ENGINE CONTROL SYSTEM

SECTION EC

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Alphabetical & P No. Index for DTC

NAEC0001

ALPHABETICAL INDEX FOR DTC

NAEC0001S01

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AIR TEMP SEN/CIRC	P0110	EC-166
A/T 1ST GR FNCTN	P0731	AT-120
A/T 2ND GR FNCTN	P0732	AT-126
A/T 3RD GR FNCTN	P0733	AT-132
A/T 4TH GR FNCTN	P0734	AT-138
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A/T TCC S/V FNCTN	P0744	AT-153
ATF TEMP SEN/CIRC	P0710	AT-105
CAM PS/CIRC (PHS)	P0340	EC-344
CLOSED LOOP-B1	P1148	EC-493
CLOSED LOOP-B2	P1168	EC-493
CLOSED TP SW/CIRC	P0510	EC-433
COOLANT T SEN/CIRC*3	P0115	EC-171
*COOLANT T SEN/CIRC	P0125	EC-189
CPS/CIRC (POS) COG	P1336	EC-519
CPS/CIRCUIT (POS)	P0335	EC-336
CPS/CIRCUIT (REF)	P1335	EC-512
CYL 1 MISFIRE	P0301	EC-322
CYL 2 MISFIRE	P0302	EC-322
CYL 3 MISFIRE	P0303	EC-322
CYL 4 MISFIRE	P0304	EC-322
CYL 5 MISFIRE	P0305	EC-322
CYL 6 MISFIRE	P0306	EC-322
ECM	P0605	EC-446
ENGINE SPEED SIG	P0725	AT-116
ENG OVER TEMP	P0217	EC-316
ENG OVER TEMP	P1217	LC-25
EVAP GROSS LEAK	P0455	EC-396
EVAP PURG FLOW/MON	P1447	EC-563
EVAP SYS PRES SEN	P0450	EC-383
EVAP SMALL LEAK	P0440	EC-354
EVAP VERY SMALL LEAK	P1441	EC-528

Items (CONSULT-II screen terms)	DTC*1	Reference page
FUEL LEVL SEN/CIRC	P0464	EC-415
FUEL LEVL SEN/CIRC	P1464	EC-584
FUEL LEVEL SENSOR	P0461	EC-413
FUEL LV SE (SLOSH)	P0460	EC-409
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FUEL SYS-LEAN/BK2	P0174	EC-296
FUEL SYS-RICH/BK1	P0172	EC-304
FUEL SYS-RICH/BK2	P0175	EC-304
FUEL TEMP SEN/CIRC	P0180	EC-311
HO2S1 HTR (B1)	P0135	EC-242
HO2S1 HTR (B2)	P0155	EC-242
HO2S1 (B1)	P0130	EC-194
HO2S1 (B1)	P0131	EC-204
HO2S1 (B1)	P0132	EC-212
HO2S1 (B1)	P0133	EC-220
HO2S1 (B1)	P0134	EC-233
HO2S1 (B2)	P0150	EC-194
HO2S1 (B2)	P0151	EC-204
HO2S1 (B2)	P0152	EC-212
HO2S1 (B2)	P0153	EC-220
HO2S1 (B2)	P0154	EC-233
HO2S2 (B1)	P0137	EC-249
HO2S2 (B1)	P0138	EC-259
HO2S2 (B1)	P0139	EC-269
HO2S2 (B1)	P0140	EC-279
HO2S2 (B2)	P0157	EC-249
HO2S2 (B2)	P0158	EC-259
HO2S2 (B2)	P0159	EC-269
HO2S2 (B2)	P0160	EC-279
HO2S2 HTR (B1)	P0141	EC-288
HO2S2 HTR (B2)	P0161	EC-288
IACV/AAC VLV/CIRC	P0505	EC-424
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Items (CONSULT-II screen terms)	DTC*1	Reference page
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INT/V TIM V/CIR-B2	P1136	EC-453
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L/PRES SOL/CIRC	P0745	AT-162
MAF SEN/CIRCUIT*3	P0100	EC-152
MULTI CYL MISFIRE	P0300	EC-322
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NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	—
O/R CLTCH SOL/CIRC	P1760	AT-185
P-N POS SW/CIRCUIT	P1706	EC-606
PNP SW/CIRC	P0705	AT-99
PURG VOLUME CONT/V	P0443	EC-369
PURG VOLUME CONT/V	P1444	EC-543
SFT SOL A/CIRC*3	P0750	AT-168
SFT SOL B/CIRC*3	P0755	AT-172
SWIRL CONT SOL/V	P1130	EC-460
SWL CON VC SW/CIRC	P1165	EC-495
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TRTL POS SEN/CIRC*3	P0120	EC-176
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VC/V BYPASS/V	P1490	EC-587
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VENT CONTROL VALVE	P0446	EC-376
VENT CONTROL VALVE	P1446	EC-555
VENT CONTROL VALVE	P1448	EC-575

