning" carried out successfully?**

Yes → Ⓑ

No → Ⓒ

Ⓒ

1. Follow the construction of "Idle Air Volume Learning".
2. Go to Ⓓ.

E

**ADJUST CAMSHAFT POSITION SENSOR.**

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

**With CONSULT-II**

2. Select "TARGET IGN TIM ADJ" in "WORK SUPPORT".
3. Touch start.
4. Adjust camshaft position sensor using timing light.
   **10°±5° BTDC**

**Without CONSULT-II**

2. Adjust camshaft position sensor using timing light.
   **10°±5° BTDC**

OK → Ⓓ

NG

**CHECK TIMING CHAIN INSTALLATION.**

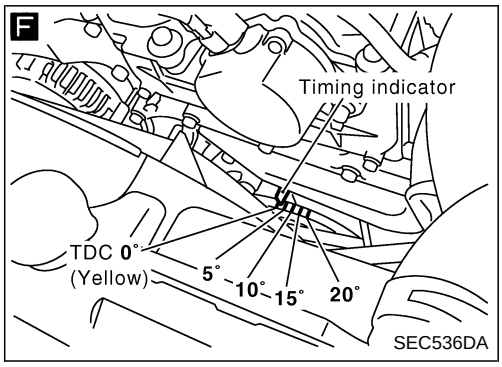
Check timing chain installation.

Refer to "TIMING CHAIN" in EM section.

NG → Ⓓ

Repair the timing chain installation.

# Basic Inspection (Cont'd)




Ⓑ

**CHECK TARGET IDLE SPEED AGAIN.**

**With CONSULT-II**

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in "DATA MONITOR" mode with CONSULT-II.
   **675±50 rpm (in "P" or "N" position)**

**Without CONSULT-II**

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   **675±50 rpm (in "P" or "N" position)**

NG →

Check the following.
- Check camshaft position sensor and circuit. Refer to EC-257.

If NG, repair or replace.
Then go to Ⓓ.

OK ↓

**CHECK ECM FUNCTION.**
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is the rarely the case.)
2. Perform initialization of NATS (Nissan Anti-Theft System) and registration of NATS (Nissan Anti-Theft System) ignition key IDs. Refer to EC-50, "NATS (Nissan Anti-Theft System)".

Ⓓ
Ⓙ

OK ↓

F

**CHECK IGNITION TIMING.**
1. Run engine at idle.
2. Check ignition timing with a timing light.
   **10°±5° BTDC (in "P" or "N" position)**

NG →

**PERFOR THROTTLE VALVE CLOSED POSITION LEARNING.**
1. Stop engine.
2. Perform EC-31, "Throttle Valve Closed Position Learning".

OK ↓

Ⓚ

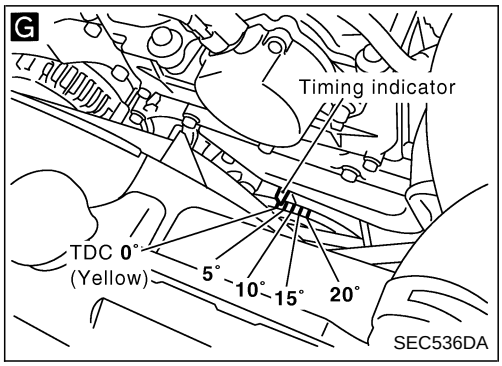
**PERFORM IDLE AIR VOLUME LEARNING.**
Refer to EC-31, "Idle Air Volume Learning".
**Is "Idle Air Volume Learning" carried out successfully?**

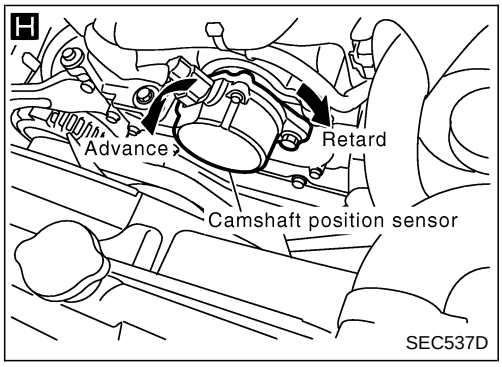
Yes → Ⓖ
No → Ⓗ

Ⓗ

1. Follow the construction of "Idle Air Volume Learning".
2. Go to Ⓓ.

## Basic Inspection (Cont'd)




Ⓖ

**CHECK TARGET IDLE SPEED AGAIN.**

**With CONSULT-II**

1. Start engine and warm it up to normal operating temperature.
2. Read idle speed in "DATA MONITOR" mode with CONSULT-II.
   **675±50 rpm (in "P" or "N" position)**

**Without CONSULT-II**

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   **675±50 rpm (in "P" or "N" position)**

NG → Ⓘ

Check the following.
- Check camshaft position sensor and circuit. Refer to EC-257.

If NG, repair or replace. Then go to Ⓓ.

**CHECK ECM FUNCTION.**
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is the rarely the case.)
2. Perform initialization of NATS (Nissan Anti-Theft System) and registration of NATS (Nissan Anti-Theft System) ignition key IDs. Refer to EC-50, "NATS (Nissan Anti-Theft System)".

Ⓓ

OK

**G**

**CHECK IGNITION TIMING AGAIN.**
1. Run engine at idle.
2. Check ignition timing with a timing light.
   **10±5° BTDC (in "P" or "N" position)**

NG → **H**

**ADJUST CAMSHAFT POSITION SENSOR.**
1. Start engine and warm it up to normal operating temperature.

**With CONSULT-II**

2. Select "TARGET IGN TIM ADJ" in "WORK SUPPORT".
3. Touch start.
4. Adjust camshaft position sensor using timing light.
   **10°±5° BTDC**

**Without CONSULT-II**

2. Adjust camshaft position sensor using timing light.
   **10°±5° BTDC**

OK → Ⓙ

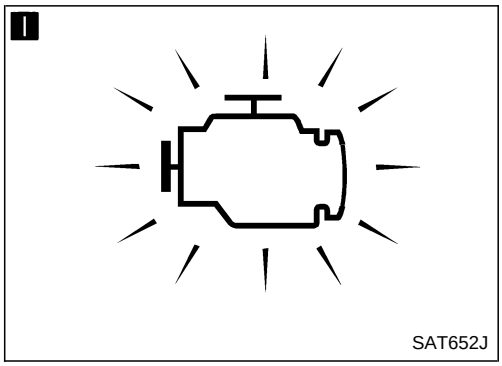
NG

**CHECK TIMING CHAIN INSTALLATION.**
Check timing chain installation. Refer to EM section, "TIMING CHAIN". If NG, repair the timing chain installation. Then go to Ⓓ.

OK → Ⓘ

OK → Ⓚ

## Basic Inspection (Cont'd)




Ⓚ

With three way catalyst

Set the diagnostic test mode II (Heated oxygen sensor 1 monitor). Refer to EC-52.

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

**CHECK HEATED OXYGEN SENSOR 1 SIGNAL.**

**With CONSULT-II**

1. See "HO2S1 MNTR" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   **1 cycle: RICH → LEAN → RICH**
   **2 cycles: RICH → LEAN → RICH → LEAN → RICH**

NG → Check oxygen sensor and the circuit.

OK

OR

**Without CONSULT-II**

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

OK

**ERASE UNNECESSARY DTC.**

After this inspection, unnecessary DTC No. might be displayed.
Erase the stored memory in ECM and TCM (Transmission control module).
Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION, EC-49.

OK

**INSPECTION END**

# Symptom Matrix Chart

## SYSTEM — BASIC ENGINE CONTROL SYSTEM

| SYSTEM — Basic engine control system | | SYMPTOM | | | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | OVERCOOLS | OVERCHARGING | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | 1P | 1X | HA | |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 3 | 3 | | | 3 | | | | 2 | EC-459 |
| | Fuel pressure regulator system | 2 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | | | EC-34 |
| | Injector circuit | 1 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | | | 2 | | | | | EC-453 |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | | | EC-269 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | | | EC-481 |
| | Incorrect idle speed adjustment | 3 | 3 | | | | 1 | 1 | 1 | 1 | | 1 | | | | | EC-30 |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | | | 2 | EC-299<br>EC-301<br>EC-309<br>EC-315 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | | | EC-30 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | | | EC-428 |
| Main power supply and ground circuit | | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 3 | 3 | | | | 2 | EC-113 |
| Cooling | Cooling fan circuit | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | | 1 | | 3 | EC-361 |
| Air conditioner circuit | | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | | | 2 | HA section |

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

## Symptom Matrix Chart (Cont'd)

| SYSTEM — Engine control system | | SYMPTOM | | | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | OVERCOOLS | OVERCHARGING | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | 1P | 1X | HA | |
| Engine control | Camshaft position sensor circuit | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | | | 3 | | | | | EC-257 |
| | Mass air flow sensor circuit | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | 2 | | | | | EC-140 |
| | Engine coolant temperature sensor circuit | 1 | 1 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | | | | | EC-152 |
| | Throttle position sensor circuit | | 1 | 2 | | 2 | 2 | 2 | 2 | 2 | | 2 | | | | | EC-235<br>EC-372<br>EC-374<br>EC-415 |
| | Accelerator pedal position sensor circuit | | | 3 | 2 | 1 | 2 | | | 2 | | | | | | | EC-401<br>EC-408<br>EC-421 |
| | Heated oxygen sensor 1 circuit | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | | | EC-172<br>EC-372<br>EC-320<br>EC-327 |
| | Intake valve timing control system | | 3 | 3 | | 2 | | 3 | 3 | | | 3 | | | | | EC-294 |
| | Vehicle speed sensor circuit | | 2 | 3 | | 3 | | | | | | 3 | | | | | EC-276 |
| | Knock sensor circuit | | | 2 | 2 | 2 | | | | | | 3 | | | | | EC-247 |
| | ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | | | EC-283 |
| | Start signal circuit | 2 | | | | | | | | | | | | | | | EC-450 |
| | Park/Neutral position switch circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | | | EC-388 |
| | Variable Induction Air Control (VIAS) system | | | | | 2 | | | | | | | | | | | EC-446 |
| | Electrical load signal circuit | | 2 | | | | | 3 | 3 | | | | | | | | EC-470 |
| | Power steering pressure sensor circuit | | 2 | | | | | 3 | 3 | | | | | | | | EC-278 |

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

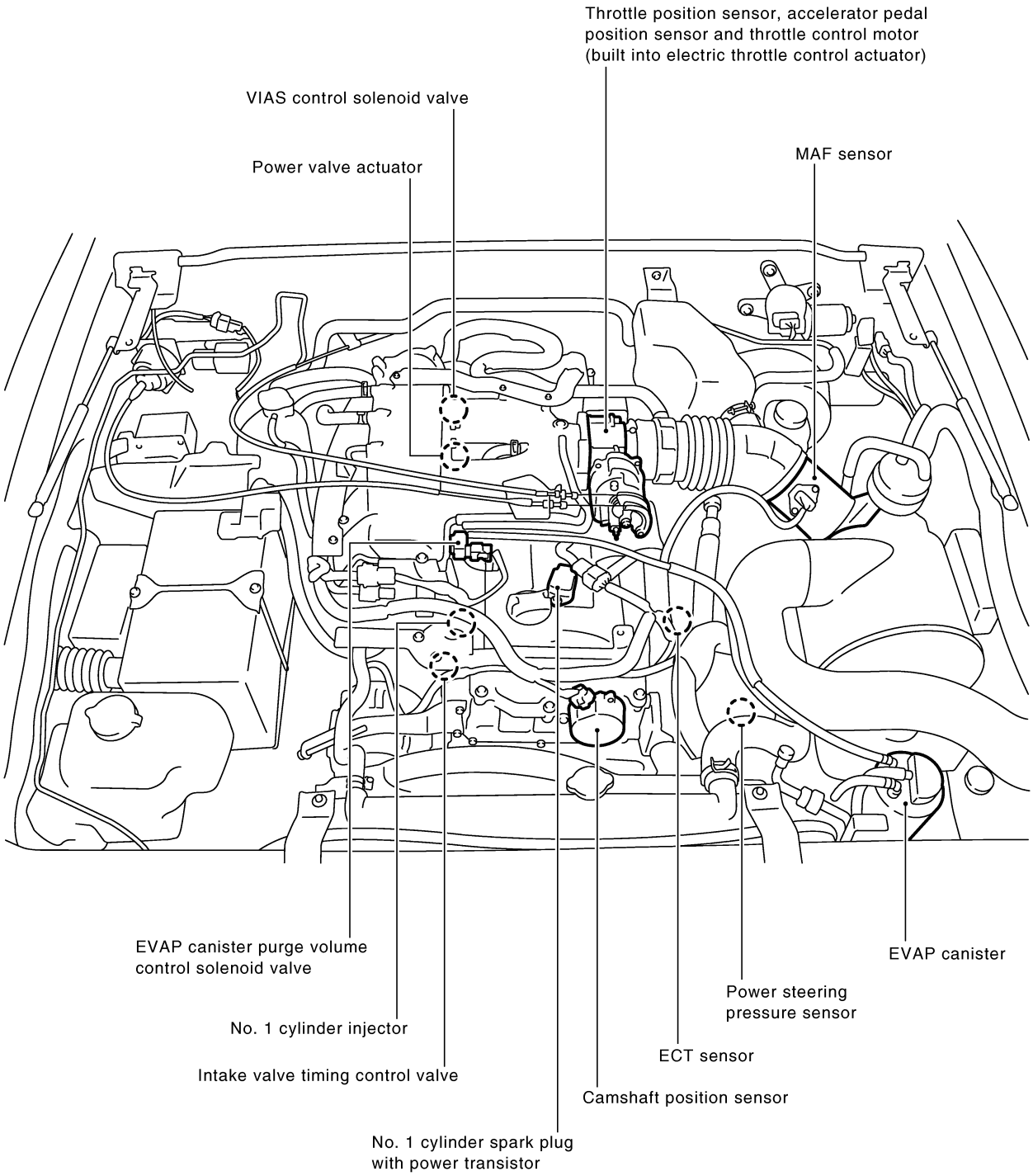
# Symptom Matrix Chart (Cont'd)

## SYSTEM — ENGINE MECHANICAL & OTHER

| SYSTEM — Engine mechanical & other | | SYMPTOM | | | | | | | | | | | | | | | Reference page |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | HARD/NO START/RESTART (EXCP. HA) | ENGINE STALL | HESITATION/SURGING/FLAT SPOT | SPARK KNOCK/DETONATION | LACK OF POWER/POOR ACCELERATION | HIGH IDLE/LOW IDLE | ROUGH IDLE/HUNTING | IDLING VIBRATION | SLOW/NO RETURN TO IDLE | OVERHEATS/WATER TEMPERATURE HIGH | EXCESSIVE FUEL CONSUMPTION | EXCESSIVE OIL CONSUMPTION | OVERCOOLS | OVERCHARGING | BATTERY DEAD (UNDER CHARGE) | |
| Warranty symptom code | | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | 1P | 1X | HA | |
| Fuel | Fuel tank | 5 | | | | | | | | | | | | | | | FE section |
| | Fuel piping | 5 | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | | | |
| | Vapor lock | | 5 | | | | | | | | | | | | | | |
| | Valve deposit | | | | | | | | | | | | | | | | |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | | | — |
| Air | Air duct | 5 | | | | | | | | | | | | | | | |
| | Air cleaner | | | | | | | | | | | | | | | | |
| | Air leakage from air duct (Mass air flow sensor — Electric throttle control actuator) | | 5 | 5 | | 5 | | 5 | 5 | | | 5 | | | | | |
| | Electric throttle control actuator, Throttle wire | 5 | | | 5 | | 5 | | | 5 | 5 | | | | | | FE section |
| | Air leakage from intake manifold/ Collector/Gasket | | | | | | | | | | | | | | | | — |
| Cranking | Battery | 1 | 1 | 1 | | 1 | | 1 | 1 | | | 1 | | | 1 | 1 | EL section |
| | Alternator circuit | | | | | | | | | | | | | | | | |
| | Starter circuit | 3 | | | | | | | | | | | | | | | |
| | PNP switch | 4 | | | | | | | | | | | | | | | AT section |
| | Drive plate | 6 | | | | | | | | | | | | | | | EM section |
| Engine | Cylinder head | | | | | | | | | | | | | | | | |
| | Cylinder head gasket | | | | | | | | | | 4 | | | | | | |
| | Cylinder block | | | | | | | | | | | | | | | | |
| | Piston | | | | | | | | | | | | 6 | | | | |
| | Piston ring | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | | | | |
| | Connecting rod | | | | | | | | | | | | | | | | |
| | Bearing | | | | | | | | | | | | | | | | EM section |
| | Crankshaft | | | | | | | | | | | | 6 | | | | |
| Valve mechanism | Timing chain | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | 6 | | | | |
| | Camshaft | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | | | |
| | Intake valve | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | 6 | | | | |
| | Exhaust valve | | | | | | | | | | | | | | | | |
| Exhaust | Exhaust manifold/Tube/Muffler/Gasket | | | 5 | | 5 | | 5 | 5 | | | 5 | | | | | EM section & FE section |
| | Three way catalyst* | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | | | FE section |
| Lubrication | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery | 5 | 5 | 5 | | 5 | | 5 | 5 | | 5 | 5 | 5 | | | | |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | | | |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | | | LC section |
| | Thermostat | | | | | | | | | | | | | 2 | | | |
| | Water pump | | 5 | 5 | 5 | 5 | | | | | 4 | 5 | | | | | |
| | Water gallery | | | | | | | | | | | | | | | | |
| | Cooling fan | | | | | | | | | | | | | 2 | | | EC section |
| | Coolant level (low)/Contaminated coolant | | | | | | | | | | | | | | | | MA section |
| NATS (Nissan Anti-Theft System) | | 1 | 1 | | | | | | | | | | | | | | EC-50 or EL section |

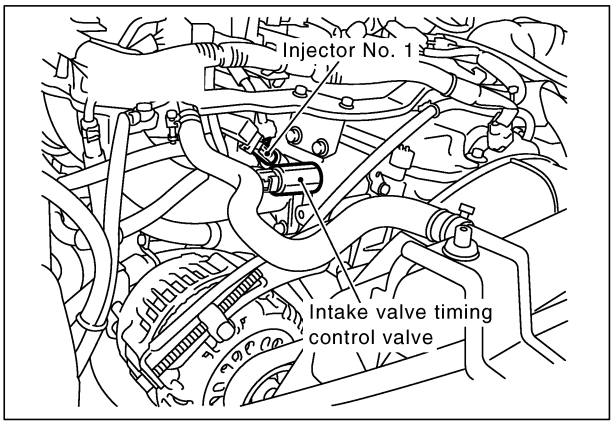
1 - 6: The numbers refer to the order of inspection.

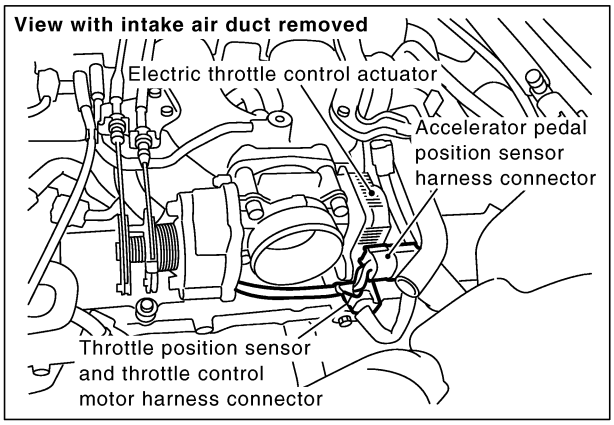
## Engine Control Component Parts Location

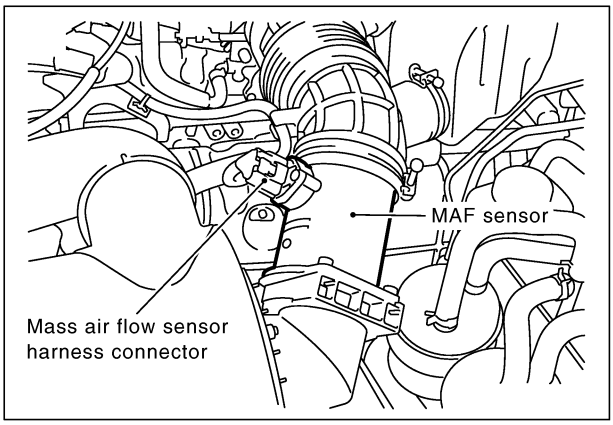


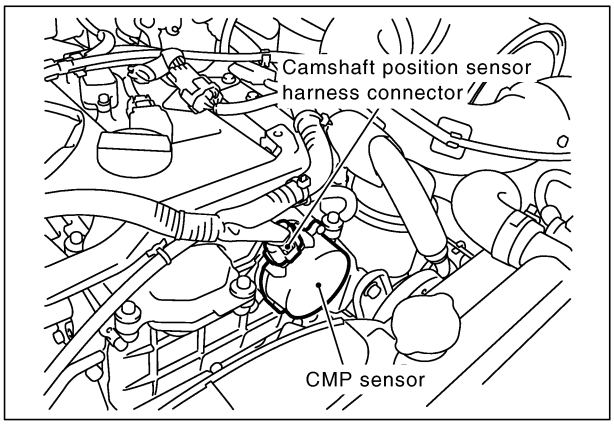

SEC666D

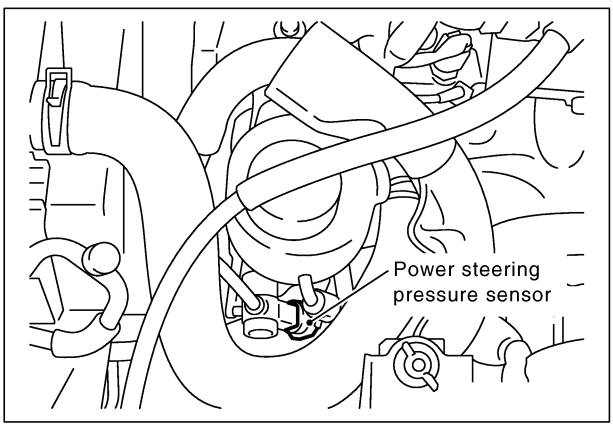
# Engine Control Component Parts Location (Cont'd)

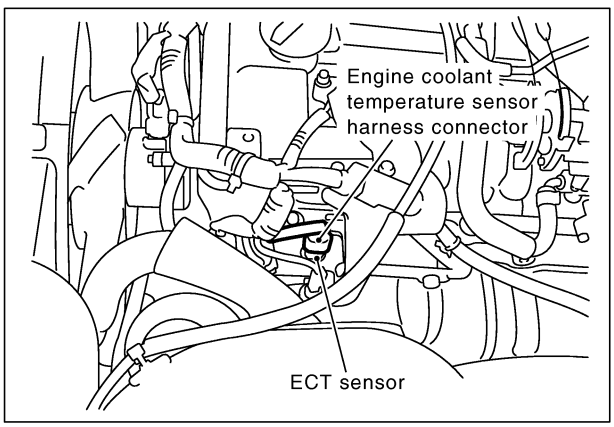


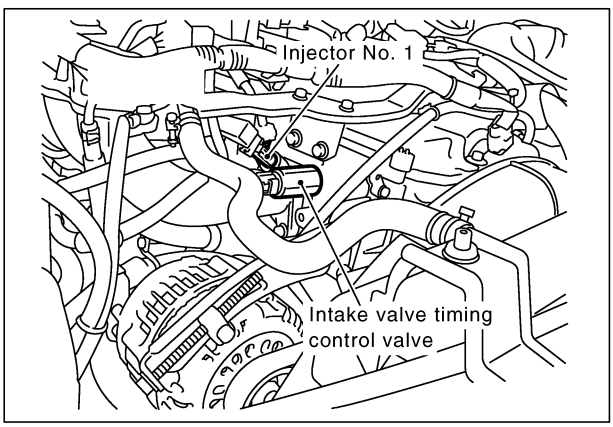



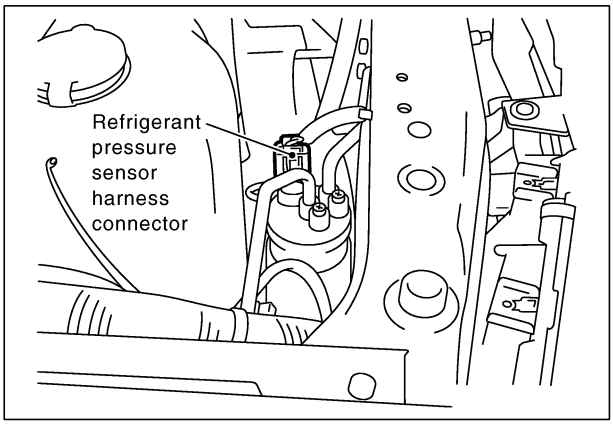



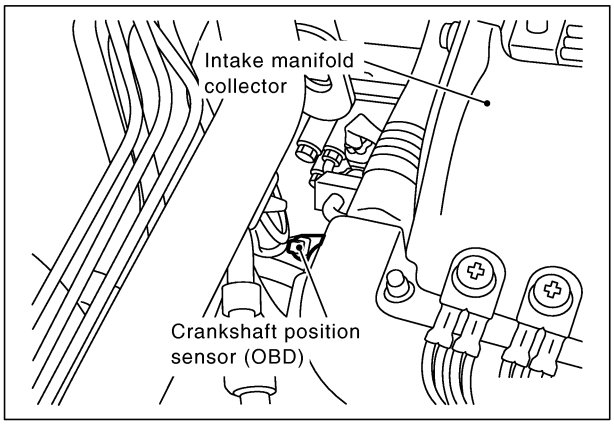



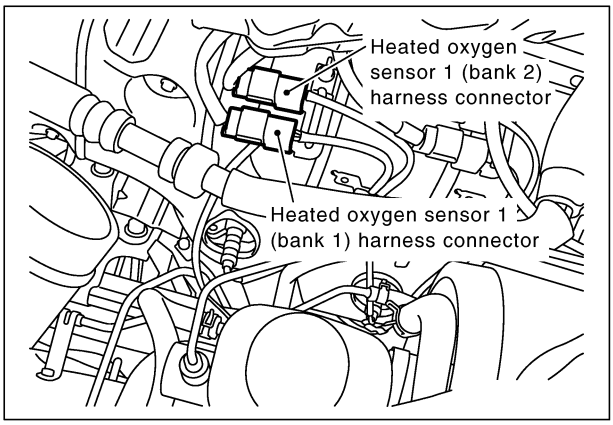



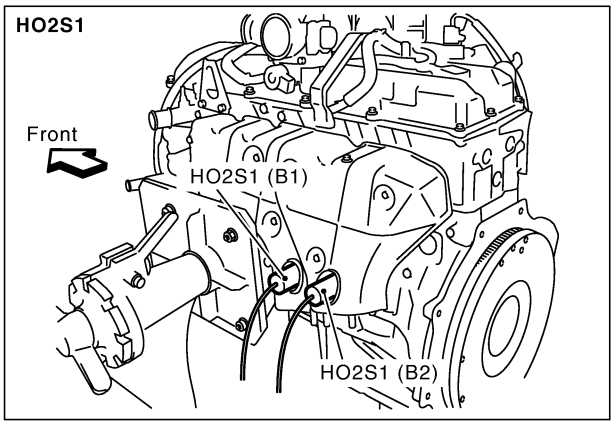

SEC733D

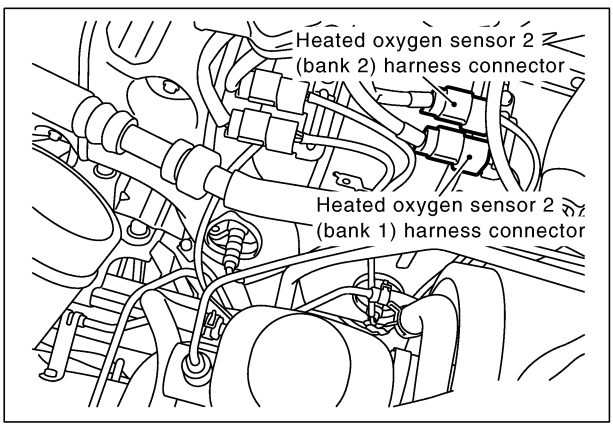
## Engine Control Component Parts Location (Cont'd)

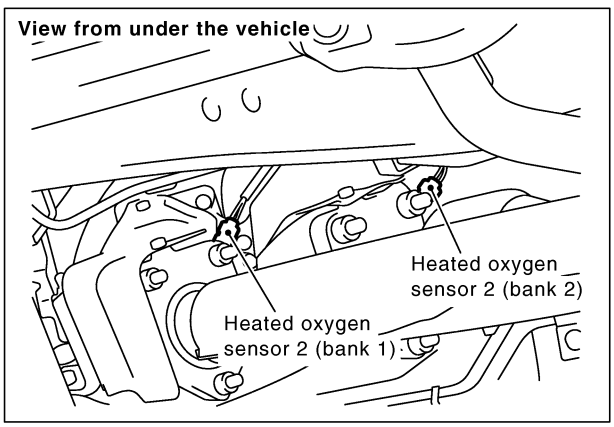


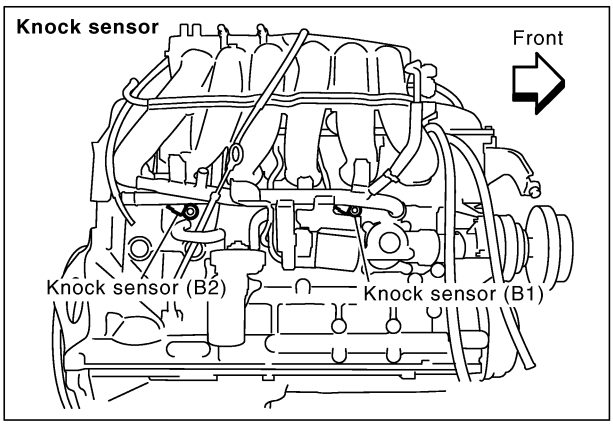



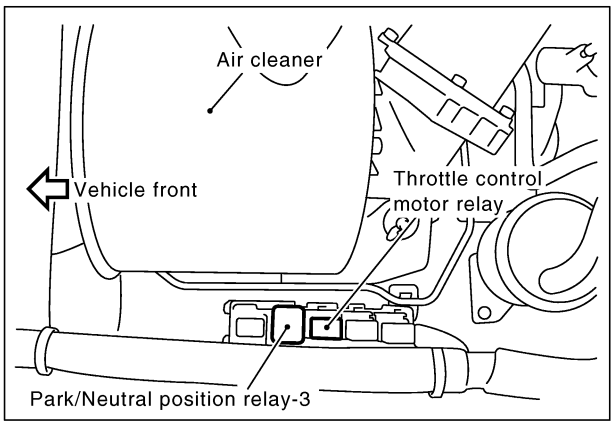



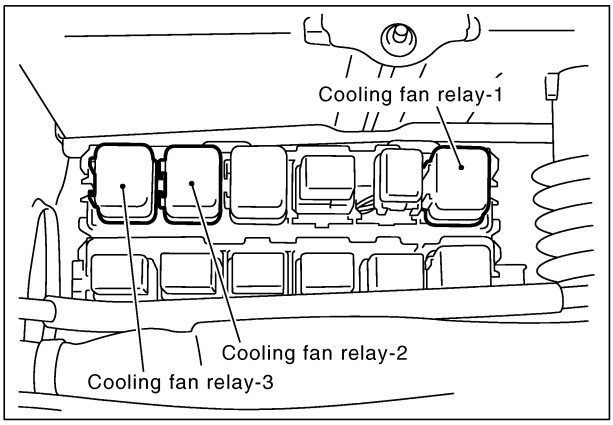



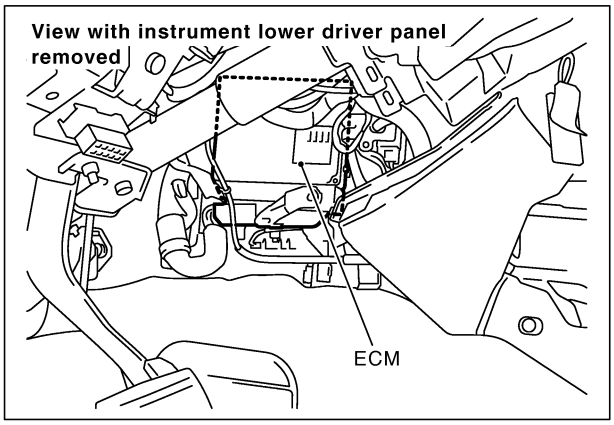



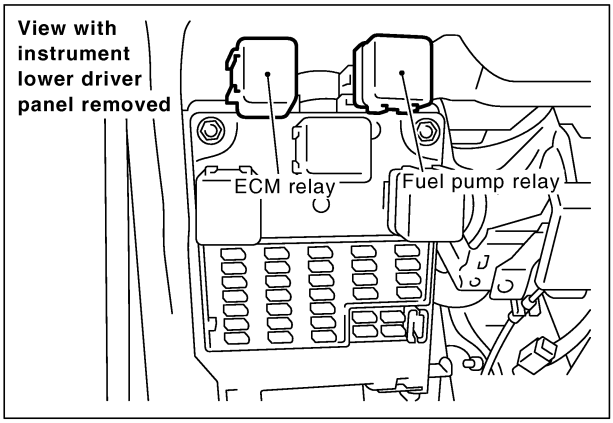



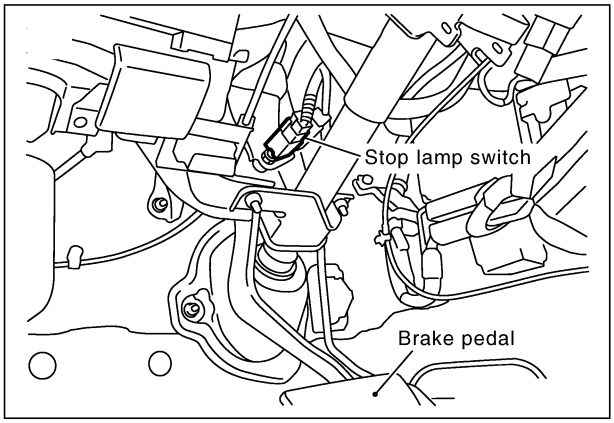

SEC734D

## Engine Control Component Parts Location (Cont'd)



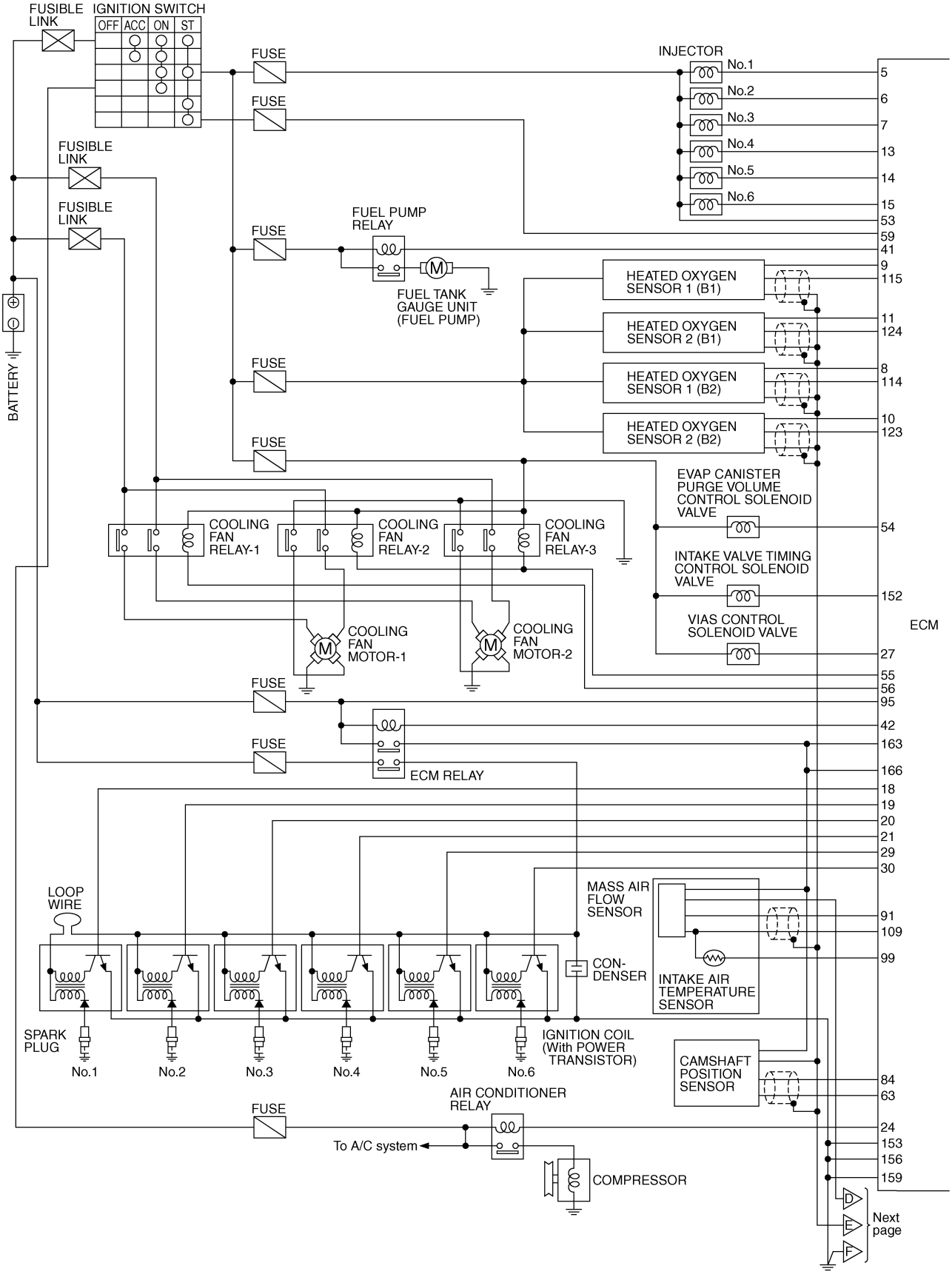



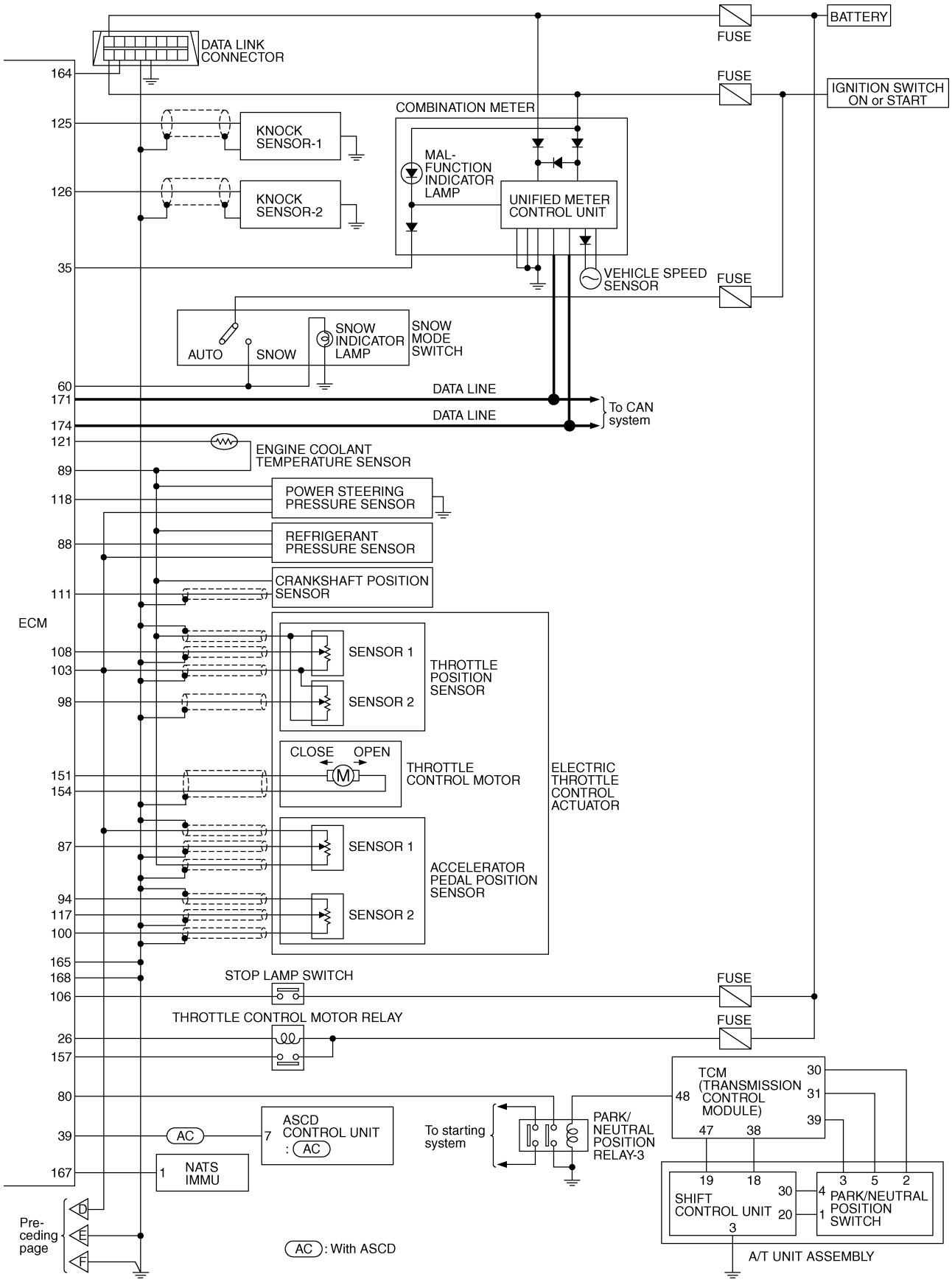

SEC744D

## Circuit Diagram



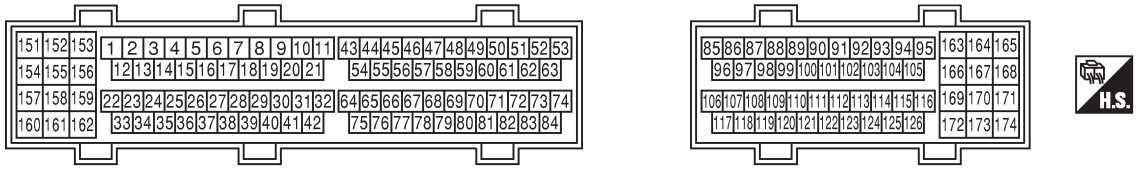

TEC410M

# Circuit Diagram (Cont'd)

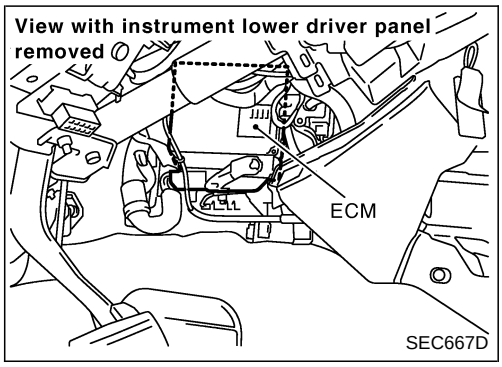



TEC329M

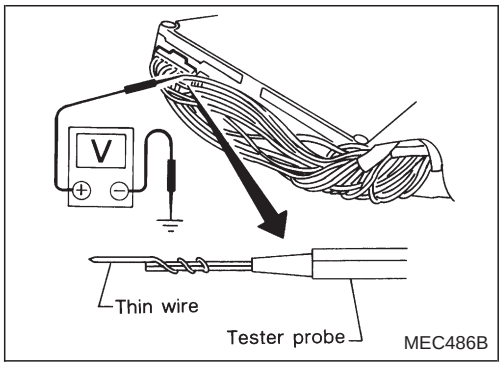
## ECM Harness Connector Terminal Layout




PBIB0075E




SEC667D




MEC486B

## ECM Terminals and Reference Value

### PREPARATION

1. ECM is located behind the center console. For this inspection, remove instrument lower driver panel.
2. Remove ECM harness protector.

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

- Open harness securing clip to make testing easily.
- Use extreme care not to touch 2 pins at one time.
- Data is for comparison and may not be exact.

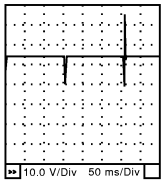
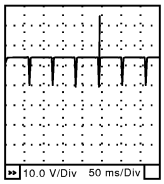
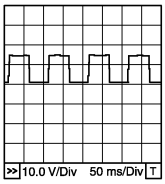
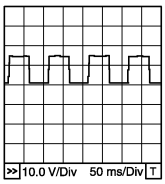
### ECM INSPECTION TABLE

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-II.

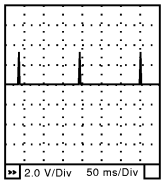
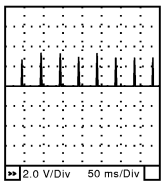
**CAUTION:**

**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.**

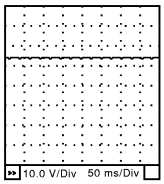
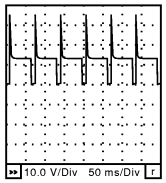
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 5<br>6<br>7<br>13<br>14<br>15 | BR/W<br>GY/L<br>BR/Y<br>GY/R<br>BR<br>GY | Injector No. 1<br>Injector No. 2<br>Injector No. 3<br>Injector No. 4<br>Injector No. 5<br>Injector No. 6 | Engine is running.<br>— Warm-up condition<br>└ Idle speed | BATTERY VOLTAGE<br>(11 - 14V)*1<br>  <br><br>SEC984C |
| | | | Engine is running.<br>— Warm-up condition<br>└ Engine speed is 2,000 rpm. | BATTERY VOLTAGE<br>(11 - 14V)*1<br>  <br><br>SEC985C |
| 8 | G/Y | Heated oxygen sensor 1 heater (bank 2) | Engine is running.<br>— Warm-up condition<br>└ Engine speed is below 2,800 rpm. | Approximately 7.0V*1<br>  <br><br>PBIB0519E |
| | | | Engine is running.<br>└ Engine speed is above 2,800 rpm. | BATTERY VOLTAGE<br>(11 - 14V) |
| 9 | Y/B | Heated oxygen sensor 1 heater (bank 1) | Engine is running.<br>— Warm-up condition<br>└ Engine speed is below 2,800 rpm. | Approximately 7.0V*1<br>  <br><br>PBIB0519E |
| | | | Engine is running.<br>└ Engine speed is above 2,800 rpm. | BATTERY VOLTAGE<br>(11 - 14V) |
| 10 | Y/R | Heated oxygen sensor 2 heater (bank 2) | Engine is running.<br>— Warm-up condition<br>— After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load<br>└ Engine speed is below 3,200 rpm | 0 - 1.0V |
| | | | Ignition switch "ON"<br>└ Engine stopped<br>Engine is running.<br>└ Engine speed is above 3,200 rpm | BATTERY VOLTAGE<br>(11 - 14V) |

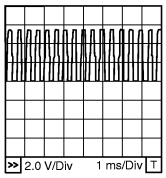
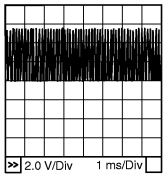
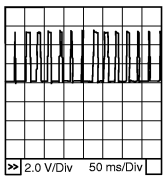
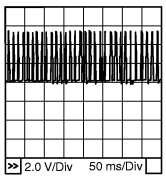
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 11 | R/G | Heated oxygen sensor 2 heater (bank 1) | Engine is running.<br>— Warm-up condition<br>— After keeping engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load<br>— Engine speed is below 3,200 rpm | 0 - 1.0V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>Engine is running.<br>— Engine speed is above 3,200 rpm | BATTERY VOLTAGE (11 - 14V) |
| 18<br>19<br>20<br>21<br>29<br>30 | Y/R<br>G<br>Y<br>R/B<br>R/G<br>R | Ignition signal No. 1<br>Ignition signal No. 2<br>Ignition signal No. 3<br>Ignition signal No. 4<br>Ignition signal No. 5<br>Ignition signal No. 6 | Engine is running.<br>— Warm-up condition<br>— Idle speed | 0 - 0.1V*1<br>  <br><br>SEC986C |
| | | | Engine is running.<br>— Warm-up condition<br>— Engine speed is 2,000 rpm. | 0 - 0.2V*1<br>  <br><br>SEC987C |
| 26 | P/L | Throttle control motor relay | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| | | | Ignition switch "ON" | 0 - 1.0V |
| 27 | LG/R | VIAS control solenoid valve | Engine is running.<br>— Idle speed | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>— Engine speed is above 5,000 rpm. | 0 - 1.0V |
| 35 | Y/G | MI | Ignition switch "ON" | 0 - 1.0V |
| | | | Engine is running.<br>— Idle speed | BATTERY VOLTAGE (11 - 14V) |
| 41 | R/Y | Fuel pump relay | Ignition switch "ON"<br>— For 5 seconds after turning ignition switch "ON"<br>Engine is running. | 0 - 1.0V |
| | | | Ignition switch "ON"<br>— More than 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 42 | B/Y | ECM relay (Self shut-off) | Engine is running.<br>Ignition switch "OFF"<br>└ For 5 seconds after turning ignition switch "OFF" | 0 - 1.0V |
| | | | Ignition switch "OFF"<br>└ 5 seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 53 | W/G | Ignition switch | Ignition switch "OFF" | 0V |
| | | | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 54 | W/B | EVAP canister purge volume control solenoid valve | Engine is running.<br>└ Idle speed | BATTERY VOLTAGE (11 - 14V)*1<br>  <br><br>SEC990C |
| | | | Engine is running.<br>└ Engine speed is about 2,000 rpm (More than 100 seconds after starting engine). | BATTERY VOLTAGE (11 - 14V)*1<br>  <br><br>SEC991C |
| 55 | L/B | Cooling fan relay (High) | Engine is running.<br>└ Cooling fan is operating at high speed. | 0 - 1.0V |
| | | | Engine is running.<br>└ Cooling fan is not operating. | BATTERY VOLTAGE (11 - 14V) |
| 56 | L | Cooling fan relay (Low) | Engine is running.<br>└ Cooling fan is operating. | 0 - 1.0V |
| | | | Engine is running.<br>└ Cooling fan is not operating. | BATTERY VOLTAGE (11 - 14V) |
| 59 | R/W | Start signal | Ignition switch "ON" | Approximately 0V |
| | | | Ignition switch "START" | 9 - 14V |
| 60 | Y/G | Snow mode switch | Ignition switch "ON"<br>└ Snow mode switch is "OFF" | Approx. 0V |
| | | | Ignition switch "ON"<br>└ Snow mode switch is "ON" | BATTERY VOLTAGE (11 - 14V) |

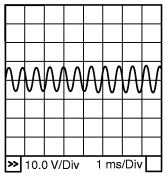
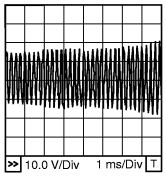
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 63 | B/W | Camshaft position sensor (POS signal) | Engine is running.<br>— Warm-up condition<br>— Idle speed | Approx. 2.6 - 2.7V*1<br>  <br><br>SEC750D |
| | | | Engine is running.<br>— Engine speed is 2,000 rpm | Approx. 2.5 - 2.6V*1<br>  <br><br>SEC751D |
| 80 | R/PU | PNP switch | Ignition switch "ON"<br>— Gear position is Neutral. | Approximately 0V |
| | | | Ignition switch "ON"<br>— Except the above gear position | Approximately 5V |
| 83<br>84 | L<br>L | Camshaft position sensor (REF signal) | Engine is running. (Warm-up condition)<br>— Idle speed | Approx. 0.3 - 0.6V*1<br>  <br><br>SEC746D |
| | | | Engine is running.<br>— Engine speed is 2,000 rpm | Approx. 0.3 - 0.6V*1<br>  <br><br>SEC747D |
| 87 | W | Accelerator pedal position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |

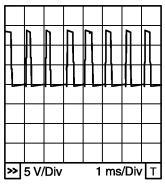
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 88 | R/G | Refrigerant pressure sensor | Engine is running.<br>— Warm-up condition<br>— Both A/C switch and blower switch are "ON" (Compressor operates) | 1.0 - 4.0V |
| 89 | B | Sensors' ground | Engine is running.<br>— Warm-up condition<br>— Idle speed | Approximately 0V |
| 91 | W/G | Mass air flow sensor | Engine is running.<br>— Warm-up condition<br>— Idle speed | 0.75 - 1.2V |
| | | | Engine is running.<br>— Warm-up condition<br>— Engine speed is 2,500 rpm. | 1.7 - 2.4V |
| 94 | LG | Accelerator pedal position sensor 2 power supply | Ignition switch "ON" | Approximately 2.5V |
| 95 | W | Power supply for ECM (Buck-up) | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 98 | R/L | Throttle position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully released | Less than 4.75V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully depressed | More than 0.36V |
| 99 | L/W | Intake air temperature sensor | Engine is running. | Approximately 0 - 4.8V<br>Output voltage varies with intake air temperature. |
| 100 | R | Accelerator pedal position sensor 2 ground | Ignition switch "ON" | Approximately 0V |
| 103 | Y | Sensors' power supply | Ignition switch "ON" | Approximately 5V |
| 106 | G/Y | Stop lamp switch | Engine is running.<br>— Brake pedal fully released | Approximately 0V |
| | | | Engine is running.<br>— Brake pedal fully depressed | BATTERY VOLTAGE (11 - 14V) |

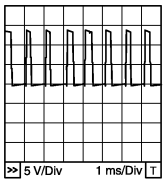
## ECM Terminals and Reference Value (Cont'd)

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 108 | L | Throttle position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |
| 109 | B/W | Mass air flow sensor ground | Engine is running.<br>— Warm-up condition<br>— Idle speed | Approximately 0V |
| 111 | W | Crankshaft position sensor (OBD) | Engine is running.<br>— Warm-up condition<br>— Idle speed | 1 - 2V<br>(AC range)<br>  <br><br>SEC748D |
| | | | Engine is running.<br>— Engine speed is 2,000 rpm. | 3 - 4V<br>(AC range)<br>  <br><br>SEC749D |
| 114 | W | Heated oxygen sensor 1 (bank 1) | Engine is running.<br>— Warm-up condition<br>— Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |
| 115 | W | Heated oxygen sensor 1 (bank 2) | Engine is running.<br>— Warm-up condition<br>— Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |
| 117 | G | Accelerator pedal position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully released | More than 0.18V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal fully depressed | Less than 2.37V |
| 118 | BR/W | Power steering pressure sensor | Engine is running.<br>— Steering wheel is being turned | 0.5 - 4.5V |
| | | | Engine is running.<br>— Steering wheel is not being turned | 0.4 - 0.8V |

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 121 | LG/B | Engine coolant temperature sensor | Engine is running. | Approximately 0 - 4.8V<br>Output voltage varies with engine coolant temperature. |
| 123 | W | Heated oxygen sensor 2 (bank 2) | Engine is running.<br>— Warm-up condition<br>— Revving engine from idle to 3,000 rpm quickly after the following conditions are met<br>— After keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |
| 124 | W | Heated oxygen sensor 2 (bank 1) | Engine is running.<br>— Warm-up condition<br>— Revving engine from idle to 3,000 rpm quickly after the following conditions are met<br>— After keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |
| 125<br>126 | W<br>W | Knock sensor (Bank 1)<br>Knock sensor (Bank 2) | Engine is running.<br>— Idle speed | Approximately 2.5V |
| 151 | L/W | Throttle control motor (Open) | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal is depressing | 0 - 14V*1<br>  <br><br>PBIB1105E |
| 152 | R | Intake valve timing control solenoid valve | Engine is running.<br>— Warm-up condition<br>— Engine speed is between 1,000 rpm and 4,200 rpm<br>— During high load condition<br>— Vehicle speed is more than 8 km/h (5 MPH) | Approximately 0V |
| | | | Engine is running.<br>— Those other than above | BATTERY VOLTAGE (11 - 14V) |
| 153<br>156<br>159<br>165<br>168 | B<br>B<br>B<br>B<br>B | ECM ground | Engine is running.<br>— Idle speed | Engine ground |

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 154 | L/B | Throttle control motor (Close) | Ignition switch "ON"<br>— Engine stopped<br>— Gear position is "D"<br>— Accelerator pedal is releasing | 0 - 14V*1<br>  <br><br>PBIB1105E |
| 157 | G | Throttle control motor relay power supply | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 163<br>166 | B/R | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 164 | PU | Data link connector | Ignition switch "ON"<br>— CONSULT-II or GST is disconnected. | BATTERY VOLTAGE (11 - 14V) |
| 171 | W/R | CAN communication line | Ignition switch "ON" | Approximately 1.7 - 2.3V<br>Output voltage varies with the communication status. |
| 174 | G/B | CAN communication line | Ignition switch "ON" | Approximately 2.6 - 3.2V<br>Output voltage varies with the communication status. |

*1: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

# CONSULT-II Function

## FUNCTION

| Diagnostic test mode | Function |
|---|---|
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-II unit. |
| Self-diagnostic results | Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1 |
| Data monitor | Input/Output data in the ECM can be read. |
| Data monitor (SPEC) | Input/Output of the specification for Basic fuel schedule, AFM, A/F feedback control value and the other data monitor items can be read. |
| Active test | Diagnostic Test Mode in which CONSULT-II drives some actuators apart from the ECMs and also shifts some parameters in a specified range. |
| Function test | This mode is used to inform customers when their vehicle condition requires periodic maintenance. |
| DTC & SRT confirmation | The status of system monitoring tests and the self-diagnosis status/result can be confirmed. |
| ECM part number | ECM part number can be read. |

*1: The following emission-related diagnostic information is cleared when the ECM memory is erased.
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values
- Others

## CONSULT-II Function (Cont'd)

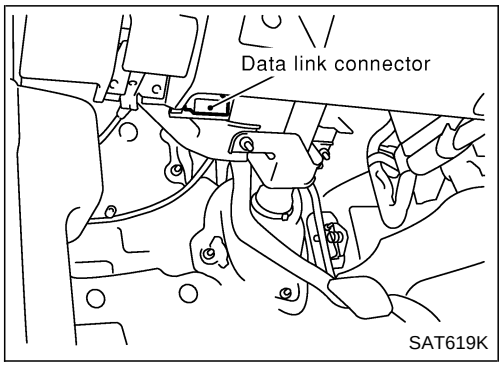
### ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

| Item | | | DIAGNOSTIC TEST MODE | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | WORK SUP-PORT | SELF-DIAGNOS-TIC RESULTS | | DATA MONI-TOR | DATA MONI-TOR (SPEC) | ACTIVE TEST | DTC & SRT CON-FIRMATION | |
| | | | | DTC*1 | FREEZE FRAME DATA | | | | SRT STATUS | DTC WORK SUP-PORT |
| ENGINE CONTROL COMPONENT PARTS | INPUT | Crankshaft position sensor (OBD) | | x | x | x | x | | | |
| | | Camshaft position sensor | | x | x | x | x | | | |
| | | Mass air flow sensor | | x | | x | x | | | |
| | | Engine coolant temperature sensor | | x | x | x | x | x | | |
| | | Heated oxygen sensor 1 | | x | | x | x | | x | x |
| | | Heated oxygen sensor 2 | | x | | x | x | | x | x |
| | | Vehicle speed signal | | x | x | x | x | | | |
| | | Accelerator pedal position sensor | | x | | x | x | | | |
| | | Throttle position sensor | | x | | x | x | | | |
| | | Intake air temperature sensor | | x | x | x | x | | | |
| | | Knock sensor | | x | | | | | | |
| | | Refrigerant pressure sensor | | | | x | x | | | |
| | | Closed throttle position switch (accelerator pedal position sensor signal) | | | | x | x | | | |
| | | Air conditioner switch | | | | x | x | | | |
| | | Park/neutral position (PNP) switch | | x | | x | x | | | |
| | | Stop lamp switch | | x | | x | x | | | |
| | | Power steering pressure sensor | | x | | x | x | | | |
| | | Battery voltage | | | | x | x | | | |
| | | Electrical load signal | | | | x | x | | | |
| | OUTPUT | Injectors | | | | x | x | x | | |
| | | Power transistor (Ignition timing) | | | | x | x | x | | |
| | | Throttle control motor relay | | x | | x | x | | | |
| | | Throttle control motor | | x | | | | | | |
| | | EVAP canister purge volume control solenoid valve | | x | | x | x | x | | |
| | | Air conditioner relay | | | | x | x | | | |
| | | Fuel pump relay | x | | | x | x | x | | |
| | | Cooling fan relay | | x | | x | x | x | | |
| | | Heated oxygen sensor 1 heater | | x | | x | x | | x | |
| | | Heated oxygen sensor 2 heater | | x | | x | x | | x | |
| | | Intake valve timing control solenoid valve | | x | | x | x | x | | |
| | | Calculated load value | | | x | x | x | | | |
| | | VIAS control solenoid valve | | | | x | x | x | | |

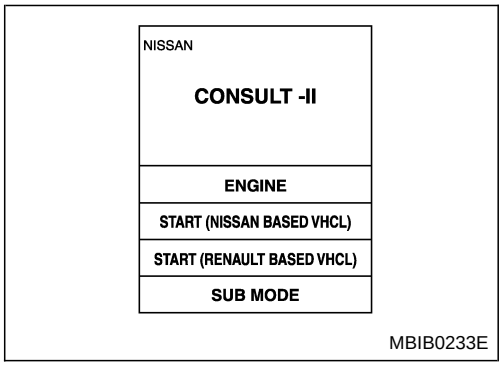
x: Applicable
*1: This item includes 1st trip DTCs.
*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-II screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-41, "FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA".

# CONSULT-II Function (Cont'd)

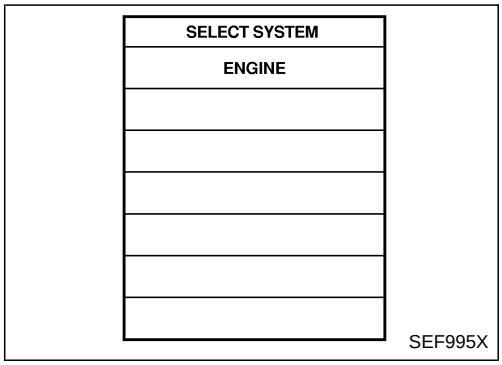
## CONSULT-II INSPECTION PROCEDURE



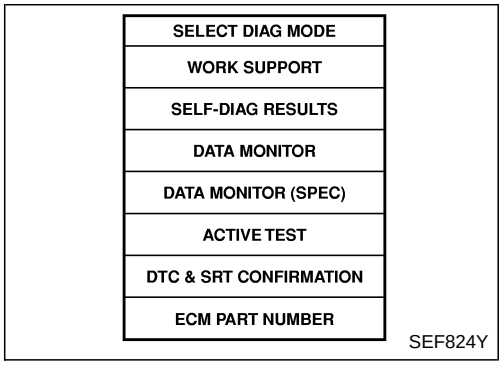

1. Turn ignition switch OFF.
2. Connect "CONSULT-II" and "CONSULT-II CONVERTER" to data link connector, which is located under the drivers side dash panel.
3. Turn ignition switch ON.




4. Touch "START (NISSAN BASED VHCL)".




5. Touch "ENGINE".
   If "ENGINE" is not indicated, go to GI section, "CONSULT-II Data Link Connector (DLC) Circuit".




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

**For further information, see the CONSULT-II Operation Manual.**

# CONSULT-II Function (Cont'd)

## WORK SUPPORT MODE

### Work item

| WORK ITEM | CONDITION | USAGE |
|---|---|---|
| FUEL PRESSURE RELEASE | ● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING.<br>CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |
| IDLE AIR VOL LEARN | ● THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM. | When learning the idle air volume |
| SELF-LEARNING CONT | ● THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT. | When clearing the coefficient of self-learning control value |
| TARGET IDLE RPM ADJ* | ● IDLE CONDITION | When setting target idle speed |
| TARGET IGN TIM ADJ* | ● IDLE CONDITION | When adjusting target ignition timing |

*: This function is not necessary in the usual service procedure.

## SELF-DIAG RESULTS MODE

### Self diagnostic item

Regarding items of "DTC and 1st trip DTC", refer to EC-9, "INDEX FOR DTC".

### Freeze frame data and 1st trip freeze frame data

| Freeze frame data item*1 | Description |
|---|---|
| DIAG TROUBLE CODE [PXXXX] | ● The engine control component part/control system has a trouble code, it is displayed as "PXXXX". (Refer to EC-9, "INDEX FOR DTC".) |
| FUEL SYS-B1 | ● "Fuel injection system status" at the moment a malfunction is detected is displayed.<br>● One mode in the following is displayed.<br>"MODE 2": Open loop due to detected system malfunction<br>"MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment)<br>"MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control<br>"MODE 5": Open loop - has not yet satisfied condition to go to closed loop |
| FUEL SYS-B2 | |
| CAL/LD VALUE [%] | ● The calculated load value at the moment a malfunction is detected is displayed. |
| COOLANT TEMP [°C] or [°F] | ● The engine coolant temperature at the moment a malfunction is detected is displayed. |
| L-FUEL TRIM-B1 [%] | ● "Long-term fuel trim" at the moment a malfunction is detected is displayed.<br>● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim. |
| S-FUEL TRIM-B1 [%] | ● "Short-term fuel trim" at the moment a malfunction is detected is displayed.<br>● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule. |
| ENGINE SPEED [rpm] | ● The engine speed at the moment a malfunction is detected is displayed. |
| VHCL SPEED [km/h] or [mph] | ● The vehicle speed at the moment a malfunction is detected is displayed. |
| B/FUEL SCHDL [msec] | ● The base fuel schedule at the moment a malfunction is detected is displayed. |
| INT/A TEMP SE [°C] or [°F] | ● The intake air temperature at the moment a malfunction is detected is displayed. |

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

# CONSULT-II Function (Cont'd)

## DATA MONITOR MODE

### Monitored item

x: Applicable

| Monitored item [Unit] | ECM INPUT SIGNALS | MAIN SIGNALS | CAN DIAG SUPPORT MNTR | Description | Remarks |
|---|---|---|---|---|---|
| ENG SPEED [rpm] | x | x | | ● Indicates the engine speed computed from the POS signal (1° signal) of the camshaft position sensor. | ● Accuracy becomes poor if engine speed drops below the idle rpm.<br>● If the signal is interrupted while the engine is running, an abnormal value may be indicated. |
| MAS A/F SE-B1 [V] | x | x | | ● The signal voltage of the mass air flow sensor is displayed. | ● When the engine is stopped, a certain value is indicated. |
| B/FUEL SCHDL [msec] | | x | | ● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | |
| A/F ALPHA-B1 [%] | | x | | ● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | ● When the engine is stopped, a certain value is indicated.<br>● This data also includes the data for the air-fuel ratio learning control. |
| A/F ALPHA-B2 [%] | | x | | | |
| COOLAN TEMP/S [°C] or [°F] | x | x | | ● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed. | ● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed. |
| HO2S1 (B1) [V] | x | x | | ● The signal voltage of the heated oxygen sensor 1 is displayed. | |
| HO2S1 (B2) [V] | x | | | | |
| HO2S2 (B1) [V] | x | x | | ● The signal voltage of the heated oxygen sensor 2 is displayed. | |
| HO2S2 (B2) [V] | x | | | | |
| HO2S1 MNTR (B1) [RICH/LEAN] | x | x | | ● Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control:<br>RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture.<br>LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture. | ● After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins.<br>● When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously. |
| HO2S1 MNTR (B2) [RICH/LEAN] | x | | | | |
| HO2S2 MNTR (B1) [RICH/LEAN] | x | | | ● Display of heated oxygen sensor 2 signal:<br>RICH ... means the amount of oxygen after three way catalyst is relatively small.<br>LEAN ... means the amount of oxygen after three way catalyst is relatively large. | ● When the engine is stopped, a certain value is indicated. |
| HO2S2 MNTR (B2) [RICH/LEAN] | x | | | | |
| VHCL SPEED SE [km/h] or [mph] | x | x | | ● The vehicle speed computed from the vehicle speed signal is displayed. | |

## CONSULT-II Function (Cont'd)

| Monitored item [Unit] | ECM INPUT SIG-NALS | MAIN SIG-NALS | CAN DIAG SUP-PORT MNTR | Description | Remarks |
|---|---|---|---|---|---|
| BATTERY VOLT [V] | x | x | | ● The power supply voltage of ECM is displayed. | |
| ACCEL SEN 1 [V] | x | x | | ● The accelerator pedal position sensor signal voltage is displayed. | |
| ACCEL SEN 2 [V] | x | | | | |
| THRTL SEN 1 [V] | x | x | | ● The throttle position sensor signal voltage is displayed. | |
| THRTL SEN 2 [V] | x | | | | |
| INT/A TEMP SE [°C] or [°F] | x | x | | ● The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated. | |
| START SIGNAL [ON/OFF] | x | x | | ● Indicates [ON/OFF] condition of the starter signal computed from the signals of the crankshaft position sensor (POS), camshaft position sensor (PHASE) and battery voltage. | ● After starting the engine, [OFF] is displayed regardless of the starter signal. |
| CLSD THL POS [ON/OFF] | x | x | | ● Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. | |
| AIR COND SIG [ON/OFF] | x | x | | ● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| P/N POSI SW [ON/OFF] | x | x | | ● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal. | |
| PW/ST SIGNAL [ON/OFF] | x | x | | ● [ON/OFF] condition of the power steering oil pressure switch as determined by the power steering oil pressure signal is indicated. | |
| LOAD SIGNAL [ON/OFF] | x | x | | ● Indicates [ON/OFF] condition from the electrical load signal.<br>ON ... Rear window defogger switch is ON and/or lighting switch is in 2nd position.<br>OFF ... Both rear window defogger switch and lighting switch are OFF. | |
| IGNITION SW [ON/OFF] | x | | | ● Indicates [ON/OFF] condition from ignition switch. | |
| BRAKE SW [ON/OFF] | x | | | ● Indicates [ON/OFF] condition from the stop lamp switch signal. | |
| INJ PULSE-B1 [msec] | | x | | ● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals. | ● When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-B2 [msec] | | | | | |
| IGN TIMING [BTDC] | | x | | ● Indicates the ignition timing computed by ECM according to the input signals. | ● When the engine is stopped, a certain value is indicated. |

## CONSULT-II Function (Cont'd)

| Monitored item [Unit] | ECM INPUT SIG-NALS | MAIN SIG-NALS | CAN DIAG SUP-PORT MNTR | Description | Remarks |
|---|---|---|---|---|---|
| CAL/LD VALUE [%] | | | | ● "Calculated load value" indicates the value of the current airflow divided by peak airflow. | |
| MASS AIRFLOW [g·m/s] | | | | ● Indicates the mass airflow computed by ECM according to the signal voltage of the mass air flow sensor. | |
| PURG VOL C/V [%] | | | | ● Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals.<br>● The opening becomes larger as the value increases. | |
| VIAS S/V [ON/OFF] | | | | ● The control condition of the VIAS control solenoid valve (determined by ECM according to the input signal) is indicated.<br>● OFF ... VIAS control solenoid valve is not operating.<br>● ON ... VIAS control solenoid valve is operating. | |
| INT/V SOL (B1) [%] | | | | ● The control condition of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated.<br>ON ... intake valve timing control is operating.<br>OFF ... Intake valve timing control is not operating. | |
| AIR COND RLY [ON/OFF] | | x | | ● The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. | |
| FUEL PUMP RLY [ON/OFF] | | x | | ● Indicates the fuel pump relay control condition determined by ECM according to the input signals. | |
| THRTL RELAY [ON/OFF] | | x*2 | | ● Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. | |
| COOLING FAN [HI/LOW/OFF] | | | | ● Indicates the condition of the cooling fan (determined by ECM according to the input signals).<br>HI ... High speed operation<br>LOW ... Low speed operation<br>OFF ... Stop | |
| HO2S1 HTR (B1) [ON/OFF] | | | | ● Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals. | |
| HO2S1 HTR (B2) [ON/OFF] | | | | | |

## CONSULT-II Function (Cont'd)

| Monitored item [Unit] | ECM INPUT SIG-NALS | MAIN SIG-NALS | CAN DIAG SUP-PORT MNTR | Description | Remarks |
|---|---|---|---|---|---|
| HO2S2 HTR (B1) [ON/OFF] | | | | ● Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals. | |
| HO2S2 HTR (B2) [ON/OFF] | | | | | |
| IDL A/V LEARN [YET/CMPLT] | | | | ● Display the condition of idle air volume learning<br>YET ... Idle air volume learning has not been performed yet.<br>CMPLT ... Idle air volume learning has already been performed successfully. | |
| TRVL AFTER MIL [km] or [mile] | | | | ● Distance traveled while MI is activated. | |
| O2SEN HTR DTY [%] | | | | ● Indicates the heated oxygen sensor 1 heater control value computed by the ECM according to the input signals. | |
| AC PRESS SEN [V] | x | | | ● The signal voltage from the refrigerant pressure sensor is displayed. | |
| Voltage [V] | | | | ● Voltage, frequency, duty cycle or pulse width measured by the probe. | ● Only "#" is displayed if item is unable to be measured.<br>● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured. |
| Frequency [msec], [Hz] or [%] | | | | | |
| DUTY-HI | | | | | |
| DUTY-LOW | | | | | |
| PLS WIDTH-HI | | | | | |
| PLS WIDTH-LOW | | | | | |
| CAN COMM [OK/NG] | | | x | ● Indicates the communication condition of CAN communication line. | ● These items are not displayed in "SELECTION FROM MENU" mode. |
| CAN CIRC 1 [OK/UNKWN] | | | x | | |
| CAN CIRC 2 [OK/UNKWN] | | | x | | |
| CAN CIRC 3 [OK/UNKWN] | | | x | | |
| CAN CIRC 4 [OK/UNKWN] | | | x | | |
| CAN CIRC 5 [OK/UNKWN] | | | x | | |
| CAN CIRC 6 [OK/UNKWN] | | | x | | |
| CAN CIRC 7 [OK/UNKWN] | | | x | | |

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

# CONSULT-II Function (Cont'd)

## DATA MONITOR (SPEC) MODE

### Monitored item

| Monitored item [Unit] | ECM input signals | Main signals | Description | Remarks |
|---|---|---|---|---|
| ENG SPEED [rpm] | x | x | ● Indicates the engine speed computed from the POS signal (1° signal) of the camshaft position sensor. | |
| MAS A/F SE-B1 [V] | x | x | ● The signal voltage of the mass air flow sensor specification is displayed. | ● When engine is running specification range is indicated. |
| B/FUEL SCHDL [msec] | | x | ● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | ● When engine is running specification range is indicated. |
| A/F ALPHA-B1 [%] | | x | ● The mean value of the air-fuel ratio feedback correction factor per cycle is indicated. | ● When engine is running specification range is indicated.<br>● This data also includes the data for the air-fuel ratio learning control. |
| A/F ALPHA-B2 [%] | | x | | |

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

## ACTIVE TEST MODE

### Test item

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| FUEL INJECTION | ● Engine: Return to the original trouble condition<br>● Change the amount of fuel injection using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Harness and connectors<br>● Fuel injectors<br>● Heated oxygen sensor 1 |
| IGNITION TIMING | ● Engine: Return to the original trouble condition<br>● Timing light: Set<br>● Retard the ignition timing using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Perform "Idle Air Volume Learning". |
| POWER BALANCE | ● Engine: After warming up, idle the engine.<br>● A/C switch "OFF"<br>● Shift lever "N"<br>● Cut off each injector signal one at a time using CONSULT-II. | Engine runs rough or dies. | ● Harness and connectors<br>● Compression<br>● Fuel injectors<br>● Power transistor<br>● Spark plugs<br>● Ignition coils |
| COOLING FAN* | ● Ignition switch: ON<br>● Turn the cooling fan "ON" and "OFF" with CONSULT-II. | Cooling fan moves and stops. | ● Harness and connectors<br>● Cooling fan relay<br>● Cooling fan motor |
| ENG COOLANT TEMP | ● Engine: Return to the original trouble condition<br>● Change the engine coolant temperature using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Harness and connectors<br>● Engine coolant temperature sensor<br>● Fuel injectors |
| FUEL PUMP RELAY | ● Ignition switch: ON (Engine stopped)<br>● Turn the fuel pump relay "ON" and "OFF" using CONSULT-II and listen to operating sound. | Fuel pump relay makes the operating sound. | ● Harness and connectors<br>● Fuel pump relay |
| VIAS SOL VALVE | ● Ignition switch: ON<br>● Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound. | Solenoid valve makes an operating sound. | ● Harness and connectors<br>● Solenoid valve |

## CONSULT-II Function (Cont'd)

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|---|---|---|---|
| PURG VOL CONT/V | ● Engine: After warming up, run engine at 1,500 rpm.<br>● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II. | Engine speed changes according to the opening percent. | ● Harness and connectors<br>● Solenoid valve |
| V/T ASSIGN ANGLE | ● Engine: Return to the original trouble condition<br>● Change intake valve timing using CONSULT-II. | If trouble symptom disappears, see CHECK ITEM. | ● Harness and connectors<br>● Intake valve timing control solenoid valve |

*: Leaving cooling fan "OFF" with CONSULT-II while engine is running may cause the engine to overheat.

### DTC & SRT CONFIRMATION MODE

### SRT STATUS mode

For details, refer to EC-42, "SYSTEM READINESS TEST (SRT) CODE".

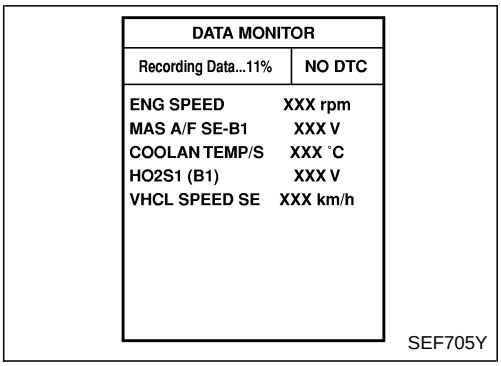
### SRT work support mode

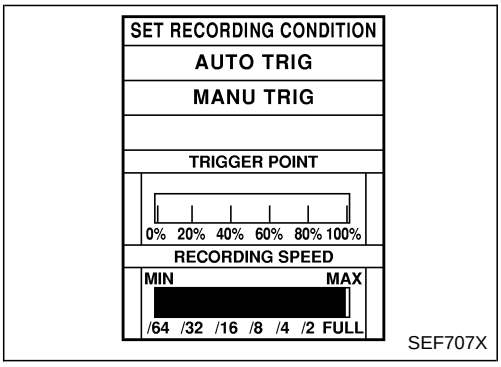
This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

### DTC work support mode

| Test mode | Test item | Condition | Reference page |
|---|---|---|---|
| HO2S1 | HO2S1 (B1) P0133, P0153 | Refer to corresponding trouble diagnosis for DTC. | EC-172 |
| | HO2S1 (B1) P0134, P0154 | | EC-185 |
| | HO2S1 (B1) P1143, P1163 | | EC-320 |
| | HO2S1 (B1) P1144, P1164 | | EC-327 |
| H02S2 | HO2S2 (B1) P0139, P0159 | | EC-205 |
| | HO2S2 (B1) P1146, P1166 | | EC-335 |
| | HO2S2 (B1) P1147, P1167 | | EC-348 |

# CONSULT-II Function (Cont'd)




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

### Description

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

1. "AUTO TRIG" (Automatic trigger):

- The malfunction will be identified on the CONSULT-II screen in real time.
  In other words, DTC/1st trip DTC and malfunction item will be displayed if the malfunction is detected by ECM.
  At the moment a malfunction is detected by ECM, "MONITOR" in "DATA MONITOR" screen is changed to "Recording Data ... xx%" as shown at right, and the data after the malfunction detection is recorded. Then when the percentage reached 100%, "REAL-TIME DIAG" screen is displayed. If "STOP" is touched on the screen during "Recording Data ... xx%", "REAL-TIME DIAG" screen is also displayed.
  The recording time after the malfunction detection and the recording speed can be changed by "TRIGGER POINT" and "Recording Speed". Refer to CONSULT-II OPERATION MANUAL.

2. "MANU TRIG" (Manual trigger):

- DTC/1st trip DTC and malfunction item will not be displayed automatically on CONSULT-II screen even though a malfunction is detected by ECM.
  DATA MONITOR can be performed continuously even though a malfunction is detected.

### Operation

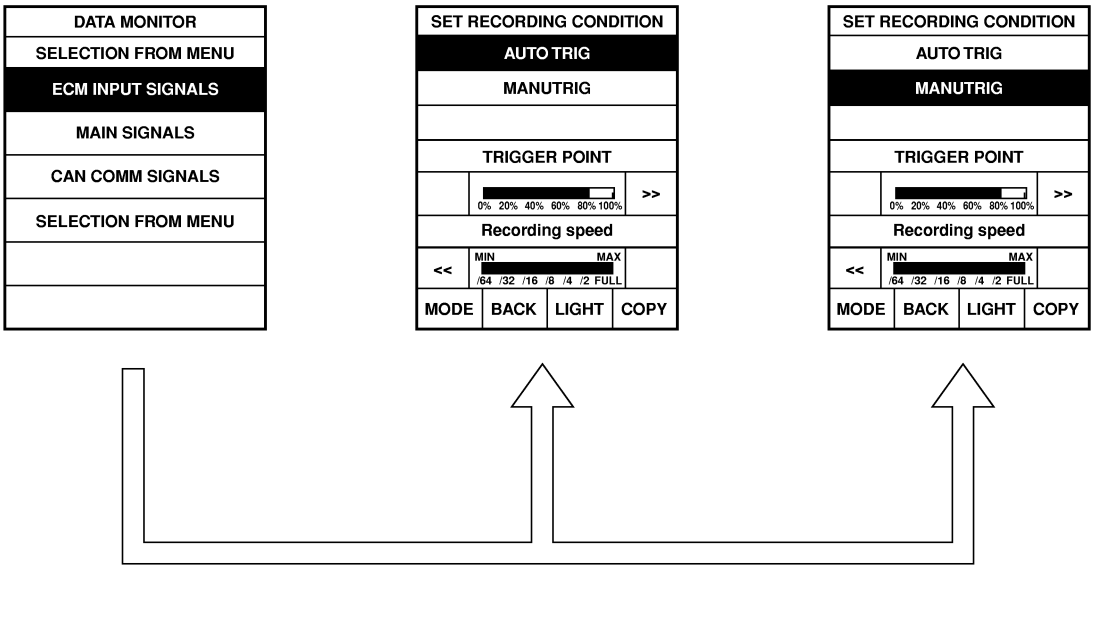
1. "AUTO TRIG"

- While trying to detect the DTC/1st trip DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II 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 "Incident Simulation Tests" in GI section.)

2. "MANU TRIG"

- If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT-II 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.

## CONSULT-II Function (Cont'd)

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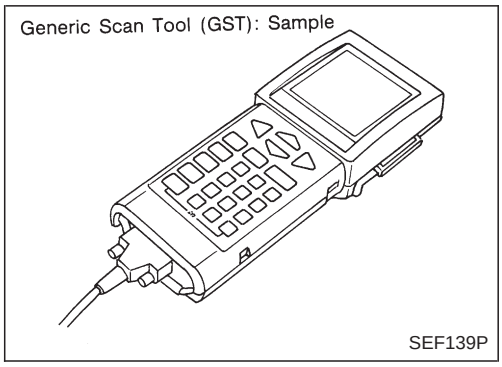


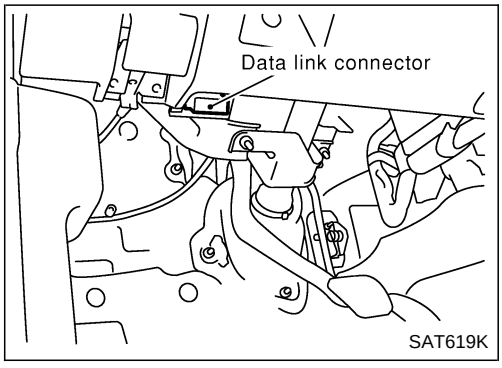

# Generic Scan Tool (GST) Function

## DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO 15031-4 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.

## FUNCTION

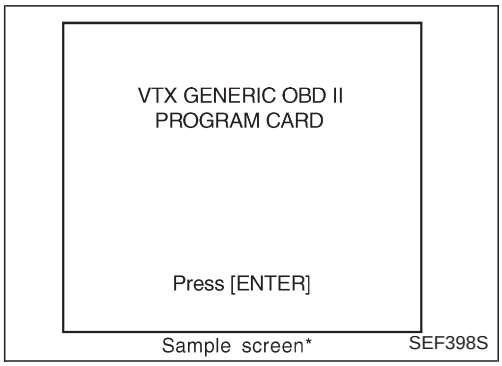
| Diagnostic test mode | | Function |
|---|---|---|
| MODE 1 | READINESS TESTS | This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information. |
| MODE 2 | (FREEZE DATA) | This mode gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-41, “FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA”. |
| MODE 3 | DTCs | This mode gains access to emission-related power train trouble codes which were stored by ECM. |
| MODE 4 | CLEAR DIAG INFO | This mode can clear all emission-related diagnostic information. This includes:<br>● Clear number of diagnostic trouble codes (MODE 1)<br>● Clear diagnostic trouble codes (MODE 3)<br>● Clear trouble code for freeze frame data (MODE 1)<br>● Clear freeze frame data (MODE 2)<br>● Reset status of system monitoring test (MODE 1)<br>● Clear on board monitoring test results (MODE 6 and 7) |
| MODE 6 | (ON BOARD TESTS) | This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored. |
| MODE 7 | (ON BOARD TESTS) | This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions. |
| MODE 8 | — | This mode is not applicable on this vehicle. |
| MODE 9 | (CALIBRATION ID) | This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs. |




## GST INSPECTION PROCEDURE

1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under the driver side dash panel near the fuse box cover.
3. Turn ignition switch ON.

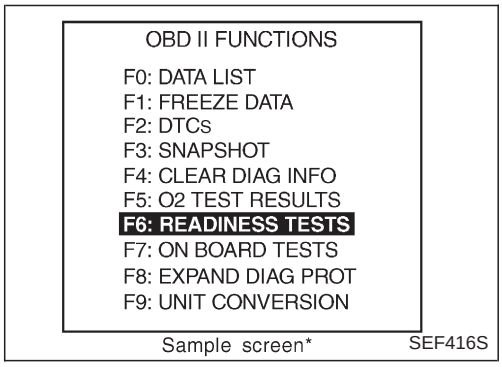
## Generic Scan Tool (GST) Function (Cont'd)



Sample screen* SEF398S

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

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



Sample screen* SEF416S

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

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

## CONSULT-II 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.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| ENG SPEED | ● Tachometer: Connect<br>● Run engine and compare CONSULT-II value with the tachometer indication. | | Almost the same speed as the tachometer indication. |
| MAS A/F SE-B1 | ● Engine: After warming up<br>● Air conditioner switch: OFF<br>● Shift lever: N<br>● No-load | Idle | Approx. 1.3 - 1.7V |
| | | 2,500 rpm | Approx. 1.7 - 2.4V |
| B/FUEL SCHDL | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 5.0 - 5.5 msec |
| | | 2,000 rpm | 5.0 - 5.5 msec |
| A/F ALPHA-B1<br>A/F ALPHA-B2 | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 75% - 125% |
| COOLAN TEMP/S | ● Engine: After warming up | | More than 70°C (158°F) |
| HO2S1 (B1)<br>HO2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S2 (B1)<br>HO2S2 (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle up to 3,000 rpm quickly. | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S1 MNTR (B1)<br>HO2S1 MNTR (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |
| HO2S2 MNTR (B1)<br>HO2S2 MNTR (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle up to 3,000 rpm quickly. | LEAN ←→ RICH |
| VEH SPEED SE | ● Turn drive wheels and compare CONSULT-II value with the speedometer indication. | | Almost the same speed as the speedometer indication |
| BATTERY VOLT | ● Ignition switch: ON (Engine stopped) | | 11 - 14V |
| ACCEL SEN1<br>ACCEL SEN2* | ● Ignition switch: ON (engine stopped)<br>● Shift lever: D | Accelerator pedal: Fully released | More than 0.36V |
| | | Accelerator pedal: Fully depressed | Less than 4.75V |
| THRTL SEN1<br>THRTL SEN2* | ● Ignition switch: ON (Engine stopped)<br>● Shift lever: D | Accelerator pedal: Fully released | More than 0.5V |
| | | Accelerator pedal: Fully depressed | Less than 1.5V |
| START SIGNAL | ● Ignition switch: ON → START → ON | | OFF → ON → OFF |
| CLSD THL POS | ● Ignition switch: ON | Accelerator pedal: Fully released | ON |
| | | Accelerator pedal: Slightly depressed | OFF |

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

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| AIR COND SIG | ● Engine: After warming up, idle the engine | Air conditioner switch: OFF | OFF |
| | | Air conditioner switch: ON (Compressor operates.) | ON |
| P/N POSI SW | ● Ignition switch: ON | Shift lever: P or N | ON |
| | | Shift lever: Except above | OFF |
| PW/ST SIGNAL | ● Engine: After warming up, idle the engine | Steering wheel is in neutral position. (Forward direction) | OFF |
| | | Steering wheel is turned. | ON |
| LOAD SIGNAL | ● Ignition switch: ON | Rear window defogger switch is ON and/or lighting switch is in 2nd. | ON |
| | | Rear window defogger switch is OFF and lighting switch is OFF. | OFF |
| IGNITION SW | ● Ignition switch: ON → OFF → ON | | ON → OFF → ON |
| BRAKE SW | ● Ignition switch: ON | Brake pedal: Fully released | OFF |
| | | Brake pedal: Slightly depressed | ON |
| INJ PULSE-B1<br>INJ PULSE-B2 | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 3.0 - 4.0 msec |
| | | 2,000 rpm | 3.0 - 4.0 msec |
| IGN TIMING | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 10°±5° BTDC |
| | | 2,000 rpm | 25° - 45° BTDC |
| CAL/LD VALUE | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 10% - 35% |
| | | 2,500 rpm | 10% - 35% |
| MASS AIRFLOW | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 3.0 - 9.0 g·m/s |
| | | 2,500 rpm | 10.0 - 25.0 g·m/s |
| PURG VOL C/V | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 0% |
| | | 2,000 rpm | 65 - 85% |
| VIAS S/V | ● Engine: After warming up | Idle | OFF |
| | | More than 5,000 rpm | ON |
| INT/V SOL-B1 | ● Engine: Idle | | OFF |
| | ● Engine: After warning up<br>● Engine speed is between 1,000 rpm and 4,200 rpm<br>● Vehicle speed is more than 8 km/h (5 MPH).<br>● During high load condition | | ON |
| AIR COND RLY | ● Engine: After warming up, idle the engine | Air conditioner switch: OFF | OFF |
| | | Air conditioner switch: ON (Compressor operates) | ON |
| FUEL PUMP RLY | ● For 1 seconds after turning ignition switch ON<br>● Engine running or cranking | | ON |
| | ● Except above conditions | | OFF |
| THRTL RELAY | ● Ignition switch: ON | | ON |

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

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| COOLING FAN | ● Engine: After warming up, idle the engine<br>● Air conditioner switch: OFF<br>● Vehicle stopped | Engine coolant temperature is 94°C (201°F) or less | OFF |
| | | Engine coolant temperature is between 95°C (203°F) and 99°C (210°F) | LOW |
| | | Engine coolant temperature is 100°C (212°F) or more | HIGH |
| HO2S1 HTR (B1)<br>HO2S1 HTR (B2) | ● Engine: After warming up<br>● Engine speed: Below 2,800 rpm | | ON |
| | ● Engine speed: Above 2,800 rpm | | OFF |
| HO2S2 HTR (B1)<br>HO2S2 HTR (B2) | ● Engine speed: Below 3,200 rpm after the following conditions are met.<br>● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | | ON |
| | ● Engine speed: Above 3,200 rpm | | OFF |
| TRVL AFTER MIL | ● Ignition switch: ON | Vehicle has traveled after MI has turned ON. | 0 - 65,280 km<br>(0 - 40,565 mile) |
| O2SEN HTR DTY | ● Engine coolant temperature when engine started: More than 80° (176°F)<br>● Engine speed: Below 2,800 rpm | | Approx. 50% |
| AC PRESS SEN | ● Ignition switch: ON (Engine stopped) | | Approx. 1.6V |
| | ● Engine: Idle<br>● Air conditioner switch: OFF | | 1.0 - 2.0V |
| VEH SPEED SE | ● Turn drive wheels and compare speedometer indication with the CONSULT-II value. | | Almost the same speed as the CONSULT-II value |
| CAN COMM | ● Ignition switch: ON | | OK |
| CAN CIRC 1 | | | OK |
| CAN CIRC 2 | | | OK |
| CAN CIRC 3 | | | UNKWN |
| CAN CIRC 4 | | | OK |
| CAN CIRC 5 | | | UNKWN |
| CAN CIRC 6 | | | UNKWN |
| CAN CIRC 7 | | | UNKWN |

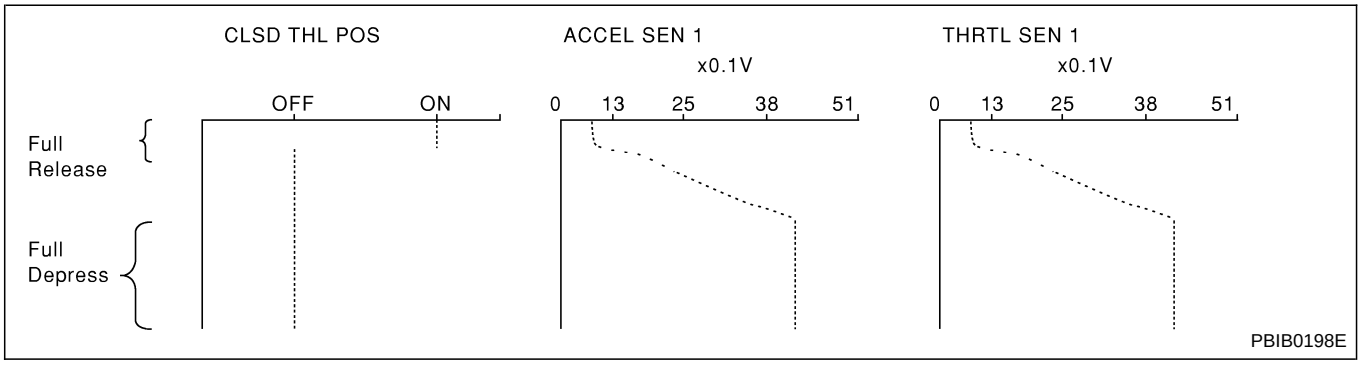
*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

## Major Sensor Reference Graph in Data Monitor Mode

The following are the major sensor reference graphs in “DATA MONITOR” mode.

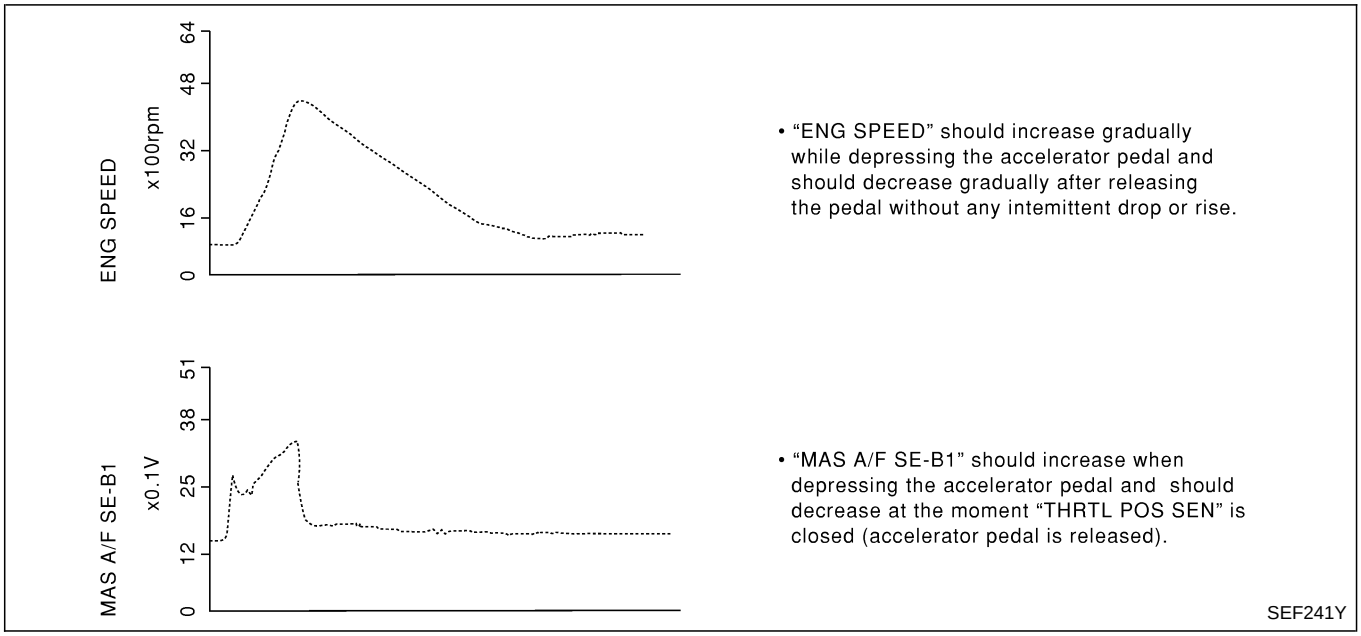
### CLSD THL POS, ACCEL SEN 1, THRTL SEN 1

Below is the data for “CLSD THL POS”, “ACCEL SEN 1” and “THRTL SEN 1” when depressing the accelerator pedal with the ignition switch “ON” and with selector lever in “D” position.
The signal of “ACCEL SEN 1” and “THRTL SEN 1” should rise gradually without any intermittent drop or rise after “CLSD THL POS” is changed from “ON” to “OFF”.

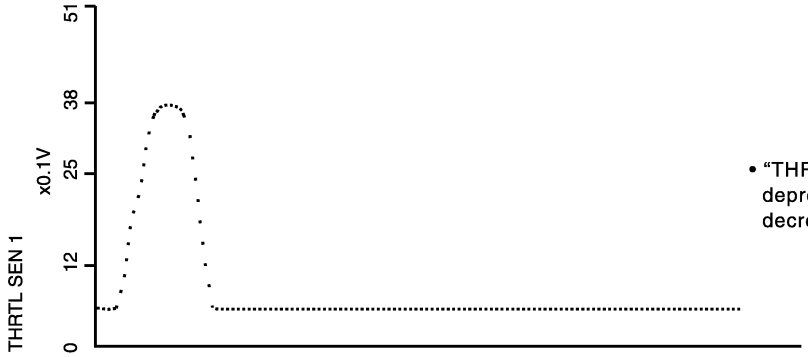



### ENG SPEED, MAS A/F SE-B1, THRTL SEN 1, HO2S2 (B1), HO2S1 (B1), INJ PULSE-B1

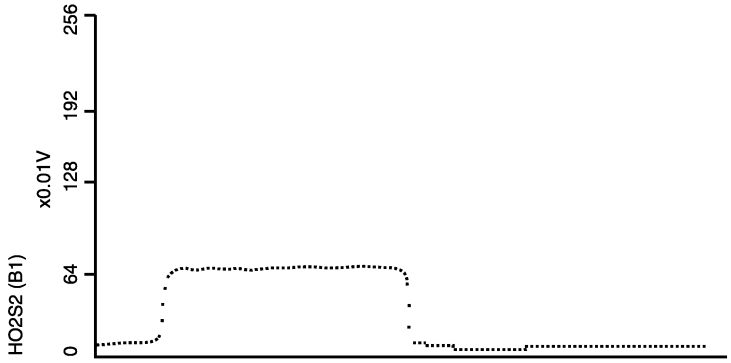
Below is the data for “ENG SPEED”, “MAS A/F SE-B1”, “THRTL SEN 1”, “HO2S2 (B1)”, “HO2S1 (B1)” and “INJ PULSE-B1” when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



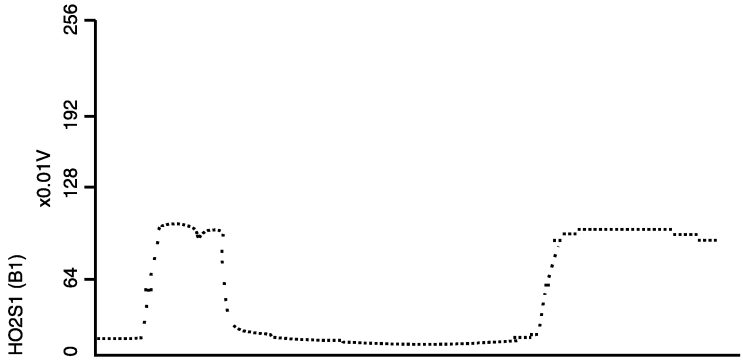
## Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



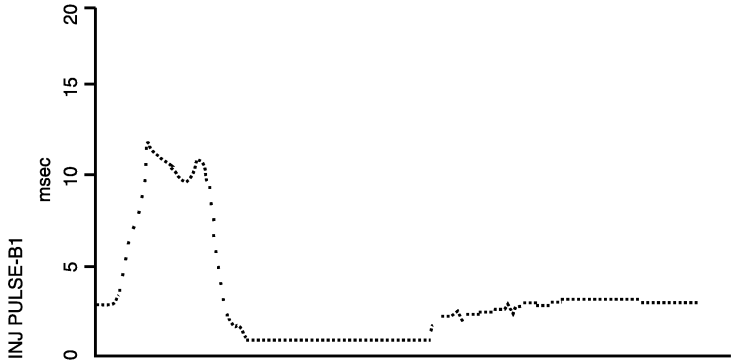

• "THRTL SEN 1" should increase while depressing the accelerator pedal and should decrease while releasing it.




• "HO2S2 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.




• "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.




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

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## Description

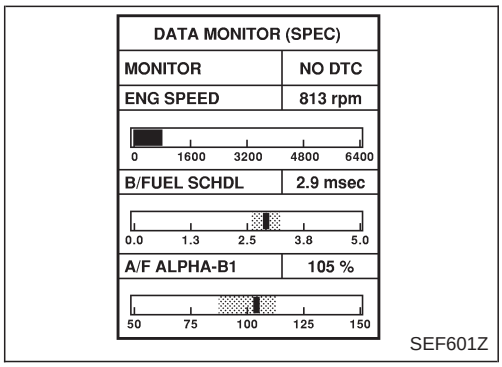
The specification (SP) value indicates the tolerance of the value that is displayed in “DATA MONITOR (SPEC)” mode of CONSULT-II during normal operation of the Engine Control System. When the value in “DATA MONITOR (SPEC)” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “DATA MONITOR (SPEC)” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not light the MIL.
The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

## Testing condition

- Vehicle driven distance: More than 5,000 km (3,017 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.98 - 1.04 bar, 1.003 - 1.064 kg/cm$^2$, 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up*1
- Electrical load: Not applied*2
- Engine speed: Idle

*1: After the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Steering wheel is straight ahead.

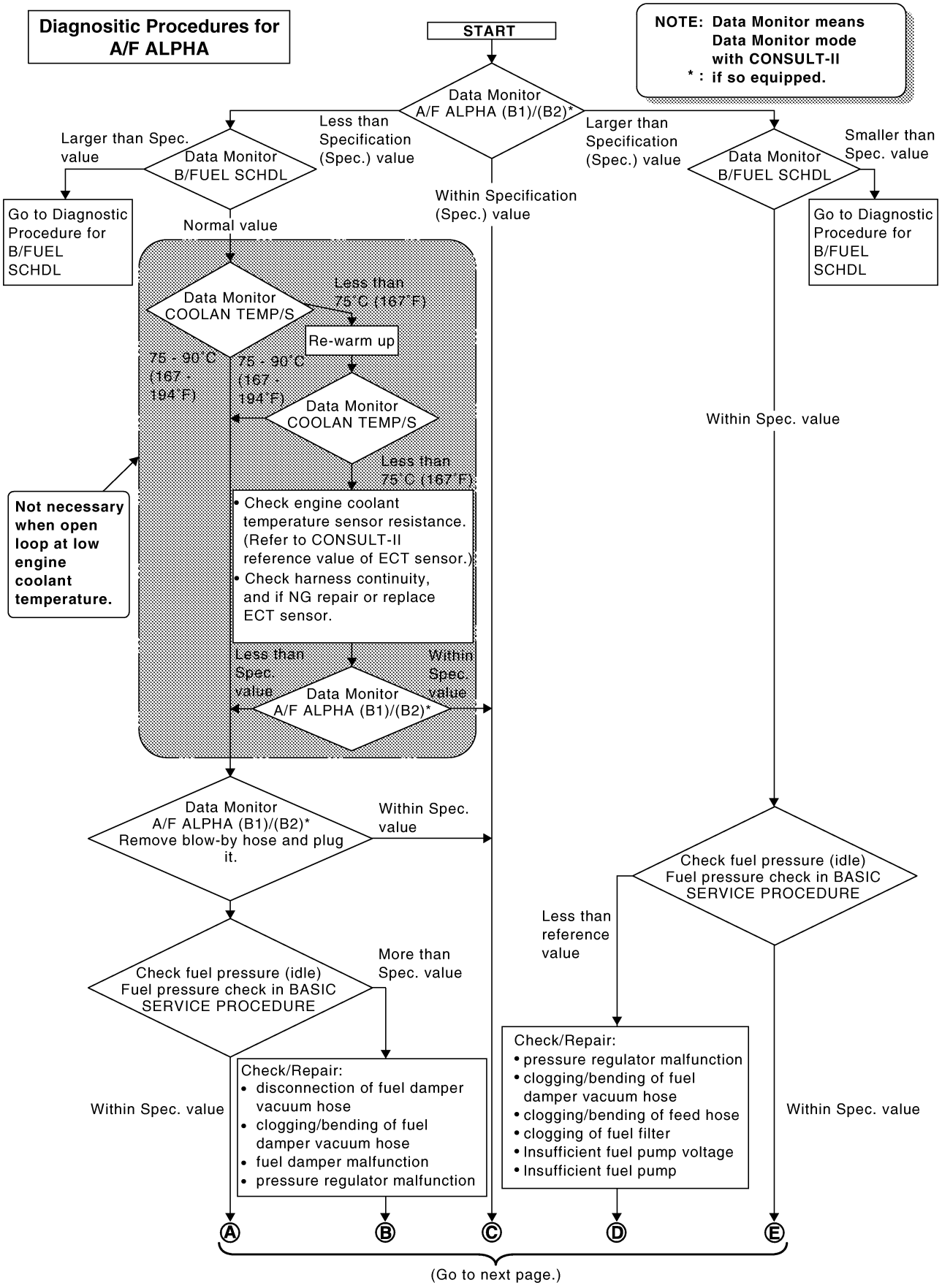



## Inspection Procedure

**NOTE:**
**Perform “DATA MONITOR (SPEC)” mode in maximum scale display.**

1. Perform EC-66, “Basic Inspection”.
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1/B2” and “MAS A/F SE-B1” in “DATA MONITOR (SPEC)” mode with CONSULT-II.
4. Make sure that monitor items are within the SP value.
5. If NG, go to EC-109, “Diagnostic Procedure”.

## Diagnostic Procedure

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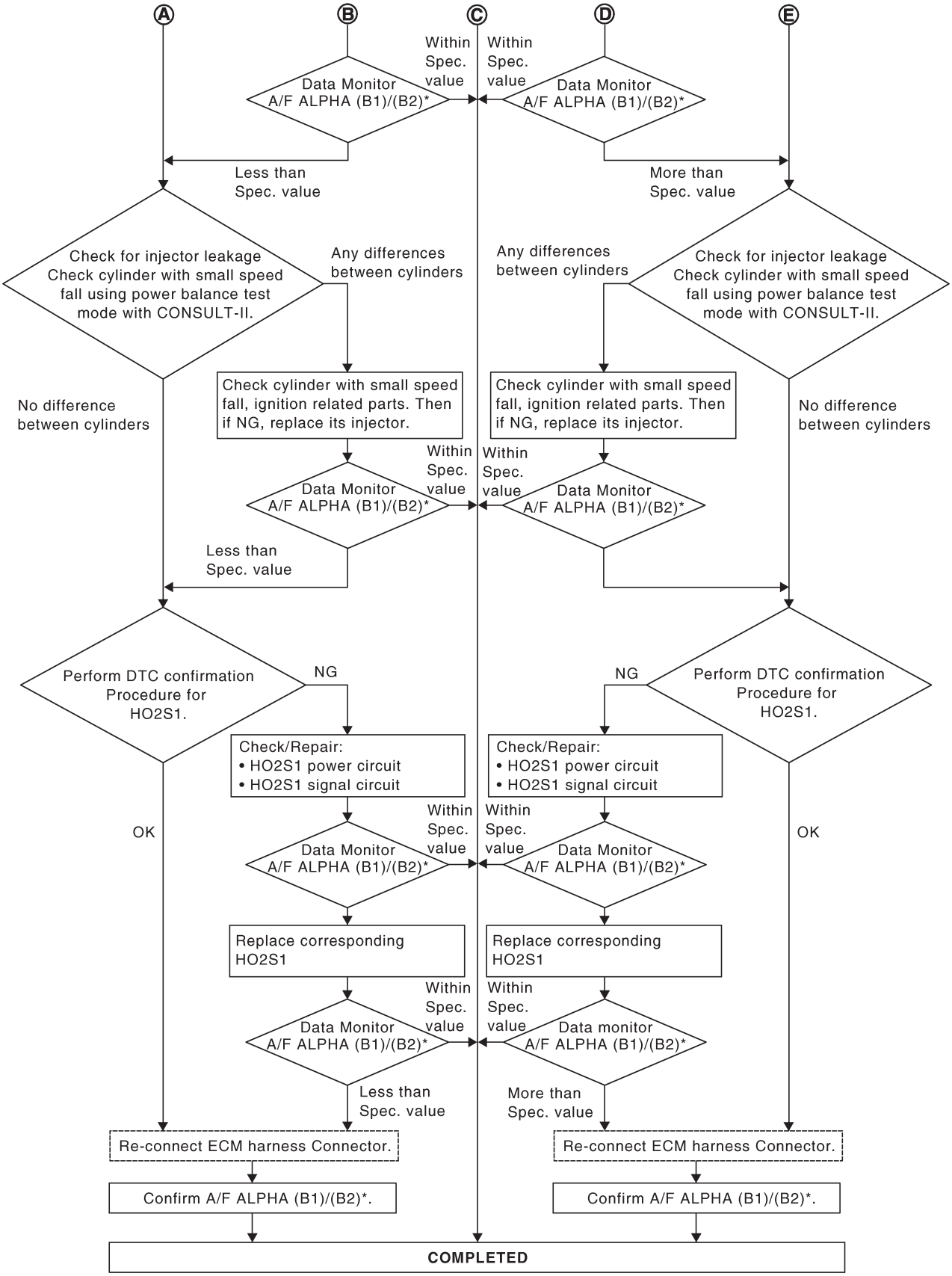
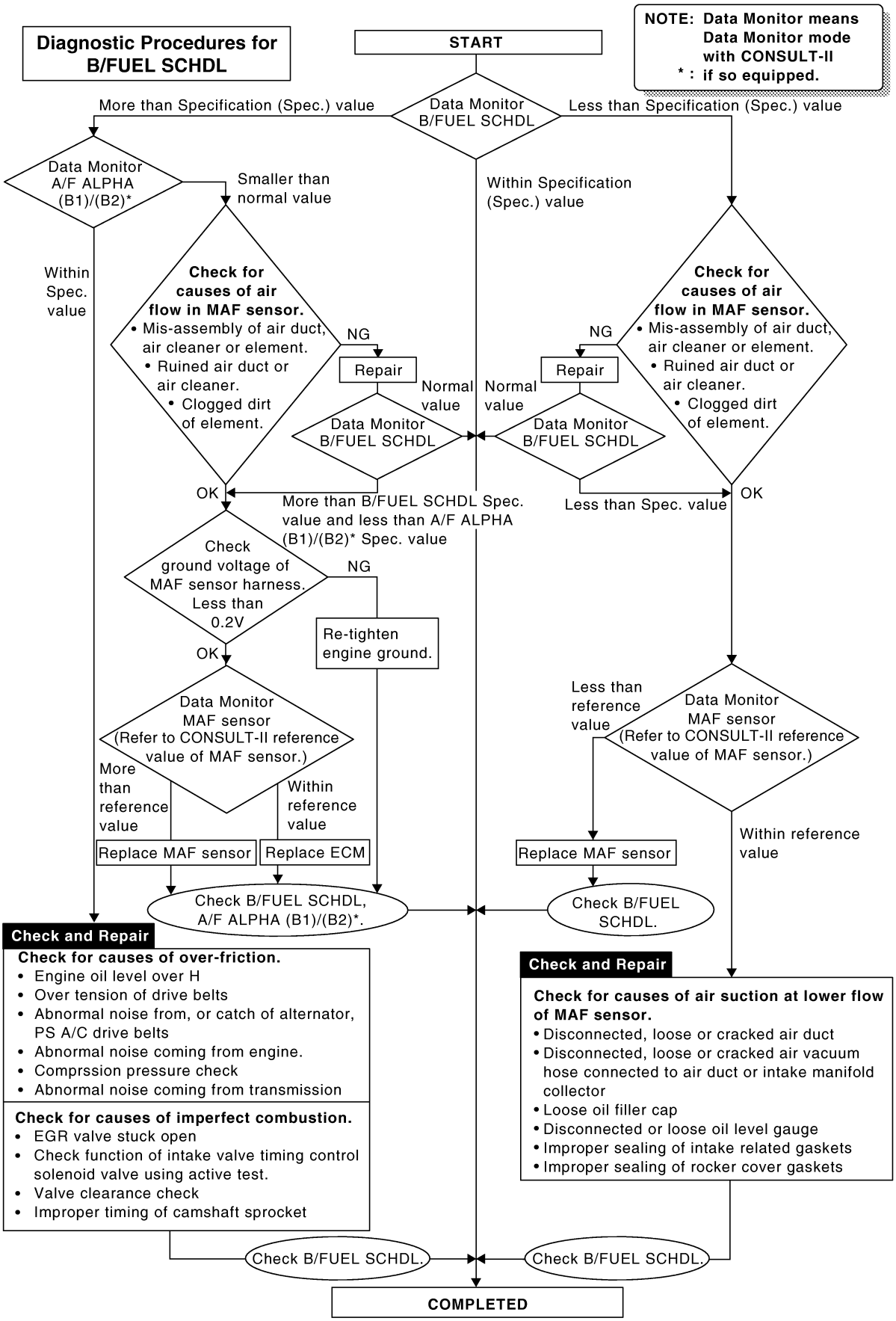
## Diagnostic Procedure (Cont'd)




SEF768Z

## Diagnostic Procedure (Cont'd)




SEF615ZA

## Description

Intermittent incidents (I/I) may occur. In many cases, the malfunction 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 malfunctioning area.