*1: 1st trip DTC No. is the same as DTC No.
*2: This DTC is displayed with CONSULT-II only.
*3: When the fail-safe operation occurs, the MIL illuminates.
*4: The MIL illuminates when both the “Revolution sensor signal” and the “Vehicle speed sensor signal” meet the fail-safe condition at the same time.

NOTE:

- Regarding R50 models, “-B1” and “BK1” indicate right bank and “-B2” and “BK2” indicate left bank.
- Bank 1 (-B1 or BK1) includes No. 1 cylinder.

P NO. INDEX FOR DTC

=NAEC0001S02

DTC*1	Items (CONSULT-II screen terms)	Reference page
—	Unable to access ECM	EC-119
P0000	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—
P0100	MAF SEN/CIRCUIT*3	EC-152
P0105	ABSL PRES SEN/CIRC	EC-160
P0110	AIR TEMP SEN/CIRC	EC-166
P0115	COOLANT T SEN/CIRC*3	EC-171
P0120	THRTL POS SEN/CIRC*3	EC-176
P0125	*COOLANT T SEN/CIRC	EC-189
P0130	HO2S1 (B1)	EC-194
P0131	HO2S1 (B1)	EC-204
P0132	HO2S1 (B1)	EC-212
P0133	HO2S1 (B1)	EC-220
P0134	HO2S1 (B1)	EC-233
P0135	HO2S1 HTR (B1)	EC-242
P0137	HO2S2 (B1)	EC-249
P0138	HO2S2 (B1)	EC-259
P0139	HO2S2 (B1)	EC-269
P0140	HO2S2 (B1)	EC-279
P0141	HO2S2 HTR (B1)	EC-288
P0150	HO2S1 (B2)	EC-194
P0151	HO2S1 (B2)	EC-204
P0152	HO2S1 (B2)	EC-212
P0153	HO2S1 (B2)	EC-220
P0154	HO2S1 (B2)	EC-233
P0155	HO2S1 HTR (B2)	EC-242
P0157	HO2S2 (B2)	EC-249
P0158	HO2S2 (B2)	EC-259
P0159	HO2S2 (B2)	EC-269
P0160	HO2S2 (B2)	EC-279
P0161	HO2S2 HTR (B2)	EC-288
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P0172	FUEL SYS-RICH/BK1	EC-304
P0174	FUEL SYS-LEAN/BK2	EC-296
P0175	FUEL SYS-RICH/BK2	EC-304
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DTC*1	Items (CONSULT-II screen terms)	Reference page
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P0301	CYL 1 MISFIRE	EC-322
P0302	CYL 2 MISFIRE	EC-322
P0303	CYL 3 MISFIRE	EC-322
P0304	CYL 4 MISFIRE	EC-322
P0305	CYL 5 MISFIRE	EC-322
P0306	CYL 6 MISFIRE	EC-322
P0325*2	KNOCK SEN/CIRC-B1	EC-330
P0335	CPS/CIRCUIT (POS)	EC-336
P0340	CAM PS/CIRC (PHS)	EC-344
P0420	TW CATALYST SYS-B1	EC-349
P0430	TW CATALYST SYS-B2	EC-349
P0440	EVAP SMALL LEAK	EC-354
P0443	PURG VOLUME CONT/V	EC-369
P0446	VENT CONTROL VALVE	EC-376
P0450	EVAP SYS PRES SEN	EC-383
P0455	EVAP GROSS LEAK	EC-396
P0460	FUEL LV SE (SLOSH)	EC-409
P0461	FUEL LEVEL SENSOR	EC-413
P0464	FUEL LEVL SEN/CIRC	EC-415
P0500	VEH SPEED SEN/CIRC*4	EC-419
P0505	IACV/AAC VLV/CIRC	EC-424
P0510	CLOSED TP SW/CIRC	EC-433
P0600*2	A/T COMM LINE	EC-442
P0605	ECM	EC-446
P0705	PNP SW/CIRC	AT-99
P0710	ATF TEMP SEN/CIRC	AT-105
P0720	VEH SPD SEN/CIR A/T*4	AT-111
P0725	ENGINE SPEED SIG	AT-116
P0731	A/T 1ST GR FNCTN	AT-120
P0732	A/T 2ND GR FNCTN	AT-126
P0733	A/T 3RD GR FNCTN	AT-132
P0734	A/T 4TH GR FNCTN	AT-138
P0740	TCC SOLENOID/CIRC	AT-148
P0744	A/T TCC S/V FNCTN	AT-153
P0745	L/PRESS SOL/CIRC	AT-162

DTC*1	Items (CONSULT-II screen terms)	Reference page
P0750	SFT SOL A/CIRC*3	AT-168
P0755	SFT SOL B/CIRC*3	AT-172
P1110	INT/V TIM CONT-B1	EC-448
P1111	INT/V TIM V/CIR-B1	EC-453
P1130	SWIRL CONT SOL/V	EC-460
P1135	INT/V TIM CONT-B2	EC-448
P1136	INT/V TIM V/CIR-B2	EC-453
P1140	INTK TIM S/CIRC-B1	EC-484
P1145	INTK TIM S/CIRC-B2	EC-484
P1148	CLOSED LOOP-B1	EC-493
P1165	SWL CON VC SW/CIRC	EC-495
P1168	CLOSED LOOP-B2	EC-493
P1217	ENG OVER TEMP	LC-25
P1320	IGN SIGNAL-PRIMARY	EC-501
P1335	CPS/CIRCUIT (REF)	EC-512
P1336	CPS/CIRC (POS) COG	EC-519
P1441	EVAP VERY SMALL LEAK	EC-528
P1444	PURG VOLUME CONT/V	EC-543
P1446	VENT CONTROL VALVE	EC-555
P1447	EVAP PURG FLOW/MON	EC-563
P1448	VENT CONTROL VALVE	EC-575
P1464	FUEL LEVEL SEN/CIRC	EC-584
P1490	VC/V BYPASS/V	EC-587
P1491	VC CUT/V BYPASS/V	EC-593
P1605	A/T DIAG COMM LINE	EC-605
P1610 - P1615*2	NATS MALFUNCTION	EL-352
P1705	TP SEN/CIRC A/T*3	AT-176
P1706	P-N POS SW/CIRCUIT	EC-606
P1760	O/R CLTCH SOL/CIRC	AT-185

*1: 1st trip DTC No. is the same as DTC No.
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*3: When the fail-safe operation occurs, the MIL illuminates.
*4: The MIL illuminates when both the "Revolution sensor signal" and the "Vehicle speed sensor signal" meet the fail-safe condition at the same time.

NOTE:

- Regarding R50 models, "-B1" and "BK1" indicate right bank and "-B2" and "BK2" indicate left bank.
- Bank 1 (-B1 or BK1) includes No. 1 cylinder.

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

NAEC0002

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 R50 is as follows:

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

Information necessary to service the system safely is included in the **RS section** of this Service Manual.

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance must be performed by an authorized 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, refer to RS section.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. Spiral cable and wiring harnesses covered with yellow insulation tape either just before the harness connectors or for the complete harness are related to the SRS.**

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

NAEC0003

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

CAUTION:

- **Be sure to turn the ignition switch OFF and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **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-6, "HARNESS CONNECTOR (SLIDE-LOCKING TYPE)".**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