### Common I/I Report Situations

| STEP in Work Flow | Situation |
|---|---|
| II | The CONSULT-II 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 malfunctioning area. |

## Diagnostic Procedure

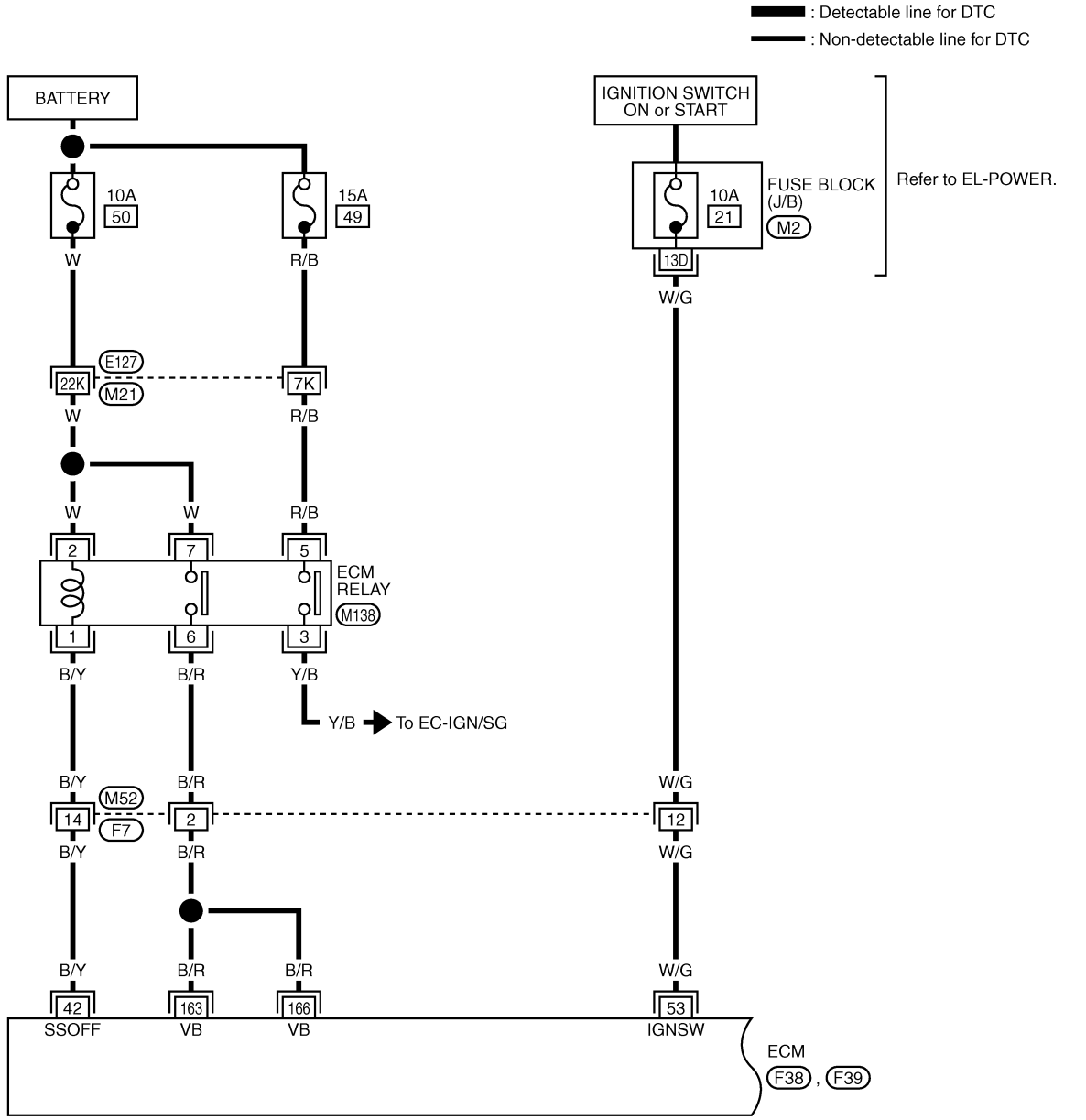
| 1 | INSPECTION START |
|---|---|
| **Erase (1st trip) DTCs. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".** | |
| ► | GO TO 2. |

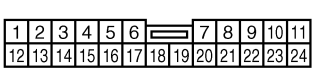
| 2 | CHECK GROUND TERMINALS |
|---|---|
| Check ground terminals for corroding or loose connection.<br>Refer to GI section, "Incident Simulation Tests".<br>**OK or NG** | |
| OK ► | GO TO 3. |
| NG ► | Repair or replace. |

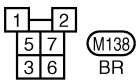
| 3 | SEARCH FOR ELECTRICAL INCIDENT |
|---|---|
| Perform GI section, "Incident Simulation Tests".<br>**OK or NG** | |
| OK ► | **INSPECTION END** |
| NG ► | Repair or replace. |

## Wiring Diagram

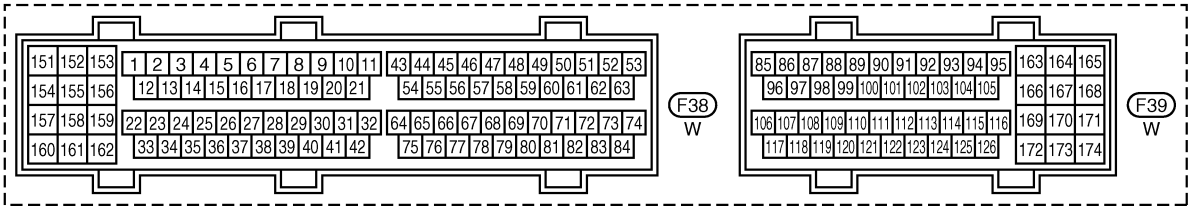
EC-MAIN-01




Refer to last page (Foldout page).
M21 , E127
M2




TEC243M

## Wiring Diagram (Cont'd)

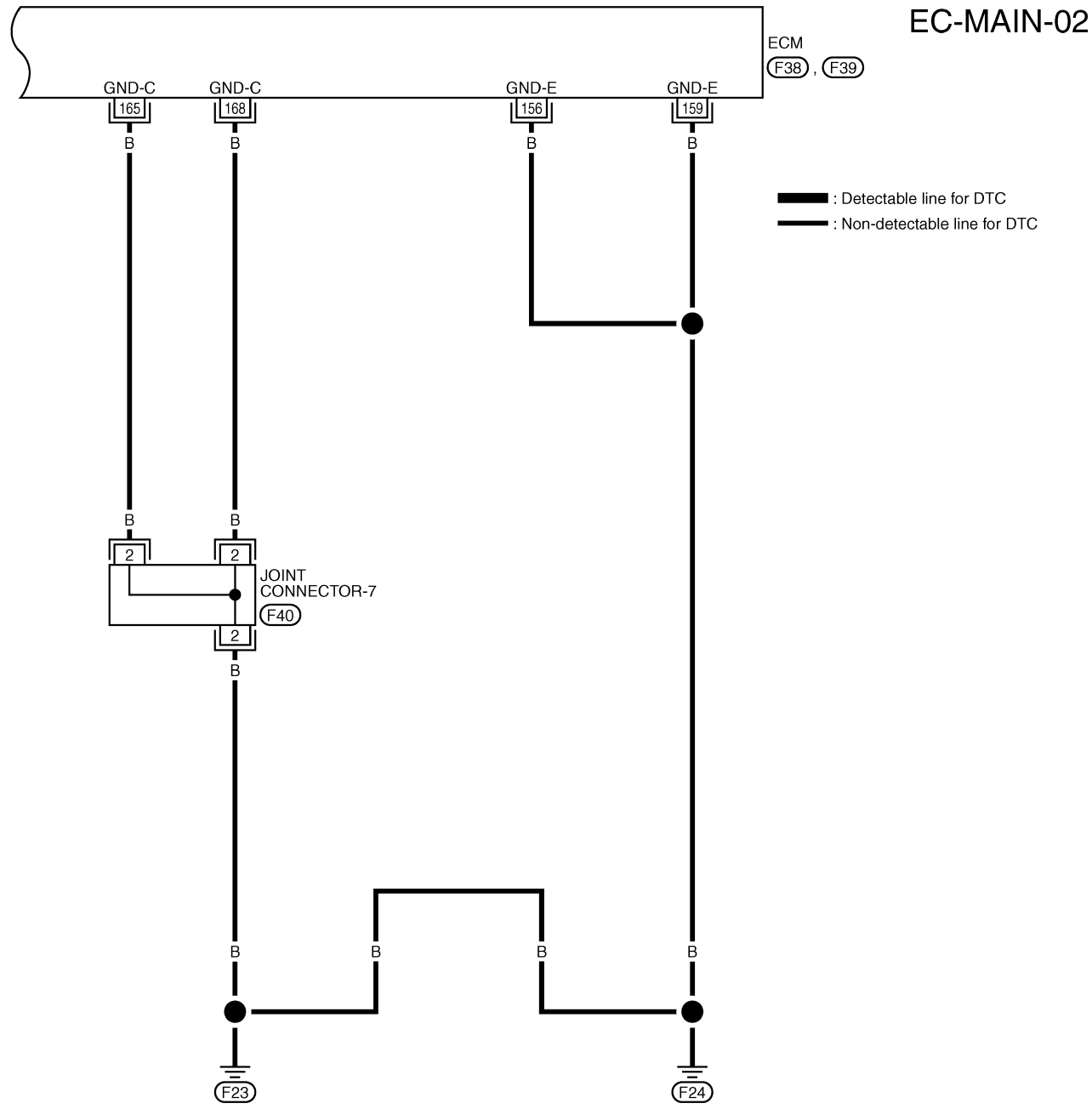
Specification data are reference values and are measured between each terminal and ground.

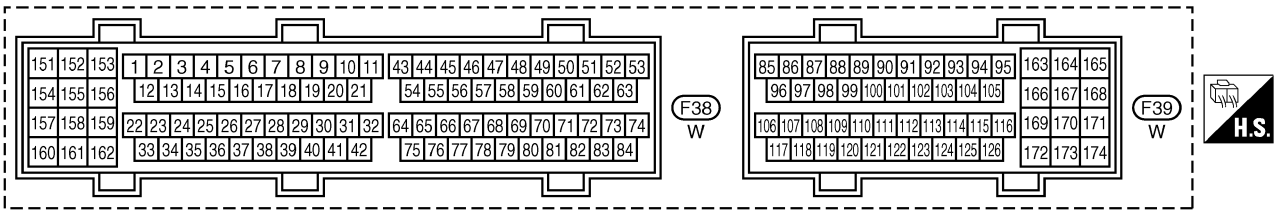
**CAUTION:**

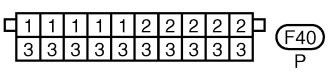
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 42 | B/Y | ECM relay (Self-shutoff) | Engine is running.<br>Ignition switch "OFF"<br>└ For 5 seconds after turning ignition switch "OFF" | 0 - 1.0V |
| | | | Ignition switch "OFF"<br>└ A few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 53 | W/G | Ignition switch | Ignition switch "OFF" | 0V |
| | | | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |
| 163<br>166 | B/R | Power supply for ECM | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

## Wiring Diagram (Cont'd)




TEC144M

## Wiring Diagram (Cont'd)

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.**

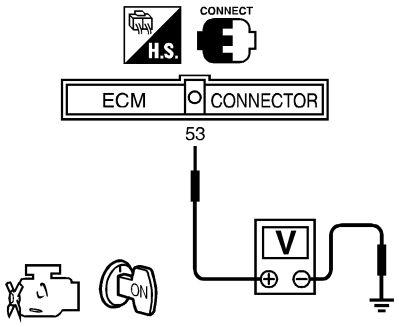
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 156<br>159<br>165<br>168 | B<br>B<br>B<br>B | ECM ground | Engine is running.<br>└ Idle speed | Engine ground |

## Diagnostic Procedure

| 1 | INSPECTION START |
|---|---|
| Start engine.<br>**Is engine running?**<br>**Yes or No** | |
| Yes ► | GO TO 11. |
| No ► | GO TO 2. |

| 2 | CHECK ECM POWER SUPPLY CIRCUIT-I |
|---|---|

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 53 and ground with CONSULT-II or tester.




SEC817C

**Voltage: Battery voltage**

**OK or NG**

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

| 3 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors M52, F7<br>● Fuse block (J/B) connector M2<br>● 10A fuse<br>● Harness for open or short between ECM and fuse | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

## Diagnostic Procedure (Cont'd)

| 4 | CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 156, 159, 165, 168 and engine ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to power.

**OK or NG**

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

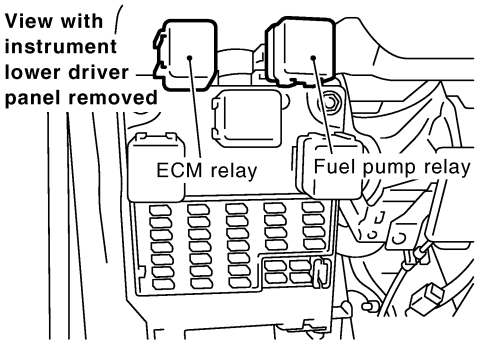
| 5 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Joint connector-7
- Harness for open or short between ECM and ground

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

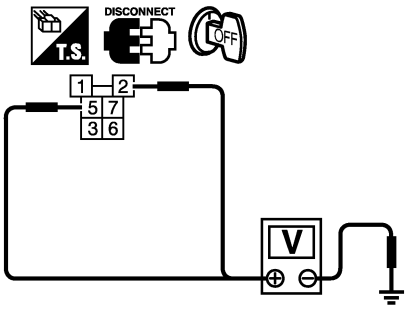
| 6 | CHECK ECM POWER SUPPLY CIRCUIT-II |
|---|---|

1. Disconnect ECM relay.




SEC668D

2. Check voltage between ECM relay terminals 2 and 5 and ground with CONSULT-II or tester.




PBIB0071E

**Voltage: Battery voltage**

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

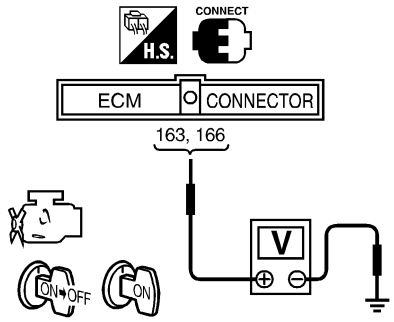
| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● 10A fuse<br>● 15A fuse<br>● Harness for open or short between ECM relay and battery | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Check harness continuity between ECM terminal 42 and ECM relay terminal 1.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 10. |
| NG ► | GO TO 9. |

| 9 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors M52, F7<br>● Harness for open or short between ECM and ECM relay | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 10 | CHECK ECM RELAY |
|---|---|
| **Refer to EC-120.**<br>**OK or NG** | |
| OK ► | GO TO EC-428. |
| NG ► | Replace ECM relay. |

| 11 | CHECK ECM POWER SUPPLY CIRCUIT-III |
|---|---|
| 1. Stop engine and wait at least 10 seconds.<br>2. Turn ignition switch "ON" and then "OFF".<br>3. Check voltage between ECM terminals 163, 166 and ground with CONSULT-II or tester. | |




SEC819C

**Voltage: After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop approximately 0V.**

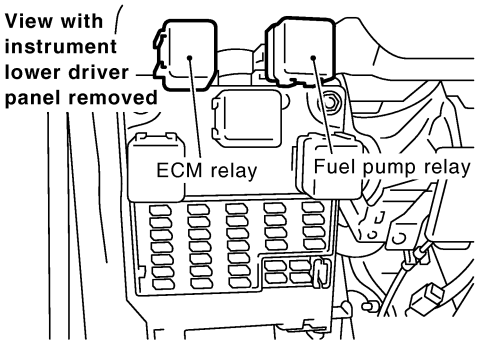
**OK or NG**

| | |
|---|---|
| OK ► | GO TO 15. |
| NG (Battery voltage does not exist.) ► | GO TO 12. |
| NG (Battery voltage exists for more than a few seconds.) ► | GO TO 14. |

## Diagnostic Procedure (Cont'd)

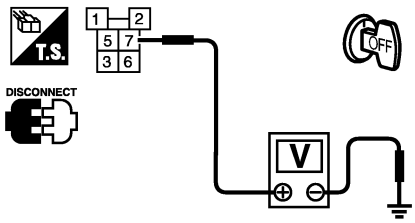
| 12 | CHECK ECM POWER SUPPLY CIRCUIT-IV |
|---|---|

1. Disconnect ECM relay.




SEC668D

2. Check voltage between ECM relay terminal 7 and ground with CONSULT-II or tester.




PBIB0074E

**Voltage: Battery voltage**

**OK or NG**

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

| 13 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors E127, M21
- Harness for open or short between ECM relay and 10A fuse

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

| 14 | CHECK ECM POWER SUPPLY CIRCUIT-V |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 163, 166 and ECM relay terminal 6.
   Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to ground and short to power.

**OK or NG**

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

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

Check the following.
- Harness connectors M52, F7
- Harness for open or short between ECM and ECM relay

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

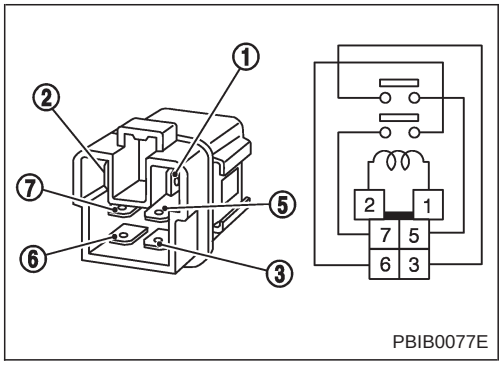
## Diagnostic Procedure (Cont'd)

| 16 | CHECK ECM RELAY |
|---|---|
| **Refer to EC-120, "Component Inspection".** | |
| **OK or NG** | |
| OK ► | GO TO 17. |
| NG ► | Replace ECM relay. |

| 17 | CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Disconnect ECM harness connector.<br>3. Check harness continuity between ECM terminals 156, 159, 165, 168 and engine ground.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>4. Also check harness for short to power. | |
| **OK or NG** | |
| OK ► | GO TO 19. |
| NG ► | GO TO 18. |

| 18 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Joint connector-7<br>● Harness for open or short between ECM and ground | |
| ► | Repair open circuit or short to power in harness or connectors. |

| 19 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| **OK or NG** | |
| OK ► | **INSPECTION END** |



PBIB0077E

## Component Inspection

### ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

| Condition | Continuity |
|---|---|
| 12V direct current supply between terminals 1 and 2 | Yes |
| OFF | No |

3. If NG, replace ECM relay.

## Description

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.

## On Board Diagnosis Logic

**This self-diagnosis has the one trip detection logic.**

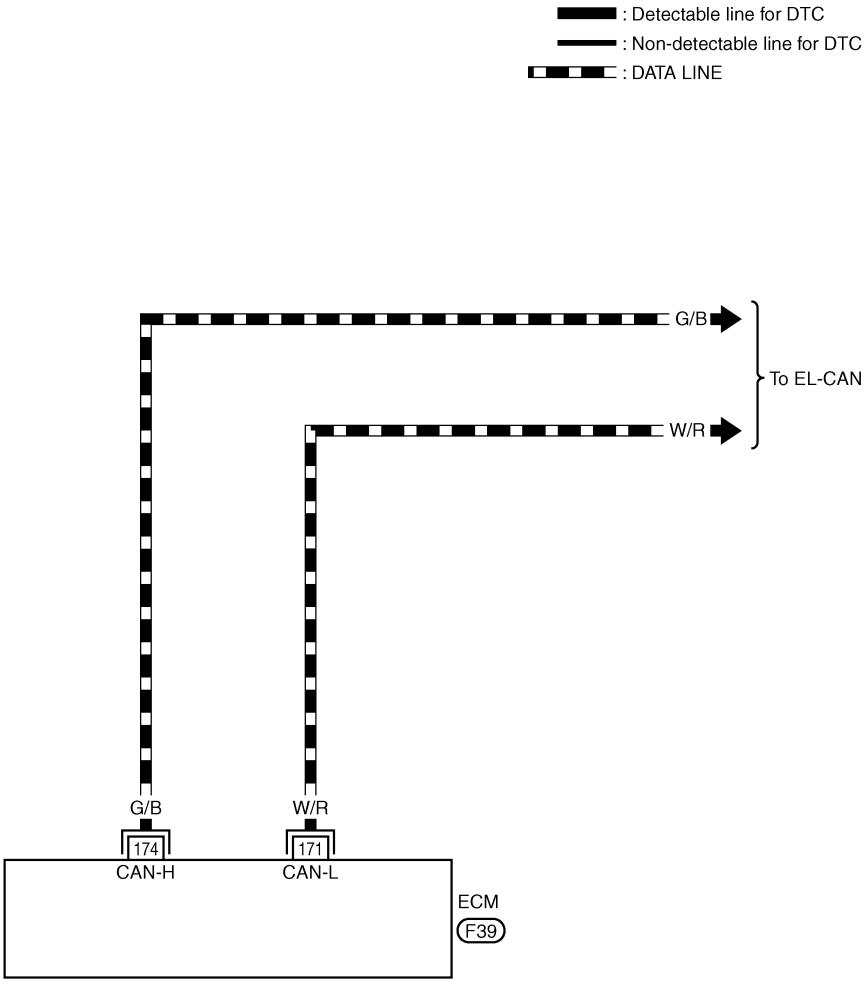
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| U1000<br>1000 | CAN communication line | ● ECM can not communicate to other control units.<br>● ECM can not communicate for more than the specified time. | ● Harness or connectors (CAN communication line is open or shorted). |

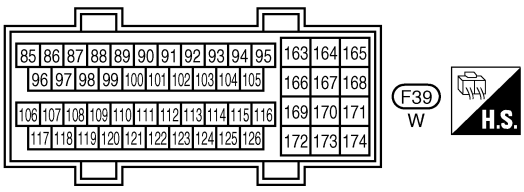
## DTC Confirmation Procedure

1. Turn ignition switch “ON” and wait at least 3 seconds.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If DTC is detected, go to EC-123, “Diagnostic Procedure”.

## Wiring Diagram

EC-CAN-01




TEC258M

## Diagnostic Procedure

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

1. Turn ignition switch “ON”.
2. Select “CAN DIAG SUPPORT MNTR” in “DATA MONITOR” mode with CONSULT-II.
3. Print out the CONSULT-II screen.

OK data

| DATA MONITOR | |
|---|---|
| MONITOR | |
| CAN COMM | OK |
| CAN CIRC 1 | OK |
| CAN CIRC 2 | OK |
| CAN CIRC 3 | UNKWN |
| CAN CIRC 4 | OK |
| CAN CIRC 5 | UNKWN |
| CAN CIRC 6 | UNKWN |
| CAN CIRC 7 | UNKWN |

NG data

| DATA MONITOR | |
|---|---|
| MONITOR | |
| CAN COMM | OK |
| CAN CIRC 1 | UNKWN |
| CAN CIRC 2 | UNKWN |
| CAN CIRC 3 | UNKWN |
| CAN CIRC 4 | UNKWN |
| CAN CIRC 5 | UNKWN |
| CAN CIRC 6 | UNKWN |
| CAN CIRC 7 | UNKWN |

SEC575D

| | |
|---|---|
| ► | Go to EL section. |

# Description

## SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Heated oxygen sensor 1 heater control | Heated oxygen sensor 1 heater |
| Engine coolant temperature sensor | Engine coolant temperature | | |

The ECM performs ON/OFF duty control of the heated oxygen sensor 1 heater corresponding to the engine speed and engine coolant temperature. The duty percent varies with engine coolant temperature when engine is started.

## OPERATION

| Engine speed rpm | Heated oxygen sensor 1 heater |
|---|---|
| Above 2,800 | OFF |
| Below 2,800 | ON |

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| HO2S1 HTR (B1)<br>HO2S1 HTR (B2) | ● Engine: After warming up<br>● Engine speed: Below 2,800 rpm | ON |
| | ● Engine speed: Above 2,800 rpm | OFF |

# On Board Diagnosis Logic

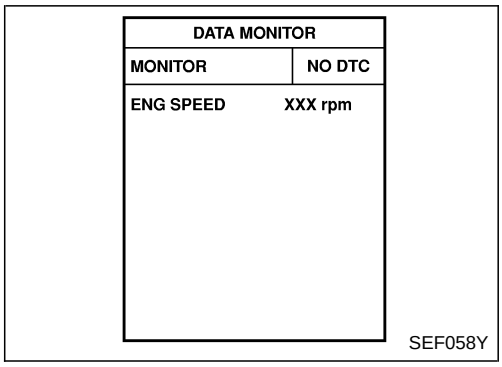
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0031<br>0031<br>(Bank 1) | Heated oxygen sensor 1 heater control circuit low | The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range.<br>(An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.) | ● Harness or connectors<br>(The heated oxygen sensor 1 heater circuit is open or shorted.)<br>● Heater oxygen sensor 1 heater |
| P0051<br>0051<br>(Bank 2) | | | |
| P0032<br>0032<br>(Bank 1) | Heated oxygen sensor 1 heater control circuit high | The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range.<br>(An excessively high voltage signal is sent to ECM through the heated oxygen sensor 1 heater.) | ● Harness or connectors<br>(The heated oxygen sensor 1 heater circuit is shorted.)<br>● Heater oxygen sensor 1 heater |
| P0052<br>0052<br>(Bank 2) | | | |

# DTC Confirmation Procedure

**NOTE:**
**If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 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.**

## DTC Confirmation Procedure (Cont'd)




### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
4. Start engine and run it for at least 6 seconds at idle speed.
5. If 1st trip DTC is detected, go to EC-129, "Diagnostic Procedure".

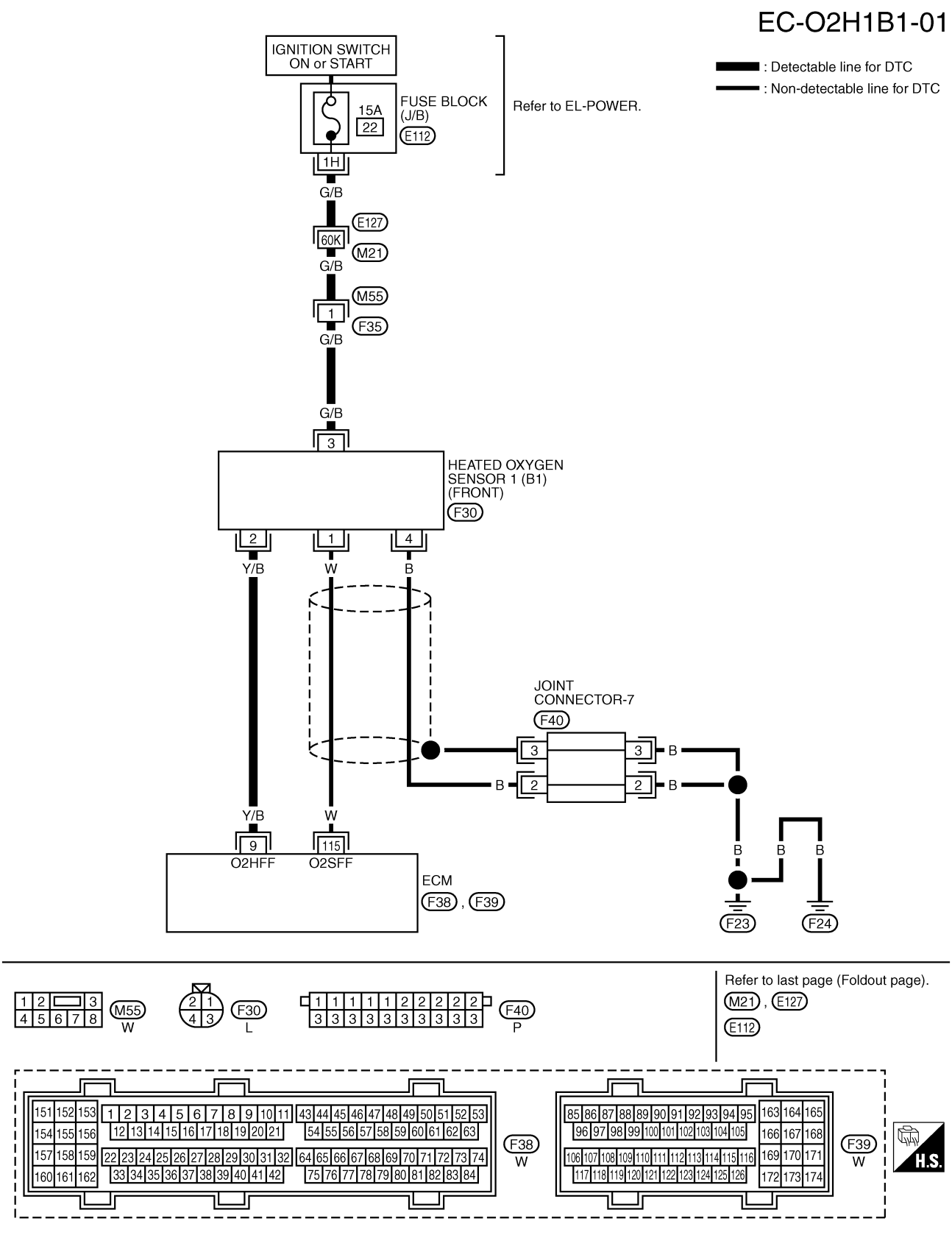
### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and run it for at least 6 seconds at idle speed.
4. Turn ignition switch "OFF" and wait at least 10 seconds.
5. Start engine and run it for at least 6 seconds at idle speed.
6. Select "MODE 3" with GST.
7. If DTC is detected, go to EC-129, "Diagnostic Procedure".

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

## Wiring Diagram

### BANK 1



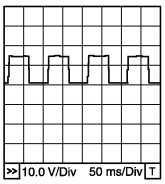

TEC409M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

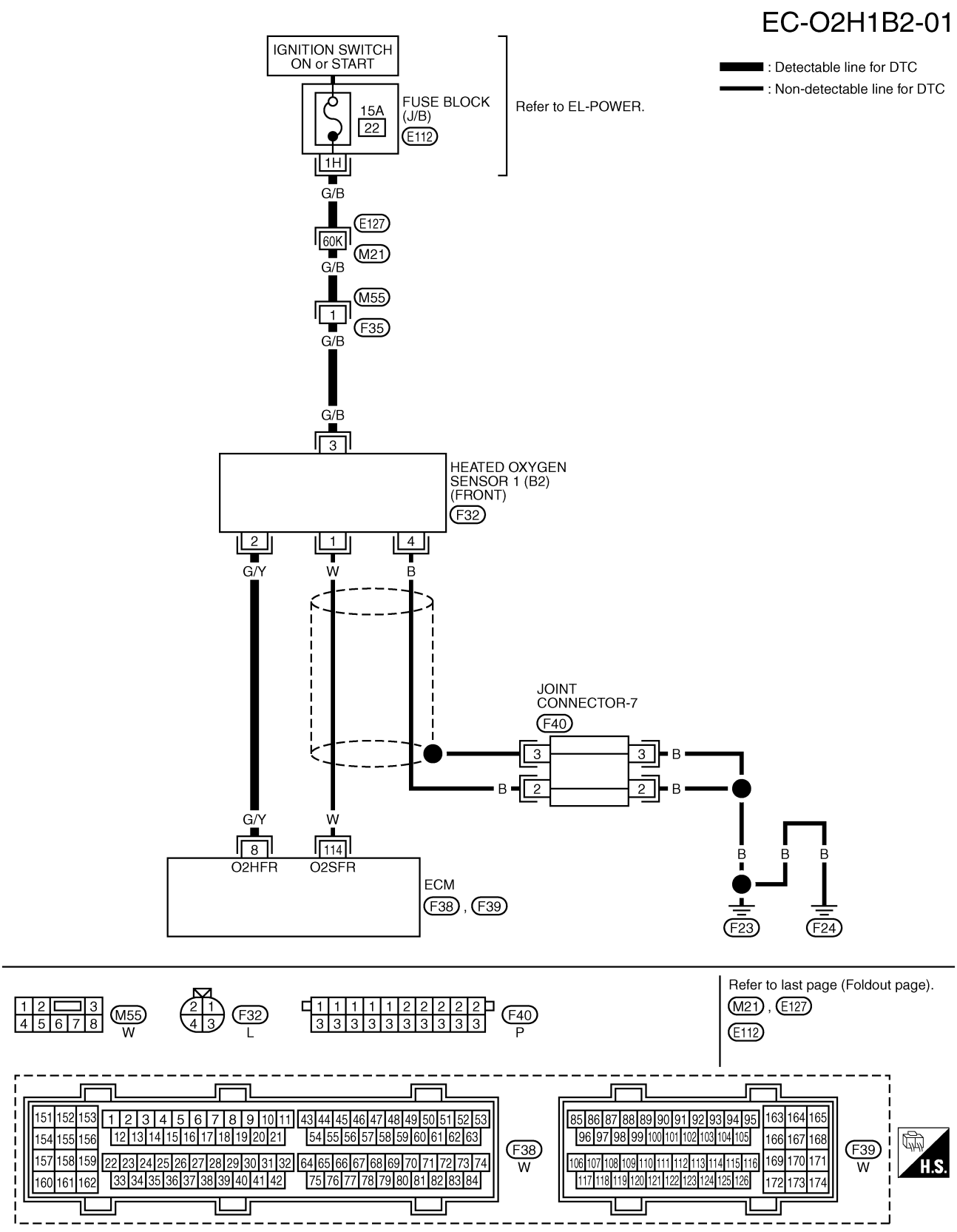
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 9 | Y/B | Heated oxygen sensor 1 heater (bank 1) | Engine is running.<br>└ **Warm-up condition.**<br>└ Engine speed is below 2,800 rpm. | Approximately 7.0V★<br>  <br><br>PBIB0519E |
| | | | Ignition switch "ON"<br>└ Engine stopped.<br>Engine is running.<br>└ Engine speed is above 2,800 rpm. | BATTERY VOLTAGE (11 - 14V) |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Wiring Diagram (Cont'd)

**BANK 2**



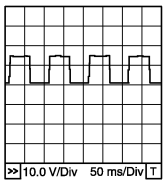

TEC414M

## Wiring Diagram (Cont'd)

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.**

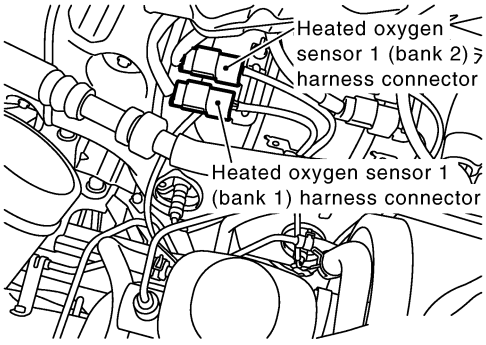
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 8 | G/Y | Heated oxygen sensor 1 heater (bank 2) | Engine is running.<br>**Warm-up condition.**<br>Engine speed is below 2,800 rpm. | Approximately 7.0V★<br>  <br><br>PBIB0519E |
| | | | Ignition switch "ON"<br>Engine stopped.<br>Engine is running.<br>Engine speed is above 2,800 rpm. | BATTERY VOLTAGE (11 - 14V) |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

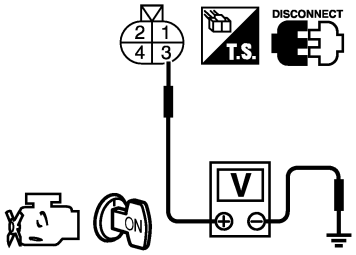
**1 CHECK HO2S1 POWER SUPPLY CIRCUIT**

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




SEC671D

3. Turn ignition switch "ON".
4. Check voltage between HO2S1 terminal 3 and ground with CONSULT-II or tester.




PBIB0112E

**Voltage: Battery voltage**

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 2 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M55, F35<br>● Fuse block (J/B) connector E112<br>● 15A fuse<br>● Harness for open or short between heated oxygen sensor 1 and fuse | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3 | CHECK HO2S1 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0031, P0032 | 9 | 2 | 1 |
| P0051, P0052 | 8 | 2 | 2 |

MTBL1566

**Continuity should exist.**

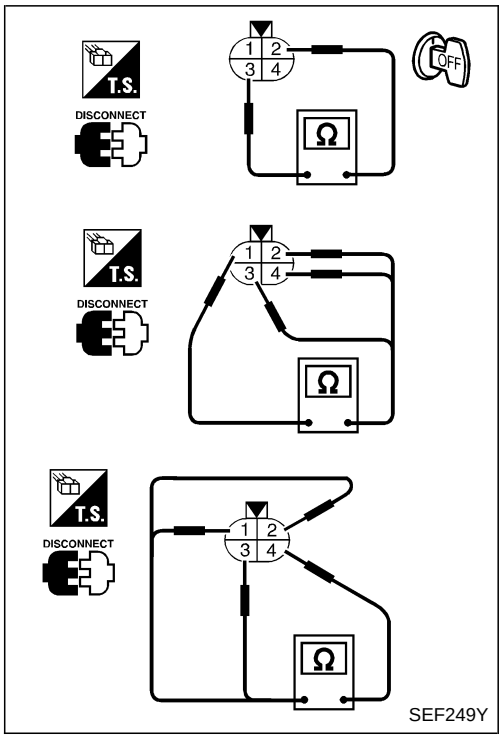
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | CHECK HEATED OXYGEN SENSOR 1 HEATER |
|---|---|
| **Refer to EC-131, "Component Inspection".**<br>**OK or NG** | |
| OK | ► GO TO 5. |
| NG | ► Replace malfunctioning heated oxygen sensor 1. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |




## Component Inspection

### HEATED OXYGEN SENSOR 1 HEATER

1. Check resistance between HO2S1 terminals as follows.

| Terminal No. | Resistance |
|---|---|
| 2 and 3 | 3.3 - 4.0Ω at 20°C (68°F) |
| 1 and 2, 3, 4 | ∞Ω (Continuity should not exist.) |
| 4 and 1, 2, 3 | |

2. If NG, replace heated oxygen sensor 1.

**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 J-43897-12 and approved anti-seize lubricant.**

# Description

## SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Heated oxygen sensor 2 heater control | Heated oxygen sensor 2 heater |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Mass air flow sensor | Amount of intake air | | |

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

## OPERATION

| Engine speed rpm | Heated oxygen sensor 2 heater |
|---|---|
| Above 3,200 | OFF |
| ● Below 3,200 rpm after the following conditions are met.<br>● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | ON |

# CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| HO2S2 HTR (B1)<br>HO2S2 HTR (B2) | ● Engine speed: Below 3,200 rpm after the following conditions are met.<br>● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | ON |
| | ● Engine speed: Above 3,200 rpm | OFF |

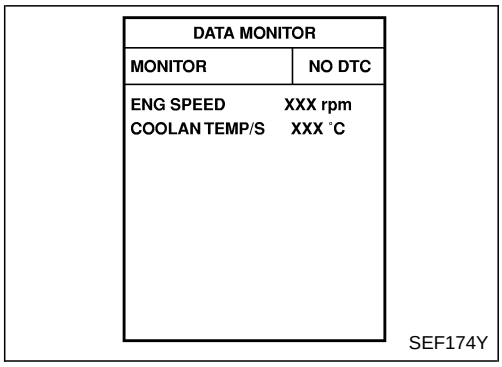
# On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0037<br>0037<br>(Bank 1) | Heated oxygen sensor 2 heater control circuit low | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range.<br>(An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | ● Harness or connectors<br>(The heated oxygen sensor 2 heater circuit is open or shorted.)<br>● Heater oxygen sensor 2 heater |
| P0057<br>0057<br>(Bank 2) | | | |
| P0038<br>0038<br>(Bank 1) | Heated oxygen sensor 2 heater control circuit high | The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range.<br>(An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.) | ● Harness or connectors<br>(The heated oxygen sensor 2 heater circuit is shorted.)<br>● Heater oxygen sensor 2 heater |
| P0058<br>0058<br>(Bank 2) | | | |

# DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 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.**




## DTC Confirmation Procedure (Cont'd)

### WITH CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch "OFF" and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for one minute.
6. If 1st trip DTC is detected, go to EC-137, "Diagnostic Procedure".

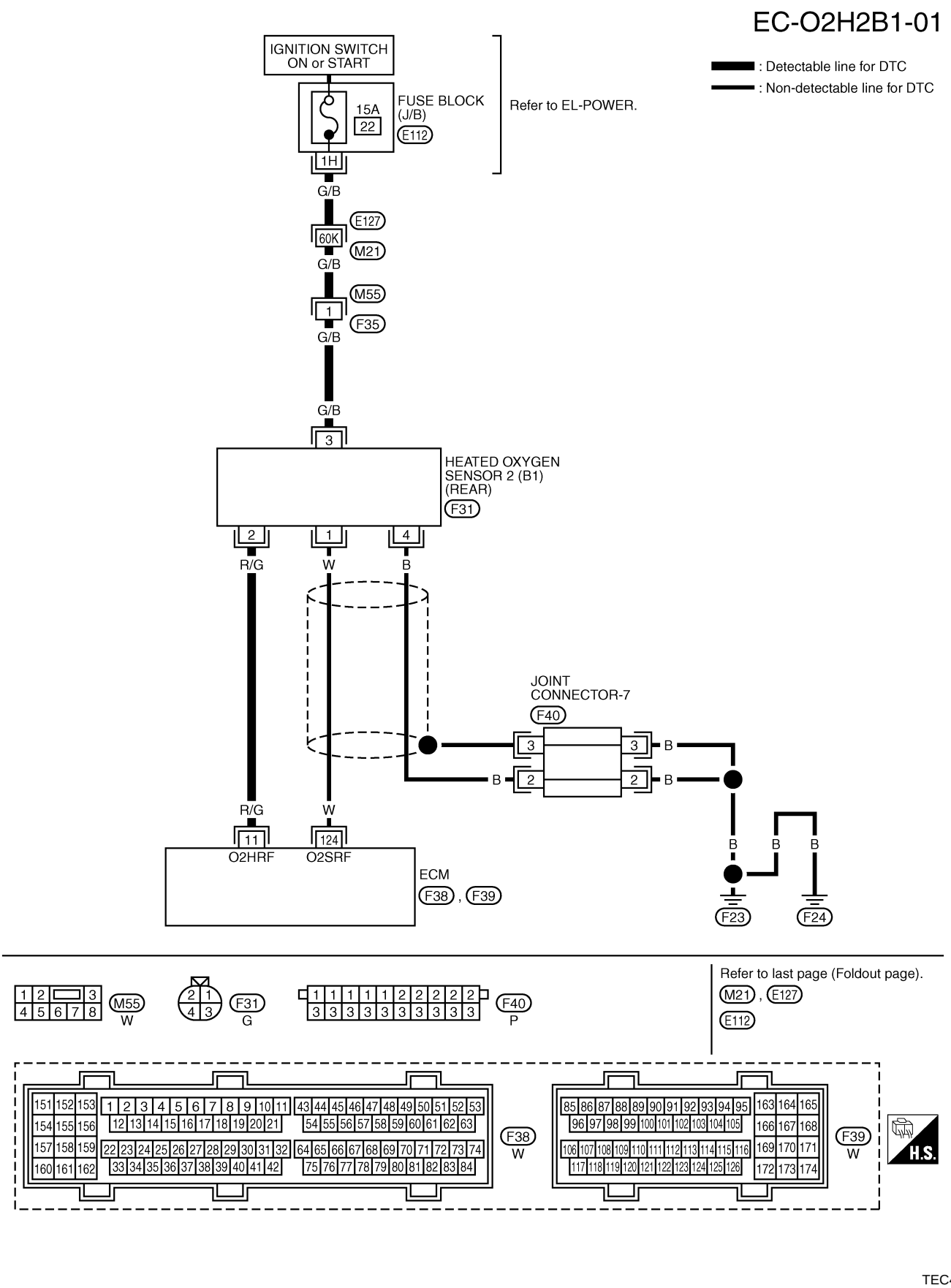
### WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Turn ignition switch "OFF" and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for one minute.
8. Select "MODE 3" with GST.
9. If DTC is detected, go to EC-137, "Diagnostic Procedure".

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

## Wiring Diagram

### BANK 1




TEC413M

## Wiring Diagram (Cont'd)

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

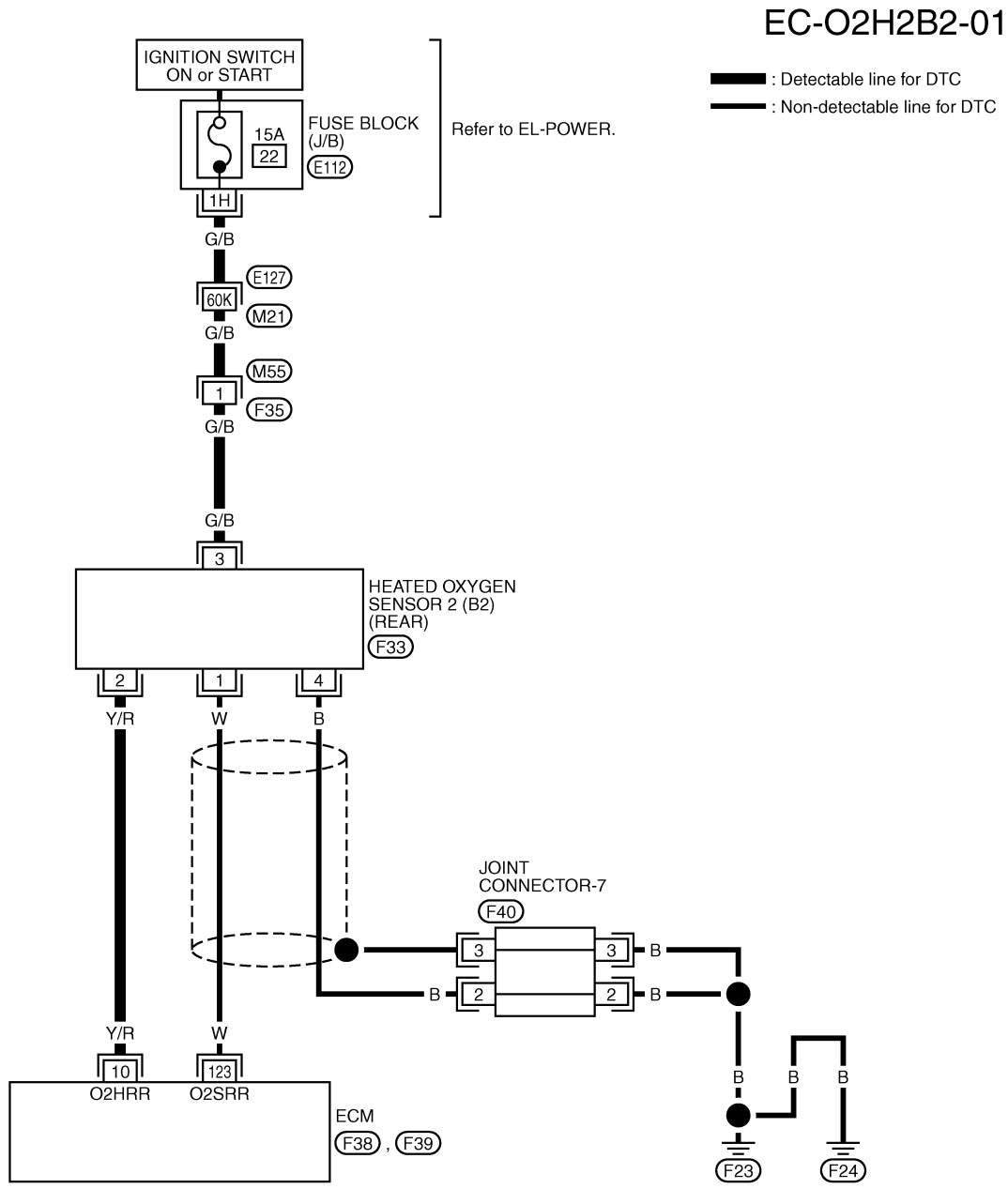
**CAUTION:**

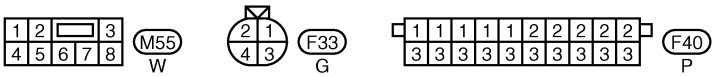
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 11 | R/G | Heated oxygen sensor 2 heater (bank 1) | Engine is running.<br>**Warm-up condition**<br>Engine speed: Below 3,200 rpm after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - 1.0V |
| | | | Ignition switch "ON"<br>Engine stopped.<br>Engine is running.<br>Engine speed is above 3,200 rpm. | BATTERY VOLTAGE (11 - 14V) |

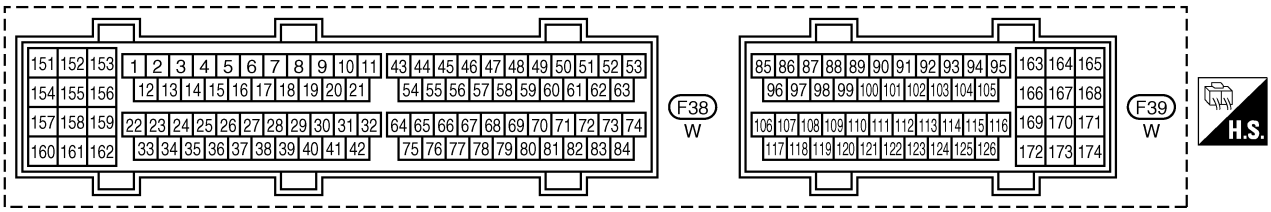
## Wiring Diagram (Cont'd)

**BANK 2**




Refer to last page (Foldout page).
M21, E127
E112




TEC340M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

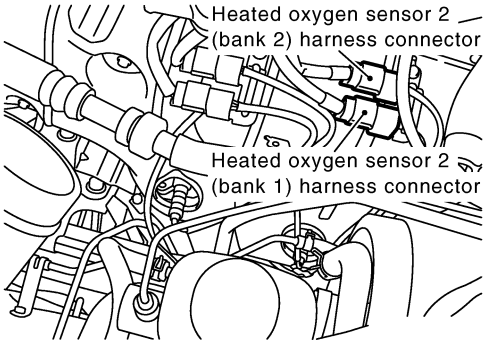
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 10 | Y/R | Heated oxygen sensor 2 heater (bank 2) | Engine is running.<br>**Warm-up condition**<br>Engine speed: Below 3,200 rpm after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - 1.0V |
| | | | Ignition switch "ON"<br>Engine stopped.<br>Engine is running.<br>Engine speed is above 3,200 rpm. | BATTERY VOLTAGE (11 - 14V) |

## Diagnostic Procedure

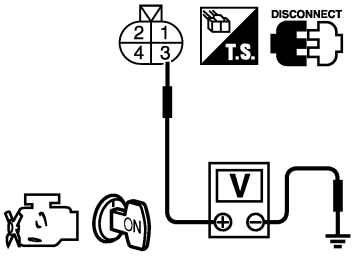
**1 CHECK HO2S2 POWER SUPPLY CIRCUIT**

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




SEC669D

3. Turn ignition switch "ON".
4. Check voltage between HO2S2 terminal 3 and ground with CONSULT-II or tester.




PBIB0112E

**Voltage: Battery voltage**

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 2 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M55, F35<br>● Fuse block (J/B) connector E112<br>● 15A fuse<br>● Harness for open or short between heated oxygen sensor 2 and fuse | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3 | CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0037, P0038 | 11 | 2 | 1 |
| P0057, P0058 | 10 | 2 | 2 |

MTBL1567

**Continuity should exist.**

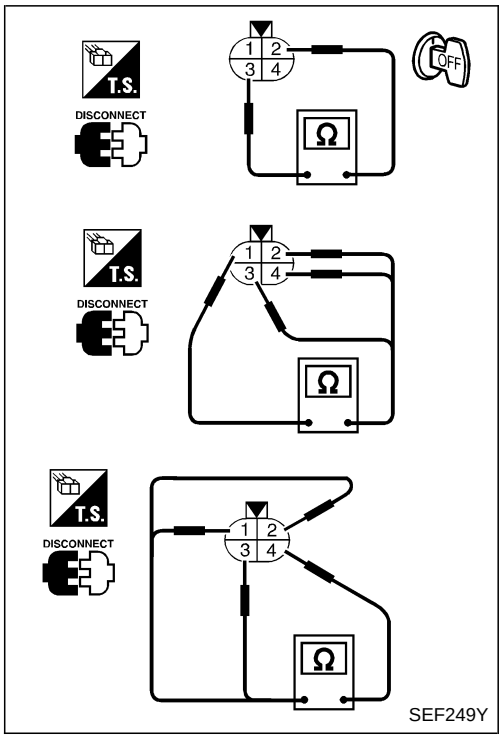
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | CHECK HEATED OXYGEN SENSOR 2 HEATER |
|---|---|
| **Refer to EC-139, "Component Inspection".**<br>**OK or NG** | |
| OK | ► GO TO 5. |
| NG | ► Replace malfunctioning heated oxygen sensor 2. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |




## Component Inspection

### HEATED OXYGEN SENSOR 2 HEATER

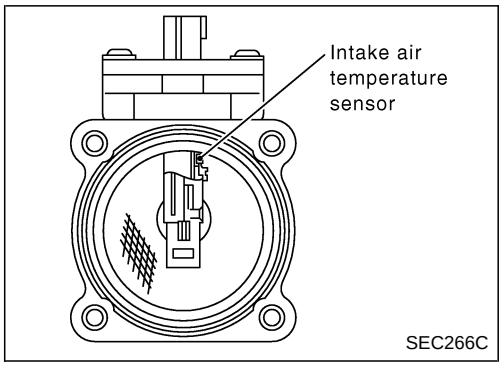
1. Check resistance between HO2S2 terminals as follows.

| Terminal No. | Resistance |
|---|---|
| 2 and 3 | 5.0 - 7.0Ω at 25°C (77°F) |
| 1 and 2, 3, 4 | ∞Ω (Continuity should not exist) |
| 4 and 1, 2, 3 | |

2. If NG, replace heated oxygen sensor 2.

**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 J-43897-12 and approved anti-seize lubricant.**




## 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 film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.
Therefore, the ECM must supply more electric current to maintain the temperature of the hot film as air flow increases. The ECM detects the air flow by means of this current change.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| MAS A/F SE-B1 | ● Engine: After warming up<br>● Air conditioner switch: OFF<br>● Shift lever: N<br>● No-load | Idle | Approx. 1.3 - 1.7V |
| | | 2,500 rpm | Approx. 1.7 - 2.4V |
| CAL/LD VALUE | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 10% - 35% |
| | | 2,500 rpm | 10% - 35% |
| MASS AIRFLOW | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 3.0 - 9.0 g·m/s |
| | | 2,500 rpm | 10.0 - 25.0 g·m/s |

## On Board Diagnosis Logic

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0102<br>0102 | Mass air flow sensor circuit low input | An excessively low voltage from the sensor is sent to ECM when engine is running. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Intake air leaks<br>● Mass air flow sensor |
| P0103<br>0103 | Mass air flow sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Mass air flow sensor |

### FAIL-SAFE MODE

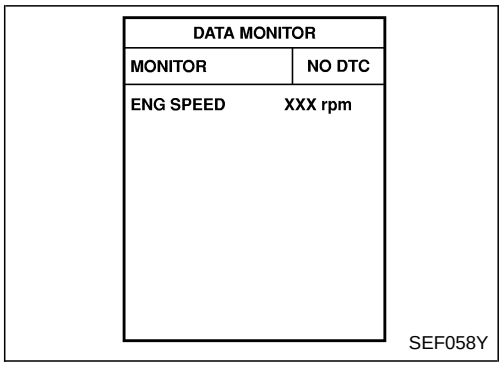
When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

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

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

## DTC Confirmation Procedure (Cont'd)



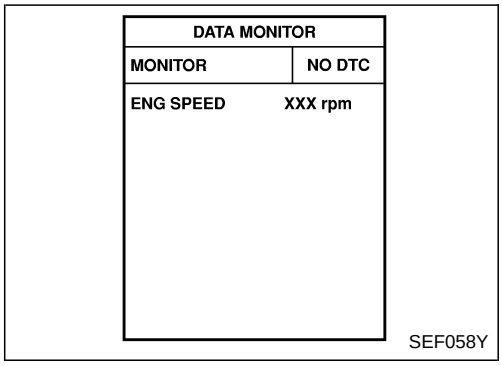

### PROCEDURE FOR DTC P0102

#### With CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and wait at least 5 seconds.
4. If DTC is detected, go to EC-143, "Diagnostic Procedure".

#### With GST

Follow the procedure "With CONSULT-II" above.




### PROCEDURE FOR DTC P0103

#### With CONSULT-II

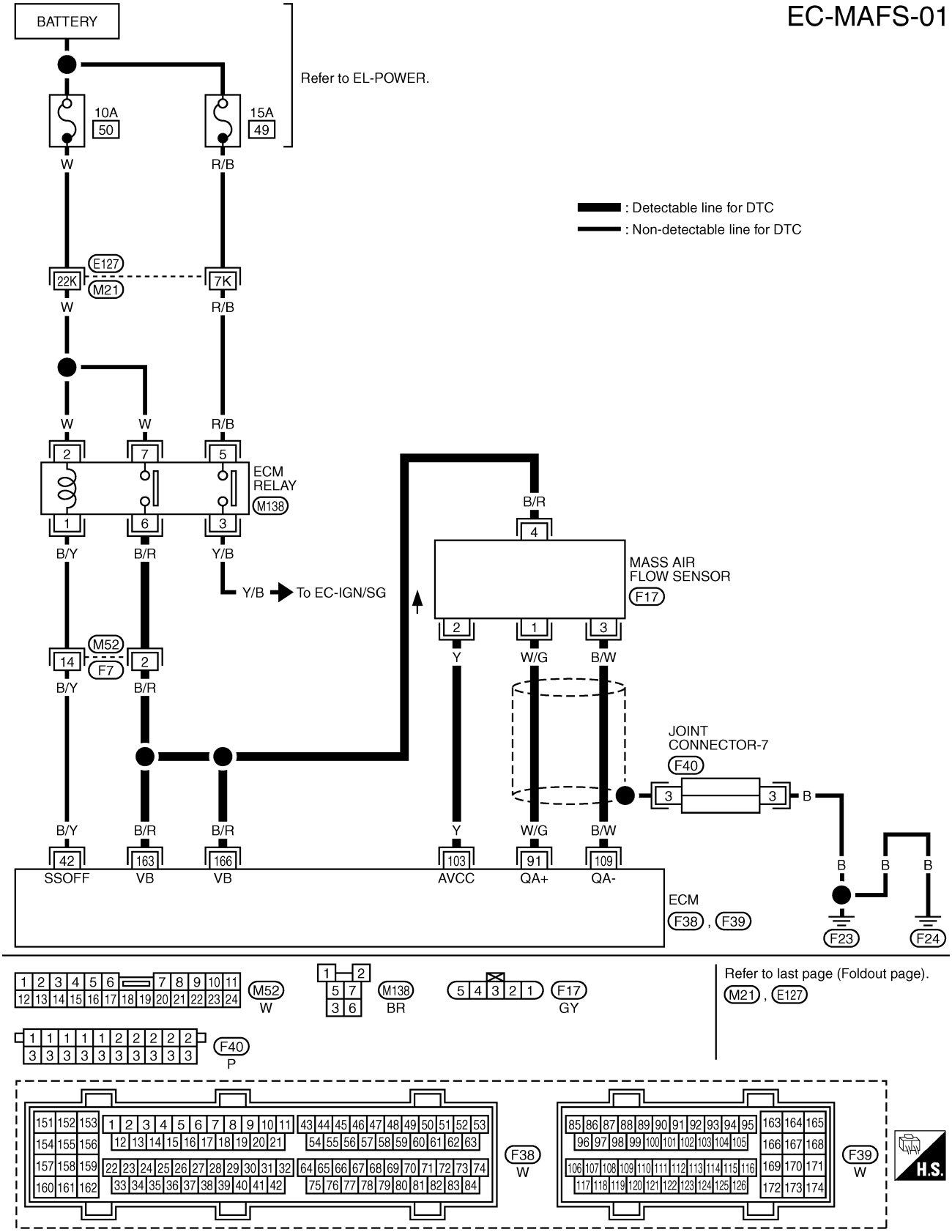
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-143, "Diagnostic Procedure".
   If DTC is not detected, go to next step.
5. Start engine and wait at least 5 seconds.
6. If DTC is detected, go to EC-143, "Diagnostic Procedure".

#### With GST

Follow the procedure "With CONSULT-II" above.

## Wiring Diagram

EC-MAFS-01




TEC146M

## Wiring Diagram (Cont'd)

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.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 91 | W/G | Mass air flow sensor | Engine is running.<br>— **Warm-up condition**<br>└ Idle speed | 1.3 - 1.7V |
| | | | Engine is running.<br>— **Warm-up condition**<br>└ Engine speed is 2,500 rpm. | 1.7 - 2.4V |
| 103 | Y | Sensor power supply (Mass air flow sensor) | Ignition switch "ON" | Approximately 5V |
| 109 | B/W | Sensor ground (Mass air flow sensor) | Engine is running.<br>— **Warm-up condition**<br>└ Idle speed | Approximately 0V |

## Diagnostic Procedure

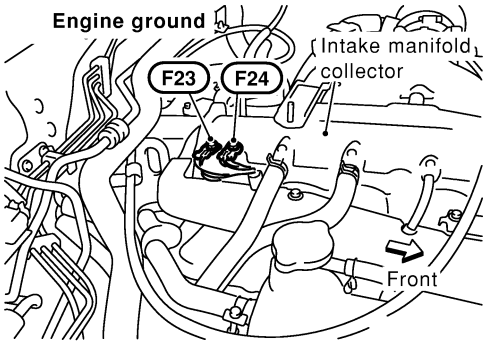
| 1 | INSPECTION START |
|---|---|
| Which malfunction (P0102 or P0103) is duplicated?<br>**P0102 or P0103** | |
| P0102 ▶ | GO TO 2. |
| P0103 ▶ | GO TO 3. |

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

## Diagnostic Procedure (Cont'd)

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

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

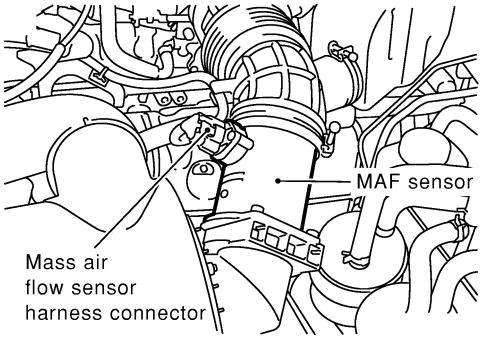



SEC690C

| | |
|---|---|
| ► | GO TO 4. |

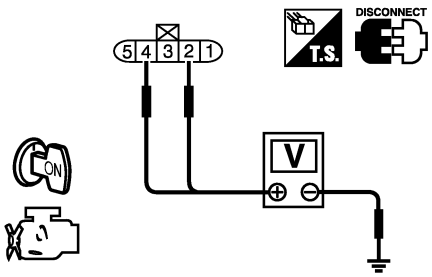
| 4 | CHECK MAF SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect MAF sensor harness connector.




SEC688C

2. Turn ignition switch "ON".
3. Check voltage between MAF sensor terminals 2, 4 and ground with CONSULT-II or tester.




PBIB0076E

| Terminal | Voltage |
|---|---|
| 2 | Approximately 5V |
| 4 | Battery voltage |

MTBL1568

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

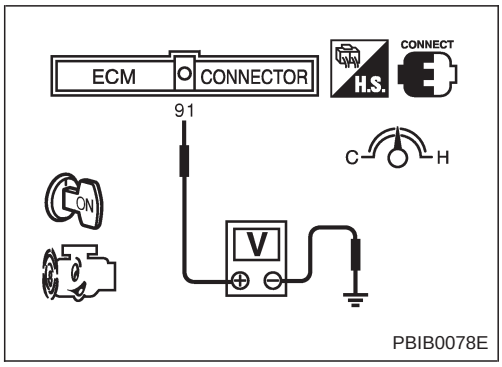
| 5 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors M52, F7<br>● Harness for open or short between mass air flow sensor and ECM<br>● Harness for open or short between mass air flow sensor and ECM relay | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Disconnect ECM harness connector.<br>3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 109.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>4. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 7. |
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Check harness continuity between MAF sensor terminal 1 and ECM terminal 91.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 8. |
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK MASS AIR FLOW SENSOR |
|---|---|
| **Refer to EC-146, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 9. |
| NG ► | Replace mass air flow sensor. |

| 9 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |




## Component Inspection

### MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 91 (Mass air flow sensor signal) and ground.

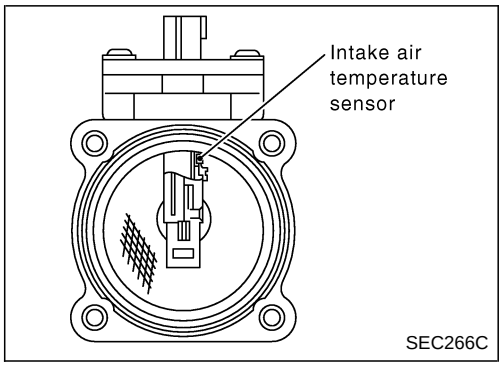
| Condition | Voltage V |
|---|---|
| Ignition switch “ON” (Engine stopped.) | Approx. 1.0 |
| Idle (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.7 - 2.4 |
| Idle to about 4,000 rpm* | 1.3 - 1.7 to Approx. 4.0 |

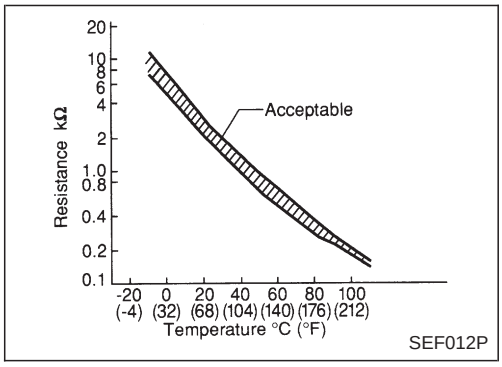
*: Check for liner voltage rise in response to engine being increased to about 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Turn ignition switch “OFF”.
b. Disconnect mass air flow sensor harness connector and reconnect it again.
c. Perform steps 2 and 3 again.

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




## Component Description

The intake air temperature sensor is built into mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.

**<Reference data>**

| Intake air temperature °C (°F) | Voltage* V | Resistance kΩ |
|---|---|---|
| −10 (14) | 4.43 | 7.9 - 9.3 |
| 25 (77) | 3.32 | 1.9 - 2.1 |
| 80 (176) | 1.23 | 0.31 - 0.37 |

*: These data are reference values and are measured between ECM terminal 99 (Intake air temperature sensor) and ground.

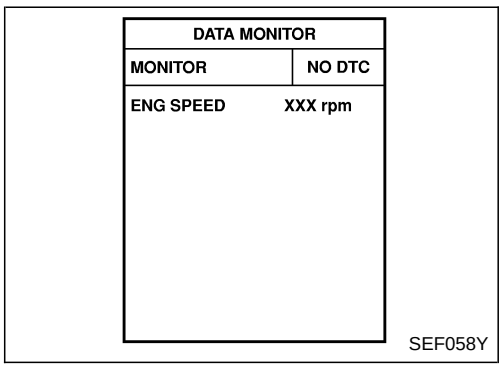
**CAUTION:**
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

## On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0112<br>0112 | Intake air temperature sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Intake air temperature sensor |
| P0113<br>0113 | Intake air temperature sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**




### WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-150, "Diagnostic Procedure".

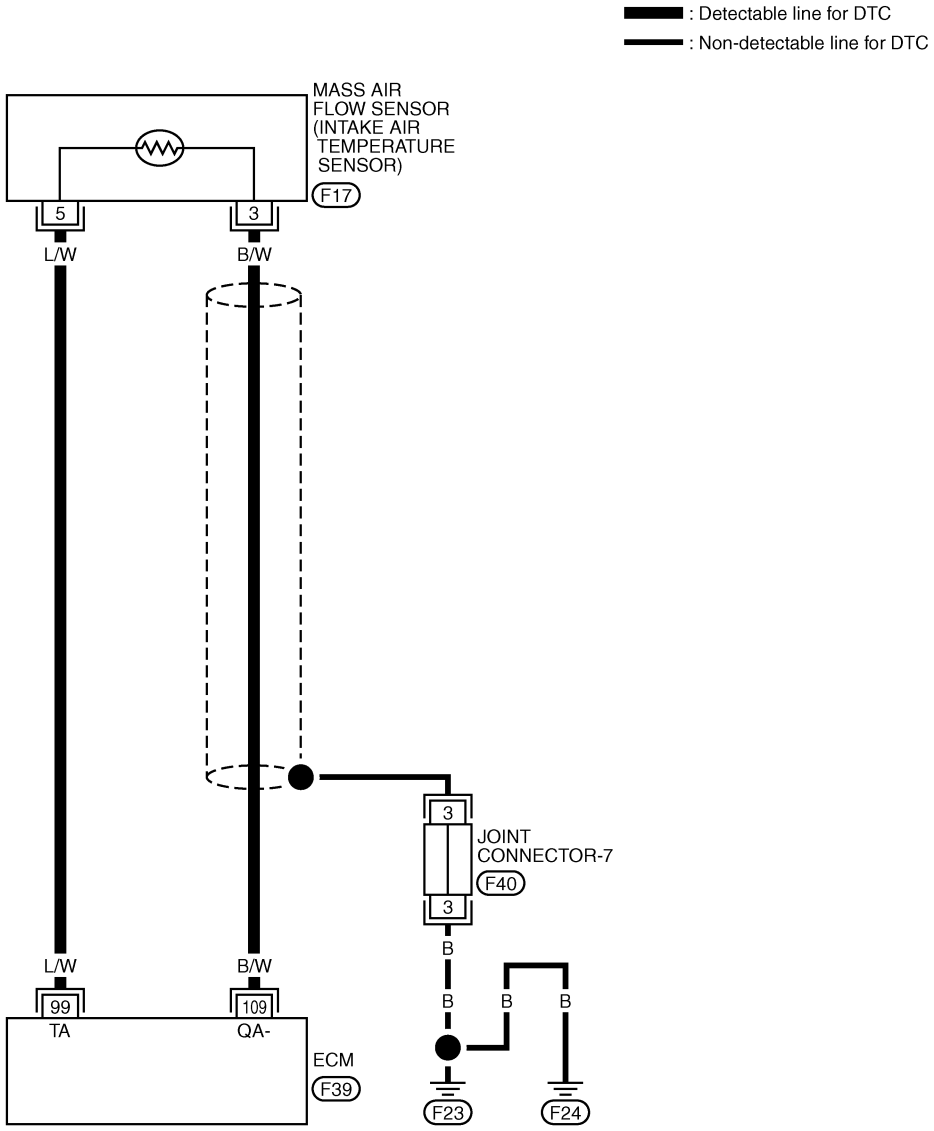
## DTC Confirmation Procedure (Cont'd)

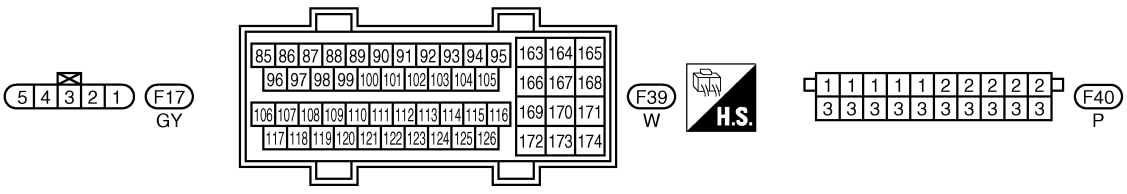
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-IATS-01



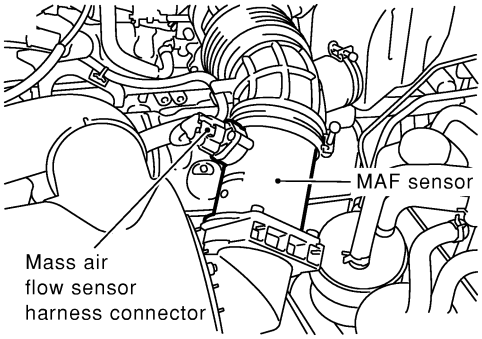




TEC343M

## Diagnostic Procedure

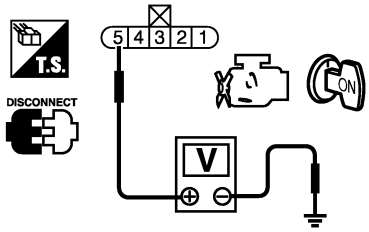
| 1 | CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch “OFF”.
2. Disconnect mass air flow sensor (intake air temperature sensor is built-into) harness connector.




SEC688C

3. Turn ignition switch “ON”.
4. Check voltage between MAF sensor terminal 5 and ground.




PBIB0066E

**Voltage: Approximately 5V**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 2. |
| NG | ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 2 | CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAF sensor terminal 3 and ECM terminal 109.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 3 | CHECK INTAKE AIR TEMPERATURE SENSOR |
|---|---|

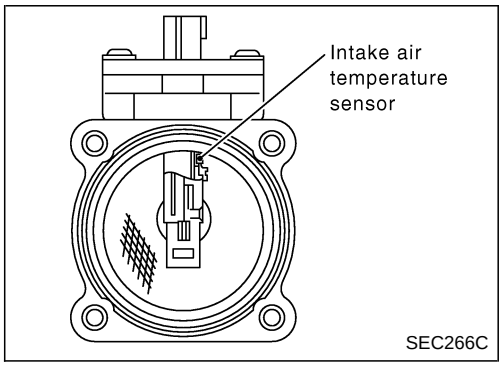
**Refer to EC-151, “Component Inspection”.**

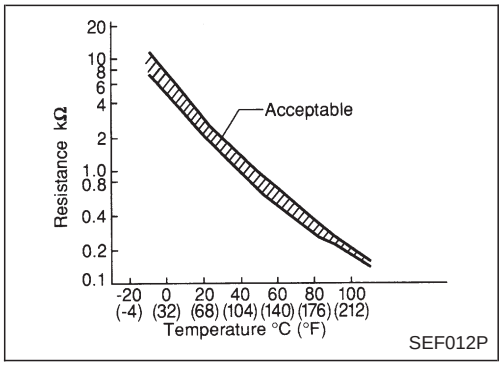
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 4. |
| NG | ► | Replace mass air flow sensor (with intake air temperature sensor). |

## Diagnostic Procedure (Cont'd)

| | |
|---|---|
| 4 | CHECK INTERMITTENT INCIDENT |
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | |
| ► | INSPECTION END |



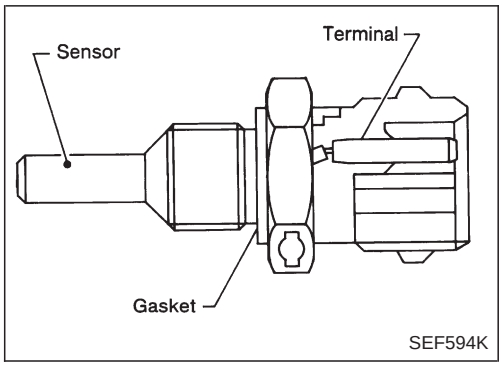

## Component Inspection

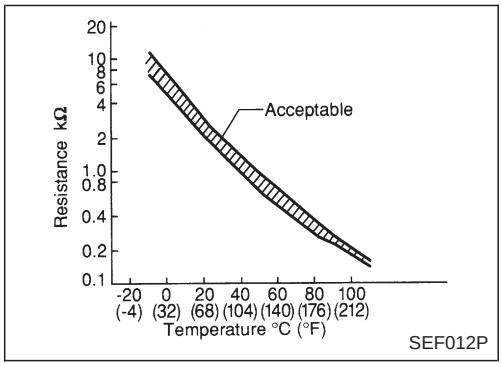
### INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor terminals 3 and 5 under the following conditions.

| Intake air temperature °C (°F) | Resistance kΩ |
|---|---|
| 25 (77) | 1.9 - 2.1 |

2. If NG, replace mass air flow sensor (with intake air temperature sensor).




## Component Description

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

**<Reference data>**

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

*: These data are reference values and are measured between ECM terminal 121 (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

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---|---|---|---|
| P0117<br>0117 | Engine coolant temperature sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Engine coolant temperature sensor |
| P0118<br>0118 | Engine coolant temperature sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

## On Board Diagnosis Logic (Cont'd)

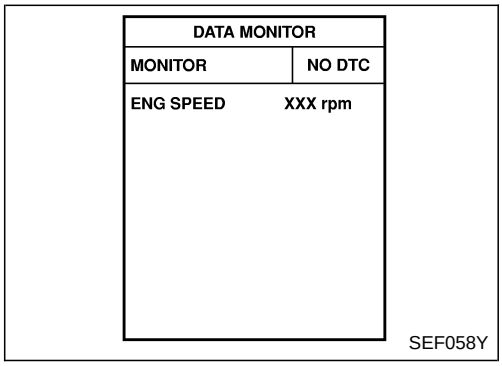
### FAIL-SAFE MODE

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

| Detected items | Engine operating condition in fail-safe mode | |
|---|---|---|
| Engine coolant temperature sensor circuit | Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START". CONSULT-II displays the engine coolant temperature decided by ECM. | |
| | Condition | Engine coolant temperature decided (CONSULT-II display) |
| | Just as ignition switch is turned ON or Start | 40°C (104°F) |
| | More than approx. 4 minutes after ignition ON or Start | 80°C (176°F) |
| | Except as shown above | 40 - 80°C (104 - 176°F) (Depends on the time) |
| | When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running. | |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**




### WITH CONSULT-II

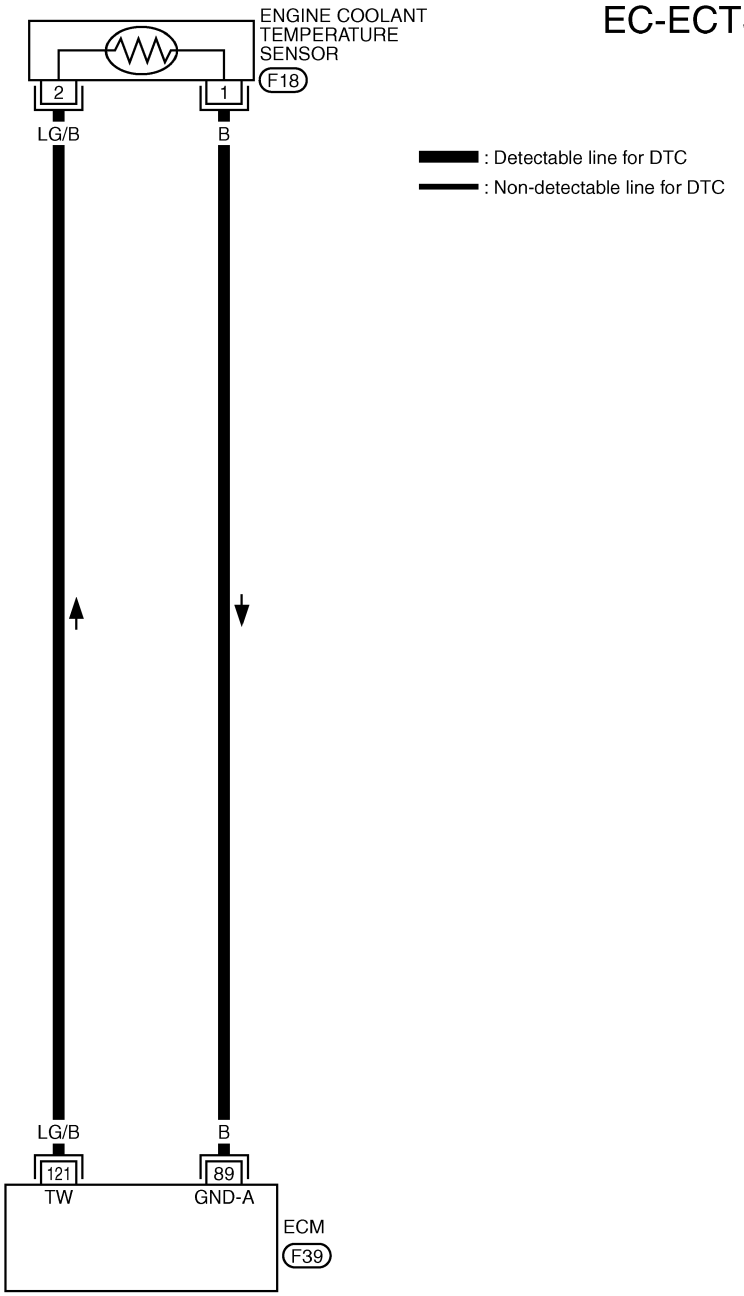
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Wait at least 5 seconds.
4. If DTC is detected, go to EC-155, "Diagnostic Procedure".

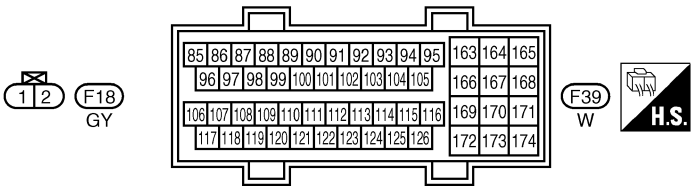
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-ECTS-01



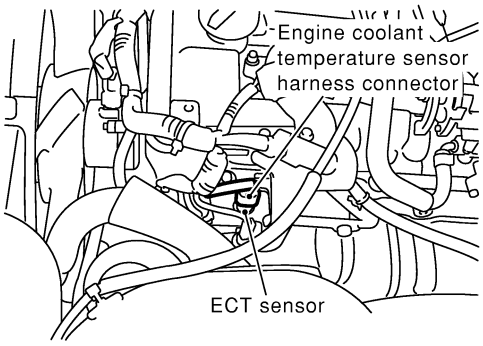




TEC147M

## Diagnostic Procedure

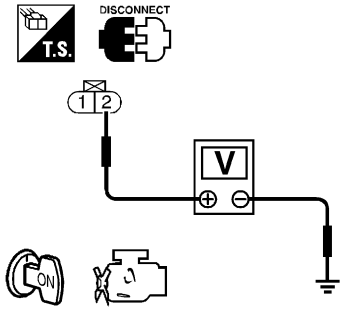
| 1 | CHECK ECT SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature (ECT) sensor harness connector.




SEC689C

3. Turn ignition switch “ON”.
4. Check voltage between ECT sensor terminal 2 and ground with CONSULT-II or tester.




SEF645R

**Voltage: Approximately 5V**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 2. |
| NG | ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 2 | CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch “OFF”.
2. Check harness continuity between ECT sensor terminal 1 and engine ground.
   Refer to Wiring Diagram.
   **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. |

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

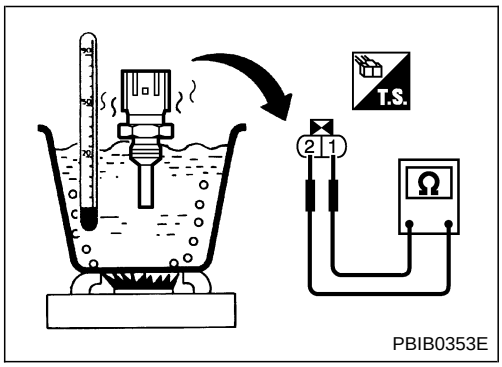
Check the following.
- Harness for open or short between engine coolant temperature sensor and ECM

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

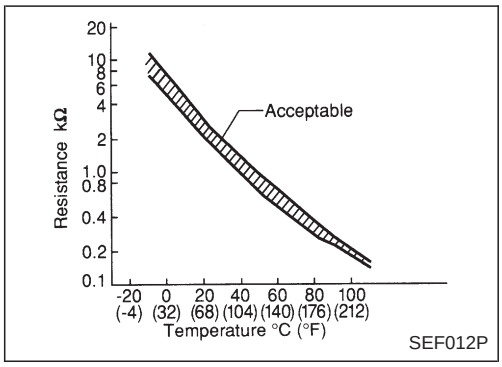
## Diagnostic Procedure (Cont'd)

| 4 | CHECK ENGINE COOLANT TEMPERATURE SENSOR | |
|---|---|---|
| Refer to EC-156, "Component Inspection". | | |
| OK or NG | | |
| OK | ▶ | GO TO 5. |
| NG | ▶ | Replace engine coolant temperature sensor. |

| 5 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | | |
| | ▶ | INSPECTION END |



PBIB0353E



SEF012P

## Component Inspection

### ENGINE COOLANT TEMPERATURE SENSOR

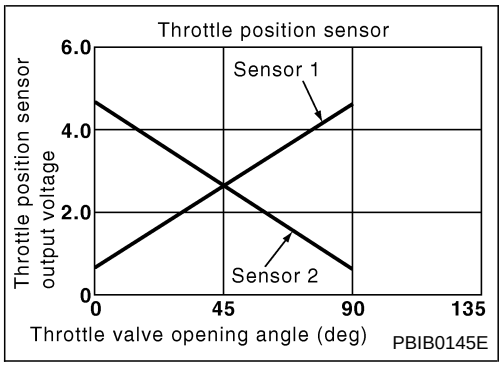
1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.

**<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 121 (Engine coolant temperature sensor) and ground.

2. If NG, replace engine coolant temperature sensor.




## Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| THRTL SEN1<br>THRTL SEN2* | ● Ignition switch: ON (Engine stopped)<br>● Shift lever: D | Accelerator pedal: Fully released | More than 0.5V |
| | | Accelerator pedal: Fully depressed | Less than 1.5V |

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs for ECM terminal voltage signal.

## On Board Diagnosis Logic

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0122<br>0122 | Throttle position sensor 2 circuit low input | An excessively low voltage from the TP sensor 2 is sent to ECM. | ● Harness or connectors (The TP sensor 2 circuit is open or shorted.)<br>● Electric throttle control actuator (TP sensor 2) |
| P0123<br>0123 | Throttle position sensor 2 circuit high input | An excessively high voltage from the TP sensor 2 is sent to ECM. | |

### FAIL-SAFE MODE

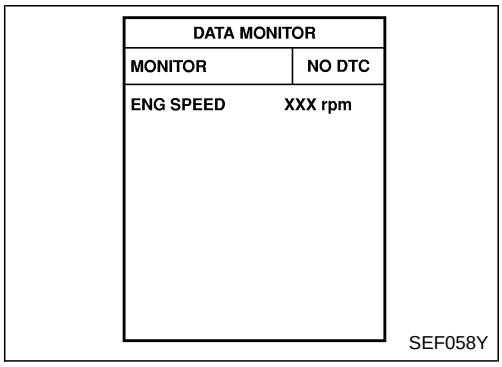
When the malfunction is detected, the ECM enters fail-safe mode and the MI lights up.

| Engine operation condition in fail-safe mode |
|---|
| The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

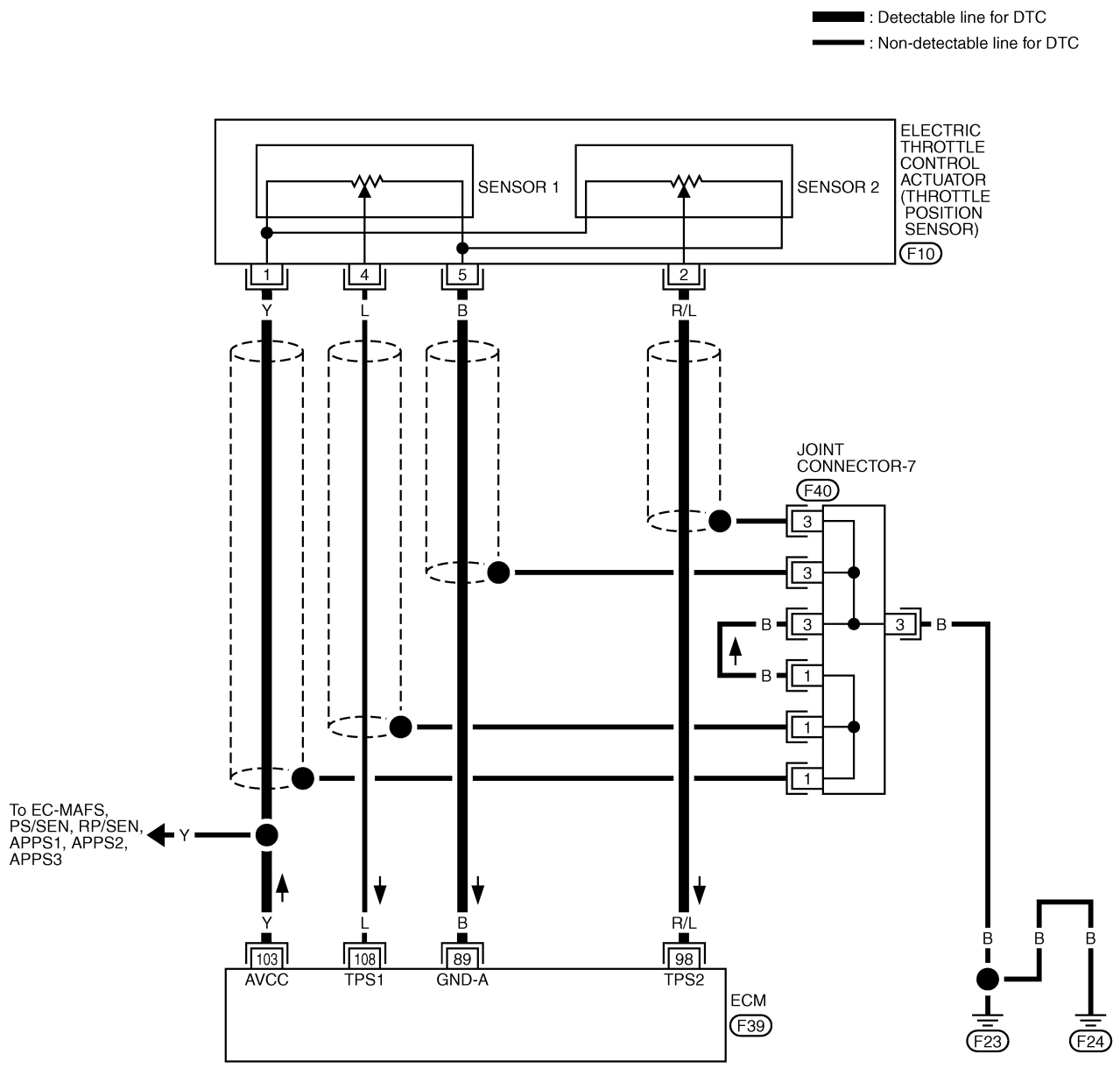
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-160, "Diagnostic Procedure".

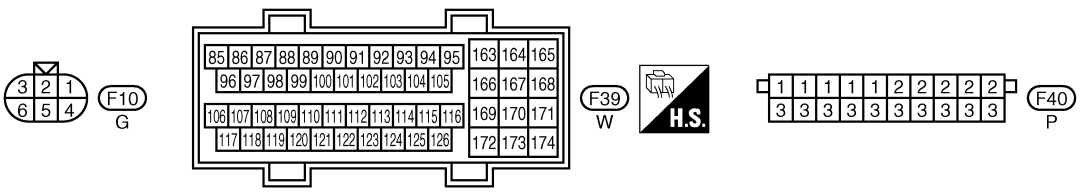
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-TPS2-01




TEC399M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

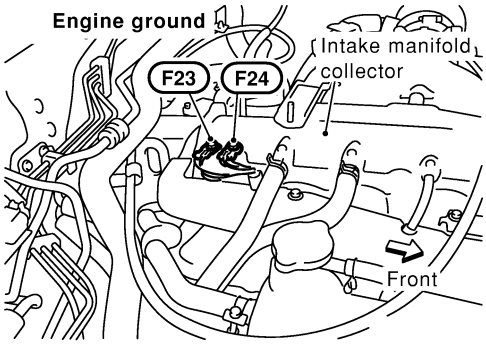
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 89 | B | Sensor ground | Engine is running.<br>— **Warm-up condition**<br>— Idle speed | Approximately 0V |
| 98 | R/L | Throttle position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | Less than 4.75V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | More than 0.36V |
| 103 | Y | Sensor power supply | Ignition switch "ON" | Approximately 5V |
| 108 | L | Throttle position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |

## Diagnostic Procedure

**1 RETIGHTEN GROUND SCREWS**

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



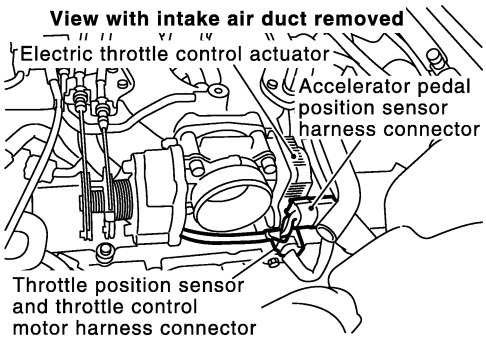

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

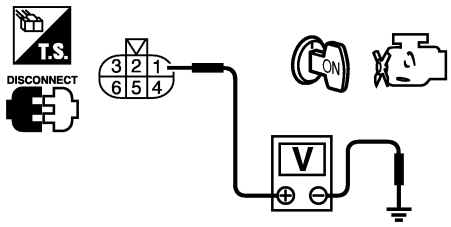
| 2 | CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect electric throttle control actuator harness connector.




SEC182D

2. Turn ignition switch "ON".
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.




PBIB0082E

**Voltage: Approximately 5V**

**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 THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 5 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal 98 and electric throttle control actuator terminal 2.
   Refer to Wiring Diagram.
   **Continuity should exist.**
2. Also check harness for short to ground and short to power.

**OK or NG**

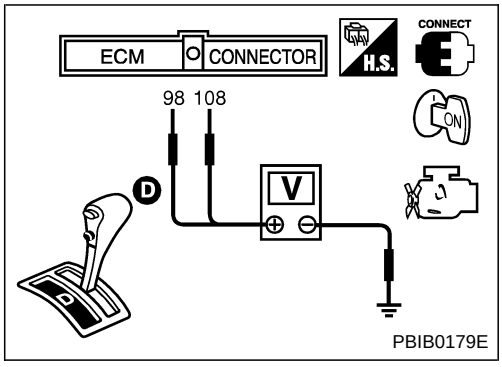
| | | |
|---|---|---|
| OK | ► | GO TO 5. |
| NG | ► | Repair open circuit or short to ground or short to power in harness or connectors. |

## Diagnostic Procedure (Cont'd)

| 5 | CHECK THROTTLE POSITION SENSOR |
|---|---|
| Refer to EC-162, "Component Inspection". | |
| OK or NG | |
| OK ► | GO TO 7. |
| NG ► | GO TO 6. |

| 6 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|
| 1. Replace the electric throttle control actuator.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | INSPECTION END |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | |
| ► | INSPECTION END |



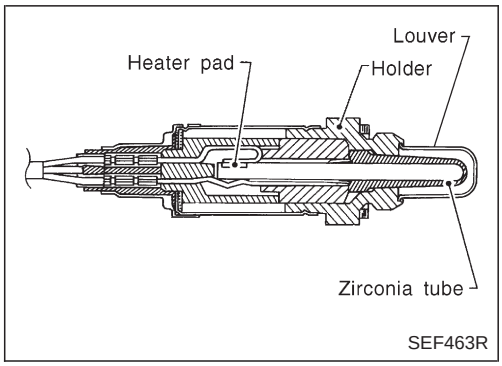

## Component Inspection

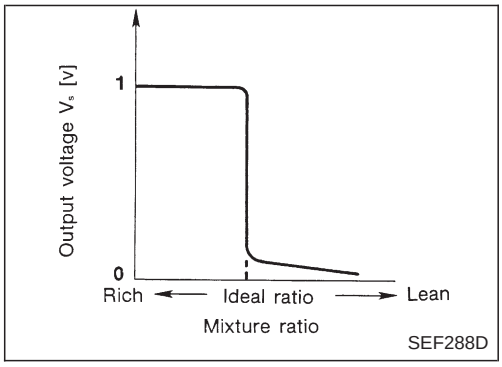
### THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-31, "Throttle Valve Closed Position Learning".
3. Turn ignition switch "ON".
4. Set selector lever to "D" position.
5. Check voltage between ECM terminals 108 (TP sensor 1 signal), 98 (TP sensor 2 signal) and engine ground under the following conditions.

| Terminal | Accelerator pedal | Voltage |
|---|---|---|
| 108 (Throttle position sensor 1) | Fully released | More than 0.36V |
| | Fully depressed | Less than 4.75V |
| 98 (Throttle position sensor 2) | Fully released | Less than 4.75V |
| | Fully depressed | More than 0.36V |

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-31, "Accelerator Pedal Released Position Learning".
8. Perform EC-31, "Throttle Valve Closed Position Learning".
9. Perform EC-31, "Idle Air Volume Learning".



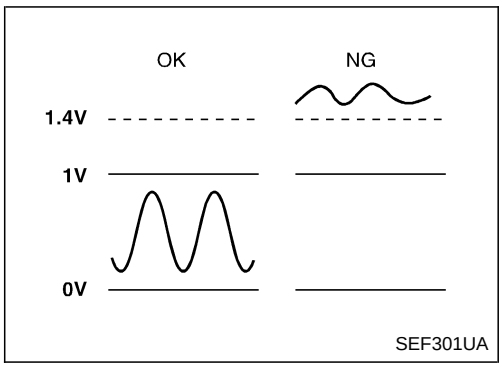

## Component Description

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

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S1 (B1)<br>HO2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S1 MNTR (B1)<br>HO2S1 MNTR (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |



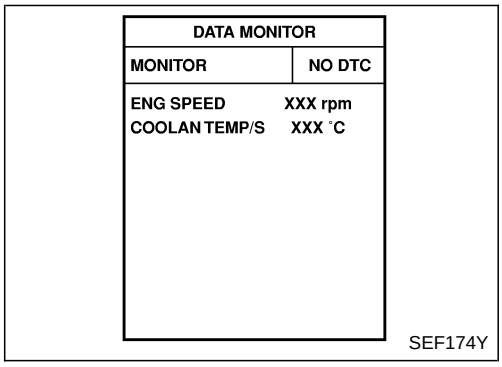

## On Board Diagnosis Logic

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 output is not inordinately high.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0132<br>0132<br>(Bank 1) | Heated oxygen sensor 1 circuit high voltage | An excessively high voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted).<br>● Heated oxygen sensor 1 |
| P0152<br>0152<br>(Bank 2) | | | |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**




### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON".
4. Select "DATA MONITOR" mode with CONSULT-II.
5. Restart engine and let it idle for 2 minutes.
6. If 1st trip DTC is detected, go to EC-168, "Diagnostic Procedure".

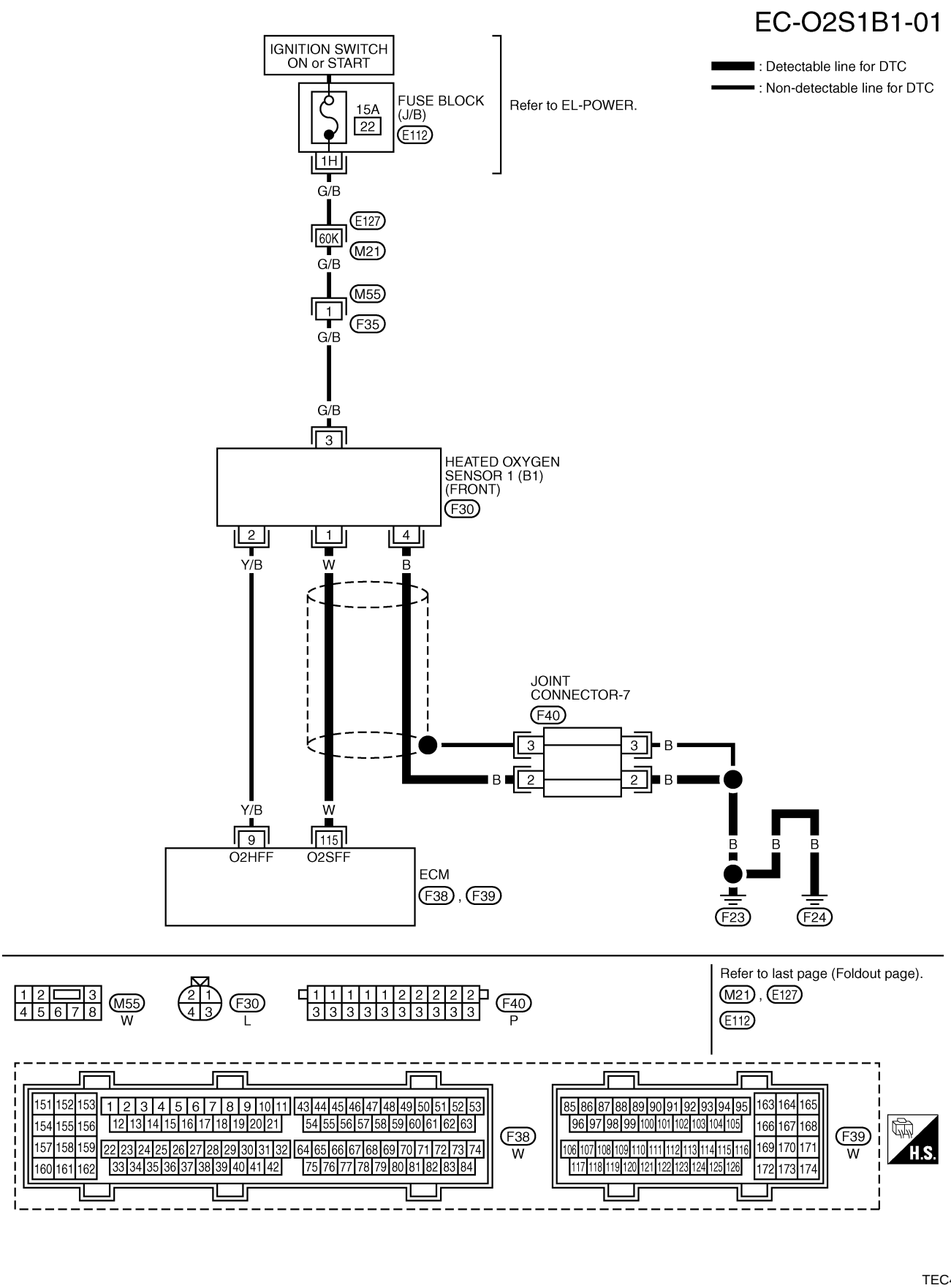
### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Restart engine and let it idle for 2 minutes.
4. Turn ignition switch "OFF" and wait at least 10 seconds.
5. Restart engine and let it idle for 2 minutes.
6. Select "MODE 3" with GST.
7. If DTC is detected, go to EC-168, "Diagnostic Procedure".

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

## Wiring Diagram

### BANK 1




TEC408M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

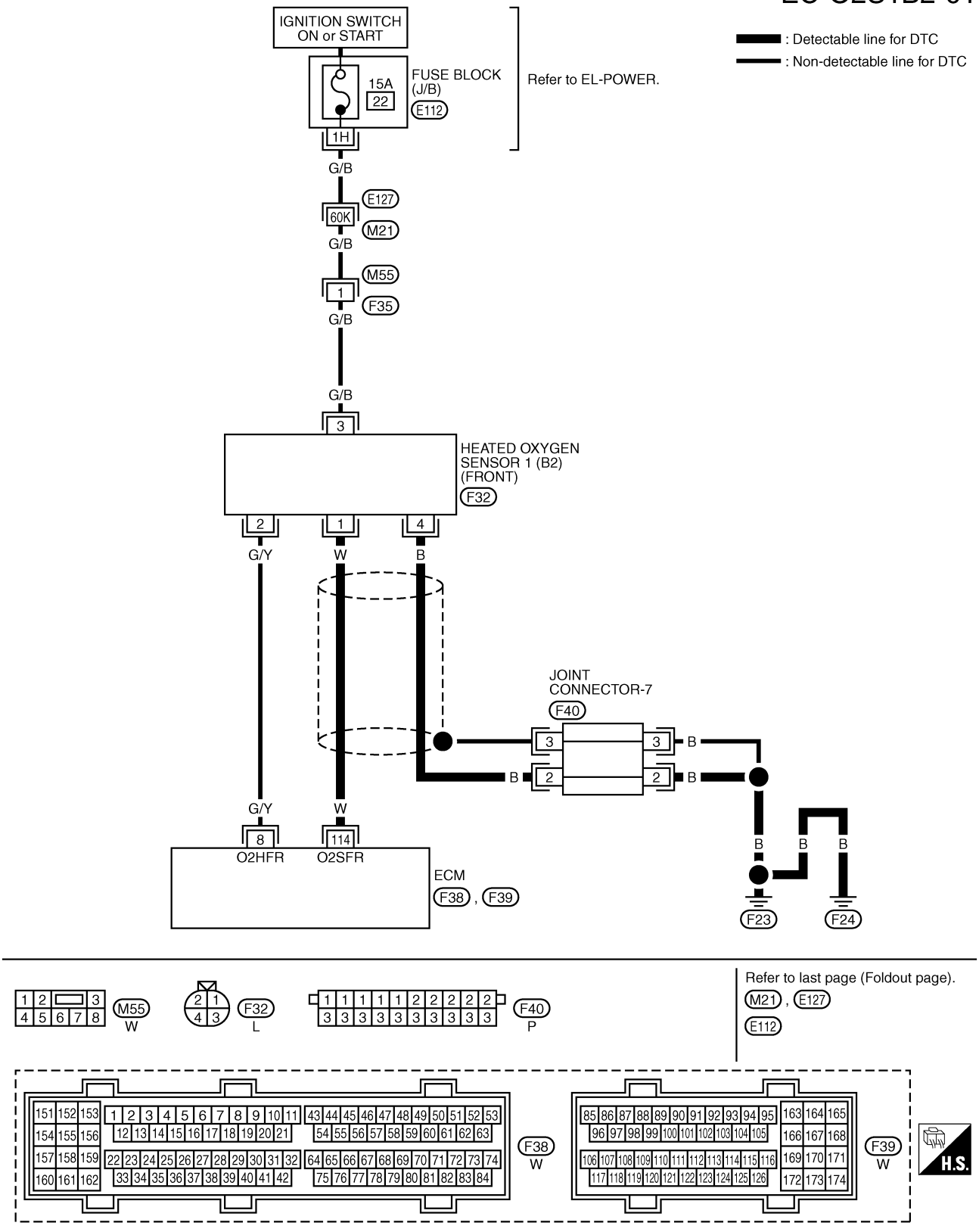
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 115 | W | Heated oxygen sensor 1 (bank 1) | Engine is running.<br>**Warm-up condition**<br>Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |

## Wiring Diagram (Cont'd)

**BANK 2**

EC-O2S1B2-01




TEC412M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

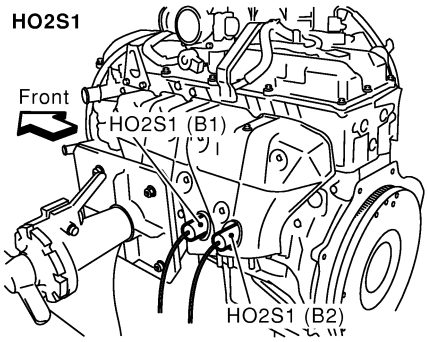
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 114 | W | Heated oxygen sensor 1 (bank 2) | Engine is running.<br>**Warm-up condition**<br>Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |

## Diagnostic Procedure

| 1 | RETIGHTEN HEATED OXYGEN SENSOR 1 |
|---|---|

1. Turn ignition switch "OFF".
2. Loosen and retighten corresponding heated oxygen sensor 1.



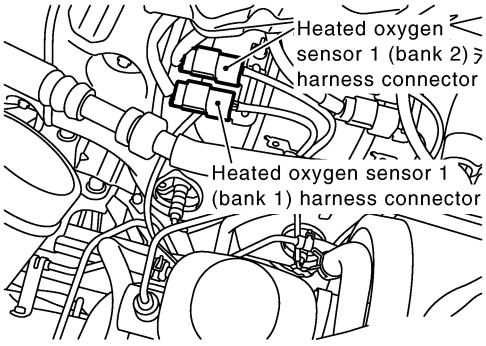

SEC888C

**Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)**

► GO TO 2.

| 2 | CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Disconnect heated oxygen sensor 1 harness connector.




SEC671D

2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. 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)

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

Check the following.
- Joint connector-7
- Harness for open or short between HO2S1 and ground

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

| 4 | CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0132 | 115 | 1 | 1 |
| P0152 | 114 | 1 | 2 |

MTBL1569

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0132 | 115 | 1 | 1 |
| P0152 | 114 | 1 | 2 |

MTBL1570

**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 HO2S1 CONNECTOR FOR WATER |
|---|---|

Check heated oxygen sensor 1 connectors for water.
**Water should not exist.**

**OK or NG**

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

| 6 | CHECK HEATED OXYGEN SENSOR 1 |
|---|---|

**Refer to EC-170, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 7. |
| NG | ► | Replace malfunctioning heated oxygen sensor 1. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

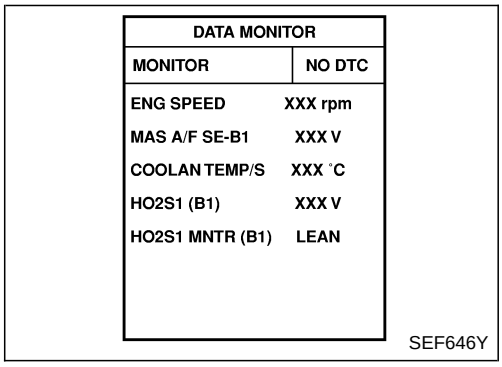
| | | |
|---|---|---|
| | ► | **INSPECTION END** |

## Component Inspection

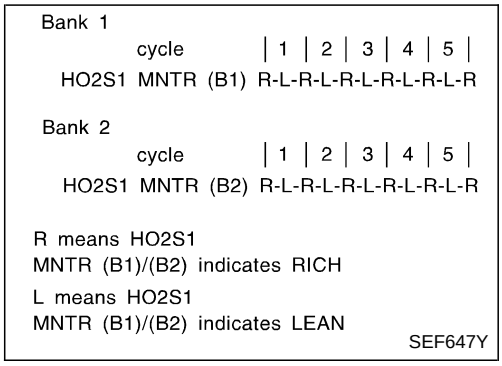
### HEATED OXYGEN SENSOR 1

#### With CONSULT-II

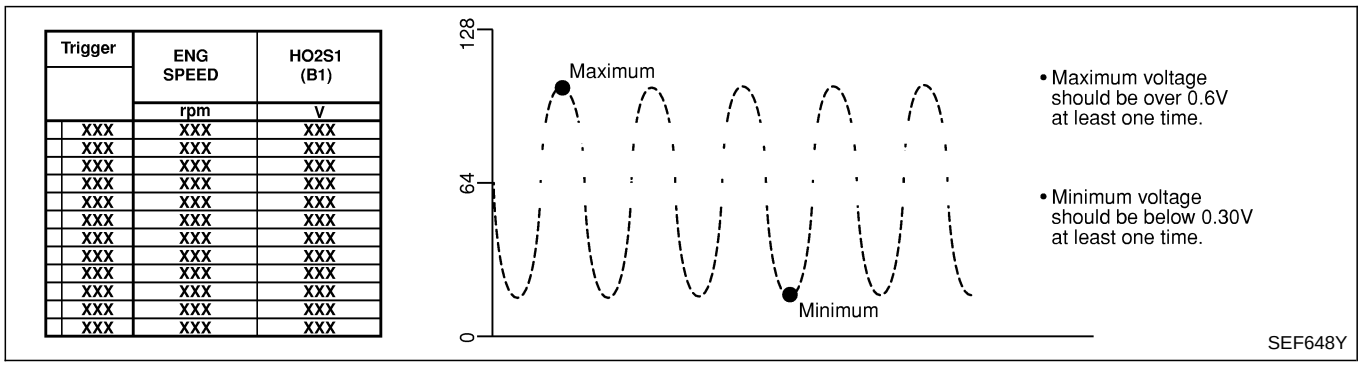
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.




5. Touch “RECORD” on CONSULT-II screen.

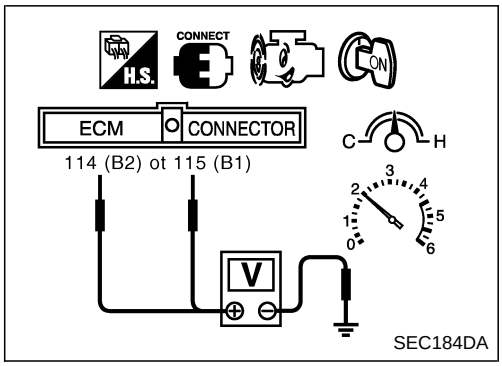



6. Check the following.
- “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
  5 times (cycles) are counted as shown at right.
- “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
- “HO2S1 (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 J-43897-12 and approved anti-seize lubricant.**

## Component Inspection (Cont'd)



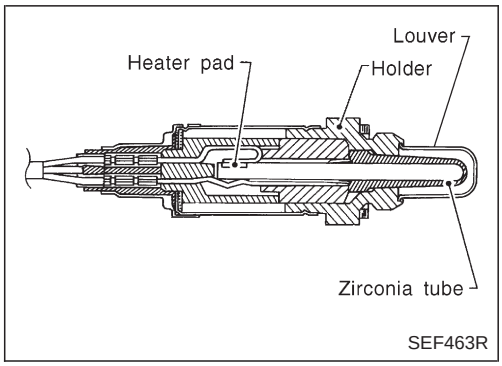

### Without CONSULT-II

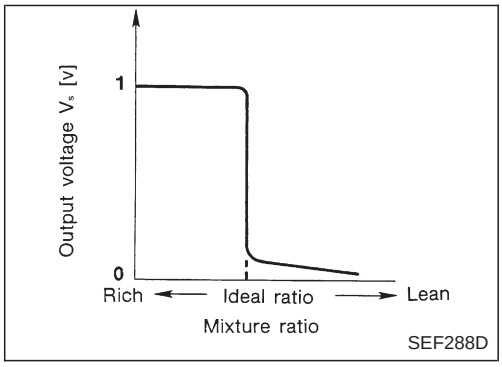
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
- 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.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 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 J-43897-12 and approved anti-seize lubricant.**



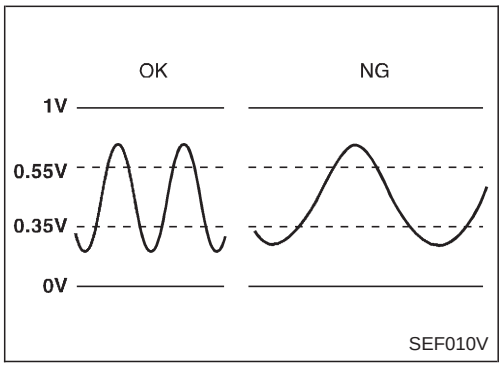

## Component Description

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

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S1 (B1)<br>HO2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S1 MNTR (B1)<br>HO2S1 MNTR (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |




## On Board Diagnosis Logic

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0133<br>0133<br>(Bank 1) | Heated oxygen sensor 1 circuit slow response | The response of the voltage signal from the sensor takes more than the specified time. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Heated oxygen sensor 1<br>● Heated oxygen sensor 1 heater<br>● Fuel pressure<br>● Injectors<br>● Intake air leaks<br>● Exhaust gas leaks<br>● PCV valve<br>● Mass air flow sensor |
| P0153<br>0153<br>(Bank 2) | | | |

## 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 10 seconds before conducting the next test.**

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

### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "HO2S1 (B1) P0133" or "HO2S1 (B2) P0153" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-II.

| HO2S1 (B1) P0133 | |
|---|---|
| OUT OF CONDITION | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| B/FUEL SCHDL | XXX msec |
| COOLAN TEMP/S | XXX °C |
| VHCL SPEED SEN | XXX km/h |

SEF338Z

4. Touch "START".
5. Start engine and let it idle for at least 3 minutes.

**NOTE:**
**Never raise engine speed above 2,800 rpm after this step. If the engine speed limit is exceeded, return to step 5.**

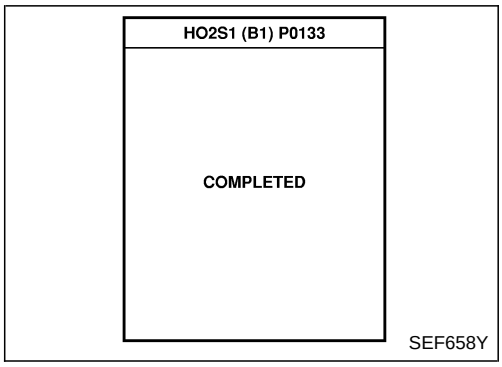
| HO2S1 (B1) P0133 | |
|---|---|
| TESTING | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| B/FUEL SCHDL | XXX msec |
| COOLAN TEMP/S | XXX °C |
| VHCL SPEED SEN | XXX km/h |

SEF339Z

6. When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 20 to 50 seconds.)

| | |
|---|---|
| ENG SPEED | 1,550 - 2,500 rpm |
| Vehicle speed | More than 80 km/h (50 MPH) |
| B/FUEL SCHDL | 5 - 16.7 msec |
| Selector lever | Suitable position |

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



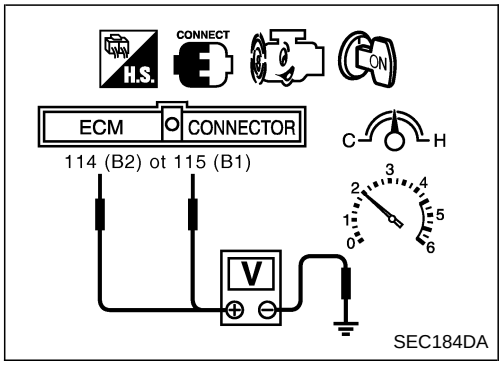

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-178, “Diagnostic Procedure”.

## Overall Function Check

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

### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1(B1) signal] or 114 [HO2S1(B2) signal] and engine ground.




3. Check the following with engine speed held at 2,000 rpm constant under no load.

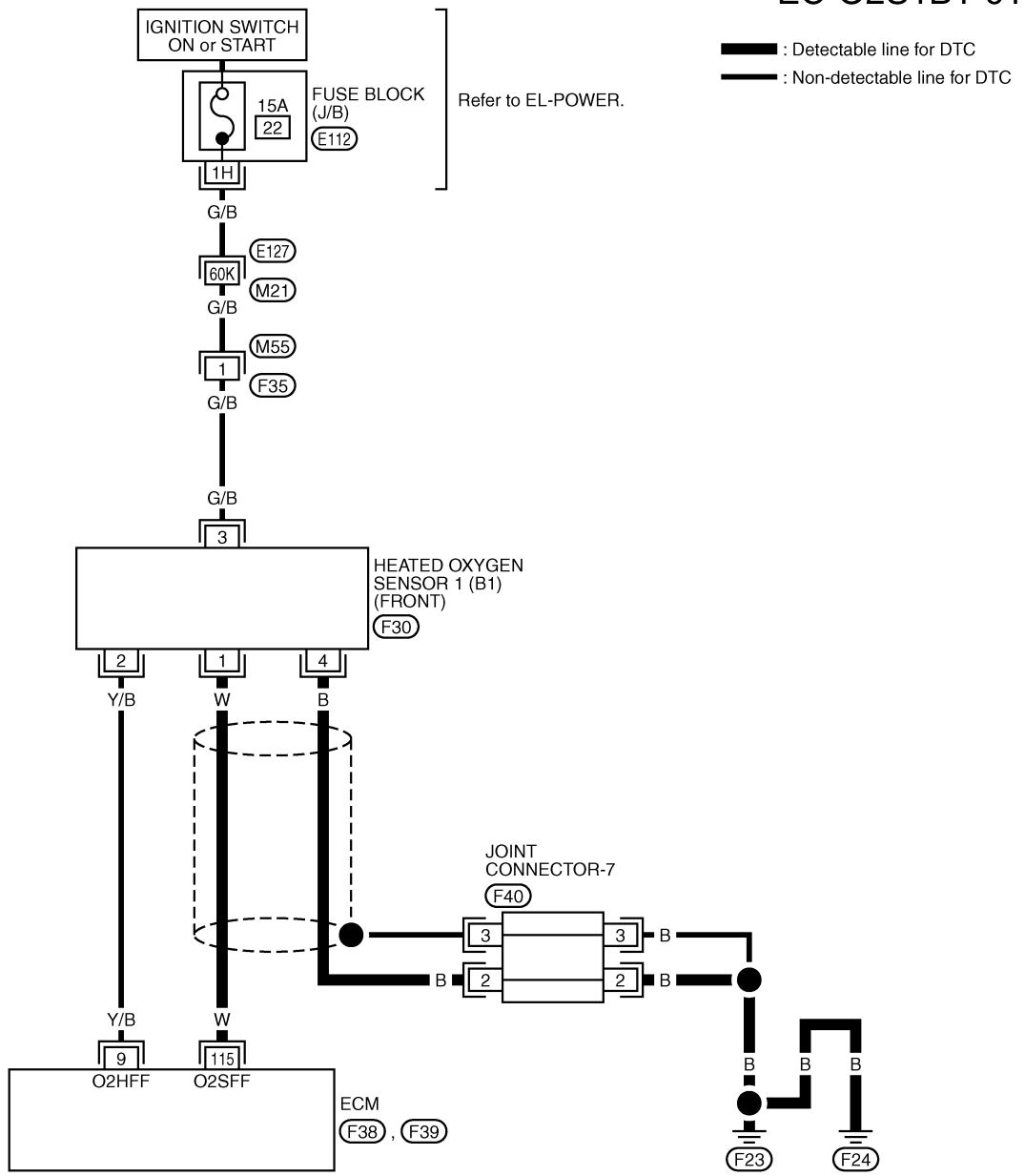
— The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
**1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**
**2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V**

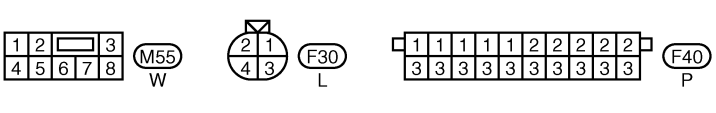
4. If NG, go to EC-178, “Diagnostic Procedure”.

## Wiring Diagram

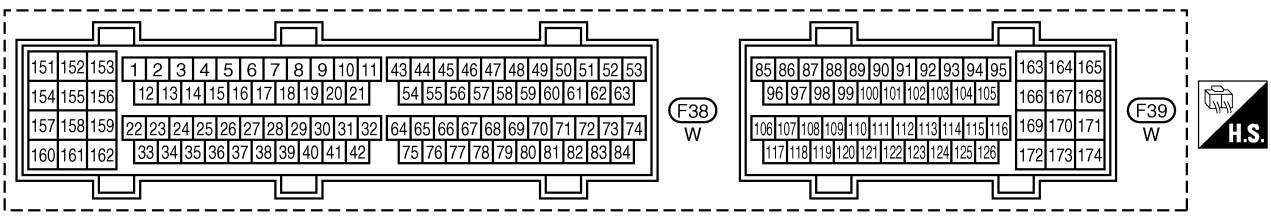
### BANK 1

EC-O2S1B1-01




Refer to last page (Foldout page).
M21 , E127
E112




TEC408M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

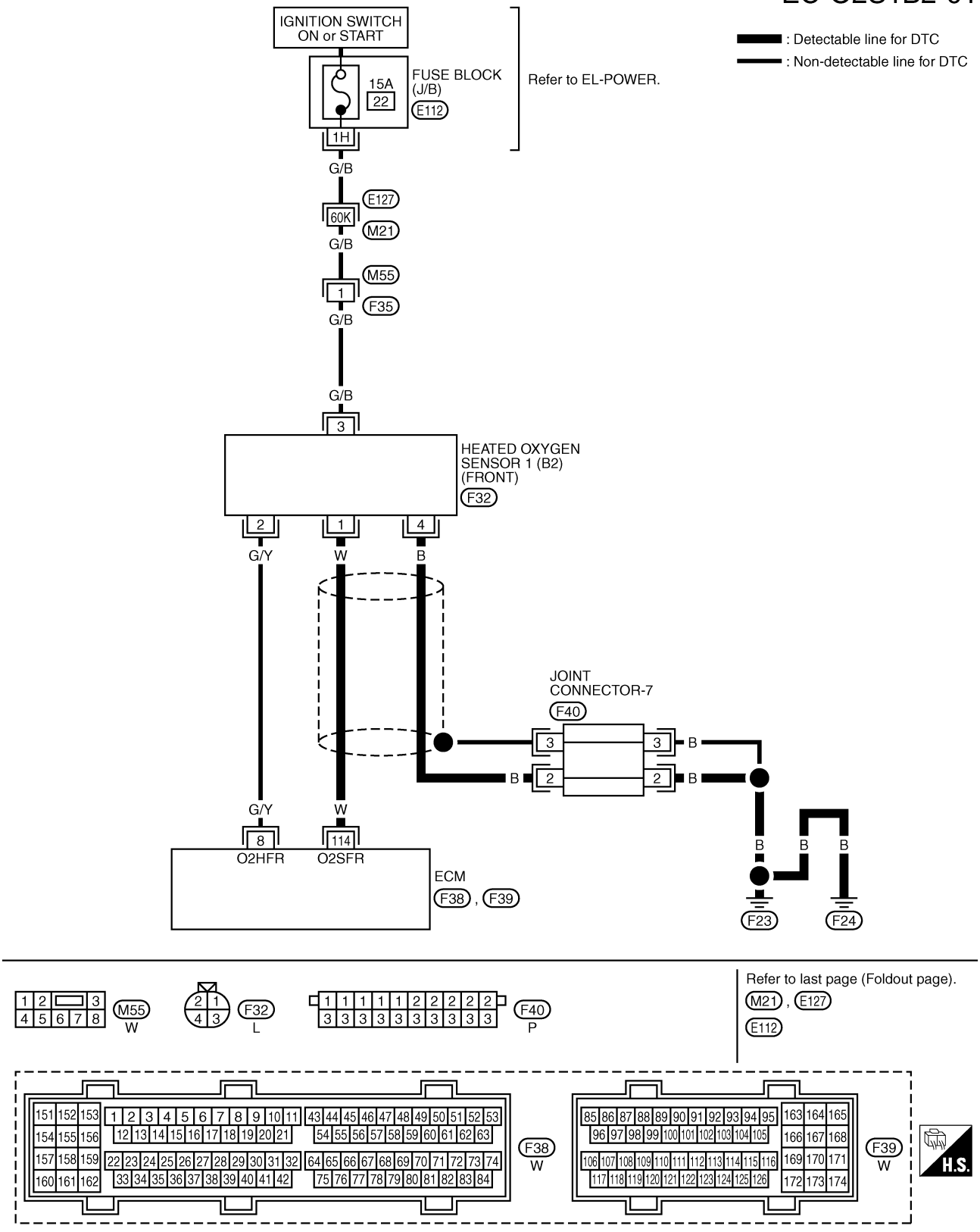
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 115 | W | Heated oxygen sensor 1 (bank 1) | Engine is running.<br>— **Warm-up condition**<br>— Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |

## Wiring Diagram (Cont'd)

**BANK 2**

EC-O2S1B2-01




TEC412M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

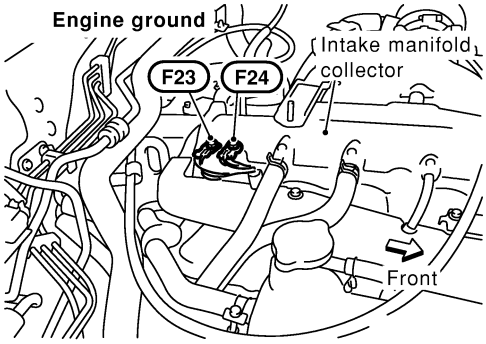
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 114 | W | Heated oxygen sensor 1 (bank 2) | Engine is running.<br>**Warm-up condition**<br>Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |

## Diagnostic Procedure

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

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



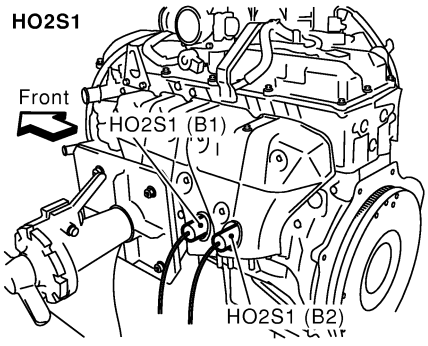

SEC690C

► GO TO 2.

| 2 | RETIGHTEN HEATED OXYGEN SENSOR 1 |
|---|---|

Loosen and retighten heated oxygen sensor 1.

**Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)**



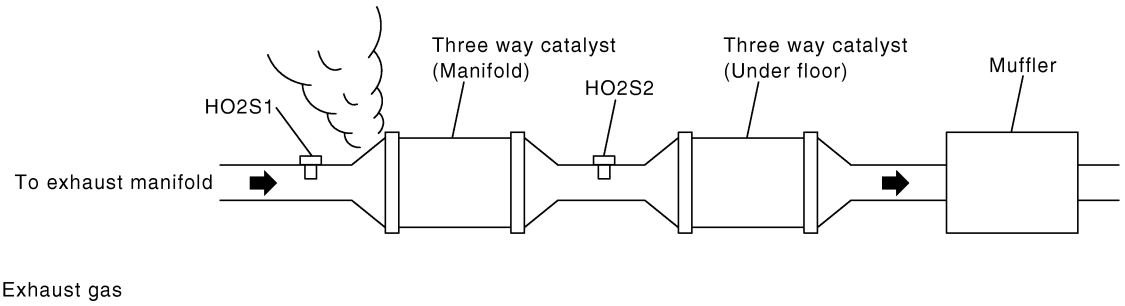

SEC888C

► GO TO 3.

## Diagnostic Procedure (Cont'd)

| 3 | CHECK FOR EXHAUST GAS LEAK |
|---|---|

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (Manifold).




SEC502D

**OK or NG**

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

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

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

**OK or NG**

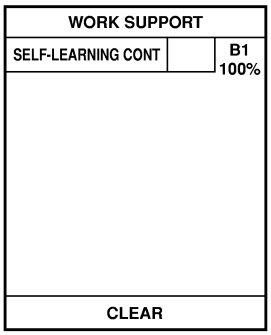
| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Repair or replace. |

## Diagnostic Procedure (Cont'd)

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

**With CONSULT-II**

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

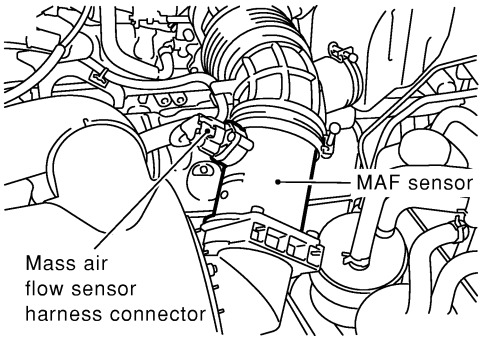



SEF215Z

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

**Without CONSULT-II**

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.




SEC688C

4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
7. Make sure that DTC P0000 is displayed.
8. 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?**

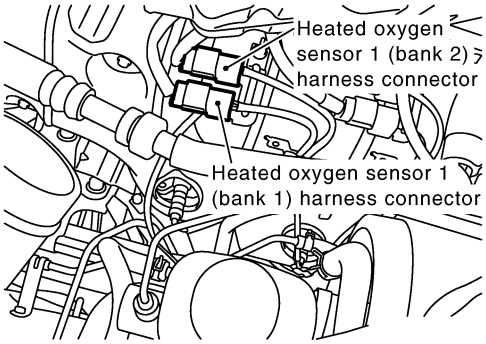
**Yes or No**

| | |
|---|---|
| Yes ► | Perform trouble diagnosis for DTC P0171, P0174 or DTC P0172, P0175 (Refer to EC-218 or EC-227). |
| No ► | GO TO 6. |

## Diagnostic Procedure (Cont'd)

| 6 | CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

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




SEC671D

3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S1 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
5. Also check harness for short to ground and short to power.

**OK or NG**

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

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

Check the following.
- Joint connector-7
- Harness for open or short between HO2S1 and ground

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

## Diagnostic Procedure (Cont'd)

**8 CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT**

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0133 | 115 | 1 | 1 |
| P0153 | 114 | 1 | 2 |

MTBL1571

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0133 | 115 | 1 | 1 |
| P0153 | 114 | 1 | 2 |

MTBL1572

**Continuity should not exist.**

3. Also check harness for short to power.

**OK or NG**

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

**9 CHECK HEATED OXYGEN SENSOR 1 HEATER**

**Refer to EC-131, "Component Inspection".**

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 9. |
| NG ► | Replace malfunctioning heated oxygen sensor 1. |

**10 CHECK MASS AIR FLOW SENSOR**

**Refer to EC-146, "Component Inspection".**

**OK or NG**

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

**11 CHECK PCV VALVE**

**Refer to EC-482, "Component Inspection".**

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 12. |
| NG ► | Replace PCV valve. |

**12 CHECK HEATED OXYGEN SENSOR 1**

**Refer to EC-183, "Component Inspection".**

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 13. |
| NG ► | Replace malfunctioning heated oxygen sensor 1. |

## Diagnostic Procedure (Cont'd)

| | |
|---|---|
| 13 | CHECK INTERMITTENT INCIDENT |
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | |
| ► | INSPECTION END |

## Component Inspection

### HEATED OXYGEN SENSOR 1

#### With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch "RECORD" on CONSULT-II screen.

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| ENG SPEED | XXX rpm |
| MAS A/F SE-B1 | XXX V |
| COOLAN TEMP/S | XXX °C |
| HO2S1 (B1) | XXX V |
| HO2S1 MNTR (B1) | LEAN |

SEF646Y

Bank 1

| cycle | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| HO2S1 MNTR (B1) | R-L-R-L-R-L-R-L-R-L-R | | | | |

Bank 2

| cycle | 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|---|
| HO2S1 MNTR (B2) | R-L-R-L-R-L-R-L-R-L-R | | | | |

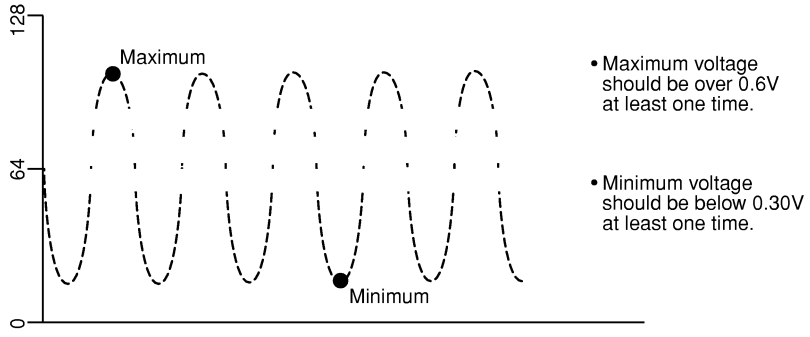
R means HO2S1 MNTR (B1)/(B2) indicates RICH

L means HO2S1 MNTR (B1)/(B2) indicates LEAN

SEF647Y

6. Check the following.
- "HO2S1 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 at right.
- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

| Trigger | ENG SPEED | HO2S1 (B1) |
|---|---|---|
| | rpm | V |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |

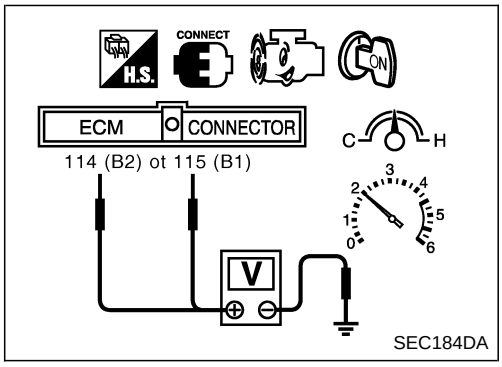



SEF648Y

## Component Inspection (Cont'd)

**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 J-43897-12 and approved anti-seize lubricant.**



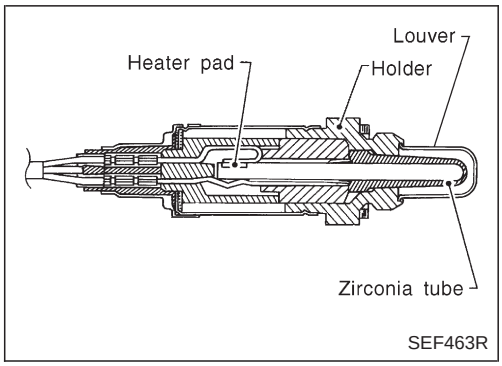

### Without CONSULT-II

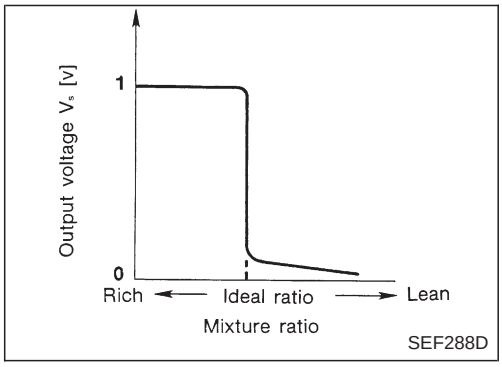
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
- 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.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 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 J-43897-12 and approved anti-seize lubricant.**



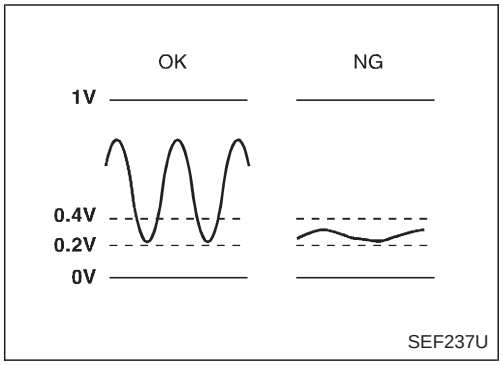

## Component Description

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

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S1 (B1)<br>HO2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S1 MNTR (B1)<br>HO2S1 MNTR (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |




## On Board Diagnosis Logic

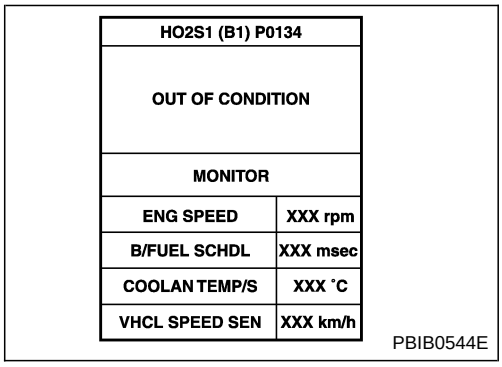
Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0134<br>0134<br>(Bank 1) | Heated oxygen sensor 1 circuit no activity detected | The voltage from the sensor is constantly approx. 0.3V. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Heated oxygen sensor 1 |
| P0154<br>0154<br>(Bank 2) | | | |

## 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 10 seconds before conducting the next test.**

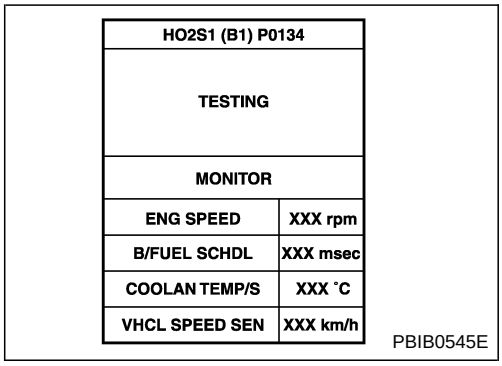
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**




### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "HO2S1 (B1) P0134" or "HO2S1 (B2) P0154" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-II.
3. Touch "START".
4. Let it idle for at least 3 minutes.

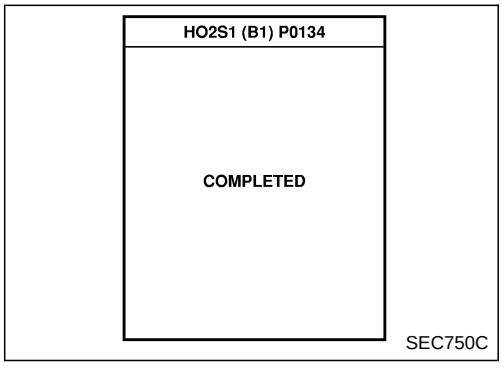
**NOTE:**
**Never raise engine speed above 2,800 rpm after this step. If the engine speed limit is exceeded, return to step 4.**




5. When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 10 to 60 seconds.)

| | |
|---|---|
| ENG SPEED | 1,550 - 2,500 rpm |
| Vehicle speed | More than 64 km/h (40 MPH) |
| B/FUEL SCHDL | 5 - 16.7 msec |
| Selector lever | Suitable position |

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



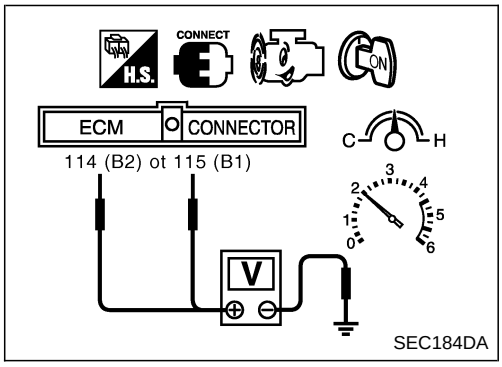

6. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to EC-191, "Diagnostic Procedure".

## Overall Function Check

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

### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.



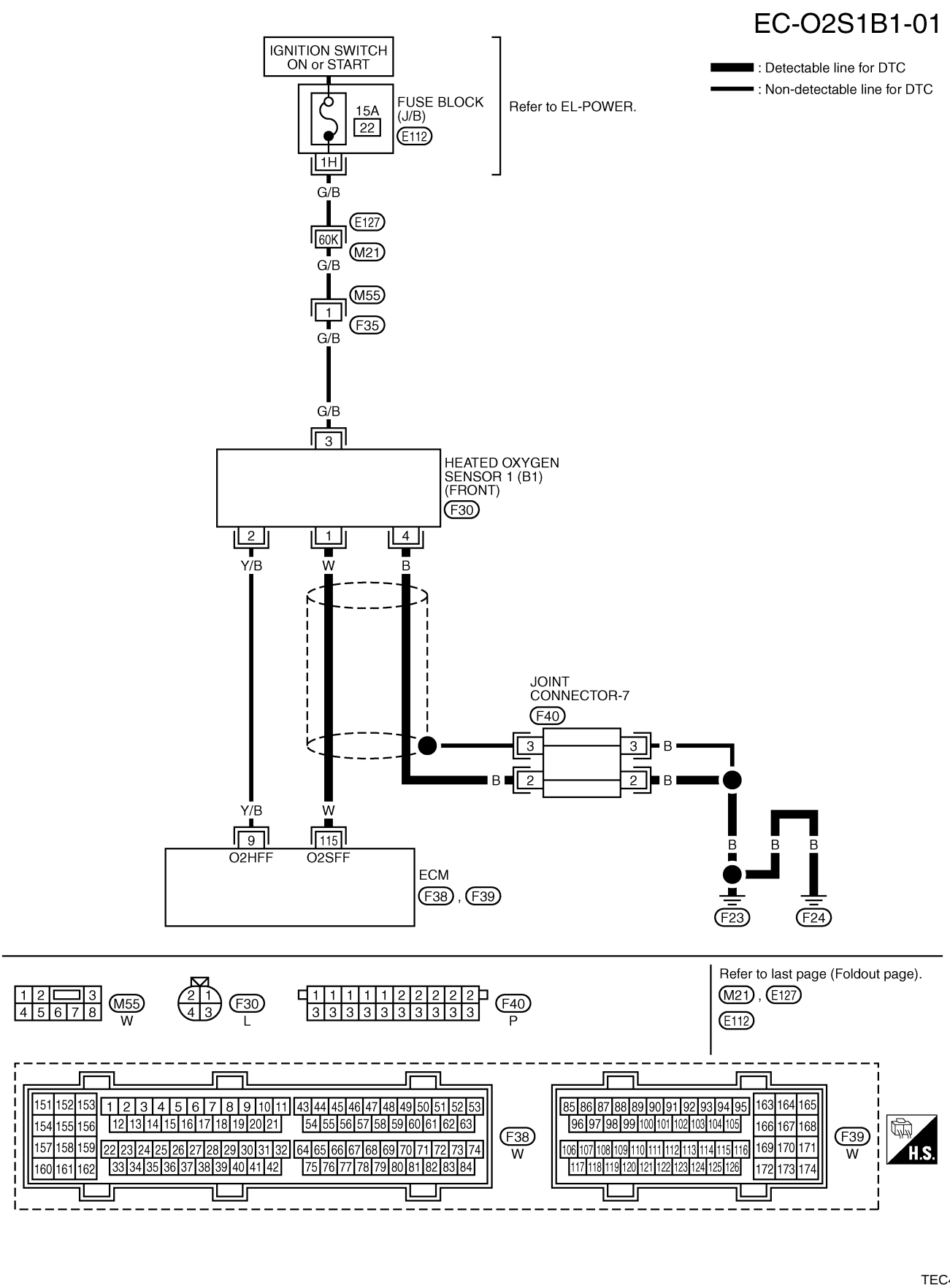

3. Check the following with engine speed held at 2,000 rpm constant under no load.

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

4. If NG, go to EC-191, “Diagnostic Procedure”.

## Wiring Diagram

### BANK 1




TEC408M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

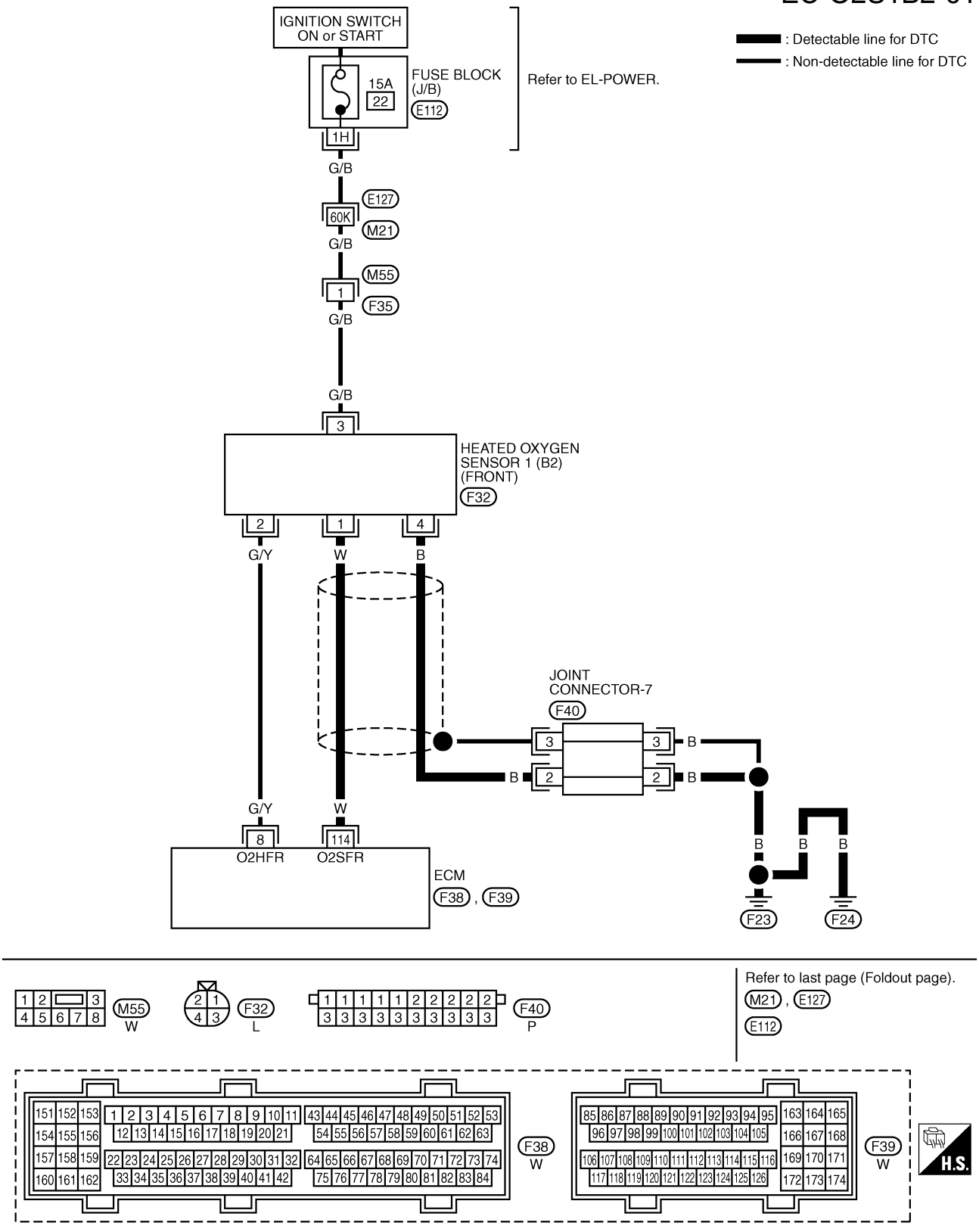
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 115 | W | Heated oxygen sensor 1 (bank 1) | Engine is running.<br>**Warm-up condition**<br>Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |

## Wiring Diagram (Cont'd)

**BANK 2**

EC-O2S1B2-01




TEC412M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

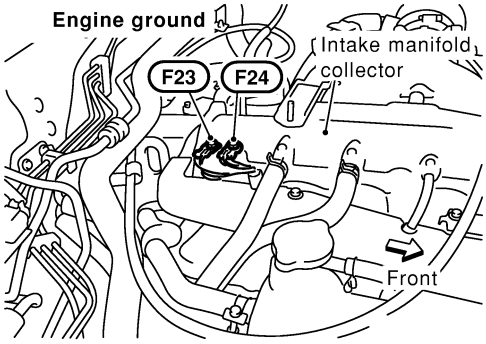
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 114 | W | Heated oxygen sensor 1 (bank 2) | Engine is running.<br>**Warm-up condition**<br>Engine speed is 2,000 rpm. | 0 - Approximately 1.0V (Periodically change) |

## Diagnostic Procedure

**1 INSPECTION START**

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

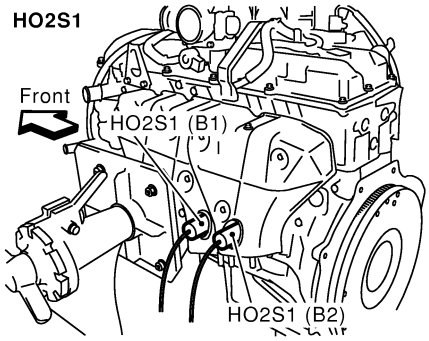



SEC690C

► GO TO 2.

**2 CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT**

1. Disconnect heated oxygen sensor 1 harness connector.




SEC888C

2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. 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)

| 3 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Joint connector-7<br>● Harness for open or short between HO2S1 and ground | |
| ► | Repair open circuit or short to power in harness or connectors. |

| 4 | CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal and HO2S1 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0134 | 115 | 1 | 1 |
| P0154 | 114 | 1 | 2 |

MTBL1573

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0134 | 115 | 1 | 1 |
| P0154 | 114 | 1 | 2 |

MTBL1574

**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 HEATED OXYGEN SENSOR 1 |
|---|---|
| **Refer to EC-193, "Component Inspection".**<br>**OK or NG** | |
| OK | ► GO TO 6. |
| NG | ► Replace malfunctioning heated oxygen sensor 1. |

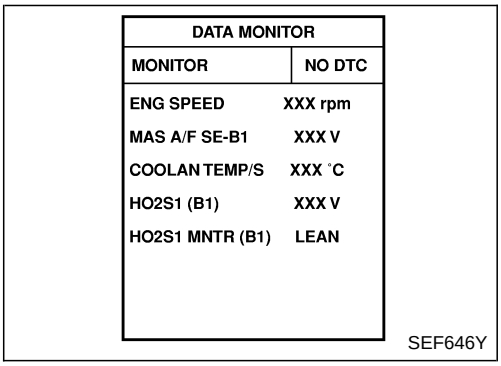
| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |

## Component Inspection

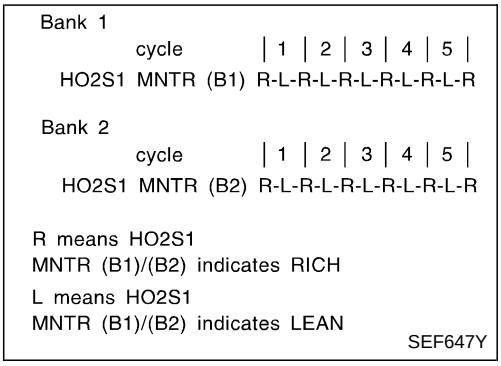
### HEATED OXYGEN SENSOR 1

#### With CONSULT-II

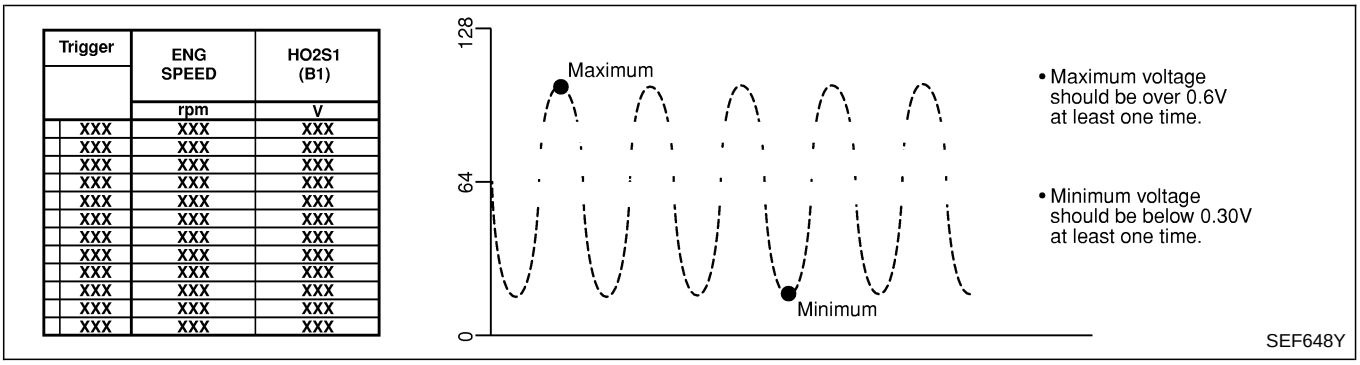
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.




5. Touch “RECORD” on CONSULT-II screen.

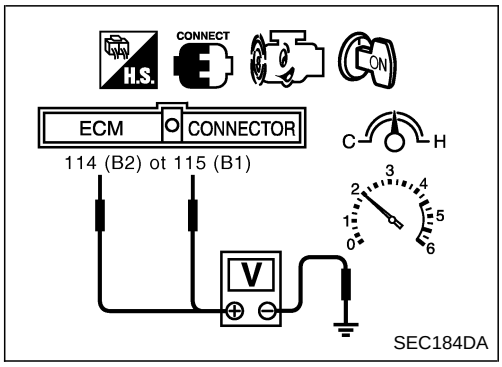



6. Check the following.
- “HO2S1 MNTR (B1)/(B2)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” 5 times in 10 seconds.
  5 times (cycles) are counted as shown at right.
- “HO2S1 (B1)/(B2)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)/(B2)” voltage goes below 0.3V at least once.
- “HO2S1 (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 J-43897-12 and approved anti-seize lubricant.**

## Component Inspection (Cont'd)



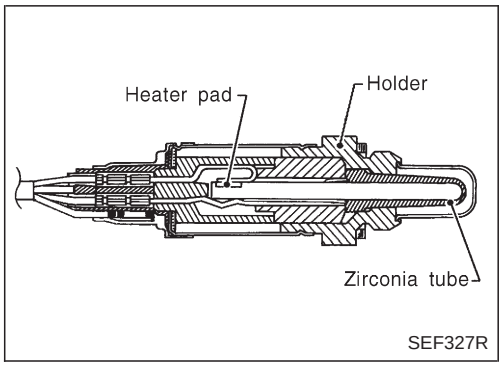

### Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
- 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.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 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 J-43897-12 and approved anti-seize lubricant.**



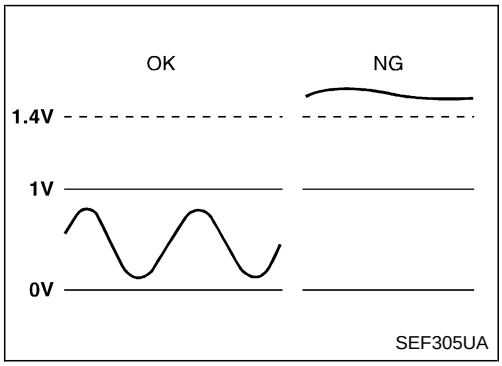

## Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
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 heated oxygen sensor 2 is not used for engine control operation.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S2 (B1)<br>HO2S2 (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S2 MNTR (B1)<br>HO2S2 MNTR (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | LEAN ←→ RICH |




## On Board Diagnosis Logic

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during the various driving condition such as fuel-cut.

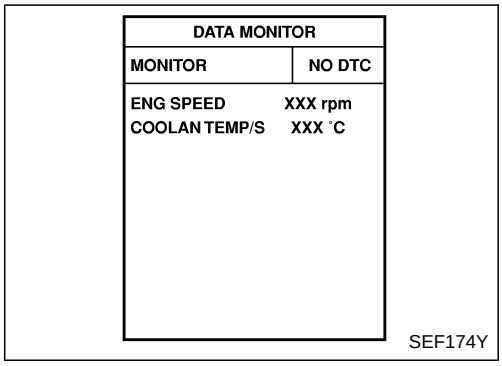
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0138<br>0138<br>(Bank 1) | Heated oxygen sensor 2 circuit high voltage | An excessively high voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Heated oxygen sensor 2 |
| P0158<br>0158<br>(Bank 2) | | | |

## 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 10 seconds before conducting the next test.**

### WITH CONSULT-II

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




4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
5. Let engine idle for two minutes.
6. If 1st trip DTC is detected, go to EC-200, "Diagnostic Procedure".

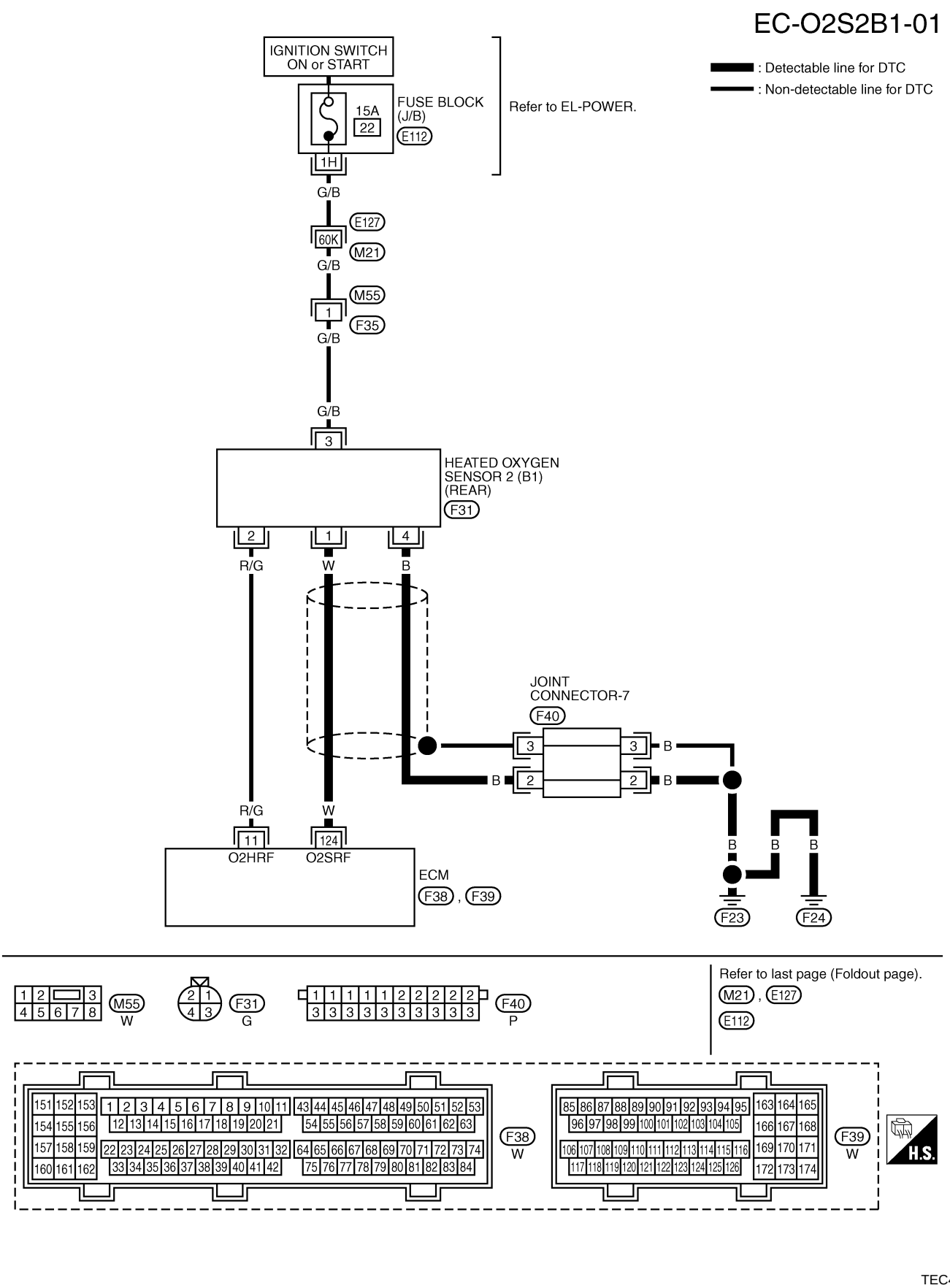
### WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for two minutes.
5. Turn ignition switch "OFF" and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
7. Let engine idle for two minutes.
8. Select "Mode 3" with GST.
9. If NG, go to EC-200, "Diagnostic Procedure".

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

## Wiring Diagram

### BANK 1




TEC411M

## Wiring Diagram (Cont'd)

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

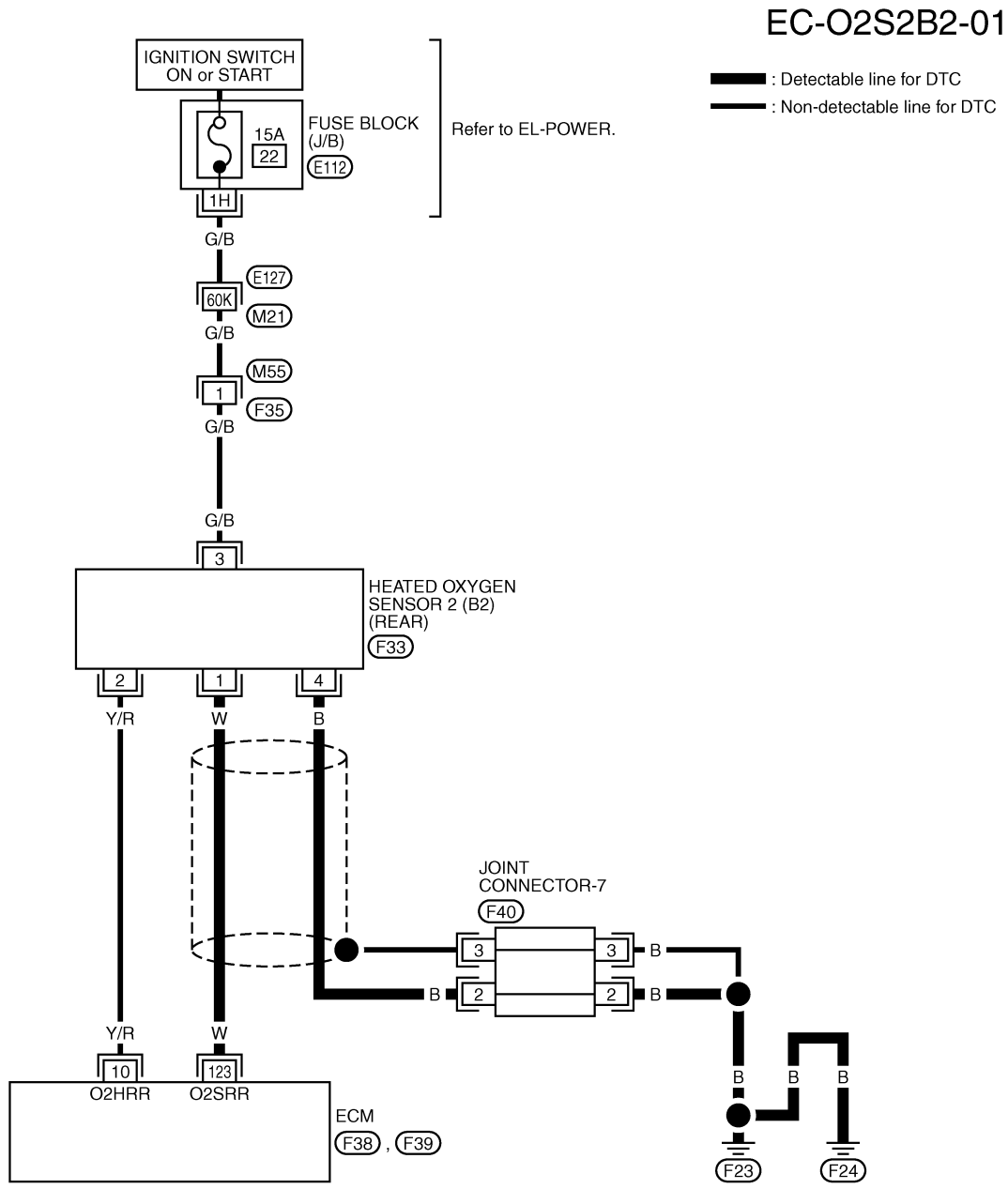
**CAUTION:**

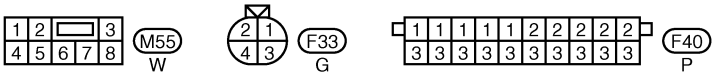
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 124 | W | Heated oxygen sensor 2 (bank 1) | Engine is running.<br>**Warm-up condition**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

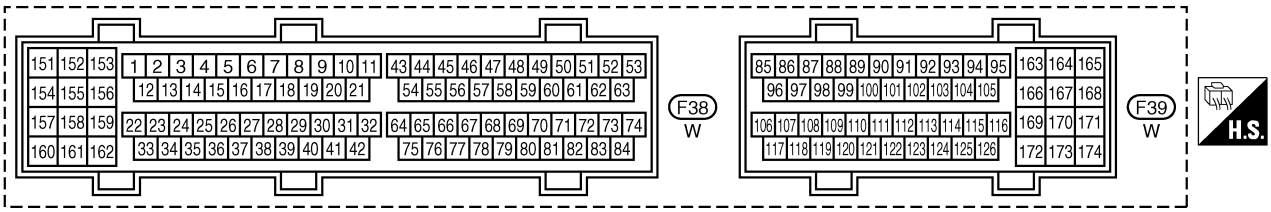
## Wiring Diagram (Cont'd)

### BANK 2




Refer to last page (Foldout page).
M21, E127
E112




TEC336M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

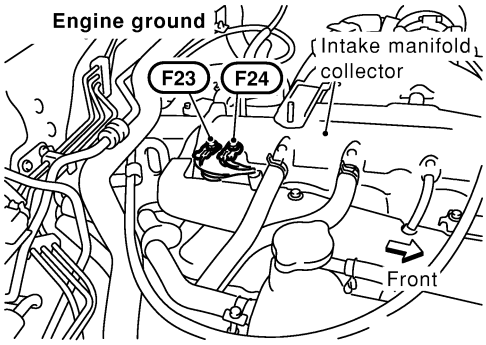
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 123 | W | Heated oxygen sensor 2 (bank 2) | Engine is running.<br>**Warm-up condition**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

## Diagnostic Procedure

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

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



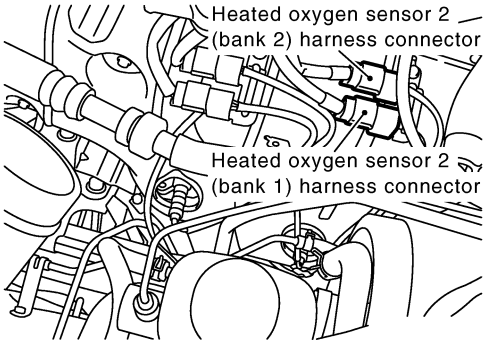

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

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




SEC669D

3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S2 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
5. Also check harness for short to ground and short to power.

**OK or NG**

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

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

Check the following.
- Joint connector-7
- Harness for open or short between HO2S2 and ground

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

## Diagnostic Procedure (Cont'd)

| 4 | CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0138 | 124 | 1 | 1 |
| P0158 | 123 | 1 | 2 |

MTBL1575

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0138 | 124 | 1 | 1 |
| P0158 | 123 | 1 | 2 |

MTBL1576

**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 HEATED OXYGEN SENSOR 2 |
|---|---|

**Refer to EC-203, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 6. |
| NG | ► | Replace heated oxygen sensor 2. |

| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

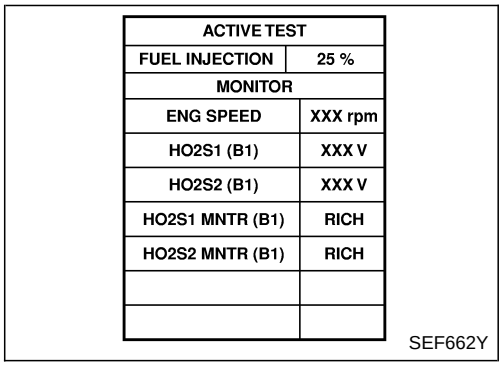
| | | |
|---|---|---|
| | ► | **INSPECTION END** |

## Component Inspection

### HEATED OXYGEN SENSOR 2

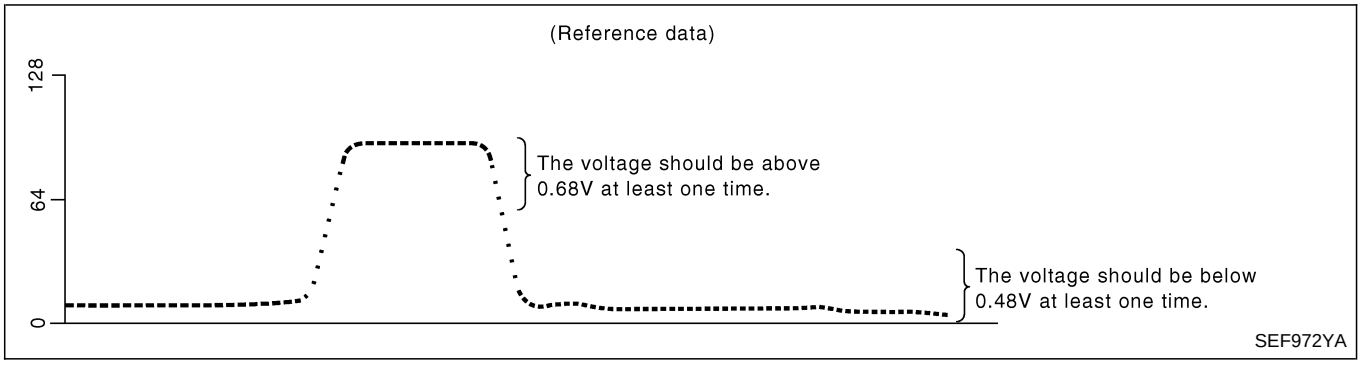
#### With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.




5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-II.

6. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.




**“HO2S2 (B1)/(B2)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.**
**“HO2S2 (B1)/(B2)” should be below 0.48V at least once when the “FUEL INJECTION” is −25%.**

**CAUTION:**

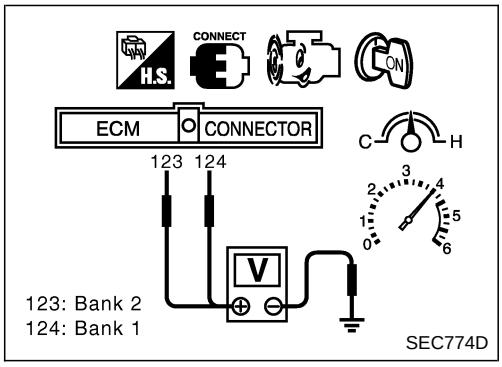
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

#### Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.

## Component Inspection (Cont'd)

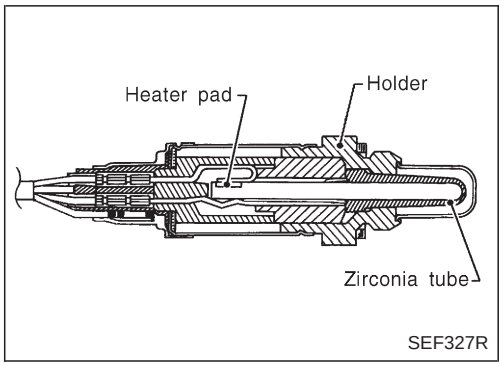
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.




6. Check the voltage when revving 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 0.68V at least once during this procedure.**
   **If the voltage is above 0.68V at step 6, step 7 is not necessary.**
7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
   **The voltage should be below 0.48V at least once during this procedure.**
8. If NG, replace heated oxygen sensor 2.

**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 J-43897-12 and approved anti-seize lubricant.**



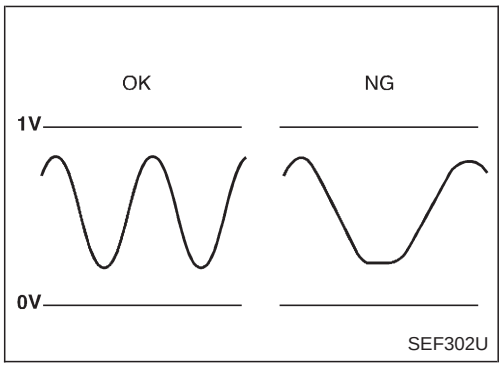

## Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
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 heated oxygen sensor 2 is not used for engine control operation.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S2 (B1)<br>HO2S2 (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S2 MNTR (B1)<br>HO2S2 MNTR (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | LEAN ←→ RICH |




## On Board Diagnosis Logic

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during the various driving condition such as fuel-cut.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0139<br>0139<br>(Bank 1) | Heated oxygen sensor 2 circuit slow response | It takes more time for the sensor to respond between rich and lean than the specified time. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Heated oxygen sensor 2<br>● Fuel pressure<br>● Injectors<br>● Intake air leaks |
| P0159<br>0159<br>(Bank 2) | | | |

## DTC Confirmation Procedure

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

**NOTE:**
- **"COMPLETED" will appear on CONSULT-II 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 10 seconds before conducting the next test.**

**TESTING CONDITION:**
**Never stop engine during this procedure. If the engine is stopped, retry this procedure from step 2 in "Procedure for COND1".**

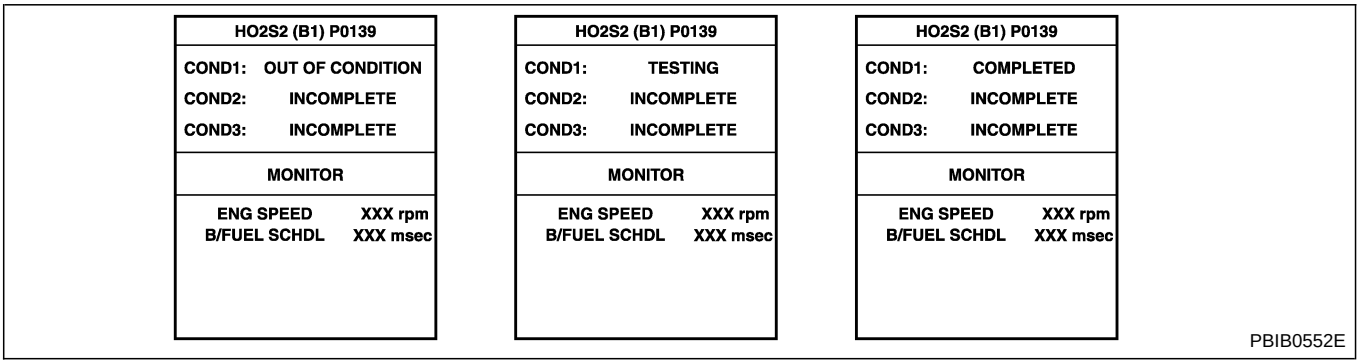
### WITH CONSULT-II

### Procedure for COND1

**For the best results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F)**

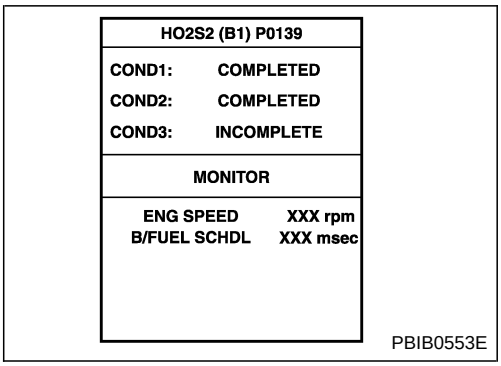
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.
5. Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch "START".
7. Let engine idle for at least 30 seconds.
8. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
9. When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

| | |
|---|---|
| ENG SPEED | More than 1,000 rpm |
| B/FUEL SCHDL | More than 1.0 msec |
| COOLANT TEMP/S | 70 - 100°C |
| Selector level | Suitable position |




**NOTE:**
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

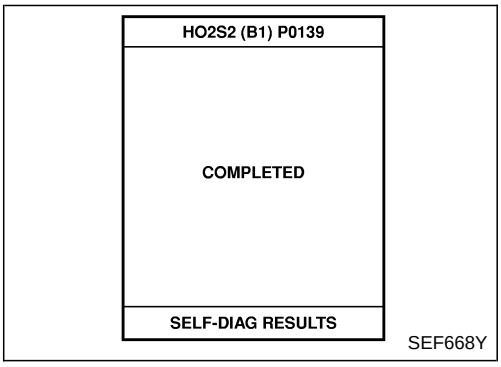
## DTC Confirmation Procedure (Cont'd)




### Procedure for COND2

1. While driving, release accelerator pedal completely with "OD" OFF from the above condition [step 9] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED". (It will take approximately 4 seconds.)

**NOTE:**
**If "COMPLETED" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".**




### Procedure for COND3

1. Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
2. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
   If "NG" is displayed, refer to EC-212, "Diagnostic Procedure".
   If "CAN NOT BE DIAGNOSED" is displayed, perform the following.

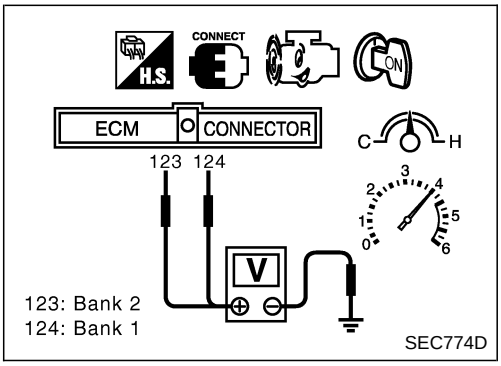
a. Turn ignition switch "OFF" and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch "ON" and select "COOLANTEMP/S" in "DATA MONITOR" mode with CONSULT-II.
c. Start engine and warm it up while monitoring "COOLANTEMP/S" indication on CONSULT-II.
d. When "COOLANTEMP/S" indication reaches to 70°C (158°F), go to "Procedure for COND 1" step 3.

## Overall Function Check

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

### WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.




6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   **A change of voltage should be more than 0.06V for 1 second during this procedure.**
   **If the voltage can be confirmed in step 6, step 7 is not necessary.**
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH)

## Overall Function Check (Cont'd)

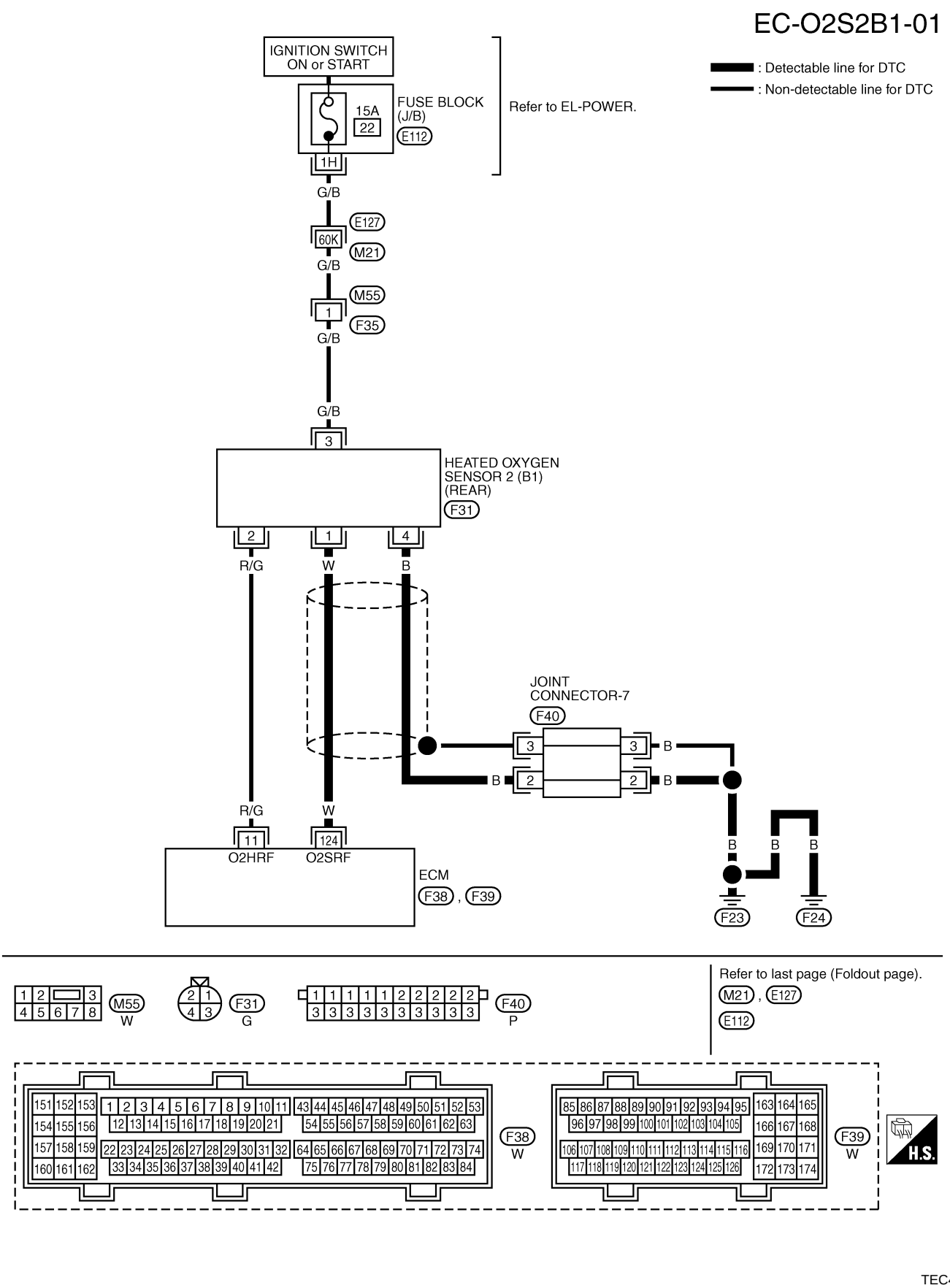
in "D" position with "OD" OFF.

**A change of voltage should be more than 0.06V for 1 second during this procedure.**

8. If NG, go to EC-212, "Diagnostic Procedure".

## Wiring Diagram

### BANK 1




TEC411M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

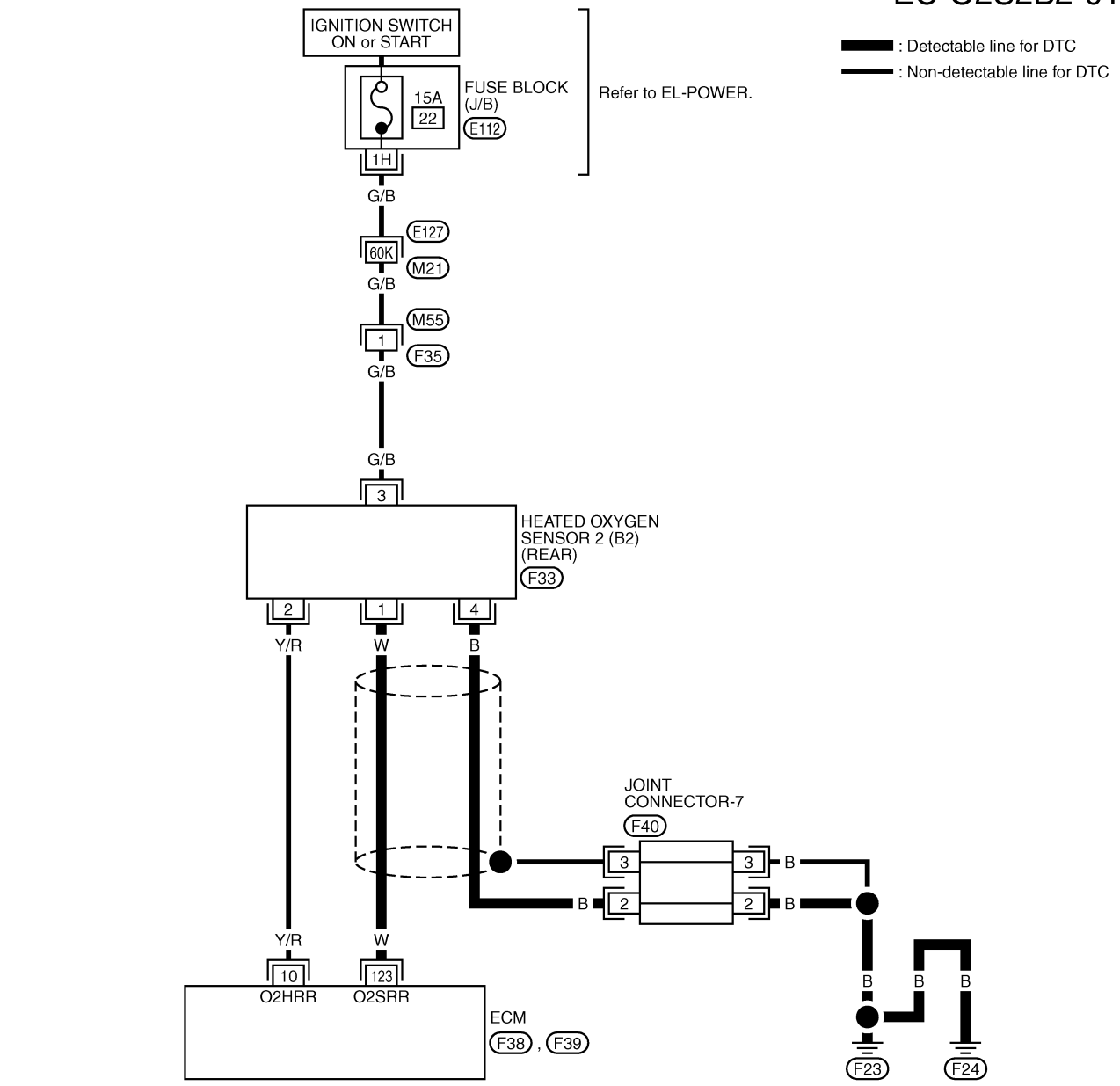
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

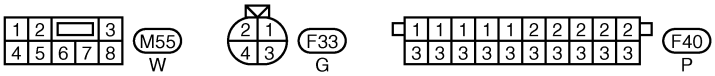
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 124 | W | Heated oxygen sensor 2 (bank 1) | Engine is running.<br>**Warm-up condition**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

## Wiring Diagram (Cont'd)

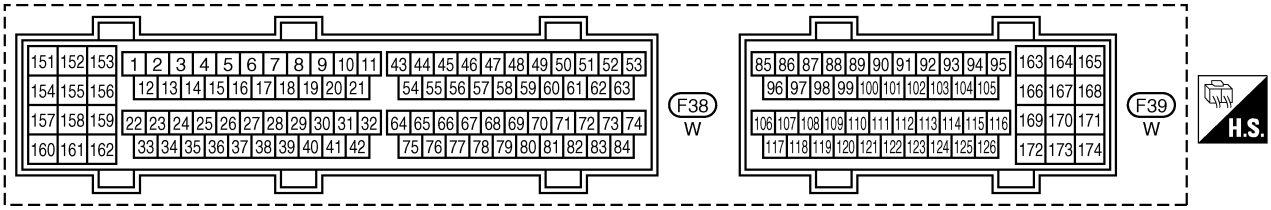
**BANK 2**

EC-O2S2B2-01




Refer to last page (Foldout page).
M21, E127
E112




TEC336M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

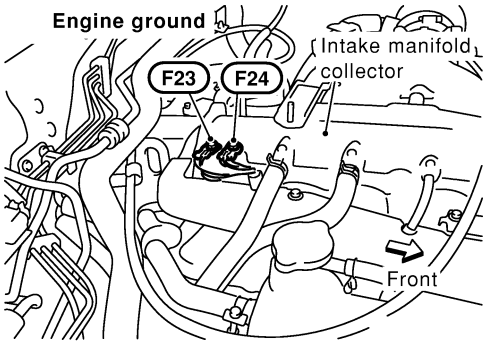
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 123 | W | Heated oxygen sensor 2 (bank 2) | Engine is running.<br>**Warm-up condition**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

## Diagnostic Procedure

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

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




SEC690C

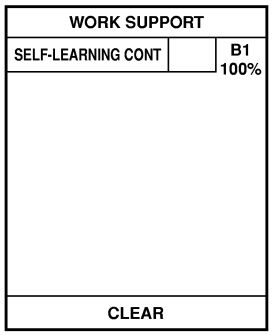
► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT-II**

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

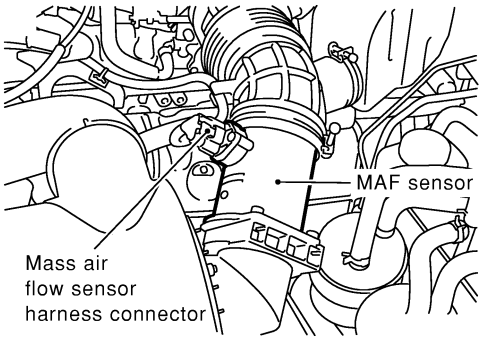



SEF215Z

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

**Without CONSULT-II**

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.




SEC688C

5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
7. Make sure that DTC P0000 is displayed.
8. 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?**

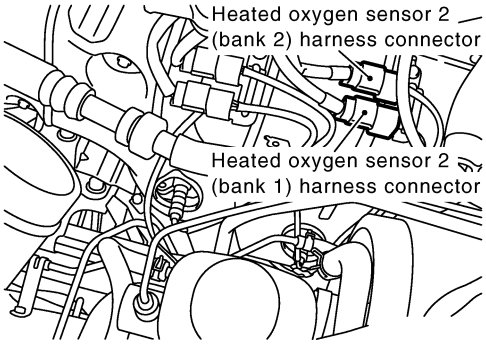
**Yes or No**

| | | |
|---|---|---|
| Yes | ► | Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-218 or EC-227. |
| No | ► | GO TO 3. |

## Diagnostic Procedure (Cont'd)

| 3 | CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

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




SEC669D

3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S2 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
5. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Joint connector-7
- Harness for open or short between HO2S2 and ground

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

## Diagnostic Procedure (Cont'd)

| 5 | CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0139 | 124 | 1 | 1 |
| P0159 | 123 | 1 | 2 |

MTBL1577

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0139 | 124 | 1 | 1 |
| P0159 | 123 | 1 | 2 |

MTBL1578

**Continuity should not exist.**

3. Also check harness for short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 6. |
| NG | ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK HEATED OXYGEN SENSOR 2 |
|---|---|

**Refer to EC-215, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 7. |
| NG | ► | Replace heated oxygen sensor 2. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

| | | |
|---|---|---|
| | ► | **INSPECTION END** |

## Component Inspection

### HEATED OXYGEN SENSOR 2

#### With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.

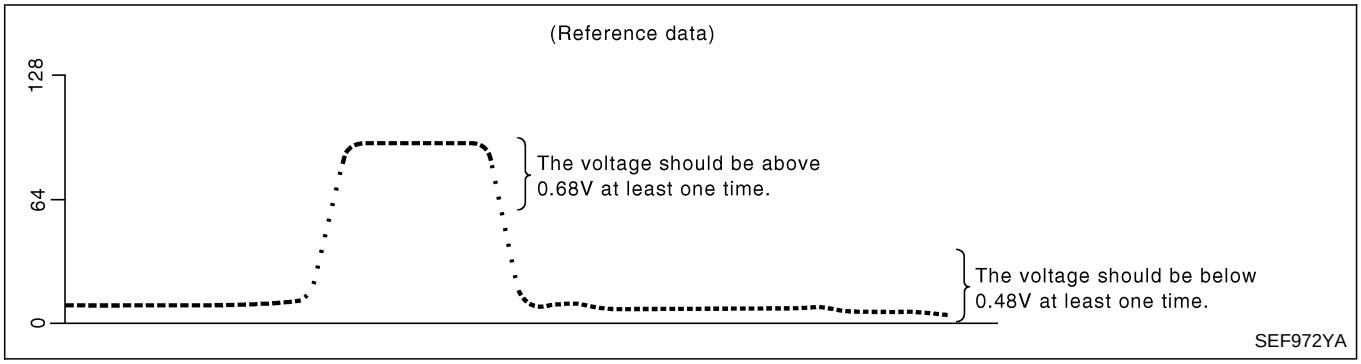
## Component Inspection (Cont'd)

| ACTIVE TEST | |
|---|---|
| FUEL INJECTION | 25 % |
| MONITOR | |
| ENG SPEED | XXX rpm |
| HO2S1 (B1) | XXX V |
| HO2S2 (B1) | XXX V |
| HO2S1 MNTR (B1) | RICH |
| HO2S2 MNTR (B1) | RICH |
| | |
| | |

SEF662Y

5. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.

6. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



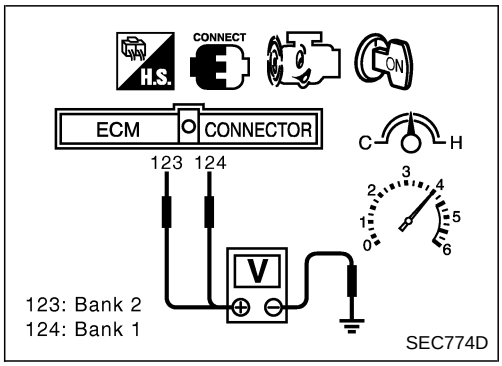

**"HO2S2 (B1)/(B2)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.**
**"HO2S2 (B1)/(B2)" should be below 0.48V at least once when the "FUEL INJECTION" is −25%.**

**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 J-43897-12 and approved anti-seize lubricant.**

### Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.

## Component Inspection (Cont'd)




6. Check the voltage when revving 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 0.68V at least once during this procedure.**
   **If the voltage is above 0.68V at step 6, step 7 is not necessary.**
7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
   **The voltage should be below 0.48V at least once during this procedure.**
8. If NG, replace heated oxygen sensor 2.

**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 J-43897-12 and approved anti-seize lubricant.**

## 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 heated oxygen sensors 1. 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 MI (2 trip detection logic).

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Heated oxygen sensors 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injectors |

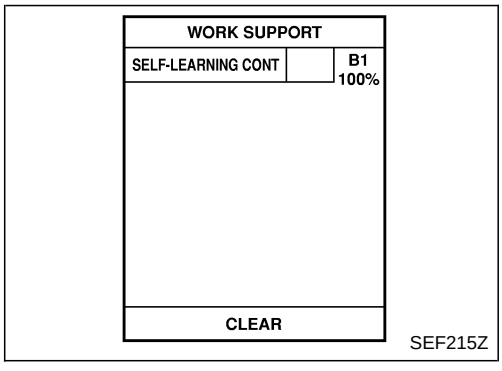
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0171<br>0171<br>(Bank 1)<br><br>P0174<br>0174<br>(Bank 2) | Fuel injection system too lean | ● Fuel injection system does not operate properly.<br>● The amount of mixture ratio compensation is too large.<br>(The mixture ratio is too lean.) | ● Intake air leaks<br>● Heated oxygen sensor 1<br>● Injectors<br>● Exhaust gas leaks<br>● Incorrect fuel pressure<br>● Lack of fuel<br>● Mass air flow sensor<br>● Incorrect PCV hose connection |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.

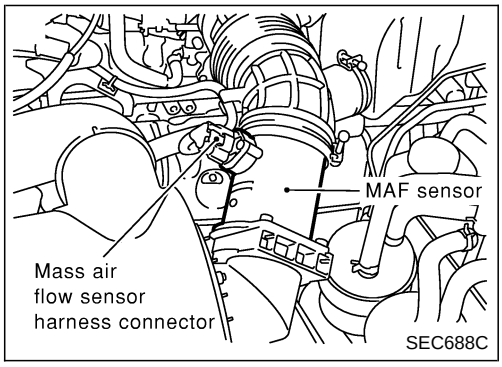



4. Clear the self-learning control coefficient by touching "CLEAR".
5. Select "DATA MONITOR" mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to EC-222, "Diagnostic Procedure".
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal. If engine starts, go to EC-222, "Diagnostic Procedure". If engine does not start, check exhaust and intake air leak visually.

## DTC Confirmation Procedure (Cont'd)

### WITH GST

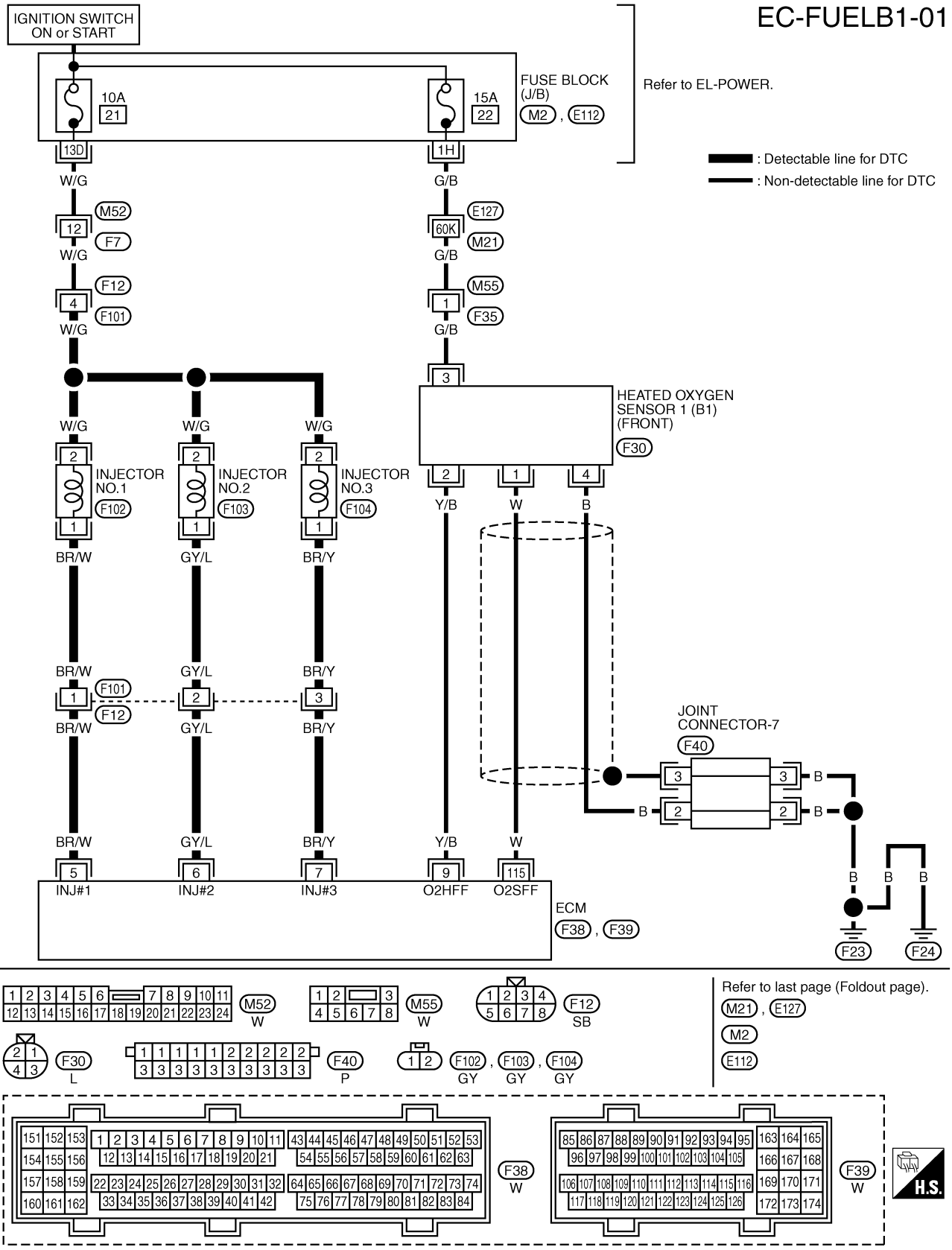
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.




3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select "MODE 3" with GST. Make sure DTC P0102 is detected.
6. Select "MODE 4" with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select "MODE 7" with GST. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to EC-222, "Diagnostic Procedure".
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal. If engine starts, go to EC-222, "Diagnostic Procedure". If engine does not start, check exhaust and intake air leak visually.

## Wiring Diagram

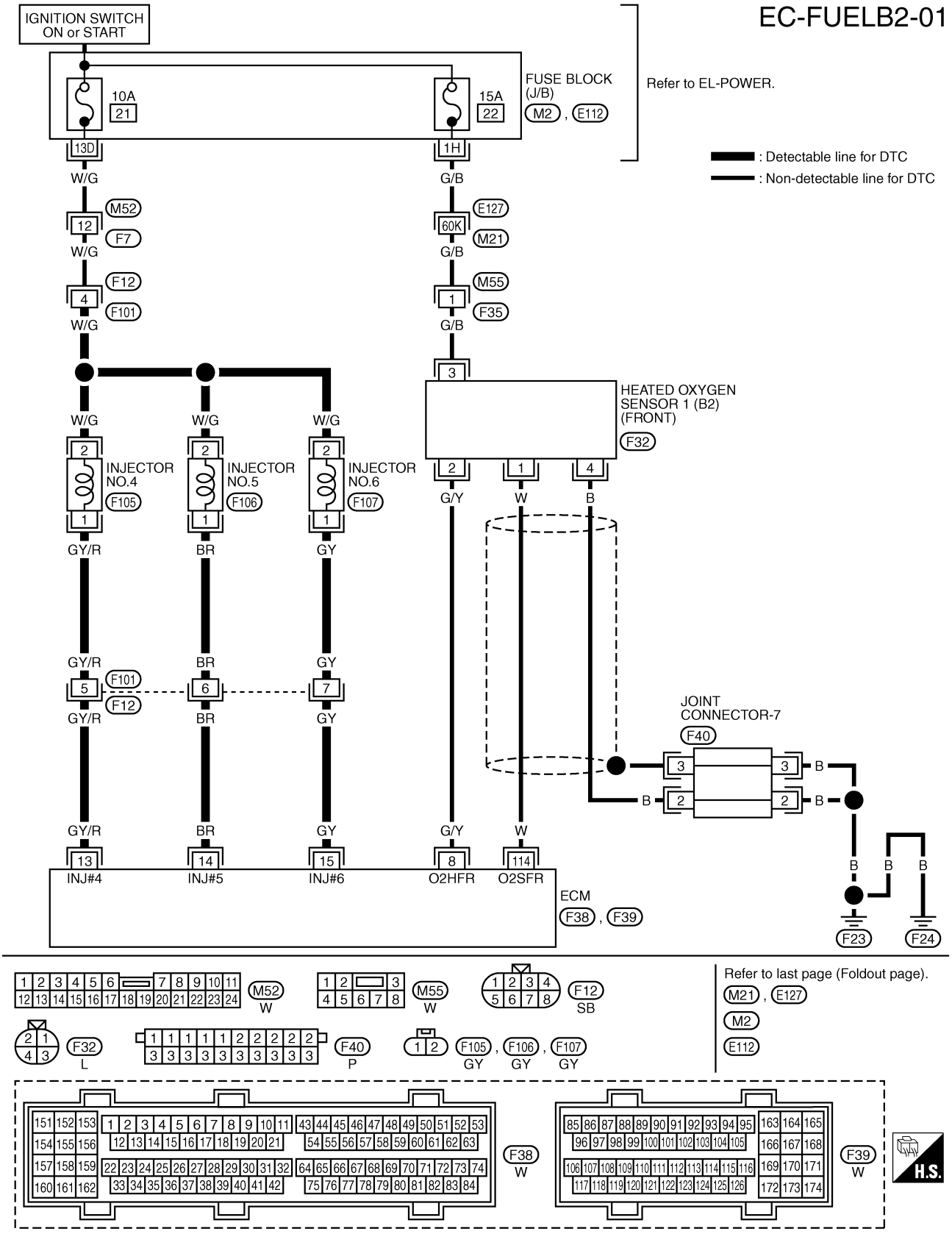
### BANK 1




TEC424M

## Wiring Diagram (Cont'd)

### BANK 2

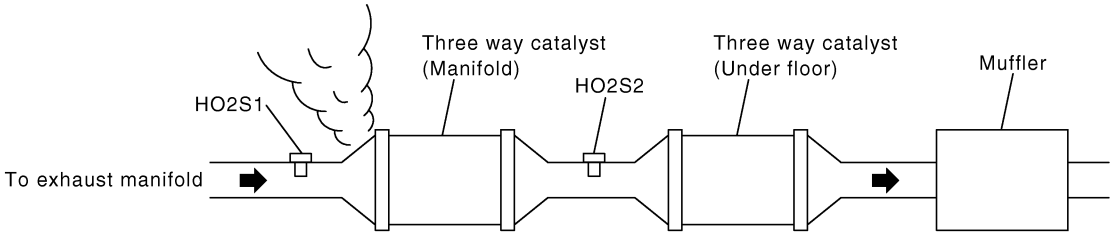



TEC425M

## Diagnostic Procedure

| 1 | CHECK EXHAUST GAS LEAK |
|---|---|

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).




: Exhaust gas

SEC502D

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace. |

| 2 | CHECK FOR INTAKE AIR LEAK |
|---|---|

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

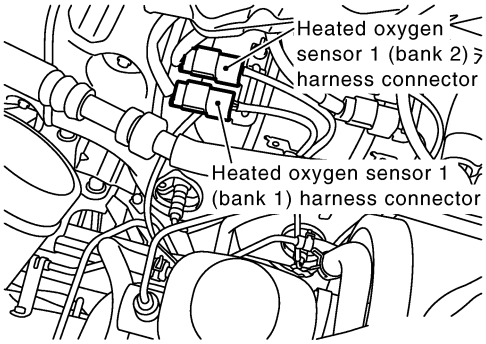
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace. |

## Diagnostic Procedure (Cont'd)

**3 CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT**

1. Turn ignition switch "OFF".
2. Disconnect corresponding heated oxygen sensor 1 (HO2S1) harness connector.




SEC671D

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0171 | 115 | 1 | 1 |
| P0174 | 114 | 1 | 2 |

MTBL1579

**Continuity should exist.**

5. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0171 | 115 | 1 | 1 |
| P0174 | 114 | 1 | 2 |

MTBL1580

**Continuity should not exist.**

6. 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. |

**4 CHECK FUEL PRESSURE**

**1. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE".**
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-34, "FUEL PRESSURE CHECK".
**At idling: 245 kPa (2.45 bar, 2.5 kg/cm$^2$, 36 psi)**

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 5 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Fuel pump and circuit (Refer to EC-459, "FUEL PUMP CIRCUIT".)<br>● Fuel pressure regulator (Refer to EC-34, "FUEL PRESSURE CHECK".)<br>● Fuel lines (Refer to MA section.)<br>● Fuel filter for clogging | |
| ▶ | Repair or replace. |

| 6 | CHECK MASS AIR FLOW SENSOR |
|---|---|
| **With CONSULT-II**<br>1. Install all removed parts.<br>2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II.<br>**3.0 - 9.0 g·m/sec: at idling**<br>**10.0 - 25.0 g·m/sec: at 2,500 rpm**<br>**With GST**<br>1. Install all removed parts.<br>2. Check mass air flow sensor signal in MODE 1 with GST.<br>**3.0 - 9.0 g·m/sec: at idling**<br>**10.0 - 25.0 g·m/sec: at 2,500 rpm**<br>**OK or NG** | |
| OK ▶ | GO TO 7. |
| NG ▶ | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-140, "DTC P0102, P0103 MAF SENSOR". |

## Diagnostic Procedure (Cont'd)

| 7 | CHECK FUNCTION OF INJECTORS |
|---|---|

**With CONSULT-II**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

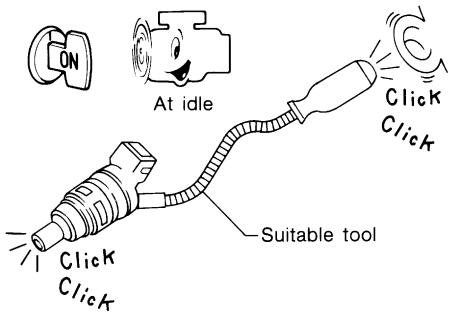
| ACTIVE TEST | |
|---|---|
| POWER BALANCE | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| MAS A/F SE-B1 | XXX V |
| | |
| | |
| | |
| | |
| | |

PBIB0133E

3. Make sure that each circuit produces a momentary engine speed drop.

**Without CONSULT-II**

1. Start engine.




MEC703B

2. Listen to each injector operating sound.
   **Clicking noise should be heard.**

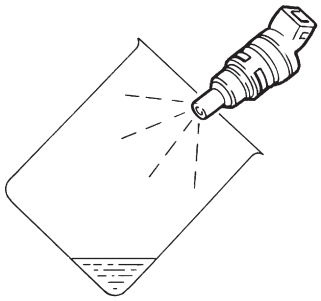
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 8. |
| NG | ► | Perform trouble diagnosis for EC-453, "INJECTOR CIRCUIT". |

## Diagnostic Procedure (Cont'd)

| 8 | CHECK INJECTOR |
|---|---|

1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
2. Turn ignition switch "OFF".
3. Disconnect injector harness connectors on bank 2 (for DTC P0171), bank 1 (for DTC P0174).
4. Remove injector gallery assembly. Refer to EM section.
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors on bank 1 (for DTC P0171), bank 2 (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 9. |
| NG | ► | Replace injectors from which fuel does not spray out. Always replace O-ring with new ones. |

| 9 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |

## 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 heated oxygen sensors 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MI (2 trip detection logic).

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Heated oxygen sensors 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | Fuel injection control | Fuel injectors |

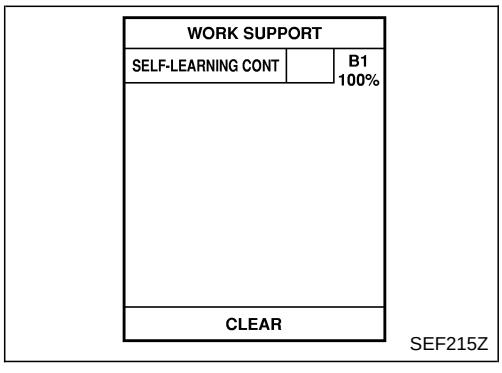
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0172<br>0172<br>(Bank 1)<br>P0175<br>0175<br>(Bank 2) | Fuel injection system too rich | ● Fuel injection system does not operate properly.<br>● The amount of mixture ratio compensation is too large.<br>(The mixture ratio is too rich.) | ● Heated oxygen sensor 1<br>● Injectors<br>● Exhaust gas leaks<br>● Incorrect fuel pressure<br>● Mass air flow sensor |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

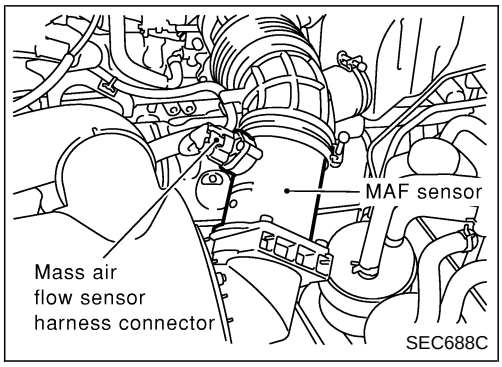
### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-II.




4. Clear the self-learning control coefficient by touching "CLEAR".
5. Select "DATA MONITOR" mode with CONSULT-II.
6. Start engine again and let it idle for at least 10 minutes.
   The 1st trip DTC P0172, P0175 should be detected at this stage, if a malfunction exists. If so, go to EC-231, "Diagnostic Procedure".
7. If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8. Crank engine while depressing accelerator pedal.
   If engine starts, go to EC-231, "Diagnostic Procedure". If engine does not start, remove ignition plugs and check for fouling, etc.

## DTC Confirmation Procedure (Cont'd)

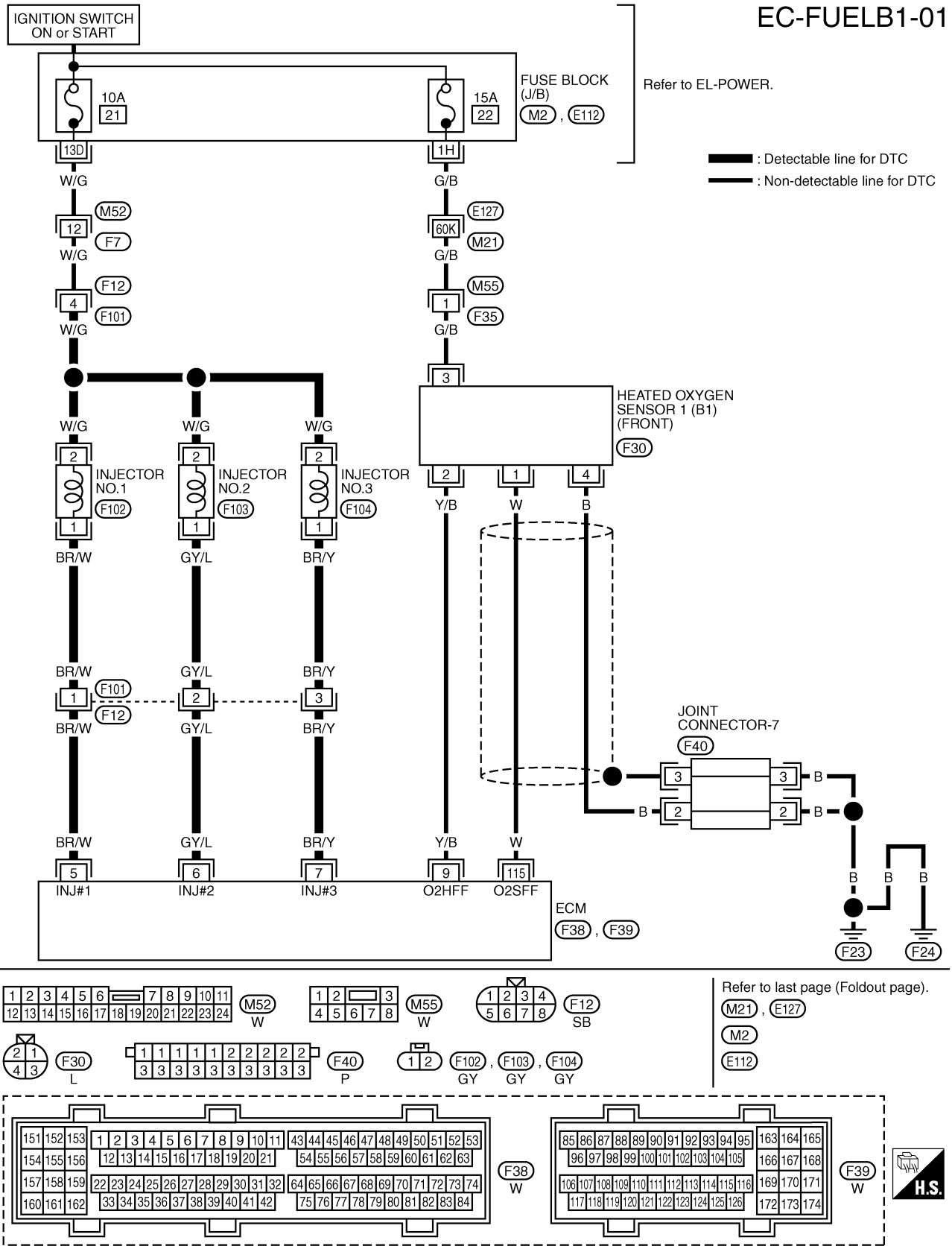



### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Select "MODE 3" with GST. Make sure DTC P0102 is detected.
6. Select "MODE 4" with GST and erase the DTC P0102.
7. Start engine again and let it idle for at least 10 minutes.
8. Select "MODE 7" with GST. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to EC-231, "Diagnostic Procedure".
9. If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10. Crank engine while depressing accelerator pedal.
    If engine starts, go to EC-231, "Diagnostic Procedure". If engine does not start, check exhaust and intake air leak visually.