Engine Fuel & Emission Control System

NAEC0004

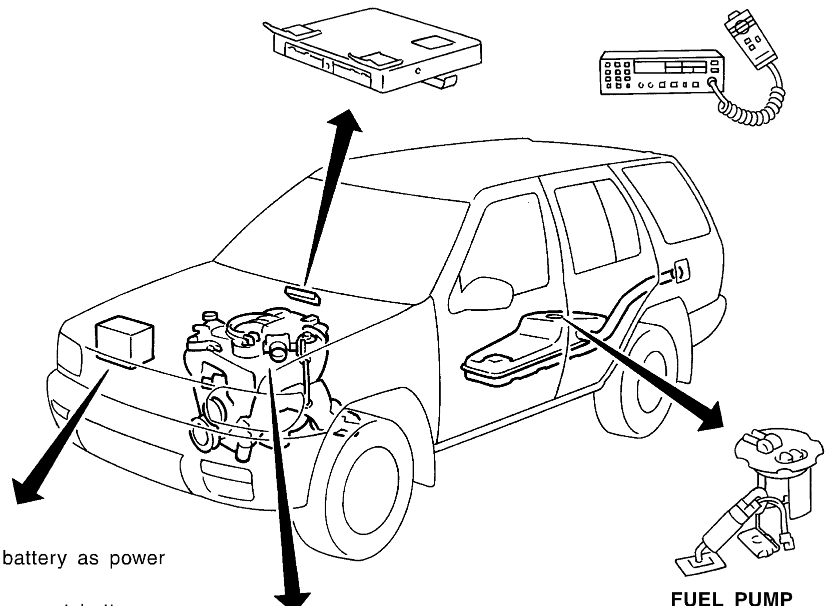
WIRELESS EQUIPMENT

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

1) Keep the antenna as far away as possible from the electronic control units.
2) Keep the antenna feeder line more than 20 cm (7.9 in) away from the harness of electronic controls.
   Do not let them run parallel for a long distance.
3) Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.
4) Be sure to ground the radio to vehicle body.

ECM

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



BATTERY

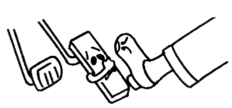
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

WHEN STARTING

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

ECM PARTS HANDLING

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



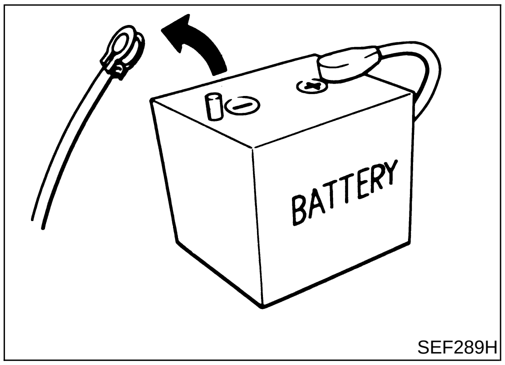
FUEL PUMP

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

ECM HARNESS HANDLING

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

SEF952RE

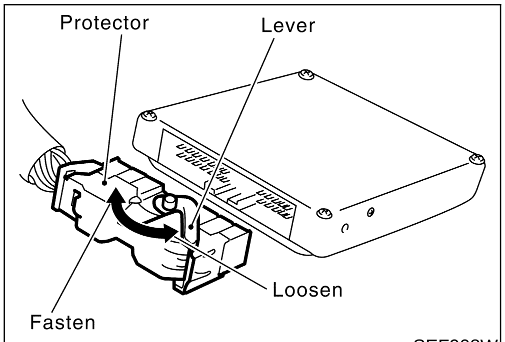


SEF289H

Precautions

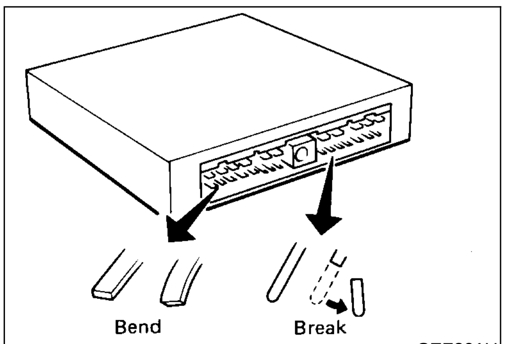
NAEC0005

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



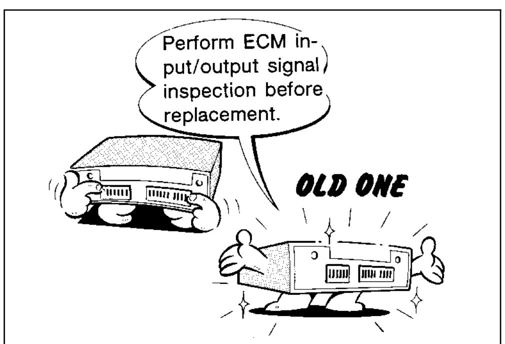
SEF908W

- **When connecting ECM harness connector, fasten it securely with a lever as far as it will go as shown at left.**



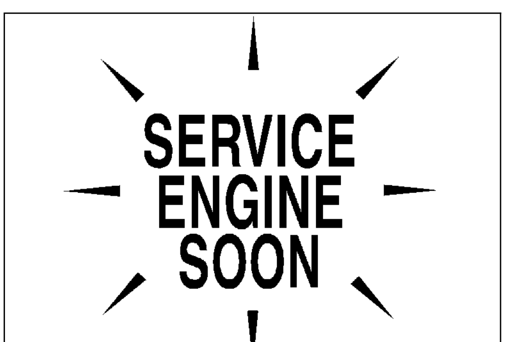
SEF291H

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.