## Wiring Diagram

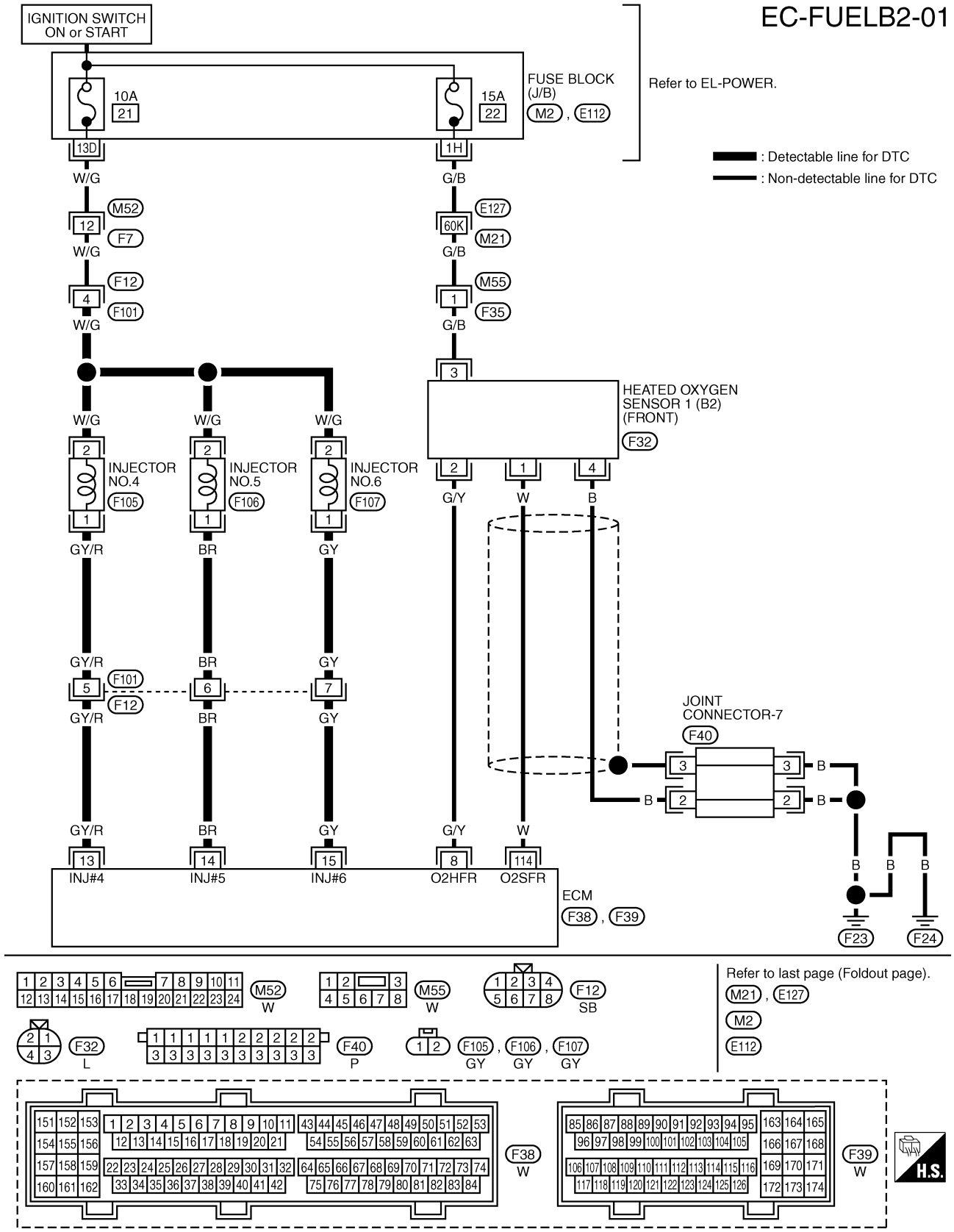
### BANK 1




TEC424M

## Wiring Diagram (Cont'd)

### BANK 2

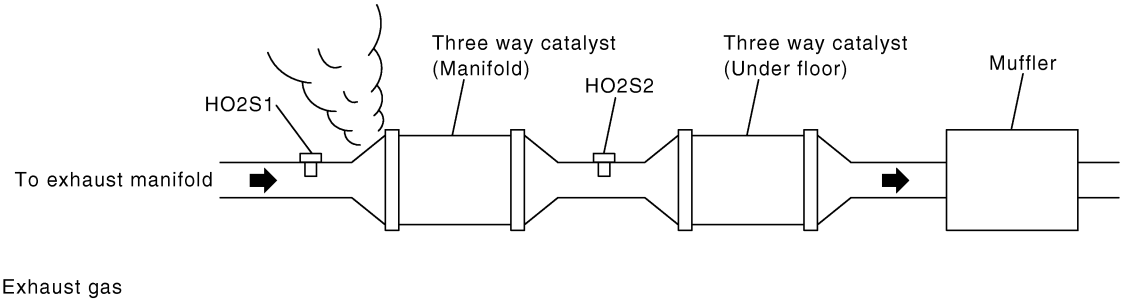



TEC425M

## Diagnostic Procedure

| 1 | CHECK EXHAUST GAS LEAK |
|---|---|

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).




SEC502D

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 2. |
| NG | ► | Repair or replace. |

| 2 | CHECK FOR INTAKE AIR LEAK |
|---|---|

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

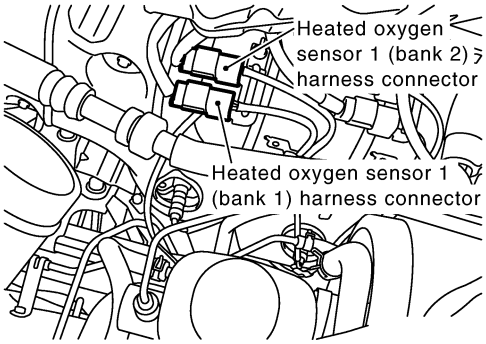
**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 3 | CHECK HEATED OXYGEN SENSOR 1 CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect corresponding heated oxygen sensor 1 (HO2S1) harness connector.




SEC671D

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal and HO2S1 terminal as follows. Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0172 | 115 | 1 | 1 |
| P0175 | 114 | 1 | 2 |

MTBL1581

**Continuity should exist.**

5. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P0172 | 115 | 1 | 1 |
| P0175 | 114 | 1 | 2 |

MTBL1582

**Continuity should not exist.**

6. 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. |

| 4 | CHECK FUEL PRESSURE |
|---|---|

**1. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE".**

2. Install fuel pressure gauge and check fuel pressure. Refer to EC-34, "FUEL PRESSURE CHECK".
   **At idling: 245 kPa (2.45 bar, 2.5 kg/cm$^2$, 36 psi)**

**OK or NG**

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

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

Check the following.
- Fuel pump and circuit (Refer to EC-459, "FUEL PUMP CIRCUIT".)
- Fuel pressure regulator (Refer to EC-34, "FUEL PRESSURE CHECK".)

| | | |
|---|---|---|
| | ▶ | Repair or replace. |

## Diagnostic Procedure (Cont'd)

| 6 | CHECK MASS AIR FLOW SENSOR |
|---|---|

**With CONSULT-II**

1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-II.
   **3.0 - 9.0 g·m/sec: at idling**
   **10.0 - 25.0 g·m/sec: at 2,500 rpm**

**With GST**

1. Install all removed parts.
2. Check mass air flow sensor signal in MODE 1 with GST.
   **3.0 - 9.0 g·m/sec: at idling**
   **10.0 - 25.0 g·m/sec: at 2,500 rpm**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-140, "DTC P0102, P0103 MAF SENSOR". |

| 7 | CHECK FUNCTION OF INJECTORS |
|---|---|

**With CONSULT-II**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

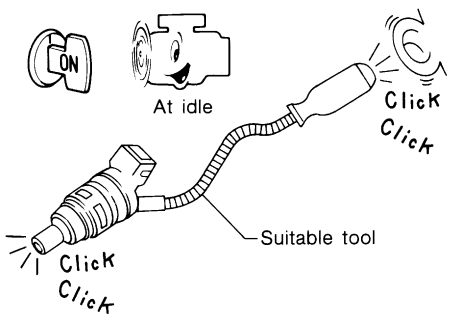
| ACTIVE TEST | |
|---|---|
| POWER BALANCE | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| MAS A/F SE-B1 | XXX V |
| | |
| | |
| | |
| | |
| | |

PBIB0133E

3. Make sure that each circuit produces a momentary engine speed drop.

**Without CONSULT-II**

1. Start engine.
2. Listen to each injector operating sound.




MEC703B

**Clicking noise should be heard.**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Perform trouble diagnosis for EC-453, "INJECTOR CIRCUIT". |

## Diagnostic Procedure (Cont'd)

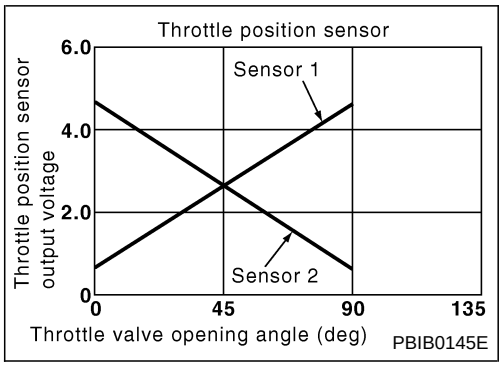
| 8 | CHECK INJECTOR |
|---|---|

1. Remove injector assembly. Refer to EM section.
   Keep fuel hose and all injectors connected to injector gallery.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect injector harness connectors bank 2 (for DTC P0172), bank 1 (for P0175).
   The injector harness connectors on bank 1 (for P0172), bank 2 (for P0175) should remain connected.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

**OK or NG**

| | | |
|---|---|---|
| OK (Does not drip.) | ► | GO TO 9. |
| NG (Drips.) | ► | Replace the injectors from which fuel is dripping. Always replace O-ring with new one. |

| 9 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |




## Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| THRTL SEN1<br>THRTL SEN2* | ● Ignition switch: ON (Engine stopped)<br>● Shift lever: D | Accelerator pedal: Fully released | More than 0.5V |
| | | Accelerator pedal: Fully depressed | Less than 1.5V |

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0222<br>0222 | Throttle position sensor 1 circuit low input | An excessively low voltage from the TP sensor 1 is sent to ECM. | ● Harness or connectors (The TP sensor 1 circuit is open or shorted.)<br>● Electric throttle control actuator (TP sensor 1) |
| P0223<br>0223 | Throttle position sensor 1 circuit high input | An excessively high voltage from the TP sensor 1 is sent to ECM. | |

### FAIL-SAFE MODE

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

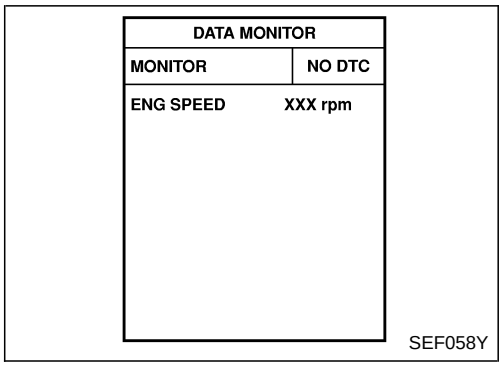
| Engine operation condition in fail-safe mode |
|---|
| The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Confirmation Procedure

**NOTE:**
**If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.**

**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

## DTC Confirmation Procedure (Cont'd)




### WITH CONSULT-II

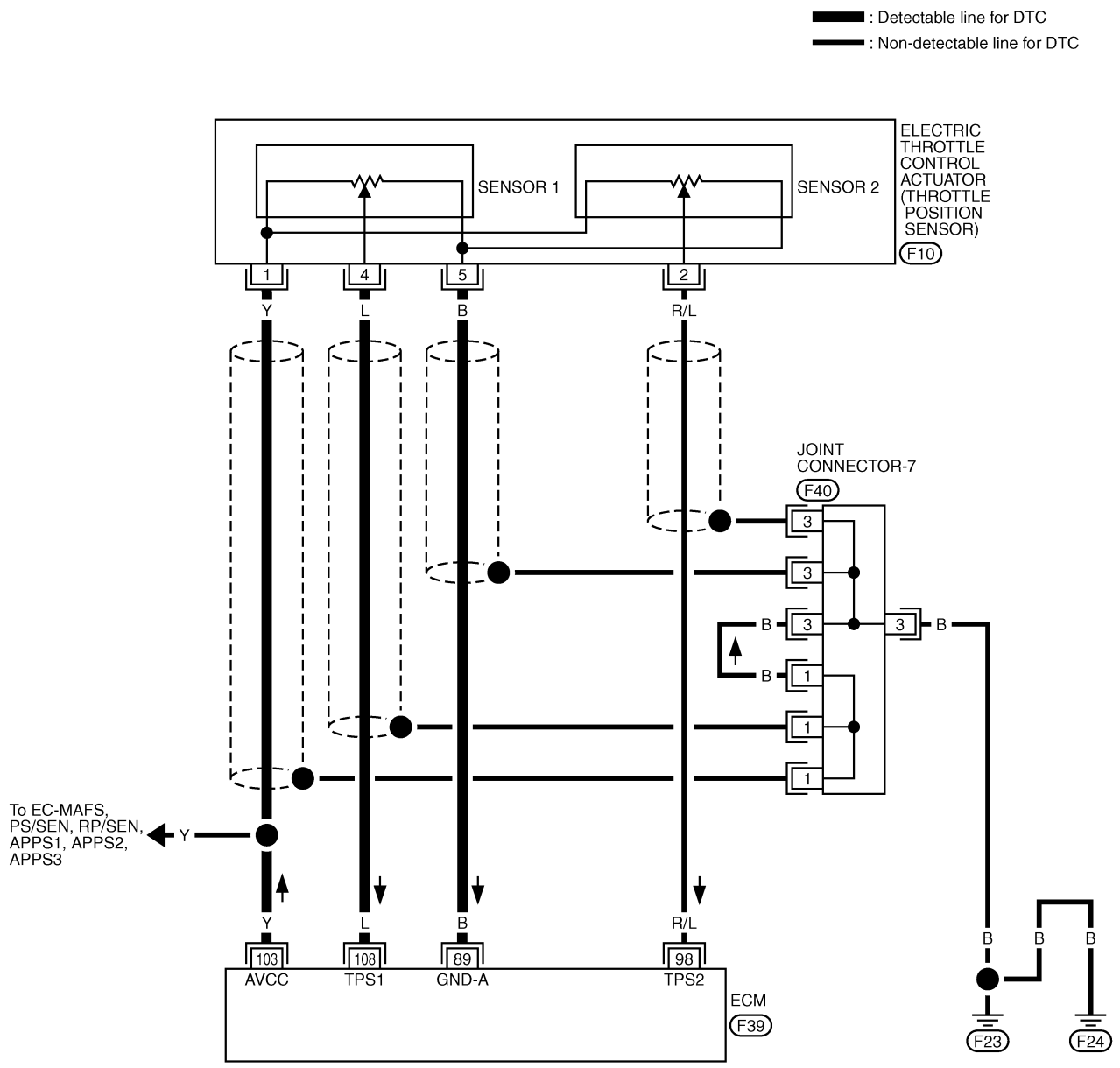
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-238, "Diagnostic Procedure".

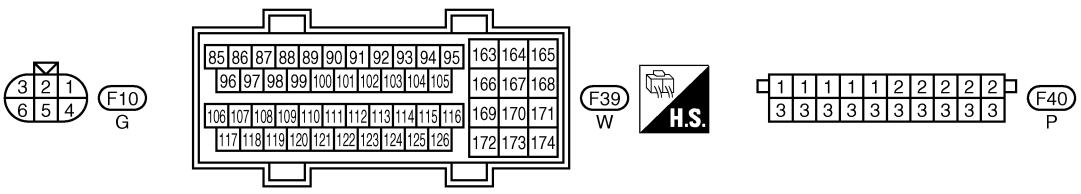
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-TPS1-01




TEC398M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

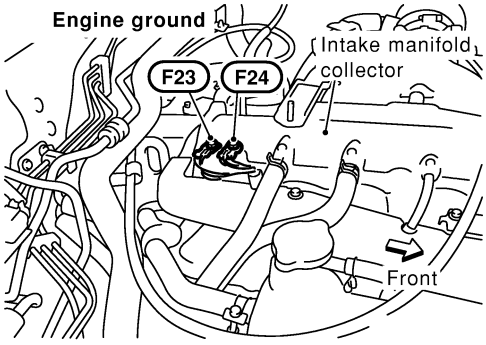
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 89 | B | Sensor ground (Throttle position sensor) | Engine is running.<br>— **Warm-up condition**<br>— Idle speed | Approximately 0V |
| 98 | R/L | Throttle position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | Less than 4.75V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | More than 0.36V |
| 103 | Y | Sensor power supply (Throttle position sensor) | Ignition switch "ON" | Approximately 5V |
| 108 | L | Throttle position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |

## Diagnostic Procedure

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

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



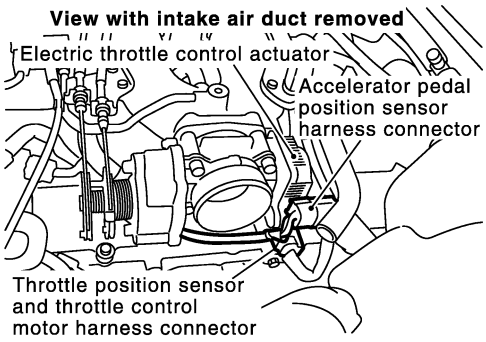

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

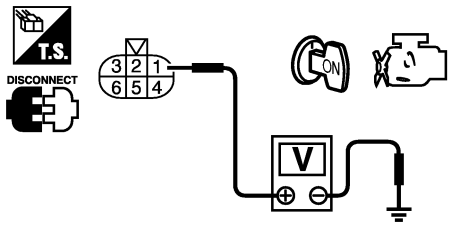
| 2 | CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect electric throttle control actuator harness connector.




SEC182D

2. Turn ignition switch "ON".
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.




PBIB0082E

**Voltage: Approximately 5V**

**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 THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 5 and engine ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal 108 and electric throttle control actuator terminal 4.
   Refer to Wiring Diagram.
   **Continuity should exist.**
2. 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. |

## Diagnostic Procedure (Cont'd)

| 5 | CHECK THROTTLE POSITION SENSOR |
|---|---|
| Refer to EC-240, "Component Inspection". | |
| OK or NG | |
| OK ► | GO TO 7. |
| NG ► | GO TO 6. |

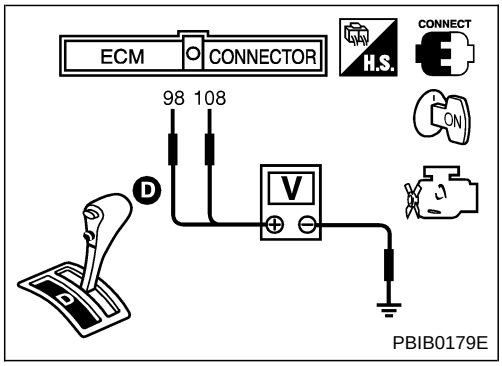
| 6 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|
| 1. Replace the electric throttle control actuator.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | INSPECTION END |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | |
| ► | INSPECTION END |

## Component Inspection

### THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-31, "Throttle Valve Closed Position Learning".
3. Turn ignition switch "ON".
4. Set selector lever to "D" position.




5. Check voltage between ECM terminals 108 (TP sensor 1 signal), 98 (TP sensor 2 signal) and engine ground under the following conditions.

| Terminal | Accelerator pedal | Voltage |
|---|---|---|
| 108 (Throttle position sensor 1) | Fully released | More than 0.36V |
| | Fully depressed | Less than 4.75V |
| 98 (Throttle position sensor 2) | Fully released | Less than 4.75V |
| | Fully depressed | More than 0.36V |

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-31, "Accelerator Pedal Released Position Learning".
8. Perform EC-31, "Throttle Valve Closed Position Learning".
9. Perform EC-31, "Idle Air Volume Learning".

## On Board Diagnosis Logic

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (OBD) signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input Signal to ECM | ECM function |
|---|---|---|
| Crankshaft position sensor (OBD) | Engine speed | On board diagnosis of misfire |

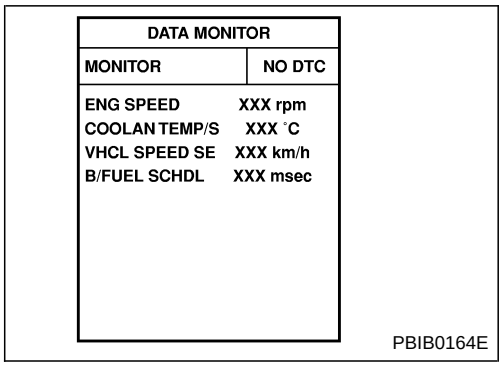
The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor (OBD) signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
   If another misfire condition occurs that can damage the TWC, the MI 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 MI 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. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0300<br>0300 | Multiple cylinder misfire detected | Multiple cylinder misfire. | ● Improper spark plug<br>● Insufficient compression<br>● Incorrect fuel pressure<br>● The injector circuit is open or shorted<br>● Fuel injectors<br>● Intake air leak<br>● The ignition signal circuit is open or shorted<br>● Lack of fuel<br>● Drive plate or flywheel<br>● Heated oxygen sensor 1<br>● Incorrect PCV hose connection |
| P0301<br>0301 | No.1 cylinder misfire detected | No. 1 cylinder misfires. | |
| P0302<br>0302 | No. 2 cylinder misfire detected | No. 2 cylinder misfires. | |
| P0303<br>0303 | No. 3 cylinder misfire detected | No. 3 cylinder misfires. | |
| P0304<br>0304 | No. 4 cylinder misfire detected | No. 4 cylinder misfires. | |
| P0305<br>0305 | No. 5 cylinder misfire detected | No. 5 cylinder misfires. | |
| P0306<br>0306 | No. 6 cylinder misfire detected | No. 6 cylinder misfires. | |

## 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 10 seconds before conducting the next test.**




## DTC Confirmation Procedure (Cont'd)

### WITH CONSULT-II

1. Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT-II.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch "OFF" and wait at least 10 seconds.
4. Start engine again and drive at 1,500 to 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.**

5. If 1st trip DTC is detected, go to EC-242, "Diagnostic Procedure".

### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Diagnostic Procedure

| 1 | CHECK FOR INTAKE AIR LEAK AND PCV HOSE | |
|---|---|---|
| 1. Start engine and run it at idle speed.<br>2. Listen for the sound of the intake air leak.<br>3. Check PCV hose connection.<br>**OK or NG** | | |
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace. |

| 2 | CHECK FOR EXHAUST SYSTEM CLOGGING | |
|---|---|---|
| Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.<br>**OK or NG** | | |
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace. |

## Diagnostic Procedure (Cont'd)

| 3 | PERFORM POWER BALANCE TEST |
|---|---|

**With CONSULT-II**

1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.

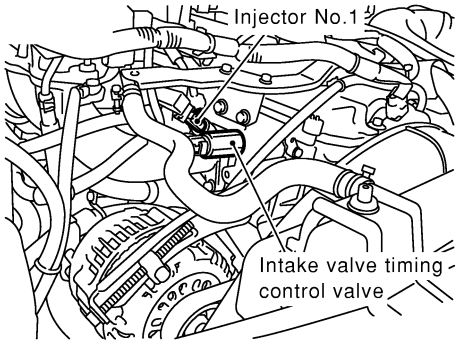
| ACTIVE TEST | |
|---|---|
| POWER BALANCE | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| MAS A/F SE-B1 | XXX V |
| | |
| | |
| | |
| | |
| | |

PBIB0133E

2. Is there any cylinder which does not produce a momentary engine speed drop?

**Without CONSULT-II**

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



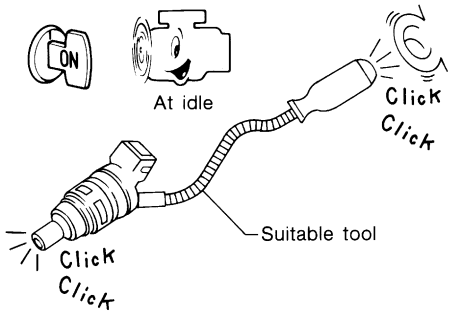

SEC793C

**Yes or No**

| | | |
|---|---|---|
| Yes | ► | GO TO 4. |
| No | ► | GO TO 7. |

| 4 | CHECK INJECTOR |
|---|---|

Does each injector make an operating sound at idle?




MEC703B

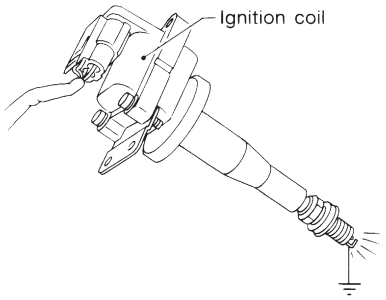
**Yes or No**

| | | |
|---|---|---|
| Yes | ► | GO TO 5. |
| No | ► | Check injector(s) and circuit(s). Refer to EC-453, "INJECTOR CIRCUIT". |

## Diagnostic Procedure (Cont'd)

| 5 | CHECK IGNITION SPARK |
|---|---|

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



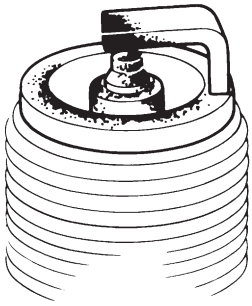

SEF575Q

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Check ignition coil, power transistor and their circuits. Refer to EC-428, "IGNITION SIGNAL". |

| 6 | CHECK SPARK PLUGS |
|---|---|

Remove the spark plugs and check for fouling, etc.



SEF156I

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Repair or replace spark plug(s) with standard type one(s). For spark plug type, refer to MA section. |

| 7 | CHECK COMPRESSION PRESSURE |
|---|---|

Check compression pressure. Refer to EM section.

**Standard: 1,226 kPa (12.26 bar, 12.5 kg/cm$^2$, 178 psi)/200 rpm**
**Minimum: 1,030 kPa (10.30 bar, 10.5 kg/cm$^2$, 149 psi)/200 rpm**
**Difference between each cylinder: 98 kPa (0.98 bar, 1.0 kg/cm$^2$, 14 psi)/200 rpm**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Check pistons, piston rings, valves, valve seats and cylinder head gaskets. |

## Diagnostic Procedure (Cont'd)

| 8 | CHECK FUEL PRESSURE |
|---|---|

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-34, "FUEL PRESSURE RELEASE".
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-34, "FUEL PRESSURE CHECK".
   **At idle: Approx. 245 kPa (2.45 bar, 2.5 kg/cm$^2$, 36 psi)**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | Follow the construction of "FUEL PRESSURE CHECK". |

| 9 | CHECK IGNITION TIMING |
|---|---|

**Check the following items. Refer to EC-66, "Basic Inspection".**

| Items | Specifications |
|---|---|
| Target idle speed | 675 ± 50 rpm (in "P" or "N" position) |
| Ignition timing | 10° ± 5° BTDC (in "P" or "N" position) |

MTBL1583

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Follow the "Basic Inspection". |

| 10 | CHECK HEATED OXYGEN SENSOR 1 |
|---|---|

**Refer to EC-170, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | GO TO 11. |

| 11 | CHECK MASS AIR FLOW SENSOR |
|---|---|

**With CONSULT-II**

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-II.

**3.0 - 9.0 g·m/sec: at idling**
**10.0 - 25.0 g·m/sec: at 2,500 rpm**

**With GST**

Check mass air flow sensor signal in MODE 1 with GST.

**3.0 - 9.0 g·m/sec: at idling**
**10.0 - 25.0 g·m/sec: at 2,500 rpm**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 12. |
| NG | ▶ | Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-140, "DTC P0102, P0103 MAF SENSOR". |

| 12 | CHECK SYMPTOM MATRIX CHART |
|---|---|

**Check items on the rough idle symptom in EC-71, "Symptom Matrix Chart".**

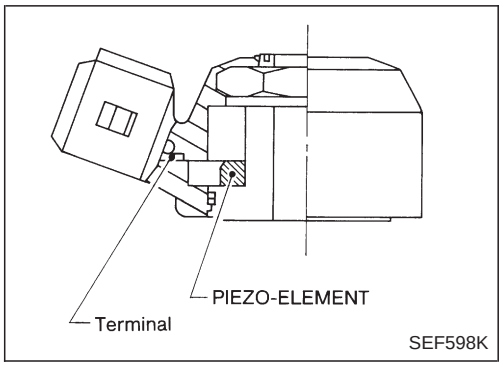
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 13. |
| NG | ▶ | Repair or replace. |

## Diagnostic Procedure (Cont'd)

| 13 | ERASE THE 1ST TRIP DTC |
|---|---|
| Some tests may cause a 1st trip DTC to be set.<br>Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". | |
| ► | GO TO 14. |

| 14 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |




## 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.

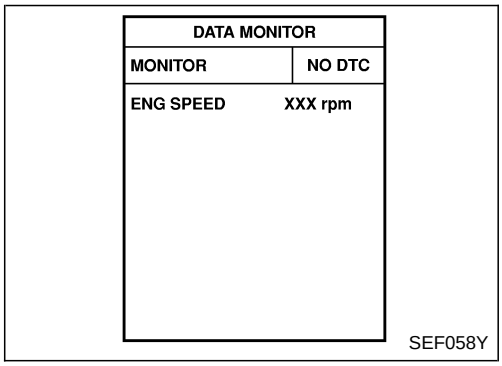
## On Board Diagnosis Logic

**The MI will not light up for these self-diagnoses.**

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---|---|---|---|
| P0327<br>0327 (bank 1)<br>P0332<br>0332 (bank 2) | Knock sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Knock sensor |
| P0328<br>0328 (bank 1)<br>P0333<br>0333 (bank 2) | Knock sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

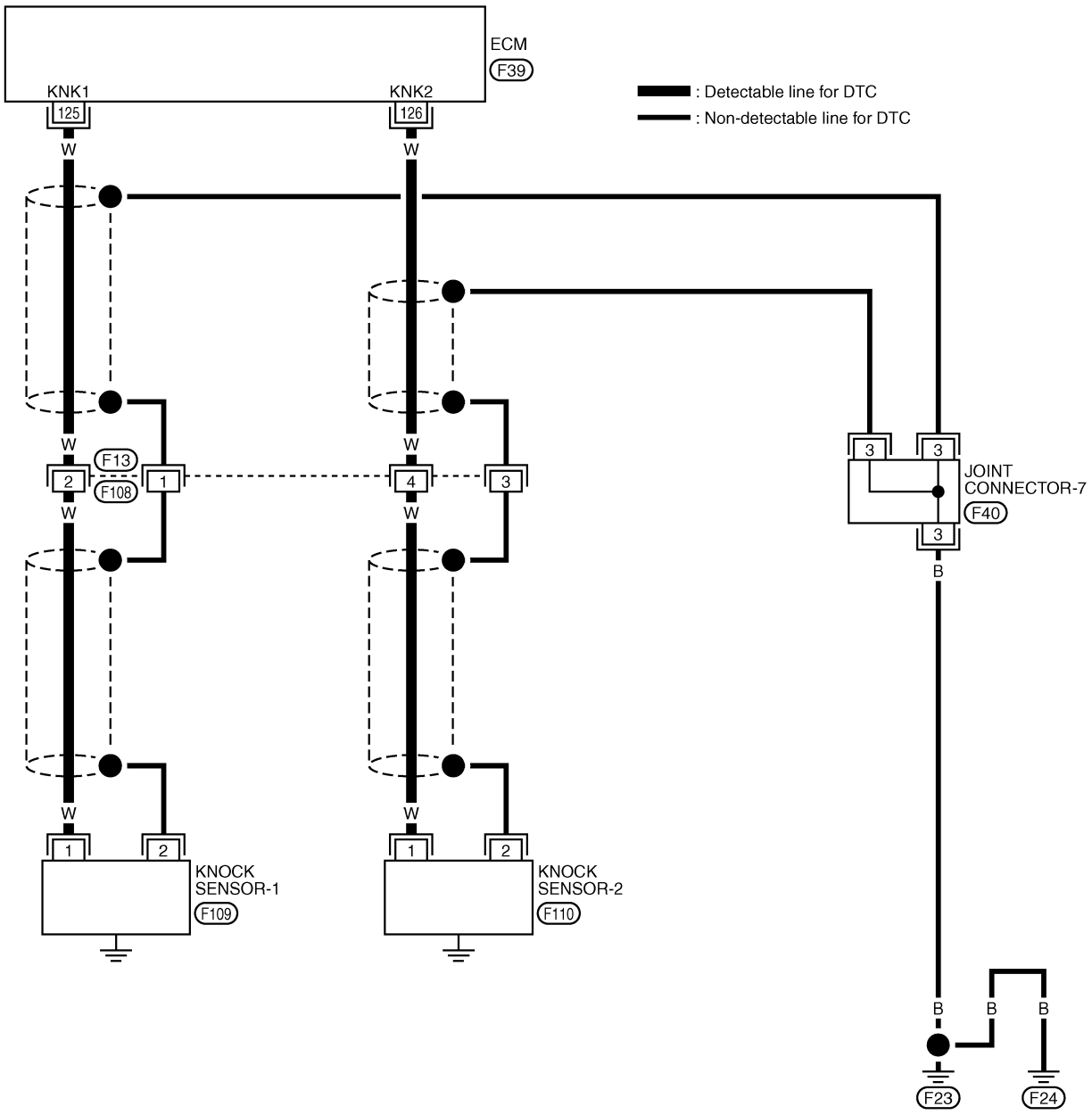
1. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2. Start engine and run it for at least 5 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-249, "Diagnostic Procedure".

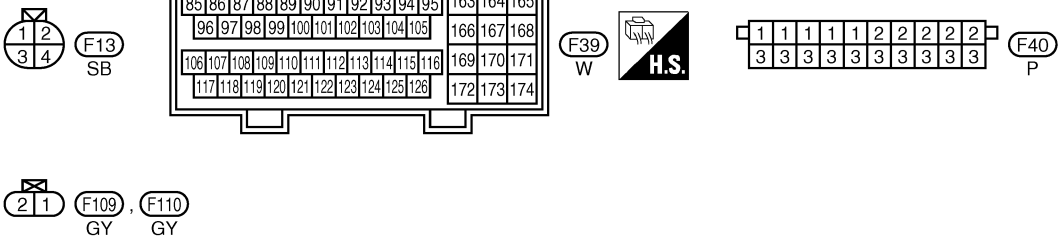
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-KS-01







TEC153M

## Wiring Diagram (Cont'd)

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.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 125 | W | Knock sensor (bank 1) | Engine is running.<br>└ Idle speed | Approximately 2.5V |
| 126 | W | Knock sensor (bank 2) | Engine is running.<br>└ Idle speed | Approximately 2.5V |

## Diagnostic Procedure

**1 CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-I**

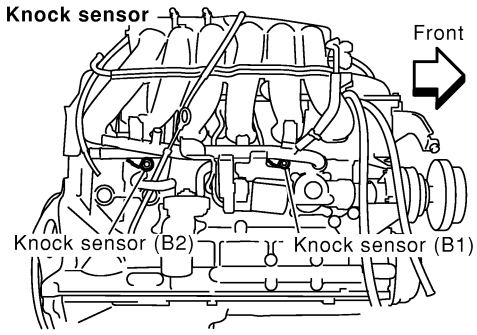
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 125 (bank 1) or 126 (bank 2) and engine ground. Refer to Wiring Diagram.
   **NOTE:**
   **It is necessary to use an ohmmeter which can measure more than 10 MΩ. Resistance: Approximately 530 - 590 kΩ [at 20°C (68°F)]**
4. Also check harness for short to ground and short to power.

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 4. |
| NG ► | GO TO 2. |

**2 CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT-II**

1. Disconnect knock sensor harness connector.




SEC889C

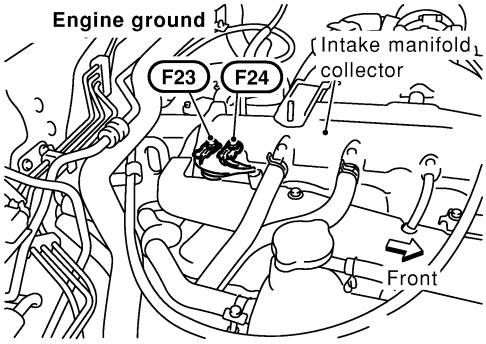
2. Check harness continuity between ECM terminal 125 (bank 1) or 126 (bank 2) and knock sensor terminal 1. Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to ground and short to power.

**OK or NG**

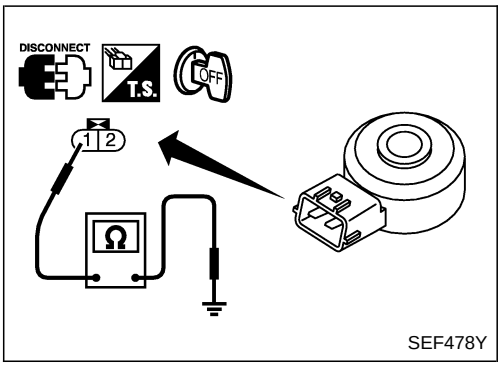
| | |
|---|---|
| OK ► | GO TO 3. |
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

## Diagnostic Procedure (Cont'd)

| 3 | CHECK KNOCK SENSOR |
|---|---|
| Refer to EC-250, "Component Inspection". | |
| OK or NG | |
| OK ► | GO TO 5. |
| NG ► | Replace knock sensor. |

| 4 | RETIGHTEN GROUND SCREWS |
|---|---|
| Loosen and retighten engine ground screws. | |
|  SEC690C | |
| ► | GO TO 5. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | |
| ► | INSPECTION END |



SEF478Y

## Component Inspection

### KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

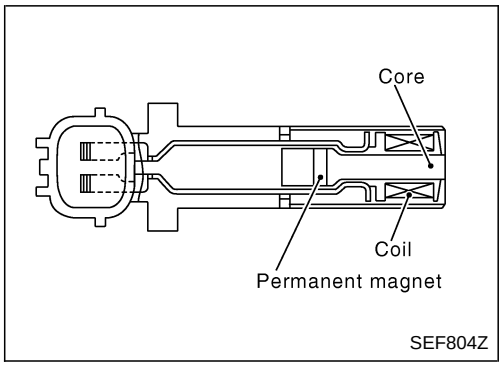
**NOTE:**

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

**Resistance: Approximately 530 - 590 kΩ [at 20°C (68°F)]**

**CAUTION:**

**Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.**




## Component Description

The crankshaft position sensor (OBD) is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at the end of the crankshaft. 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 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.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

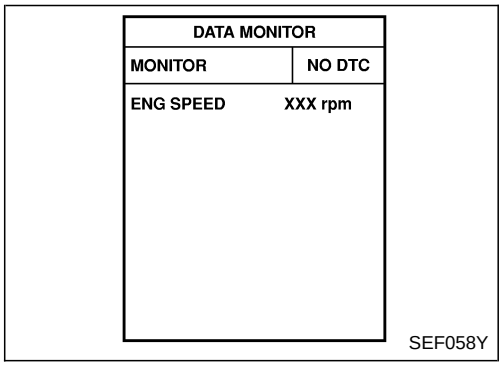
| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| ENG SPEED | ● Tachometer: Connect<br>● Run engine and compare CONSULT-II value with the tachometer indication. | Almost the same speed as the tachometer indication. |

## On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0335<br>0335 | Crankshaft position sensor (OBD) circuit | ● The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Crankshaft position sensor (OBD) |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch ON".**




### WITH CONSULT-II

1. Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2. Start engine and run it for at least 15 seconds at idle speed.
3. If 1st trip DTC is detected, go to EC-254, "Diagnostic Procedure".

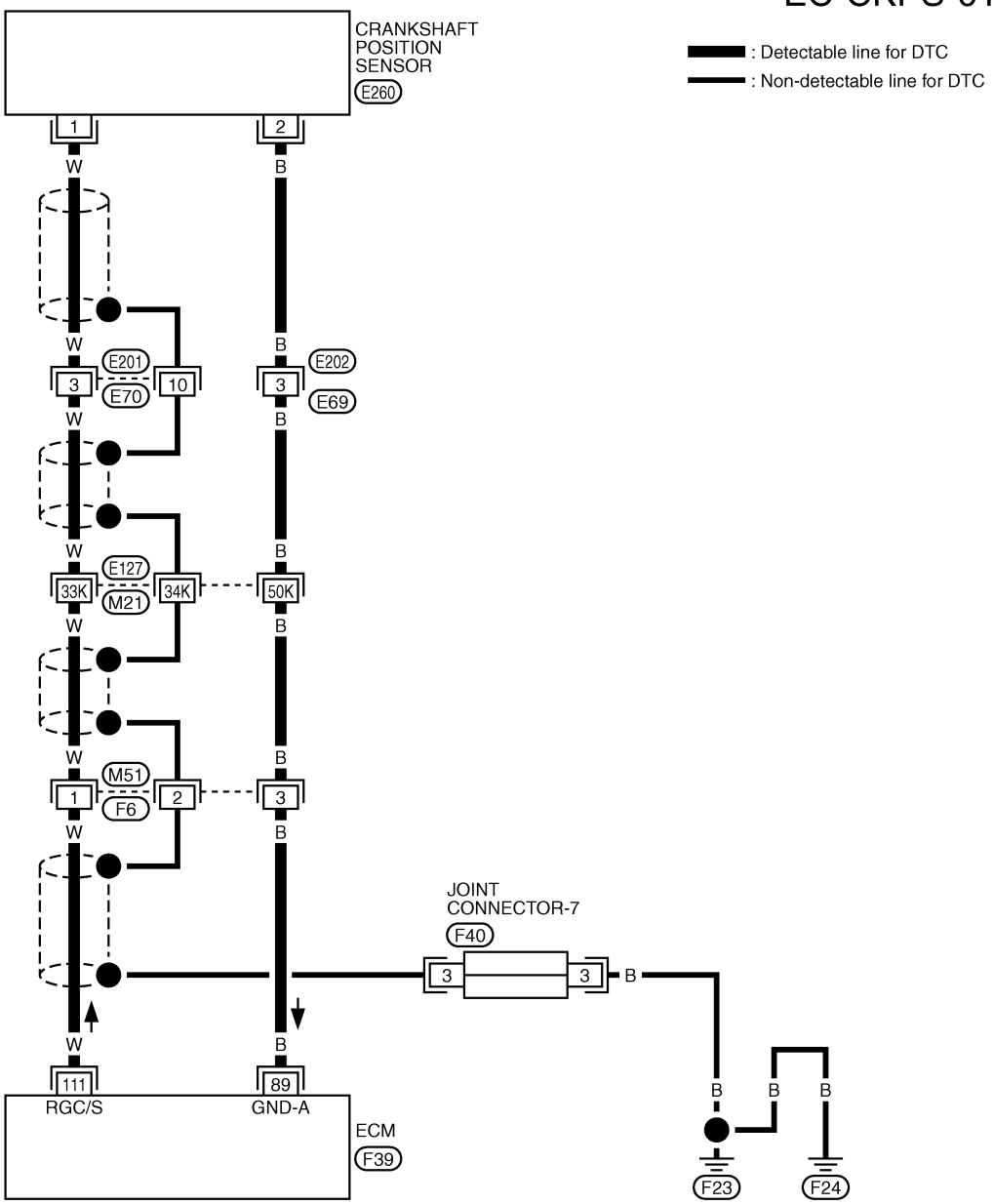
## DTC Confirmation Procedure (Cont'd)

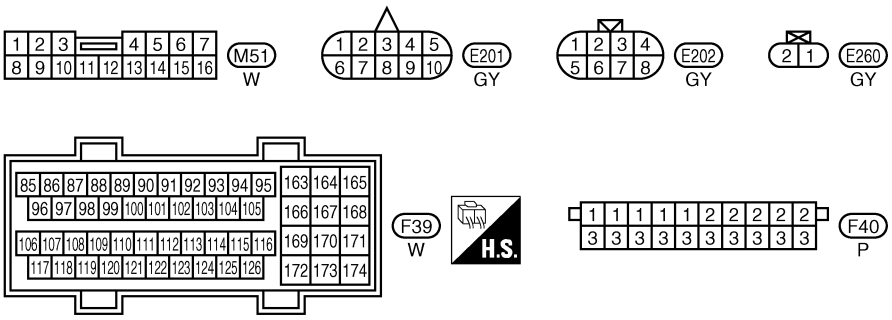
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-CKPS-01




Refer to last page (Foldout page).
M21 , E127

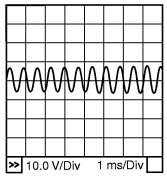
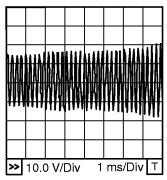
TEC344M

## Wiring Diagram (Cont'd)

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.**

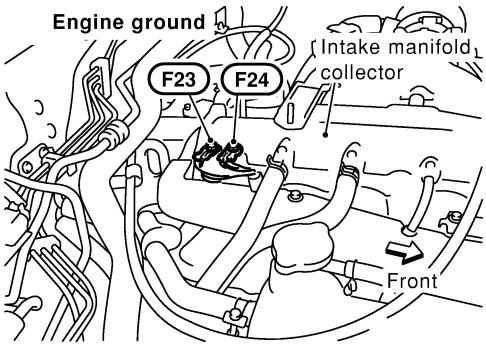
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 89 | B | Crankshaft position sensor (OBD) ground | Engine is running.<br>└ Idle speed | Approximately 0V |
| 111 | W | Crankshaft position sensor (OBD) | Engine is running.<br>└ **Warm-up condition.**<br>└ Idle speed | Approximately 1 - 2V★<br>  <br><br>SEC748D |
| | | | Engine is running.<br>└ Engine speed is 2,000 rpm | Approximately 3 - 4V★<br>  <br><br>SEC749D |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

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

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



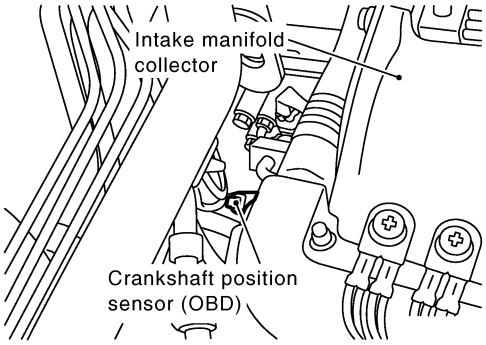

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CHECK CKP SENSOR (OBD) POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect crankshaft position (CKP) sensor (OBD) harness connector and ECM harness connector.




SEC732D

2. Check harness continuity between CKP sensor (OBD) terminal 1 and ECM terminal 111.
   **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. |

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

Check the following.
- Harness connectors E201, E70
- Harness connectors E127, M21
- Harness connectors M51, F6
- Harness for open or short between crankshaft position sensor (OBD) and ECM

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

| 4 | CHECK CKP SENSOR (OBD) GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Reconnect ECM harness connector.
2. Check harness continuity between CKP sensor (OBD) terminal 2 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for and 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 E202, E69
- Harness connectors E127, M21
- Harness connectors M51, F6
- Harness for open or short between crankshaft position sensor (OBD) and ECM

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

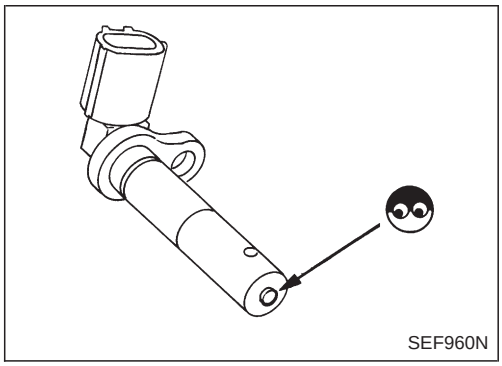
## Diagnostic Procedure (Cont'd)

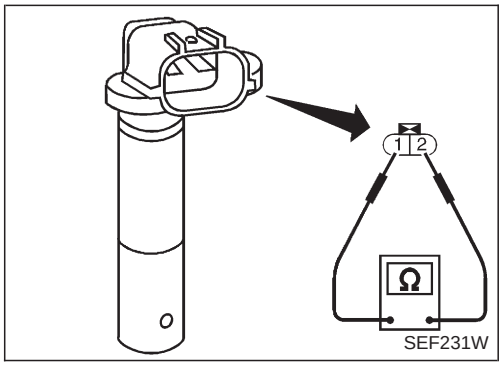
| 6 | CHECK SHIELD CIRCUIT |
|---|---|
| 1. Disconnect harness connectors E201, E70.<br>2. Check harness continuity between harness connector E70 terminal 10 and ground.<br>**Continuity should exist.**<br>3. Also check harness for short to power.<br>4. Then reconnect harness connectors.<br>**OK or NG** | |
| OK ▶ | GO TO 8. |
| NG ▶ | GO TO 7. |

| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M51, F6<br>● Joint connector-7<br>● Harness for open or short between harness connector E70 and ground | |
| ▶ | Repair open circuit or short to power in harness or connectors. |

| 8 | CHECK CRANKSHAFT POSITION SENSOR (OBD) |
|---|---|
| **Refer to EC-256, "Component Inspection".**<br>**OK or NG** | |
| OK ▶ | GO TO 9. |
| NG ▶ | Replace crankshaft position sensor (OBD). |

| 9 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ▶ | **INSPECTION END** |


SEF960N

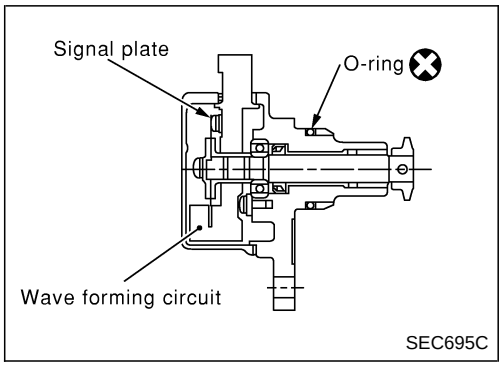


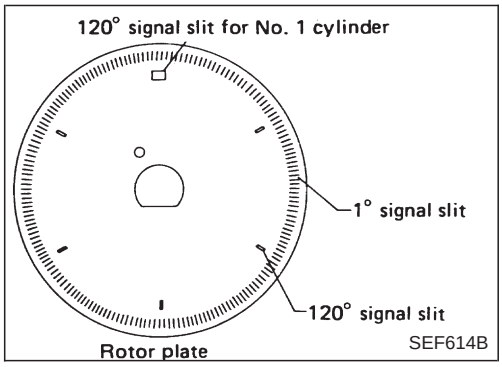
SEF231W

## Component Inspection

### CRANKSHAFT POSITION SENSOR (OBD)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (OBD) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.
5. Check resistance as shown in the figure.
   **Resistance: Approximately 512 - 632Ω [at 20°C (68°F)]**
6. If NG, replace crankshaft position sensor (OBD).




## Component Description

The camshaft position sensor (CMPS) is a basic component of the ECM. It monitors engine speed and piston position. It sends signals to the ECM to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 6 slits for 120° signal. Light Emitting Diodes (LED) and photo diodes are built into the wave-forming circuit.

When the rotor plate passes between the LED and the photo diode, the following happens:

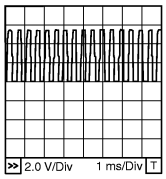
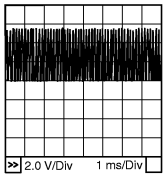
Slits in the rotor plate continually cut the transmitted light to the photo diode from the LED. This generates rough-shaped pulses converted into on-off pulses by the wave forming circuit sent to the ECM.

## ECM Terminals and Reference Value

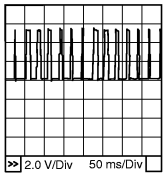
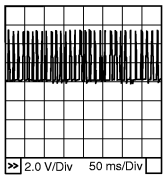
Specification data are reference values, and are measured between each terminal and ground.

**CAUTION:**

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

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 63 | B/W | Camshaft position sensor (POS signal) | Engine is running. (Warmed-up condition)<br>└ Idle speed | 1.0 - 4.0V*1<br>  <br><br>SEC750D |
| | | | Engine is running. (Warmed-up condition)<br>└ Engine speed is 2,000 rpm. | 1.0 - 4.0V*1<br>  <br><br>SEC751D |

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

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 83<br>84 | L | Camshaft position sensor (REF signal) | Engine is running. (Warmed-up condition)<br>└ Idle speed | Approximately 0.3 - 0.6V*1<br>  <br><br>SEC746D |
| | | | Engine is running. (Warmed-up condition)<br>└ Engine speed is 2,000 rpm. | Approximately 0.3 - 0.6V*1<br>  <br><br>SEC747D |

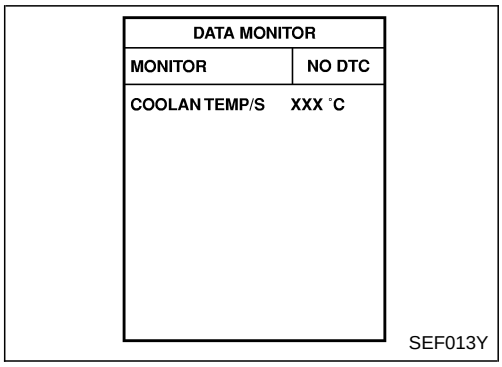
*1: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## On Board Diagnosis Logic

| Diagnostic Trouble Code No. | Malfunction is detected when .... | Check Items (Possible Cause) |
|---|---|---|
| P0340<br>0340 | A) Either 1° or 120° signal is not sent to ECM for the first few seconds during engine cranking.<br>.....<br>B) Either 1° or 120° signal is not sent to ECM during engine running.<br>.....<br>C) Either 1° or 120° signal is not in the normal pattern during engine running. | ● Harness or connectors (The camshaft position sensor circuit is open or shorted.)<br>● Camshaft position sensor<br>● Starter motor (Refer to EL section.)<br>● Starting system circuit (Refer to EL section.)<br>● Dead (Weak) battery |

## DTC Confirmation Procedure

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

**With CONSULT-II**

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Crank engine at least 2 seconds.
   (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
3) If DTC is detected, go to "Diagnostic Procedure", EC-261.

**Without CONSULT-II**

1) Crank engine for at least 2 seconds.
   (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-261.

### PROCEDURE FOR MALFUNCTION B AND C

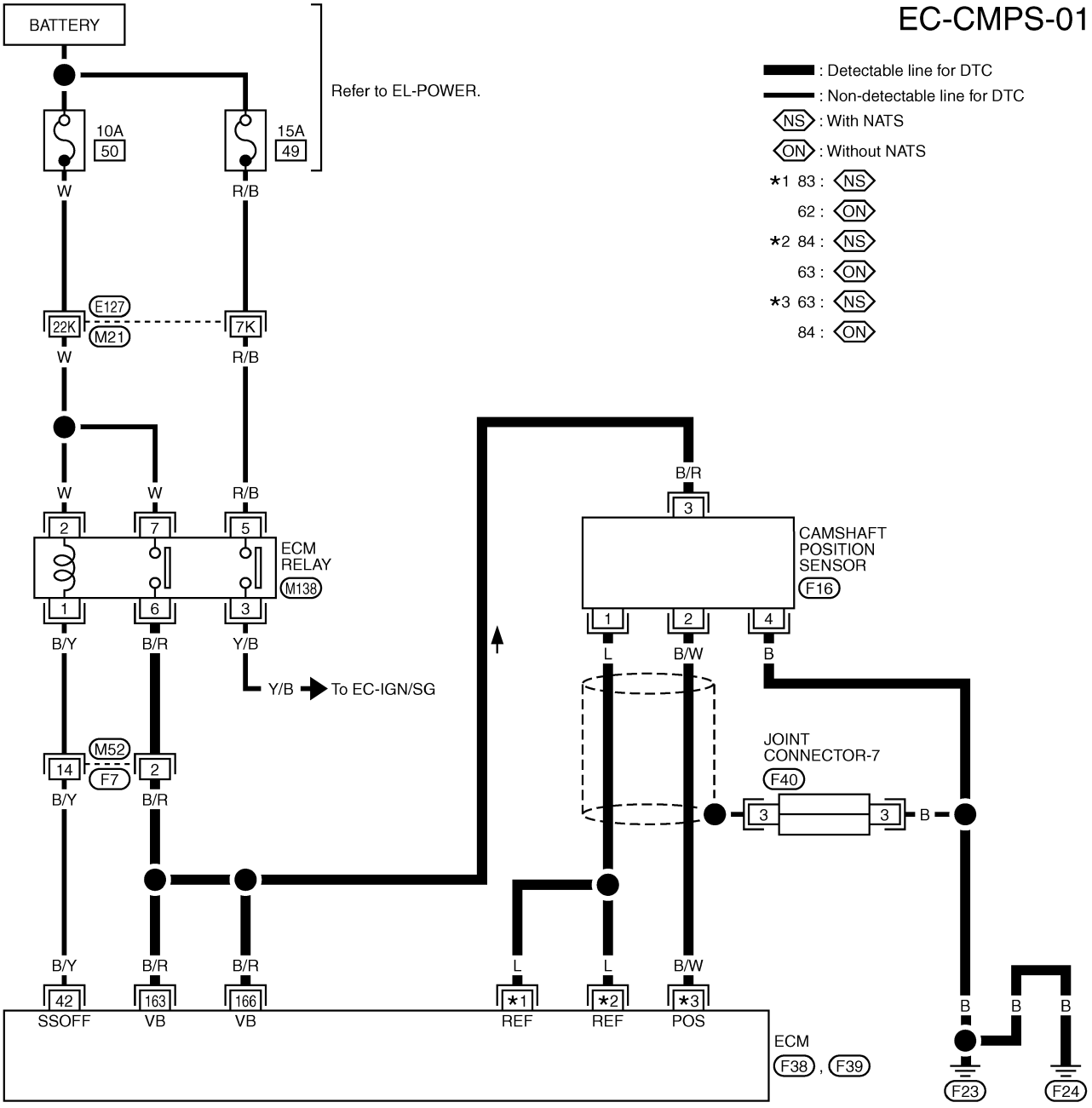
**With CONSULT-II**

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-261.

**Without CONSULT-II**

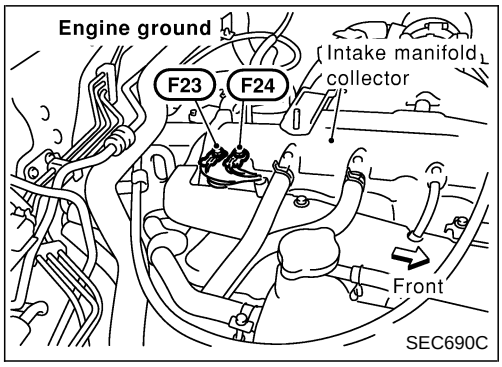
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 10 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If DTC is detected, go to "Diagnostic Procedure", EC-261.

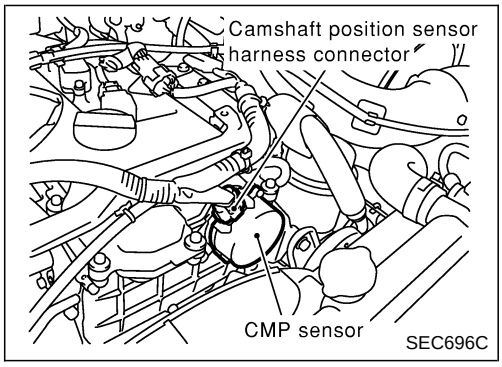
## Wiring Diagram

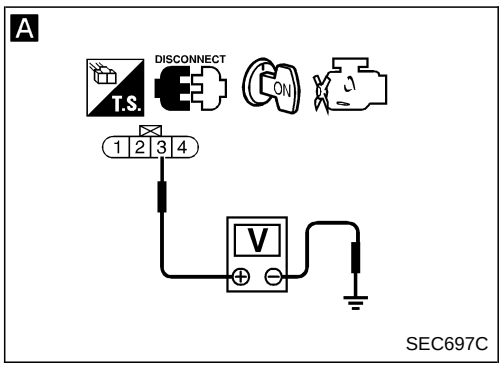



TEC145M

## Diagnostic Procedure




INSPECTION START

CHECK STARTING SYSTEM.
Does the engine turn over?
(Does the starter motor operate?)

No → Check starting system. (Refer to EL section.)

Yes

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

OK

A

**CHECK POWER SUPPLY.**
1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch “ON”.
3. Check voltage between terminal ③ and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

NG → Check the following.
- Harness connectors (M52), (F7)
- Harness for open or short between camshaft position sensor and ECM
- Harness for open or short between camshaft position sensor and ECM relay

If NG, repair harness or connectors.

OK

CHECK GROUND CIRCUIT.
1. Turn ignition switch “OFF”.
2. Check harness continuity between terminal ④ and engine ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
   If OK, check harness for short to power.

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

OK

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between CMPS terminals ①, ② and ECM terminals.

| | CMPS terminal | ECM terminal | Continuity |
|---|---|---|---|
| 120° signal (REF signal) | ① | (83), (84) | Yes |
| 1° signal (POS signal) | ② | (63) | Yes |

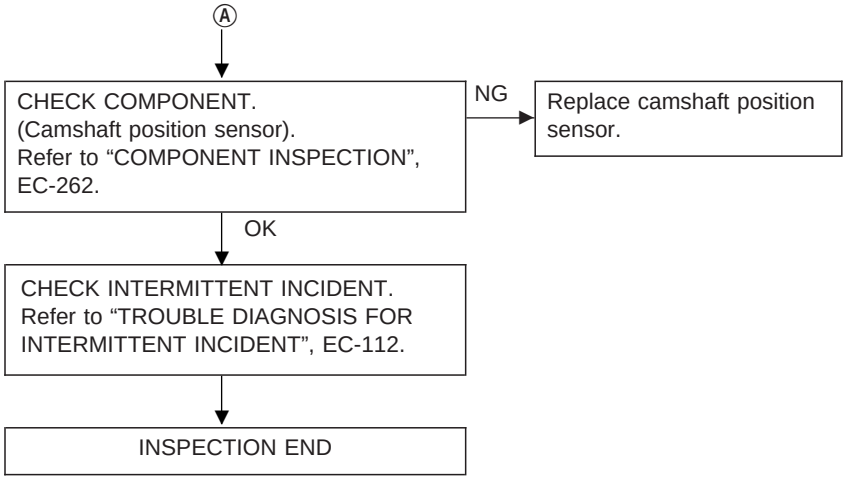
Refer to Wiring Diagram.
If OK, check harness for short to ground and short to power.

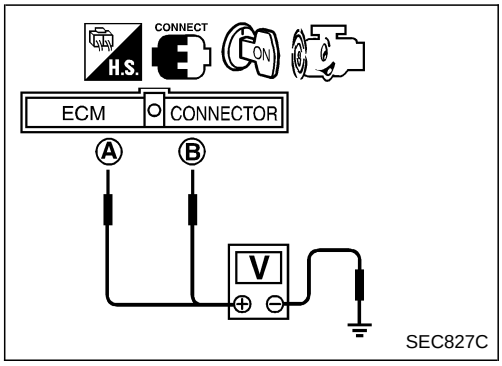
NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

Ⓐ

## Diagnostic Procedure (Cont'd)




## Component Inspection

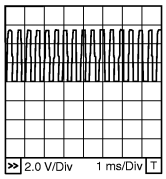
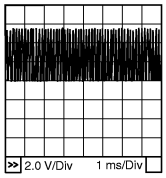
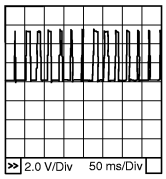
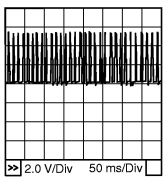
### CAMSHAFT POSITION SENSOR

1. Start engine and warm it up to the normal operating temperature.
2. Check voltage between the following ECM terminals and ground with DC range.

| | ECM terminal | Reference illustration |
|---|---|---|
| 1° signal (POS signal) | ⑥③ | Ⓐ |
| 120° signal (REF signal) | ⑧③ , ⑧④ | Ⓑ |

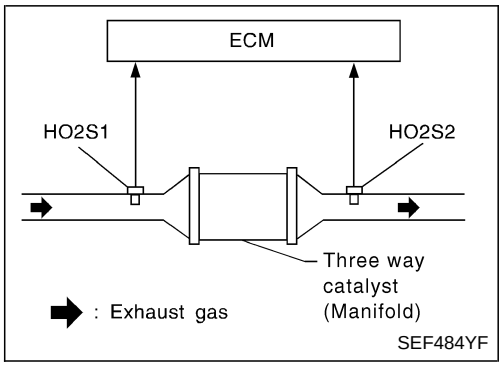
**CAUTION:**
**Do not use ECM ground terminals when measuring voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals such as the body ground.**

## Component Inspection (Cont'd)

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 63 | B/W | Camshaft position sensor (POS signal) | Engine is running. (Warmed-up condition)<br>└ Idle speed | 1.0 - 4.0V*1<br>  <br><br>SEC750D |
| | | | Engine is running. (Warmed-up condition)<br>└ Engine speed is 2,000 rpm. | 1.0 - 4.0V*1<br>  <br><br>SEC751D |
| 83<br>84 | L | Camshaft position sensor (REF signal) | Engine is running. (Warmed-up condition)<br>└ Idle speed | Approximately 0.3 - 0.6V*1<br>  <br><br>SEC746D |
| | | | Engine is running. (Warmed-up condition)<br>└ Engine speed is 2,000 rpm. | Approximately 0.3 - 0.6V*1<br>  <br><br>SEC747D |

*1: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

If NG, replace camshaft position sensor.




## On Board Diagnosis Logic

The ECM monitors the switching frequency ratio of heated oxygen sensors 1 and 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of heated oxygen sensors 1 and 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0420<br>0420<br>(Bank 1) | Catalyst system efficiency below threshold | ● Three way catalyst (manifold) does not operate properly.<br>● Three way catalyst (manifold) does not have enough oxygen storage capacity. | ● Three way catalyst (manifold)<br>● Exhaust tube<br>● Intake air leaks<br>● Fuel injectors<br>● Fuel injector leaks<br>● Spark plug<br>● Improper ignition timing |
| P0430<br>0430<br>(Bank 2) | | | |

## DTC Confirmation Procedure

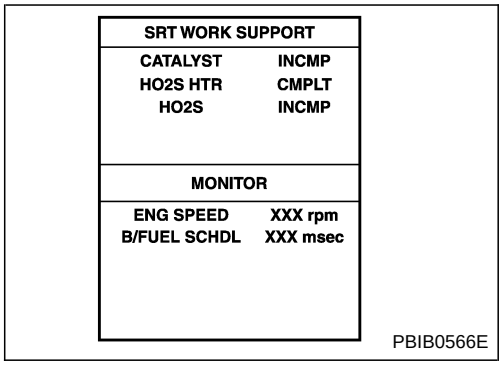
**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

### WITH CONSULT-II

**TESTING CONDITION:**

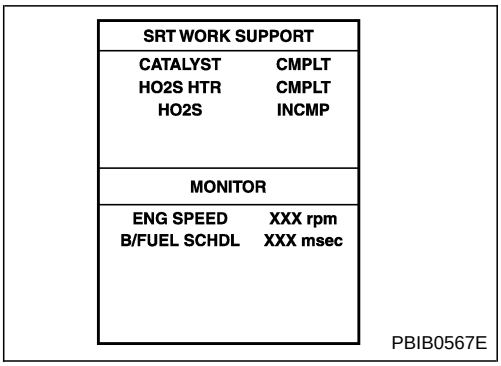
- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.



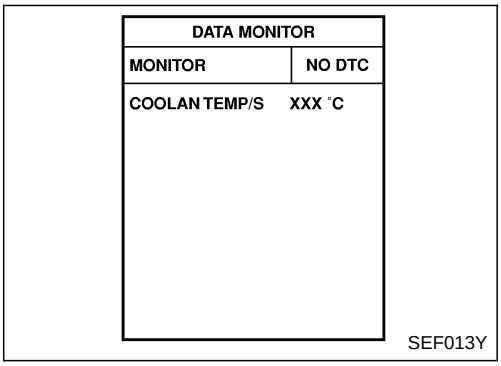

5. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-II.
6. Rev engine up to 2,500 to 3,500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
   If "INCMP" of "CATALYST" changed to "COMPLT", go to step 9
7. Wait 5 seconds at idle.

## DTC Confirmation Procedure (Cont'd)

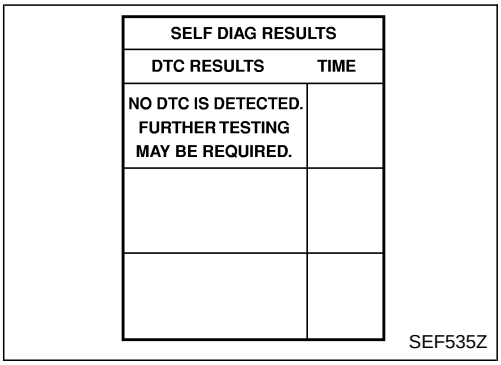



8. Rev engine up to 2,000 to 3,000 rpm and maintain it until "INCMP" of "CATALYST" changes to "CMPLT" (It will take approximately 5 minutes).
   If not "CMPLT", stop engine and cool it down to less than 70°C (158°F) and then retest from step 1.

a. Turn ignition switch "OFF" and leave the vehicle in a cool place (soak the vehicle).




b. Turn ignition switch "ON" and select "COOLANTEMP/S" in "DATA MONITOR" mode with CONSULT-II.
c. Start engine and warm it up while monitoring "COOLANTEMP/S" indication on CONSULT-II.
d. When "COOLANTEMP/S" indication reaches to 70°C (158°F), go to step 3.




9. Select "SELF-DIAG RESULTS" mode with CONSULT-II.
10. Confirm that the 1st trip DTC is not detected.
    If the 1st trip DTC is detected, go to EC-266, "Diagnostic Procedure".

## Overall Function Check

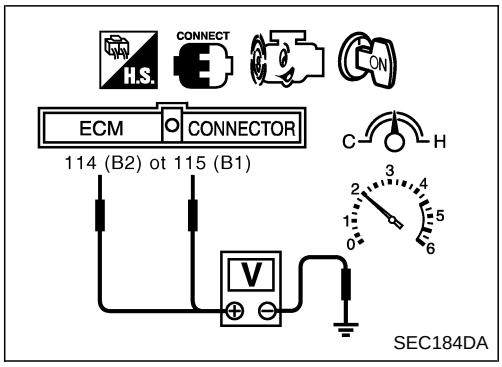
Use this procedure to check the overall function of the three way catalyst (Manifold). During this check, a DTC might not be confirmed.

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

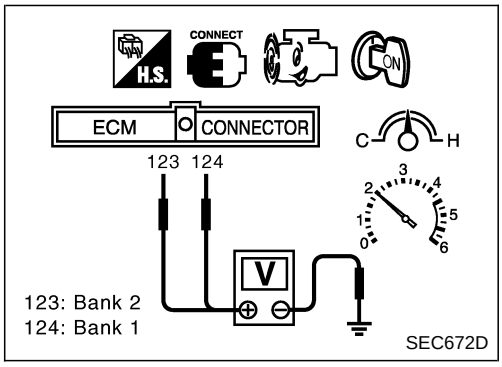
### WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.

## Overall Function Check (Cont'd)




5. Set voltmeters probes between ECM terminals 115 [HO2S1 (B 1) signal], 114 [HO2S1 (B 2) signal] and engine ground, and ECM terminals 124 [HO2S2 (B 1) signal], 123 [HO2S2 (B 2) signal] and engine ground.
6. Keep engine speed at 2,000 rpm constant under no load.

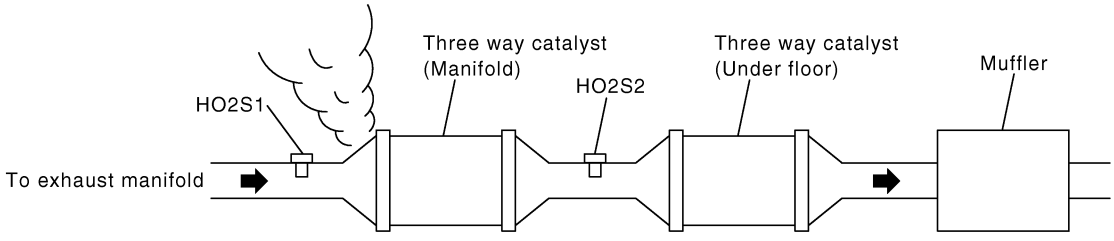



7. Make sure that the voltage switching frequency (high & low) between ECM terminals 124 and engine ground, or 123 and engine ground is very less than that of ECM terminals 115 and engine ground, or 114 and engine ground.
   **Switching frequency ratio = A/B**
   **A: Heated oxygen sensor 2 voltage switching frequency**
   **B: Heated oxygen sensor 1 voltage switching frequency**
   **This ratio should be less than 0.75.**
   If the ratio is greater than above, it means three way catalyst does not operate properly. Go to EC-266, "Diagnostic Procedure".

**NOTE:**
**If the voltage at terminal 35 or 36 does not switch periodically more than 5 times within 10 seconds at step 7, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-172.)**

## Diagnostic Procedure

| 1 | CHECK EXHAUST SYSTEM | |
|---|---|---|
| Visually check exhaust tubes and muffler for dent.<br>**OK or NG** | | |
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace. |

| 2 | CHECK EXHAUST GAS LEAK | |
|---|---|---|
| 1. Start engine and run it at idle.<br>2. Listen for an exhaust gas leak before the three way catalyst (manifold).<br>  <br><br>➡ : Exhaust gas<br>SEC502D<br>**OK or NG** | | |
| OK | ▶ | GO TO 3. |
| NG | ▶ | Repair or replace. |

## Diagnostic Procedure (Cont'd)

| 3 | CHECK INTAKE AIR LEAK | |
|---|---|---|
| Listen for an intake air leak after the mass air flow sensor.<br>**OK or NG** | | |
| OK | ▶ | GO TO 4. |
| NG | ▶ | Repair or replace. |

| 4 | CHECK IGNITION TIMING | |
|---|---|---|
| **Check the following items. Refer to EC-66, "Basic Inspection".** | | |

| Items | Specifications |
|---|---|
| Ignition timing | 10° ± 5° BTDC (in "P" or "N" position) |
| Target idle speed | 675 ± 50 rpm (in "P" or "N" position) |

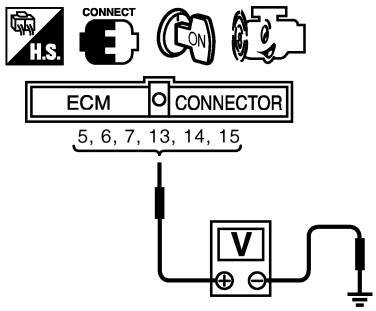
MTBL1584

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | Follow the EC-66, "Basic Inspection". |

| 5 | CHECK INJECTORS | |
|---|---|---|

1. Stop engine and then turn ignition switch "ON".
2. Check voltage between ECM terminals 5, 6, 7, 13, 14, 15 and ground with CONSULT-II or tester.




SEC743D

**Battery voltage should exist.**

3. Refer to Wiring Diagram for Injectors, EC-454.

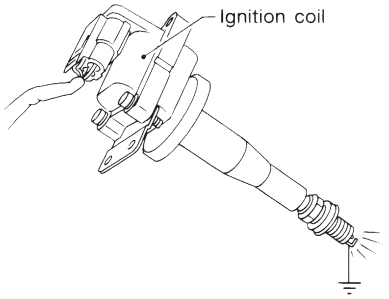
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Perform EC-455, "Diagnostic Procedure". |

## Diagnostic Procedure (Cont'd)

| 6 | CHECK IGNITION SPARK |
|---|---|

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




SEF575Q

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Check ignition coil with power transistor and their circuit. Refer to EC-428, "IGNITION SIGNAL". |

| 7 | CHECK INJECTOR |
|---|---|

1. Turn ignition switch "OFF".
2. Remove injector assembly.
   Refer to EM section.
   Keep fuel hose and all injectors connected to injector gallery.
3. Disconnect all ignition coil harness connectors.
4. Turn ignition switch "ON".
   Make sure fuel does not drip from injector.

**OK or NG**

| | | |
|---|---|---|
| OK (Does not drip.) | ▶ | GO TO 8. |
| NG (Drips.) | ▶ | Replace the injector(s) from which fuel is dripping. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

| | | |
|---|---|---|
| Trouble is fixed. | ▶ | **INSPECTION END** |
| Trouble is not fixed. | ▶ | Replace three way catalyst (Manifold). |

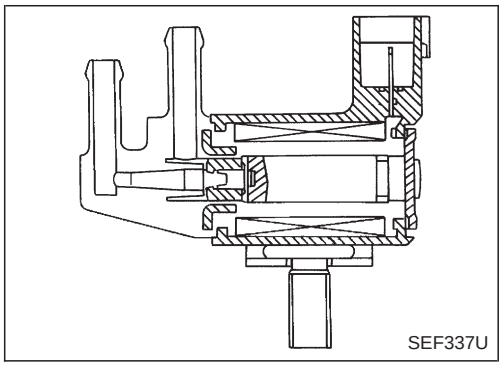
# Description

## SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | EVAP canister purge flow control | EVAP canister purge volume control solenoid valve |
| Mass air flow sensor | Amount of intake air | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Ignition switch | Start signal | | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Closed throttle position | | |
| Heated oxygen sensors 1 | Density of oxygen in exhaust gas (Mixture ratio feedback signal) | | |
| Vehicle speed sensor | Vehicle speed | | |

*: This signal is sent to the ECM through CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.


SEF337U

## COMPONENT DESCRIPTION

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-II Reference Value in Data Monitor Mode

Specification data are reference values.

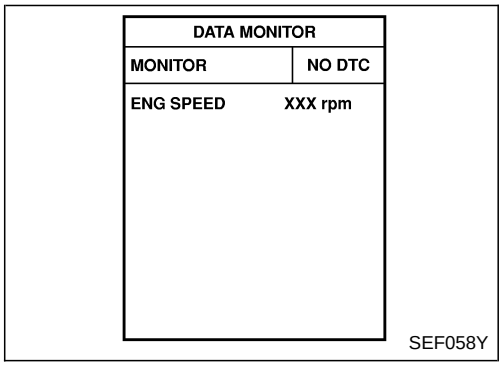
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| PURG VOL C/V | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 0% |
| | | 2,000 rpm | 65 - 85% |

# On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0444<br>0444 | EVAP canister purge volume control solenoid valve circuit open | An excessively low voltage signal is sent to ECM through the valve | ● Harness or connectors (The solenoid valve circuit is open or shorted.)<br>● EVAP canister purge volume control solenoid valve |
| P0445<br>0445 | EVAP canister purge volume control solenoid valve circuit shorted | An excessively high voltage signal is sent to ECM through the valve | ● Harness or connectors (The solenoid valve circuit is shorted.)<br>● EVAP canister purge volume control solenoid valve |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm battery voltage is more than 11V at idle.**




### WITH CONSULT-II

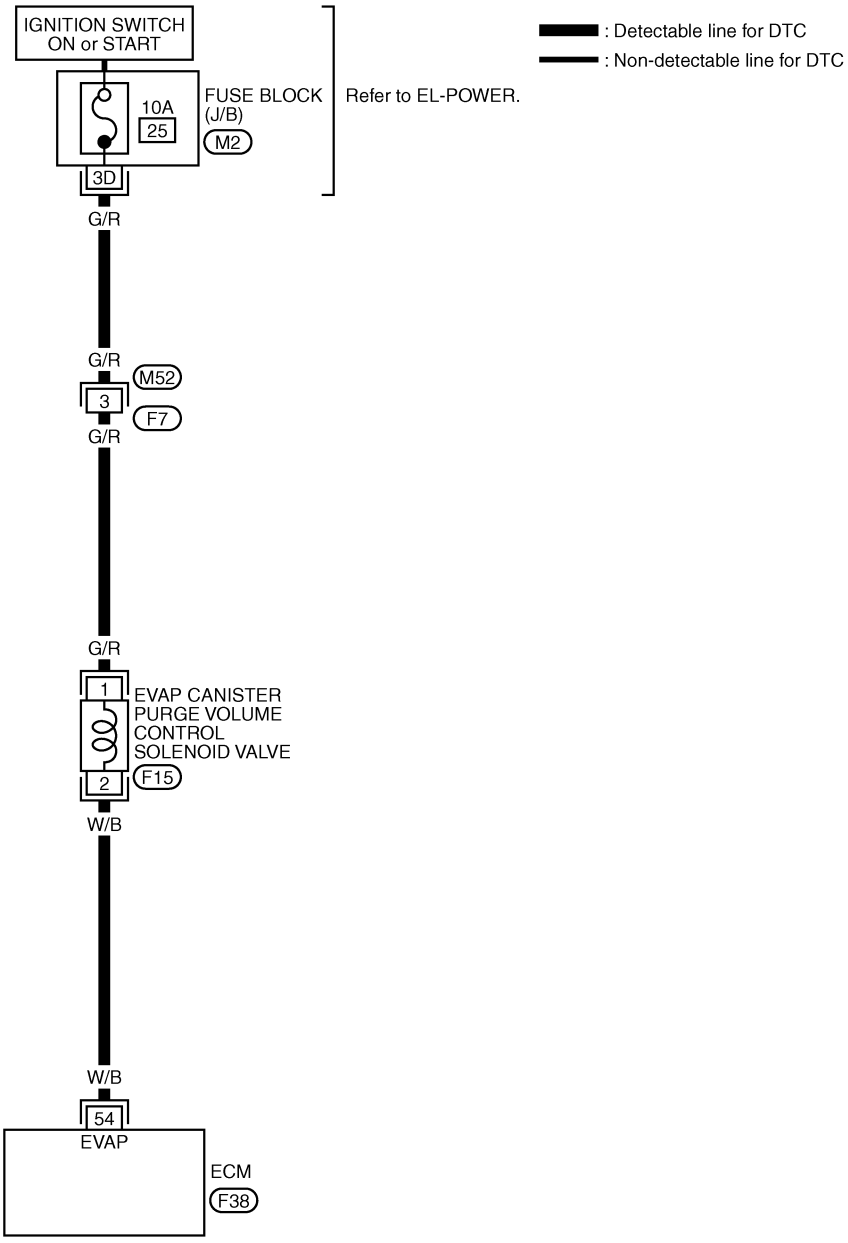
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for at least 30 seconds.
4. If 1st trip DTC is detected, go to EC-273, "Diagnostic Procedure".

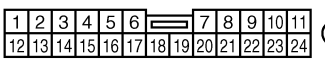
### WITH GST

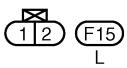
Follow the procedure "WITH CONSULT-II" above.

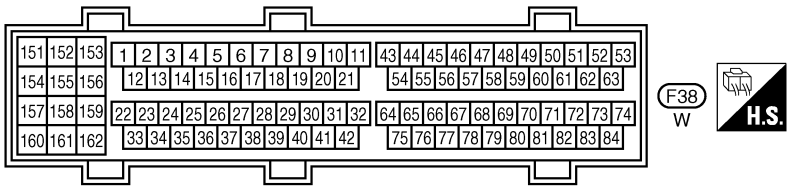
## Wiring Diagram

EC-PGC/V-01




Refer to last page (Foldout page).
M2

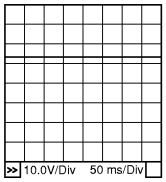
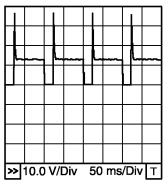
TEC418M

## Wiring Diagram (Cont'd)

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.**

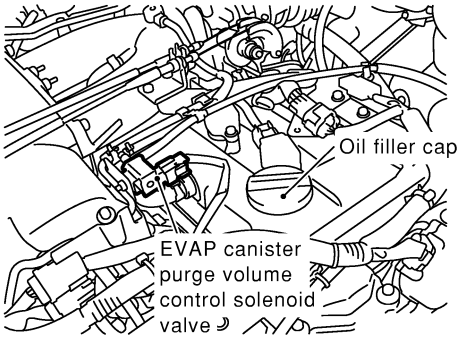
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 54 | W/B | EVAP canister purge volume control solenoid valve | Engine is running.<br>└ Idle speed | BATTERY VOLTAGE (11 - 14V)<br>  <br><br>PBIB0050E |
| | | | Engine is running.<br>└ Engine speed is about 2,000 rpm (More than 100 seconds after starting engine) | Approximately 10V★<br>  <br><br>PBIB0520E |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

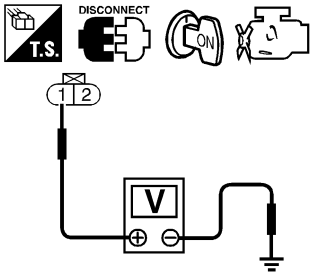
| 1 | CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.




SEC785C

3. Turn ignition switch “ON”.
4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-II or tester.




SEC815C

**Voltage: Battery voltage**

**OK or NG**

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

| 2 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- 10A fuse
- Fuse block (J/B) connector M2
- Harness connectors M52, F7
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

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

## Diagnostic Procedure (Cont'd)

| 3 | CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 54 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK (With CONSULT-II) | ► | GO TO 4. |
| OK (Without CONSULT-II) | ► | GO TO 5. |
| NG | ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION |
|---|---|

**With CONSULT-II**

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-II. Check that engine speed varies according to the valve opening.

| ACTIVE TEST | |
|---|---|
| PURG VOL CONT/V | 0 % |
| MONITOR | |
| ENG SPEED | XXX rpm |
| HO2S1 MNTR (B1) | LEAN |
| HO2S1 MNTR (B2) | LEAN |
| A/F ALPHA-B1 | XXX % |
| A/F ALPHA-B2 | XXX % |
| | |
| | |

PBIB0147E

**OK or NG**

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

| 5 | CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE |
|---|---|

**Refer to EC-275, "Component Inspection".**

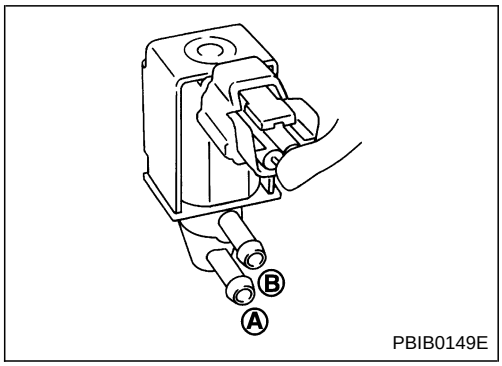
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 6. |
| NG | ► | Replace EVAP canister purge volume control solenoid valve. |

| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

| | | |
|---|---|---|
| | ► | **INSPECTION END** |



PBIB0149E

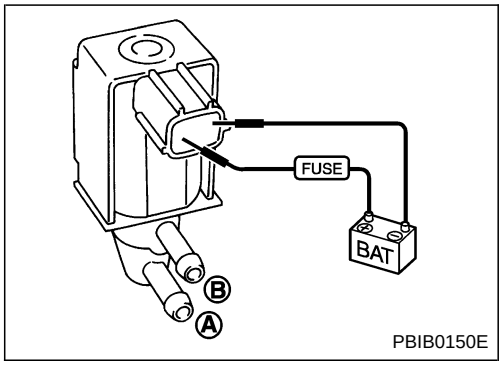
## Component Inspection

### EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

#### With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

| Condition (PURG VOL CONT/V value) | Air passage continuity between A and B |
|---|---|
| 100.0% | Yes |
| 0.0% | No |



PBIB0150E

#### Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

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

## Description

**NOTE:**
**If DTC P0500 is displayed with DTC U1000, first perform the trouble diagnosis for DTC U1000. Refer to EC-121, "DTC U1000 CAN COMMUNICATION LINE".**

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the combination meter. The combination meter then sends a signal to the ECM through CAN communication line.

## On Board Diagnosis Logic

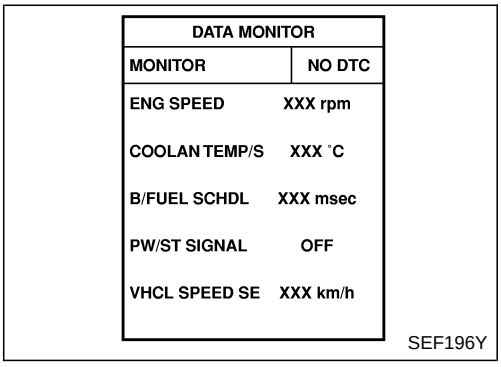
| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0500<br>0500 | Vehicle speed sensor | The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven. | ● Harness or connectors<br>(The CAN communication line is open or shorted.)<br>● Harness or connectors<br>(The vehicle speed signal circuit is open or shorted.)<br>● Combination meter<br>● Vehicle speed signal |

## 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 10 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.**

### WITH CONSULT-II

1. Start engine.
2. Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-II. The vehicle speed on CONSULT-II should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-277, "Diagnostic Procedure".
   If OK, go to following step.
3. Select "DATA MONITOR" mode with CONSULT-II.
4. Warm engine up to normal operating temperature.




5. Maintain the following conditions for at least 60 consecutive seconds.

| | |
|---|---|
| ENG SPEED | More than 1,350 rpm |
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | More than 6.5 msec |
| Selector lever | Suitable position |
| PW/ST SIGNAL | OFF |

6. If 1st trip DTC is detected, go to EC-277, "Diagnostic Procedure".

## Overall Function Check

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

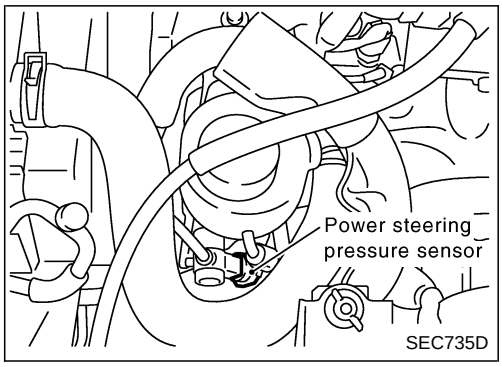
### WITH GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in “MODE 1” with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-277, “Diagnostic Procedure”.

## Diagnostic Procedure

| 1 | CHECK VEHICLE SPEED SENSOR CIRCUIT | |
|---|---|---|
| Refer to EL section. | | |
| | **OK or NG** | |
| OK | ▶ | GO TO 2. |
| NG | ▶ | Repair or replace. |

| 2 | CHECK COMBINATION METER | |
|---|---|---|
| Check combination meter function.<br>Refer to EL section. | | |
| | ▶ | **INSPECTION END** |




## Component Description

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load. This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| PW/ST SIGNAL | ● Engine: After warming up, idle the engine | Steering wheel is in neutral position. (Forward direction) | OFF |
| | | Steering wheel is turned. | ON |

## On Board Diagnosis Logic

**The MI will not light up for this diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0550<br>0550 | Power steering pressure sensor circuit | An excessively low or high voltage from the sensor is sent to ECM. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Power steering pressure sensor |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

### WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for at least 5 seconds.
4. If 1st trip DTC is detected, go to EC-280, "Diagnostic Procedure".

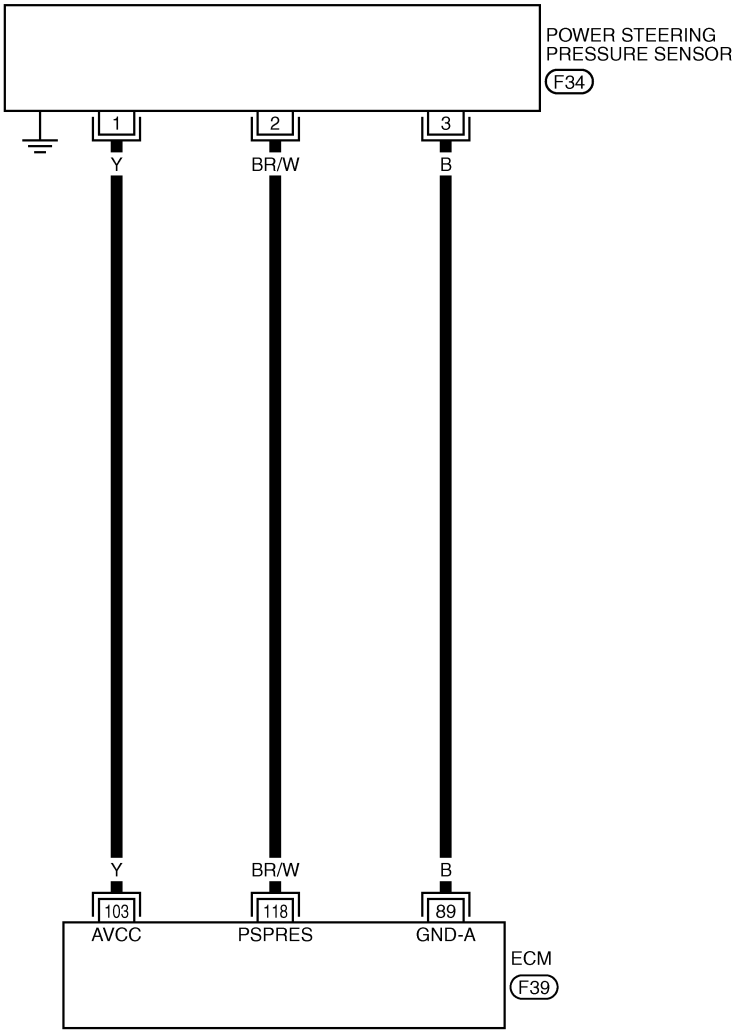
### WITH GST

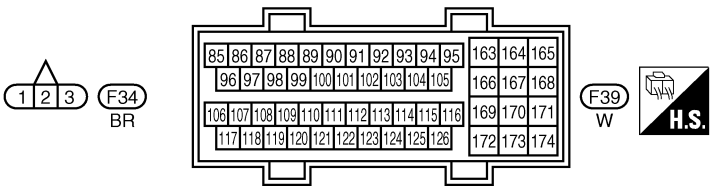
Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-PS/SEN-01

: Detectable line for DTC
: Non-detectable line for DTC




TEC342M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

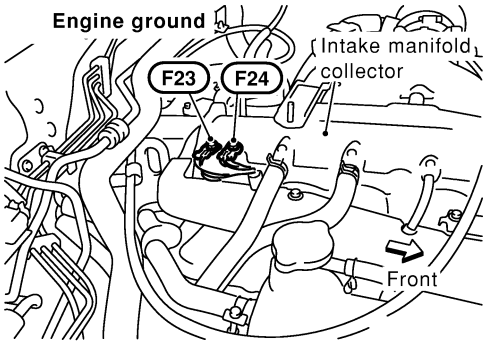
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 89 | B | Sensor ground (Power steering pressure sensor) | Engine is running.<br>└ Idle speed | Approximately 0V |
| 103 | Y | Sensor power supply (Power steering pressure sensor) | Ignition switch "ON" | Approximately 5V |
| 118 | BR/W | Power steering pressure sensor | Engine is running.<br>└ Steering wheel is being turned. | 0.5 - 4.0V |
| | | | Engine is running.<br>└ Steering wheel is not being turned. | 0.4 - 0.8V |

## Diagnostic Procedure

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

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



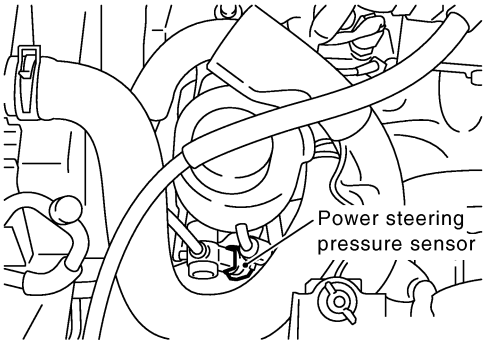

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

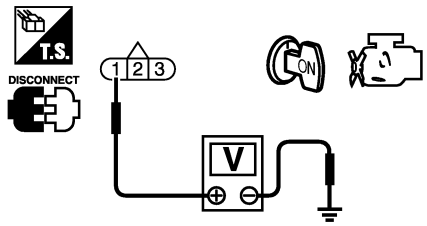
| 2 | CHECK PSP SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect PSP sensor harness connector.




SEC735D

2. Turn ignition switch "ON".
3. Check voltage between PSP sensor terminal 1 and ground with CONSULT-II or tester.




PBIB0085E

**Voltage: Approximately 5V**

**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 PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between PSP sensor terminal 3 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal 118 and PSP sensor terminal 2.
   **Continuity should exist.**
2. Also check harness for short to ground and short to power.

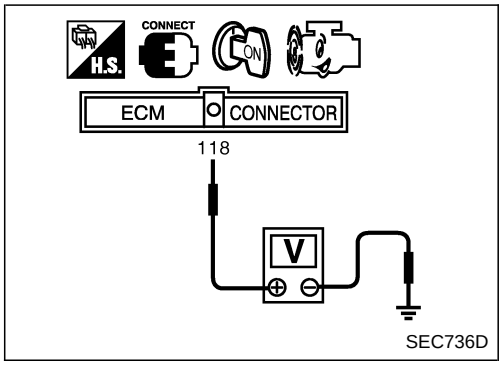
**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 5 | CHECK PSP SENSOR | |
|---|---|---|
| Refer to EC-282, "Component Inspection". | | |
| OK or NG | | |
| OK | ► | GO TO 6. |
| NG | ► | Replace PSP sensor. |

| 6 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | | |
| | ► | INSPECTION END |

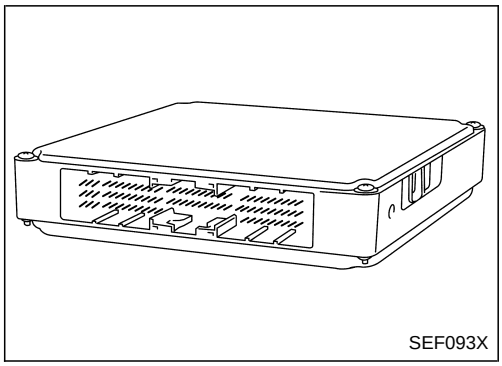



## Component Inspection

### POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 118 and ground under the following conditions.

| Condition | Voltage |
|---|---|
| Steering wheel is being turned fully. | 0.5 - 4.0V |
| Steering wheel is not being turned. | 0.4 - 0.8V |


SEF093X

## Component Description

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.

## On Board Diagnosis Logic

**This self-diagnosis has one or two trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---|---|---|---|---|
| P0605<br>0605 | Engine control module | A) | ECM calculation function is malfunctioning. | ● ECM |
| | | B) | ECM EEP-ROM system is malfunctioning. | |
| | | C) | ECM self shut-off function is malfunctioning. | |

### FAIL-SAFE MODE

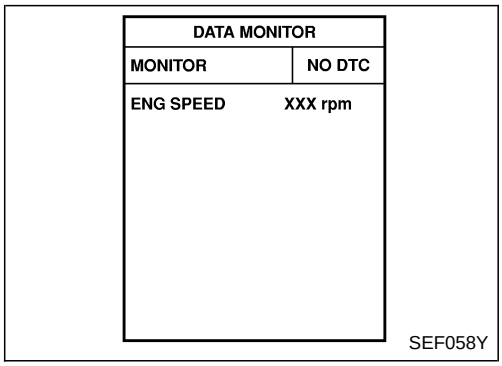
ECM enters fail-safe mode when malfunction A is detected.

| Detected items | Engine operation condition in fail-safe mode |
|---|---|
| Malfunction A | ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |

## DTC Confirmation Procedure

**Perform “PROCEDURE FOR MALFUNCTION A” first. If the DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B”. If there is no malfunction 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 10 seconds before conducting the next test.**



SEF058Y

### PROCEDURE FOR MALFUNCTION A

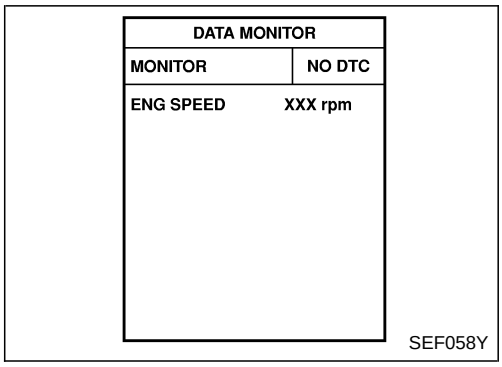
#### With CONSULT-II

1. Turn ignition switch “ON”.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. If 1st DTC is detected, go to EC-285, “Diagnostic Procedure”.

#### With GST

Follow the procedure “With CONSULT-II” above.

## DTC Confirmation Procedure (Cont'd)



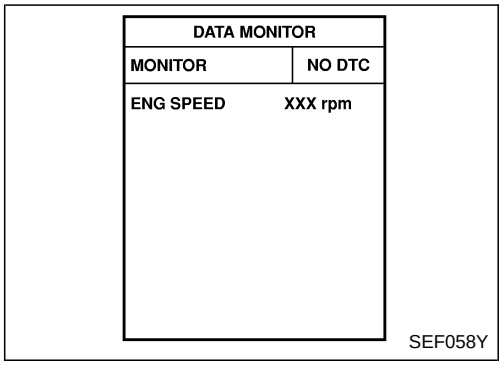

### PROCEDURE FOR MALFUNCTION B

#### With CONSULT-II

1. Turn ignition switch "ON" and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch "OFF", wait at least 10 seconds, and then turn "ON".
4. If 1st trip DTC is detected, go to EC-285, "Diagnostic Procedure".

#### With GST

Follow the procedure "With CONSULT-II" above.




### PROCEDURE FOR MALFUNCTION C

#### With CONSULT-II

1. Turn ignition switch "ON" and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch "OFF", wait at least 10 seconds, and then turn "ON".
4. Repeat step 3 for 32 times.
5. If 1st trip DTC is detected, go to EC-285, "Diagnostic Procedure".

#### With GST

Follow the procedure "With CONSULT-II" above.

# Diagnostic Procedure

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

**With CONSULT-II**

1. Turn ignition switch “ON”.
2. Select “SELF DIAG RESULTS” mode with CONSULT-II.
3. Touch “ERASE”.
4. **Perform “DTC Confirmation Procedure”.**
   See EC-283.
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-283.
5. Is the 1st trip DTC P0605 displayed again?

| Yes or No | |
|---|---|
| Yes ► | GO TO 2. |
| No ► | **INSPECTION END** |

| 2 | REPLACE ECM |
|---|---|

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-50, “NATS (Nissan Anti-theft System)”.
3. Perform EC-31, “Accelerator Pedal Released Position Learning”.
4. Perform EC-31, “Throttle Valve Closed Position Learning”.
5. Perform EC-31, “Idle Air Volume Learning”.

| | |
|---|---|
| ► | **INSPECTION END** |

## Component Description

Malfunction Indicator (MI) is located on the instrument panel. When the ignition switch is turned ON without engine running, MI will light up. This is a bulb check. When the engine is started, MI should go off. If MI remains on, the on board diagnostic system has detected an engine system malfunction.

## On Board Diagnosis Logic

**The MI will not light up for this self-diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P0650<br>0650 | Malfunction indicator (MI) control circuit | ● An excessively high voltage is sent to ECM through the MI circuit under the condition that calls for MI light up.<br>● An excessively low voltage is sent to ECM through the MI circuit under the condition that calls for MI not to light up. | ● Harness or connectors (MI circuit is open or shorted.)<br>● MI |

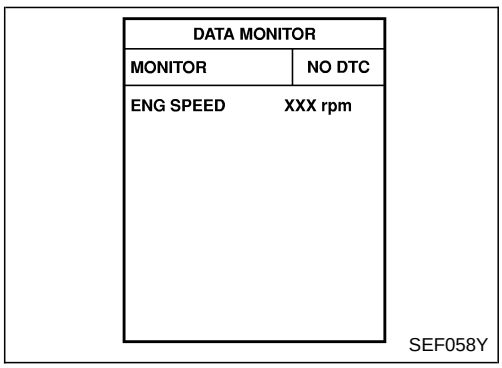
### FAIL-SAFE MODE

ECM enters fail-safe mode when both DTC P0650 and another DTC, which calls for MI to light up, are detected at the same time.

| Detected items | Engine operating condition in fail-safe mode |
|---|---|
| MI circuit | Engine speed will not rise more than 2,500 rpm due to the fuel cut. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**




### WITH CONSULT-II

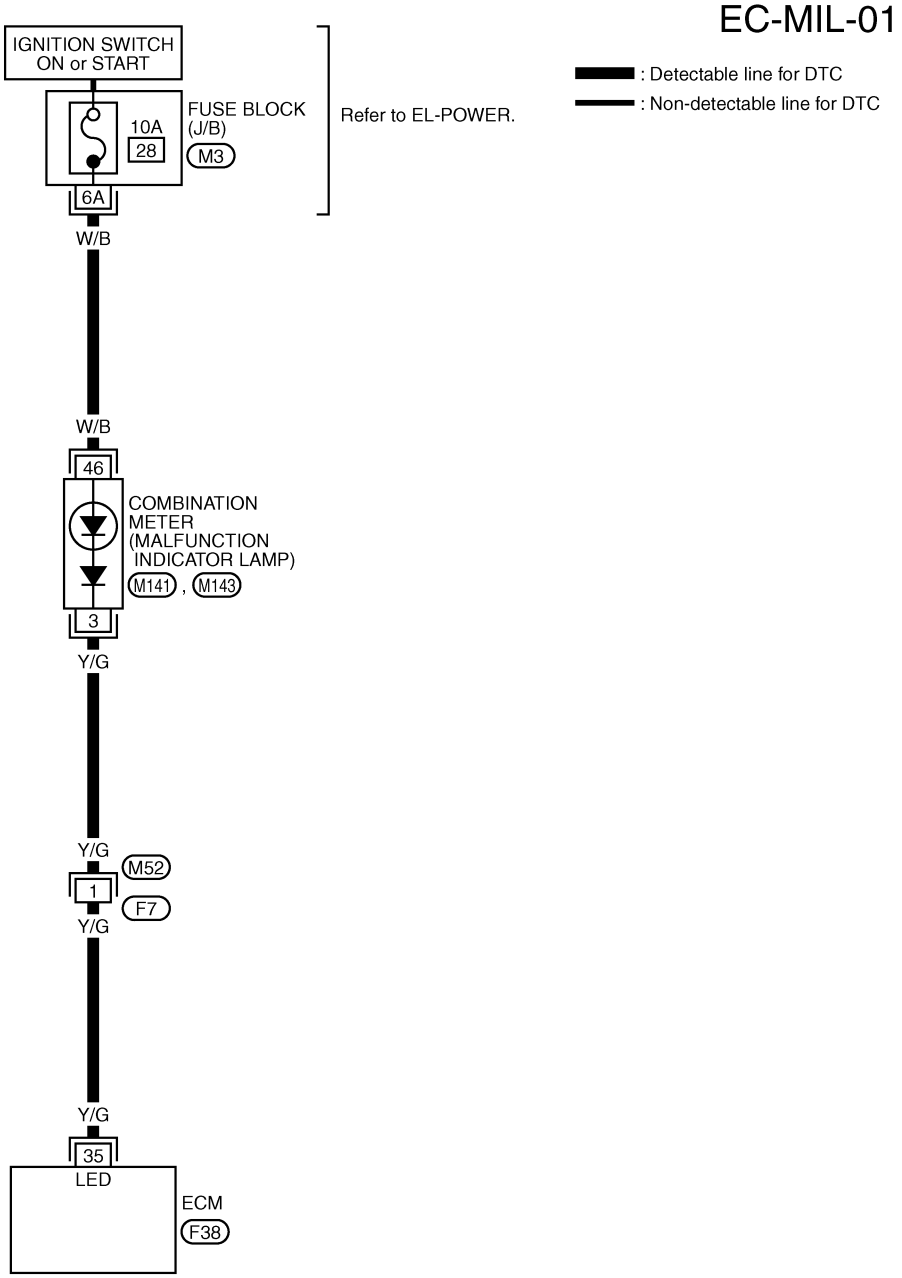
1. Turn ignition switch "ON" and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-288.

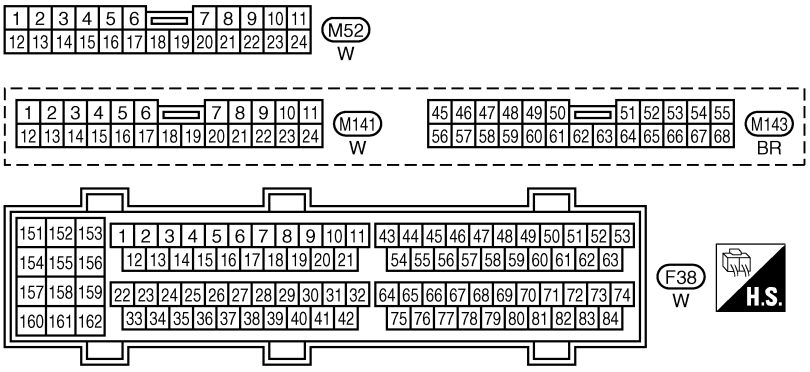
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-MIL-01




Refer to last page (Foldout page).

M3

TEC422M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

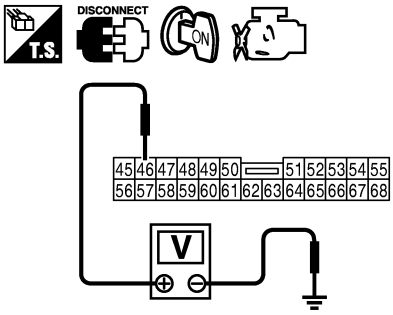
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 35 | Y/G | MI | Ignition switch "ON" | 0 - 1.0V |
| | | | Engine is running.<br>└ Idle speed | BATTERY VOLTAGE (11 - 14V) |

## Diagnostic Procedure

| 1 | CHECK MIL POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect combination meter harness connector.
3. Turn ignition switch "ON".
4. Check voltage between combination meter terminal 46 and ground with CONSULT-II or tester.




SEC737D

**Voltage: Battery voltage**

**OK or NG**

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

| 2 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.

- Fuse block (J/B) connector M3
- 10A fuse
- Harness for open or short between fuse block (J/B) and combination meter

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

| 3 | CHECK MIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 35 and combination meter terminal 3.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

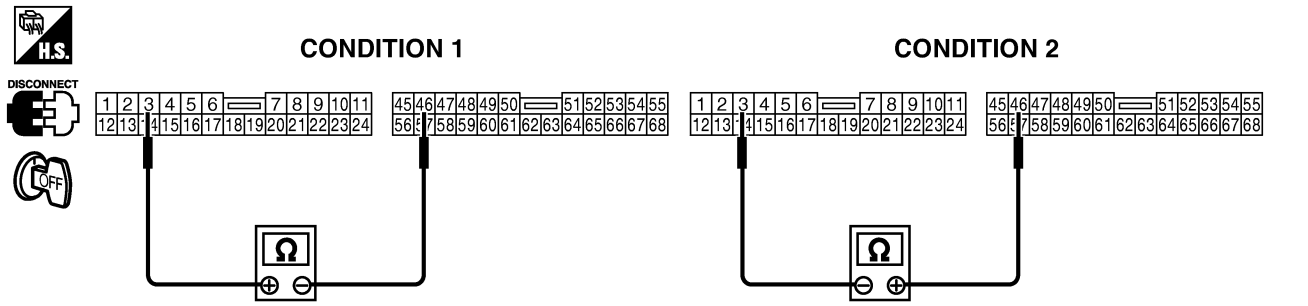
| | | |
|---|---|---|
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

## Diagnostic Procedure (Cont'd)

| 4 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors M52, F7<br>● 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. |

| 5 | CHECK COMBINATION METER |
|---|---|

Check continuity between combination meter terminals 46 and 3 under the following conditions.




SEC777D

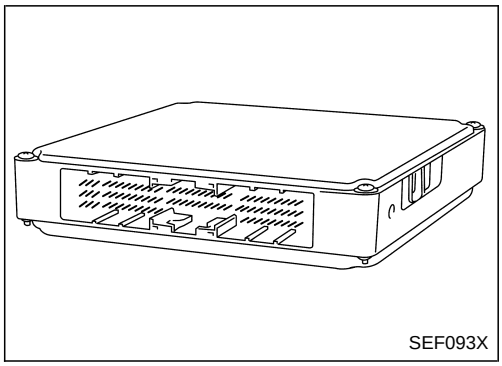
| Condition | Continuity |
|---|---|
| 1 | Should exit. |
| 2 | Should not exit. |

MTBL1599

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 6. |
| NG | ► | Replace combination meter. |

| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-112.** | |
| **OK or NG** | |
| OK | ► Replace combination meter. Refer to EL section. |
| NG | ► Repair or replace. |


SEF093X

## Component Description

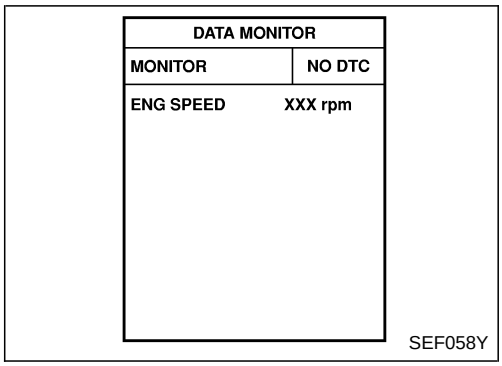
Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.

## On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1065<br>1065 | ECM power supply circuit | ECM back up RAM system does not function properly. | ● Harness or connectors<br>[ECM power supply (back-up) circuit is open or shorted.]<br>● ECM |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**



SEF058Y

### WITH CONSULT-II

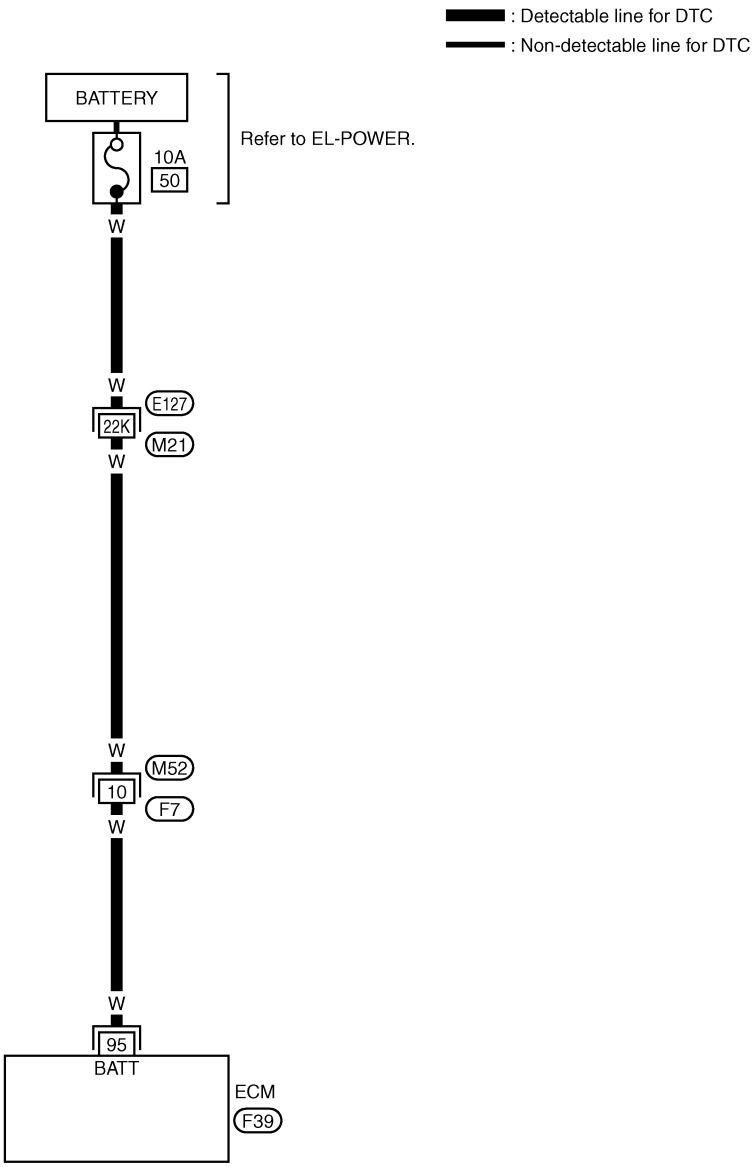
1. Turn ignition switch "ON" and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. Turn ignition switch "OFF", wait at least 10 seconds, and then turn "ON".
5. Repeat steps 3 and 4 four times.
6. If 1st trip DTC is detected, go to EC-292, "Diagnostic Procedure".

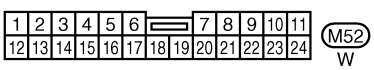
### WITH GST

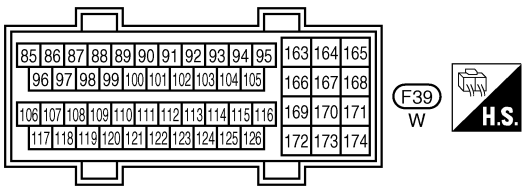
Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-POWER-01




Refer to last page (Foldout page).
M21 , E127

TEC244M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

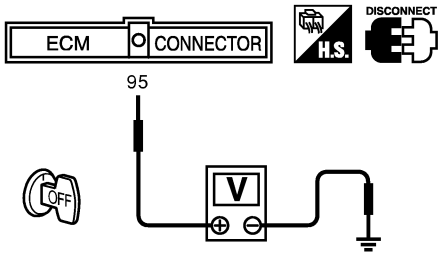
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 95 | W | Power supply for ECM (Buck-up) | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

## Diagnostic Procedure

| 1 | CHECK ECM POWER SUPPLY |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 95 and ground with CONSULT-II or tester.




PBIB0087E

**Voltage: Battery voltage**

**OK or NG**

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

| 2 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.

- Harness connectors E127, M21
- Harness connectors M52, F7
- 10A fuse
- Harness for open or short between ECM and battery

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

| 3 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

**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)

| 4 | PERFORM DTC CONFIRMATION PROCEDURE |
|---|---|

**With CONSULT-II**

1. Turn ignition switch "ON".
2. Select "SELF DIAG RESULTS" mode with CONSULT-II.
3. Touch "ERASE".
4. **Perform "DTC Confirmation Procedure".**
   See EC-290.
5. Is the 1st trip DTC P1065 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-290.
5. Is the 1st trip DTC P1065 displayed again?

| Yes or No | |
|---|---|
| Yes ► | GO TO 5. |
| No ► | **INSPECTION END** |

| 5 | REPLACE ECM |
|---|---|

1. Replace ECM.
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to EC-50, "NATS (Nissan Anti-theft System)".
3. Perform EC-31, "Accelerator Pedal Released Position Learning".
4. Perform EC-31, "Throttle Valve Closed Position Learning".
5. Perform EC-31, "Idle Air Volume Learning".

| | |
|---|---|
| ► | **INSPECTION END** |

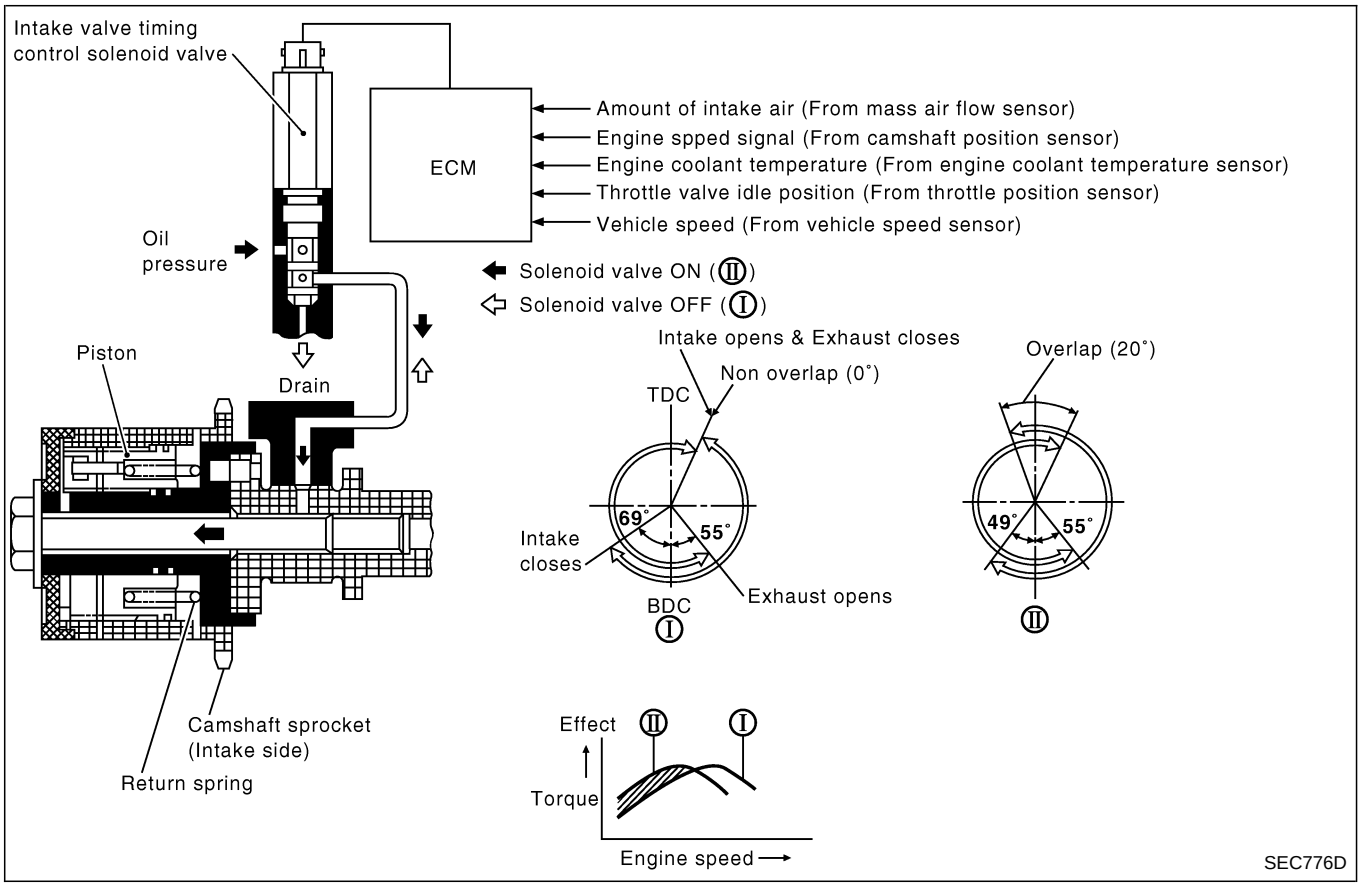
# Description

## SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM Function | Actuator |
|---|---|---|---|
| Camshaft position sensor | Engine speed | Intake valve timing control | Intake valve timing control solenoid valve |
| Engine coolant temperature sensor | Engine coolant temperature | | |
| Vehicle speed sensor | Vehicle speed | | |

The intake valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine speed, amount of intake air, vehicle speed and throttle position are used to determine intake valve timing. The intake camshaft sprocket position is regulated by oil pressure controlled by the intake valve timing control.

When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.




# Operation

| Engine operating condition | Intake valve timing control solenoid valve | Intake valve opening and closing time | Valve overlap | Engine valve timing |
|---|---|---|---|---|
| ● Engine coolant temperature is between 70°C (158°F) to 119°C (246°F) and engine speed is between 1,000 rpm and 4,200 rpm.<br>● During high load condition<br>● Vehicle speed is more than 8 km/h (5 MPH). | ON | Advance | Increased | Ⅱ |
| Those other than above | OFF | Normal | Normal | Ⅰ |

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

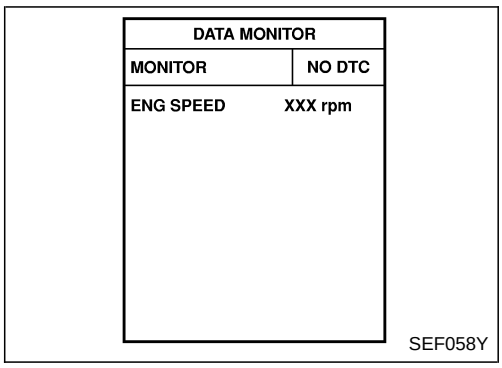
| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| INT/V SOL-B1 | ● Engine: Idle | OFF |
| | ● Engine: After warning up<br>● Engine speed is between 1,000 rpm and 4,200 rpm<br>● Vehicle speed is more than 8 km/h (5 MPH).<br>● During high load condition | ON |

## On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1111<br>1111 | Intake valve timing control solenoid valve circuit | An improper voltage is sent to the ECM through intake valve timing control solenoid valve. | ● Harness or connectors (Solenoid valve circuit is open or shorted.)<br>● Intake valve timing control solenoid valve |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**




### WITH CONSULT-II

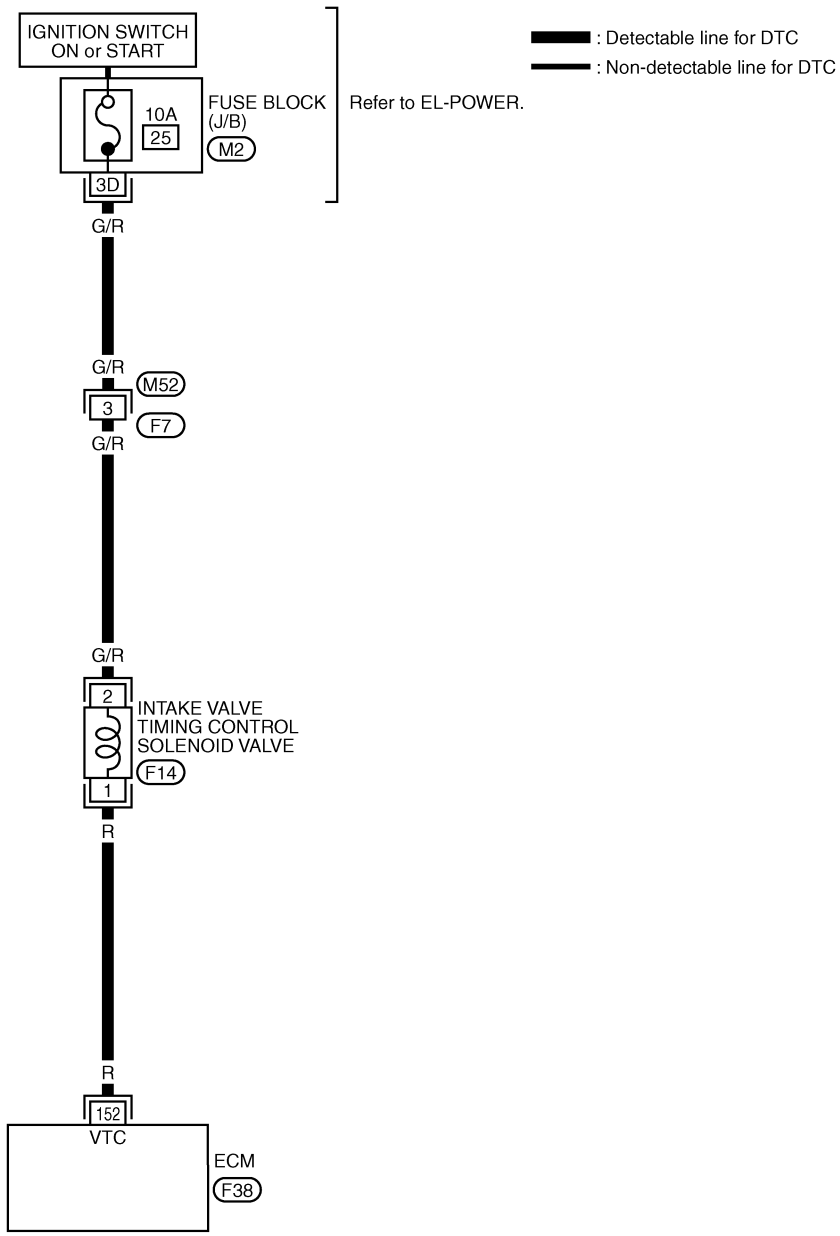
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If 1st trip DTC is detected, go to EC-297, "Diagnostic Procedure".

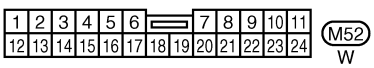
### WITH GST

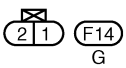
Following the procedure "WITH CONSULT-II" above.

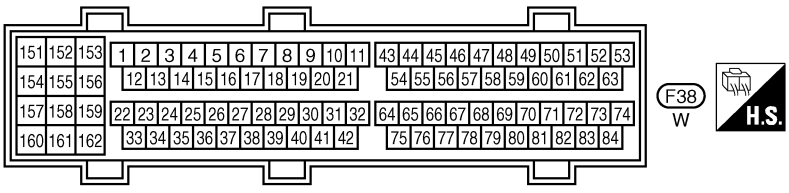
## Wiring Diagram

EC-IVC-01




Refer to last page (Foldout page).
M2

TEC419M

## Wiring Diagram (Cont'd)

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.**

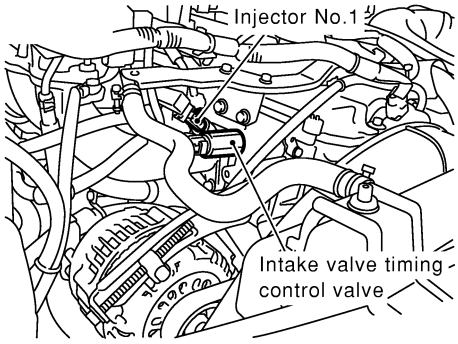
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 152 | R | Intake valve timing control solenoid valve | Engine is running.<br>└ Intake valve timing control solenoid is operating. | Approximately 0V |
| | | | Engine is running.<br>└ Intake valve timing control solenoid is not operating. | BATTERY VOLTAGE (11 - 14V) |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

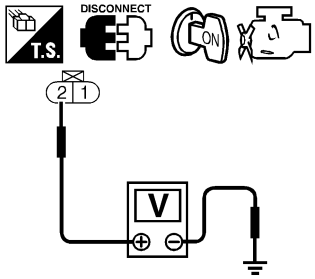
**1 CHECK IVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT**

1. Turn ignition switch "OFF".
2. Disconnect intake valve timing control solenoid valve harness connector.




SEC793C

3. Turn ignition switch "ON".
4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-II or tester.




SEC794C

**Voltage: Battery voltage**

**OK or NG**

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

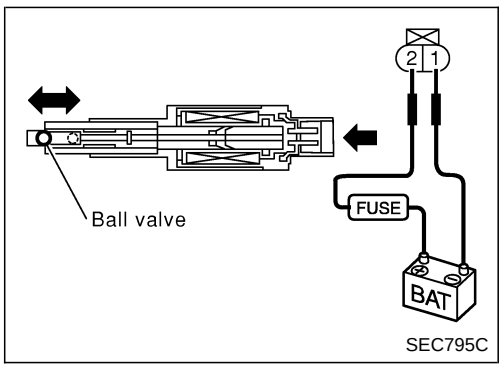
## Diagnostic Procedure (Cont'd)

| 2 | DETECT MALFUNCTION PART |
|---|---|
| Check the following.<br>● Harness connectors M52, F7<br>● 10A fuse<br>● Fuse block (J/B) connector M2<br>● Harness for open or short between intake valve timing control solenoid valve and fuse | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 3 | CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Disconnect ECM harness connector.<br>3. Check harness continuity between ECM terminal 152 and intake valve timing control solenoid valve terminal 1. Refer to Wiring Diagram.<br>**Continuity should exist.**<br>4. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 4. |
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE |
|---|---|
| **Refer to EC-298, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 5. |
| NG ► | Replace intake valve timing control solenoid valve. |

| 5 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT.** | |
| ► | **INSPECTION END** |




## Component Inspection

### INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Check oil passage visually for any metal debris.
2. Supply intake valve timing control solenoid valve terminals with battery voltage.
3. Make sure that inside plunger protrudes.
   If NG, replace intake valve timing control solenoid valve.

## Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---|---|---|---|---|
| P1121<br>1121 | Electric throttle control actuator | A) | Electric throttle control actuator does not function properly due to the return spring malfunction. | ● Electric throttle control actuator |
| | | B) | Throttle valve opening angle in fail-safe mode is not in specified range. | |
| | | C) | ECM detect the throttle valve is stuck open.<br>**This self-diagnosis has the one trip detection logic.** | |

### FAIL-SAFE MODE

When the malfunction A or B is detected in the two consecutive trips, the ECM enters fail-safe mode and the MI lights up.
When the malfunction C is detected even in the 1st trip, the ECM enters fail-safe mode and the MI lights up.

| Detected items | Engine operating condition in fail-safe mode |
|---|---|
| Malfunction A | The ECM controls the electric throttle actuator by regulating the throttle opening around the idle position.<br>The engine speed will not rise more than 2,000 rpm. |
| Malfunction B | ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less. |
| Malfunction C | While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.<br>The engine can restart in “N” or “P” position, and engine speed will not exceed 1,000 rpm or more. |

## DTC Confirmation Procedure

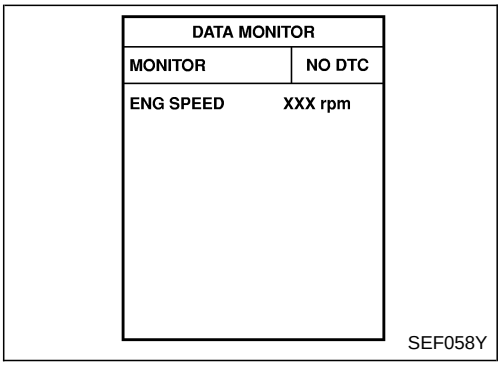
**NOTE:**

- **Perform “PROCEDURE FOR MALFUNCTION A AND B” first. If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION C”.**
  **If there is no malfunction on “PROCEDURE FOR MALFUNCTION A AND B”, perform “PROCEDURE FOR MALFUNCTION C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

### PROCEDURE FOR MALFUNCTION A AND B

#### With CONSULT-II

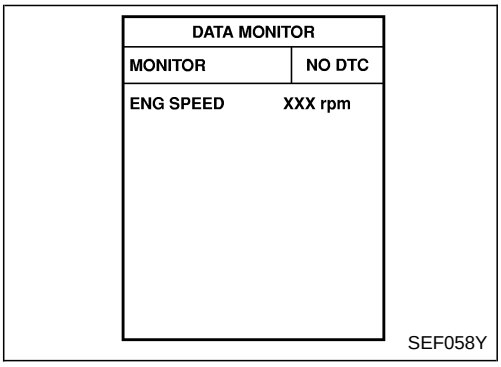
1. Turn ignition witch “ON” and wait at least 1 second.
2. Select “DATA MONITOR” mode with CONSULT-II.
3. Shift selector lever to “D” position and wait at least 2 seconds.
4. Turn ignition switch “OFF”, wait at least 10 seconds, and then turn “ON”.
5. If 1st trip DTC is detected, go to EC-300, “Diagnostic Procedure”.



## DTC Confirmation Procedure (Cont'd)

### With GST

Follow the procedure "With CONSULT-II" above.




### PROCEDURE FOR MALFUNCTION C

### With CONSULT-II

1. Turn ignition switch "ON" and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Shift selector lever to "D" position and wait at least 2 seconds.
4. Shift selector lever to "N" or "P" position.
5. Start engine and let it idle for 3 seconds.
6. If DTC is detected, go to EC-300, "Diagnostic Procedure".

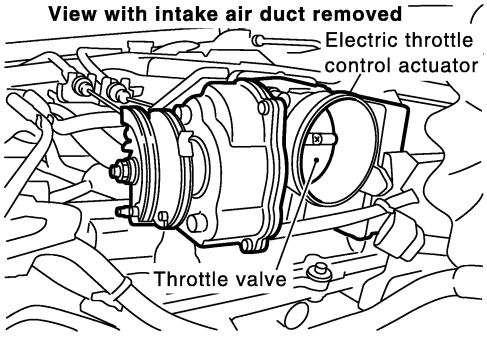
### With GST

Follow the procedure "With CONSULT-II" above.

## Diagnostic Procedure

| 1 | CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY |
|---|---|

1. Remove the intake air duct.
2. Perform 31, "Accelerator Pedal Released Position Learning".
3. Check if a foreign matter is caught between the throttle valve and the housing.




**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 2. |
| NG | ► | Remove the foreign matter and clean the electric throttle control actuator inside. |

| 2 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Accelerator Pedal Released Position Learning".
3. Perform EC-31, "Throttle Valve Closed Position Learning".
4. Perform EC-31, "Idle Air Volume Learning".

| | | |
|---|---|---|
| | ► | **INSPECTION END** |

## Description

**NOTE:**
**If DTC P1122 is displayed with DTC P1121 or 1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to EC-299 or EC-309.**

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## On Board Diagnosis Logic

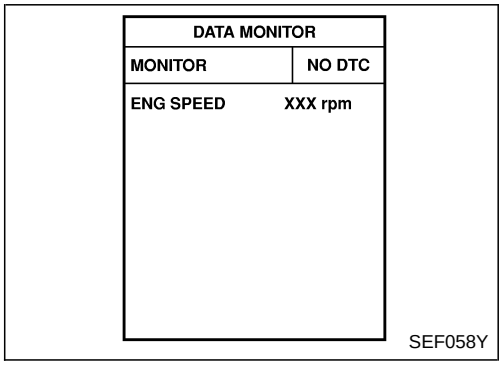
**This self-diagnosis has the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1122<br>1122 | Electric throttle control performance problem | Electric throttle control function does not operate properly. | ● Harness or connectors (Throttle control motor circuit is open or shorted.)<br>● Harness or connectors (Throttle control motor relay circuit is open or shorted.)<br>● Electric throttle control actuator<br>● Throttle control motor relay |

### FAIL-SAFE MODE

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

| Engine operating condition in fail-safe mode |
|---|
| ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |




## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

### WITH CONSULT-II

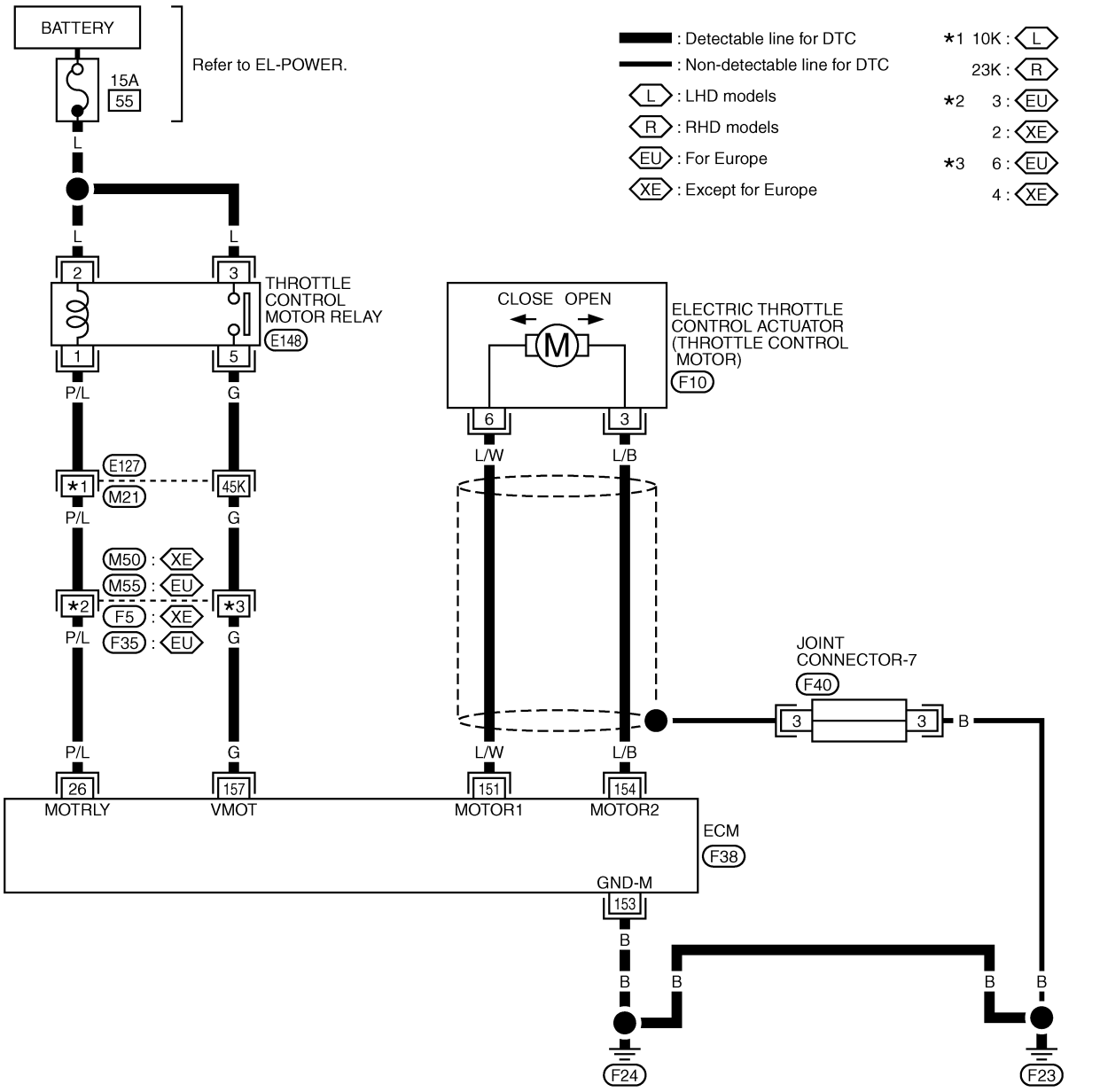
1. Turn ignition switch "ON" and wait at least 2 seconds.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-303, "Diagnostic Procedure".

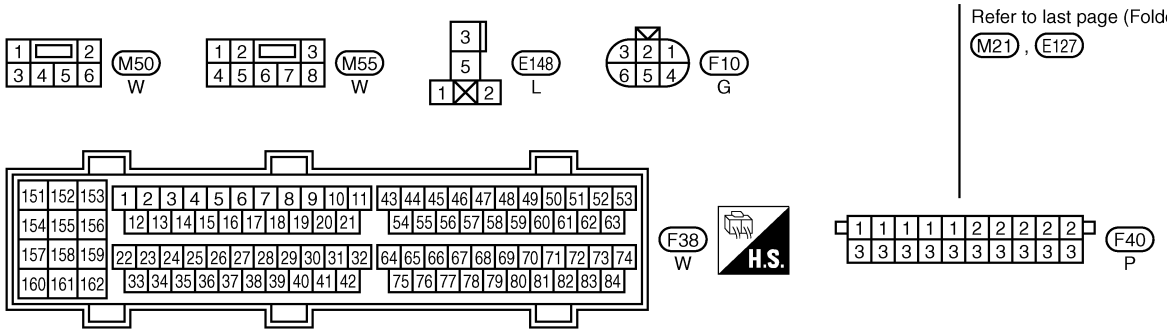
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-ETC1-01




Refer to last page (Foldout page).
M21 , E127

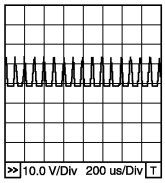
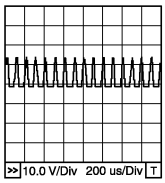
TEC404M

## Wiring Diagram (Cont'd)

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.**

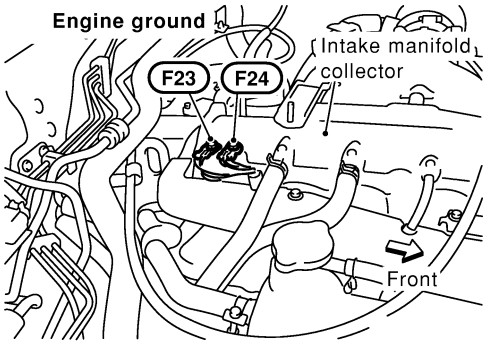
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 26 | P/L | Throttle control motor relay | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| | | | Ignition switch "ON" | 0 - 1.0V |
| 151 | L/W | Throttle control motor (Open) | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal is depressed | 0 - 14V★<br>  <br><br>PBIB0534E |
| 153 | B | Throttle control motor ground | Engine is running. | Approximately 0V |
| 154 | L/B | Throttle control motor (Close) | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal is released | 0 - 14V★<br>  <br><br>PBIB0533E |
| 157 | G | Throttle control motor power supply | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

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

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




SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CHECK THROTTLE CONTROL MOTOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

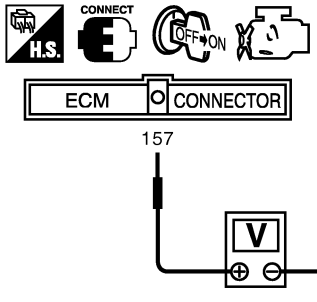
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 153 and engine ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to power.

**OK or NG**

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

| 3 | CHECK THROTTLE CONTROL MOTOR RELAY SIGNAL CIRCUIT |
|---|---|

1. Reconnect harness connectors disconnected.
2. Check voltage between ECM terminal 157 and ground under the following conditions with CONSULT-II or tester.




SEC740D

| Ignition switch | Voltage |
|---|---|
| OFF | Approximately 0V |
| ON | Battery voltage (11 - 14V) |

MTBL1585

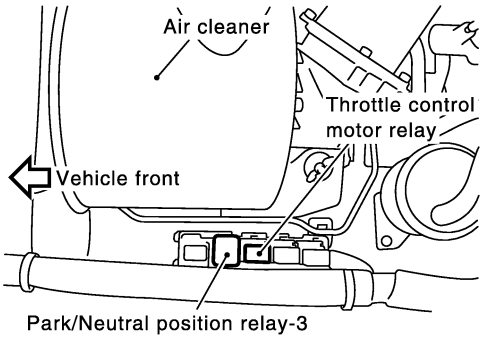
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 11. |
| NG | ► | GO TO 4. |

## Diagnostic Procedure (Cont'd)

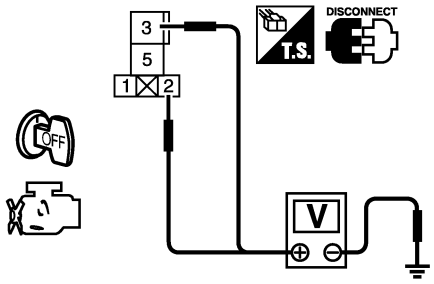
| 4 | CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.




SEC185D

3. Check voltage between throttle control motor relay terminals 2, 3 and ground.




PBIB0097E

**Voltage: Battery voltage**

**OK or NG**

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

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

Check the following.
- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

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

| 6 | CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 157 and throttle control motor relay terminal 5.
   Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to ground and short to power.

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M55, F35<br>● Harness for open or short between ECM and throttle control motor relay | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT |
|---|---|
| 1. Check continuity between ECM terminal 26 and throttle control motor relay terminal 1. Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 10. |
| NG ► | GO TO 9. |

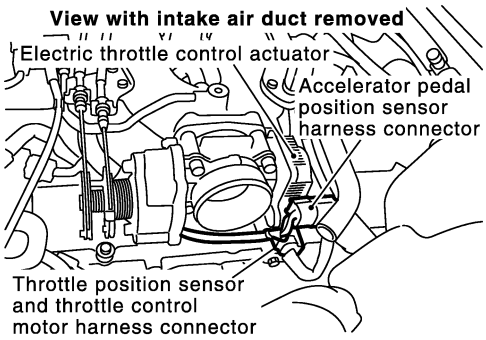
| 9 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M55, F35<br>● Harness for open or short between ECM and throttle control motor relay | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 10 | CHECK THROTTLE CONTROL MOTOR RELAY |
|---|---|
| **Refer to EC-308, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 14. |
| NG ► | Replace throttle control motor relay. |

## Diagnostic Procedure (Cont'd)

**11** **CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT**

1. Turn ignition switch "OFF".
2. Disconnect electric throttle control actuator harness connector.




SEC182D

3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.
   Refer to Wiring Diagram.

| Electric throttle control actuator terminal | ECM terminal | Continuity |
|---|---|---|
| 3 | 154 | Should exist |
| | 151 | Should not exist |
| 6 | 154 | Should not exist |
| | 151 | Should exist |

MTBL1586

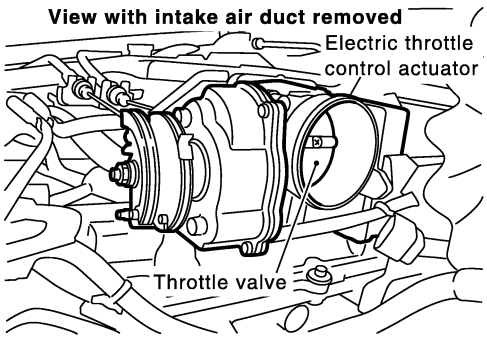
5. Also check harness for short to ground and short to power.

**OK or NG**

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

**12** **CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY**

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.




SEC183D

**OK or NG**

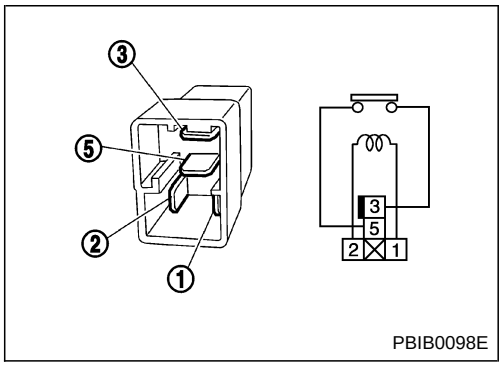
| | | |
|---|---|---|
| OK | ► | GO TO 13. |
| NG | ► | Remove the foreign matter and clean the electric throttle control actuator inside. |

## Diagnostic Procedure (Cont'd)

| 13 | CHECK THROTTLE CONTROL MOTOR |
|---|---|
| Refer to EC-308, "Component Inspection". OK or NG | |
| OK ► | GO TO 14. |
| NG ► | GO TO 15. |

| 14 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT. OK or NG | |
| OK ► | GO TO 15. |
| NG ► | Repair or replace harness or connectors. |

| 15 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|
| 1. Replace the electric throttle control actuator.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | INSPECTION END |



PBIB0098E

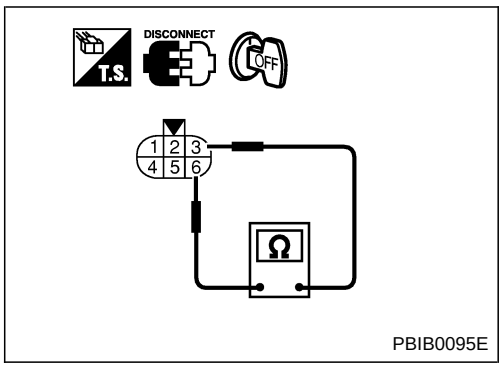
## Component Inspection

### THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

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

3. If NG, replace throttle control motor relay.



PBIB0095E

### THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.
   **Resistance: Approximately 1 - 15 Ω [at 25°C (77°F)]**
3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-31, "Accelerator Pedal Released Position Learning".
5. Perform EC-31, "Throttle Valve Closed Position Learning".
6. Perform EC-31, "Idle Air Volume Learning".

## Component Description

Power supply for the Throttle Control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the ECM. When the ignition switch is turned OFF, the ECM sends an OFF signal to throttle control motor relay and battery voltage is not provided to the ECM.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| THRTL RELAY | ● Ignition switch: ON | ON |

## On Board Diagnosis Logic

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1124<br>1124 | Throttle control motor relay circuit short | ECM detect the throttle control motor relay is stuck ON. | ● Harness or connectors (Throttle control motor relay circuit is shorted.)<br>● Throttle control motor relay |
| P1126<br>1126 | Throttle control motor relay circuit open | ECM detects a voltage of power source for throttle control motor is excessively low. | ● Harness or connectors (Throttle control motor relay circuit is open.)<br>● Throttle control motor relay |

### FAIL-SAFE MODE

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

| Engine operating condition in fail-safe mode |
|---|
| ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |

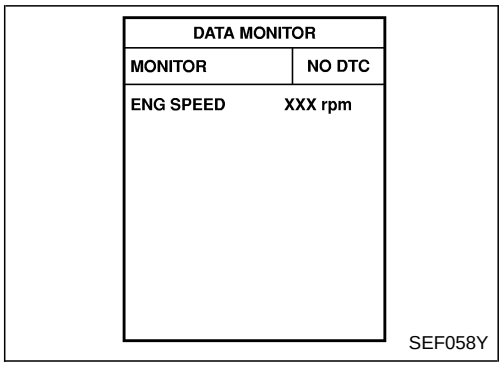
## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**

### PROCEDURE FOR DTC P1124

**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

## DTC Confirmation Procedure (Cont'd)

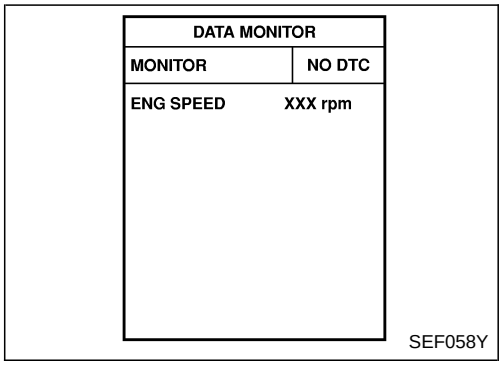



### With CONSULT-II

1. Turn ignition switch "ON" and wait at least 1 second.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. If DTC is detected, go to EC-312, "Diagnostic Procedure".

### With GST

Follow the procedure "With CONSULT-II" above.




### PROCEDURE FOR DTC P1126

### With CONSULT-II

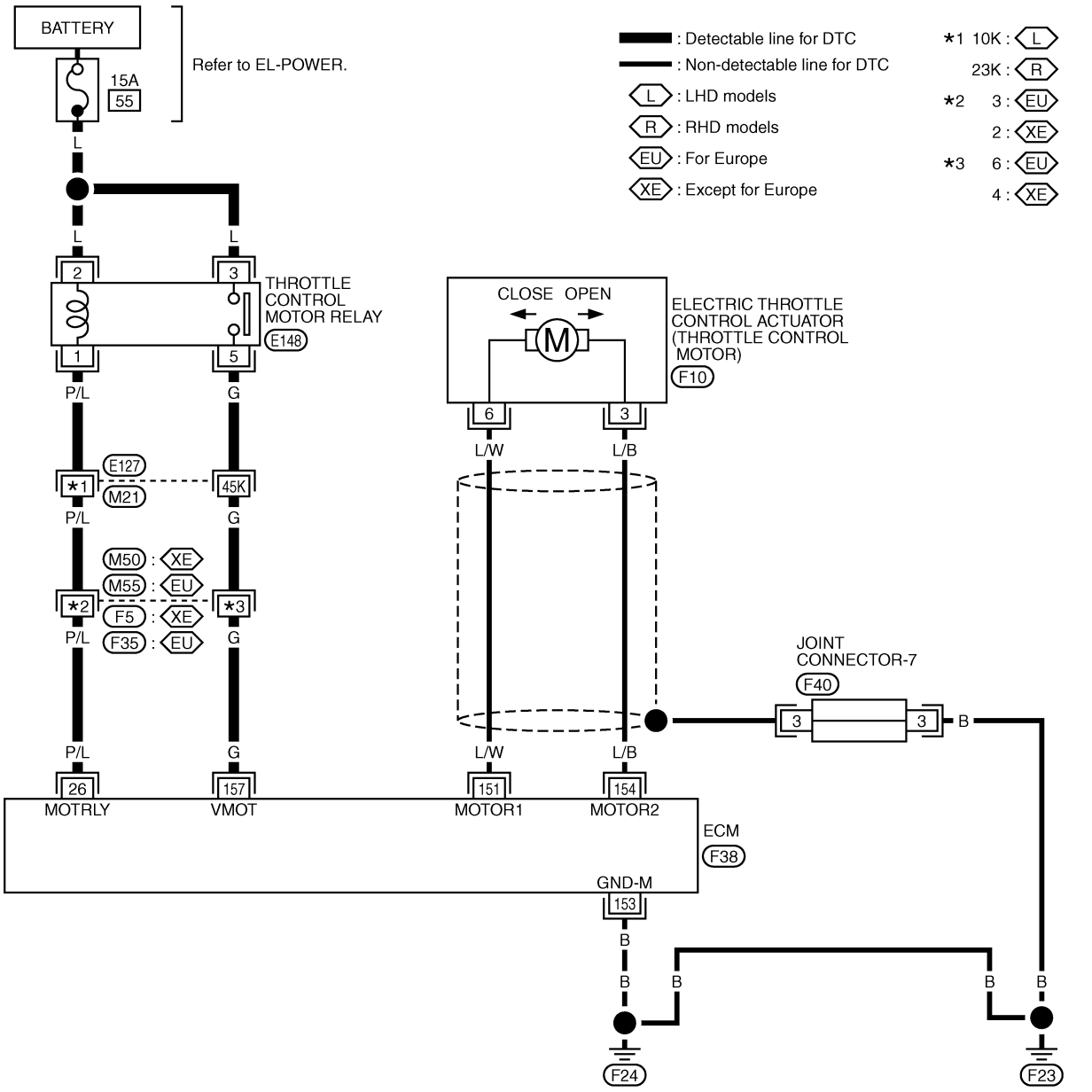
1. Turn ignition switch "ON" and wait at least 2 seconds.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-312, "Diagnostic Procedure".

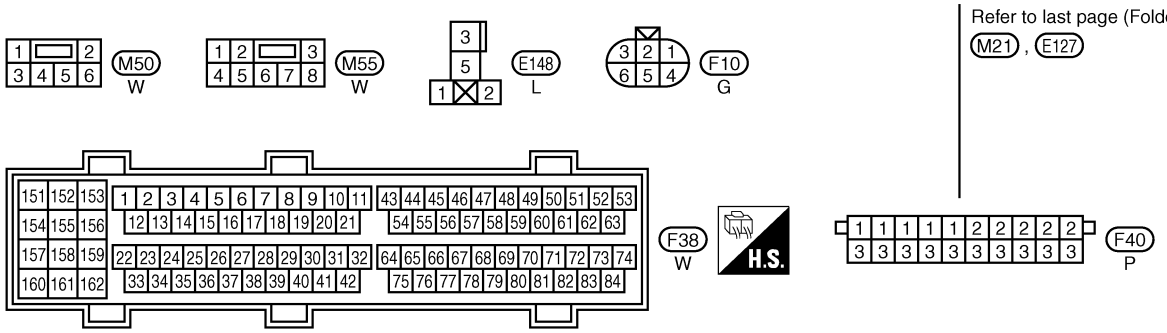
### With GST

Follow the procedure "With CONSULT-II" above.

## Wiring Diagram

EC-ETC2-01




Refer to last page (Foldout page).
M21 , E127

TEC405M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

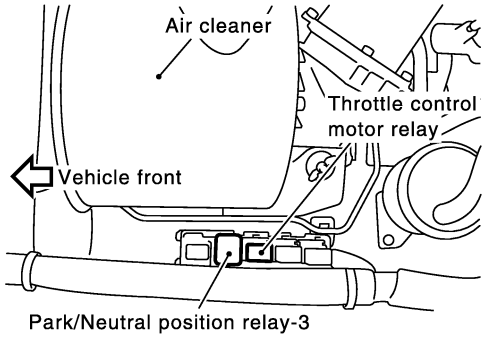
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 26 | P/L | Throttle control motor relay | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| | | | Ignition switch "ON" | 0 - 1.0V |
| 157 | G | Throttle control motor power supply | Ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

## Diagnostic Procedure

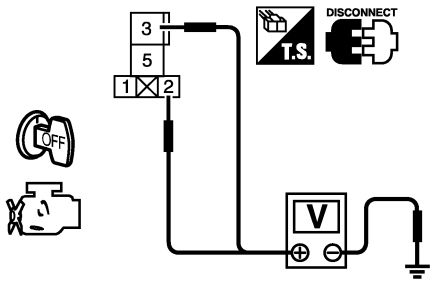
**1 CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT**

1. Turn ignition switch "OFF".
2. Disconnect throttle control motor relay.




SEC185D

3. Check voltage between throttle control motor relay terminals 2, 3 and ground.




PBIB0097E

**Voltage: Battery voltage**

**OK or NG**

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

**2 DETECT MALFUNCTIONING PART**

Check the following.

- 15A fuse
- Harness for open or short between throttle control motor relay and fuse

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

## Diagnostic Procedure (Cont'd)

| 3 | CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT | |
|---|---|---|
| 1. Disconnect ECM harness connector.<br>2. Check harness continuity between ECM terminal 157 and throttle control motor relay terminal 5. Refer to Wiring Diagram.<br>**Continuity should exist.**<br>3. Also check harness for short to ground and short to power.<br>**OK or NG** | | |
| OK | ▶ | GO TO 5. |
| NG | ▶ | GO TO 4. |

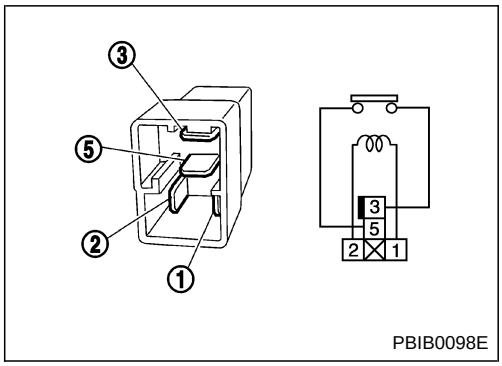
| 4 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M51, F35<br>● Harness for open or short between ECM and throttle control motor relay | | |
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 5 | CHECK THROTTLE CONTROL MOTOR RELAY OUTPUT SIGNAL CIRCUIT | |
|---|---|---|
| 1. Check continuity between ECM terminal 26 and throttle control motor relay terminal 1. Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

| 6 | DETECT MALFUNCTIONING PART | |
|---|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M55, F35<br>● Harness for open or short between ECM and throttle control motor relay | | |
| | ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK THROTTLE CONTROL MOTOR RELAY | |
|---|---|---|
| **Refer to EC-314, "Component Inspection".**<br>**OK or NG** | | |
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace throttle control motor relay. |

| 8 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | | |
| | ▶ | **INSPECTION END** |



PBIB0098E

## Component Inspection

### THROTTLE CONTROL MOTOR RELAY

1. Apply 12V direct current between relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5.

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

3. If NG, replace throttle control motor relay.

## Component Description

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM to control the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## On Board Diagnosis Logic

**This self-diagnosis has the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1128<br>1128 | Throttle control motor circuit short | ECM detects short both circuits between ECM and throttle control motor. | ● Harness or connectors (Throttle control motor circuit is shorted.)<br>● Electric throttle control actuator (Throttle control motor) |

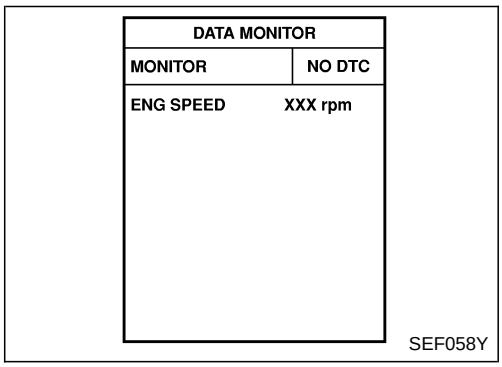
### FAIL-SAFE MODE

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

| Engine operating condition in fail-safe mode |
|---|
| ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**




### WITH CONSULT-II

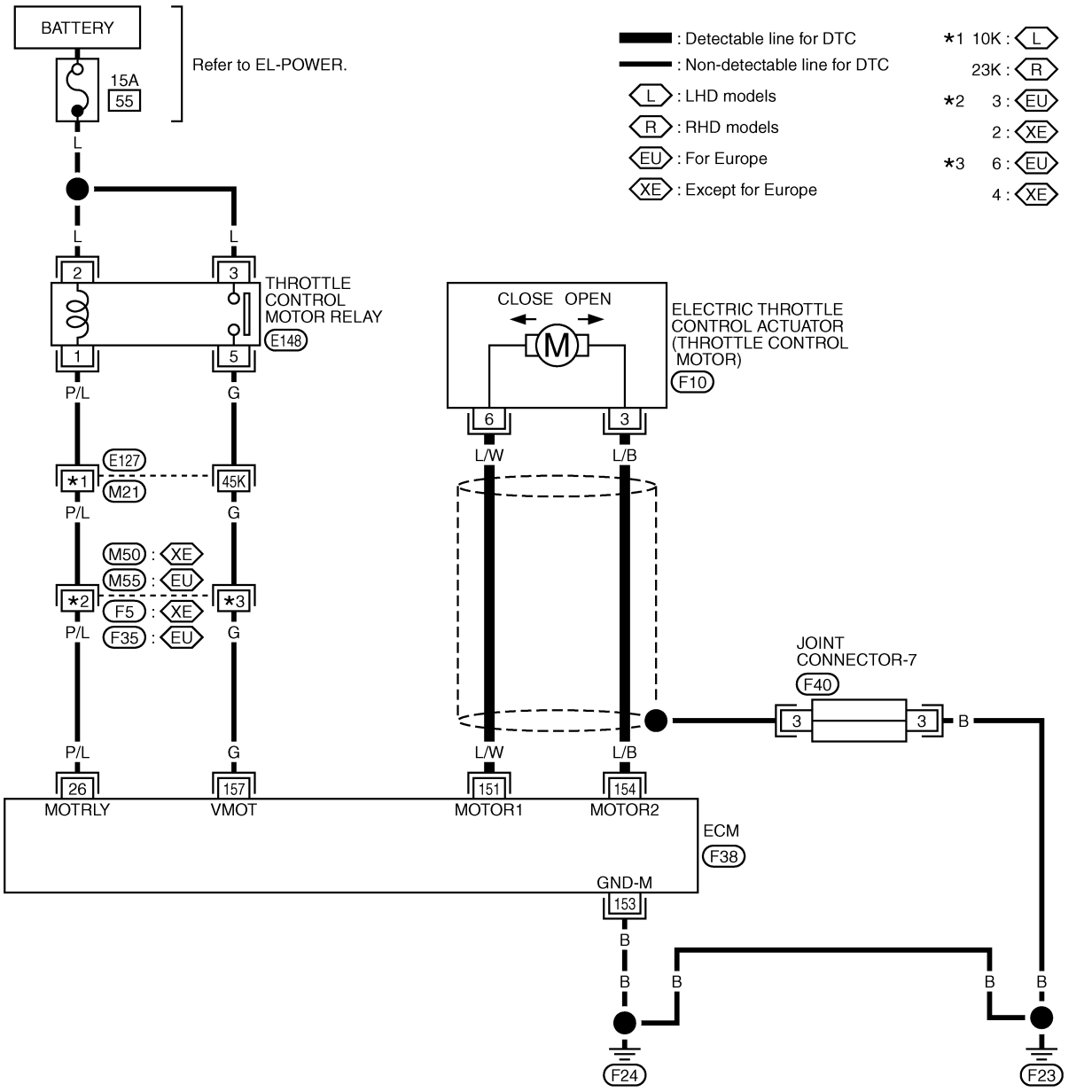
1. Turn ignition switch "ON" and wait at least 2 seconds.
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 5 seconds.
4. If DTC is detected, go to EC-317, "Diagnostic Procedure".

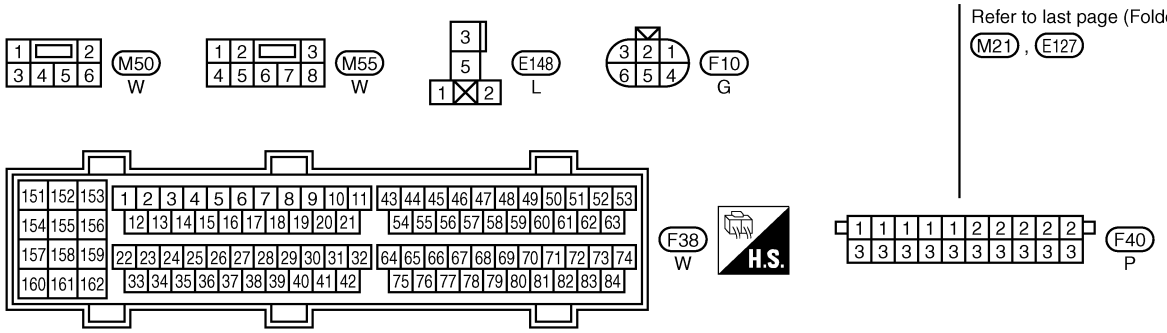
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-ETC3-01




Refer to last page (Foldout page).
M21 , E127

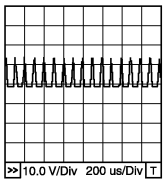
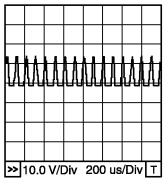
TEC406M

## Wiring Diagram (Cont'd)

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.**

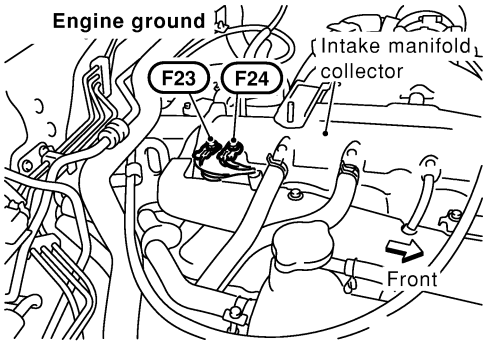
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 151 | L/W | Throttle control motor (Open) | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal is depressed | 0 - 14V★<br>  <br><br>PBIB0534E |
| 154 | L/B | Throttle control motor (Close) | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal is released | 0 - 14V★<br>  <br><br>PBIB0533E |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

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

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



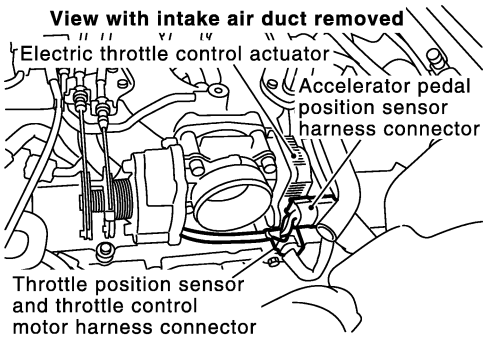

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect electric throttle control actuator harness connector.




SEC182D

3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.
   Refer to Wiring Diagram.

| Electric throttle control actuator terminal | ECM terminal | Continuity |
|---|---|---|
| 3 | 154 | Should exist |
| | 151 | Should not exist |
| 6 | 154 | Should not exist |
| | 151 | Should exist |

MTBL1587

5. Also check harness for short to ground and short to power.

**OK or NG**

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

| 3 | CHECK THROTTLE CONTROL MOTOR |
|---|---|

**Refer to EC-319, "Component Inspection".**

**OK or NG**

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

| 4 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

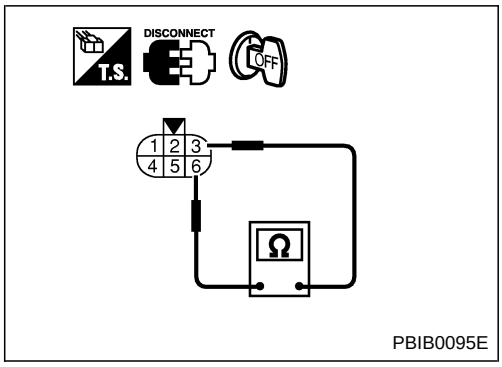
**OK or NG**

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

| 5 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|

1. Replace the electric throttle control actuator.
2. Perform EC-31, "Accelerator Pedal Released Position Learning".
3. Perform EC-31, "Throttle Valve Closed Position Learning".
4. Perform EC-31, "Idle Air Volume Learning".

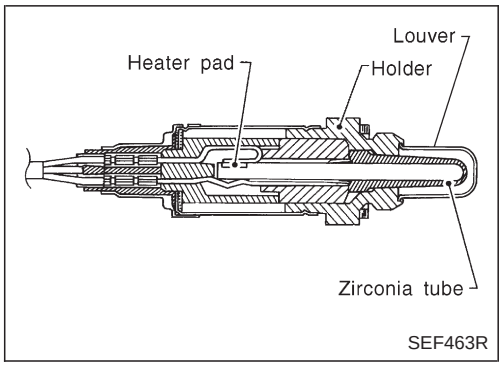
► **INSPECTION END**

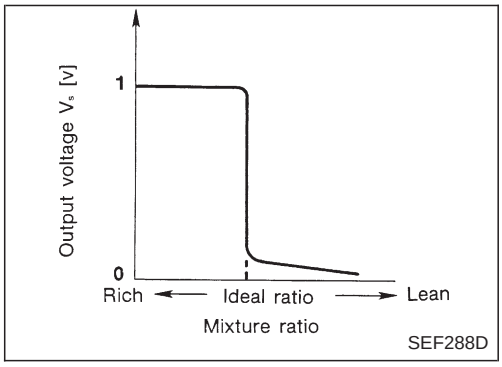



## Component Inspection

### THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 3 and 6.
   **Resistance: Approximately 1 - 15Ω [at 25°C (77°F)]**
3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-31, “Accelerator Pedal Released Position Learning”.
5. Perform EC-31, “Throttle Valve Closed Position Learning”.
6. Perform EC-31, “Idle Air Volume Learning”.



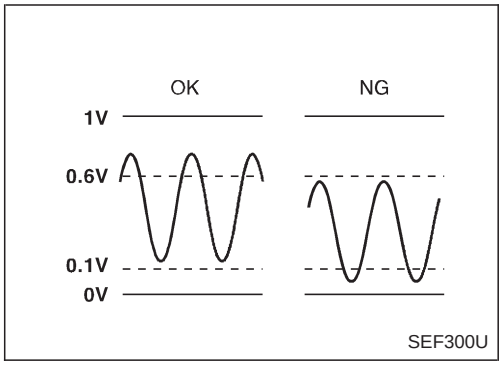

## Component Description

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

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S1 (B1)<br>HO2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S1 MNTR (B1)<br>HO2S1 MNTR (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |




## On Board Diagnosis Logic

To judge the malfunction, the output from the heated oxygen sensor 1 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. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1143<br>1143<br>(Bank 1) | Heated oxygen sensor 1 lean shift monitoring | The maximum and minimum voltage from the sensor are not reached to the specified voltages. | ● Heated oxygen sensor 1<br>● Heated oxygen sensor 1 heater<br>● Fuel pressure<br>● Injectors<br>● Intake air leaks |
| P1163<br>1163<br>(Bank 2) | | | |

## 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 10 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.**

### WITH CONSULT-II

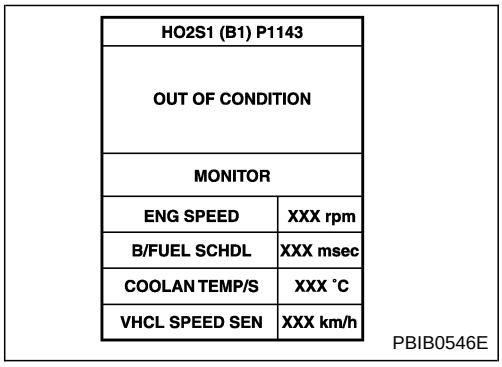
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch "ON" and select "HO2S1 (B1) P1143" of "HO2S1" or "HO2S1 (B2) P1163" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-II.
4. Touch "START".
5. Start engine and let it idle for at least 3 minutes.

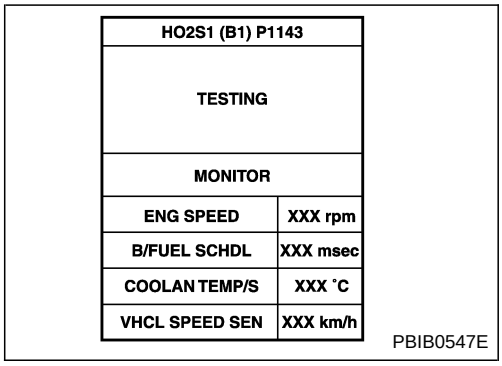
**NOTE:**
**Never raise engine speed above 2,800 rpm after this step. If the engine speed limit is exceeded, return to step 5.**

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

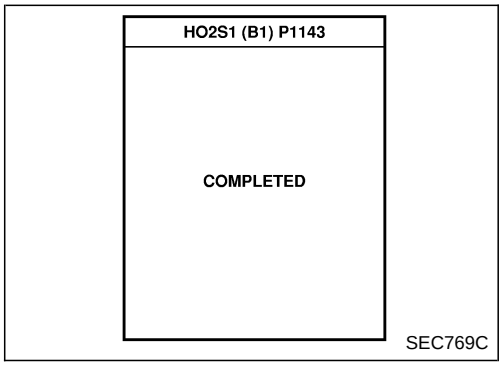
| | |
|---|---|
| ENG SPEED | 1,050 - 2,500 rpm |
| Vehicle speed | Less than 100 km/h (62 MPH) |
| B/FUEL SCHDL | 5 - 16.7 msec |
| Selector lever | Suitable position |

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



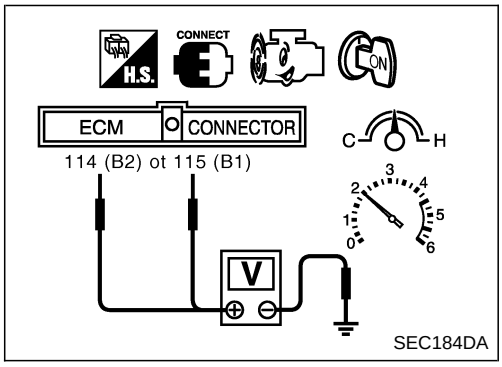




7. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to EC-322, "Diagnostic Procedure".



## Overall Function Check

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



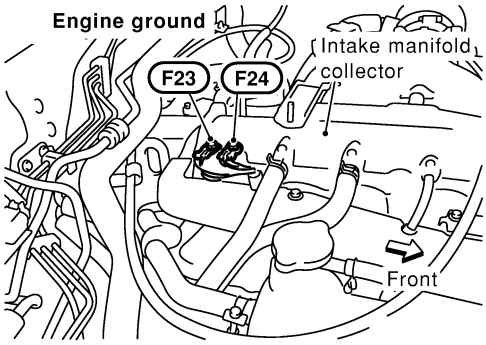

### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.
3. Check one of the following with engine speed held at 2,000 rpm constant under no load.
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is over 0.1V at least one time.
4. If NG, go to EC-322, “Diagnostic Procedure”.

## Diagnostic Procedure

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

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



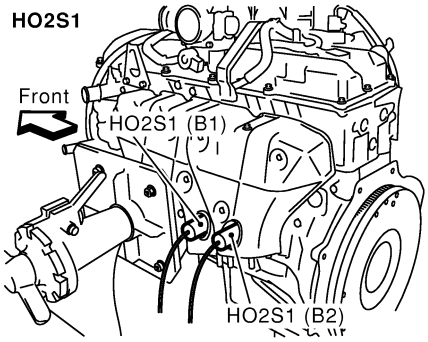

SEC690C

| ► | GO TO 2. |
|---|---|

## Diagnostic Procedure (Cont'd)

| 2 | RETIGHTEN HEATED OXYGEN SENSOR 1 |
|---|---|

Loosen and retighten corresponding heated oxygen sensor 1.




SEC888C

**Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)**

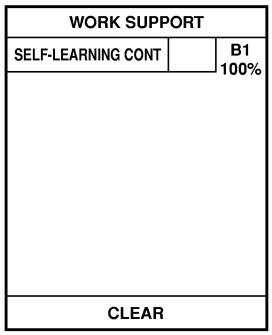
| | |
|---|---|
| ► | GO TO 3. |

## Diagnostic Procedure (Cont'd)

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

**With CONSULT-II**

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

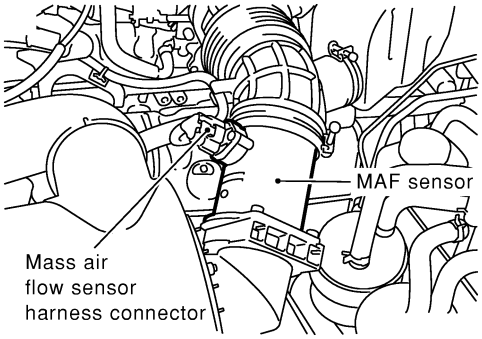



SEF215Z

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

**Without CONSULT-II**

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.




SEC688C

5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   **Is the 1st trip DTC P0171 or P0174 detected?**
   **Is it difficult to start engine?**

**Yes or No**

| | | |
|---|---|---|
| Yes | ► | Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-218. |
| No | ► | GO TO 4. |

| 4 | CHECK HEATED OXYGEN SENSOR 1 HEATER |
|---|---|

**Refer to EC-131, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 5. |
| NG | ► | Replace malfunctioning heated oxygen sensor 1. |

## Diagnostic Procedure (Cont'd)

| 5 | CHECK HEATED OXYGEN SENSOR 1 |
|---|---|
| Refer to EC-325, "Component Inspection". | |
| OK or NG | |
| OK ▶ | GO TO 6. |
| NG ▶ | Replace malfunctioning heated oxygen sensor 1. |

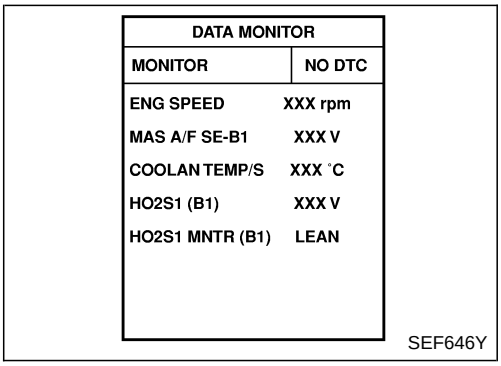
| 6 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT.<br>For circuit, refer to EC-165, "Wiring Diagram". | |
| ▶ | INSPECTION END |

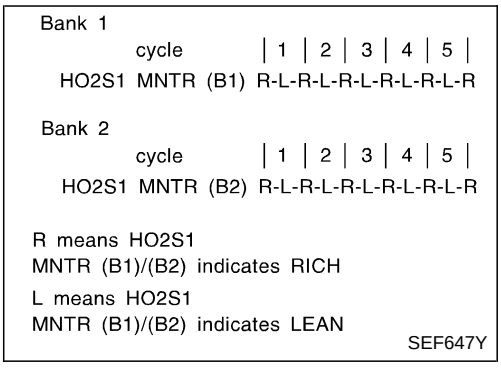
## Component Inspection

### HEATED OXYGEN SENSOR 1

#### With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch "RECORD" on CONSULT-II screen.

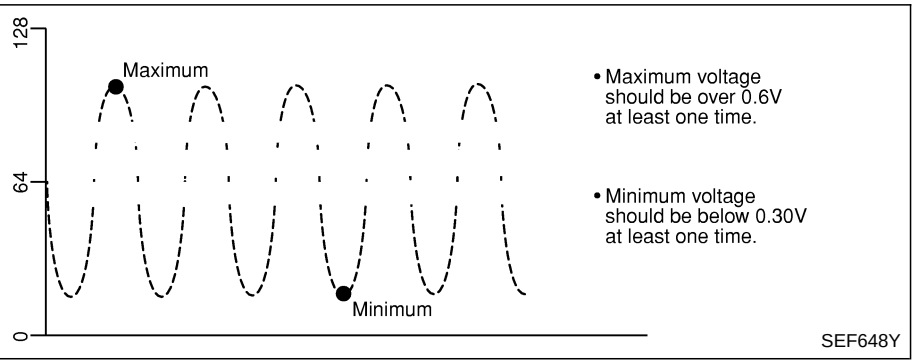


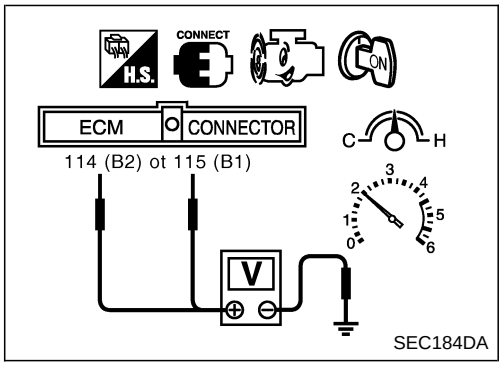

6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown at right.
- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

## Component Inspection (Cont'd)

| Trigger | ENG SPEED | HO2S1 (B1) |
|---|---|---|
| | rpm | V |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |




**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 J-43897-12 and approved anti-seize lubricant.**

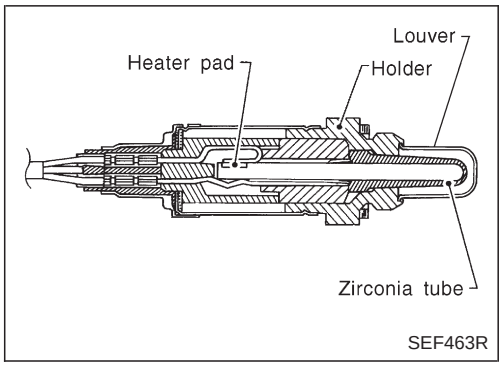


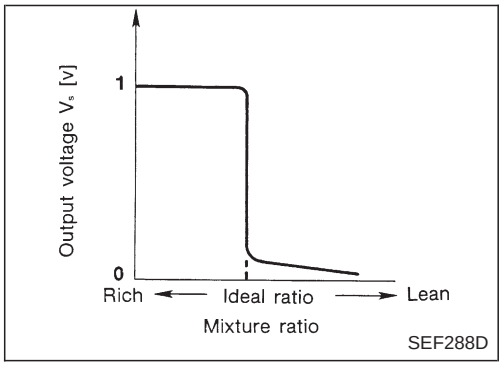

### Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.

- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
- 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.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 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 J-43897-12 and approved anti-seize lubricant.**



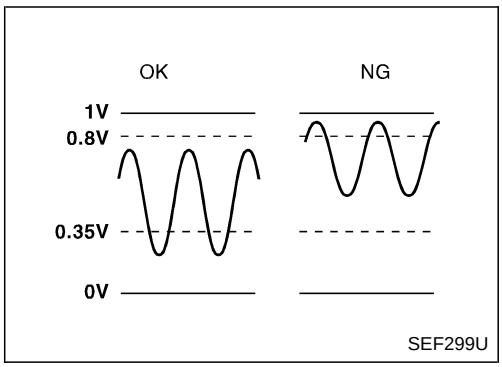

## Component Description

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

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S1 (B1)<br>HO2S1 (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S1 MNTR (B1)<br>HO2S1 MNTR (B2) | ● Engine: After warming up | Maintaining engine speed at 2,000 rpm | LEAN ←→ RICH<br>Changes more than 5 times during 10 seconds. |




## On Board Diagnosis Logic

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high. The “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1144<br>1144<br>(Bank 1) | Heated oxygen sensor 1 rich shift monitoring | The maximum and minimum voltages from the sensor are beyond the specified voltages. | ● Heated oxygen sensor 1<br>● Heated oxygen sensor 1 heater<br>● Fuel pressure<br>● Injectors |
| P1164<br>1164<br>(Bank 2) | | | |

## 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 10 seconds before conducting the next test.**
**TESTING CONDITION:**

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

### WITH CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 5 seconds.
3. Turn ignition switch "ON" and select "HO2S1 (B1) P1144" or "HO2S1 (B2) P1164" of "HO2S1" in "DTC WORK SUPPORT" mode with CONSULT-II.

| HO2S1 (B1) P1144 | |
|---|---|
| OUT OF CONDITION | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| B/FUEL SCHDL | XXX msec |
| COOLAN TEMP/S | XXX °C |
| VHCL SPEED SEN | XXX km/h |

PBIB0548E

4. Touch "START".
5. Start engine and let it idle for at least 3 minutes.

**NOTE:**
**Never raise engine speed above 2,800 rpm after this step. If the engine speed limit is exceeded, return to step 5.**

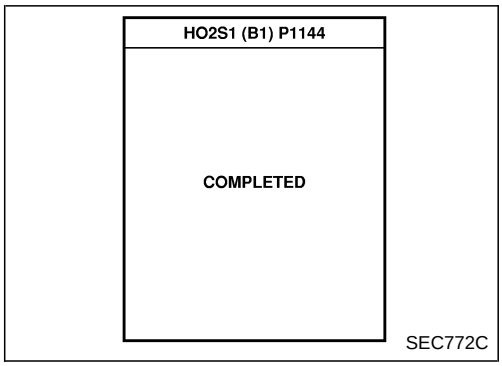
| HO2S1 (B1) P1144 | |
|---|---|
| TESTING | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| B/FUEL SCHDL | XXX msec |
| COOLAN TEMP/S | XXX °C |
| VHCL SPEED SEN | XXX km/h |

PBIB0549E

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

| | |
|---|---|
| ENG SPEED | 1,500 - 2,500 rpm |
| Vehicle speed | Less than 100 km/h (62 MPH) |
| B/FUEL SCHDL | 5 - 16.7 msec |
| Selector lever | Suitable position |

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



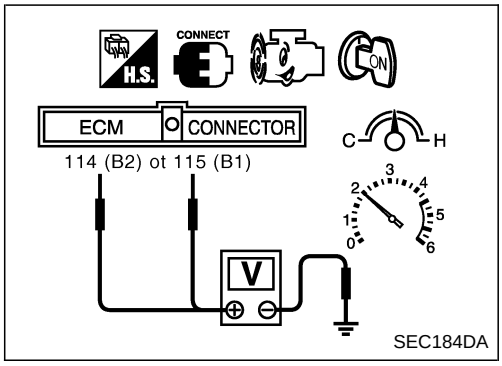

7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-329, “Diagnostic Procedure”.

## Overall Function Check

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

### WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.




3. Check one of the following with engine speed held at 2,000 rpm constant under no load.

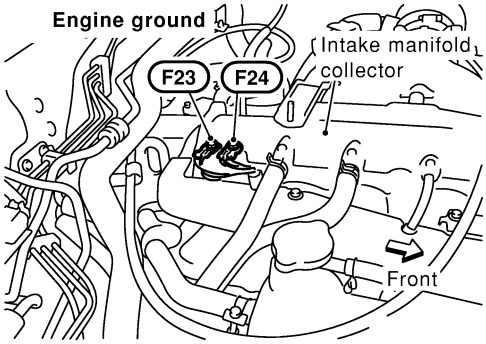
— The maximum voltage is below 0.8V at least one time.
— The minimum voltage is below 0.32V at least one time.

4. If NG, go to EC-329, “Diagnostic Procedure”.

## Diagnostic Procedure

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

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

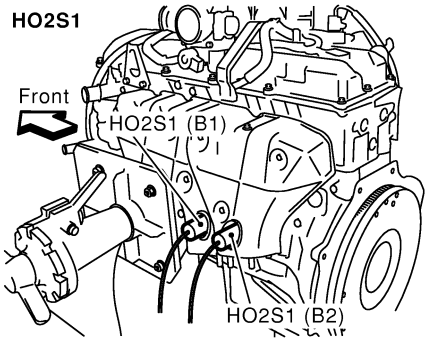



| ► | GO TO 2. |
|---|---|

## Diagnostic Procedure (Cont'd)

| 2 | RETIGHTEN HEATED OXYGEN SENSOR 1 |
|---|---|

Loosen and retighten heated oxygen sensor 1.




SEC888C

**Tightening torque: 40 - 60 N·m (4.1 - 6.2 kg-m, 30 - 44 ft-lb)**

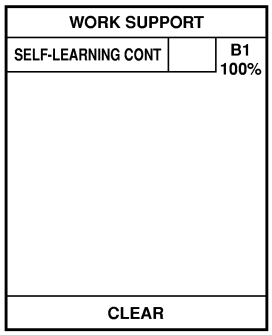
| | |
|---|---|
| ► | GO TO 3. |

## Diagnostic Procedure (Cont'd)

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

**With CONSULT-II**

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

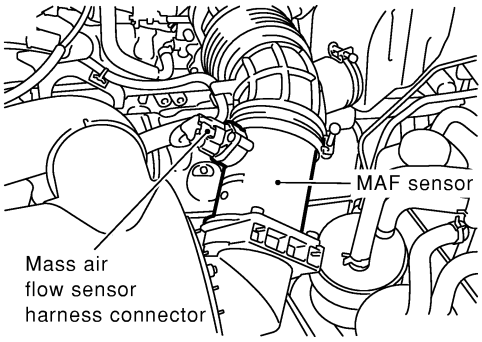



SEF215Z

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-II**

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.




SEC688C

5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
7. Make sure that DTC P0000 is displayed.
8. 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?**

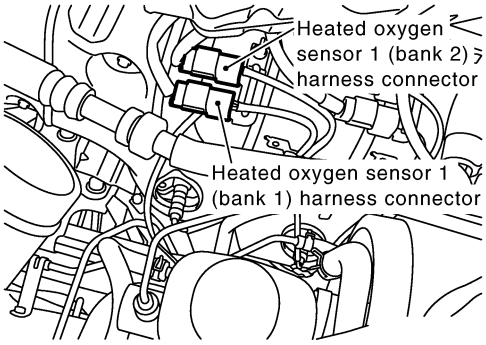
**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-227. |
| No | ▶ | GO TO 4. |

## Diagnostic Procedure (Cont'd)

| 4 | CHECK HO2S1 CONNECTOR FOR WATER |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.




SEC671D

**Water should not exist.**

**OK or NG**

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

| 5 | CHECK HEATED OXYGEN SENSOR 1 HEATER |
|---|---|

**Refer to EC-131, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 6. |
| NG | ▶ | Replace malfunctioning heated oxygen sensor 1. |

| 6 | CHECK HEATED OXYGEN SENSOR 1 |
|---|---|

**Refer to EC-332, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace malfunctioning heated oxygen sensor 1. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**
For circuit, refer to EC-165, "Wiring Diagram".

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

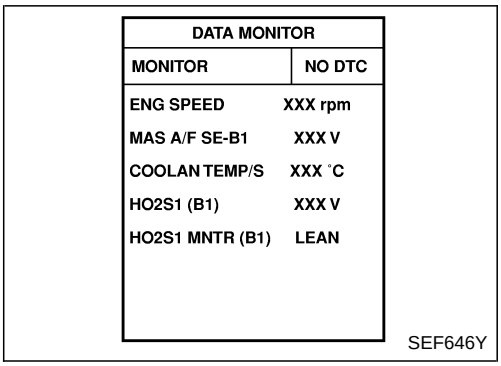
## Component Inspection

### HEATED OXYGEN SENSOR 1

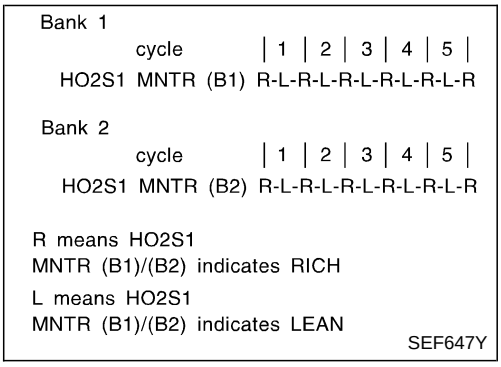
#### With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)" and "HO2S1 MNTR (B1)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.

## Component Inspection (Cont'd)

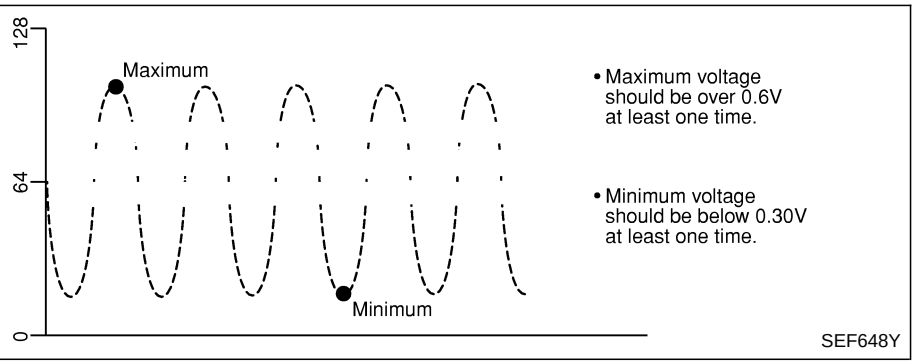



5. Touch "RECORD" on CONSULT-II screen.

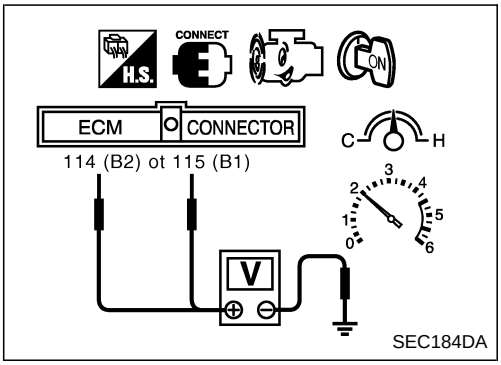



6. Check the following.
- "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown at right.
- "HO2S1 (B1)/(B2)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)/(B2)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)/(B2)" voltage never exceeds 1.0V.

| Trigger | ENG SPEED | HO2S1 (B1) |
|---|---|---|
| | rpm | V |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |
| XXX | XXX | XXX |




**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 J-43897-12 and approved anti-seize lubricant.**




### Without CONSULT-II

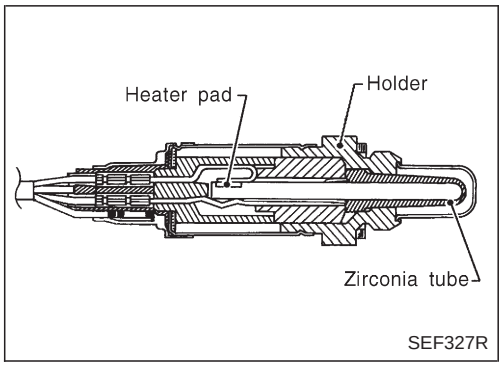
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 115 [HO2S1 (B1) signal] or 114 [HO2S1 (B2) signal] and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.
- The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds.
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.3V at least one time.

## Component Inspection (Cont'd)

- The voltage never exceeds 1.0V.
  1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V
  2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 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 J-43897-12 and approved anti-seize lubricant.**



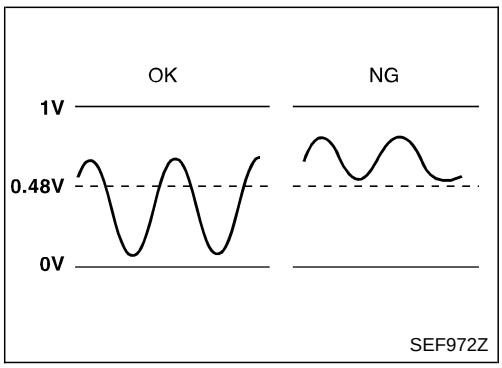

## Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
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 heated oxygen sensor 2 is not used for engine control operation.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S2 (B1)<br>HO2S2 (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S2 MNTR (B1)<br>HO2S2 MNTR (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | LEAN ←→ RICH |




## On Board Diagnosis Logic

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1146<br>1146<br>(Bank 1) | Heated oxygen sensor 2 minimum voltage monitoring | The minimum voltage from the sensor is not reached to the specified voltage. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Heated oxygen sensor 2<br>● Fuel pressure<br>● Injectors |
| P1166<br>1166<br>(Bank 2) | | | |

## DTC Confirmation Procedure

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

**NOTE:**
- **"COMPLETED" will appear on CONSULT-II 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 10 seconds before conducting the next test.**

**TESTING CONDITION:**
**Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in "Procedure for COND1"**

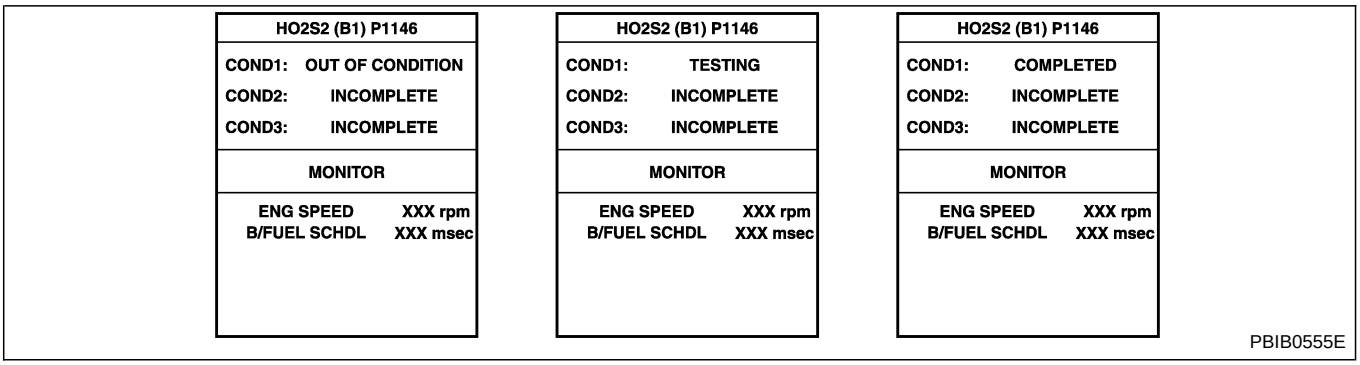
### WITH CONSULT-II

### Procedure for COND1

**For the best results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).**

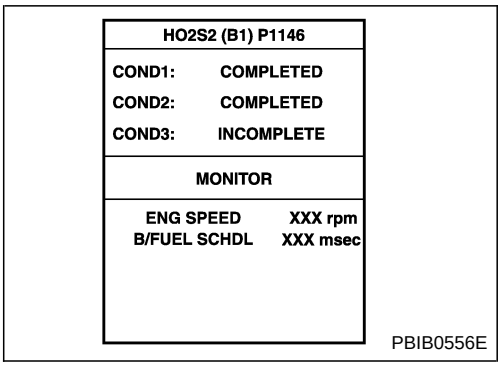
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select "HO2S2 (B1) P1146" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch START".
7. Let engine idle for at least 30 seconds.
8. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
9. When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

| | |
|---|---|
| ENG SPEED | More than 1,000 rpm |
| B/FUEL SCHDL | More than 1.0 msec |
| COOLANT TEMP/S | 70 - 100°C |
| Selector lever | Suitable position |




**NOTE:**
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in "Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

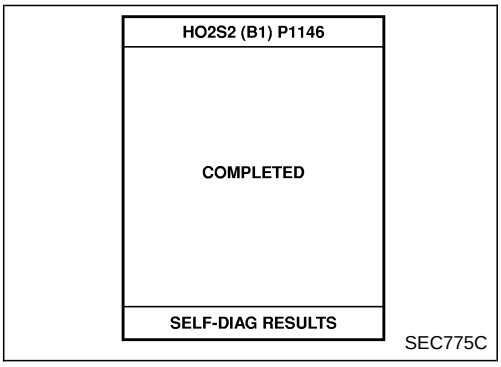
## DTC Confirmation Procedure (Cont'd)




### Procedure for COND2

1. While driving, release accelerator pedal completed with "OD" OFF from the above condition [step 9] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED" (It will take approximately 4 seconds.)

**NOTE:**
**If "COMPLETE" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".**




### Procedure for COND3

1. Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to COMPLETED". (It will take a maximum of approximately 6 minutes.)
2. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
   If "NG" is displayed, refer to EC-342, "Diagnostic Procedure".
   If "CAN NOT BE DIAGNOSED" is displayed, perform the following.

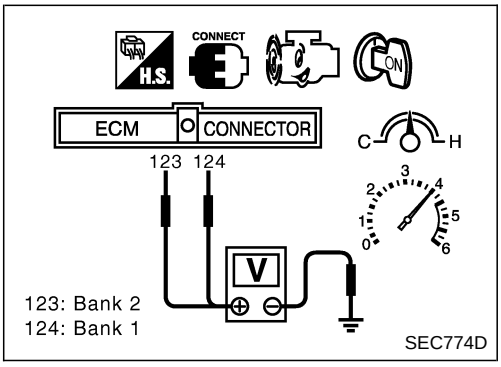
a. Turn ignition switch "OFF" and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch "ON" and select "COOLANTEMP/S" in "DATA MONITOR" mode with CONSULT-II
c. Start engine and warm it up while monitoring "COOLANTEMP/S" indication on CONSULT-II.
d. When "COOLANTEMP/S" indication reaches to 70°C (158°F), go to "Procedure for COND 1" step 3.

## Overall Function Check

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

### WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.



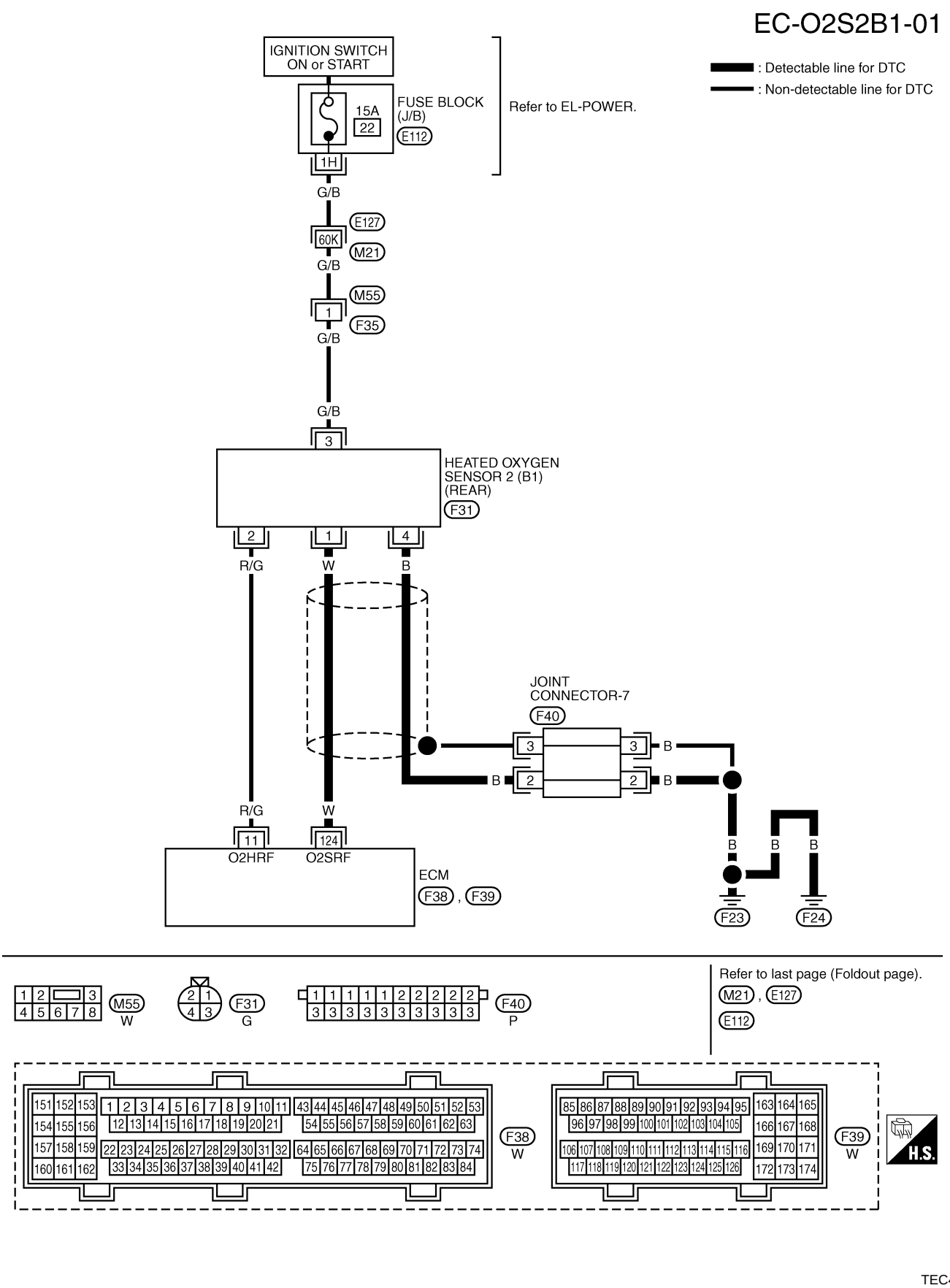

6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   **The voltage should be below 0.48V at least once during this procedure.**
   **If the voltage can be confirmed in step 6, step 7 is not necessary.**

## Overall Function Check (Cont'd)

7. 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 0.48V at least once during this procedure.**
8. If NG, go to EC-342, "Diagnostic Procedure".

## Wiring Diagram

### BANK 1




TEC411M

## Wiring Diagram (Cont'd)

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

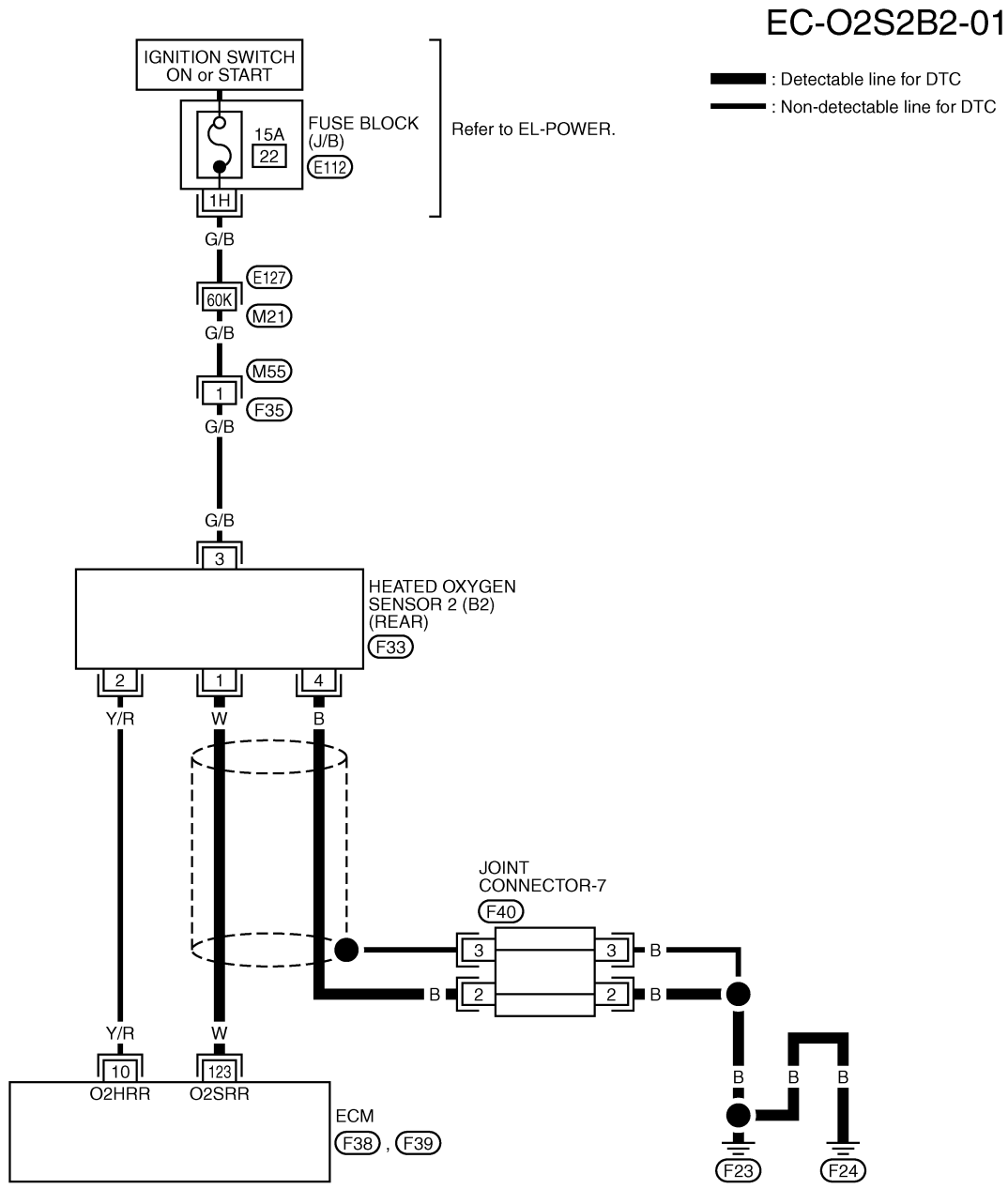
**CAUTION:**

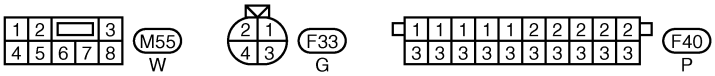
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 124 | W | Heated oxygen sensor 2 (bank 1) | Engine is running.<br>**Warm-up condition.**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

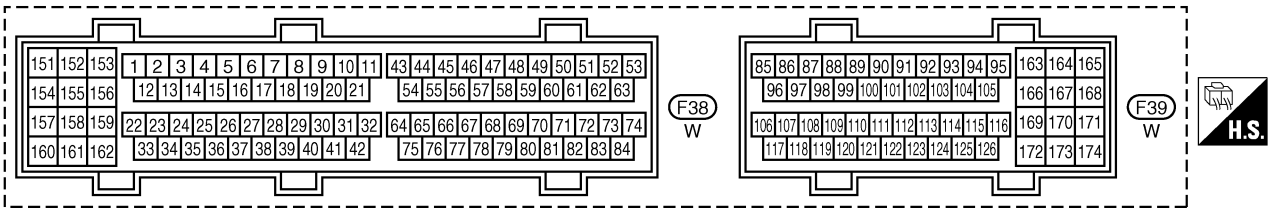
## Wiring Diagram (Cont'd)

### BANK 2




Refer to last page (Foldout page).
M21 , E127
E112




TEC336M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

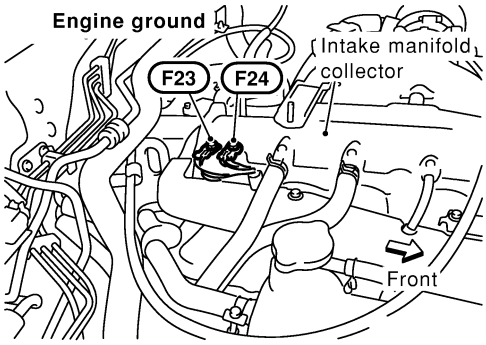
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 123 | W | Heated oxygen sensor 2 (bank 2) | Engine is running.<br>— **Warm-up condition.**<br>— Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>— Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

## Diagnostic Procedure

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

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




SEC690C

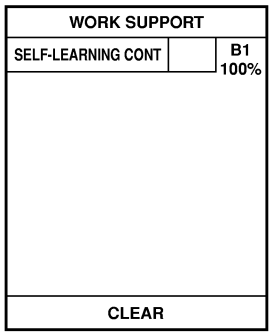
► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT-II**

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

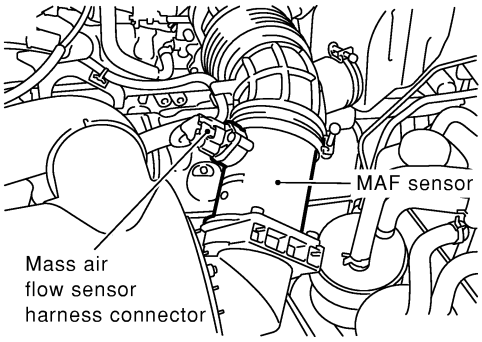



SEF215Z

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-II**

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.




SEC688C

5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
7. Make sure that DTC P0000 is displayed.
8. 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?**

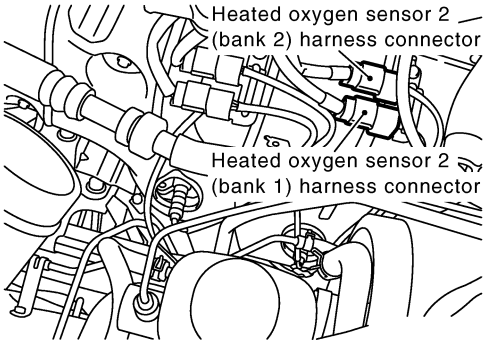
**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-227. |
| No | ▶ | GO TO 3. |

## Diagnostic Procedure (Cont'd)

| 3 | CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

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




SEC669D

3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S2 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
5. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Joint connector-7
- Harness for open or short between heated oxygen sensor 2 and ground

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

## Diagnostic Procedure (Cont'd)

| 5 | CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P1146 | 124 | 1 | 1 |
| P1166 | 123 | 1 | 2 |

MTBL1588

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P1146 | 124 | 1 | 1 |
| P1166 | 123 | 1 | 2 |

MTBL1589

**Continuity should not exist.**

3. Also check harness for short to power.

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 6. |
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK HEATED OXYGEN SENSOR 2 |
|---|---|

**Refer to EC-345, "Component Inspection".**

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 7. |
| NG ► | Replace heated oxygen sensor 2. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

► **INSPECTION END**

## Component Inspection

### HEATED OXYGEN SENSOR 2

#### With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle one minute.

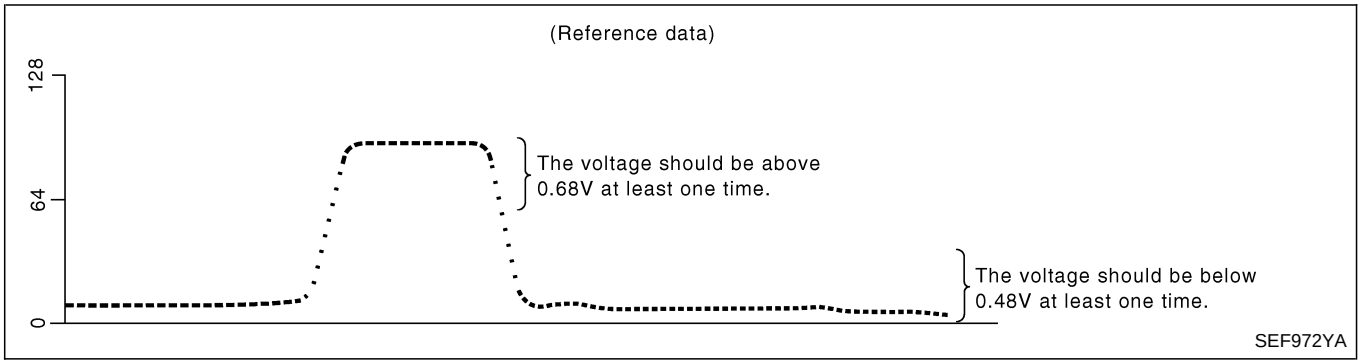
## Component Inspection (Cont'd)

| ACTIVE TEST | |
|---|---|
| FUEL INJECTION | 25 % |
| MONITOR | |
| ENG SPEED | XXX rpm |
| HO2S1 (B1) | XXX V |
| HO2S2 (B1) | XXX V |
| HO2S1 MNTR (B1) | RICH |
| HO2S2 MNTR (B1) | RICH |
| | |
| | |

SEF662Y

5. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.

6. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.




**"HO2S2 (B1)/(B2)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.**
**"HO2S2 (B1)/(B2)" should be below 0.48V at least once when the "FUEL INJECTION" is −25%.**

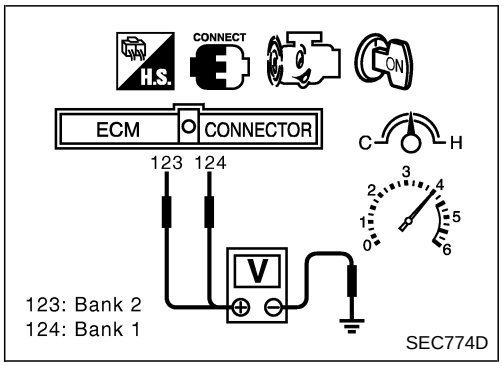
**CAUTION:**

- **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 J-43897-12 and approved anti-seize lubricant.**

### Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.

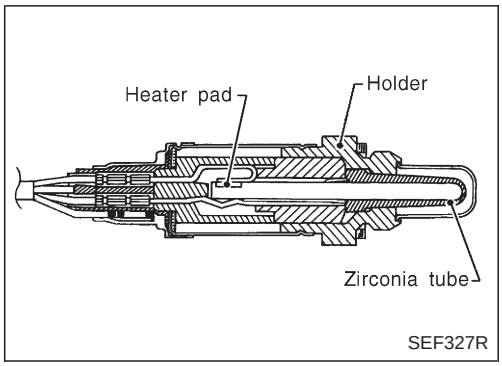
## Component Inspection (Cont'd)




6. Check the voltage when revving 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 0.68V at least once during this procedure.**
   **If the voltage is above 0.68V at step 6, step 7 is not necessary.**
7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
   **The voltage should be below 0.48V at least once during this procedure.**
8. If NG, replace heated oxygen sensor 2.

**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 J-43897-12 and approved anti-seize lubricant.**



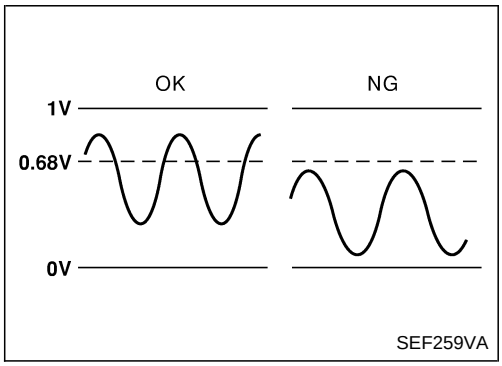

## Component Description

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
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 heated oxygen sensor 2 is not used for engine control operation.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| HO2S2 (B1)<br>HO2S2 (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | 0 - 0.3V ←→ Approx. 0.6 - 1.0V |
| HO2S2 MNTR (B1)<br>HO2S2 MNTR (B2) | ● Engine: After warming up<br>● Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | Revving engine from idle to 3,000 rpm quickly. | LEAN ←→ RICH |




## On Board Diagnosis Logic

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity before the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1147<br>1147<br>(Bank 1) | Heated oxygen sensor 2 maximum voltage monitoring | The maximum voltage from the sensor is not reached to the specified voltage. | ● Harness or connectors (The sensor circuit is open or shorted.)<br>● Heated oxygen sensor 2<br>● Fuel pressure<br>● Injectors<br>● Intake air leaks |
| P1167<br>1167<br>(Bank 2) | | | |

## DTC Confirmation Procedure

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

**NOTE:**
- **"COMPLETED" will appear on CONSULT-II 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 10 seconds before conducting the next test.

**TESTING CONDITION:**
**Never stop engine during this procedure. If the engine is stopped, retry procedure from step 2 in "Procedure for COND1"**

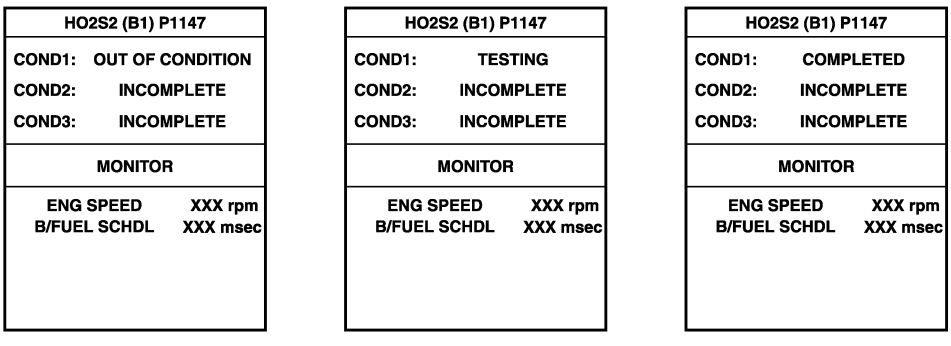
### WITH CONSULT-II

### Procedure for COND1

**For the best results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).**

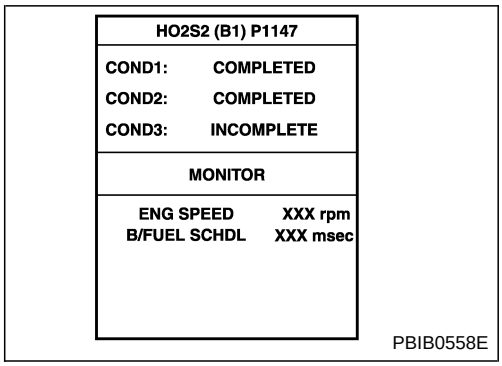
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Select "HO2S2 (B1) P1147" or "HO2S2 (B2) P1167" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-II.
6. Touch "START".
7. Let engine idle for at least 30 seconds.
8. Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT-II screen, go to step 2 in "Procedure for COND3".
   If "COMPLETED" does not appear on CONSULT-II screen, go to the following step.
9. When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)

| | |
|---|---|
| ENG SPEED | More than 1,000 rpm |
| B/FUEL SCHDL | More than 1.0 msec |
| COOLANT TEMP/S | 70 - 100°C |
| Selector lever | Suitable position |




**NOTE:**
- **If "TESTING" is not displayed after 5 minutes, retry from step 2 in Procedure for COND1".**
- **If "COMPLETED" already appears at "COND2" on CONSULT-II screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND2".**

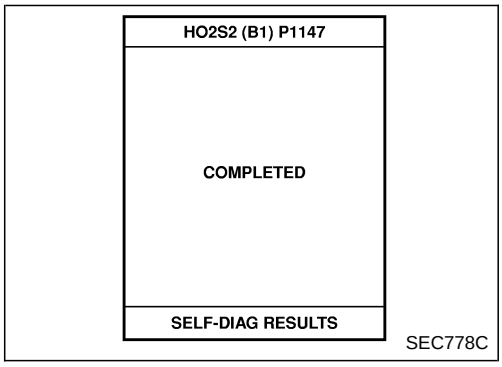
## DTC Confirmation Procedure (Cont'd)




### Procedure for COND2

1. While driving, release accelerator pedal completed with "OD" OFF from the above condition [step 9] until "INCOMPLETE" at "COND2" on CONSULT-II screen has turned to "COMPLETED" (It will take approximately 4 seconds.)