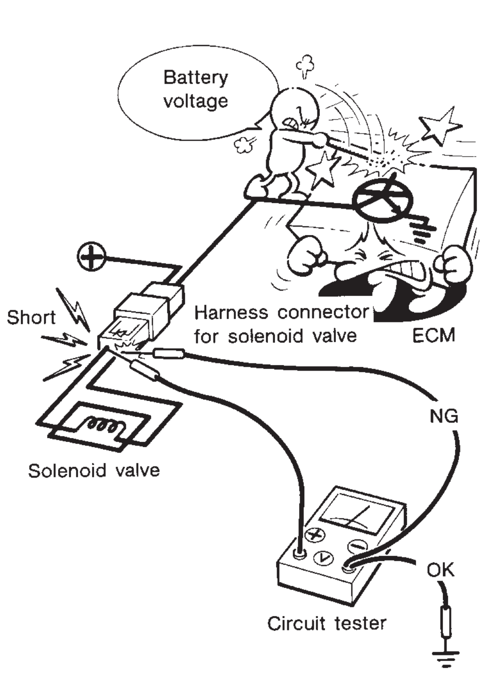
MEF040D

- **Before replacing ECM, perform “ECM Terminals and Reference Value” inspection and make sure ECM functions properly. Refer to EC-129.**



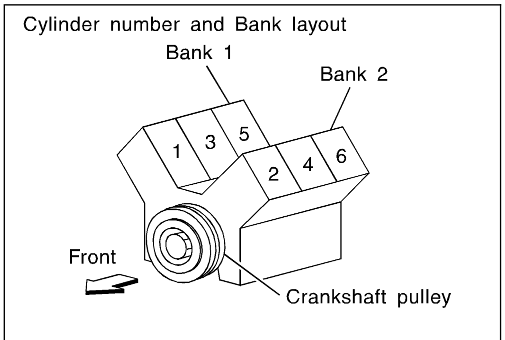
SEF217U

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



SEF348N

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



SEF099WB

- **Regarding model R50, "-B1" indicates the right bank and "-B2" indicates the left bank as shown in the figure.**
- **Bank 1 includes No. 1 cylinder.**

Wiring Diagrams and Trouble Diagnosis

NAEC0006

When you read Wiring diagrams, refer to the following:

- GI-11, "HOW TO READ WIRING DIAGRAMS"
- EL-9, "POWER SUPPLY ROUTING" for power distribution circuit

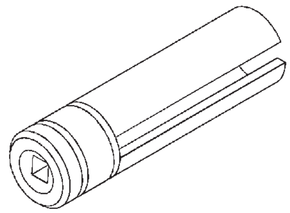
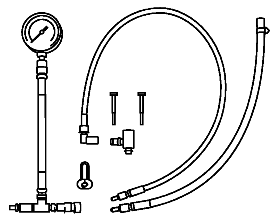
When you perform trouble diagnosis, refer to the following:

- GI-35, "HOW TO FOLLOW TEST GROUPS IN TROUBLE DIAGNOSES"
- GI-24, "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT"

Special Service Tools

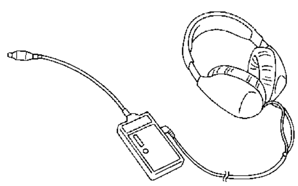
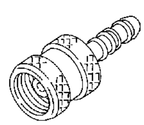
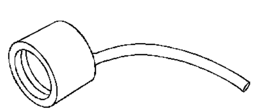
NAEC0007

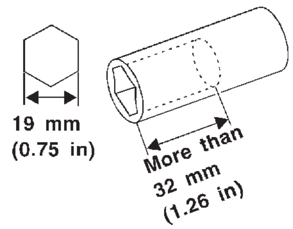
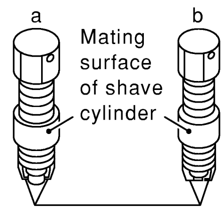
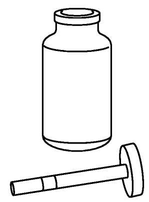
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description	
KV10117100 (J36471-A) Front heated oxygen sensor wrench Rear heated oxygen sensor wrench	 NT379	Loosening or tightening front and rear heated oxygen sensors with 22 mm (0.87 in) hexagon nut
(J44321) Fuel pressure adapter and gauge kit	 SEF326Z	Checking fuel pressure with pressure gauge