**NOTE:**
**If "COMPLETE" already appears at "COND3" on CONSULT-II screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 1 in "Procedure for COND3".**




### Procedure for COND3

1. Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT-II screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
2. Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
   If "NG" is displayed, refer to EC-355, "Diagnostic Procedure".
   If "CAN NOT BE DIAGNOSED" is displayed, perform the following.

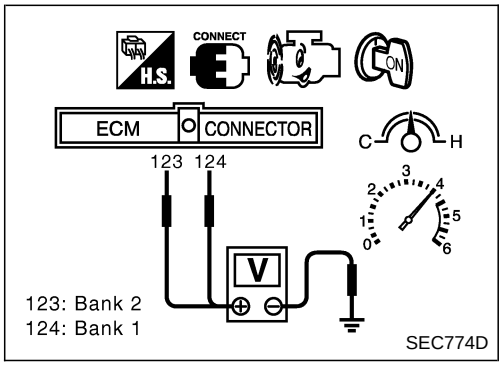
a. Turn ignition switch "OFF" and leave the vehicle in a cool place (soak the vehicle).
b. Turn ignition switch "ON" and select "COOLANTEMP/S" in "DATA MONITOR" mode with CONSULT-II
c. Start engine and warm it up while monitoring "COOLANTEMP/S" indication on CONSULT-II.
d. When "COOLANTEMP/S" indication reaches to 70°C (158°F), go to "Procedure for COND 1" step 3.

## Overall Function Check

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a DTC might not be confirmed.

### WITH GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.



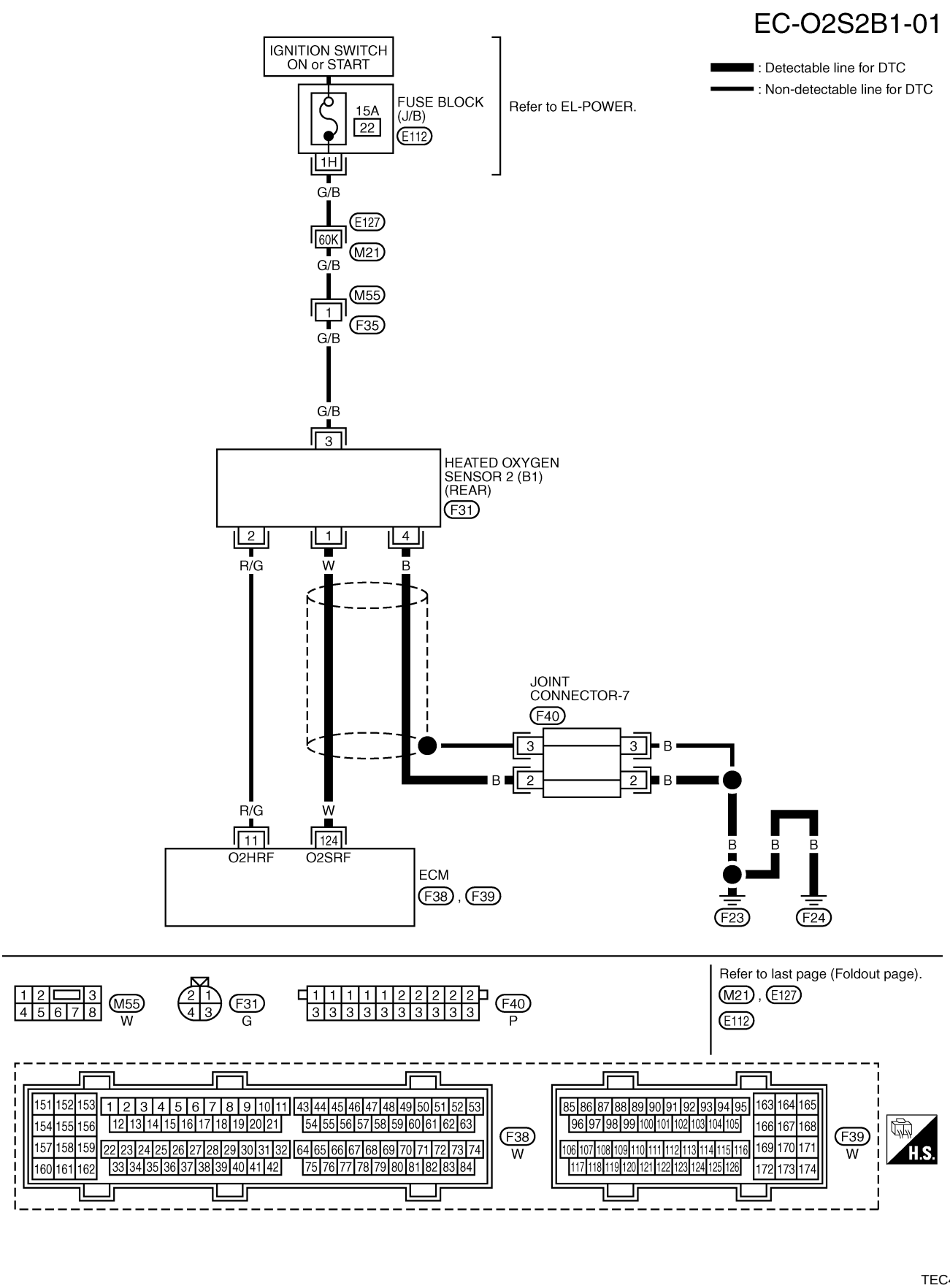

6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   **The voltage should be above 0.68V at least once during this procedure.**
   **If the voltage can be confirmed in step 6, step 7 is not necessary.**

## Overall Function Check (Cont'd)

7. Keep vehicle 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 0.68V at least once during this procedure.**
8. If NG, go to EC-355, "Diagnostic Procedure".

## Wiring Diagram

### BANK 1




TEC411M

## Wiring Diagram (Cont'd)

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

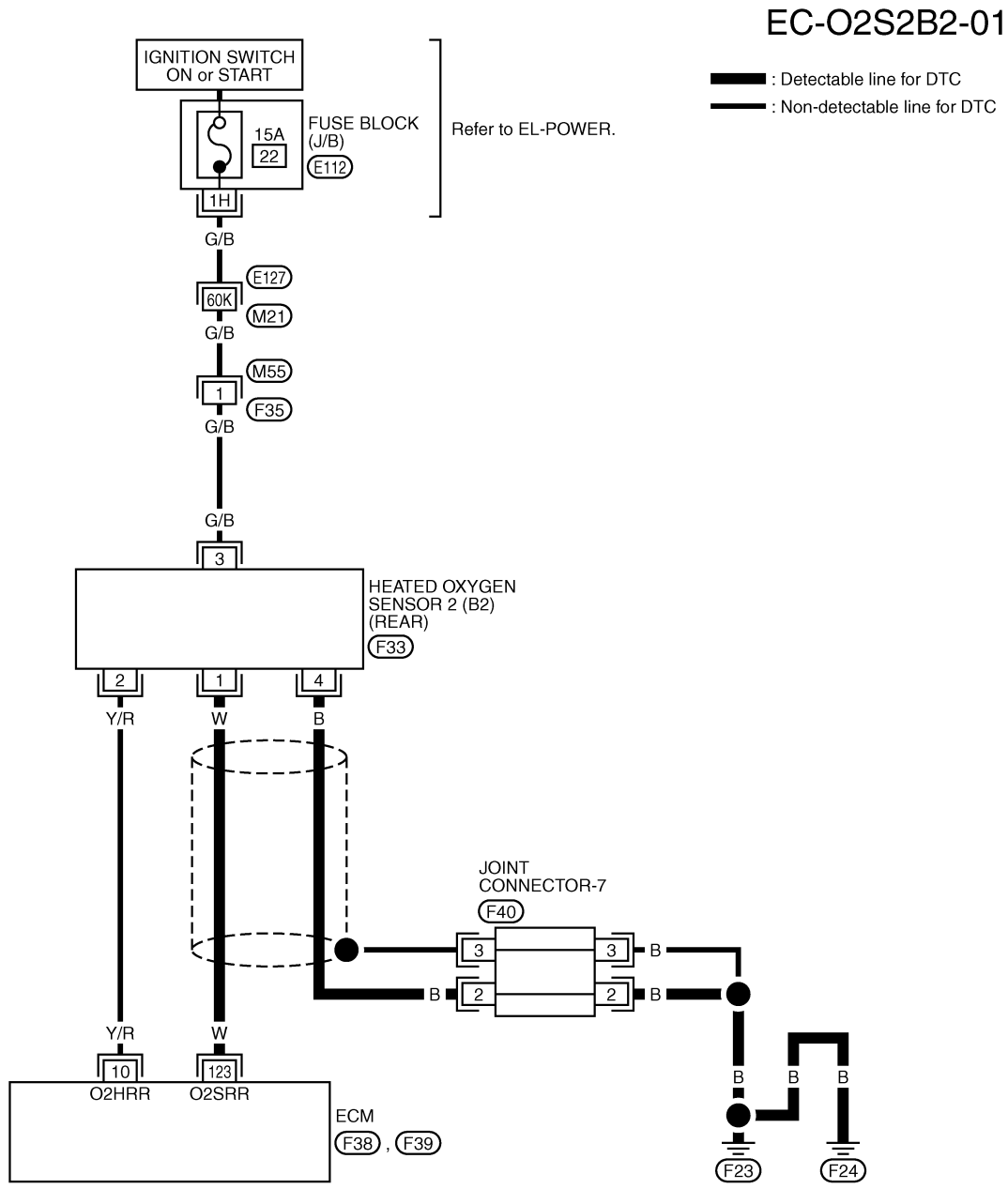
**CAUTION:**

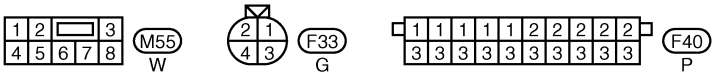
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 124 | W | Heated oxygen sensor 2 (bank 1) | Engine is running.<br>**Warm-up condition.**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

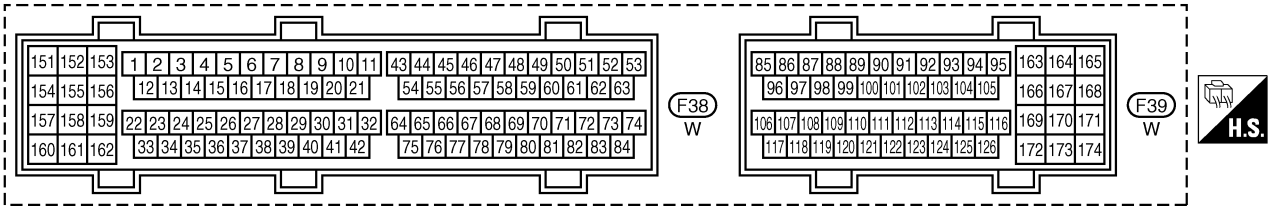
## Wiring Diagram (Cont'd)

**BANK 2**




Refer to last page (Foldout page).
M21 , E127
E112




TEC336M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

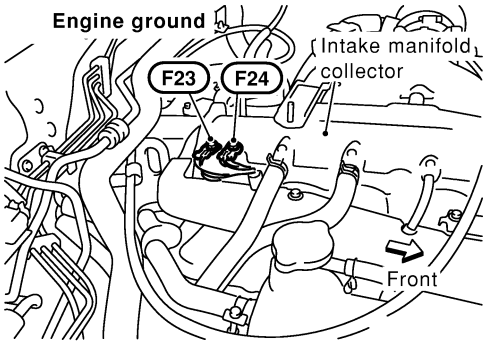
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 123 | W | Heated oxygen sensor 2 (bank 2) | Engine is running.<br>**Warm-up condition.**<br>Revving engine from idle to 3,000 rpm quickly after the following conditions are met.<br>Keeping the engine speed between 3,500 and 4,000 rpm for one minute and at idle for one minute under no load | 0 - Approximately 1.0V |

## Diagnostic Procedure

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

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




SEC690C

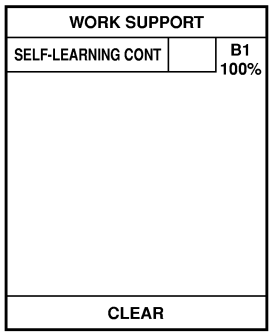
► GO TO 2.

## Diagnostic Procedure (Cont'd)

| 2 | CLEAR THE SELF-LEARNING DATA |
|---|---|

**With CONSULT-II**

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

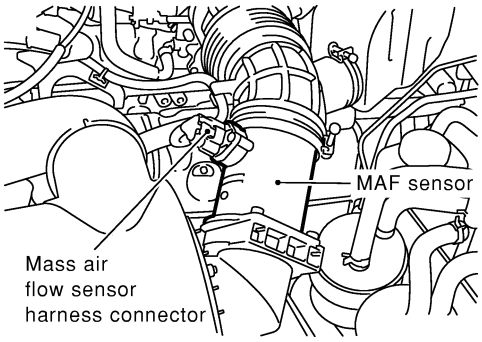



SEF215Z

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

**Without CONSULT-II**

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.




SEC688C

5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to EC-49, "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".
7. Make sure that DTC P0000 is displayed.
8. Run engine for at least 10 minutes at idle speed.
   **Is the 1st trip DTC P0171 or P0174 detected?**
   **Is it difficult to start engine?**

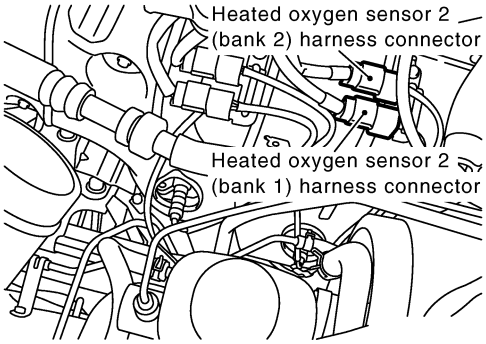
**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | Perform trouble diagnosis for DTC P0171, P0174. Refer to EC-218. |
| No | ▶ | GO TO 3. |

## Diagnostic Procedure (Cont'd)

| 3 | CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

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




SEC669D

3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S2 terminal 4 and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
5. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Joint connector-7
- Harness for open or short between heated oxygen sensor 2 and ground

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

## Diagnostic Procedure (Cont'd)

| 5 | CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P1147 | 124 | 1 | 1 |
| P1167 | 123 | 1 | 2 |

MTBL1590

**Continuity should exist.**

2. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

| DTC | Terminals | | Bank |
|---|---|---|---|
| | ECM | Sensor | |
| P1147 | 124 | 1 | 1 |
| P1167 | 123 | 1 | 2 |

MTBL1591

**Continuity should not exist.**

3. Also check harness for short to power.

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 6. |
| NG ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK HEATED OXYGEN SENSOR 2 |
|---|---|

**Refer to EC-358, "Component Inspection".**

**OK or NG**

| | |
|---|---|
| OK ► | GO TO 7. |
| NG ► | Replace heated oxygen sensor 2. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

► **INSPECTION END**

## Component Inspection

### HEATED OXYGEN SENSOR 2

#### With CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.

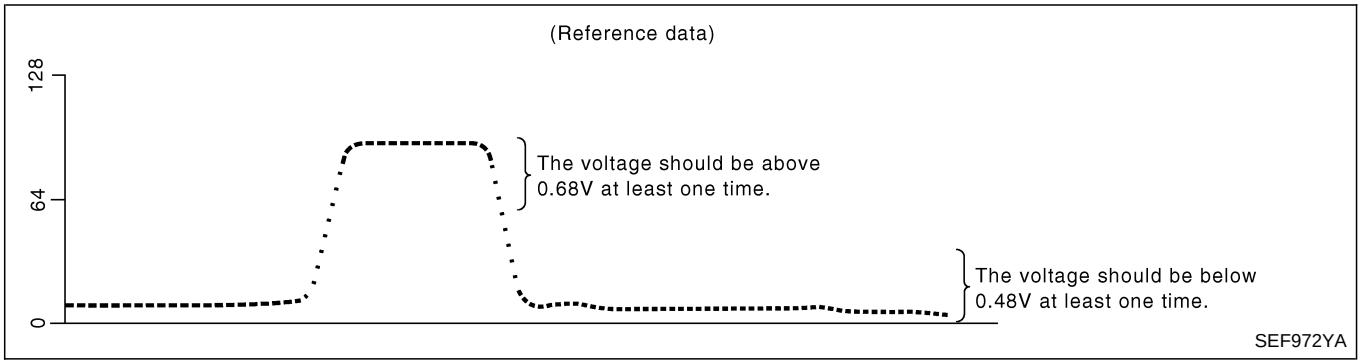
## Component Inspection (Cont'd)

| ACTIVE TEST | |
|---|---|
| FUEL INJECTION | 25 % |
| MONITOR | |
| ENG SPEED | XXX rpm |
| HO2S1 (B1) | XXX V |
| HO2S2 (B1) | XXX V |
| HO2S1 MNTR (B1) | RICH |
| HO2S2 MNTR (B1) | RICH |
| | |
| | |

SEF662Y

5. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.

6. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



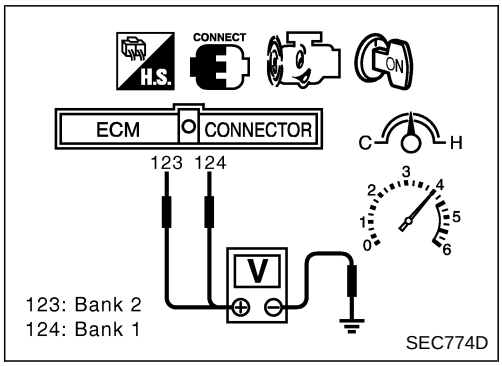

**"HO2S2 (B1)/(B2)" should be above 0.68V at least once when the "FUEL INJECTION" is +25%.**
**"HO2S2 (B1)/(B2)" should be below 0.48V at least once when the "FUEL INJECTION" is -25%.**
**CAUTION:**

- **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 J-43897-12 and approved anti-seize lubricant.**

### Without CONSULT-II

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least one minute under no load.
4. Let engine idle for one minute.
5. Set voltmeter probes between ECM terminal 124 [HO2S2 (B1) signal] or 123 [HO2S2 (B2) signal] and engine ground.

## Component Inspection (Cont'd)

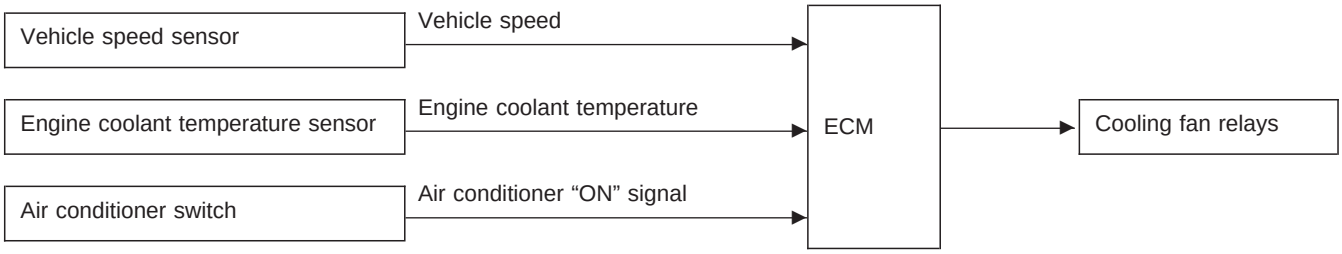



6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   **The voltage should be above 0.68V at least once during this procedure.**
   **If the voltage is above 0.68V at step 6, step 7 is not necessary.**
7. Keep vehicle idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in "D" position with "OD" OFF.
   **The voltage should be below 0.56V at least once during this procedure.**
8. If NG, replace heated oxygen sensor 2.

**CAUTION:**

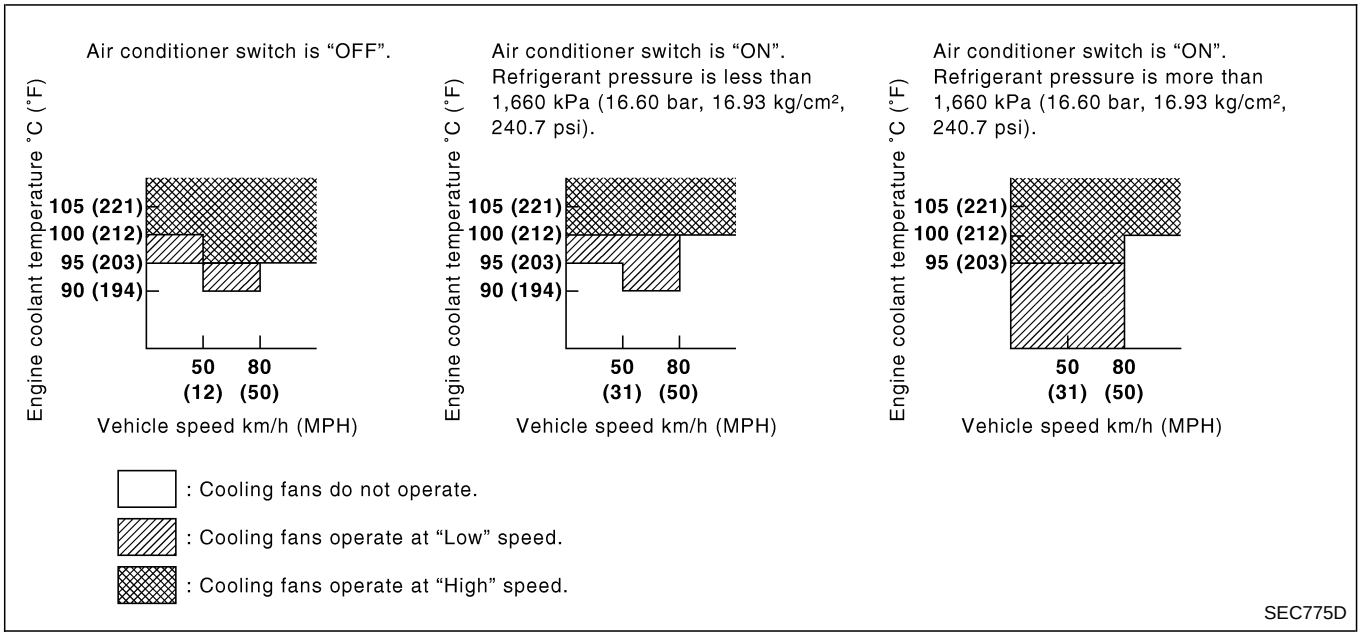
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.**

## System Description




The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner ON signal. The control system has 3-step control [HIGH/LOW/OFF].

## Operation




## CONSULT-II Reference Value In Data Monitor Mode

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| COOLING FAN | ● After warming up engine, idle the engine.<br>● Air conditioner switch "OFF"<br>● Vehicle stopped | Engine coolant temperature is 94°C (201°F) or less. | OFF |
| | | Engine coolant temperature is between 95°C (203°F) and 99°C (210°F) | LOW |
| | | Engine coolant temperature is 100°C (212°F) or more. | HIGH |
| AIR COND SIG | ● Engine: After warming up, idle the engine | Air conditioner switch: "OFF" | OFF |
| | | Air conditioner switch: "ON" (Compressor operates.) | ON |

## 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.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 56 | L | Cooling fan relay (Low speed) | Engine is running.<br>└ Cooling fan is not operating. | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>└ Cooling fan is operating. | Approximately 0V |
| 55 | L/B | Cooling fan relay (High speed) | Engine is running.<br>├ Cooling fan is not operating.<br>└ Cooling fan is operating at low speed. | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>└ Cooling fan is operating at high speed. | Approximately 0V |

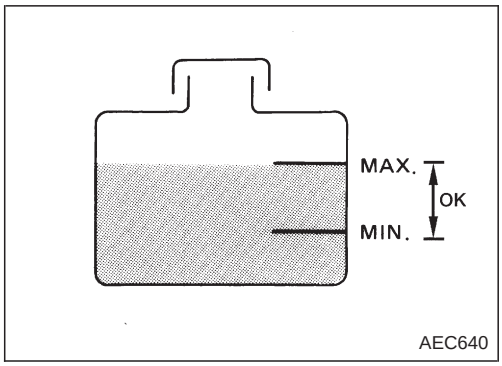
## On Board Diagnosis Logic

This diagnosis continuously monitors the engine coolant temperature.
If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is detected by the ECM and the MIL lights on.

| Diagnostic trouble code No. | Malfunction is detected when ... | Check Items (Possible Cause) |
|---|---|---|
| P1217<br>1217 | ● Cooling fan does not operate properly (Overheat).<br>● Cooling fan system does not operate properly (Overheat).<br>● Engine coolant was not added to the system using the proper filling method. | ● Harness or connectors (The cooling fan circuit is open or shorted)<br>● Cooling fan<br>● Thermostat<br>● Improper ignition timing<br>● Engine coolant temperature sensor<br>● Blocked radiator<br>● Blocked front end (Improper fitting of nose mask)<br>● Crushed vehicle frontal area (Vehicle frontal is collided but not repaired)<br>● Blocked air passage by improper installation of front fog lamp or fog lamps.<br>● Improper mixture ratio of coolant<br>● Damaged bumper<br>For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-370. |

**CAUTION:**
**When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.**

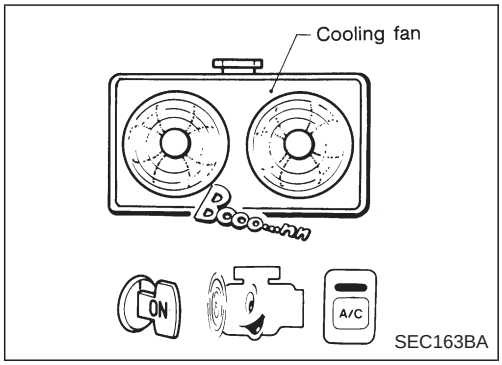
**a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED LUBRICANTS AND FLUIDS").**
**b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.**



AEC640

| ACTIVE TEST | |
|---|---|
| COOLING FAN | OFF |
| MONITOR | |
| COOLAN TEMP/S | XXX °C |
| | |
| | |
| | |
| | |
| | |
| | |

SEF646X



SEC163BA

## Overall Function Check

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

**WARNING:**

**Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.**

**Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.**

### With CONSULT-II

1) Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
   **Allow engine to cool before checking coolant level and mixture ratio.**
- If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-365.
- If the coolant mixture ratio is out of the range of 45 to 55% (varies depending on destinations), replace the coolant in the following procedure LC section, “Changing Engine Coolant”.

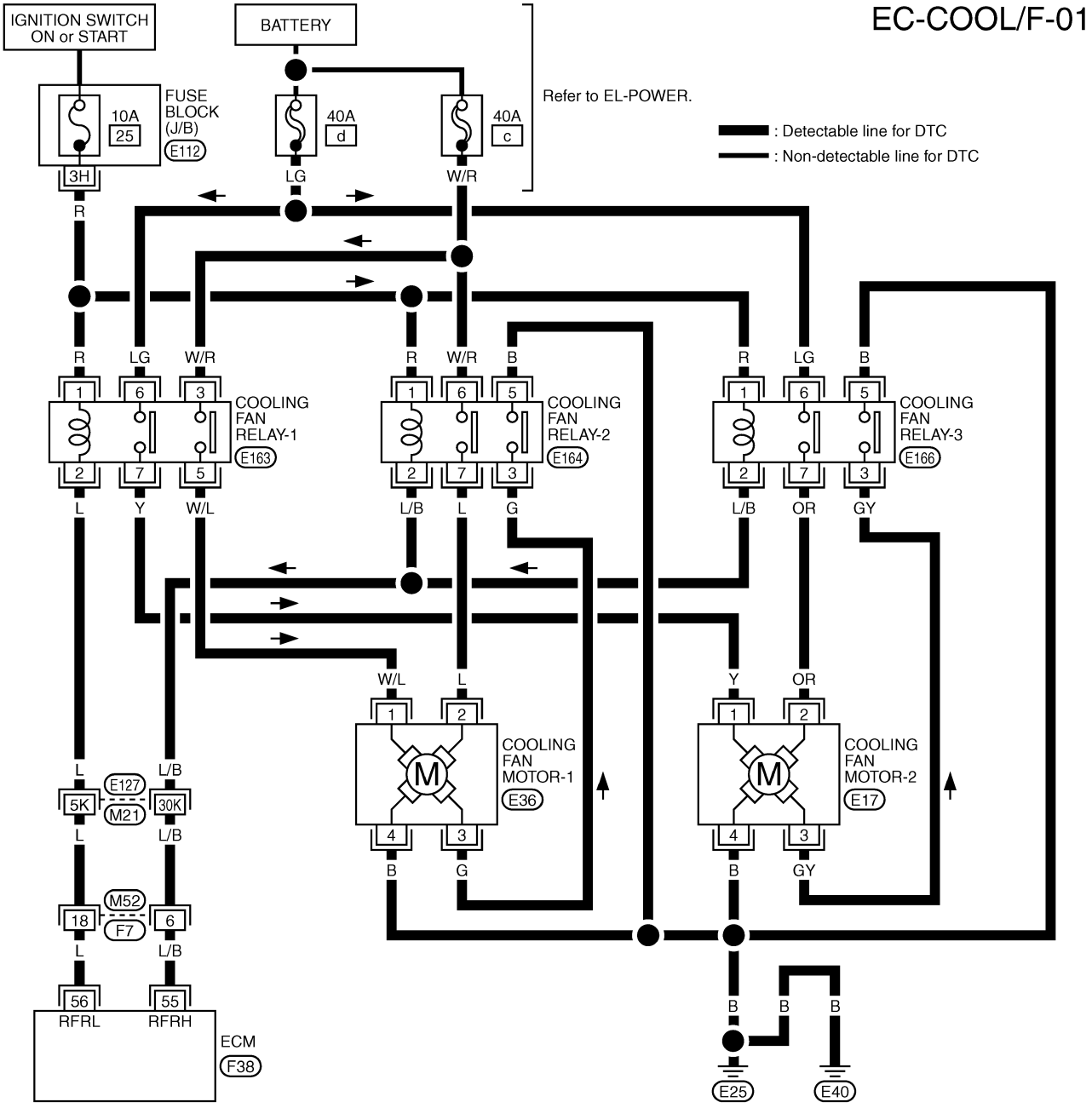
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-365.
3) Turn ignition switch “ON”.
4) Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5) If the results are NG, go to “Diagnostic Procedure”, EC-365.

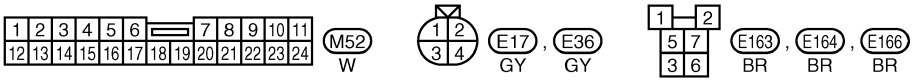
### Without CONSULT-II

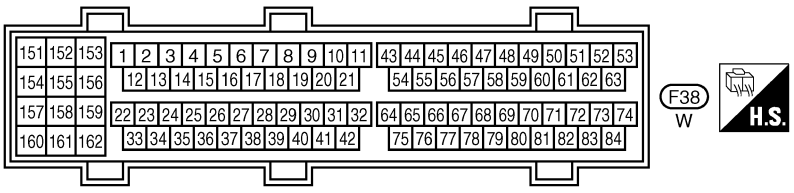
1) Check the coolant level and mixture ratio (using coolant tester) in the reservoir tank and radiator.
   **Allow engine to cool before checking coolant level and mixture ratio.**
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to “Diagnostic Procedure”, EC-365.
- If the coolant mixture ratio is out of the range of 45 to 55% (varies depending on destinations), replace the coolant in the following procedure LC section, “Changing Engine Coolant”.

2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to “Diagnostic Procedure”, EC-365.
3) Start engine.
   **Be careful not to overheat engine.**
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch “ON”.
6) Turn blower fan switch “ON”.
7) Run engine at idle for a few minutes with air conditioner operating.
   **Be careful not to overheat engine.**
8) Make sure that cooling fan operates. Refer to “OPERATION” table of Cooling fan, EC-361.
   If NG, go to “Diagnostic Procedure”, EC-365.

## Wiring Diagram



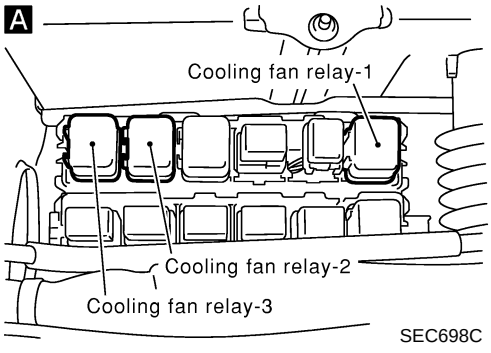




Refer to last page (Foldout page).
E127 , M21
E112

TEC151M

A




SEC698C

A

| ACTIVE TEST | |
|---|---|
| COOLING FAN | OFF |
| MONITOR | |
| COOLAN TEMP/S | XXX °C |
| | |
| | |
| | |
| | |
| | |
| | |

SEF646X

B

| ACTIVE TEST | |
|---|---|
| COOLING FAN | OFF |
| MONITOR | |
| COOLAN TEMP/S | XXX °C |
| | |
| | |
| | |
| | |
| | |
| | |

SEF111X

## Diagnostic Procedure

INSPECTION START

Do you have CONSULT-II?

No → GO TO Ⓐ Without CONSULT-II.

Yes

A

**CHECK COOLING FAN LOW SPEED OPERATION.**

**With CONSULT-II**

1. Disconnect cooling fan relay-2 and -3.
2. Turn ignition switch “ON”.
3. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
4. Make sure that cooling fans-1 and -2 operate at low speed.

NG → GO TO Ⓒ. Check cooling fan low speed control circuit.

OK

B

**CHECK COOLING FAN HIGH SPEED OPERATION.**

**With CONSULT-II**

1. Turn ignition switch “OFF”.
2. Reconnect cooling fan relay-2 and -3.
3. Turn ignition switch “ON”.
4. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.
5. Make sure that cooling fans-1 and -2 operate at high speed.

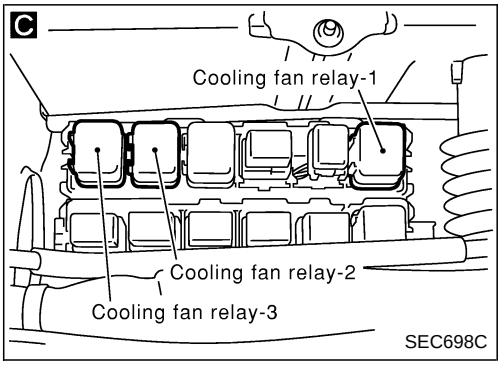
NG → GO TO Ⓓ. Check cooling fan high speed control circuit.

OK

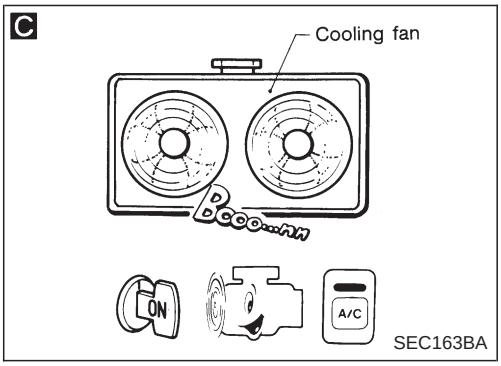
GO TO Ⓑ.

## Diagnostic Procedure (Cont'd)

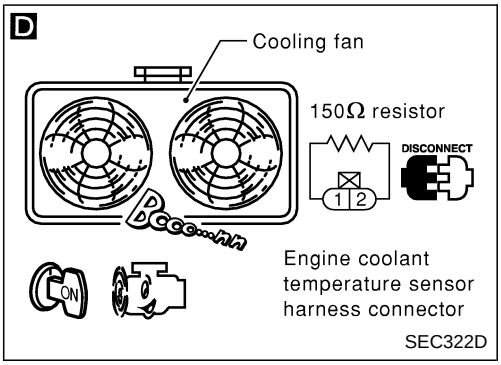
C




C




D




Ⓐ

C

**CHECK COOLING FAN LOW SPEED OPERATION.**

**Without CONSULT-II**

1. Disconnect cooling fan relays-2 and -3.
2. Start engine and let it idle.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch "ON".
5. Turn blower fan switch "ON".
6. Make sure that cooling fans-1 and -2 operate at low speed.

NG → GO TO Ⓒ. Check cooling fan low speed control circuit.

OK ↓

D

**CHECK COOLING FAN HIGH SPEED OPERATION.**

**Without CONSULT-II**

1. Turn ignitions witch "OFF".
2. Reconnect cooling fan relays-2 and -3.
3. Turn air conditioner switch and blower fan switch "OFF".
4. Disconnect engine coolant temperature sensor harness connector.
5. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
6. Restart engine and make sure that cooling fans-1 and -2 operate at high speed.

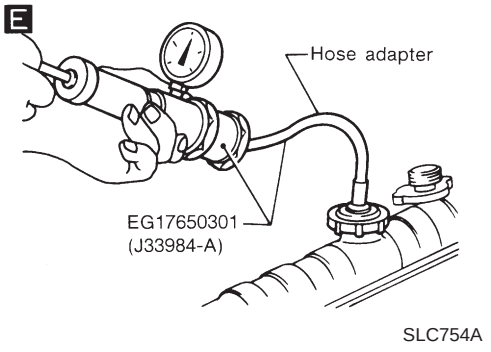
NG → GO TO Ⓓ. Check cooling fan high speed control circuit.

OK ↓

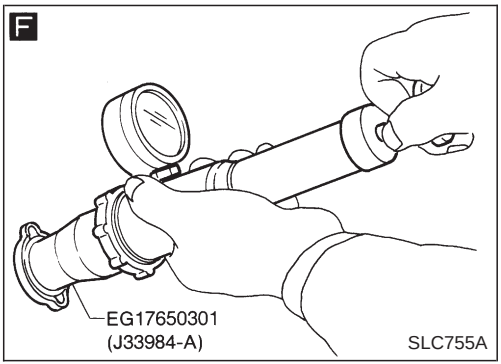
GO TO Ⓑ.

## Diagnostic Procedure (Cont'd)

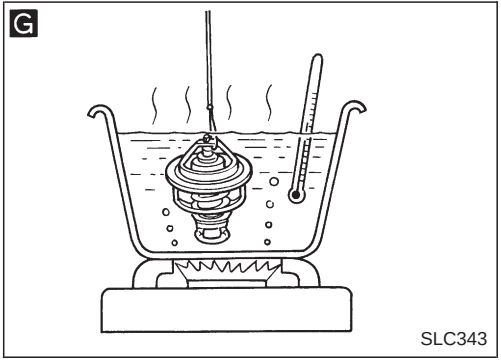
E




F




G




Ⓑ

E

**CHECK COOLING SYSTEM FOR LEAK.**
Apply pressure to the cooling system with a tester, and check if the pressure drops.
**Testing pressure:**
**157 kPa (1.6 kg/cm$^2$, 23 psi)**
**CAUTION:**
**Higher than the specified pressure may cause radiator damage.**
**Pressure should not drop.**

NG → Check the following for leak.
- Hose
- Radiator
- Water pump (Refer to LC section, "Water Pump".)

If NG, repair or replace.

OK ↓

F

**CHECK RADIATOR CAP.**
Apply pressure to cap with a tester and check radiator cap relief pressure.
**Radiator cap relief pressure:**
**For the Middle East:**
**78 - 98 kPa (0.78 - 0.98 bar, 0.8 - 1.0 kg/cm$^2$, 11 - 14 psi)**
**Except above:**
**108 - 127 kPa (1.08 - 1.27 bar, 1.1 - 1.3 kg/cm$^2$, 16 - 18 psi)**

NG → Replace radiator cap.

OK ↓

G

**CHECK THERMOSTAT.**
1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   **It should seat tightly.**
3. Check valve opening temperature and valve lift.
   **Valve opening temperature:**
   **76.5°C (170°F) [standard]**
   **Valve lift:**
   **More than 10 mm/90°C (0.39 in/194°F)**
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC section, "Thermostat".

NG → Replace thermostat.

OK ↓

CHECK ENGINE COOLANT TEMPERATURE SENSOR.
Refer to "COMPONENT INSPECTION", EC-156.

NG → Replace engine coolant temperature sensor.

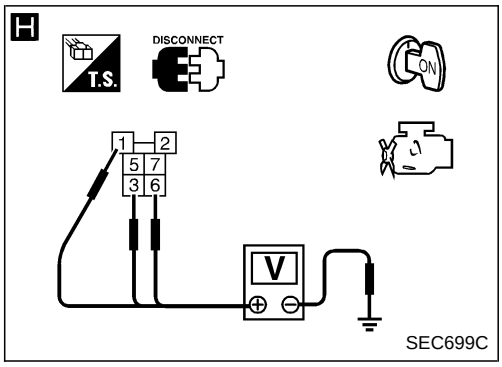
OK ↓

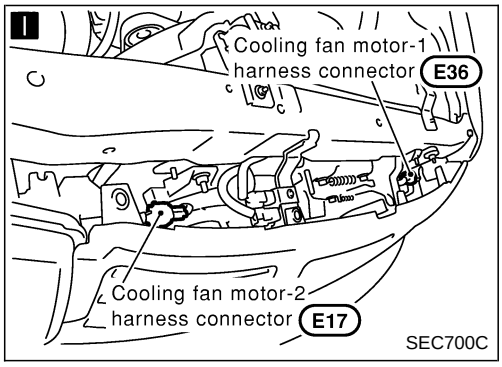
CHECK MAIN 12 CAUSES.
If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-370.

↓

CHECK INSPECTION END

## Diagnostic Procedure (Cont'd)




Ⓒ

**H**

**CHECK COOLING FAN POWER SUPPLY CIRCUIT.**
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relay-1 terminals ①, ③, ⑥ and ground with CONSULT-II or tester.
   **Battery voltage**

NG → Check the following.
- 10A fuse
- 40A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

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

OK ↓

**I**

**CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT**
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-1 terminal ⑤ and cooling fan motor-1 terminal ①, cooling fan motor-1 terminal ④ and body ground. Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-1 terminal ⑦ and cooling fan motor-2 terminal ①, cooling fan motor-2 terminal ④ and body ground. Refer to Wiring Diagram.
   **Continuity should exist.**
6. Also check harness for short to ground and short to power.

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

OK ↓

CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑯ and cooling fan relay-1 terminal ②. Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (E127), (M21)
- Harness connectors (M52), (F7)
- Harness for open or short between cooling fan relay-1 and ECM

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

OK ↓

CHECK COOLING FAN RELAY-1.
Refer to "Component Inspection", EC-371

NG → Replace cooling fan relay.

OK ↓

CHECK COOLING FAN MOTORS-1 AND -2.
Refer to "Component Inspection", EC-371.

NG → Replace cooling fan motors.

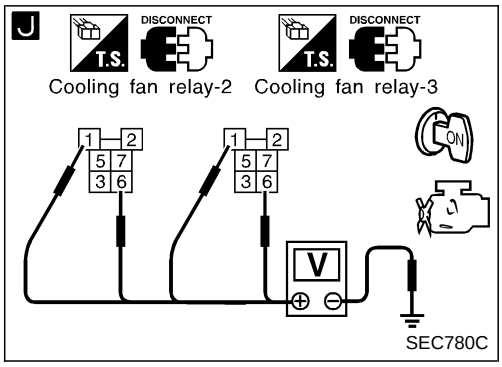
OK ↓

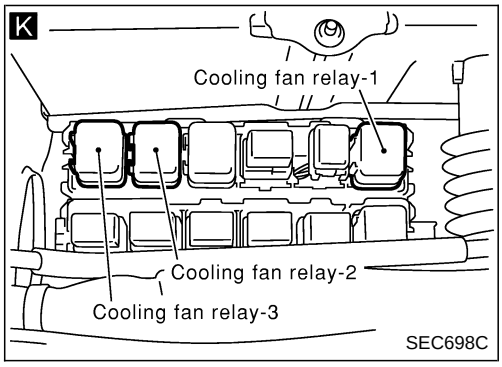
CHECK INTERMITTENT INCIDENT.
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-112.

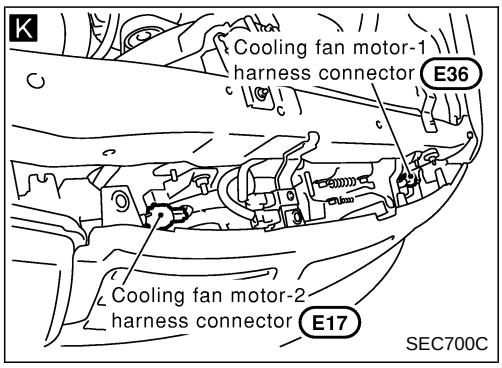
OK ↓

INSPECTION END

## Diagnostic Procedure (Cont'd)




Ⓓ

J

**CHECK COOLING FAN POWER SUPPLY CIRCUIT.**
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2 and -3 terminals ①, ⑥ and ground with CONSULT-II or tester.
   **Battery voltage**

NG → Check the following.
- Harness for open or short between cooling fan relays-2 and -3 and 10A fuse
- Harness for open or short between cooling fan relays-2 and fusible link

If NG, repair harness or connectors.

OK ↓

K

**CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT**
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector and cooling fan motor-2 harness connector.
3. Check harness continuity between cooling fan relay-2 terminal ⑦ and cooling fan motor-1 terminal ②, cooling fan relay-2 terminal ③ and cooling fan motor-1 terminal ③, cooling fan relay-2 terminal ⑤ and body ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.
5. Check harness continuity between cooling fan relay-3 terminal ⑦ and cooling fan motor-2 terminal ②, cooling fan relay-3 terminal ③, cooling fan relay-2 terminal ⑤.
   Refer to Wiring Diagram.
   **Continuity should exist.**
6. Also check harness for short to ground and short to power.

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

OK ↓

CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊺ and cooling fan relay-2 terminal ②, cooling fan relay-3 terminal ②.
   Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to ground and short power.

NG → Check the following.
- Harness connectors E127, M21
- Harness connectors M52, F7
- Harness for open or short between cooling fan relay-2 and -3 and ECM

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

OK ↓

CHECK COOLING FAN RELAYS-2 AND -3.
Refer to "Component Inspection", EC-371.

NG → Replace cooling fan relays.

OK ↓

CHECK COOLING FAN MOTORS.
Refer to "Component Inspection", EC-371.

NG → Replace cooling fan motors.

OK ↓

CHECK INTERMITTENT INCIDENT.
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-112.

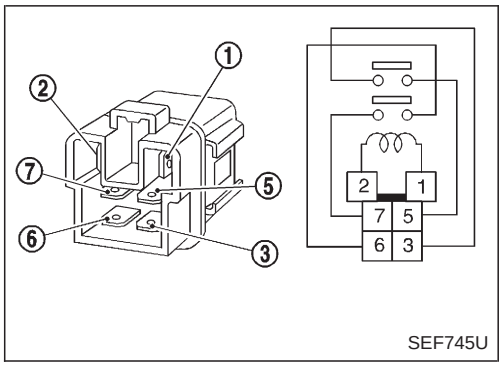
OK ↓

INSPECTION END

## Main 12 Causes of Overheating

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|---|---|---|---|---|---|
| OFF | 1 | ● Blocked radiator<br>● Blocked condenser<br>● Blocked radiator grille<br>● Blocked bumper | ● Visual | No blocking | — |
| | 2 | ● Coolant mixture | ● Coolant tester | 30 - 50% coolant mixture | See “RECOMMENDED FLUIDS AND LUBRICANTS” in MA section. |
| | 3 | ● Coolant level | ● Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | See “Changing Engine Coolant”, “ENGINE MAINTENANCE” in MA section. |
| | 4 | ● Radiator cap | ● Pressure tester | 108 - 127 kPa (1.08 - 1.27 bar, 1.1 - 1.3 kg/cm$^2$, 16 - 18 psi)<br>59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm$^2$, 9 - 14 psi) (Limit) | See “System Check”, “ENGINE COOLING SYSTEM” in LC section. |
| ON*2 | 5 | ● Coolant leaks | ● Visual | No leaks | See “System Check”, “ENGINE COOLING SYSTEM” in LC section. |
| ON*2 | 6 | ● Thermostat | ● Touch the upper and lower radiator hoses | Both hoses should be hot. | See “Thermostat” and “Radiator”, “ENGINE COOLING SYSTEM” in LC section. |
| ON*1 | 7 | ● Cooling fan | ● Visual (Coupling)<br>● CONSULT-II | Operating | See “TROUBLE DIAGNOSIS FOR DTC P1217”, EC-361. |
| OFF | 8 | ● Combustion gas leak | ● Color checker chemical tester 4 gas analyzer | Negative | — |
| ON*3 | 9 | ● Coolant temperature gauge | ● Visual | Gauge less than 3/4 when driving | — |
| | | ● Coolant overflow to reservoir tank | ● Visual | No overflow during driving and idling | See “Changing Engine Coolant”, “ENGINE MAINTENANCE” in MA section. |
| OFF*4 | 10 | ● Coolant return from reservoir tank to radiator | ● Visual | Should be initial level in reservoir tank | See “ENGINE MAINTENANCE” in MA section. |
| OFF | 11 | ● Cylinder head | ● Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | See “Inspection”, “CYLINDER HEAD” in EM section. |
| | 12 | ● Cylinder block and pistons | ● Visual | No scuffing on cylinder walls or piston | See “Inspection”, “CYLINDER BLOCK” in EM section. |

*1: Engine running at idle for coupling type. Turn ignition switch ON for electrical cooling fan.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to “OVERHEATING CAUSE ANALYSIS” in LC section.



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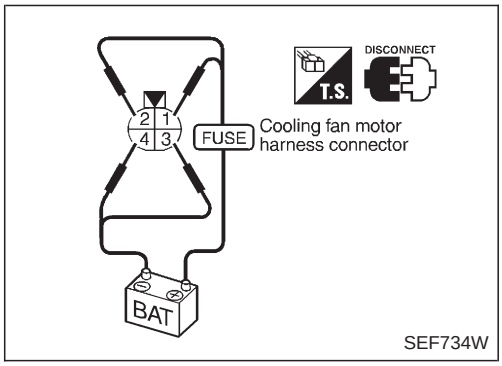


SEF734W

## Component Inspection

### COOLING FAN RELAYS-1, -2 AND -3

Check continuity between terminals ③ and ⑤, ⑥ and ⑦.

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

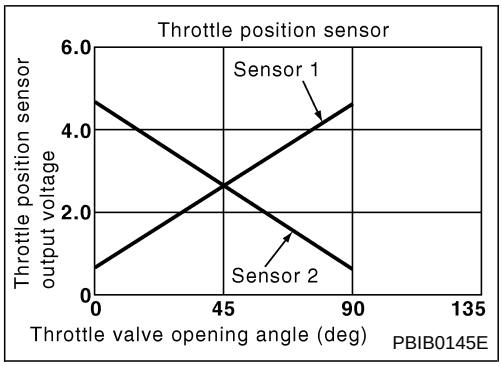
If NG, replace relay.

### COOLING FAN MOTORS-1 AND -2

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

| | Speed | Terminals | |
|---|---|---|---|
| | | (+) | (−) |
| Cooling fan motor | Low | 1 | 4 |
| | High | 1, 2 | 3, 4 |

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




## Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

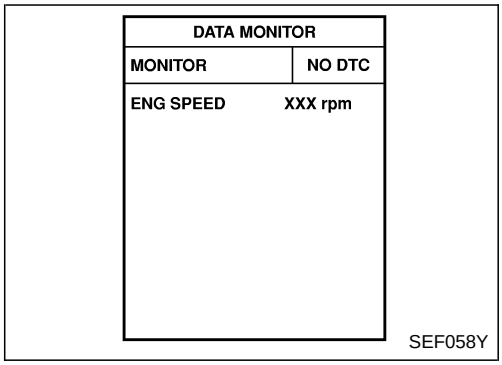
## On Board Diagnosis Logic

**The MI will not light up for this self-diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1225<br>1225 | Closed throttle position learning performance problem | Closed throttle position learning value is excessively low. | ● Electric throttle control actuator (TP sensor 1 and 2) |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch "OFF", wait at least 10 seconds.
4. Turn ignition switch "ON".
5. If 1st trip DTC is detected, go to EC-373, "Diagnostic Procedure".

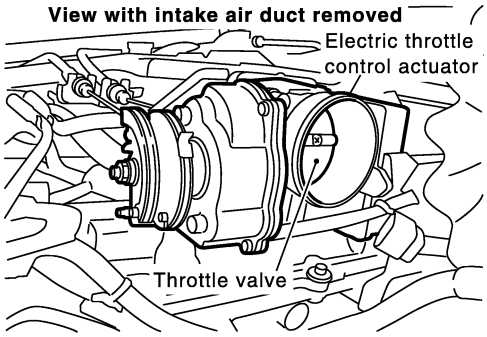
### WITH GST

Follow the procedure "With CONSULT-II" above.

## Diagnostic Procedure

| 1 | CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY |
|---|---|

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.




SEC183D

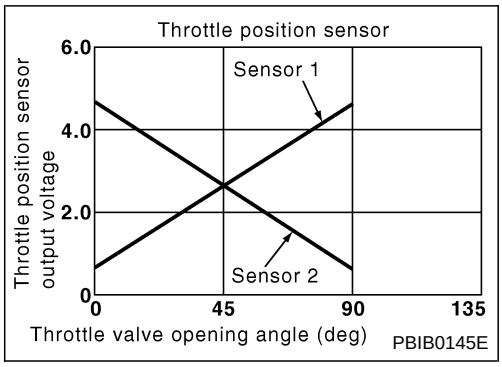
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 2. |
| NG | ► | Remove the foreign matter and clean the electric throttle control actuator inside. |

| 2 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|

1. Replace the electric throttle control actuator.
2. Perform EC-31, “Accelerator Pedal Released Position Learning”.
3. Perform EC-31, “Throttle Valve Closed Position Learning”.
4. Perform EC-31, “Idle Air Volume Learning”.

| | | |
|---|---|---|
| | ► | **INSPECTION END** |




## Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

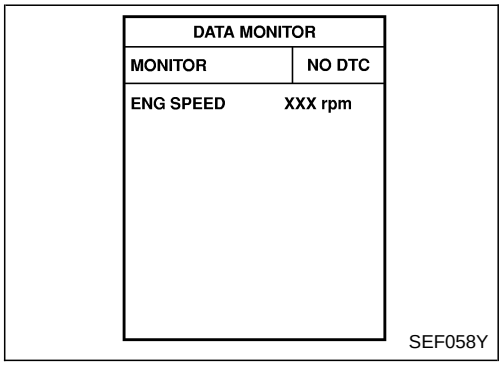
## On Board Diagnosis Logic

**The MI will not light up for this self-diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1226<br>1226 | Closed throttle position learning performance problem | Closed throttle position learning is not performed successfully, repeatedly. | ● Electric throttle control actuator (TP sensor 1 and 2) |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Turn ignition switch "OFF", wait at least 10 seconds.
4. Turn ignition switch "ON".
5. Repeat steps 3 and 4, 32 times.
6. If 1st trip DTC is detected, go to EC-375, "Diagnostic Procedure".

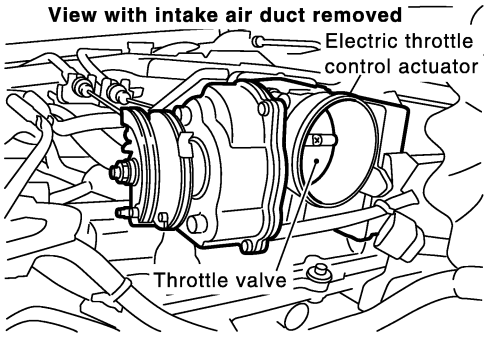
### WITH GST

Follow the procedure "With CONSULT-II" above.

## Diagnostic Procedure

| 1 | CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY |
|---|---|

1. Turn ignition switch “OFF”.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.




SEC183D

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 2. |
| NG | ► | Remove the foreign matter and clean the electric throttle control actuator inside. |

| 2 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|

1. Replace the electric throttle control actuator.
2. Perform EC-31, “Accelerator Pedal Released Position Learning”.
3. Perform EC-31, “Throttle Valve Closed Position Learning”.
4. Perform EC-31, “Idle Air Volume Learning”.

| | | |
|---|---|---|
| | ► | **INSPECTION END** |

## On Board Diagnosis Logic

**This self-diagnosis has the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1229<br>1229 | Sensor power supply circuit short | ECM detects a voltage of power source for sensor is excessively low or high. | ● Harness or connectors<br>(The TP sensor 1 and 2 circuit is shorted.)<br>(APP sensor circuit is shorted.)<br>(MAF sensor circuit is shorted.)<br>(Power steering pressure sensor circuit is shorted.)<br>(Refrigerant pressure sensor circuit is shorted.)<br>● Electric throttle control actuator (TP sensor 1 and 2)<br>● Accelerator pedal position sensor (APP sensor 1)<br>● MAF sensor<br>● Power steering pressure sensor<br>● Refrigerant pressure sensor<br>● ECM pin terminal |

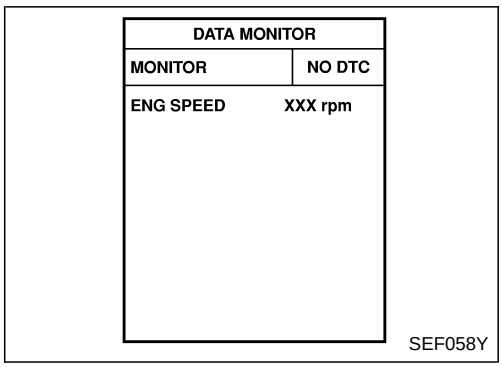
### FAIL-SAFE MODE

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

| Engine operation condition in fail-safe mode |
|---|
| ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

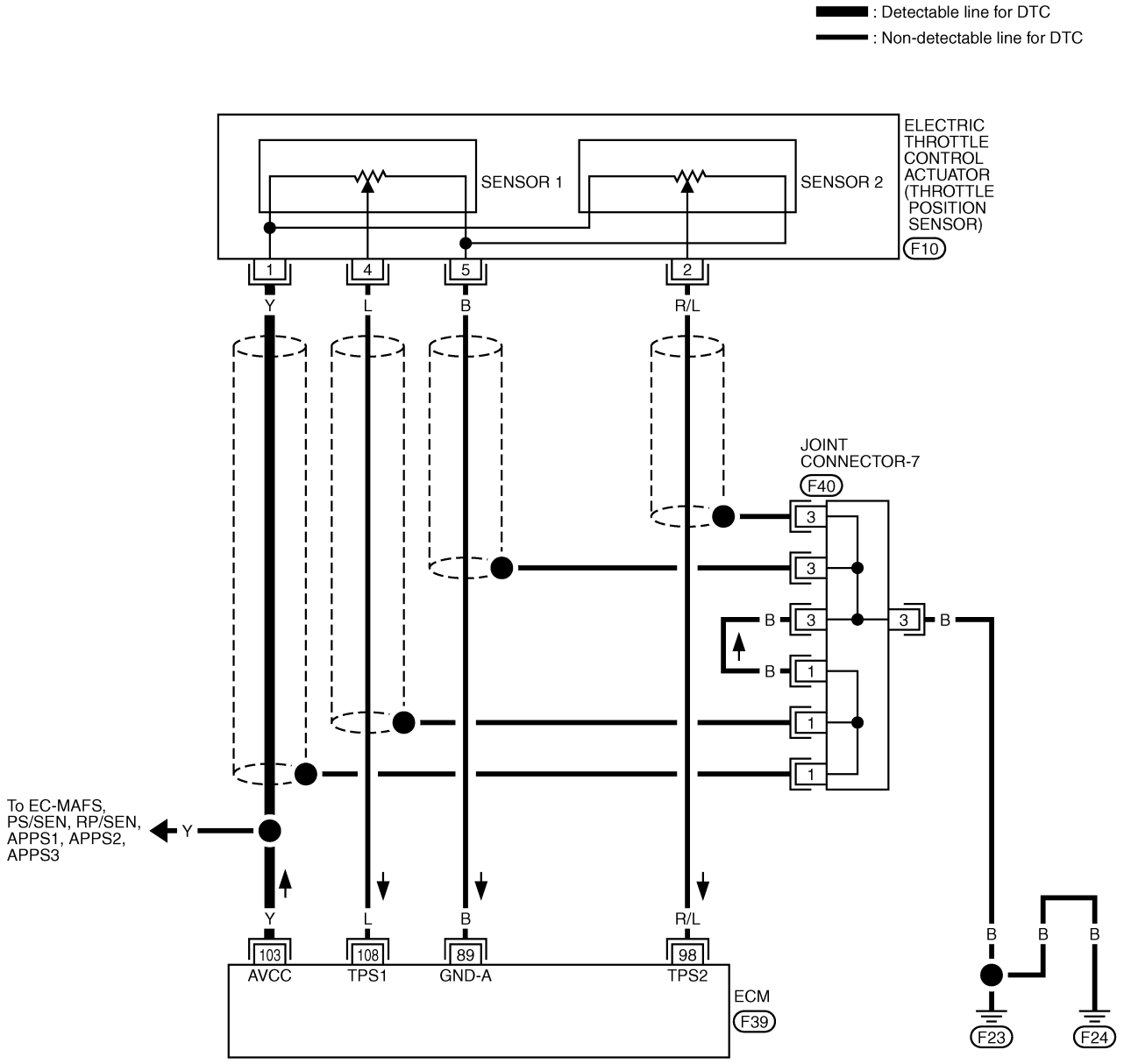
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-378, "Diagnostic Procedure".

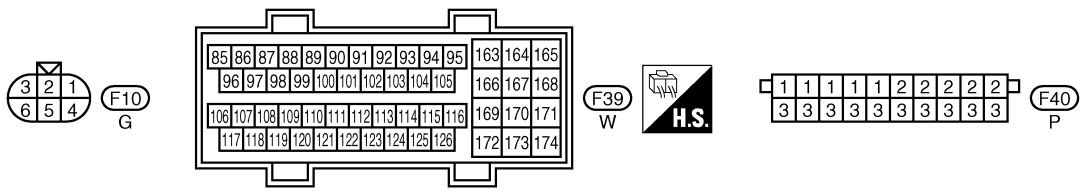
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-SEN/PW-01




TEC407M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

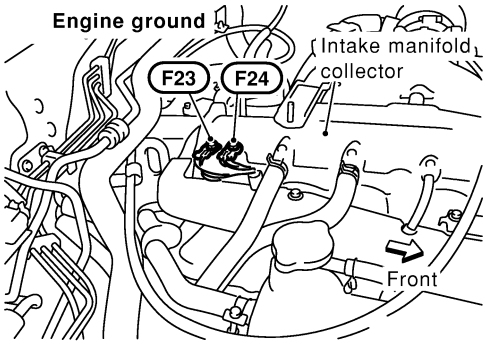
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 103 | Y | Sensors' power supply | Ignition switch "ON" | Approximately 5V |

## Diagnostic Procedure

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

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



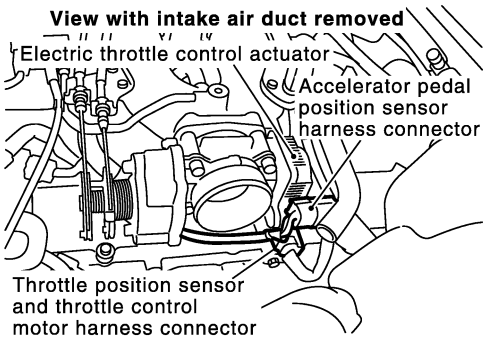

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

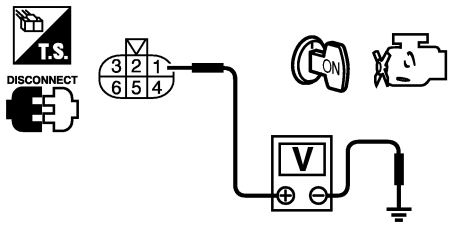
| 2 | CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect electric throttle control actuator harness connector.




SEC182D

2. Turn ignition switch "ON".
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.




PBIB0082E

**Voltage: Approximately 5V**

**OK or NG**

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

| 3 | CHECK SENSOR POWER SUPPLY CIRCUITS FOR SHORT |
|---|---|

Check the following.

- Harness for short to power and short to ground, between the following terminals.

| ECM terminal | Sensor terminals | Reference Wiring Diagram |
|---|---|---|
| 103 | Electric throttle actuator terminal 1 | EC-449 |
| | APP sensor terminal 7 | EC-455 |
| | MAF sensor terminal 2 | EC-174 |
| | Power steering pressure sensor terminal 1 | EC-311 |
| | Refrigerant pressure snsor terminal 1 | EC-498 |

MTBL1592

- ECM pin terminal.

**OK or NG**

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

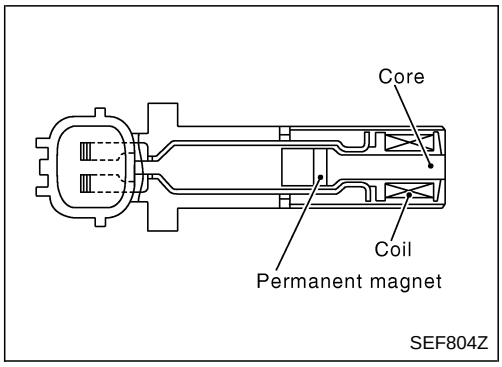
## Diagnostic Procedure (Cont'd)

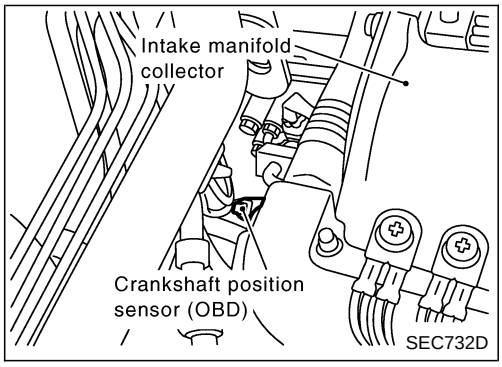
| 4 | CHECK COMPONENTS | |
|---|---|---|
| Check the following.<br>● Accelerator pedal position sensor (Refer to EC-427, "Component Inspection".)<br>● Mass air flow sensor (Refer to EC-146, "Component Inspection".)<br>● Power steering pressure sensor (Refer to EC-282, "Component Inspection".) | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace malfunctioning component. |

| 5 | CHECK THROTTLE POSITION SENSOR | |
|---|---|---|
| **Refer to EC-420, "Component Inspection".** | | |
| **OK or NG** | | |
| OK | ▶ | GO TO 6. |
| NG | ▶ | GO TO 5. |

| 6 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR | |
|---|---|---|
| 1. Replace electric throttle control actuator.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | | |
| | ▶ | **INSPECTION END** |

| 7 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | | |
| | ▶ | **INSPECTION END** |



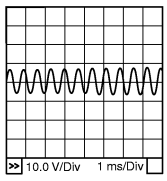
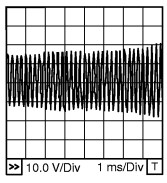

## Component Description

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

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 the ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (AC Voltage) |
|---|---|---|---|---|
| 111 | W | Crankshaft position sensor (OBD) | Engine is running.<br>**Warm-up condition.**<br>Idle speed | Approximately 1 - 2V★<br>  <br><br>SEC748D |
| | | | Engine is running.<br>Engine speed is 2,000 rpm | 3 - 4V★<br>(AC range)<br>  <br><br>SEC749D |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## On Board Diagnosis Logic

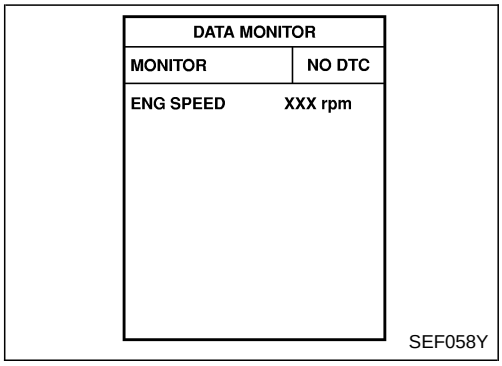
Malfunction is detected when a chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.

### POSSIBLE CAUSE

- Harness or connectors
- Crankshaft position sensor (OBD)
- Drive plate/Flywheel

## 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.**




### With CONSULT-II

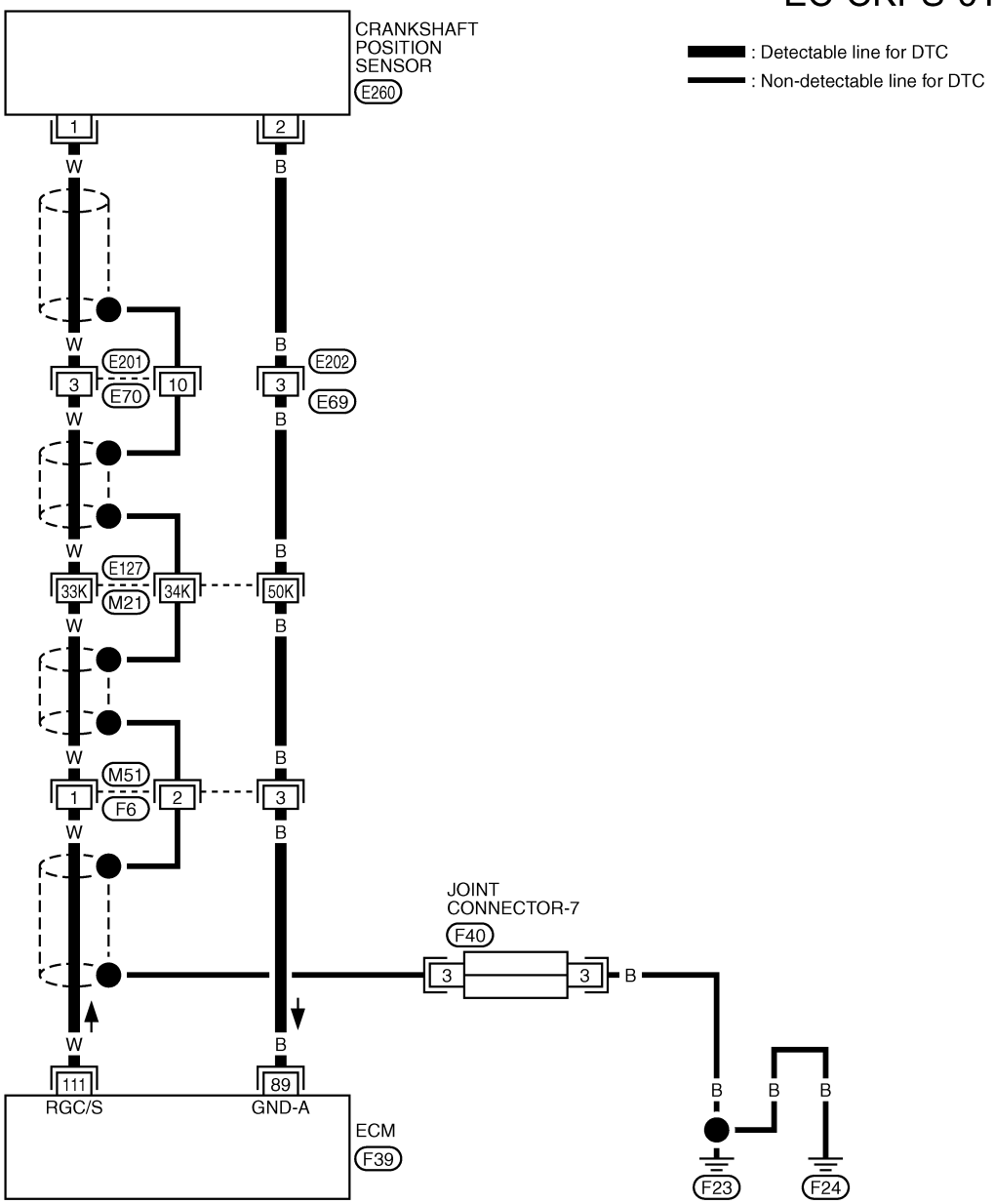
1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-II.
2. Start engine and run it for at least 2 minutes at idle speed.
3. If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-384.

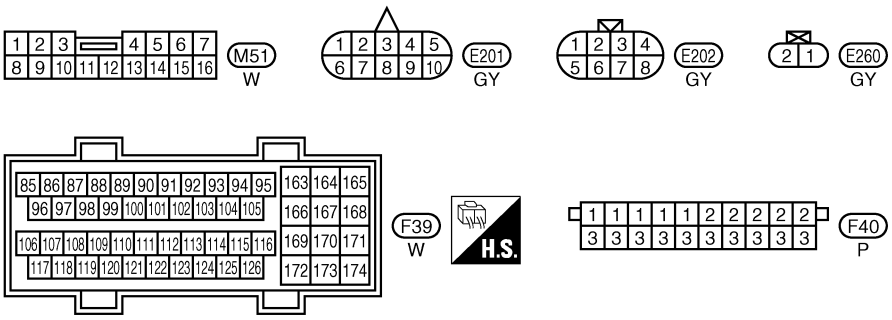
### With GST

Follow the procedure "With CONSULT-II".

## Wiring Diagram

EC-CKPS-01



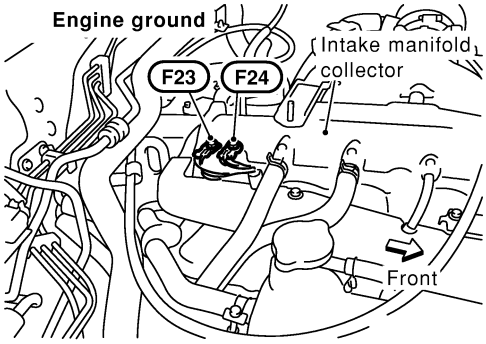

Refer to last page (Foldout page).
M21 , E127

TEC344M

## Diagnostic Procedure

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

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

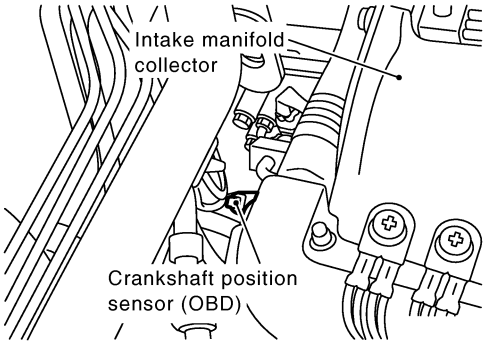



SEC690C

| | |
|---|---|
| ► | GO TO 2. |

| 2 | CHECK CKPS (OBD) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.




SEC732D

2. Check continuity between ECM terminal 111 and sensor terminal 1.
   **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. |

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

Check the following.
- Harness connectors E201, E70
- Harness connectors E127, M21
- Harness connectors M51, F6
- Harness for open or short between ECM and crankshaft position sensor (OBD)

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

## Diagnostic Procedure (Cont'd)

| 4 | CHECK CKPS (OBD) GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Reconnect ECM harness connectors.
2. Check harness continuity between CKPS (OBD) terminal 2 and engine ground. Refer to Wiring Diagram.
   **Continuity should exist.**
3. 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 E202, E69
- Harness connectors E127, M21
- Harness connectors M51, F6
- Harness for open between crankshaft position sensor (OBD) and ECM

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

| 6 | CHECK IMPROPER INSTALLATION |
|---|---|

1. Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD).
2. Perform "DTC Confirmation Procedure", again.
   **Is a 1st trip DTC P1336 detected?**

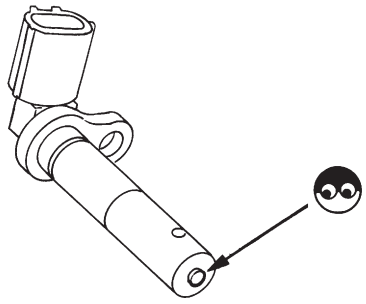
**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 7. |
| No | ▶ | **INSPECTION END** |

## Diagnostic Procedure (Cont'd)

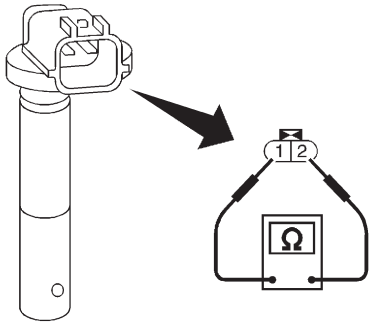
| 7 | CHECK CRANKSHAFT POSITION SENSOR (OBD) |
|---|---|

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



SEF960N

5. Check resistance as shown in the figure.




SEF504V

**Resistance: Approximately 512 - 632Ω [at 20°C (68°F)]**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 8. |
| NG | ▶ | Replace crankshaft position sensor (OBD). |

| 8 | CHECK CKPS (OBD) SHIELD CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Disconnect harness connectors E201, E70.
2. Check harness continuity between harness connector E70 terminal 10 and engine ground.
   **Continuity should exist.**
3. Also check harness for short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | GO TO 9. |

| 9 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors E201, E70
- Harness connectors E127, M21
- Harness connectors M51, F6
- Joint connector-7
- Harness for open between harness connector F38 and engine ground

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

## Diagnostic Procedure (Cont'd)

| 10 | CHECK GEAR TOOTH | |
|---|---|---|
| Visually check for chipping flywheel or drive plate gear tooth (cog).<br>**OK or NG** | | |
| OK | ► | GO TO 11. |
| NG | ► | Replace the flywheel or drive plate. |

| 11 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| **Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-112.** | | |
| | ► | **INSPECTION END** |

## Component Description

When the shift lever 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.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

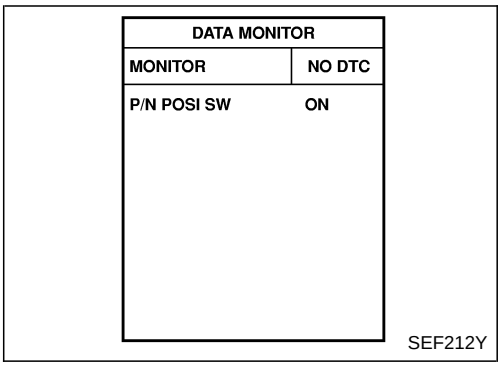
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| P/N POSI SW | ● Ignition switch: ON | Shift lever: P or N | ON |
| | | Shift lever: Except above | OFF |

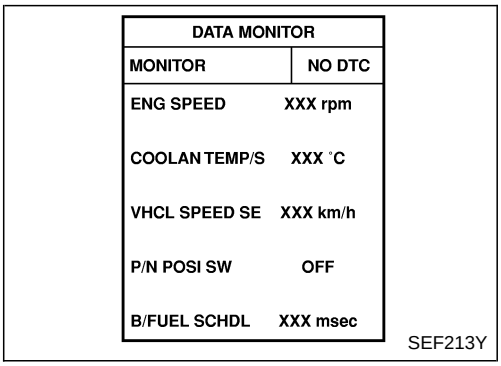
## On Board Diagnosis Logic

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1706<br>1706 | Park/neutral position switch | The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving. | ● Harness or connectors (PNP switch circuit is open or shorted.)<br>● Park/neutral position (PNP) switch |

## 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 10 seconds before conducting the next test.**




### WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-II. 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 EC-392, “Diagnostic Procedure”.
If OK, go to following step.

3. Select “DATA MONITOR” mode with CONSULT-II.
4. Start engine and warm it up to normal operating temperature.
5. Maintain the following conditions for at least 60 consecutive seconds.

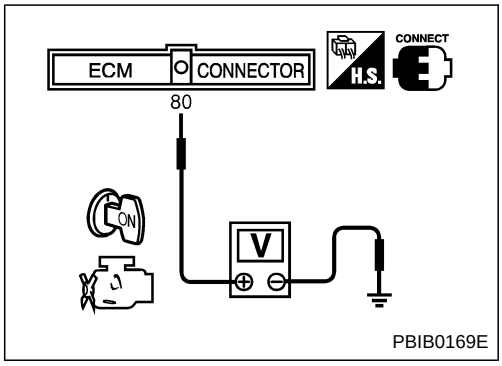
| | |
|---|---|
| ENG SPEED | 1,250 - 6,375 rpm |
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | More than 5 msec |
| VHCL SPEED SE | More than 64 km/h (40 MPH) |
| Selector lever | Suitable position |

## DTC Confirmation Procedure (Cont'd)

6. If 1st trip DTC is detected, go to EC-392, "Diagnostic Procedure".

## Overall Function Check

Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.




### WITH GST

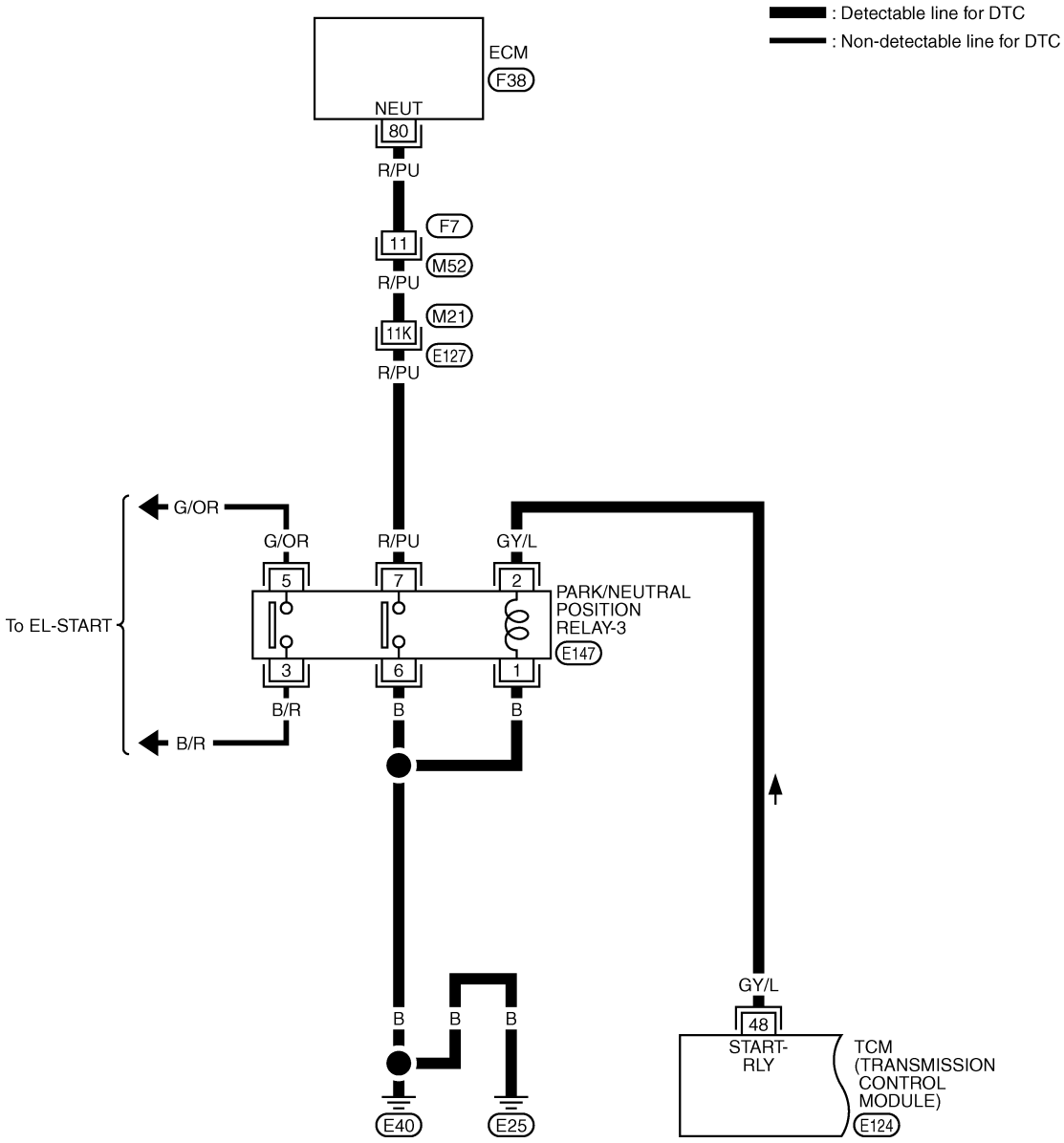
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal 80 (PNP switch signal) and body ground under the following conditions.

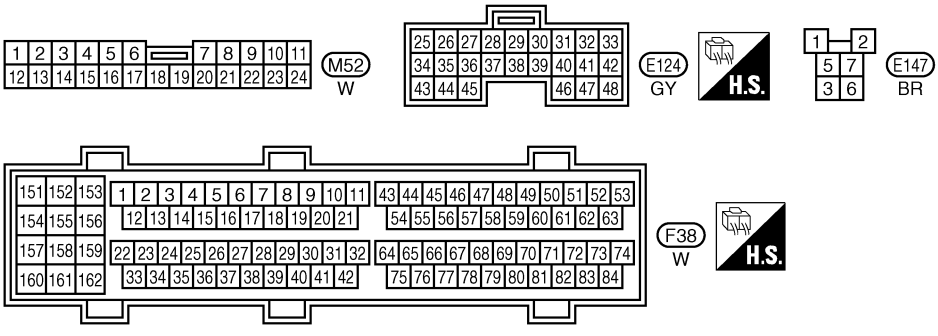
| Condition (Gear position) | Voltage V (Known-good data) |
|---|---|
| "P" and "N" position | Approximately 0 |
| Except the above position | Battery voltage |

3. If NG, go to EC-392, "Diagnostic Procedure".

## Wiring Diagram

EC-PNP/SW-01

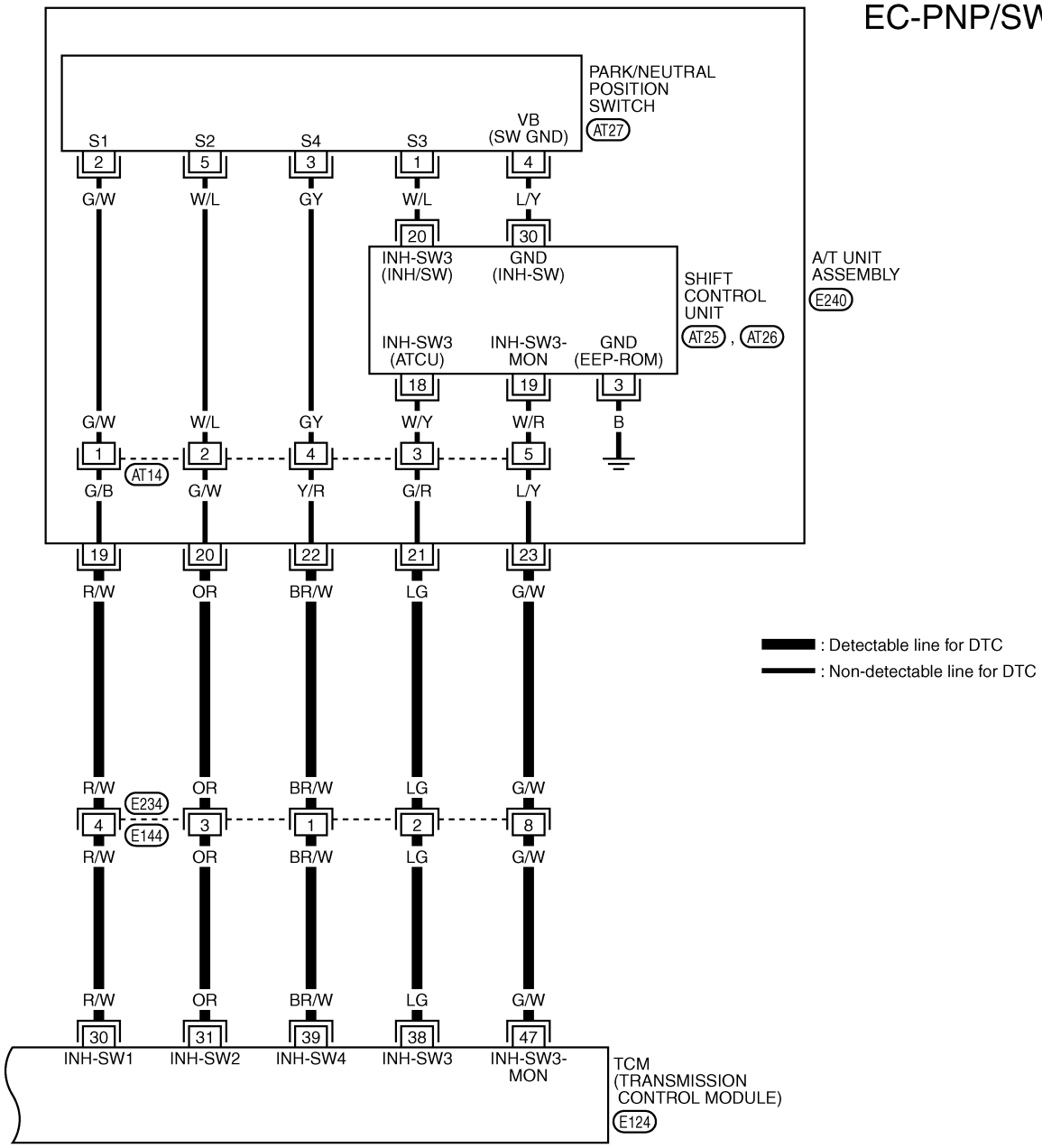


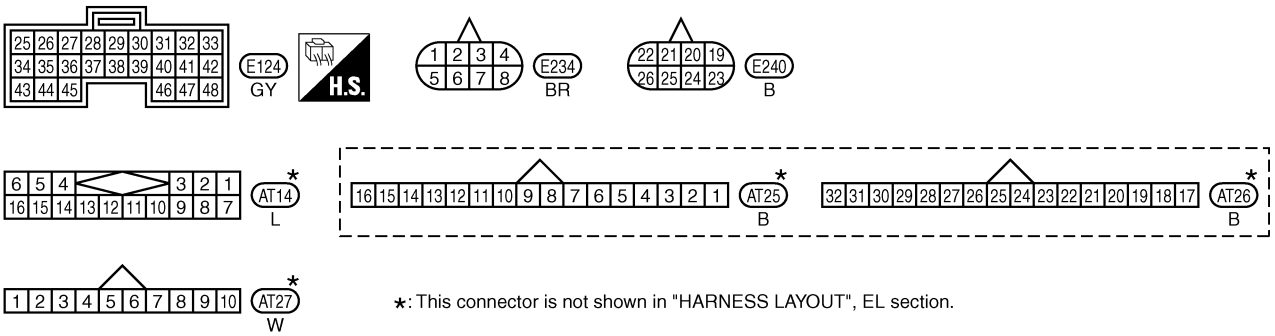




Refer to last page (Foldout page).
M21 , E127

## Wiring Diagram (Cont'd)

EC-PNP/SW-02




*: This connector is not shown in "HARNESS LAYOUT", EL section.

TEC421M

## Wiring Diagram (Cont'd)

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.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 80 | R/PU | PNP switch | Ignition switch "ON"<br>└ Shift lever position is "P" or "N". | Approximately 0V |
| | | | Ignition switch "ON"<br>└ Except the above gear position | BATTERY VOLTAGE (11 - 14V) |

## Diagnostic Procedure

| 1 | INSPECTION START |
|---|---|
| Do you have CONSULT-II?<br>**Yes or No** | |
| Yes ► | GO TO 2. |
| No ► | GO TO 3. |

| 2 | CHECK PNP SWITCH SIGNAL |
|---|---|

1. Turn ignition switch "ON".
2. Select "A/T", then "DATA MONITOR" mode while CONSULT-II.
3. Select "P/N POSI SW" signal and check its indication under the following conditions.

| DATA MONITOR | |
|---|---|
| MONITORING | NO DTC |
| P/N POSI SW | ON |

PBIB0102E

| Condition (Gear position) | P/N POSI SW |
|---|---|
| "P" or "N" position | ON |
| Other positions | OFF |

MTBL1597

**OK or NG**

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

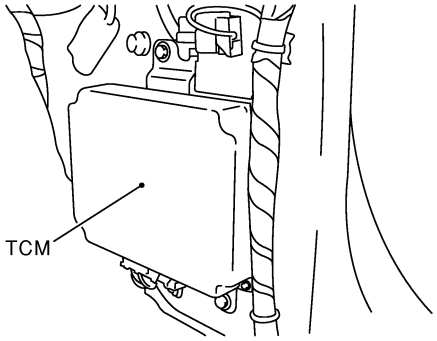
## Diagnostic Procedure (Cont'd)

| 3 | CHECK PNP SWITCH SIGNAL |
|---|---|
| Confirm that the PNP switch signal is sent to TCM correctly.<br>Refer to AT section. | |
| **OK or NG** | |
| OK ▶ | GO TO 5. |
| NG ▶ | GO TO 4. |

| 4 | CHECK PNP SWITCH CIRCUIT |
|---|---|
| Check the PNP switch circuit.<br>Refer to AT section. | |
| ▶ | **INSPECTION END** |

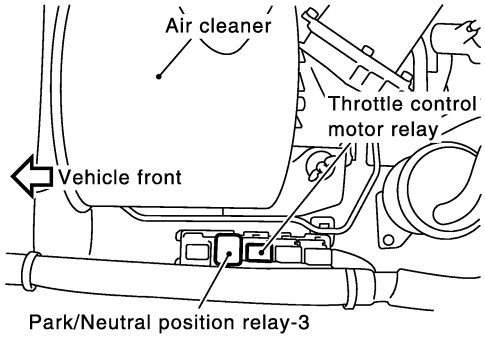
**5 CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I**

1. Turn ignition switch "OFF".
2. Disconnect TCM harness connector.




SEC298D

3. Disconnect park/neutral position relay-3 harness connector.




SEC185D

4. Check harness continuity between TCM terminal 48 and park/neutral position relay-3 terminal 2. Refer to Wiring Diagram.
   **Continuity should exist.**
5. 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. |

## Diagnostic Procedure (Cont'd)

| 6 | CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II |
|---|---|
| 1. Check harness continuity between park/neutral position relay-3 terminal 1, 6 and ground.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to power.<br>**OK or NG** | |
| OK ▶ | GO TO 7. |
| NG ▶ | Repair open circuit or short to power in harness or connectors. |

| 7 | CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-III |
|---|---|
| 1. Disconnect ECM harness connector.<br>2. Check harness continuity between ECM terminal 80 and park/neutral position relay-3 terminal 7.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>3. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ▶ | GO TO 9. |
| NG ▶ | GO TO 8. |

| 8 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors F7, M52<br>● Harness connectors M21, E127<br>● Harness for open between ECM and park/neutral position relay-3 | |
| ▶ | Repair open circuit or short to ground or short to power in harness or connectors. |

| 9 | CHECK PARK/NEUTRAL POSITION RELAY-3 |
|---|---|
| Refer to AT section.<br>**OK or NG** | |
| OK ▶ | |
| NG ▶ | |

| 10 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ▶ | **INSPECTION END** |

## Description

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is driving.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| BRAKE SW | ● Ignition switch: ON | Brake pedal: Fully released | OFF |
| | | Brake pedal: Slightly depressed | ON |

## On Board Diagnosis Logic

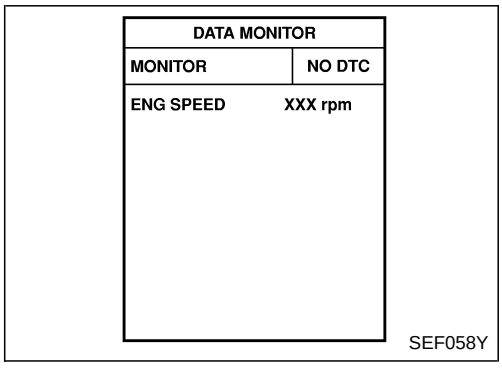
**The MI will not light up for this self-diagnosis.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P1805<br>1805 | Brake switch | A brake switch signal is not sent to ECM for an extremely long time while the vehicle is driving. | ● Harness or connectors (Stop lamp switch circuit is open or shorted.)<br>● Stop lamp switch |

### FALI-SAFE MODE

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

| Engine operating condition in fail-safe mode | |
|---|---|
| ECM controls the electric throttle control actuator by regulating the throttle opening to a small range.<br>Therefore, acceleration will be poor. | |
| Vehicle condition | Driving condition |
| When engine is idling | Normal |
| When accelerating | Poor acceleration |




## DTC Confirmation Procedure

### WITH CONSULT-II

1. Turn ignition switch “ON”.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC with CONSULT-II.
4. Select “DATA MONITOR” mode with CONSULT-II.
5. If 1st trip DTC is detected, go to EC-397, “Diagnostic Procedure”.

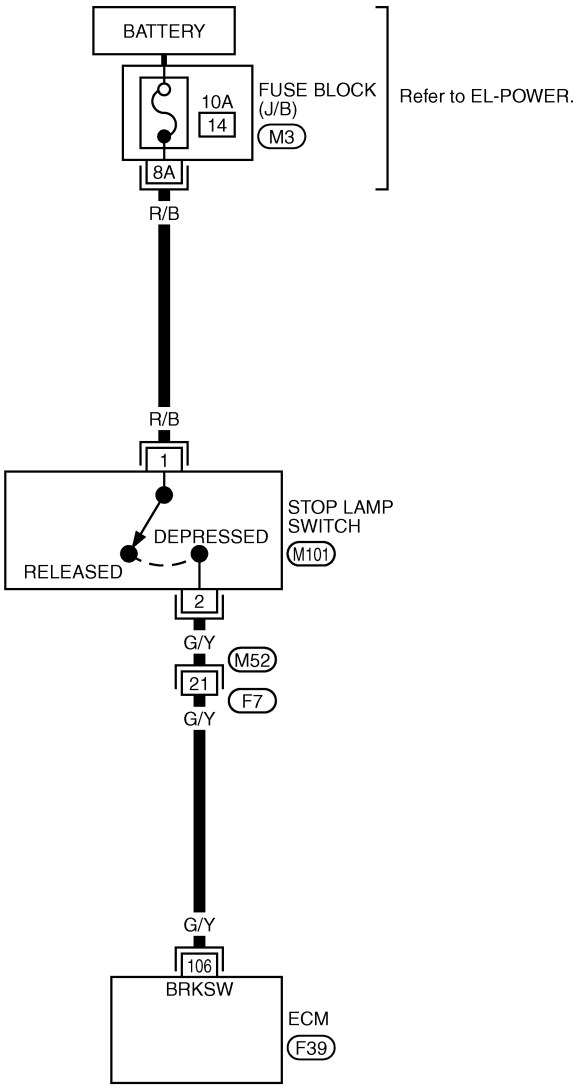
### WITH GST

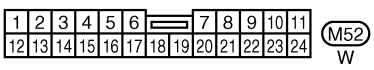
Follow the procedure “WITH CONSULT-II” above.

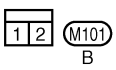
## Wiring Diagram

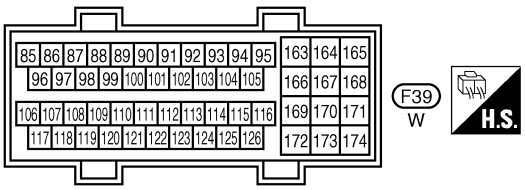
EC-BRK/SW-01

: Detectable line for DTC
: Non-detectable line for DTC




Refer to last page (Foldout page).
M3

TEC249M

## Wiring Diagram (Cont'd)

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.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 106 | G/Y | Stop lamp switch | Engine is running.<br>└ Brake pedal fully released | Approximately 0V |
| | | | Engine is running.<br>└ Brake pedal depressed | BATTERY VOLTAGE (11 - 14V) |

## Diagnostic Procedure

| 1 | CHECK STOP LAMP SWITCH CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Check the stop lamp when depressing and releasing the brake pedal.

| Brake pedal | Stop lamp |
|---|---|
| Fully released | Not illuminated |
| Depressed | Illuminated |

MTBL1593

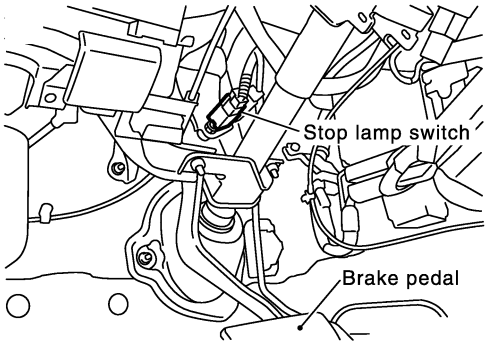
**OK or NG**

| | |
|---|---|
| OK ► | GO TO 4. |
| NG ► | GO TO 2. |

## Diagnostic Procedure (Cont'd)

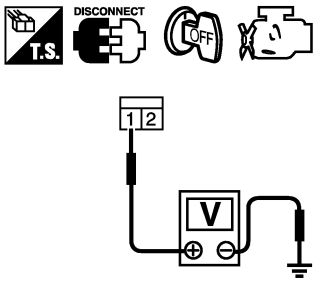
| 2 | CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect stop lamp switch harness connector.




SEC194D

2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-II or tester.




PBIB0117E

**Voltage: Battery voltage**

**OK or NG**

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

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

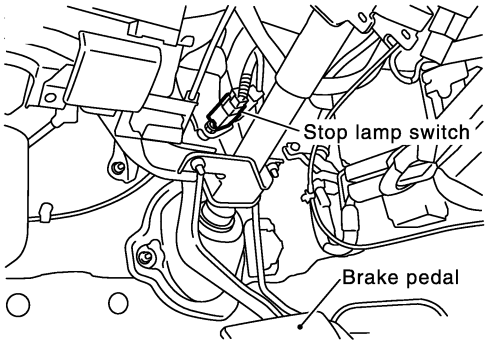
Check the following.
- 10A fuse
- Fuse block (J/B) connector M3
- Harness for open and short between stop lamp switch and battery

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

## Diagnostic Procedure (Cont'd)

| 4 | CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect stop lamp switch harness connector.




SEC194D

4. Check harness continuity between ECM terminal 106 and stop lamp switch terminal 2. Refer to Wiring Diagram.
   **Continuity should exist.**
5. 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 M52, F7
- Harness for open or short between ECM and stop lamp switch

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

| 6 | CHECK STOP LAMP SWITCH |
|---|---|

**Refer to EC-399, "Component Inspection".**

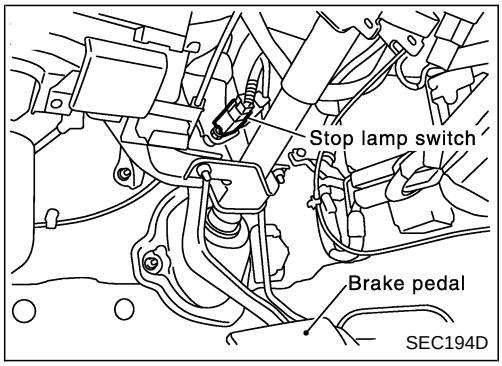
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | Replace stop lamp switch. |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|

**Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**

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

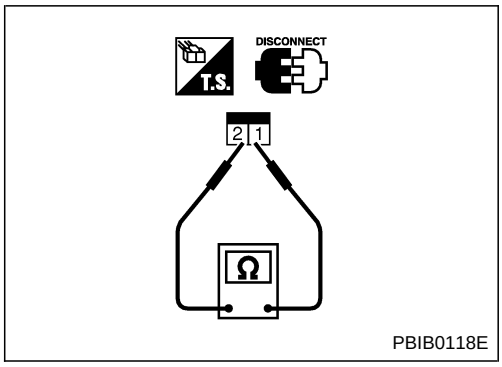



## Component Inspection

### STOP LAMP SWITCH

1. Disconnect stop lamp switch harness connector.

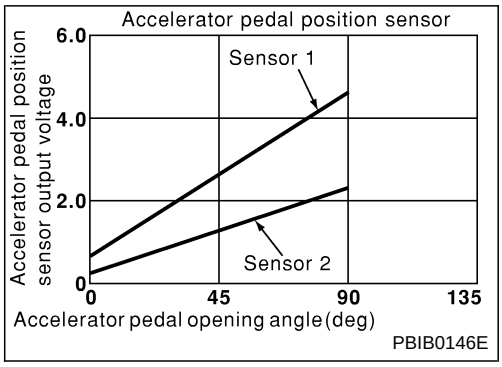
## Component Inspection (Cont'd)




2. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

| Conditions | Continuity |
|---|---|
| Brake pedal fully released | Should not exist. |
| Brake pedal depressed | Should exist. |

If NG, adjust brake pedal installation, refer to BR section, and perform step 2 again.




## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| ACCEL SEN1<br>ACCEL SEN2* | ● Ignition switch: ON (engine stopped)<br>● Shift lever position is “D” | Accelerator pedal: Fully released | More than 0.36V |
| | | Accelerator pedal: Fully depressed | Less than 4.75V |
| CLSD THL POS | ● Ignition switch: ON (engine stopped)<br>● Shift lever position is “D” | Accelerator pedal: Fully released | ON |
| | | Accelerator pedal: Slightly depressed | OFF |

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2122<br>2122 | Accelerator pedal position sensor 1 circuit low input | An excessively low voltage from the APP sensor 1 is sent to ECM. | ● Harness or connectors (The APP sensor 1 circuit is open or shorted.)<br>● Accelerator pedal position sensor (Accelerator pedal position sensor 1) |
| P2123<br>2123 | Accelerator pedal position sensor 1 circuit high input | An excessively high voltage from the APP sensor 1 is sent to ECM. | |

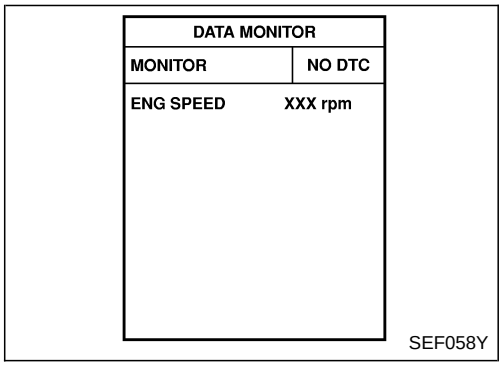
### FAIL-SAFE MODE

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

| Engine operating condition in fail-safe mode |
|---|
| The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

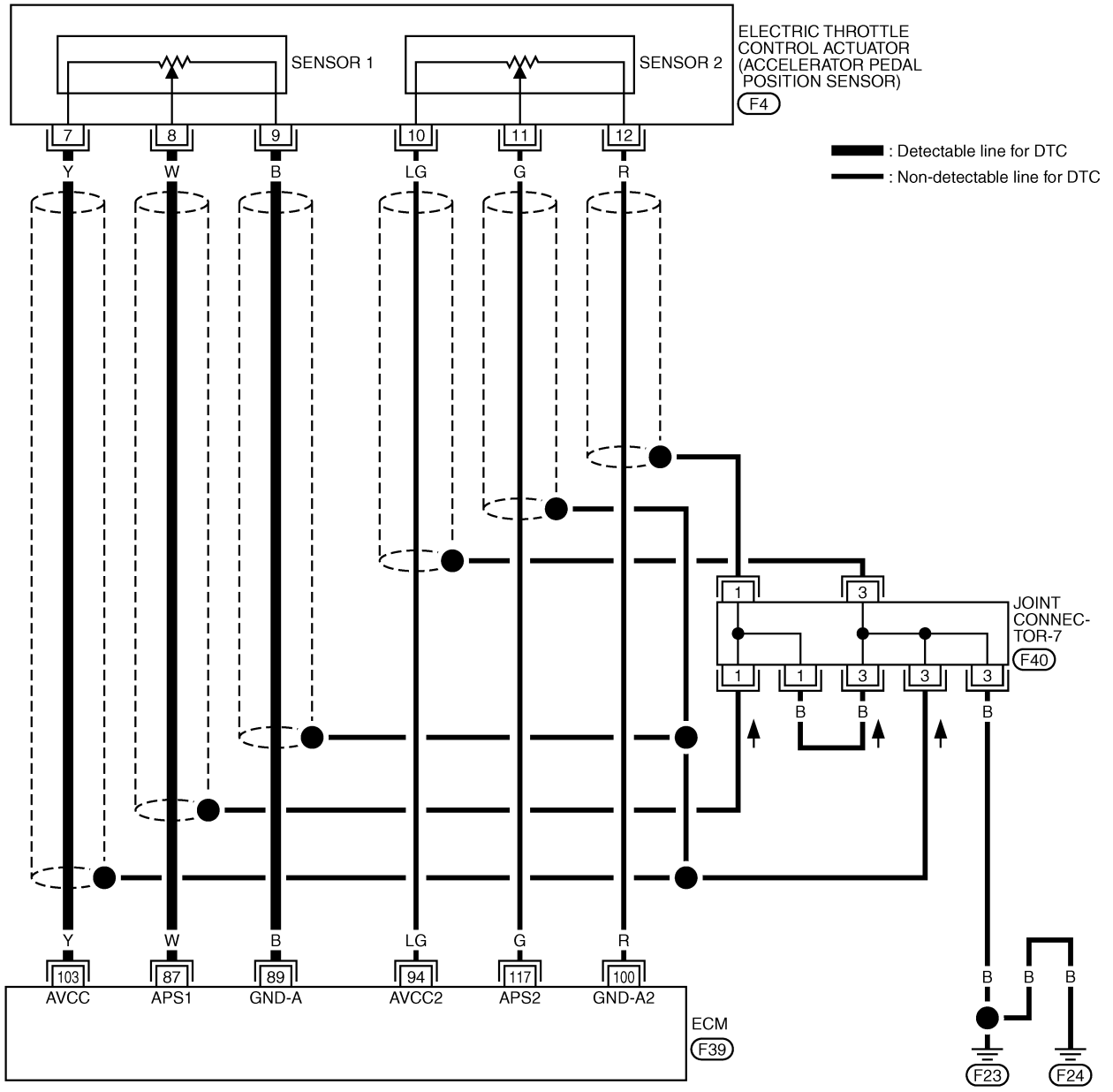
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-405, "Diagnostic Procedure".

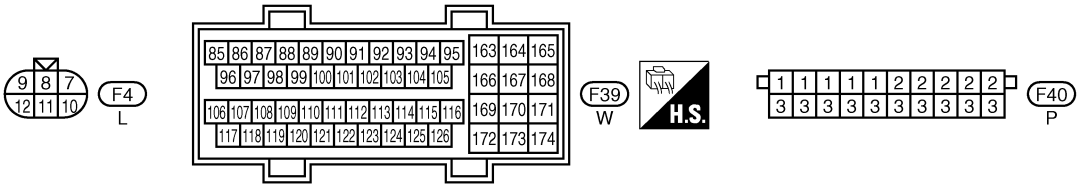
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-APPS1-01




TEC401M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

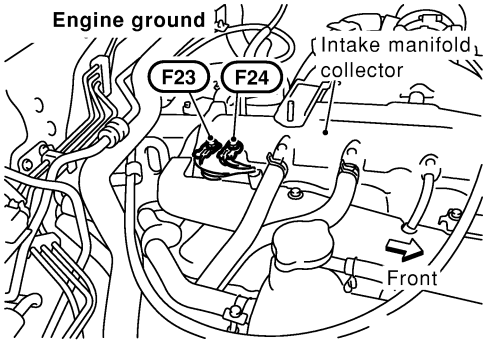
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 87 | W | Accelerator pedal position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |
| 89 | B | Sensor ground (Accelerator pedal position sensor 1) | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | Approximately 0V |
| 94 | LG | Sensor power supply (Accelerator pedal position sensor 2) | Ignition switch "ON" | Approximately 2.5V |
| 100 | R | Sensor ground (Accelerator pedal position sensor 2) | Ignition switch "ON" | Approximately 0V |
| 103 | Y | Sensor power supply (Accelerator pedal position sensor 1) | Ignition switch "ON" | Approximately 5V |
| 117 | G | Accelerator pedal position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.18V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 2.37V |

## Diagnostic Procedure

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

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

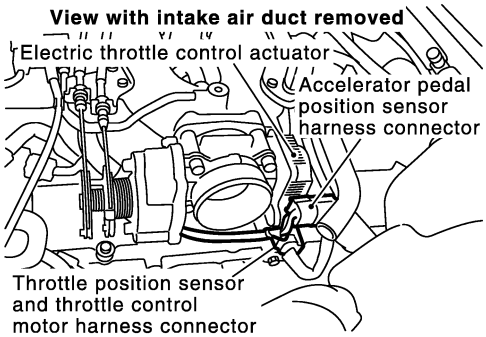



SEC690C

| | |
|---|---|
| ► | GO TO 2. |

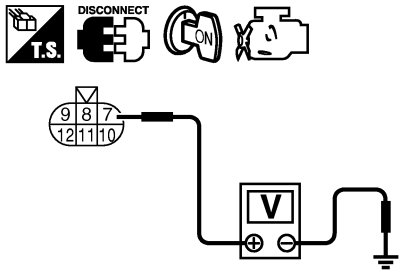
| 2 | CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect accelerator pedal position (APP) sensor harness connector.




SEC182D

2. Turn ignition switch “ON”.
3. Check voltage between APP sensor terminal 7 and ground with CONSULT-II or tester.




SEC673D

**Voltage: Approximately 5V**

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 3 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Disconnect ECM harness connector.<br>3. Check harness continuity between APP sensor terminal 9 and ground.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>4. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 6. |
| NG ► | GO TO 5. |

| 5 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK APP SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Check harness continuity between ECM terminal 87 and APP sensor terminal 8.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 8. |
| NG ► | GO TO 7. |

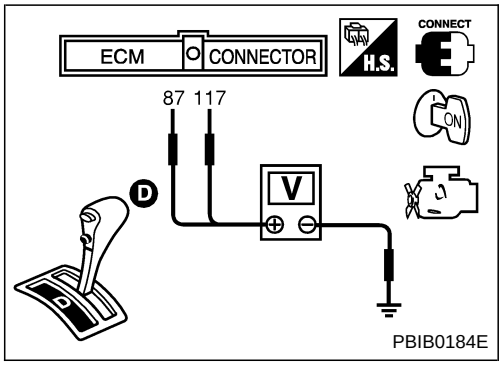
| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK APP SENSOR |
|---|---|
| **Refer to EC-407, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 10. |
| NG ► | GO TO 9. |

| 9 | REPLACE APP SENSOR |
|---|---|
| 1. Replace the accelerator pedal position sensor.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | **INSPECTION END** |

## Diagnostic Procedure (Cont'd)

| | |
|---|---|
| **10** | **CHECK INTERMITTENT INCIDENT** |
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| **►** | **INSPECTION END** |



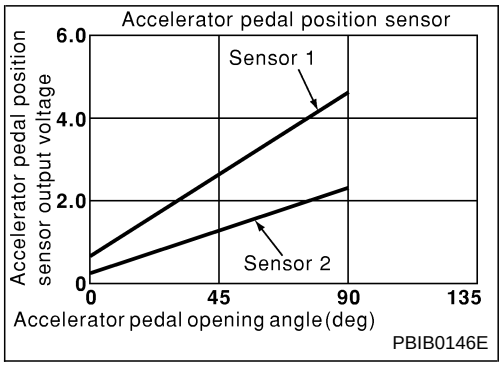

## Component Inspection

### ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminals 87 (APP sensor 1 signal), 117 (APP sensor 2 signal) and engine ground under the following conditions.

| Terminal | Accelerator pedal | Voltage |
|---|---|---|
| 87 (Accelerator pedal position sensor 1) | Fully released | More than 0.36V |
| | Fully depressed | Less than 4.75V |
| 117 (Accelerator pedal position sensor 2) | Fully released | More than 0.18V |
| | Fully depressed | Less than 2.37V |

4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-31, "Accelerator Pedal Released Position Learning".
6. Perform EC-31, "Throttle Valve Closed Position Learning".
7. Perform EC-31, "Idle Air Volume Learning".




## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| ACCEL SEN1<br>ACCEL SEN2* | ● Ignition switch: ON (engine stopped)<br>● Shift lever position is “D” | Accelerator pedal: Fully released | More than 0.36 |
| | | Accelerator pedal: Fully depressed | Less than 4.75V |
| CLSD THL POS | ● Ignition switch: ON (engine stopped)<br>● Shift lever position is “D” | Accelerator pedal: Fully released | ON |
| | | Accelerator pedal: Slightly depressed | OFF |

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

**These self-diagnoses have the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2127<br>2127 | Accelerator pedal position sensor 2 circuit low input | An excessively low voltage from the APP sensor 2 is sent to ECM. | ● Harness or connectors (The APP sensor 2 circuit is open or shorted.)<br>● Accelerator pedal position sensor (Accelerator pedal position sensor 2) |
| P2128<br>2128 | Accelerator pedal position sensor 2 circuit high input | An excessively high voltage from the APP sensor 2 is sent to ECM. | |

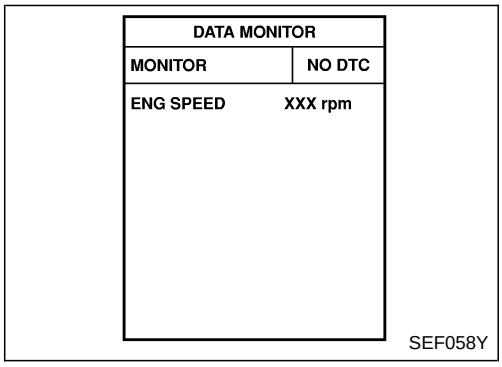
### FAIL-SAFE MODE

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

| Engine operating condition in fail-safe mode |
|---|
| The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

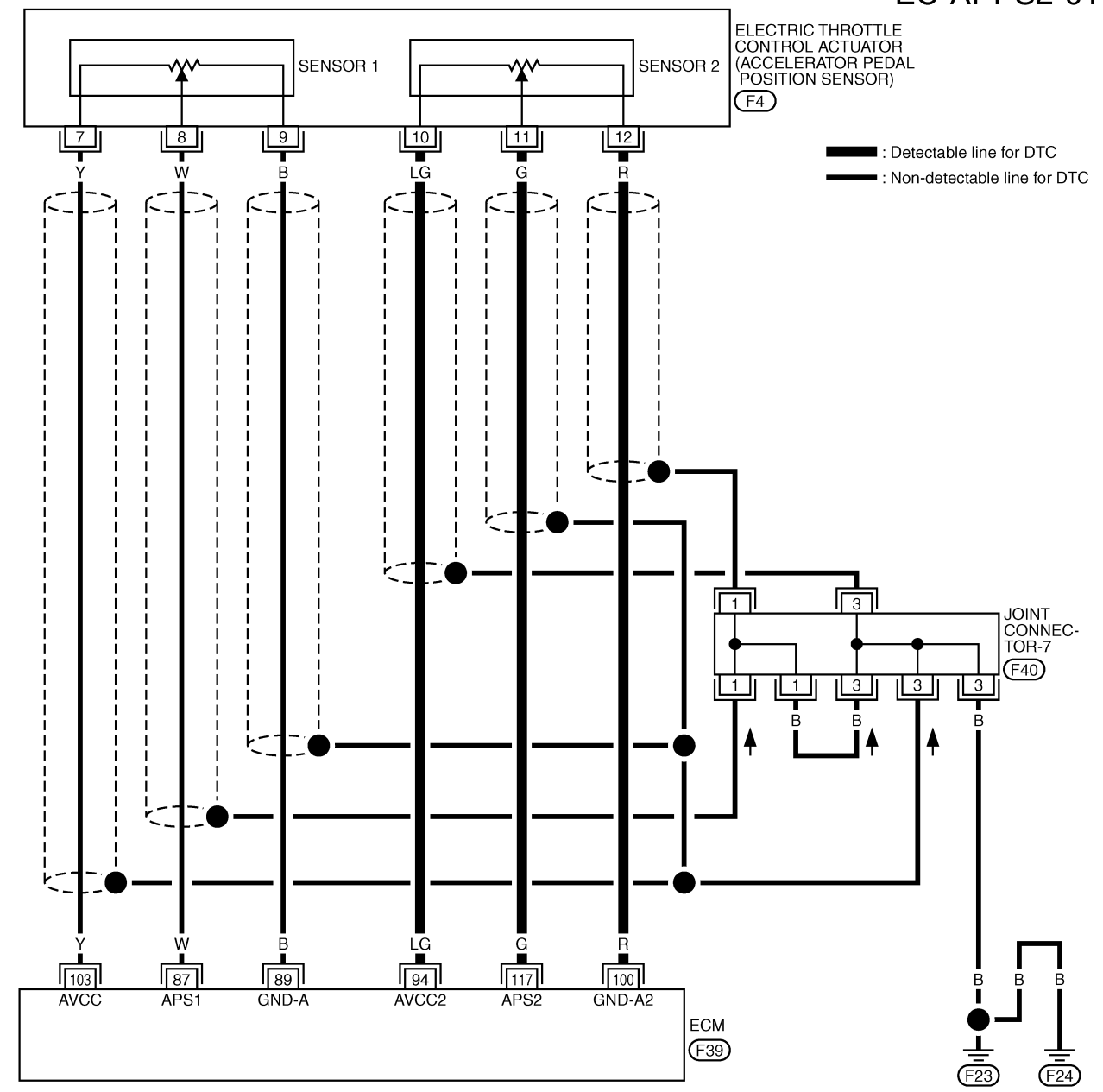
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-411, "Diagnostic Procedure".

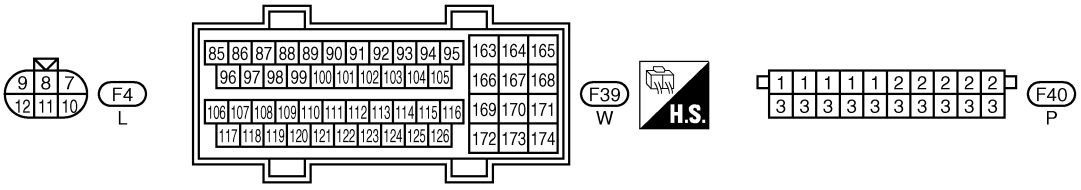
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-APPS2-01




TEC402M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

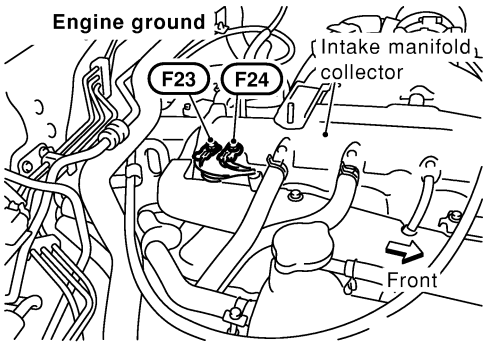
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 87 | W | Accelerator pedal position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |
| 89 | B | Sensors' ground | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | Approximately 0V |
| 94 | LG | Sensor power supply (Accelerator pedal position sensor 2) | Ignition switch "ON" | Approximately 2.5V |
| 100 | R | Sensor ground (Accelerator pedal position sensor 2) | Ignition switch "ON" | Approximately 0V |
| 103 | Y | Sensors' power supply | Ignition switch "ON" | Approximately 5V |
| 117 | G | Accelerator pedal position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.18V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 2.37V |

## Diagnostic Procedure

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

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



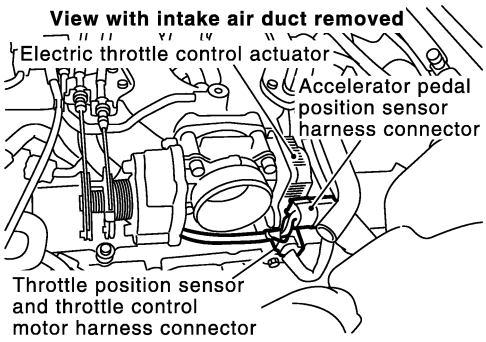

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

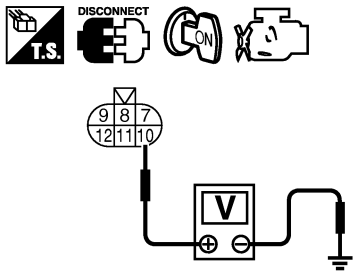
| 2 | CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect accelerator pedal position (APP) sensor harness connector.




SEC182D

2. Turn ignition switch "ON".
3. Check voltage between APP sensor terminal 10 and ground with CONSULT-II or tester.




SEC674D

**Voltage: Approximately 2.5V**

**OK or NG**

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

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

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor

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

| 4 | CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 12 and ground.
   Refer to Wiring Diagram.
   **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. |

## Diagnostic Procedure (Cont'd)

| 5 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

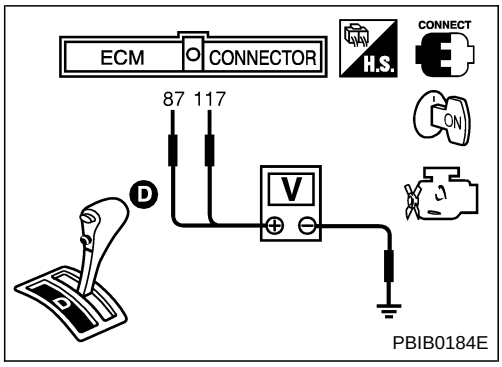
| 6 | CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Check harness continuity between ECM terminal 117 and APP sensor terminal 11. Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 8. |
| NG ► | GO TO 7. |

| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK APP SENSOR |
|---|---|
| **Refer to EC-414, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 10. |
| NG ► | GO TO 9. |

| 9 | REPLACE APP SENSOR |
|---|---|
| 1. Replace the accelerator pedal position sensor.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | **INSPECTION END** |

| 10 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |



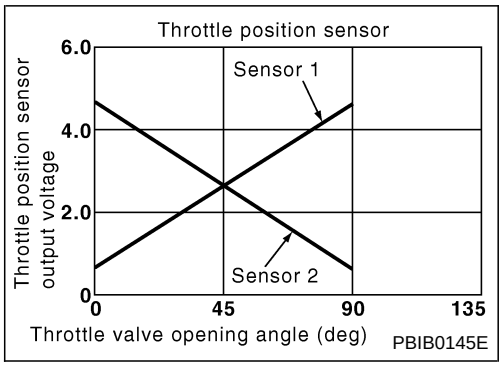

## Component Inspection

### ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 87 (APP sensor 1 signal), 117 (APP sensor 2 signal) and engine ground under the following conditions.

| Terminal | Accelerator pedal | Voltage |
|---|---|---|
| 87 (Accelerator pedal position sensor 1) | Fully released | More than 0.36V |
| | Fully depressed | Less than 4.75V |
| 117 (Accelerator pedal position sensor 2) | Fully released | More than 0.18V |
| | Fully depressed | Less than 2.37V |

4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-31, “Accelerator Pedal Released Position Learning”.
6. Perform EC-31, “Throttle Valve Closed Position Learning”.
7. Perform EC-31, “Idle Air Volume Learning”.




## Component Description

Electric Throttle Control Actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has the two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| THRTL SEN1<br>THRTL SEN2* | ● Ignition switch: ON (Engine stopped)<br>● Shift lever: D | Accelerator pedal: Fully released | More than 0.5V |
| | | Accelerator pedal: Fully depressed | Less than 1.5V |

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

**This self-diagnosis has the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2135<br>2135 | Throttle position sensor circuit range/performance problem | Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2. | ● Harness or connector (The TP sensor 1 and 2 circuit is open or shorted.)<br>● Electric throttle control actuator (TP sensor 1 and 2) |

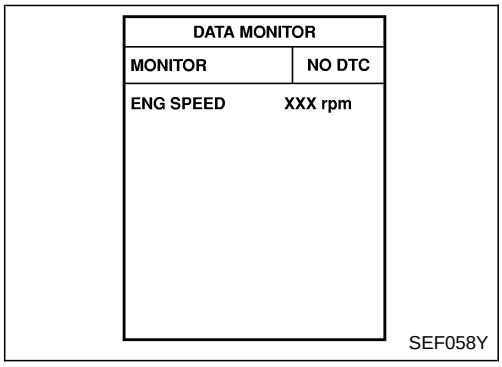
### FAIL-SAFE MODE

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

| Engine operation condition in fail-safe mode |
|---|
| The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

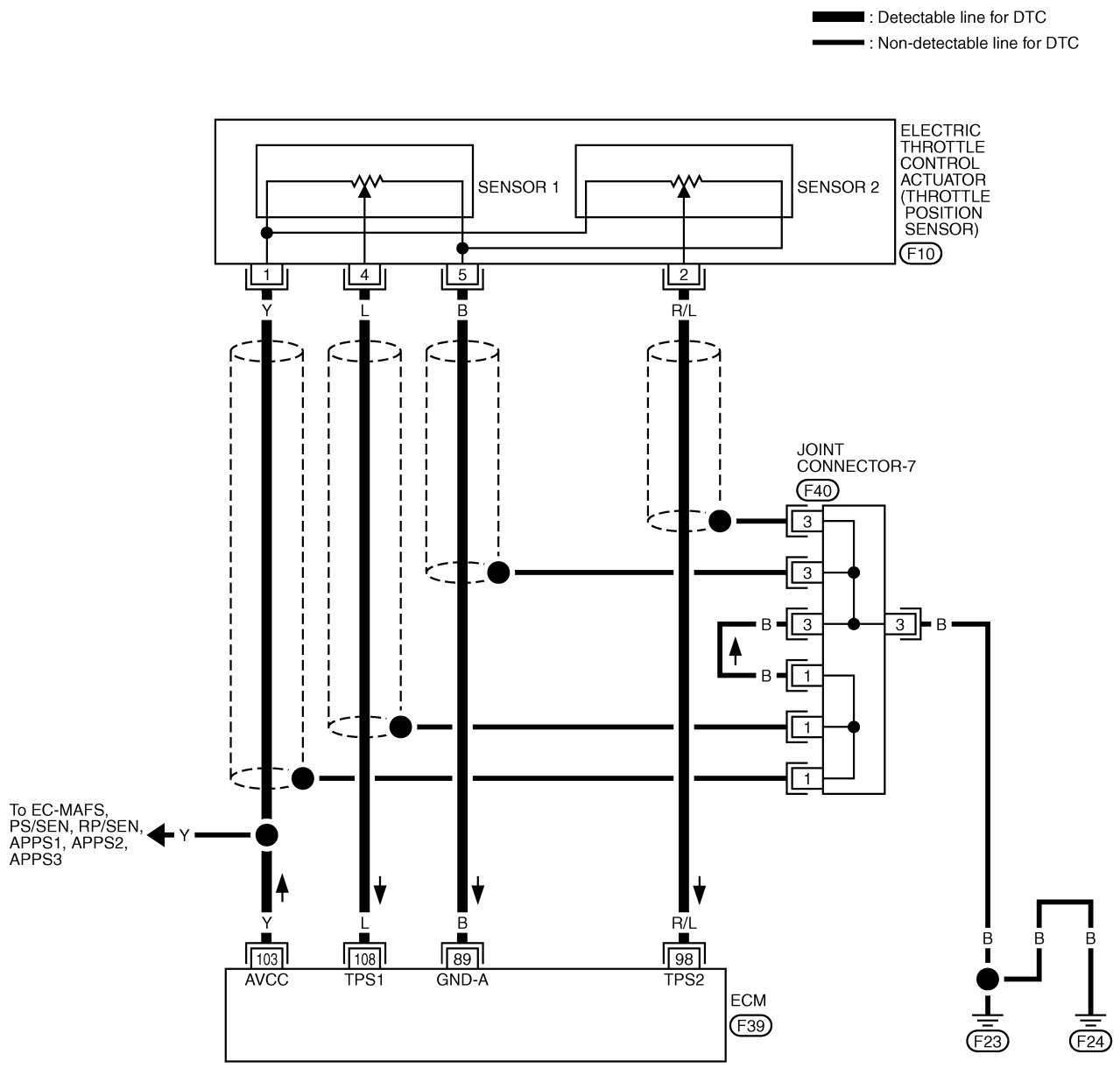
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-418, "Diagnostic Procedure".

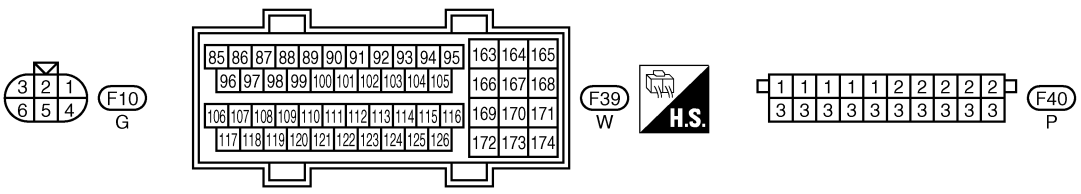
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-TPS3-01




TEC400M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

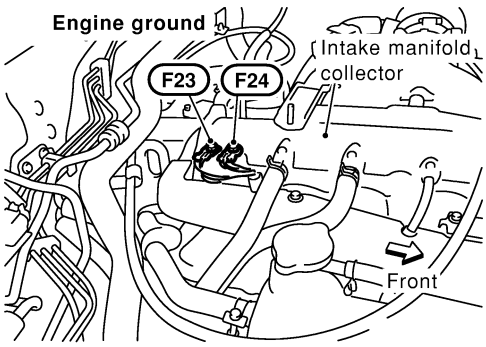
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 89 | B | Sensor ground (Throttle position sensor) | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | Approximately 0V |
| 98 | R/L | Throttle position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | Less than 4.75V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | More than 0.36V |
| 103 | Y | Sensor power supply (Throttle position sensor) | Ignition switch "ON" | Approximately 5V |
| 108 | L | Throttle position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |

## Diagnostic Procedure

**1 RETIGHTEN GROUND SCREWS**

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



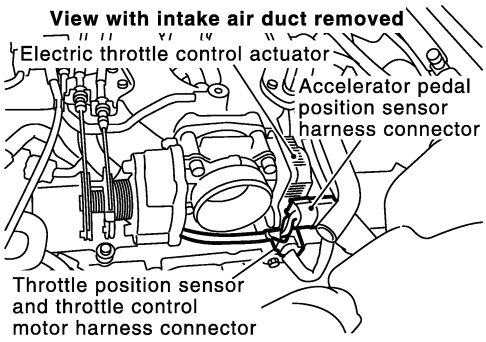

SEC690C

► GO TO 2.

## Diagnostic Procedure (Cont'd)

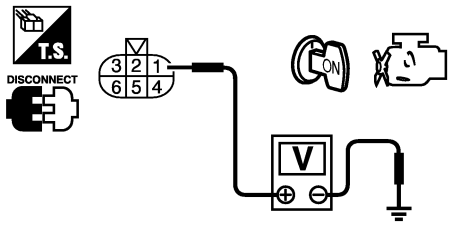
| 2 | CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect electric throttle control actuator harness connector.




SEC182D

2. Turn ignition switch "ON".
3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-II or tester.




PBIB0082E

**Voltage: Approximately 5V**

**OK or NG**

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

| 3 | CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 5 and engine ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 4 | CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Check harness continuity between ECM terminal 108 and electric throttle control actuator terminal 4, ECM terminal 98 and electric throttle control actuator terminal 2.
   Refer to Wiring Diagram.
   **Continuity should exist.**
2. Also check harness for short to ground and short to power.

**OK or NG**

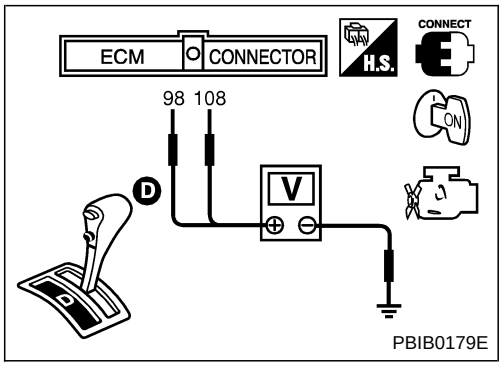
| | | |
|---|---|---|
| OK | ► | GO TO 5. |
| NG | ► | Repair open circuit or short to ground or short to power in harness or connectors. |

## Diagnostic Procedure (Cont'd)

| 5 | CHECK THROTTLE POSITION SENSOR |
|---|---|
| Refer to EC-420, "Component Inspection". | |
| OK or NG | |
| OK ► | GO TO 7. |
| NG ► | GO TO 6. |

| 6 | REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR |
|---|---|
| 1. Replace the electric throttle control actuator.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | INSPECTION END |

| 7 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT". | |
| ► | INSPECTION END |



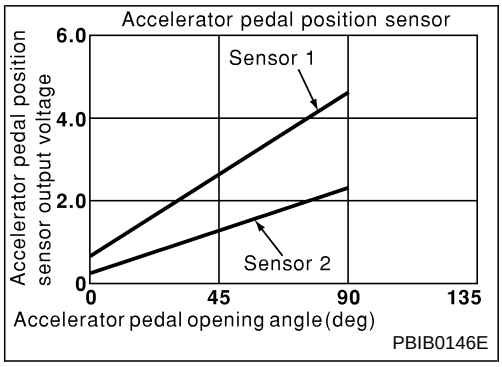

## Component Inspection

### THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-31, "Throttle Valve Closed Position Learning".
3. Turn ignition switch "ON".
4. Set selector lever to "D" position.
5. Check voltage between ECM terminals 108 (TP sensor 1 signal), 98 (TP sensor 2 signal) and engine ground under the following conditions.

| Terminal | Accelerator pedal | Voltage |
|---|---|---|
| 108 (Throttle position sensor 1) | Fully released | More than 0.36V |
| | Fully depressed | Less than 4.75V |
| 98 (Throttle position sensor 2) | Fully released | Less than 4.75V |
| | Fully depressed | More than 0.36V |

6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-31, "Accelerator Pedal Released Position Learning".
8. Perform EC-31, "Throttle Valve Closed Position Learning".
9. Perform EC-31, "Idle Air Volume Learning".




## Component Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| ACCEL SEN1<br>ACCEL SEN2* | ● Ignition switch: ON (engine stopped)<br>● Shift lever position is “D” | Accelerator pedal: Fully released | More than 0.36V |
| | | Accelerator pedal: Fully depressed | Less than 4.75V |
| CLSD THL POS | ● Ignition switch: ON (engine stopped)<br>● Shift lever position is “D” | Accelerator pedal: Fully released | ON |
| | | Accelerator pedal: Slightly depressed | OFF |

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

## On Board Diagnosis Logic

**This self-diagnosis has the one trip detection logic.**

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---|---|---|---|
| P2138<br>2138 | Accelerator pedal position sensor circuit range/ performance problem | Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2. | ● Harness or connector (The APP sensor 1 and 2 circuit is open or shorted.)<br>● Accelerator pedal position sensor 1 and 2 |

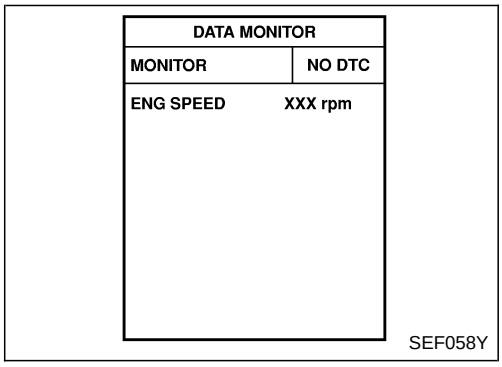
### FAIL-SAFE MODE

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

| Engine operating condition in fail-safe mode |
|---|
| The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.<br>The ECM regulates the opening speed of throttle valve to be slower than the normal condition.<br>So, the acceleration will be poor. |

## DTC Confirmation Procedure

**NOTE:**
**If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.**
**TESTING CONDITION:**
**Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**




### WITH CONSULT-II

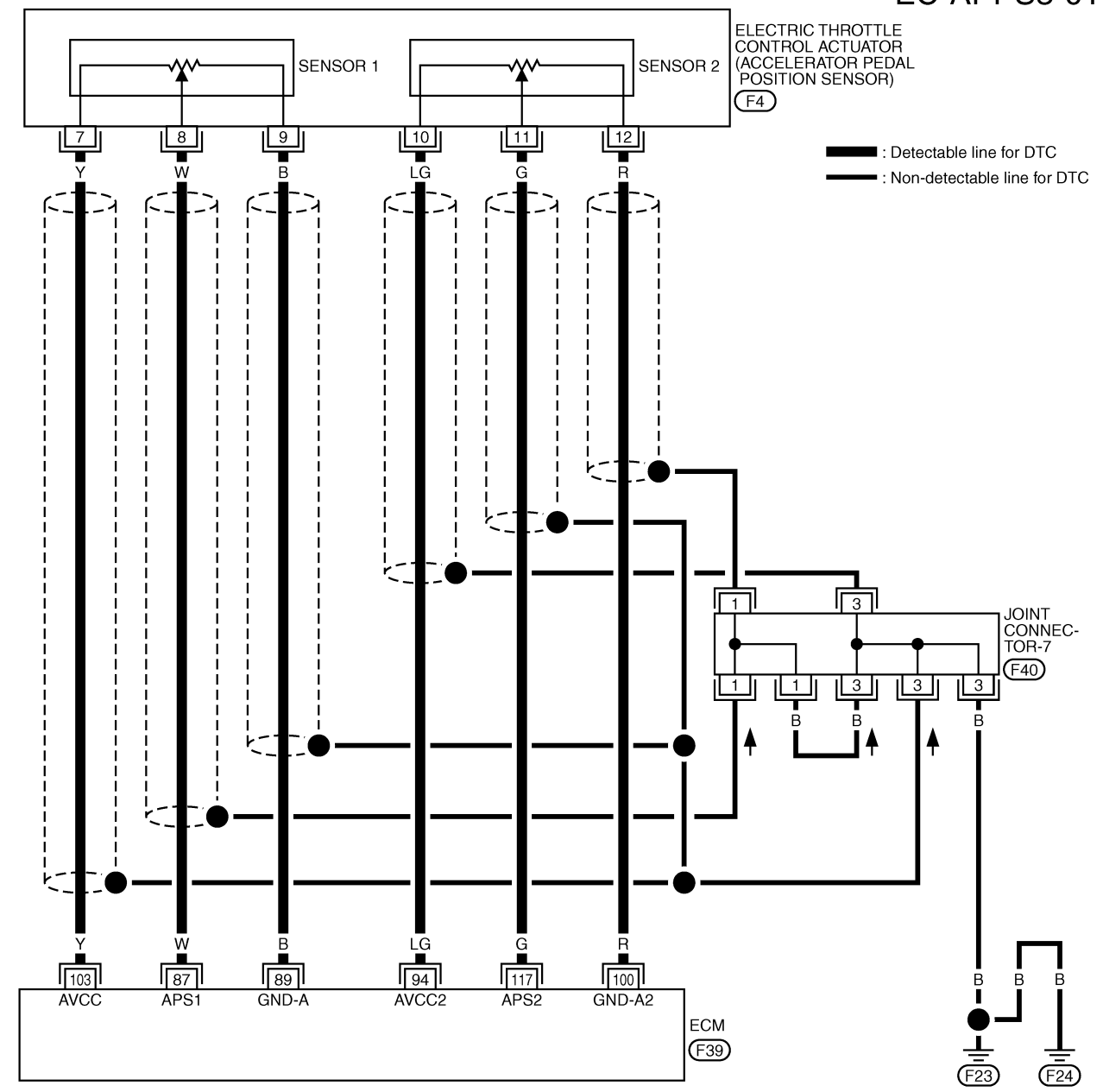
1. Turn ignition switch "ON".
2. Select "DATA MONITOR" mode with CONSULT-II.
3. Start engine and let it idle for 1 second.
4. If DTC is detected, go to EC-425, "Diagnostic Procedure".

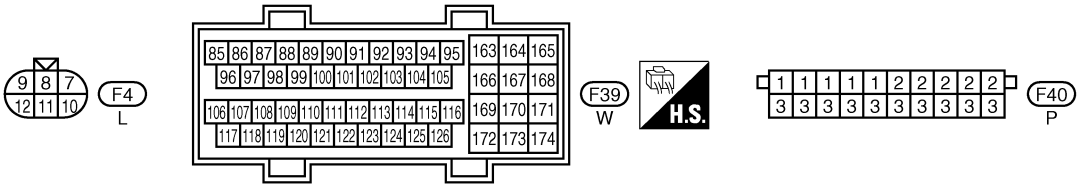
### WITH GST

Follow the procedure "WITH CONSULT-II" above.

## Wiring Diagram

EC-APPS3-01




TEC403M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

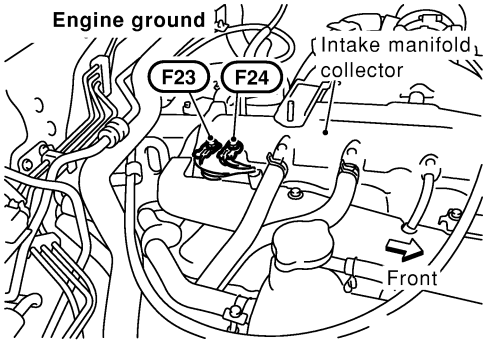
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 87 | W | Accelerator pedal position sensor 1 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.36V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 4.75V |
| 89 | B | Sensor ground (Accelerator pedal position sensor 1) | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | Approximately 0V |
| 94 | LG | Sensor power supply (Accelerator pedal position sensor 2) | Ignition switch "ON" | Approximately 2.5V |
| 100 | R | Sensor ground (Accelerator pedal position sensor 2) | Ignition switch "ON" | Approximately 0V |
| 103 | Y | Sensor power supply (Accelerator pedal position sensor 1) | Ignition switch "ON" | Approximately 5V |
| 117 | G | Accelerator pedal position sensor 2 | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully released | More than 0.18V |
| | | | Ignition switch "ON"<br>— Engine stopped<br>— Shift lever position is "D"<br>— Accelerator pedal fully depressed | Less than 2.37V |

## Diagnostic Procedure

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

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

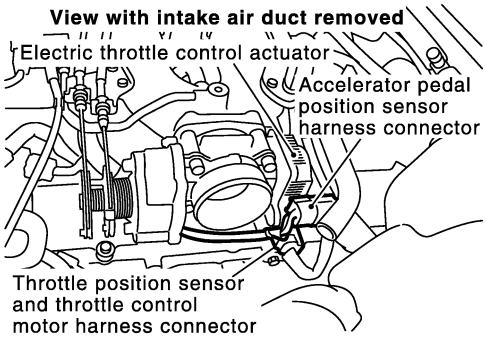



SEC690C

► GO TO 2.

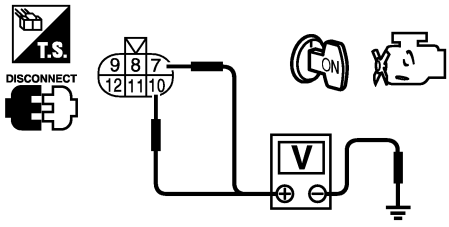
| 2 | CHECK APP SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Disconnect accelerator pedal position (APP) sensor harness connector.




SEC182D

2. Turn ignition switch “ON”.
3. Check voltage between APP sensor terminals 7, 10 and ground with CONSULT-II or tester.




PBIB0084E

**Voltage: Approximately 5V**

**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 3 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 4 | CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Disconnect ECM harness connector.<br>3. Check harness continuity between APP sensor terminals 9, 12 and ground.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>4. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 6. |
| NG ► | GO TO 5. |

| 5 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

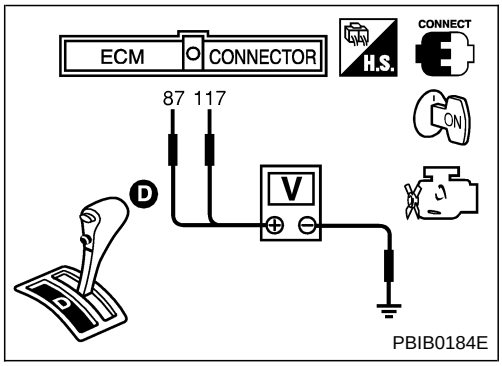
| 6 | CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Check harness continuity between ECM terminal 87 and APP sensor terminal 8, ECM terminal 117 and APP sensor terminal 11.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 8. |
| NG ► | GO TO 7. |

| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness for open or short between ECM and accelerator pedal position sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK APP SENSOR |
|---|---|
| **Refer to EC-427, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 10. |
| NG ► | GO TO 9. |

| 9 | REPLACE APP SENSOR |
|---|---|
| 1. Replace the accelerator pedal position sensor.<br>2. Perform EC-31, "Accelerator Pedal Released Position Learning".<br>3. Perform EC-31, "Throttle Valve Closed Position Learning".<br>4. Perform EC-31, "Idle Air Volume Learning". | |
| ► | **INSPECTION END** |

| 10 | CHECK INTERMITTENT INCIDENT |
|---|---|
| Refer to EC-112, “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”. | |



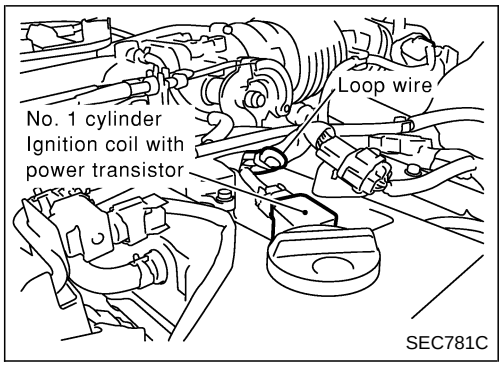

## Component Inspection

### ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch “ON”.
3. Check voltage between ECM terminals 87 (APP sensor 1 signal), 117 (APP sensor 2 signal) and engine ground under the following conditions.

| Terminal | Accelerator pedal | Voltage |
|---|---|---|
| 87 (Accelerator pedal position sensor 1) | Fully released | More than 0.36V |
| | Fully depressed | Less than 4.75V |
| 117 (Accelerator pedal position sensor 2) | Fully released | More than 0.18V |
| | Fully depressed | Less than 2.37V |

4. If NG, replace accelerator pedal assembly and go to the next step.
5. Perform EC-31, “Accelerator Pedal Released Position Learning”.
6. Perform EC-31, “Throttle Valve Closed Position Learning”.
7. Perform EC-31, “Idle Air Volume Learning”.

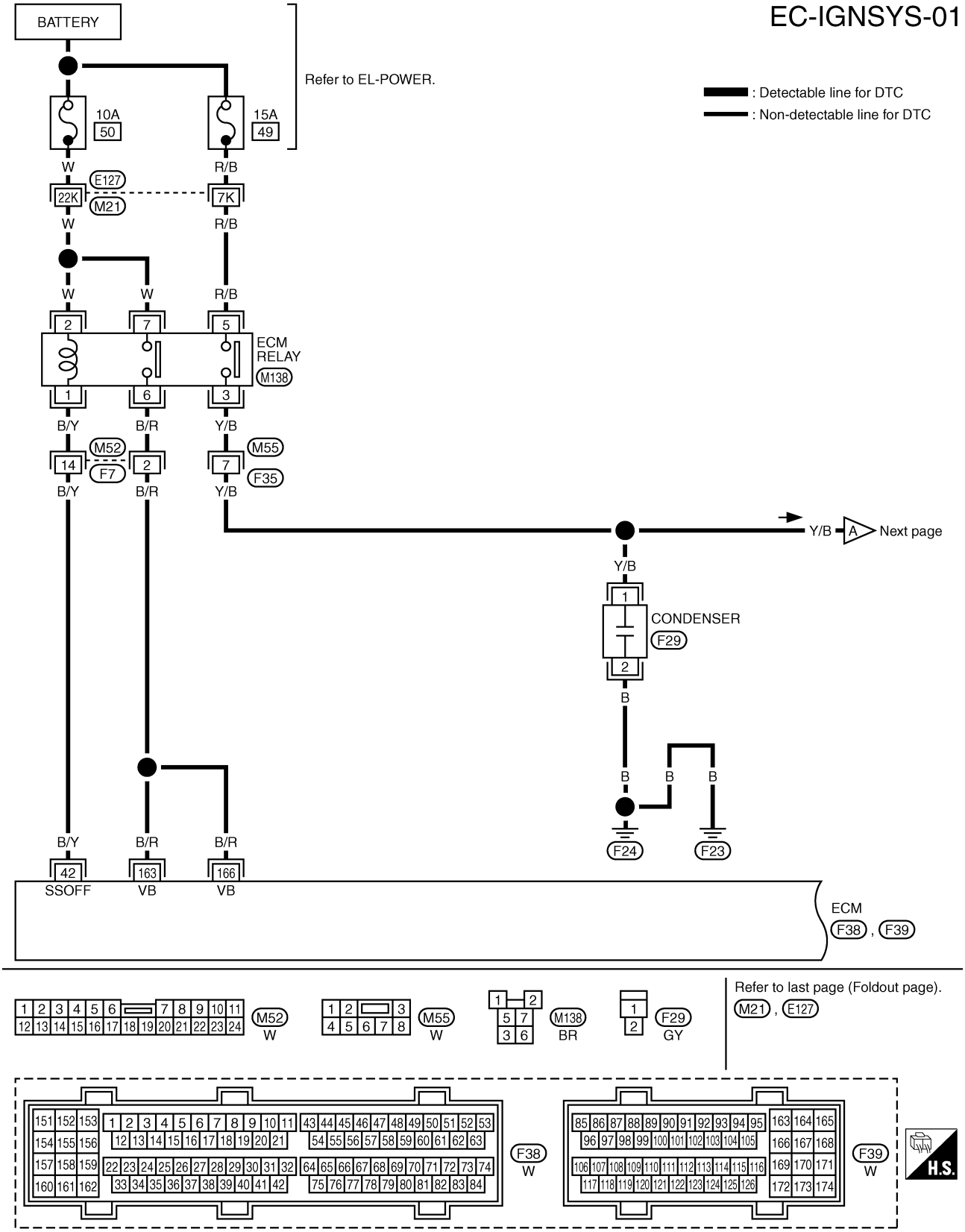



## Component Description

### IGNITION COIL & POWER TRANSISTOR

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

## Wiring Diagram




TEC415M

## Wiring Diagram (Cont'd)

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

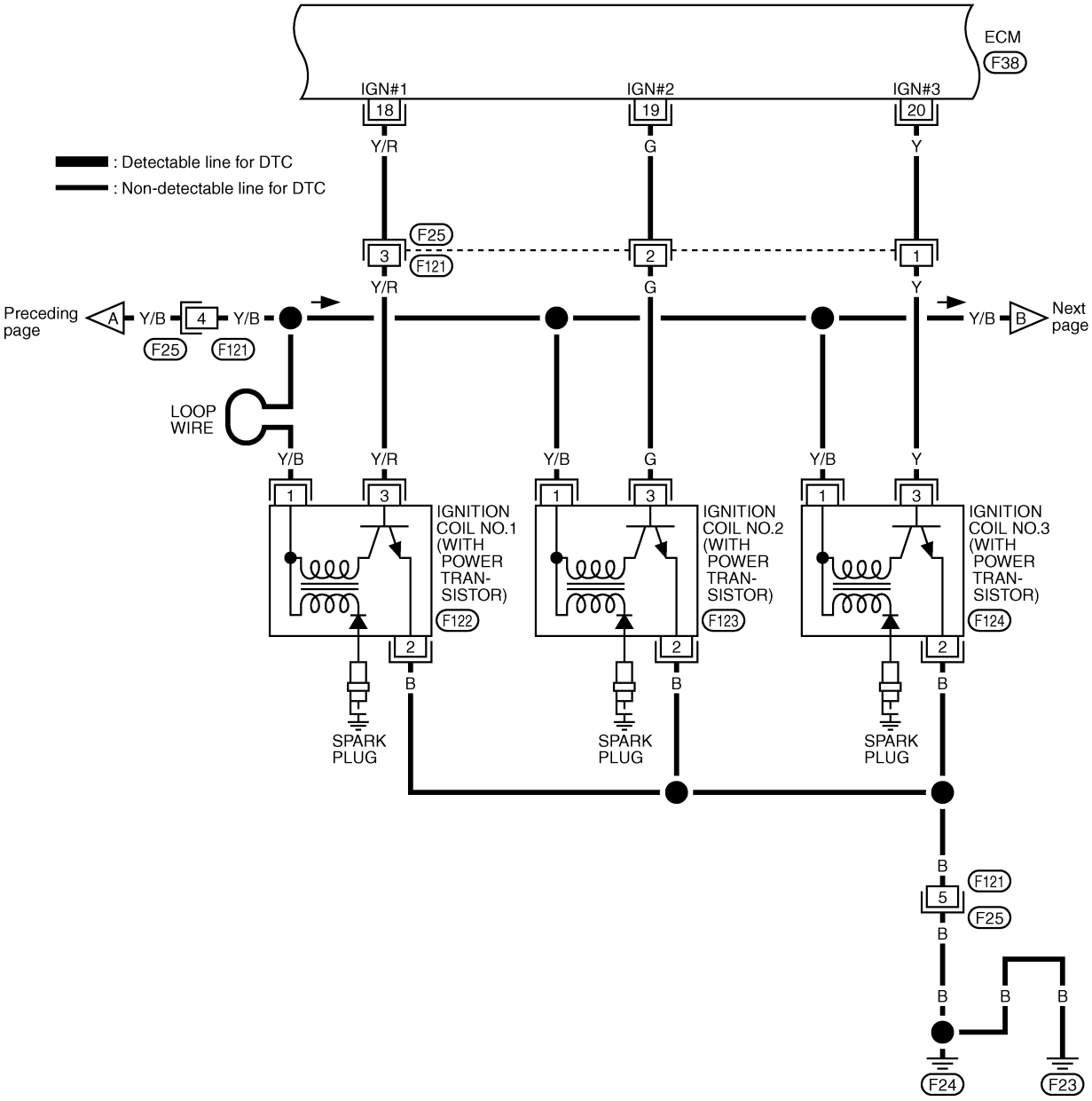
**CAUTION:**

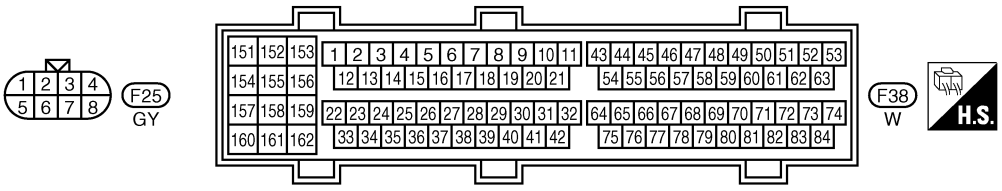
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

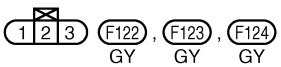
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 42 | B/Y | ECM relay (Self shut-off) | Engine is running.<br>Ignition switch "OFF"<br>└ For a few seconds after turning ignition switch "OFF" | 0 - 1.0V |
| | | | Ignition switch "OFF"<br>└ More than a few seconds passed after turning ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |
| 163<br>166 | B/R<br>B/R | Power supply for ECM | Ignition switch "OFF" | BATTERY VOLTAGE (11 - 14V) |

## Wiring Diagram (Cont'd)

EC-IGNSYS-02



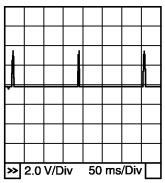
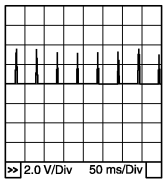

TEC416M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

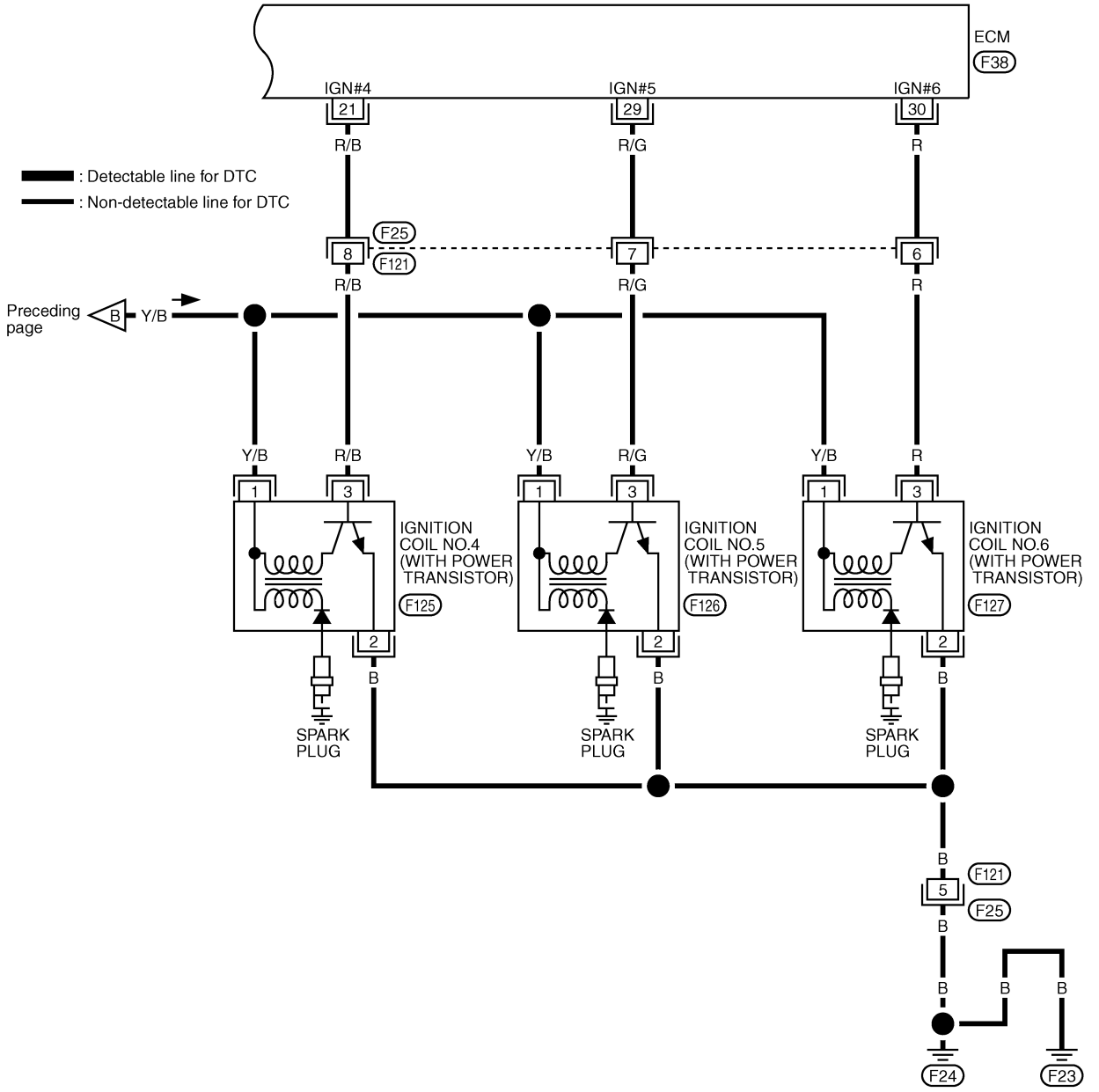
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

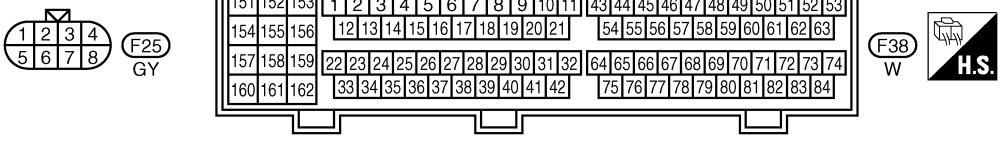
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 18<br>19<br>20 | Y/R<br>G<br>Y | Ignition signal No. 1<br>Ignition signal No. 2<br>Ignition signal No. 3 | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | 0 - 0.1V★<br>  <br><br>PBIB0521E |
| | | | Engine is running.<br>— **Warm-up condition.**<br>— Engine speed is 2,000 rpm | 0 - 0.2V★<br>  <br><br>PBIB0522E |

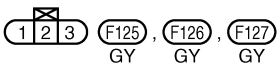
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Wiring Diagram (Cont'd)

EC-IGNSYS-03



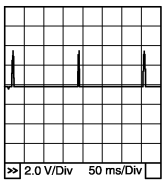
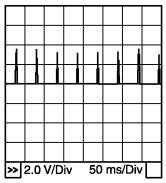

TEC417M

## Wiring Diagram (Cont'd)

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.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 21<br>29<br>30 | R/B<br>R/G<br>R | Ignition signal No. 4<br>Ignition signal No. 5<br>Ignition signal No. 6 | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | 0 - 0.1V★<br>  <br><br>PBIB0521E |
| | | | Engine is running.<br>— **Warm-up condition.**<br>— Engine speed is 2,000 rpm | 0 - 0.2V★<br>  <br><br>PBIB0522E |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

| 1 | CHECK ENGINE START |
|---|---|
| Turn ignition switch “OFF”, and restart engine.<br>**Is engine running?** | |
| **Yes or No** | |
| Yes (With CONSULT-II) ► | GO TO 2. |
| Yes (Without CONSULT-II) ► | GO TO 3. |
| No ► | GO TO 4. |

| 2 | CHECK OVERALL FUNCTION |
|---|---|

**With CONSULT-II**

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Make sure that each circuit produces a momentary engine speed drop.

| ACTIVE TEST | |
|---|---|
| POWER BALANCE | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| MAS A/F SE-B1 | XXX V |
| | |
| | |
| | |
| | |
| | |

PBIB0133E

**OK or NG**

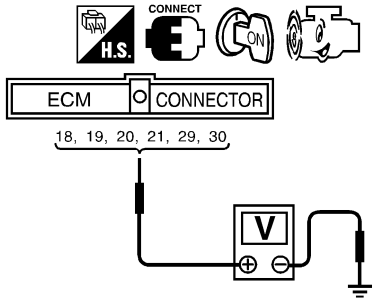
| | |
|---|---|
| OK ► | **INSPECTION END** |
| NG ► | GO TO 13. |

## Diagnostic Procedure (Cont'd)

| 3 | CHECK OVERALL FUNCTION |
|---|---|

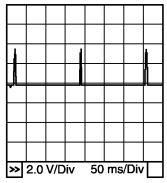
**Without CONSULT-II**

1. Let engine idle.
2. Read the voltage signal between ECM terminals 18, 19, 20, 21, 29, 30 and ground with an oscilloscope.




SEC828C

3. Verify that the oscilloscope screen shows the signal wave as shown below.



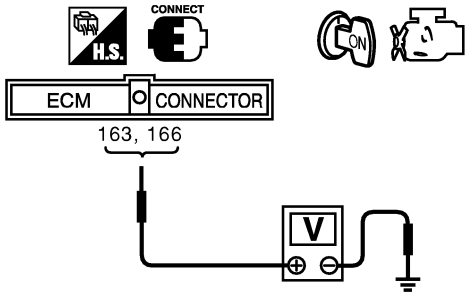

PBIB0521E

**OK or NG**

| | | |
|---|---|---|
| OK | ► | **INSPECTION END** |
| NG | ► | GO TO 13. |

| 4 | CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I |
|---|---|

1. Turn ignition switch "ON".
2. Check voltage between ECM terminals 163, 166 and ground with CONSULT-II or tester.




PBIB0135E

**Voltage: Battery voltage**

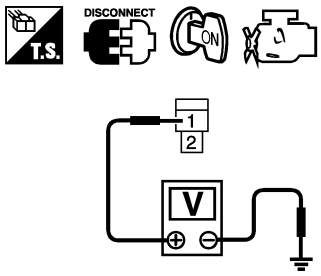
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 5. |
| NG | ► | Go to EC-113, "POWER SUPPLY CIRCUIT FOR ECM". |

## Diagnostic Procedure (Cont'd)

| 5 | CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect condenser harness connector.
3. Turn ignition switch "ON".
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.




PBIB0624E

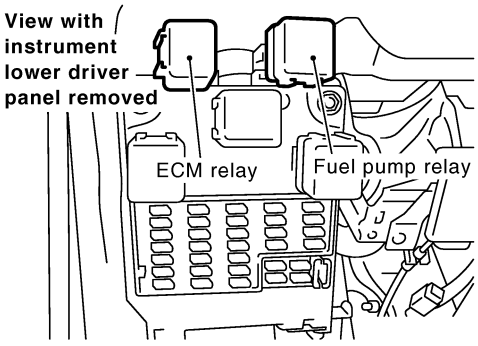
**Voltage: Battery voltage**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 11. |
| NG | ► | GO TO 6. |

| 6 | CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM relay.




SEC668D

3. Check harness continuity between ECM relay terminal 3 and condenser terminal 1.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

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

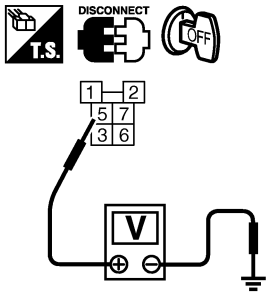
Check the following.
- Harness connectors M55, F35
- Harness for open or short between ECM relay and condenser

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

## Diagnostic Procedure (Cont'd)

| 8 | CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV |
|---|---|

Check voltage between ECM relay terminal 5 and ground with CONSULT-II or tester.




SEC741D

**Voltage: Battery voltage**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 10. |
| NG | ► | GO TO 9. |

| 9 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors E127, M21
- 15A fuse
- Harness for open or short between ECM relay and battery

| | | |
|---|---|---|
| | ► | Repair or replace harness or connectors. |

| 10 | CHECK ECM RELAY |
|---|---|

**Refer to EC-112, "Component Inspection".**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 20. |
| NG | ► | Replace ECM relay. |

| 11 | CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect condenser harness connector.
3. Check harness continuity between condenser terminal 2 and ground.
   Refer to Wiring diagram.
   **Continuity should exist.**
4. Also check harness for short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 12. |
| NG | ► | Repair open circuit or short to power in harness or connector. |

| 12 | CHECK CONDENSER |
|---|---|

**Refer to EC-441, "Component Inspection".**

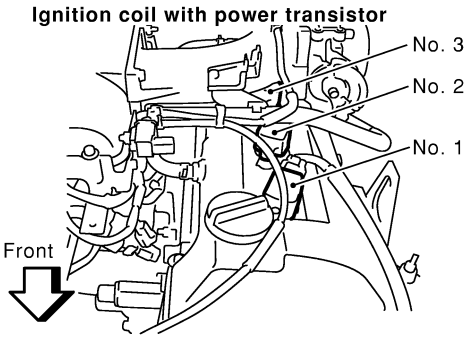
**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 13. |
| NG | ► | Replace condenser. |

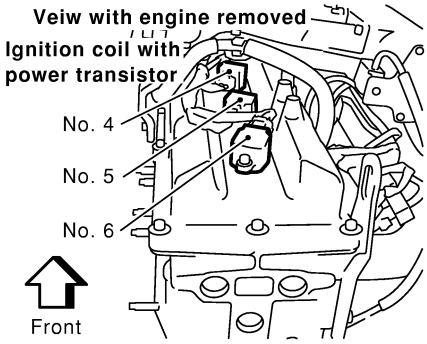
## Diagnostic Procedure (Cont'd)

| 13 | CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V |
|---|---|

1. Turn ignition switch "OFF".
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.

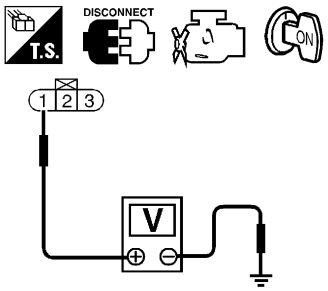



SEC783C




SEC784C

4. Turn ignition switch "ON".
5. Check voltage between ignition coil terminal 1 and ground with CONSULT-II or tester.




SEF107S

**Voltage: Battery voltage**

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 15. |
| NG | ► | GO TO 14. |

| 14 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F25, F121
- Harness for open or short between ignition coil and ECM relay

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

## Diagnostic Procedure (Cont'd)

| 15 | CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Turn ignition switch "OFF".<br>2. Check harness continuity between ignition coil terminal 2 and engine ground.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>3. Also check harness for short to power.<br>**OK or NG** | |
| OK ► | GO TO 17. |
| NG ► | GO TO 16. |

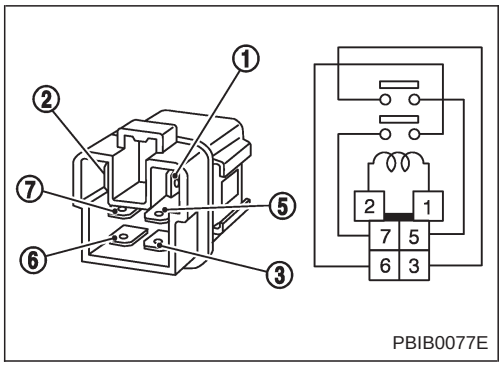
| 16 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors F25, F121<br>● Harness for open or short between ignition coil and ground | |
| ► | Repair open circuit or short to power in harness or connectors. |

| 17 | CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|
| 1. Disconnect ECM harness connector.<br>2. Check harness continuity between ECM terminals 18, 19, 20, 21, 29, 30 and ignition coil terminal 3.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>3. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 19. |
| NG ► | GO TO 18. |

| 18 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors F25, F121<br>● Harness for open or short between ECM and ignition coil | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 19 | CHECK IGNITION COIL WITH POWER TRANSISTOR |
|---|---|
| **Refer to EC-441, "Component Inspection".**<br>**OK or NG** | |
| OK ► | GO TO 20. |
| NG ► | Replace ignition coil with power transistor. |

| 20 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |



PBIB0077E

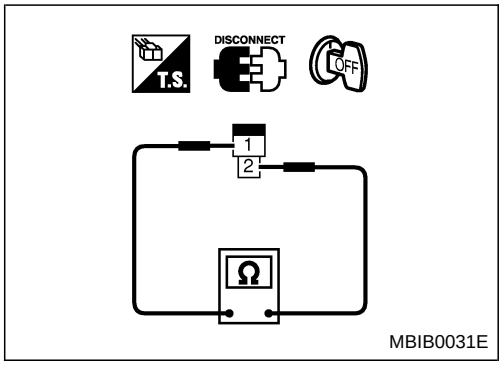
## Component Inspection

### ECM RELAY

1. Apply 12V direct current between ECM relay terminals 1 and 2.
2. Check continuity between relay terminals 3 and 5, 6 and 7.

| Condition | Continuity |
|---|---|
| 12V direct current supply between terminals 1 and 2 | Yes |
| OFF | No |

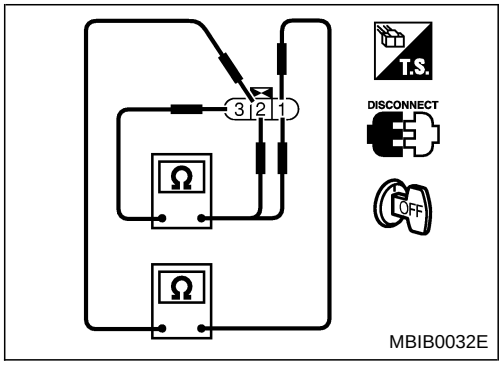
3. If NG, replace ECM relay.



MBIB0031E

### CONDENSER

1. Turn ignition switch “OFF”.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.
   **Resistance: Above 1 MΩ at 25°C (77°F)**

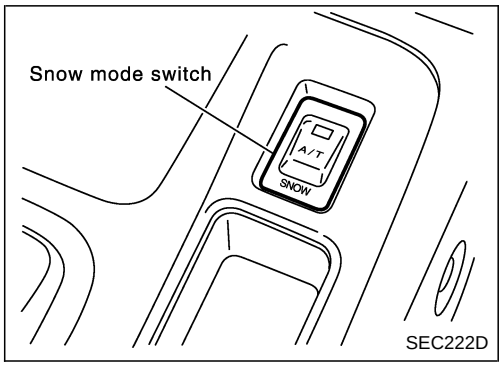


MBIB0032E

### IGNITION COIL WITH POWER TRANSISTOR

1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as follows.

| Terminal No. | Resistance Ω [at 25°C (77°F)] |
|---|---|
| 3 and 1 | Except 0 or ∞ |
| 3 and 2 | Except 0 |
| 1 and 2 | |




## Component Description

To turn on the switch, push the lower side of it. The indicator light of the switch will illuminate and the transmission shifts into the snow driving mode.

- This mode is used for standing starts on slippery (snowy, sandy) roads.
- When the selector lever is in the D position, the transmission shifts from 1st to 5th gear automatically from standing starts or when accelerating from low speed.

## ECM Terminals and Reference Value

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

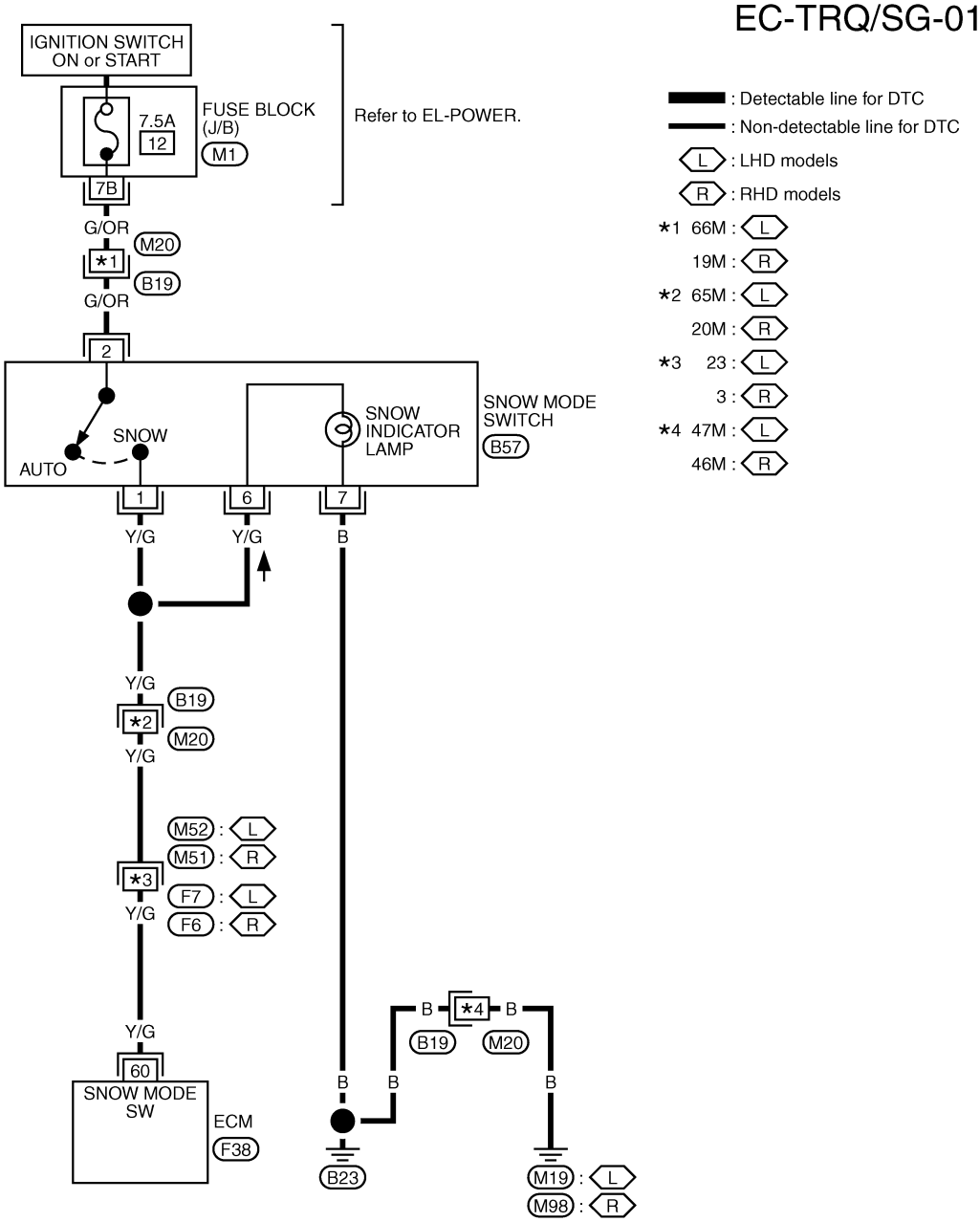
**CAUTION:**

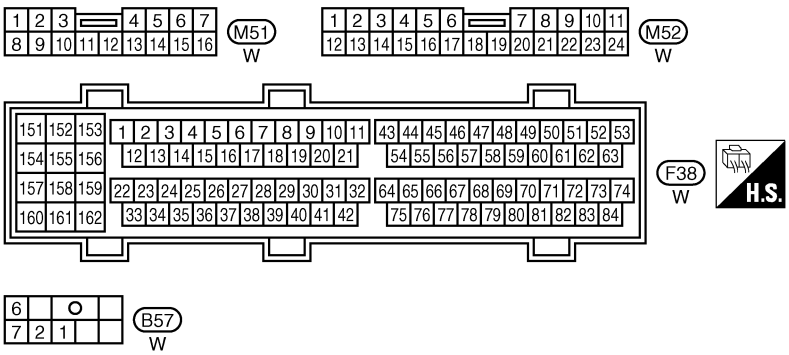
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 60 | Y/G | Snow mode switch | Ignition switch "ON"<br>— Snow mode switch is snow position.<br>└ Snow switch is "ON". | Battery voltage (11 - 14V) |
| | | | Ignition switch "ON"<br>└ Except above switch position | Approximately 0V |

## Wiring Diagram

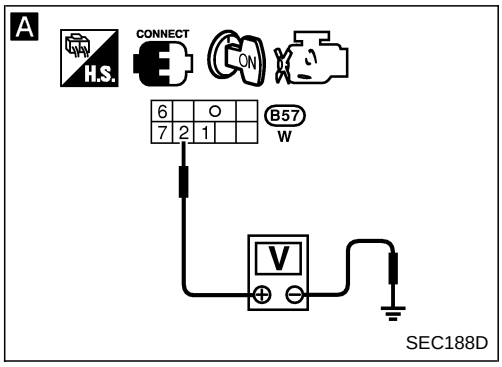
EC-TRQ/SG-01




Refer to last page (Foldout page).
M20 , B19
M1

TEC332M




## Diagnostic Procedure

INSPECTION START

CHECK OVERALL FUNCTION.
1. Turn ignition switch “ON”.
2. Check voltage as follows.

| Snow mode switch | ECM terminal ⑥⓪ voltage |
|---|---|
| AUTO | 0 V |
| SNOW | 11 - 14 V (Battery voltage) |

OK → CHECK SNOW INDICATOR LAMP.
1. Turn ignition switch “ON”.
2. Check snow indicator lamp as follows.

| Snow mode switch | Snow indicator lamp |
|---|---|
| AUTO | OFF |
| SNOW | ON |

NG → Ⓐ

OK → INSPECTION END

NG

A

**CHECK POWER SUPPLY FOR SNOW MODE SWITCH.**
1. Turn ignition switch “OFF”.
2. Disconnect snow mode switch harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between snow mode switch terminal ② and ground.
   **Battery voltage**

NG → Check the following.
- 7.5A fuse
- Harness connectors (M20), (B19)
- Harness for open or short between snow mode switch and fuse.

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

OK

CHECK INPUT SIGNAL CIRCUIT-I.
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between snow mode switch terminal ① and ECM terminal ⑥⓪.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Check harness continuity between ECM terminal ⑥⓪ and snow mode switch terminal ⑥. Refer to wiring diagram.
   **Continuity should exist.**
5. Also check harness for short to ground and short to power.

If OK, reconnect ECM harness connector.

NG → Check the following.
- Harness connector (B19), (M20)
- Harness connector (M52), (F7)
- Harness for open or short between snow mode switch and ECM

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

OK

CHECK GROUND CIRCUIT.
1. Check harness continuity between snow mode switch harness connector terminal ⑦ and ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**

If OK, check harness for short to power.

NG → Check the following.
- Harness connector (B19), (M20)
- Harness for open or short between snow mode switch and ground.

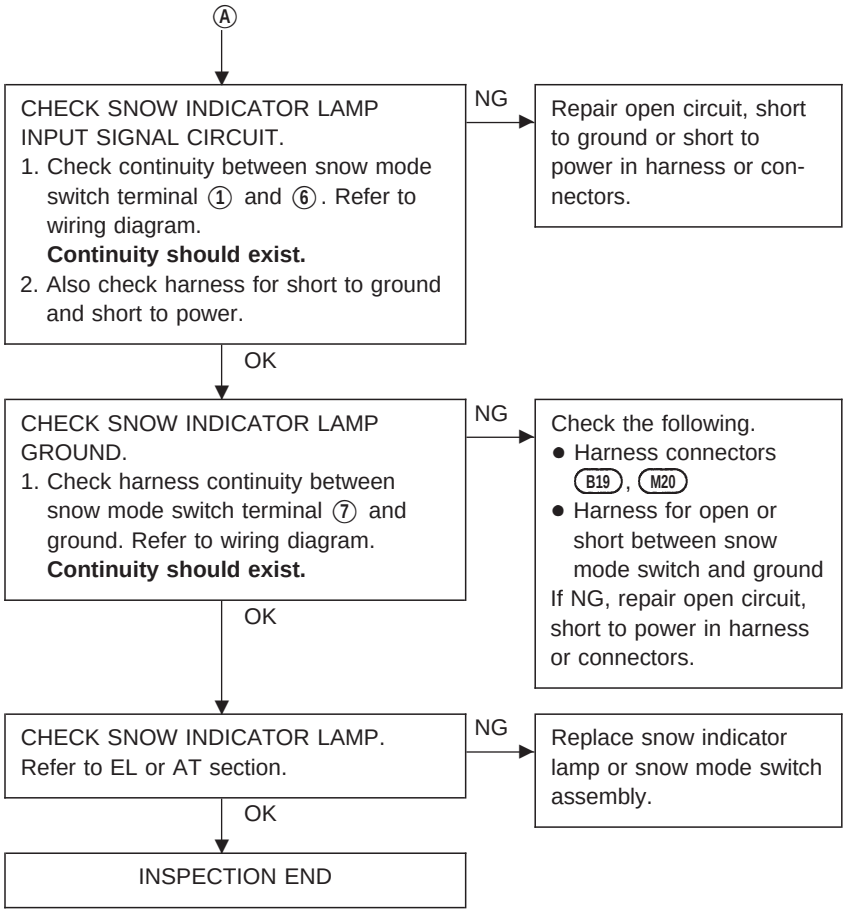
If NG, repair open circuit, short to power in harness or connectors.

OK

CHECK INTERMITTENT INCIDENT.
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-112.

INSPECTION END

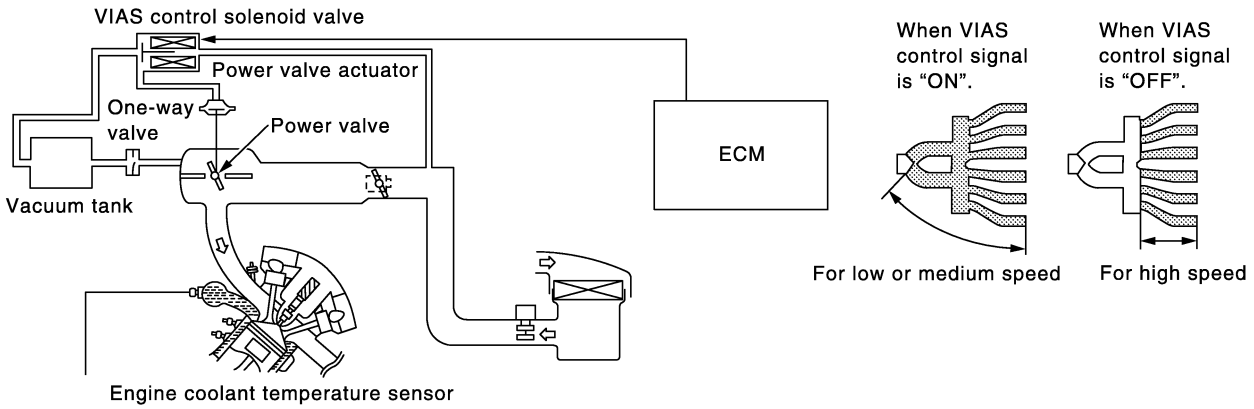
## Diagnostic Procedure (Cont'd)



# Description

## SYSTEM DESCRIPTION

| Sensor | Input Signal to ECM | ECM function | Actuator |
|---|---|---|---|
| Mass air flow sensor | Amount of intake air | VIAS control | VIAS control solenoid valve |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Ignition switch | Start signal | | |
| Camshaft position sensor | Engine speed | | |
| Engine coolant temperature sensor | Engine coolant temperature | | |




SEC802C

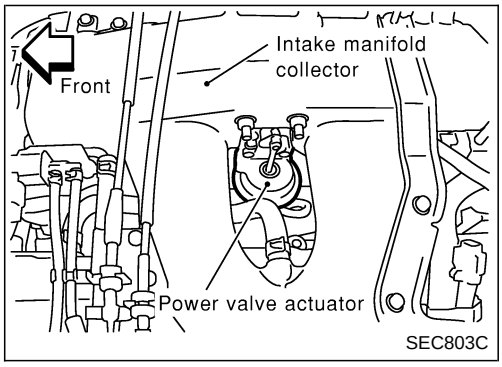
When the engine is running at low or medium speed, the ECM sends the signal to the VIAS control solenoid valve then power valve is fully closed. Under this condition, the effective suction port length is equivalent to the total length of the intake manifold collector’s suction port including the intake valve. This long suction port provides increased air intake which results in improved suction efficiency and higher torque generation.

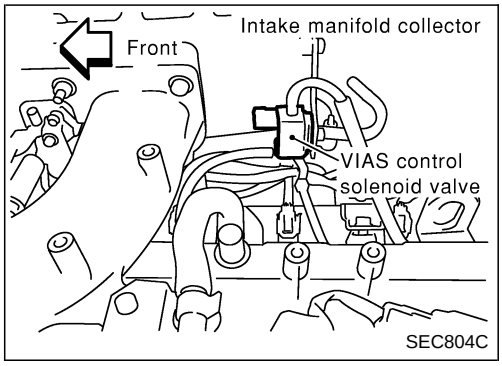
The surge tank and one-way valve are provided. When engine is running at high speed, the ECM does not send the signal to the VIAS control solenoid valve, thus enabling power valve to be fully opened. This signal introduces the intake manifold vacuum into the power valve actuator and therefore opens the power valve to two suction passages together in the collector.

Under this condition, the effective port length is equivalent to the

## Description (Cont'd)

length of the suction port provided independently for each cylinder. This shortened port length results in enhanced engine output with reduced suction resistance under high speeds.




### COMPONENT DESCRIPTION

#### Power valve

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.

#### VIAS control solenoid valve

The VIAS control solenoid valve cuts the intake manifold vacuum signal for power valve control. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is for high speed. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.

## ECM Terminals and Reference Value

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

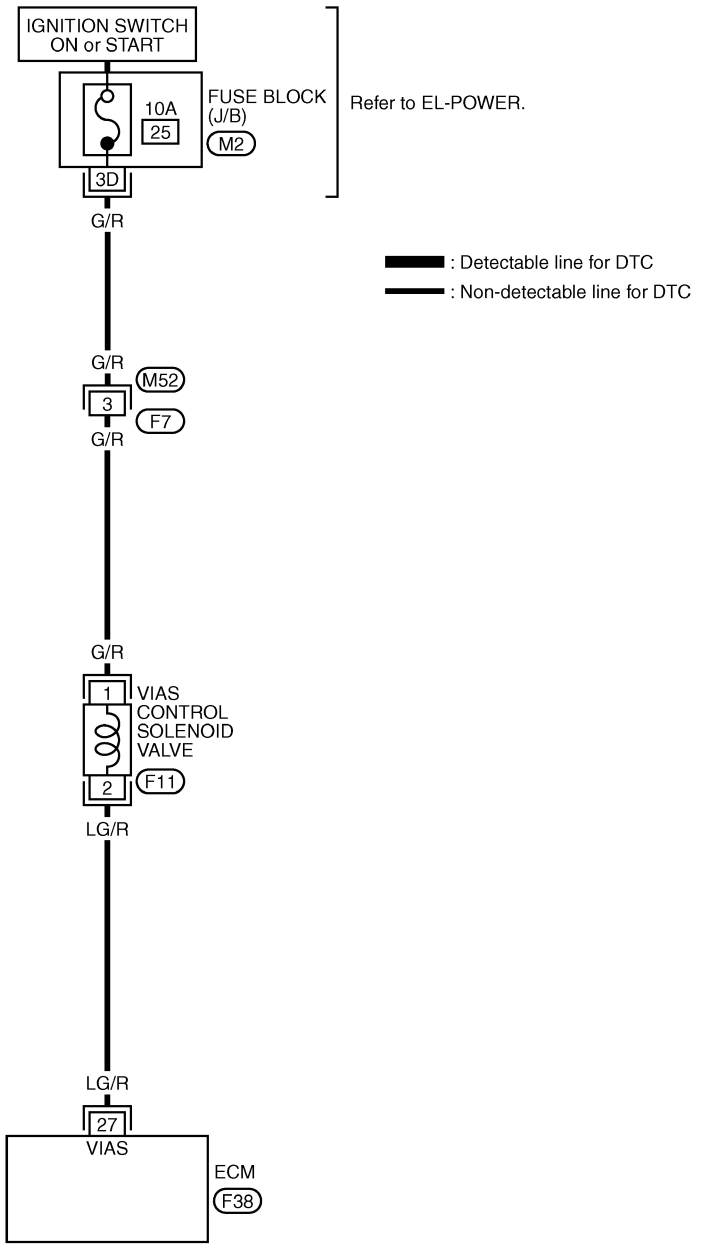
**CAUTION:**

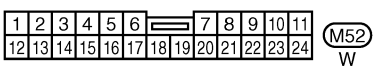
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

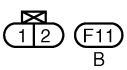
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 27 | LG/R | VIAS control solenoid valve | Engine is running.<br>└ Idle speed | BATTERY VOLTAGE (11 - 14V) |
| | | | Engine is running.<br>└ Engine speed is above 5,000 rpm. | 0 - 1.0V |

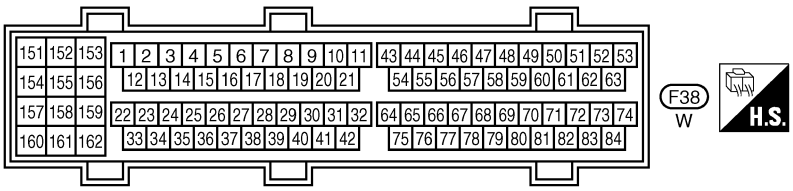
## Wiring Diagram

EC-VIAS/V-01



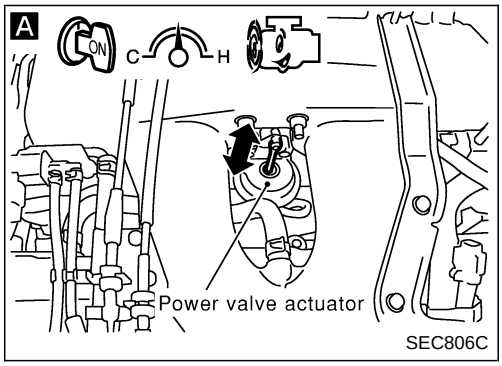

Refer to last page (Foldout page).
M2

TEC161M

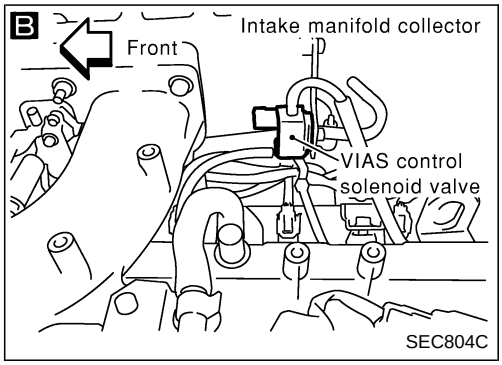
A

| ACTIVE TEST | |
|---|---|
| VIAS SOL VALVE | OFF |
| MONITOR | |
| ENG SPEED | XXX rpm |
| IACV-AAC/V | XXX step |
| | |
| | |
| | |
| | |
| | |

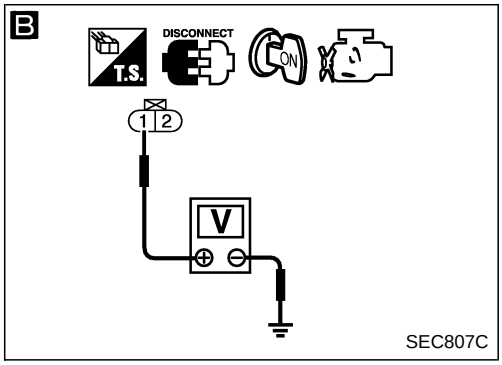
SEC805C




SEC806C




SEC804C




SEC807C

## Diagnostic Procedure

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

**With CONSULT-II**

1. Start engine and warm it up to normal operating temperature.
2. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.
3. Turn VIAS control solenoid valve “ON” and “OFF”, and make sure that power valve actuator rod moves.

**Without CONSULT-II**

1. Start engine and warm it up to normal operating temperature.
2. Rev engine quickly up to above 5,000 rpm and make sure that power valve actuator rod moves.

OK → INSPECTION END

NG ↓

B

**CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT.**

1. Stop engine.
2. Disconnect VIAS control solenoid valve harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between terminal ① and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

NG → Check the following.
- Harness connectors M52, F7
- 10A fuse
- Harness continuity between fuse and VIAS control solenoid valve

If NG, repair harness or connectors.

OK ↓

CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT.

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ㉗ and terminal ②. Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

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

OK ↓

RETEST OVERALL FUNCTION.

1. Reconnect harness connectors disconnected.
2. Perform CHECK OVERALL FUNCTION again.

OK → INSPECTION END

NG ↓

CHECK INTERMITTENT INCIDENT. Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-112.

NG → Repair or replace harness or connectors.

OK ↓

Replace VIAS control solenoid valve as intake manifold collector assembly.

## CONSULT-II Reference Value in Data Monitor Mode

Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| START SIGNAL | ● Ignition switch: ON → START → ON | OFF → ON → OFF |

## ECM Terminals and Reference Value

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

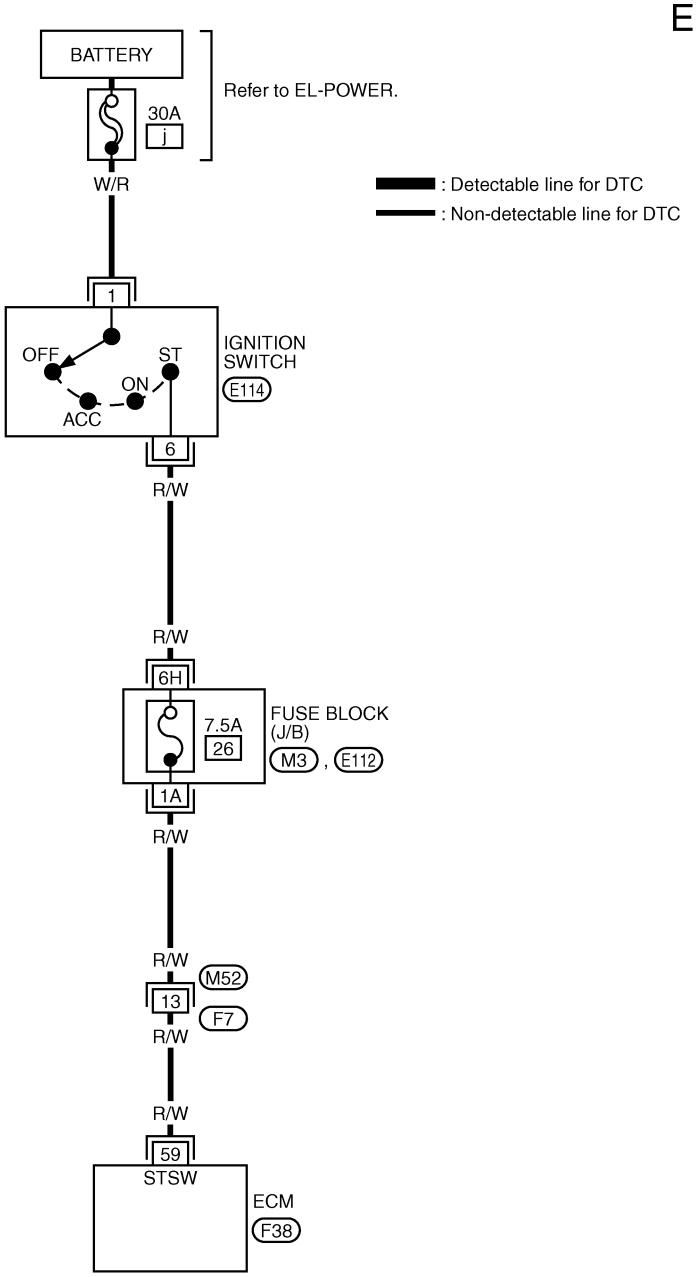
**CAUTION:**

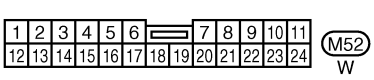
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

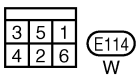
| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 59 | R/W | Start signal | Ignition switch "ON" | Approximately 0V |
| | | | Ignition switch "START" | 9 - 12V |

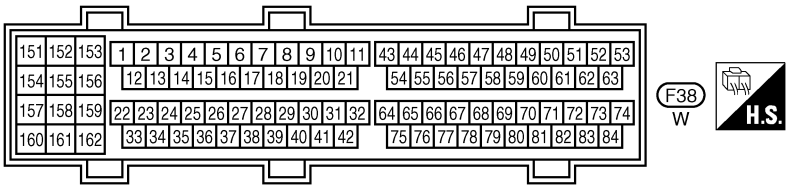
## Wiring Diagram

EC-S/SIG-01




Refer to last page (Foldout page).

M3

E112

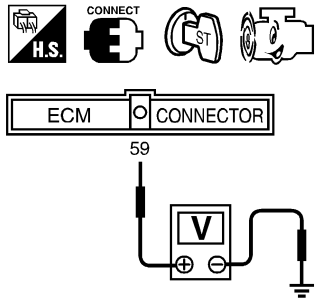
TEC163M

A

| DATA MONITOR | |
|---|---|
| MONITOR | NO DTC |
| START SIGNAL | OFF |
| CLSD THL POS | ON |
| AIR COND SIG | OFF |
| P/N POSI SW | ON |

PBIB0182E

A




SEC824C

## Diagnostic Procedure

INSPECTION START

A

**CHECK OVERALL FUNCTION.**

**With CONSULT-II**

1. Turn ignition switch “ON”.
2. Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT-II.

| | |
|---|---|
| IGN “ON” | OFF |
| IGN “START” | ON |

OK → INSPECTION END

OR

**Without CONSULT-II**

1. Turn ignition switch to “START”.
2. Check voltage between ECM terminal (59) and ground.

**Voltage:**

**Ignition switch “START”**

**Battery voltage (9 - 12V)**

**Except above**

**Approximately 0V**

NG

Check if 7.5A fuse is OK. → NG → Replace 7.5A fuse.

OK

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and 7.5A fuse.
3. Check harness continuity between ECM terminal (59) and fuse block.
   Refer to Wiring Diagram.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.

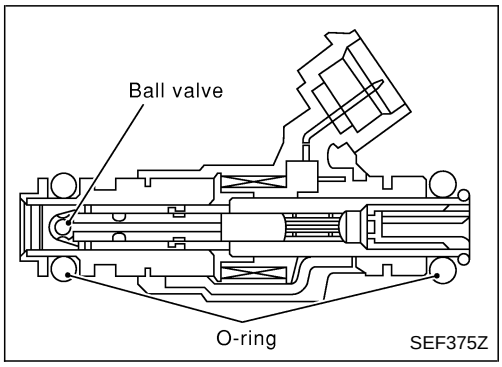
NG → Check the following.
- Harness connectors (M52), (F7)
- Harness for open or short between ECM and fuse block

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

OK

CHECK INTERMITTENT INCIDENT.
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-112.

INSPECTION END




## 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.

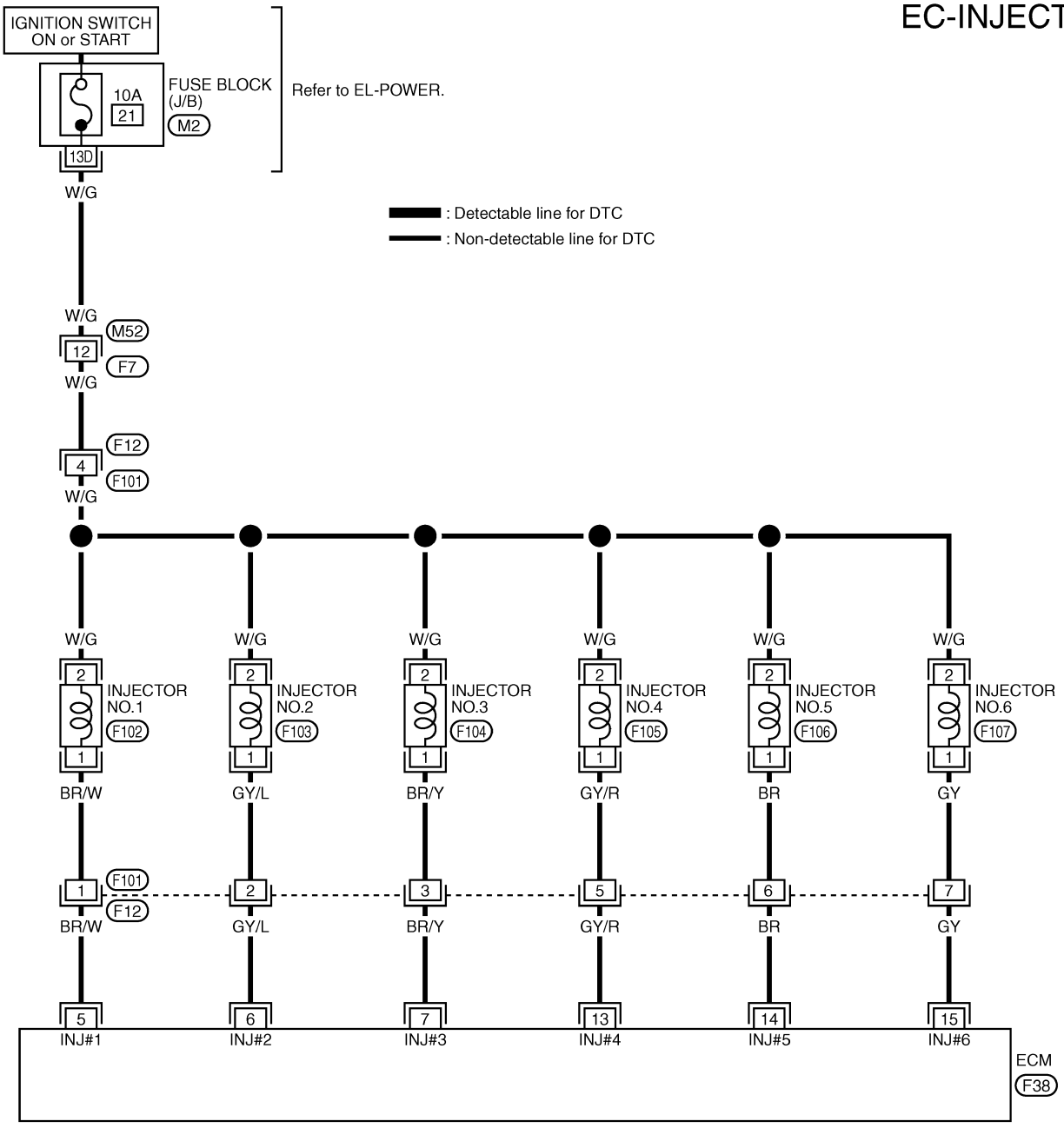
## CONSULT-II Reference Value in Data Monitor Mode

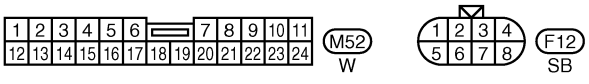
Specification data are reference values.

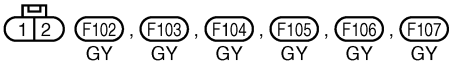
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| B/FUEL SCHDL | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 5.0 - 5.5 msec |
| | | 2,000 rpm | 5.0 - 5.5 msec |
| INJ PULSE-B1<br>INJ PULSE-B2 | ● Engine: After warming up<br>● Shift lever: N<br>● Air conditioner switch: OFF<br>● No-load | Idle | 3.0 - 4.0 msec |
| | | 2,000 rpm | 3.0 - 4.0 msec |

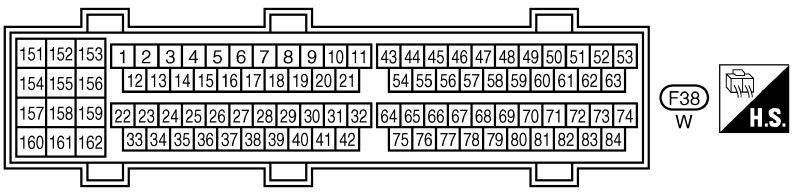
## Wiring Diagram

EC-INJECT-01




Refer to last page (Foldout page).
M2

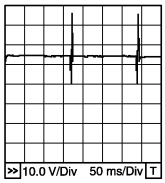
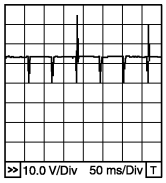
TEC162M

## Wiring Diagram (Cont'd)

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.**

| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 5<br>6<br>7<br>13<br>14<br>15 | BR/W<br>GY/L<br>BR/Y<br>GY/R<br>BR<br>GY | Injector No. 1<br>Injector No. 2<br>Injector No. 3<br>Injector No. 4<br>Injector No. 5<br>Injector No. 6 | Engine is running.<br>**Warm-up condition.**<br>Idle speed | BATTERY VOLTAGE<br>(11 - 14V)★<br>  <br><br>PBIB0529E |
| | | | Engine is running.<br>**Warm-up condition.**<br>Engine speed is 2,000 rpm | BATTERY VOLTAGE<br>(11 - 14V)★<br>  <br><br>PBIB0530E |

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

## Diagnostic Procedure

| 1 | INSPECTION START | |
|---|---|---|
| Turn ignition switch to "START".<br>**Is any cylinder ignited?** | | |
| | **Yes or No** | |
| Yes | ▶ | GO TO 2. |
| No | ▶ | GO TO 3. |

## Diagnostic Procedure (Cont'd)

| 2 | CHECK OVERALL FUNCTION |
|---|---|

**With CONSULT-II**

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

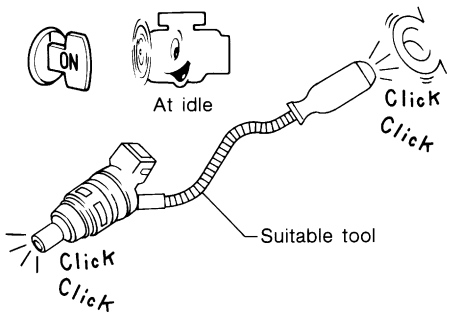
| ACTIVE TEST | |
|---|---|
| POWER BALANCE | |
| MONITOR | |
| ENG SPEED | XXX rpm |
| MAS A/F SE-B1 | XXX V |
| | |
| | |
| | |
| | |
| | |

PBIB0133E

3. Make sure that each circuit produces a momentary engine speed drop.

**Without CONSULT-II**

1. Start engine.
2. Listen to each injector operating sound.




MEC703B

**Clicking noise should be heard.**

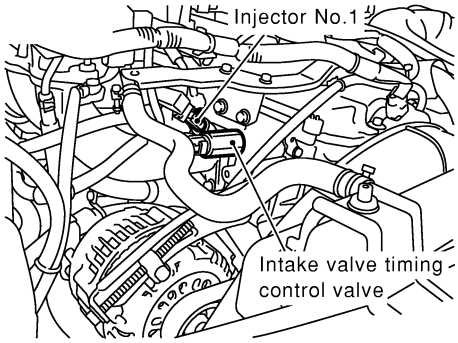
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | **INSPECTION END** |
| NG | ▶ | GO TO 3. |

## Diagnostic Procedure (Cont'd)

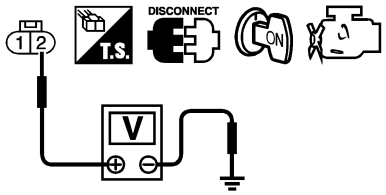
| 3 | CHECK INJECTOR POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect injector harness connector.




SEC793C

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




PBIB0289E

**Voltage: Battery voltage**

**OK or NG**

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

| 4 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors F12, F101
- Harness connectors M52, F7
- Fuse block (J/B) connector M2
- 10A fuse
- Harness for open or short between injector and fuse

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

| 5 | CHECK INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector terminal 1 and ECM terminals 5, 6, 7, 13, 14, 15.
   Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

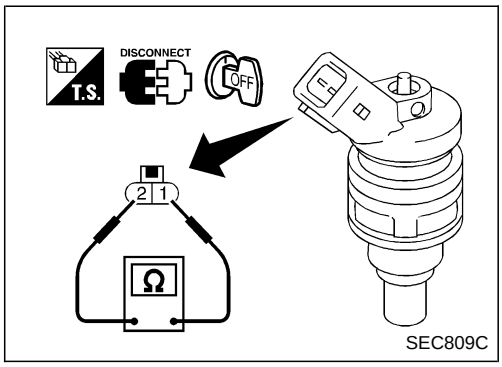
| | | |
|---|---|---|
| OK | ▶ | GO TO 7. |
| NG | ▶ | GO TO 6. |

## Diagnostic Procedure (Cont'd)

| 6 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors F101, F12<br>● Harness for open or short between ECM and injector | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 7 | CHECK INJECTOR |
|---|---|
| **Refer to EC-458, "Component Inspection".** | |
| **OK or NG** | |
| OK ► | GO TO 8. |
| NG ► | Replace injector. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | |
| ► | **INSPECTION END** |

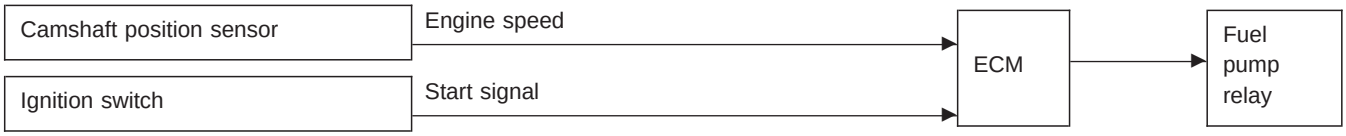



## Component Inspection

### INJECTOR

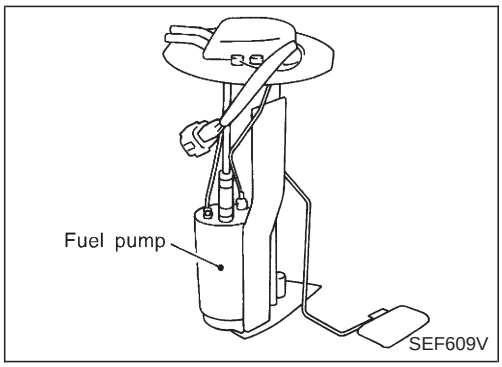
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   **Resistance: 13.5 - 17.5Ω [at 20°C (68°F)]**

## System Description




The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine storability. If the ECM receives a 120° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to operate. If the 120° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

| Condition | Fuel pump operation |
|---|---|
| Ignition switch is turned to ON. | Operates for 5 seconds. |
| Engine running and cranking | Operates. |
| When engine is stopped | Stops in 1 second. |
| Except as shown above | Stops. |




## Component Description

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

## CONSULT-II Reference Value in Data Monitor Mode

Remarks: Specification data are reference values.

| MONITOR ITEM | CONDITION | SPECIFICATION |
|---|---|---|
| FUEL PUMP RLY | ● Ignition switch is turned to ON (Operates for 5 seconds).<br>● Engine running and cranking<br>● When engine is stopped (Stops in 1 second) | ON |
| | Except as shown above | OFF |

## ECM Terminals and Reference Value

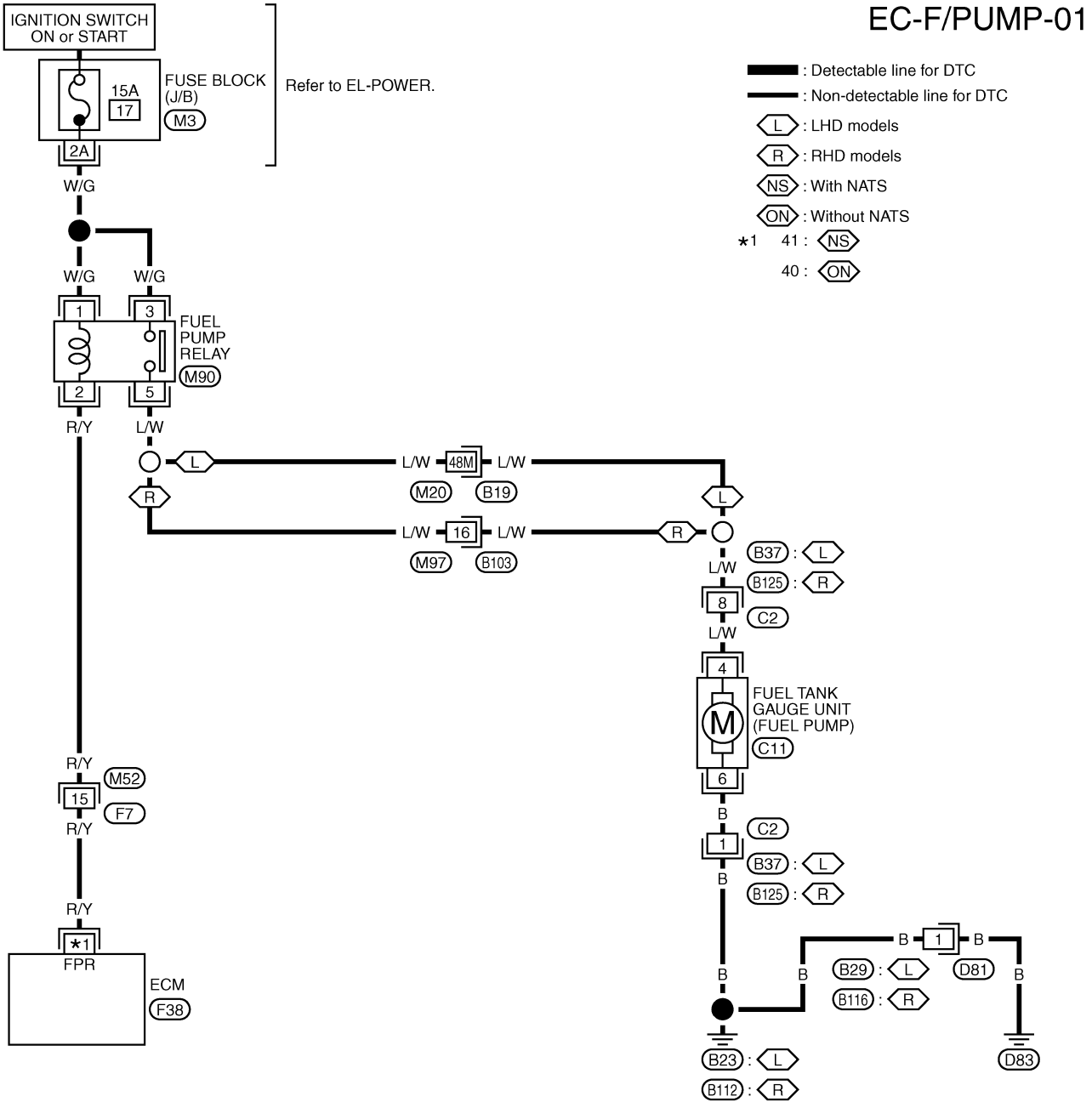
Specification data are reference values and are measured between each terminal and ground.

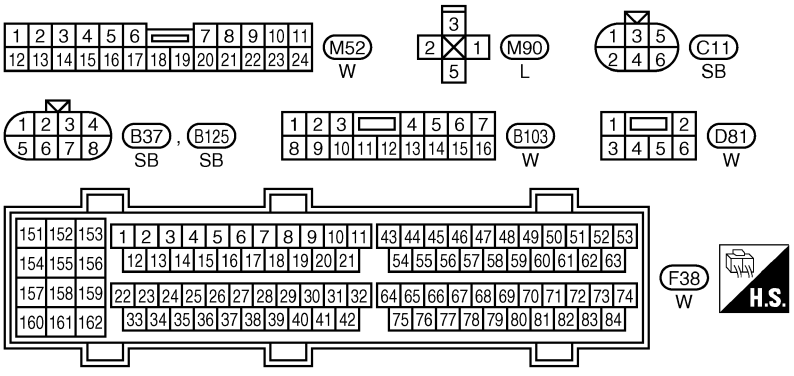
**CAUTION:**

**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.**

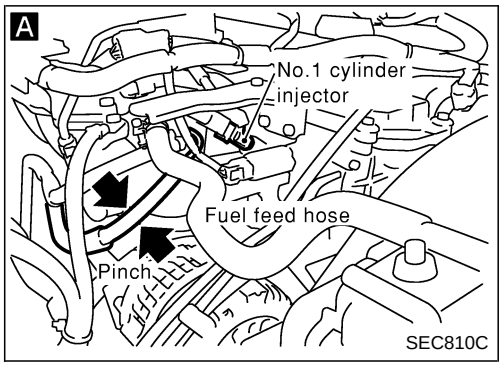
| TER-MINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC voltage) |
|---|---|---|---|---|
| 41 | R/Y | Fuel pump relay | Ignition switch "ON"<br>└ For 5 seconds after turning ignition switch "ON"<br>Engine is running. | 0 - 1.0V |
| | | | Ignition switch "ON"<br>└ 5 seconds after turning ignition switch "ON" | BATTERY VOLTAGE (11 - 14V) |

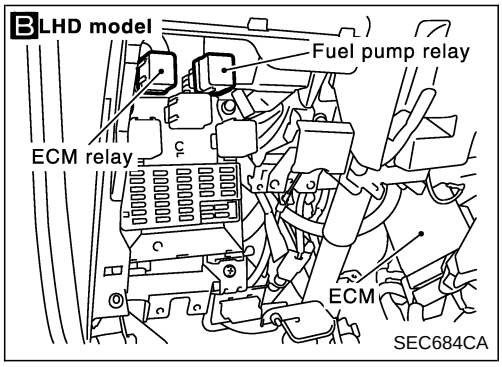
## Wiring Diagram

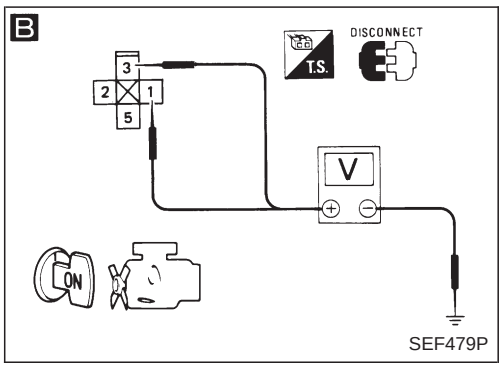


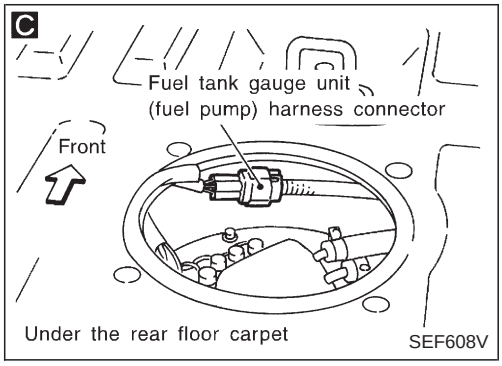




Refer to last page (Foldout page).
M20 , B19
M3




## Diagnostic Procedure

INSPECTION START

**A**

**CHECK OVERALL FUNCTION.**
1. Turn ignition switch “ON”.
2. Pinch fuel feed hose with fingers.
   **Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned “ON”.**

OK → INSPECTION END

NG ↓

**B**

**CHECK POWER SUPPLY.**
1. Turn ignition switch “OFF”.
2. Disconnect fuel pump relay.
3. Turn ignition switch “ON”.
4. Check voltage between terminals ①, ③ and ground with CONSULT-II or tester.
   **Voltage: Battery voltage**

NG → Check the following.
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK ↓

**C**

**CHECK GROUND CIRCUIT-I.**
1. Turn ignition switch “OFF”.
2. Disconnect fuel tank gauge unit (fuel pump) harness connector.
3. Check harness continuity between terminal ⑥ and body ground.
   Refer to Wiring Diagram.
   **Continuity should exist.**
   If OK, check harness for short to power.

NG → Check the following.
- Harness connectors (C2), (B37)
- Harness for open or short between fuel pump and body ground

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

OK ↓

CHECK GROUND CIRCUIT-II.
1. Turn ignition switch “OFF”.
2. Check harness continuity between relay terminal ⑤ and fuel pump terminal ④.
   Refer to Wiring Diagram.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M20), (B19)
- Harness connectors (B137), (C2)
- Harness for open or short between fuel pump and fuel pump relay

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

OK ↓

Ⓐ

(Go to next page.)

## Diagnostic Procedure (Cont'd)

D

| ACTIVE TEST | |
|---|---|
| FUEL PUMP RELAY | ON |
| MONITOR | |
| ENG SPEED | XXX rpm |

SEF073Y

Ⓐ

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (41) and fuel pump relay terminal (2).
   Refer to Wiring Diagram.
   **Continuity should exist.**
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M52), (F7)
- Harness for open or short between ECM and fuel pump relay

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

OK ↓

D

**CHECK COMPONENT**
(Fuel pump relay).

**With CONSULT-II**

1. Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT-II and check operating sound.

NG → Replace fuel pump relay.

OR

**Without CONSULT-II**

Refer to "COMPONENT INSPECTION", EC-464.

OK ↓

CHECK COMPONENT
(Fuel pump).
Refer to "COMPONENT INSPECTION", EC-464.

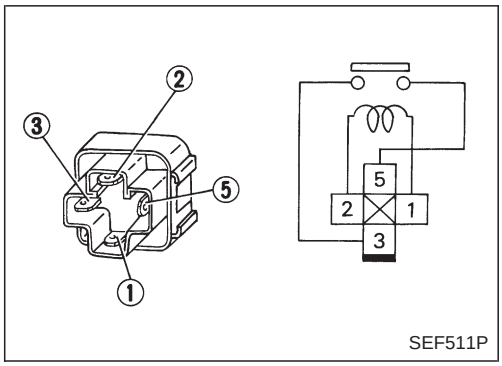
NG → Replace fuel pump.

OK ↓

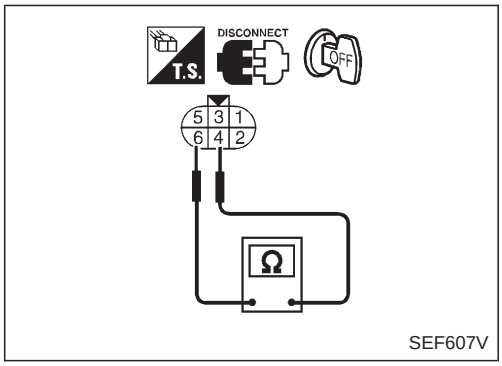
CHECK INTERMITTENT INCIDENT.
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-112.

↓

INSPECTION END



SEF511P



SEF607V

## Component Inspection

### FUEL PUMP RELAY

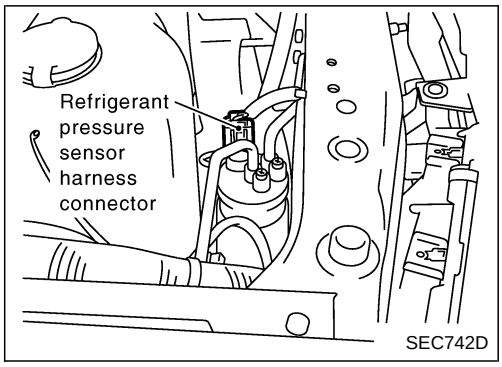
Check continuity between terminals ③ and ⑤.

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

If NG, replace relay.

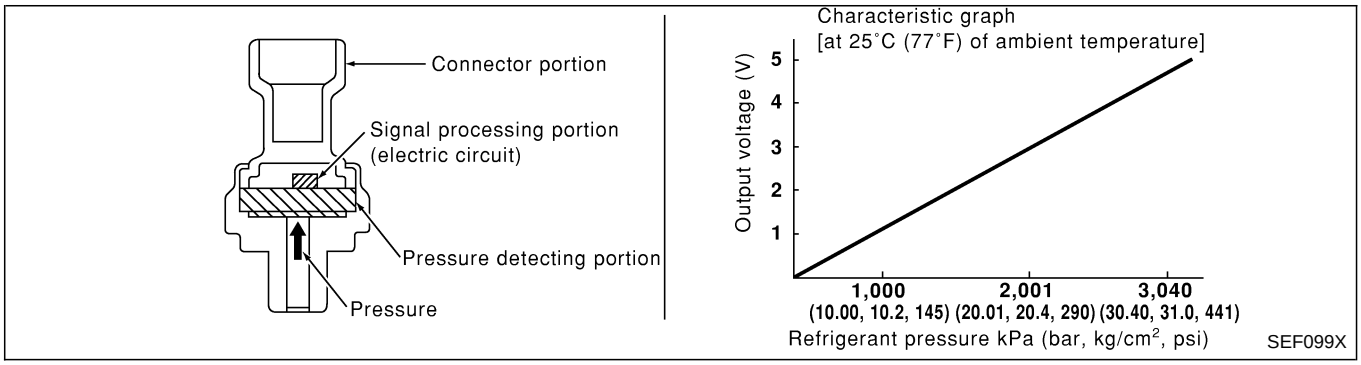
### FUEL PUMP

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ④ and ⑥.
   **Resistance: 0.2 - 5.0Ω at 25°C (77°F)**
   If NG, replace fuel pump.




## Component Description

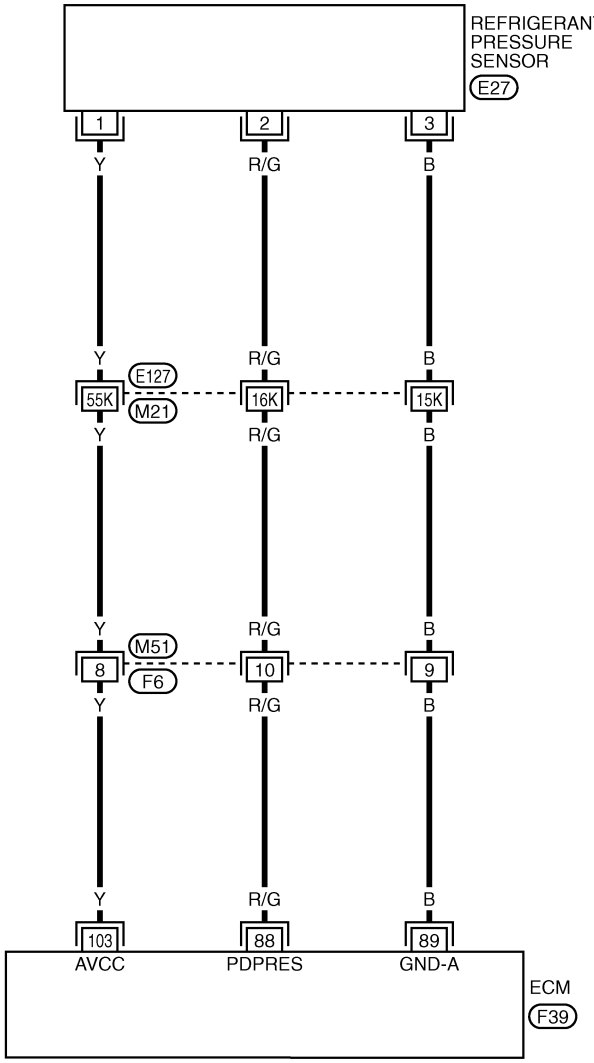
The refrigerant pressure sensor is installed at the liquid tank of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.

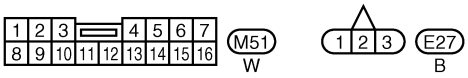


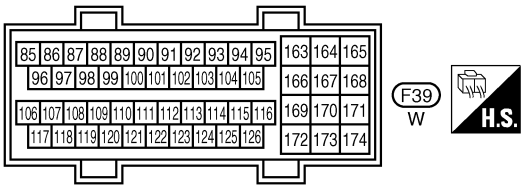
## Wiring Diagram

EC-RP/SEN-01

: Detectable line for DTC
: Non-detectable line for DTC




Refer to last page (Foldout page).
M21 , E127

TEC341M

## Wiring Diagram (Cont'd)

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

**CAUTION:**

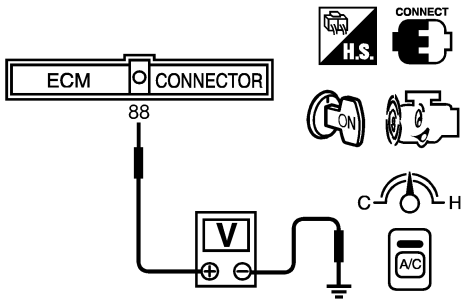
**Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

| TERMINAL NO. | WIRE COLOR | ITEM | CONDITION | DATA (DC Voltage) |
|---|---|---|---|---|
| 88 | R/G | Refrigerant pressure sensor | Engine is running.<br>— **Warm-up condition.**<br>— Both A/C switch and blower switch are "ON".<br>— (Compressor operates.) | 1.0 - 4.0V |
| 89 | B | Sensor ground (Refrigerant pressure sensor) | Engine is running.<br>— **Warm-up condition.**<br>— Idle speed | Approximately 0V |
| 103 | Y | Sensors' power supply | Ignition switch "ON" | Approximately 5V |

## Diagnostic Procedure

| 1 | CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION |
|---|---|

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower switch "ON".
3. Check voltage between ECM terminal 88 and ground with CONSULT-II or tester.




PBIB0187E

**Voltage: 1.0 - 4.0V**

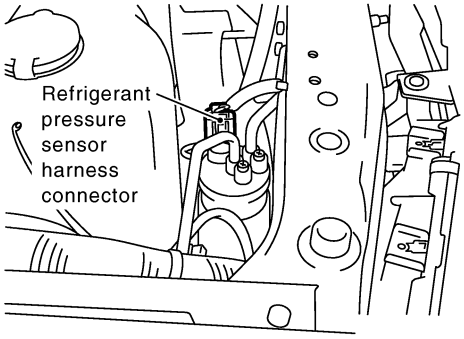
**OK or NG**

| | | |
|---|---|---|
| OK | ► | **INSPECTION END** |
| NG | ► | GO TO 2. |

## Diagnostic Procedure (Cont'd)

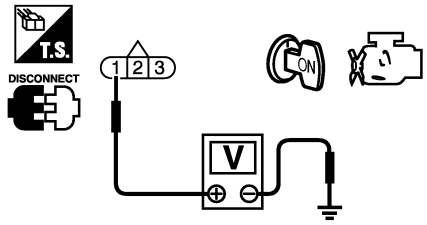
| 2 | CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT |
|---|---|

1. Turn A/C switch and blower switch "OFF".
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.




SEC742D

4. Turn ignition switch "ON".
5. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT-II or tester.




PBIB0085E

**Voltage: Approximately 5V**

**OK or NG**

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

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

Check the following.
- Harness connectors E127, M21
- Harness connectors M51, F6
- Harness for open or short between ECM and refrigerant pressure sensor

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

| 4 | CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between refrigerant pressure sensor terminal 3 and ground.
   Refer to Wiring Diagram.
   **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. |

## Diagnostic Procedure (Cont'd)

| 5 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M51, F6<br>● Harness for open or short between ECM and refrigerant pressure sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 6 | CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN ANDSHORT |
|---|---|
| 1. Check harness continuity between ECM terminal 88 and refrigerant pressure sensor terminal 2.<br>Refer to Wiring Diagram.<br>**Continuity should exist.**<br>2. Also check harness for short to ground and short to power.<br>**OK or NG** | |
| OK ► | GO TO 8. |
| NG ► | GO TO 7. |

| 7 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Harness connectors M51, F6<br>● Harness for open or short between ECM and refrigerant pressure sensor | |
| ► | Repair open circuit or short to ground or short to power in harness or connectors. |

| 8 | CHECK INTERMITTENT INCIDENT |
|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".**<br>**OK or NG** | |
| OK ► | Replace refrigerant pressure sensor. |
| NG ► | Repair or replace. |

## Description

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line from combination meter to ECM.

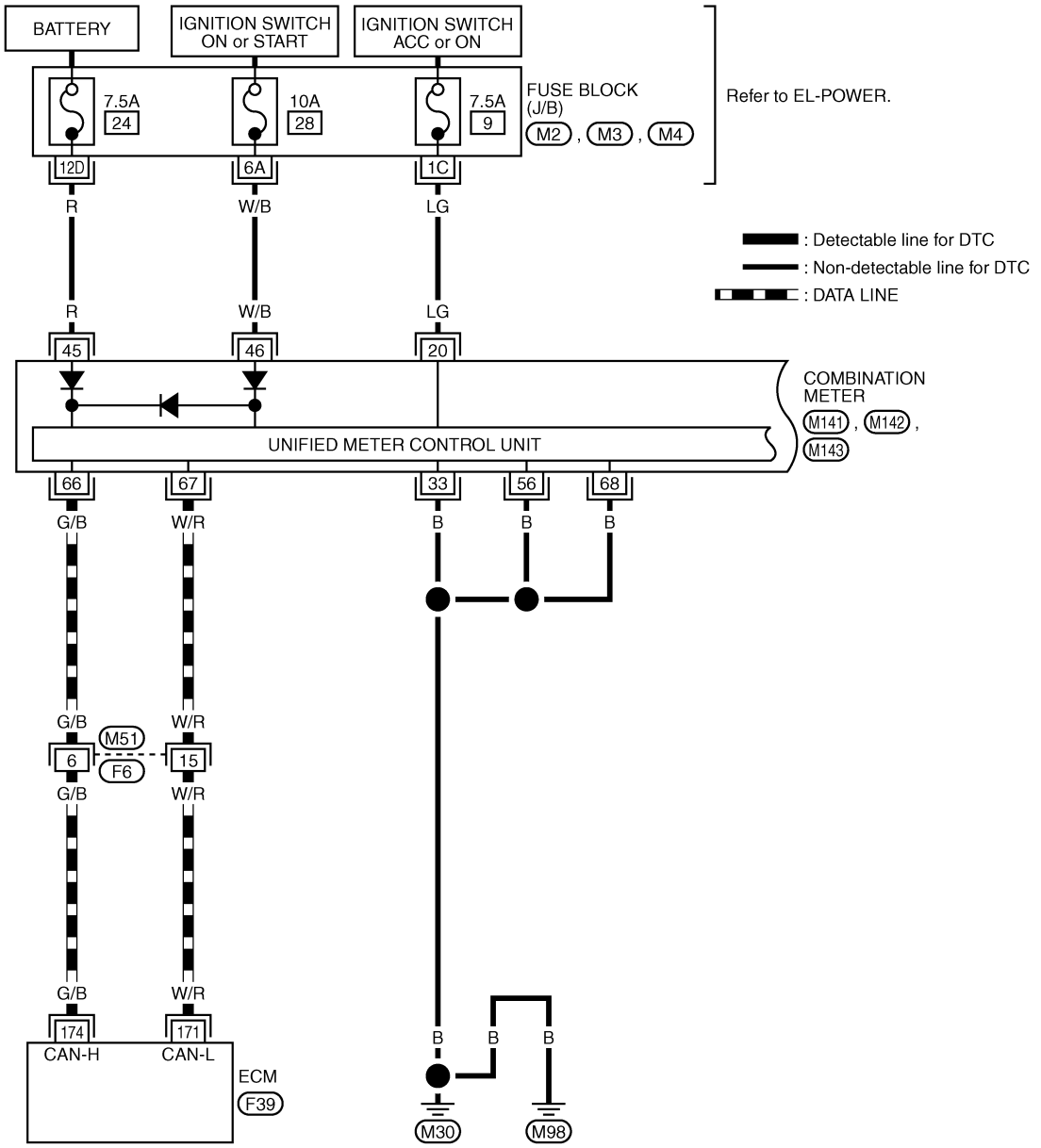
## CONSULT-II Reference Value in Data Monitor Mode

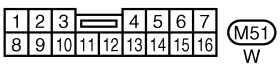
Specification data are reference values.

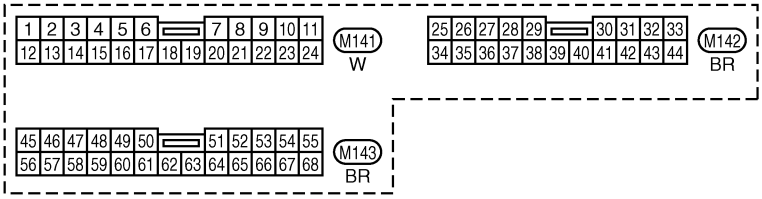
| MONITOR ITEM | CONDITION | | SPECIFICATION |
|---|---|---|---|
| LOAD SIGNAL | ● Ignition switch: ON | Rear window defogger switch is ON and/or lighting switch is 2nd. | ON |
| | | Rear window defogger switch is OFF and lighting switch is OFF. | OFF |

## Wiring Diagram

EC-LOAD-01




Refer to last page (Foldout page).

M2

M3

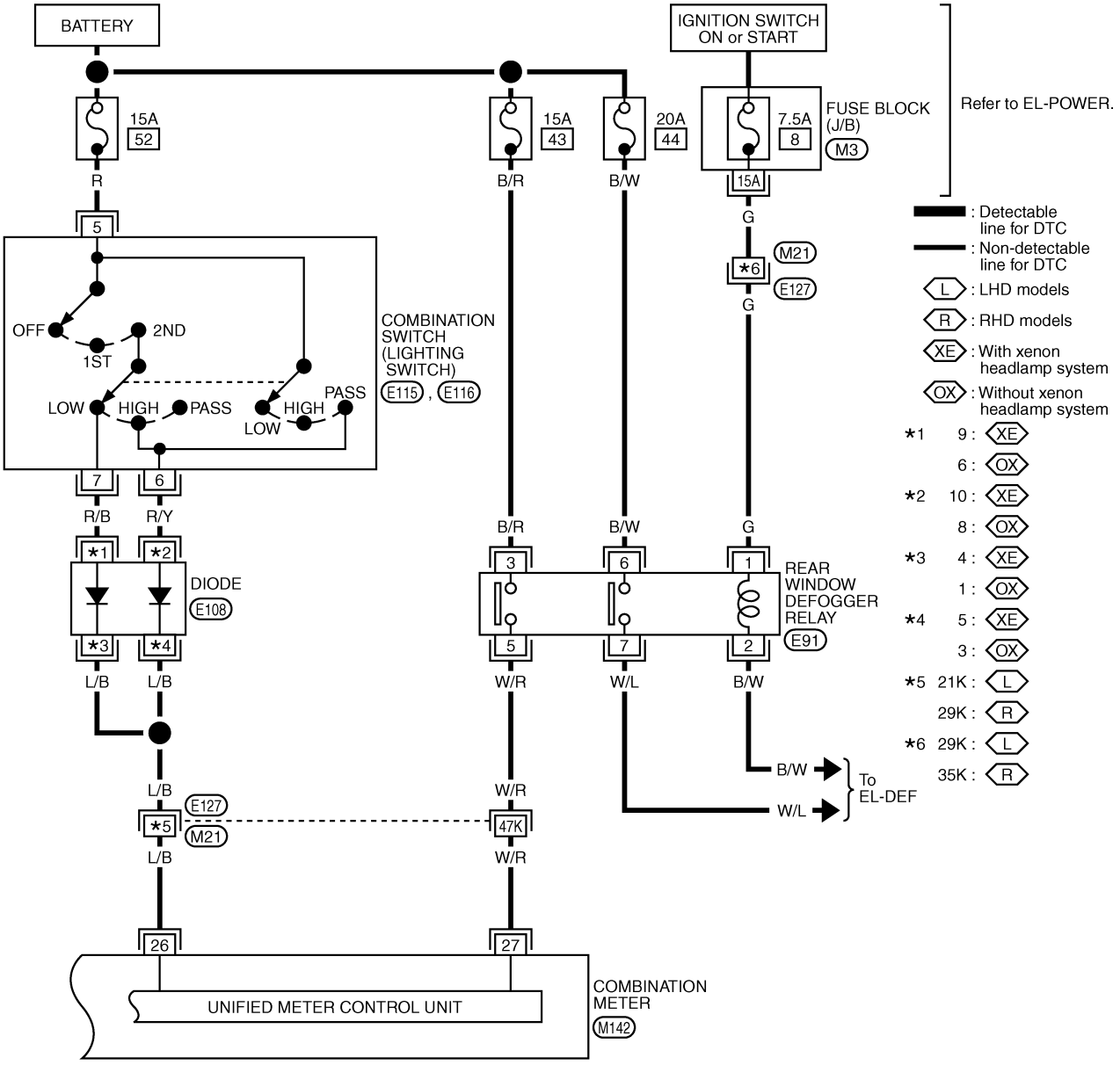
M4

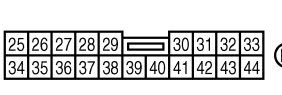
F39

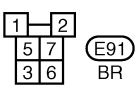
TEC426M

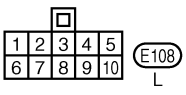
## Wiring Diagram (Cont'd)

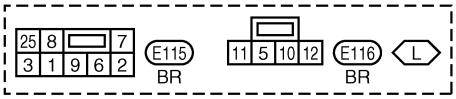
EC-LOAD-02

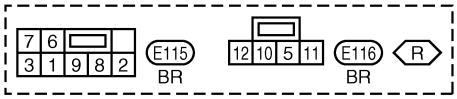



Refer to last page (Foldout page).
M21 , E127
M3

TEC371M

## Diagnostic Procedure

| 1 | CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I |
|---|---|

**With CONSULT-II**

**With GST**

1. Turn ignition switch “ON”.
2. Connect CONSULT-II or GST and select “DATA MONITOR” mode.
3. Select “LOAD SIGNAL” and check indication under the following conditions.

| DATA MONITOR | |
|---|---|
| MONITORING | NO DTC |
| LOAD SIGNAL | ON |

PBIB0103E

| Condition | Indication |
|---|---|
| Rear window defogger switch “ON” | ON |
| Rear window defogger switch “OFF” | OFF |

MTBL1594

**OK or NG**

| | |
|---|---|
| OK (With CONSULT-II) ► | GO TO 2. |
| OK (Without CONSULT-II) ► | GO TO 3. |
| NG ► | GO TO 4. |

## Diagnostic Procedure (Cont'd)

| 2 | CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II |
|---|---|

**With CONSULT-II**

Check "LOAD SIGNAL" indication under the following conditions.

| DATA MONITOR | |
|---|---|
| MONITORING | NO DTC |
| LOAD SIGNAL | ON |

PBIB0103E

| Condition | Indication |
|---|---|
| Lighting switch "ON" at 2nd position | ON |
| Lighting switch "OFF" | OFF |

MTBL1595

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | **INSPECTION END** |
| NG | ▶ | GO TO 5. |

| 3 | CHECK REAR WINDOW DEFOGGER FUNCTION |
|---|---|

1. Start engine.
2. Turn "ON" the rear window defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

**Yes or No**

| | | |
|---|---|---|
| Yes | ▶ | GO TO 4. |
| No | ▶ | Check rear window defogger circuit. Refer to xx. |

| 4 | CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT |
|---|---|

1. Stop engine.
2. Disconnect rear window defogger relay.
3. Disconnect combination meter harness connector.
4. Check harness continuity between rear window defogger relay terminal 5 and combination meter terminal 27. Refer to Wiring Diagram.
   **Continuity should exist.**
5. 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 E127, M21
- Harness for open or short between rear window defogger relay and combination meter

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

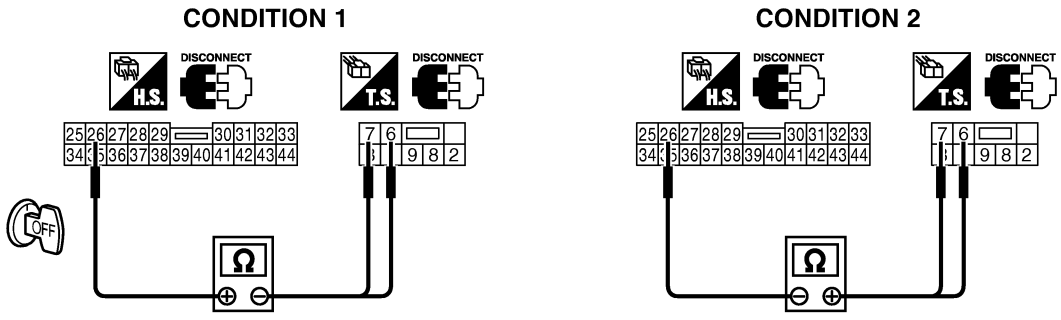
## Diagnostic Procedure (Cont'd)

| 6 | CHECK COMBINATION METER |
|---|---|
| Refer to EL section. | |
| **OK or NG** | |
| OK ▶ | GO TO 10. |
| NG ▶ | Replace combination meter. |

| 7 | CHECK HEADLAMP FUNCTION |
|---|---|
| 1. Start engine.<br>2. Lighting switch "ON" at 2nd position.<br>3. Check that headlamp high beams are illuminated. | |
| **OK or NG** | |
| OK ▶ | GO TO 8. |
| NG ▶ | Check headlamp circuit. Refer to EL section. |

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

1. Stop engine.
2. Disconnect combination meter harness connector.
3. Disconnect combination switch harness connector.
4. Check harness continuity between combination switch terminals 6, 7 and combination meter terminal 26.




SEC761D

| Condition | Continuity |
|---|---|
| 1 | Should exist. |
| 2 | Should not exist. |

MTBL1596

5. Also check harness for short to ground and short to power.

**OK or NG**

| | |
|---|---|
| OK ▶ | GO TO 10. |
| NG ▶ | GO TO 9. |

| 9 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following.<br>● Harness connectors E127, M21<br>● Diode E108<br>● Harness for open or short between combination switch and combination meter | |
| ▶ | Repair open circuit or short to ground or short to power. |

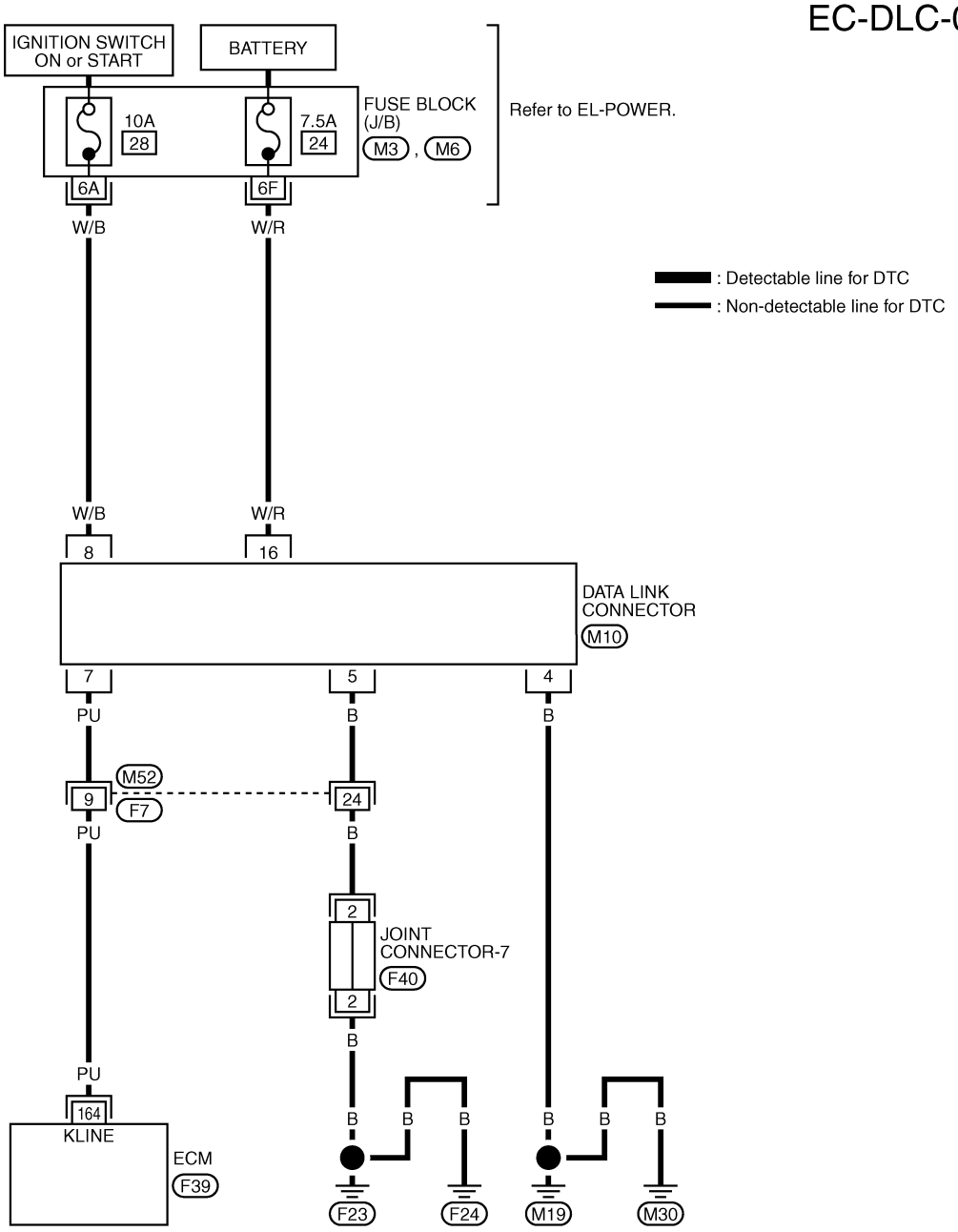
## Diagnostic Procedure (Cont'd)

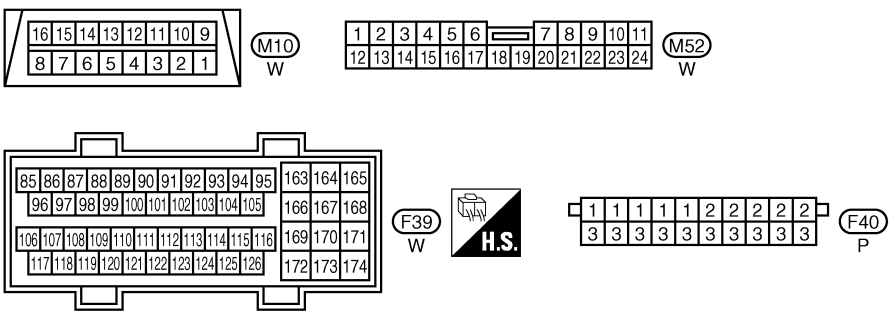
| 10 | CHECK COMBINATION METER | |
|---|---|---|
| Refer to EL section.<br>**OK or NG** | | |
| OK | ▶ | GO TO 11. |
| NG | ▶ | Replace combination meter. |

| 11 | CHECK INTERMITTENT INCIDENT | |
|---|---|---|
| **Refer to EC-112, "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".** | | |
| | ▶ | **INSPECTION END** |

## Wiring Diagram

EC-DLC-01



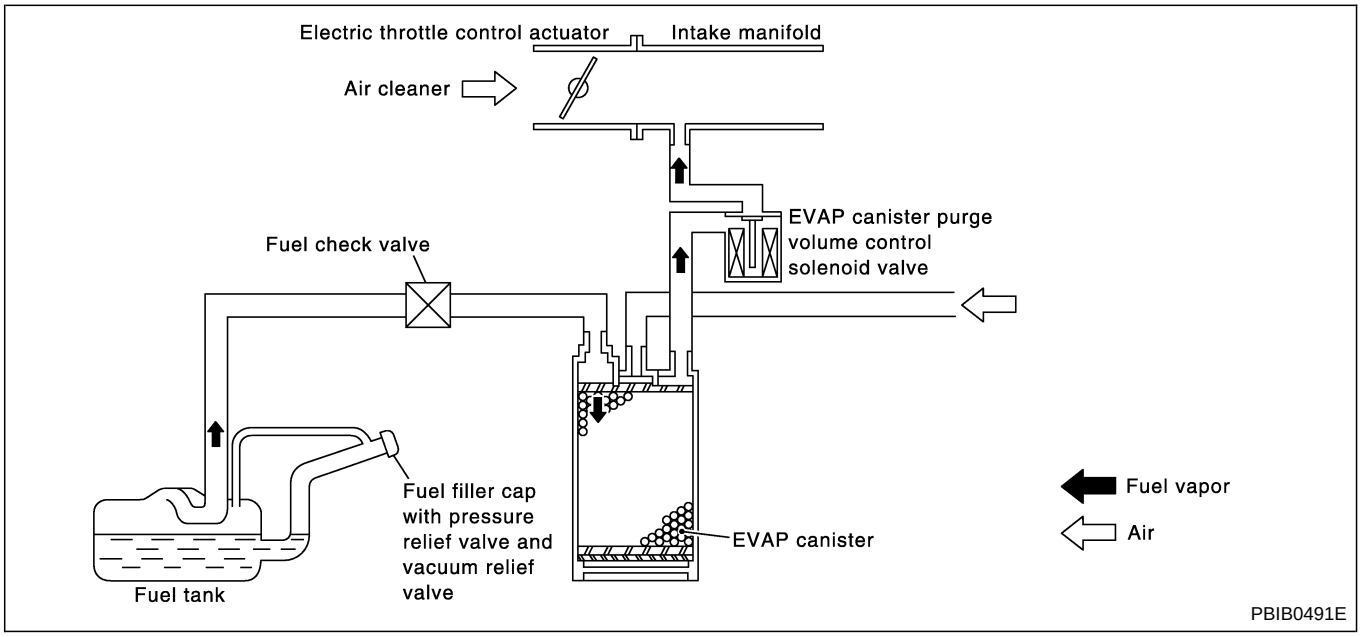




Refer to last page (Foldout page).
M3 , M6

TEC423M

# Description

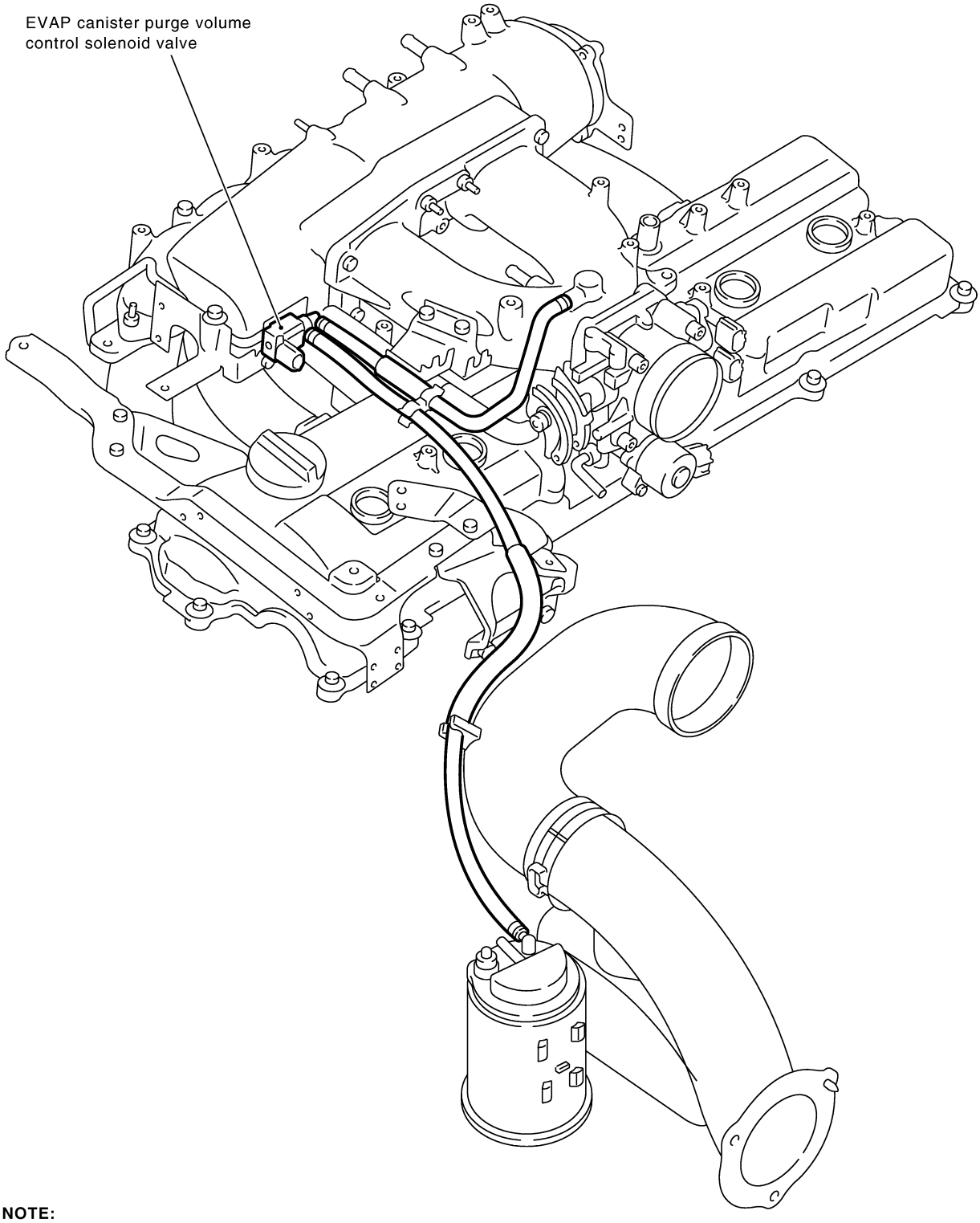
## SYSTEM DESCRIPTION




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.

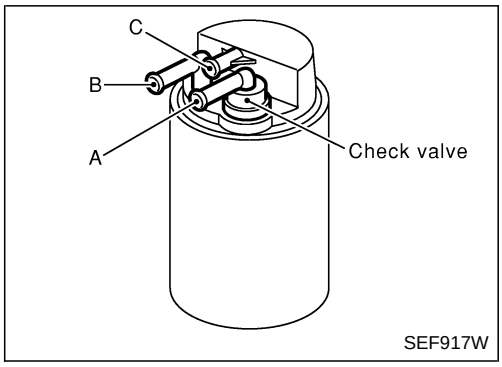
# Description (Cont'd)

## EVAPORATIVE EMISSION LINE DRAWING




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

SEC665D

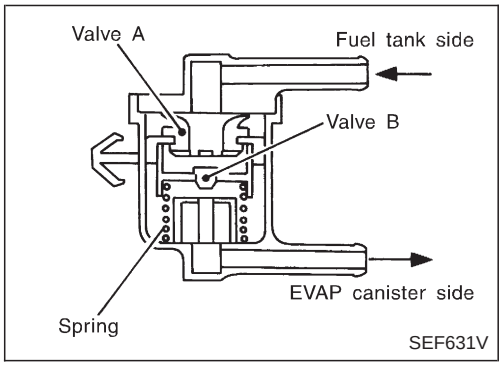



## Component Inspection

### EVAP CANISTER

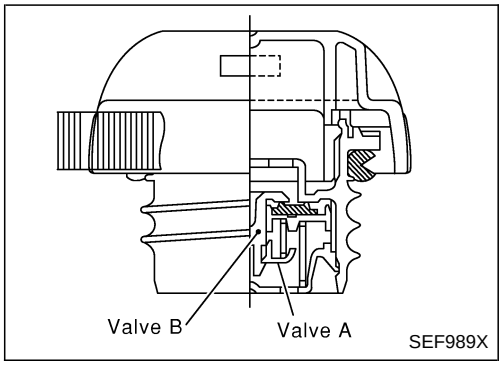
Check EVAP canister as follows:

1. Block port **C**. Orally blow air through port **A**. Check that air flows freely through port **B**.
2. Block port **A**. Orally blow air through port **C**. Check that air flows freely through port **B**.



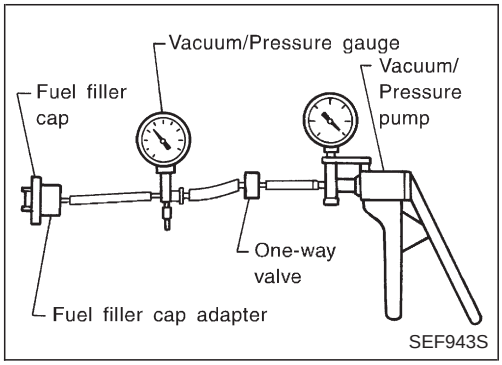

### FUEL CHECK VALVE

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




### FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

1. Wipe clean valve housing.



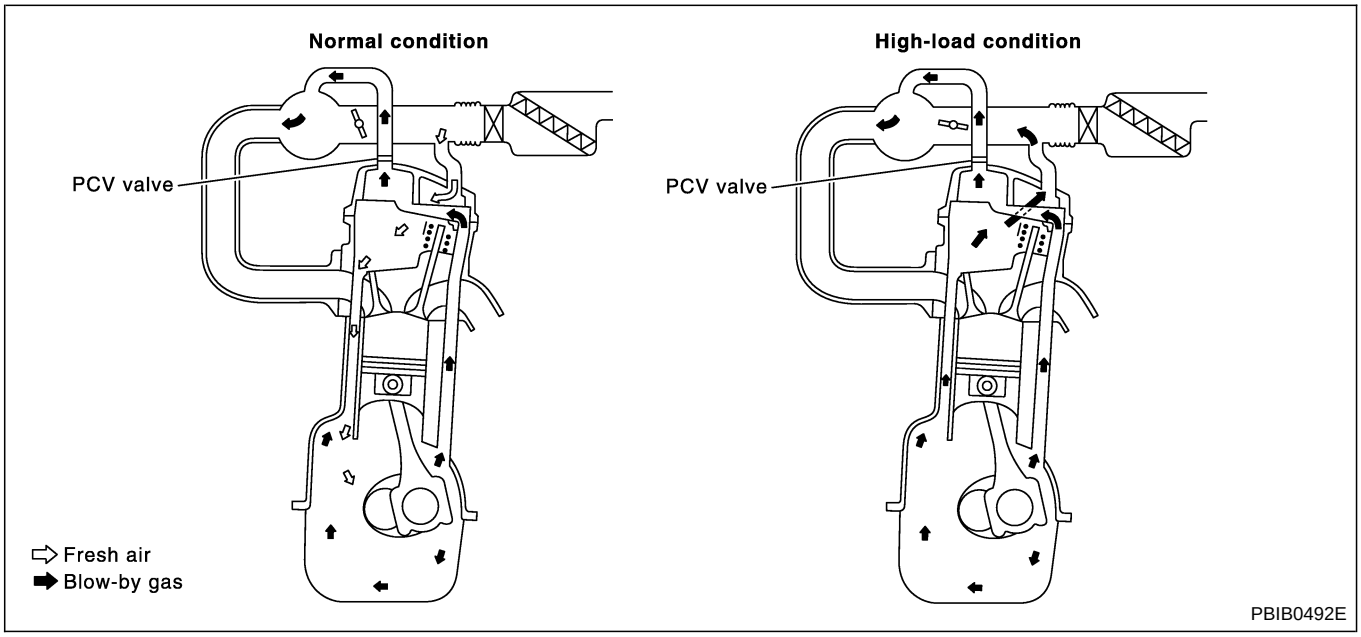

2. Check valve opening pressure and vacuum.
   **Pressure:**
   **16.0 - 20.0 kPa (0.16 - 0.200 bar, 0.163 - 0.204 kg/cm$^2$, 2.32 - 2.90 psi)**
   **Vacuum:**
   **−6.0 to −3.5 kPa (−0.060 to −0.035 bar, −0.061 to −0.036 kg/cm$^2$, −0.87 to −0.51 psi)**
3. If out of specification, replace fuel filler cap as an assembly.

### EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

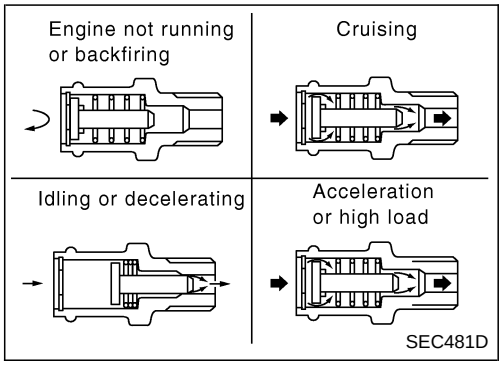
Refer to EC-275, “Component Inspection”.

# Description

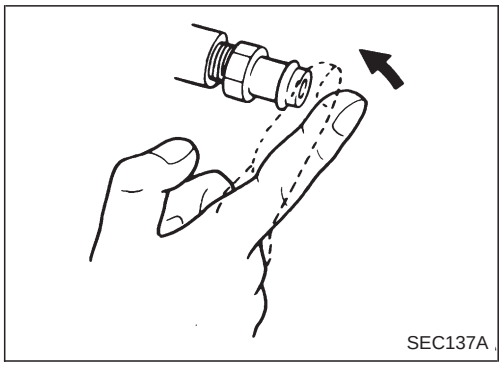
## SYSTEM DESCRIPTION

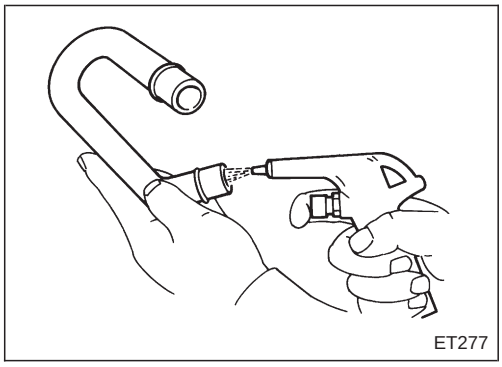



This system returns blow-by gas to the intake manifold.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold. During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve. Normally, the capacity 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.


SEC137A


ET277

## Component Inspection

### PCV (POSITIVE CRANKCASE VENTILATION) VALVE

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

### PCV VALVE VENTILATION HOSE

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

## Fuel Pressure Regulator

| | |
|---|---|
| Fuel pressure kPa (bar, kg/cm$^2$, psi) | |
| At idle | Approximately 245 (2.45, 2.5, 36) |
| A few seconds after ignition switch is turned OFF to ON | Approximately 294 (2.94, 3.0, 43) |

## Idle Speed and Ignition Timing

| | | |
|---|---|---|
| Idle speed rpm | Target idle speed | 675±50 |
| No-load*1 (in “N” position) | | |
| Air conditioner: ON (in “N” position) | 750 rpm or more | |
| Ignition timing | 10°±5° BTDC | |

*1: Under the following conditions:
- Air conditioner switch: OFF
- Steering wheel: Kept in straight-ahead position
- Electrical load: OFF (Lights, heater fan & rear window defogger)

## Mass Air Flow Sensor

| | | |
|---|---|---|
| Supply voltage | V | Battery voltage (11 - 14) |
| Output voltage at idle | V | 0.75 - 1.5 at idle*<br>1.7 - 2.4 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 |
|---|---|
| 20 (68) | 2.1 - 2.9 kΩ |
| 50 (122) | 0.68 - 1.00 kΩ |
| 90 (194) | 0.236 - 0.260 kΩ |

## Heated Oxygen Sensor 1

| | |
|---|---|
| Resistance [at 25°C (77°F)] | 3.3 - 4.0Ω |

## Heated Oxygen Sensor 2

| | |
|---|---|
| Resistance [at 25°C (77°F)] | 5.0 - 7.0Ω |

## Fuel Pump

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | Ω | 0.2 - 5.0 |

## EVAP Canister Purge Volume Control Solenoid Valve

| | | |
|---|---|---|
| Resistance [at 20°C (68°F)] | Ω | 31 - 35 |

## Injector

| | | |
|---|---|---|
| Resistance [at 20°C (77°F)] | Ω | 14.0 - 15.0 |

## Ignition Coil with Power Transistor

| Terminal No. (Polarity) | Resistance Ω [at 25°C (77°F)] |
|---|---|
| 3 (+) - 2 (−) | Except 0 or ∞ |
| 1 (+) - 3 (−) | Except 0 |
| 1 (+) - 2 (−) | |

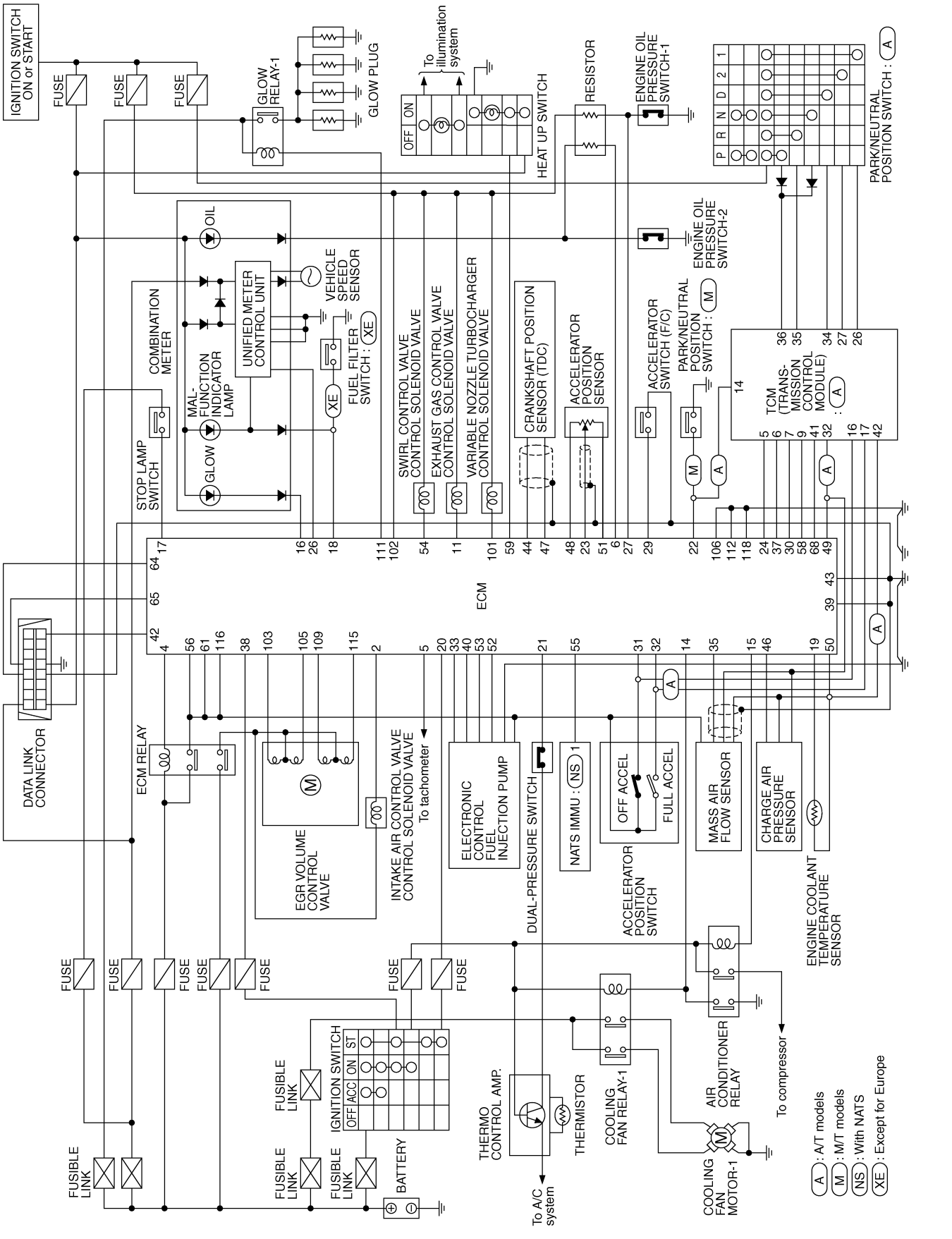
## Condenser

| | | |
|---|---|---|
| Resistance [at 25°C (77°F)] | MΩ | Above 1 |

## Throttle Control Motor

| | |
|---|---|
| Resistance [at 25°C (77°F)] | Approximately 1 - 15 Ω |

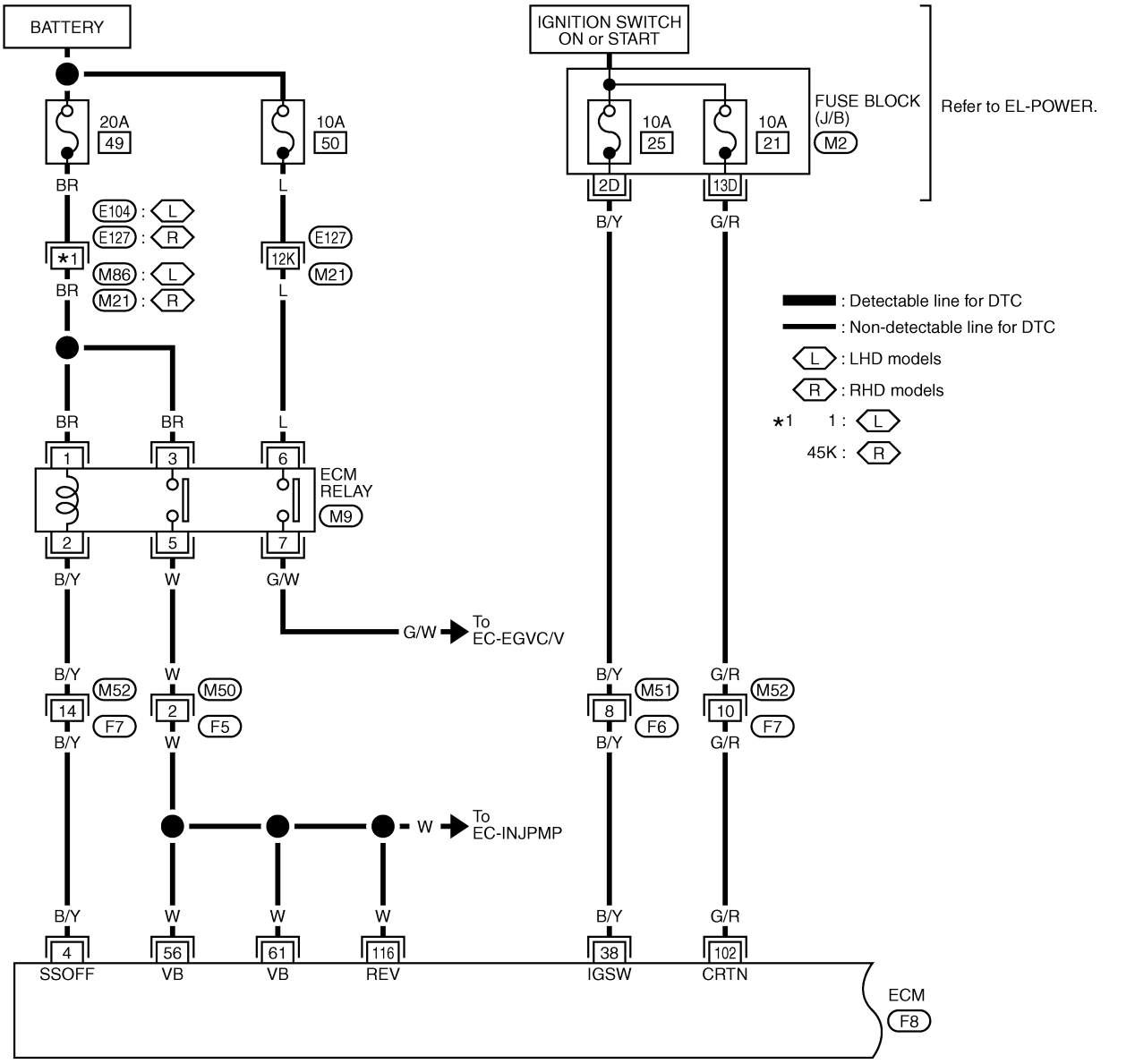
## Circuit Diagram

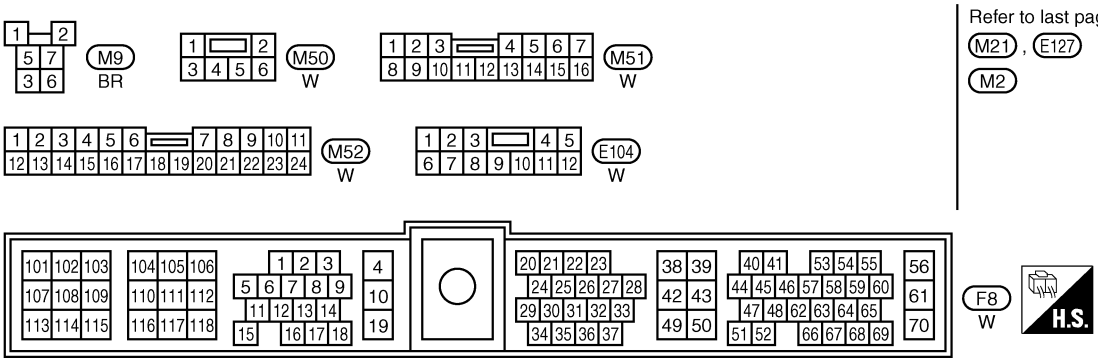



TEC395M

## Main Power Supply and Ground Circuit

EC-MAIN-01

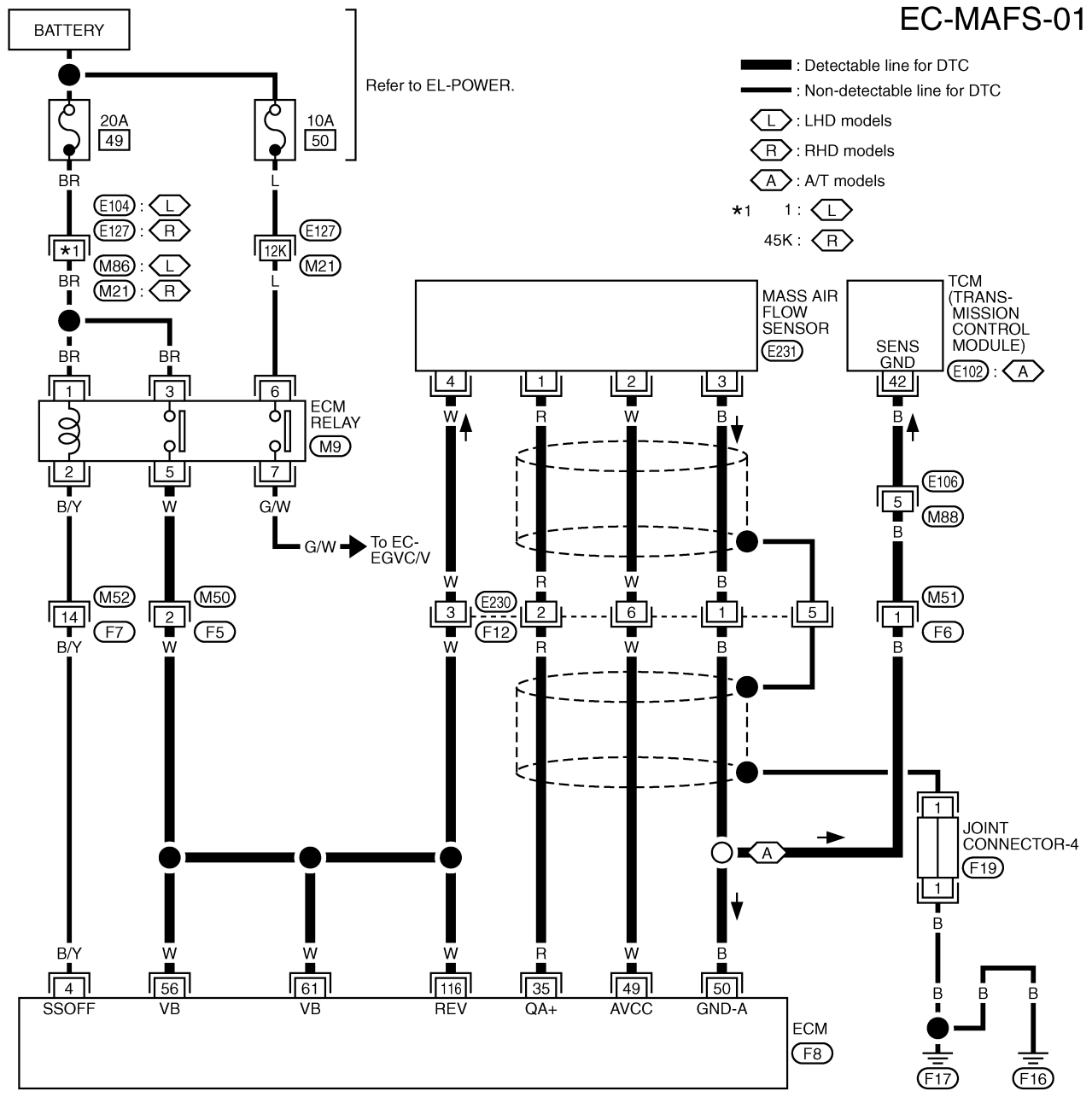


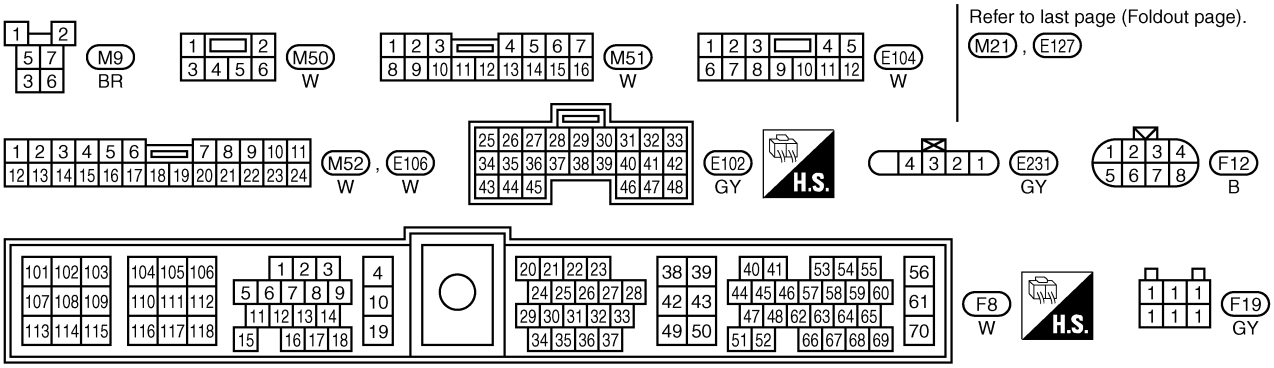




Refer to last page (Foldout page).
M21 , E127
M2

TEC352M

## Wiring Diagram

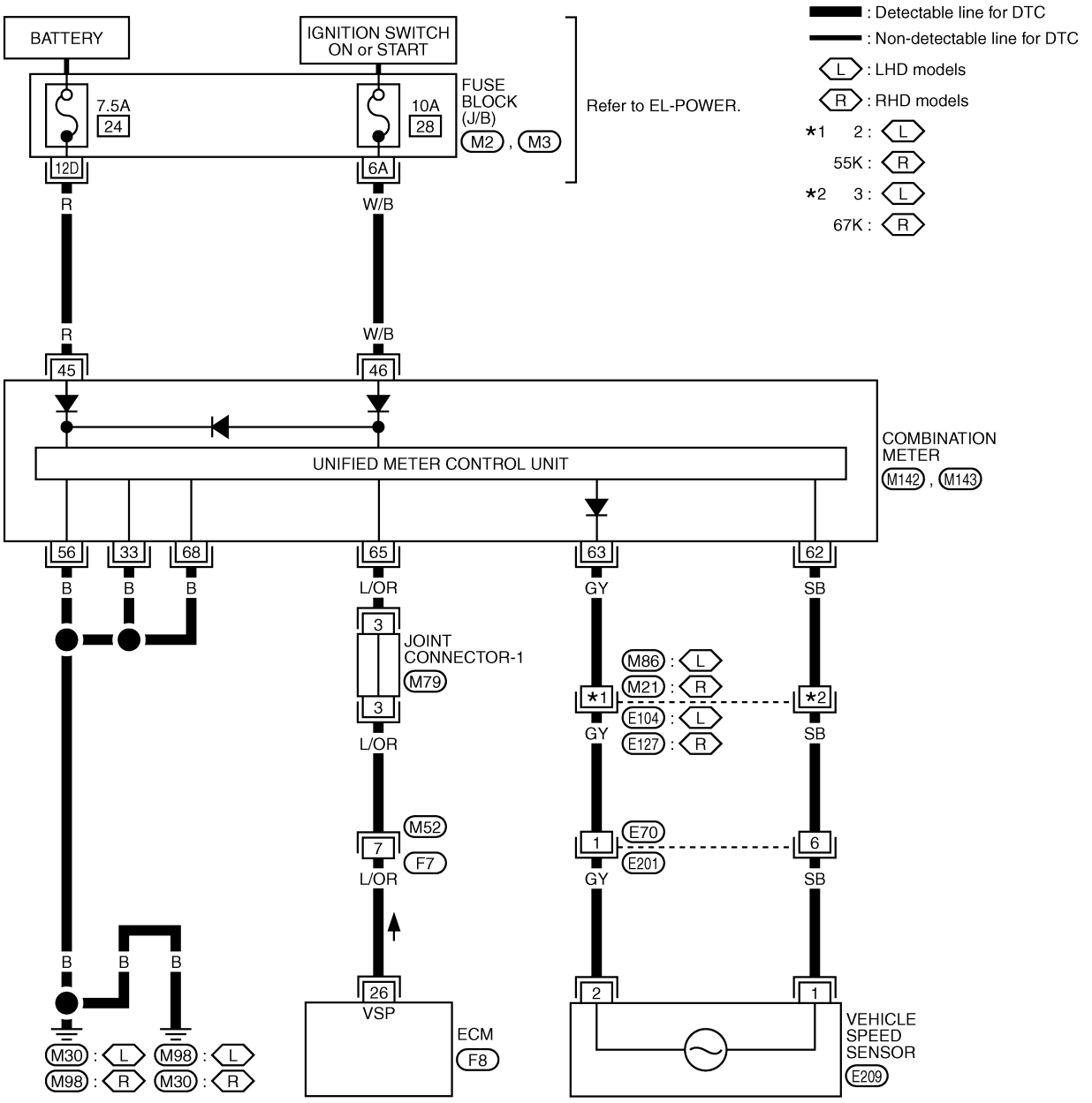


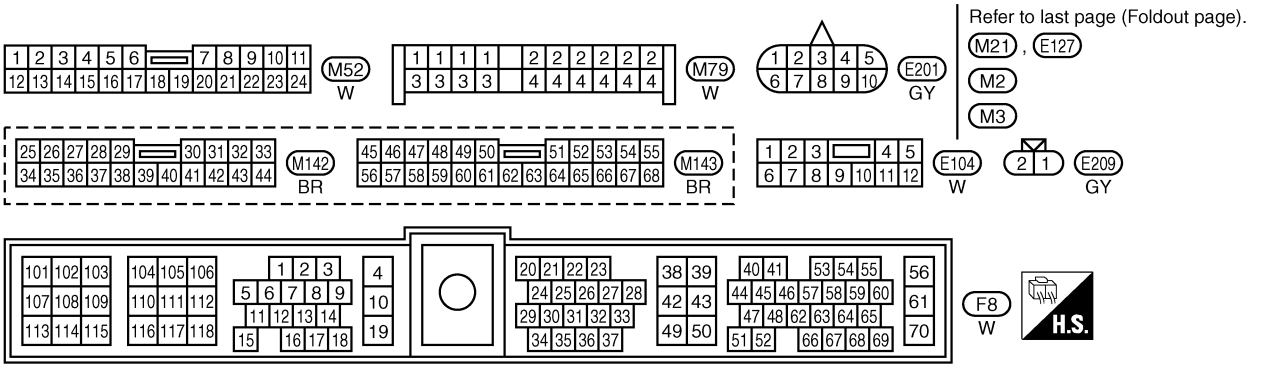




TEC353M

## Wiring Diagram

EC-VSS-01

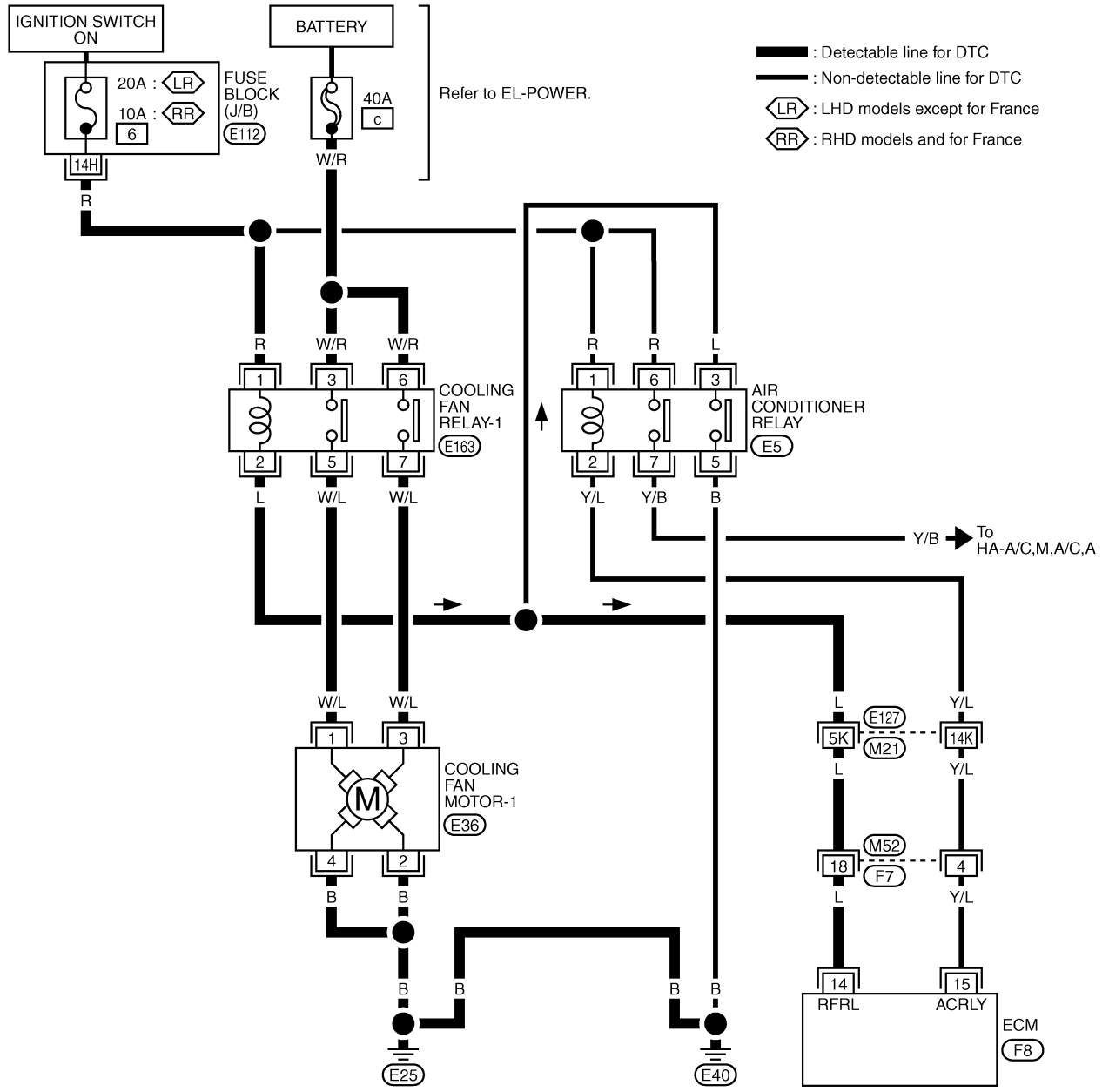


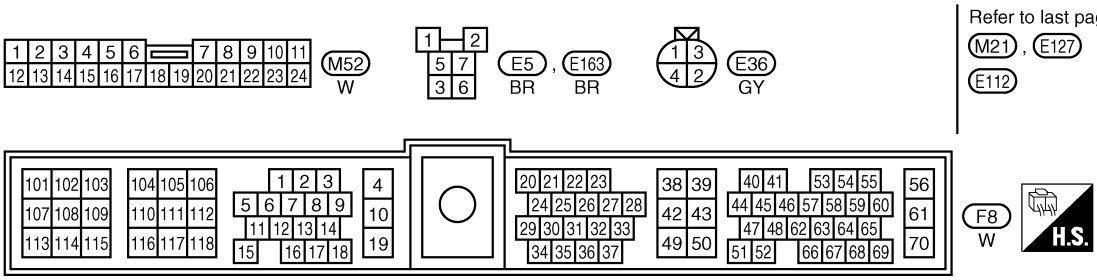




TEC354M

## Wiring Diagram

EC-COOL/F-01




TEC355M

## Diagnostic Procedure

| 1 | INSPECTION START |
|---|---|
| Do you have CONSULT-II? | |
| **Yes or No** | |
| Yes ► | GO TO 2. |
| No ► | GO TO 3. |

| 2 | CHECK COOLING FAN OPERATION |
|---|---|

**With CONSULT-II**

1. Turn ignition switch “ON”.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-II.

| ACTIVE TEST | |
|---|---|
| COOLING FAN | OFF |
| MONITOR | |
| COOLAN TEMP/S | XXX °C |
| | |
| | |
| | |
| | |
| | |
| | |

SEF646X

3. Make sure that cooling fan-1 operates.

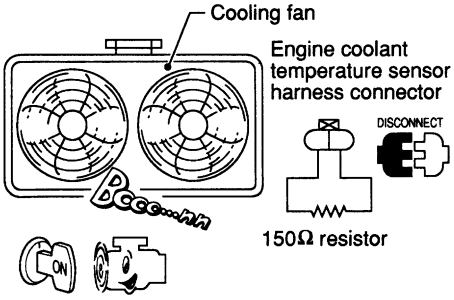
**OK or NG**

| | |
|---|---|
| OK ► | GO TO 12. |
| NG ► | GO TO 4. |

| 3 | CHECK COOLING FAN OPERATION |
|---|---|

**Without CONSULT-II**

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor harness connector.
3. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
4. Restart engine and make sure that cooling fan operates.




MEC475B

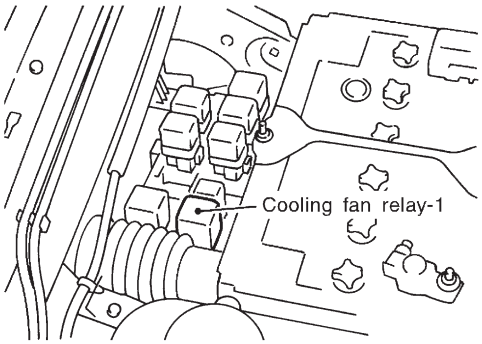
**OK or NG**

| | |
|---|---|
| OK ► | GO TO 12. |
| NG ► | GO TO 4. |

## Diagnostic Procedure (Cont'd)

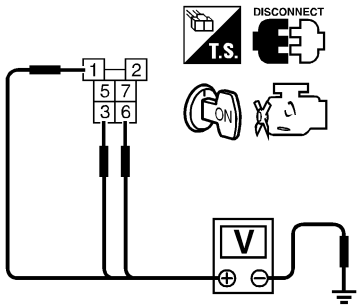
| 4 | CHECK COOLING FAN POWER SUPPLY CIRCUIT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.




SEF690V

3. Turn ignition switch "ON".
4. Check voltage between cooling fan relay-1 terminals 1, 3, 6 and ground with CONSULT-II or tester.




**Voltage: Battery voltage**

SEC533D

**OK or NG**

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

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

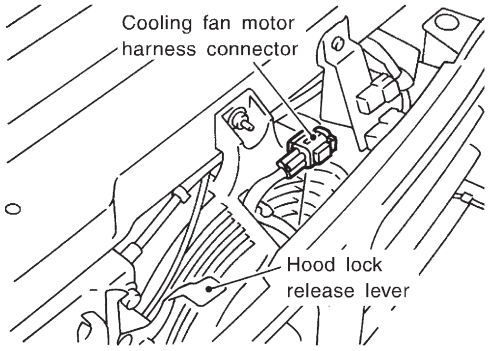
Check the following.
- Fuse block (J/B) connector E112
- 10A fuse or 20A fuse
- 40A fusible links
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

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

## Diagnostic Procedure (Cont'd)

| 6 | CHECK COOLING FAN GROUND CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-1 harness connector.




SEF691V

3. Check harness continuity between cooling fan relay-1 terminal 5 and cooling fan motor-1 terminal 1, cooling fan relay-1 terminal 7 and cooling fan motor-1 terminal 3, cooling fan motor-1 terminals 2, 4 and body ground. Refer to Wiring Diagram.
   **Continuity should exist.**
4. Also check harness for short to ground and short to power.

**OK or NG**

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

| 7 | CHECK COOLING FAN OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT |
|---|---|

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 14 and cooling fan relay-1 terminal 2. Refer to Wiring Diagram.
   **Continuity should exist.**
3. Also check harness for short to ground and short to power.

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 9. |
| NG | ▶ | GO TO 8. |

| 8 | DETECT MALFUNCTIONING PART |
|---|---|

Check the following.
- Harness connectors E127, M21
- Harness connectors M52, F7
- Harness for open or short between cooling fan relay-1 and ECM

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

| 9 | CHECK COOLING FAN RELAY-1 |
|---|---|

**Refer to "Component Inspection", EC-495.**

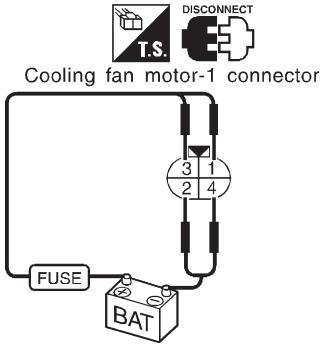
**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 10. |
| NG | ▶ | Replace cooling fan relay. |

## Diagnostic Procedure (Cont'd)

| 10 | CHECK COOLING FAN MOTOR-1 |
|---|---|

Supply battery voltage between the following terminals and check operation.




SEF645V

| | Terminals | |
|---|---|---|
| | (+) | (–) |
| Cooling fan motor-1 | 1 , 3 | 2 , 4 |

MTBL1304

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 11. |
| NG | ► | Replace cooling fan motor. |

| 11 | CHECK INTERMITTENT INCIDENT |
|---|---|

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT".

► **INSPECTION END**

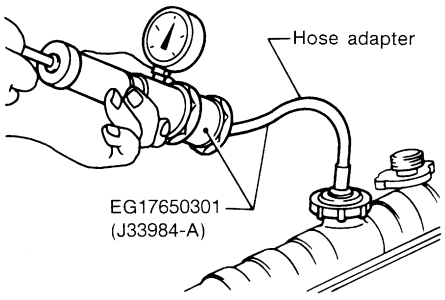
| 12 | CHECK COOLING SYSTEM FOR LEAK |
|---|---|

Apply pressure to the cooling system with a tester, and check if the pressure drops.

**Testing pressure: 98 kPa (0.98 bar, 1.0 kg/cm$^2$, 14 psi)**

**CAUTION:**

**Higher than the specified pressure may cause radiator damage.**




SLC754A

**Pressure should not drop.**

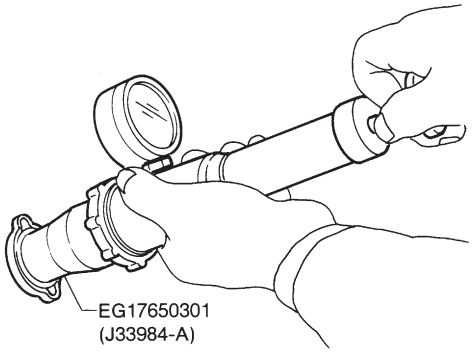
**OK or NG**

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

## Diagnostic Procedure (Cont'd)

| 13 | DETECT MALFUNCTIONING PART |
|---|---|
| Check the following for leak.<br>● Hose<br>● Radiator<br>● Water pump (Refer to LC section, "Water Pump".) | |
| ▶ | Repair or replace. |

| 14 | CHECK RADIATOR CAP |
|---|---|
| Apply pressure to cap with a tester and check radiator cap relief pressure. | |




SLC755A

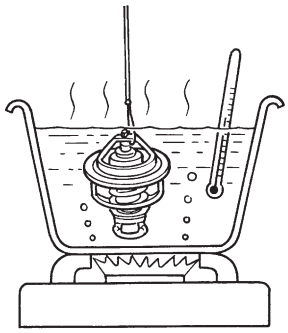
**Radiator cap relief pressure:**
**59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm$^2$, 9 - 14 psi)**

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 15. |
| NG | ▶ | Replace radiator cap. |

| 15 | CHECK THERMOSTAT |
|---|---|

1. Remove thermostat.
2. Check valve seating condition at normal room temperatures.
   **It should seat tightly.**
3. Check valve opening temperature and valve lift.



SLC343

**Valve opening temperature:**
**82°C (180°F) [standard] (Models for cold areas)**
**76.5°C (170°F) [standard] (Models for except cold areas)**
**Valve lift:**
**More than 10 mm/95°C (0.394 in/203°F)**

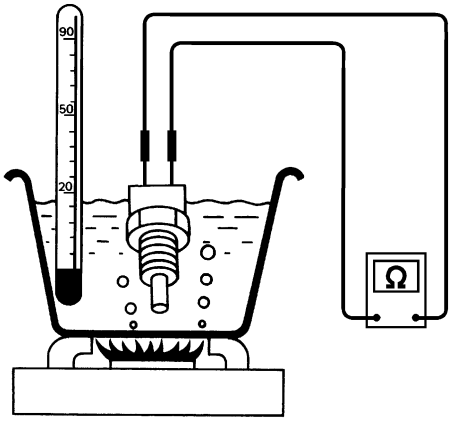
4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC section, "Thermostat".

**OK or NG**

| | | |
|---|---|---|
| OK | ▶ | GO TO 16. |
| NG | ▶ | Replace thermostat. |

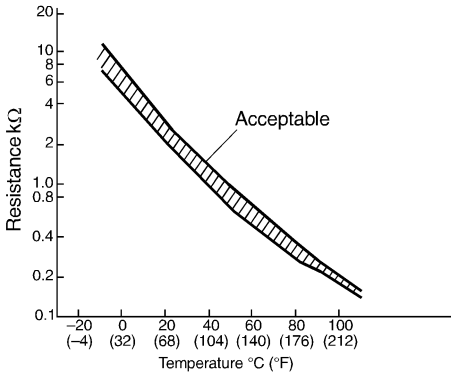
| 16 | CHECK ENGINE COOLANT TEMPERATURE SENSOR |
|---|---|

1. Remove engine coolant temperature sensor.
2. Check resistance between engine coolant temperature sensor terminals 1 and 2 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 |

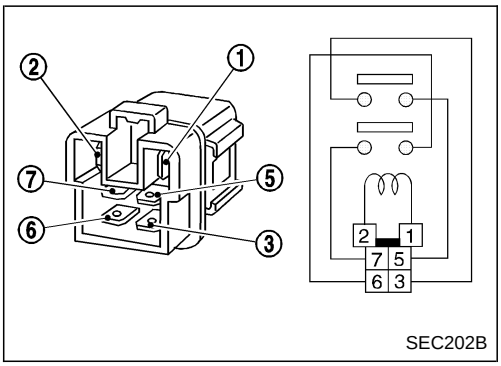



SEF304X

**OK or NG**

| | | |
|---|---|---|
| OK | ► | GO TO 17. |
| NG | ► | Replace engine coolant temperature sensor. |

| 17 | CHECK MAIN 12 CAUSES |
|---|---|
| **If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-496.** | |
| ► | **INSPECTION END** |




SEC202B

## Component Inspection

### COOLING FAN RELAY-1

Check continuity between terminals ③ and ⑤, ⑥ and ⑦.

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

If NG, replace relay.

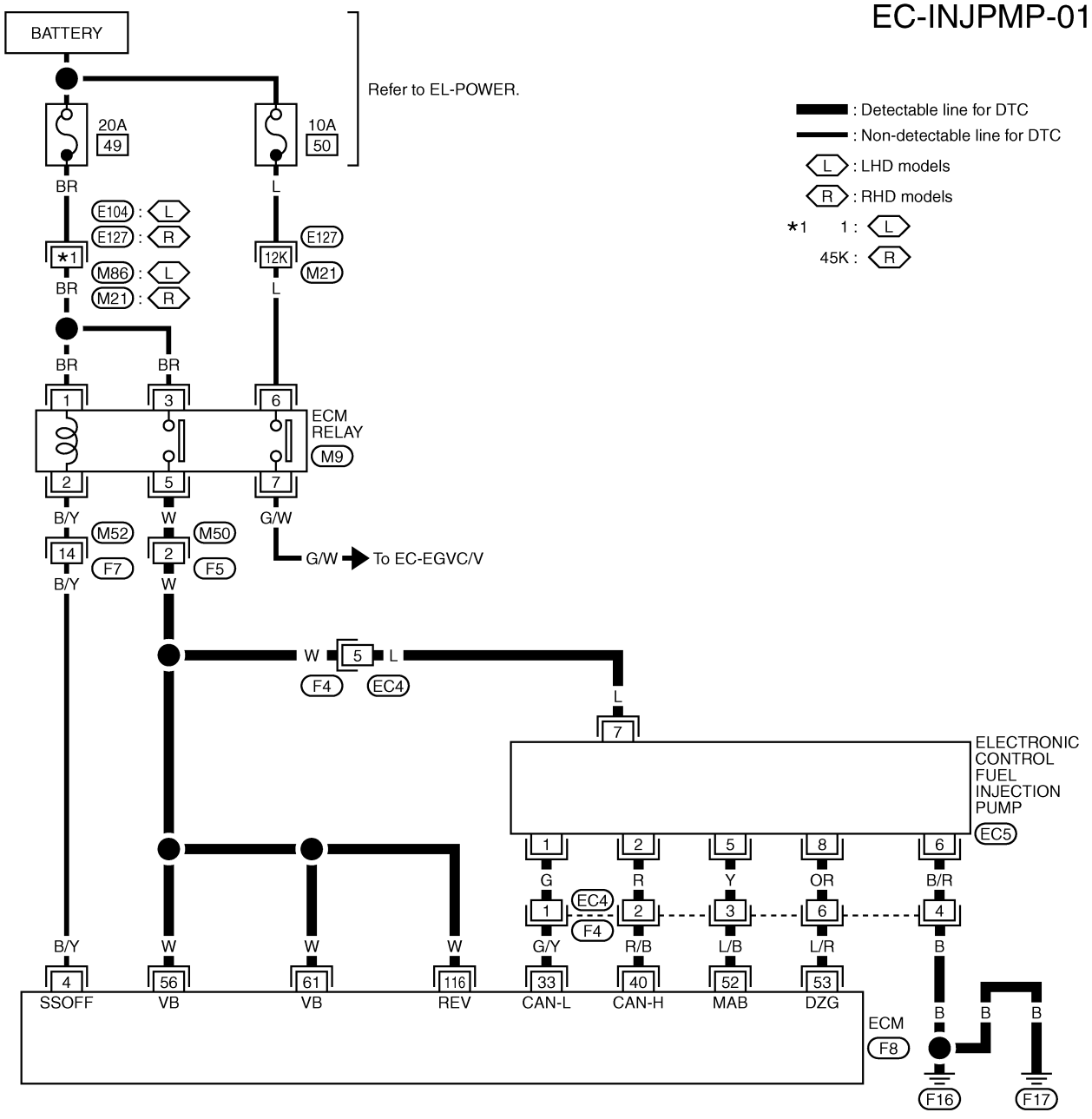
## Main 12 Causes of Overheating

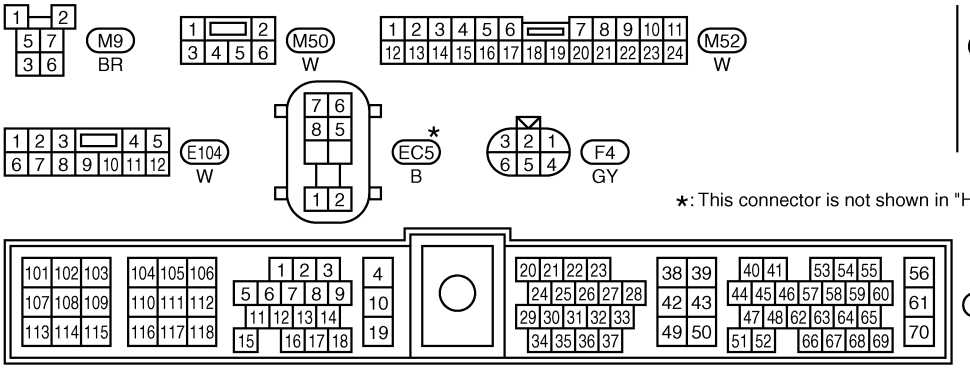
| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|---|---|---|---|---|---|
| OFF | 1 | ● Blocked radiator<br>● Blocked condenser<br>● Blocked radiator grille<br>● Blocked bumper | ● Visual | No blocking | — |
| | 2 | ● Coolant mixture | ● Coolant tester | 30 - 50% coolant mixture | See “RECOMMENDED FLUIDS AND LUBRICANTS” in MA section. |
| | 3 | ● Coolant level | ● Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | See “Changing Engine Coolant”, “ENGINE MAINTENANCE” in MA section. |
| | 4 | ● Radiator cap | ● Pressure tester | 59 - 98 kPa (0.59 - 0.98 bar, 0.6 - 1.0 kg/cm$^2$, 9 - 14 psi) (Limit) | See “System Check”, “ENGINE COOLING SYSTEM” in LC section. |
| ON*2 | 5 | ● Coolant leaks | ● Visual | No leaks | See “System Check”, “ENGINE COOLING SYSTEM” in LC section. |
| ON*2 | 6 | ● Thermostat | ● Touch the upper and lower radiator hoses | Both hoses should be hot. | See “Thermostat” and “Radiator”, “ENGINE COOLING SYSTEM” in LC section. |
| ON*1 | 7 | ● Cooling fan | ● Visual | Operating | See “DTC 0208 OVER HEAT”. |
| OFF | 8 | ● Combustion gas leak | ● Color checker chemical tester 4 gas analyzer | Negative | — |
| ON*3 | 9 | ● Coolant temperature gauge | ● Visual | Gauge less than 3/4 when driving | — |
| | | ● Coolant overflow to reservoir tank | ● Visual | No overflow during driving and idling | See “Changing Engine Coolant”, “ENGINE MAINTENANCE” in MA section. |
| OFF*4 | 10 | ● Coolant return from reservoir tank to radiator | ● Visual | Should be initial level in reservoir tank | See “ENGINE MAINTENANCE” in MA section. |
| OFF | 11 | ● Cylinder head | ● Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | See “Inspection”, “CYLINDER HEAD” in EM section. |
| | 12 | ● Cylinder block and pistons | ● Visual | No scuffing on cylinder walls or piston | See “Inspection”, “CYLINDER BLOCK” in EM section. |

*1: Engine running at idle.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to “OVERHEATING CAUSE ANALYSIS” in LC section.

## Wiring Diagram

EC-INJPMP-01



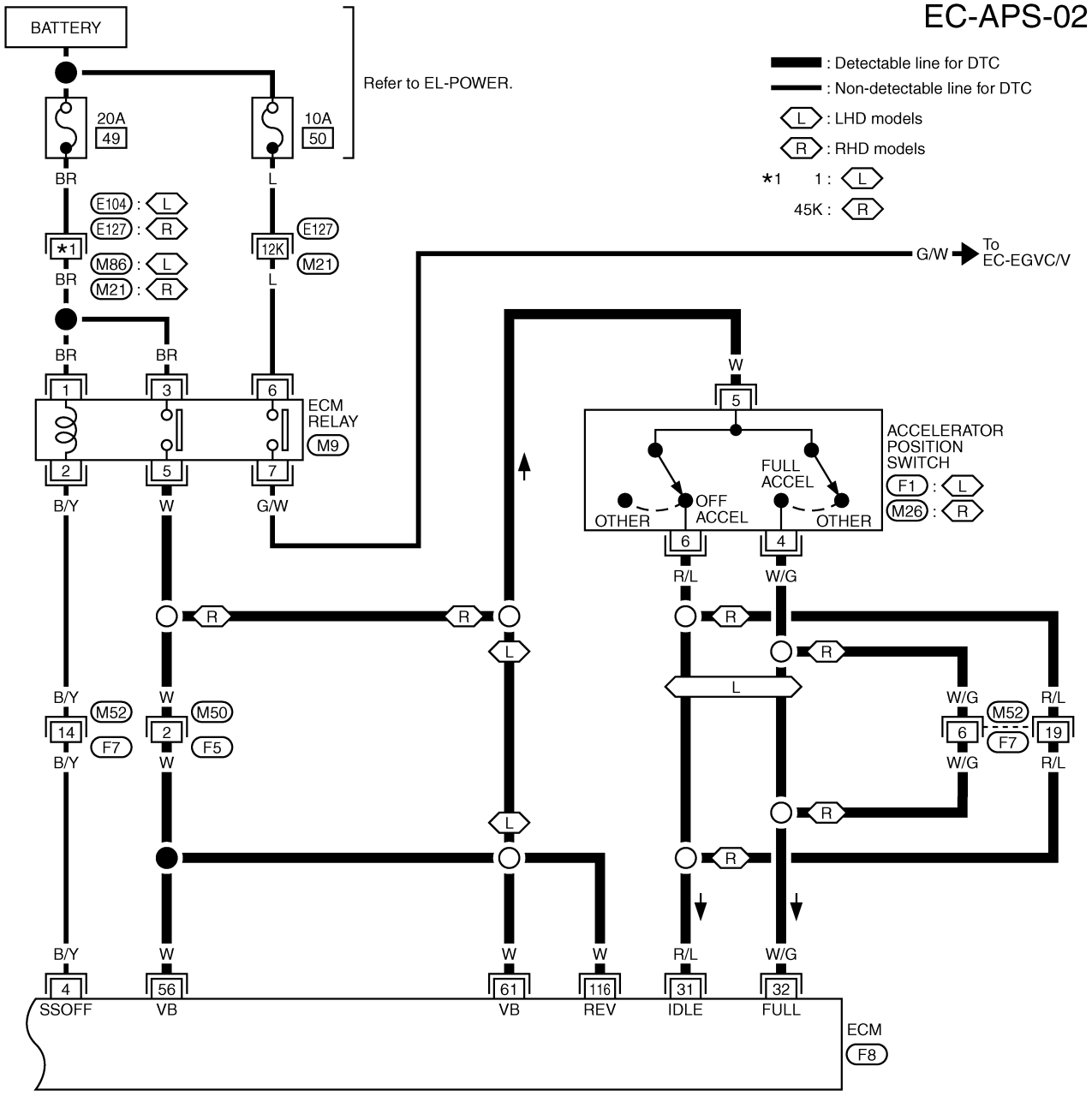



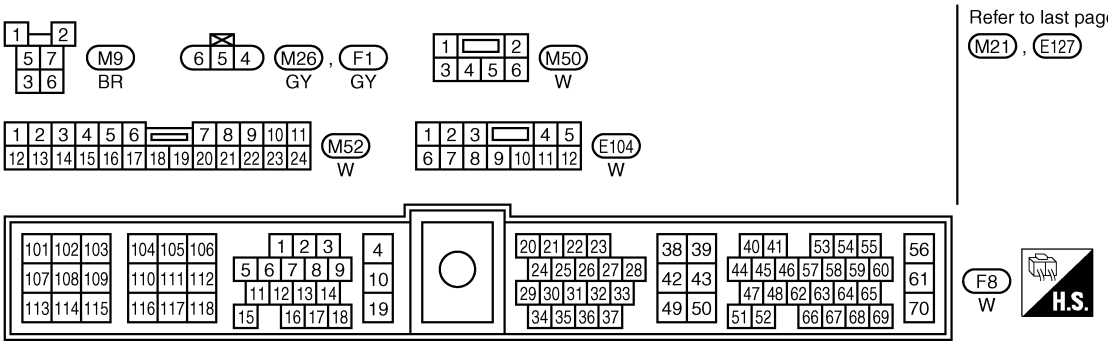

Refer to last page (Foldout page).
M21 , E127

*: This connector is not shown in "HARNESS LAYOUT", EL section.

TEC356M

## Wiring Diagram

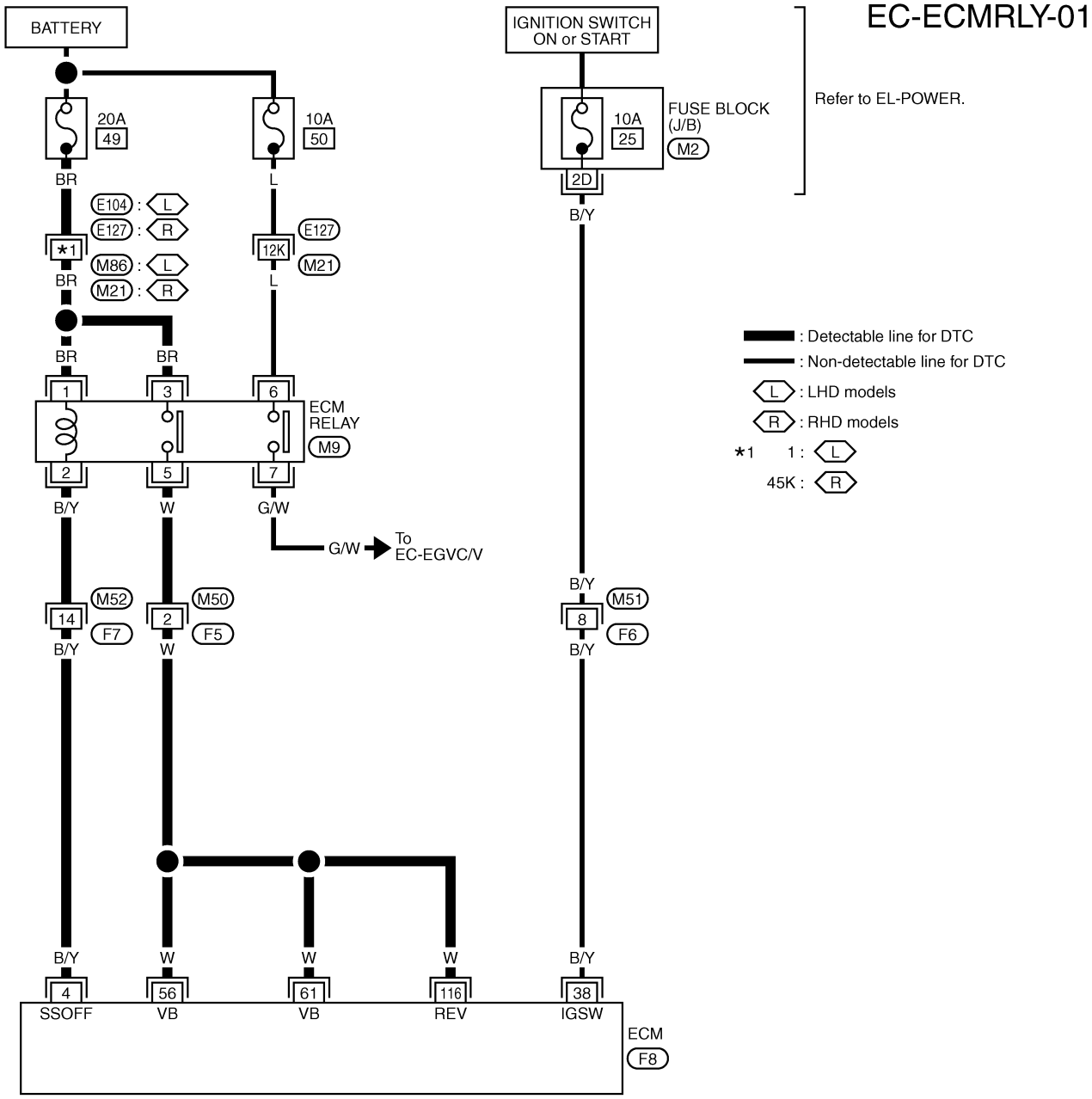


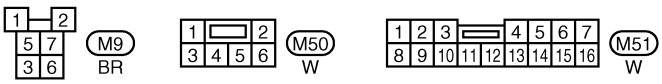




Refer to last page (Foldout page).
M21 , E127

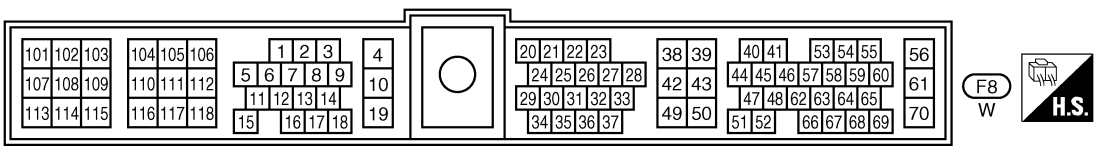
TEC357M

## Wiring Diagram



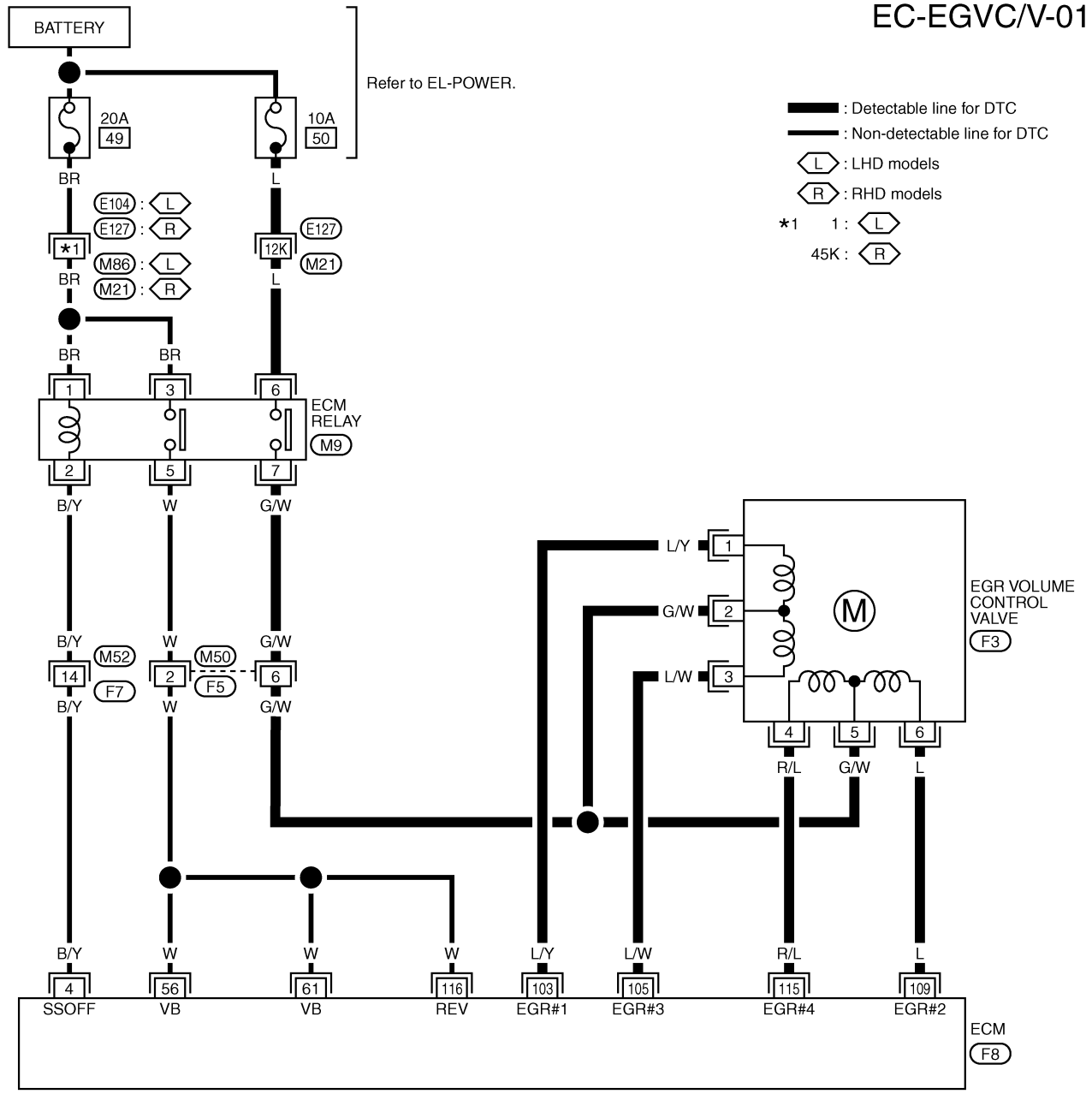


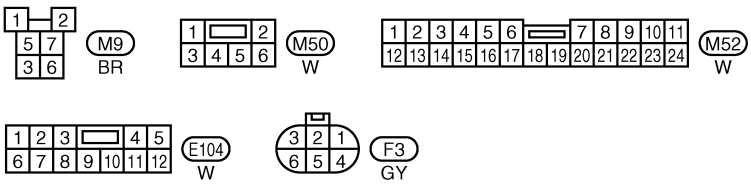



Refer to last page (Foldout page).
M21 , E127
M2

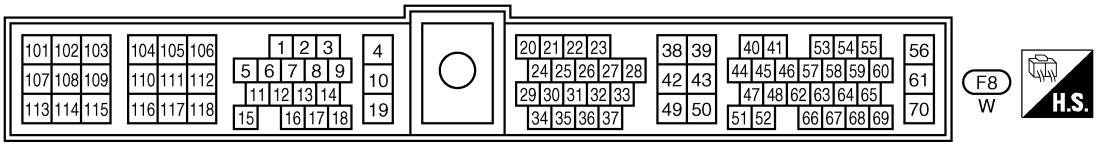
TEC358M

## Wiring Diagram



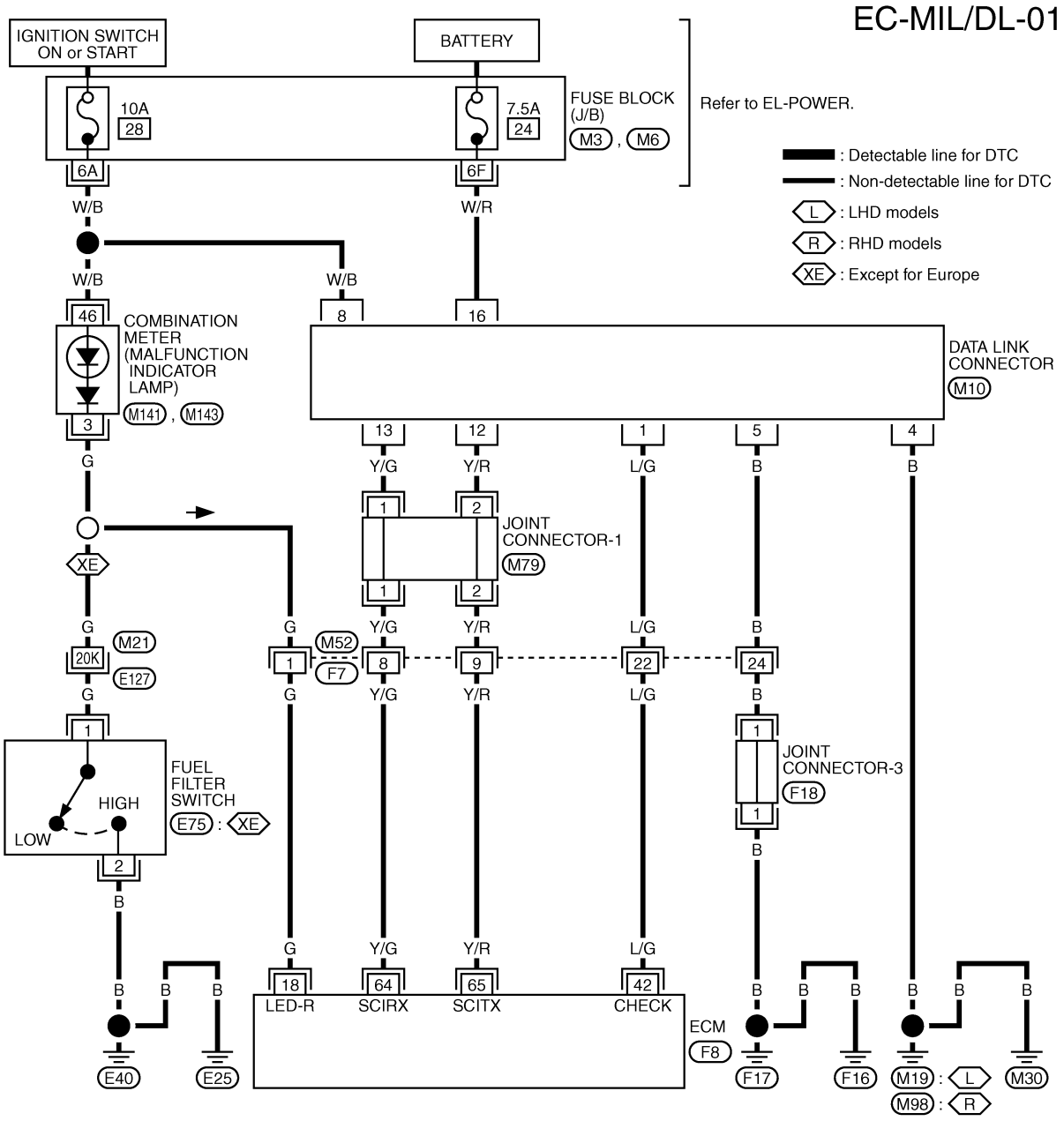



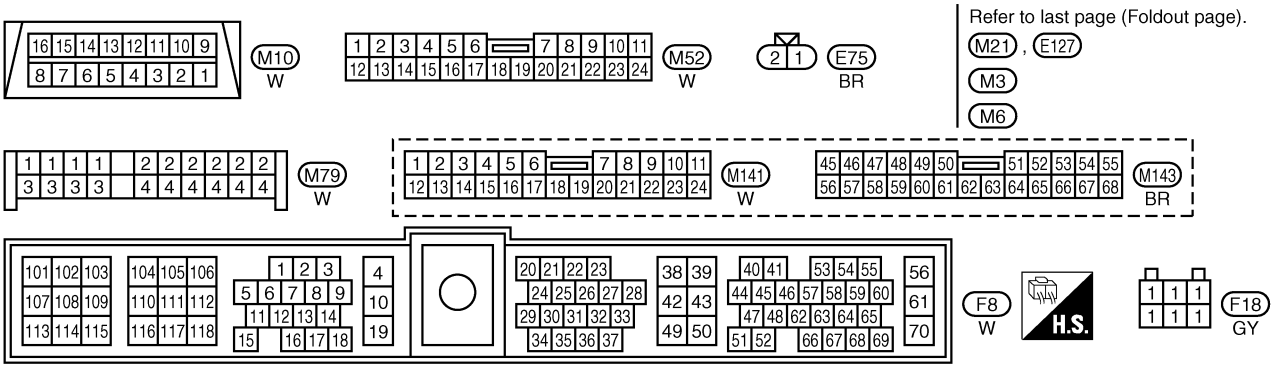

Refer to last page (Foldout page).
M21 , E127




TEC359M

## Wiring Diagram




TEC396M