Commercial Service Tools

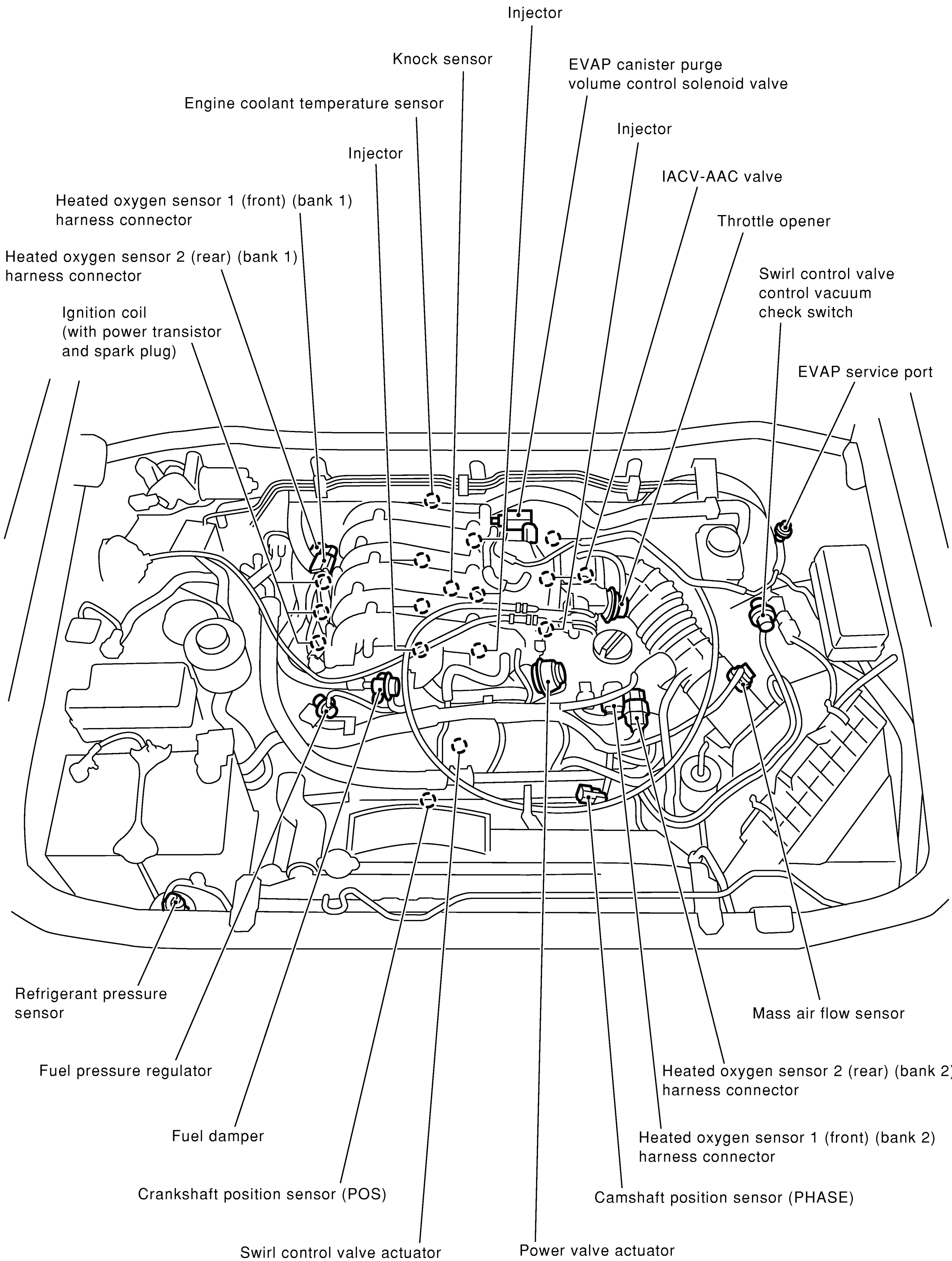
NAEC0008

Tool name (Kent-Moore No.)	Description	
Leak detector (J41416)	 NT703	Locating the EVAP leak
EVAP service port adapter (J41413-OBD)	 NT704	Applying positive pressure through EVAP service port
Fuel filler cap adapter	 NT653	Checking fuel tank vacuum relief valve opening pressure

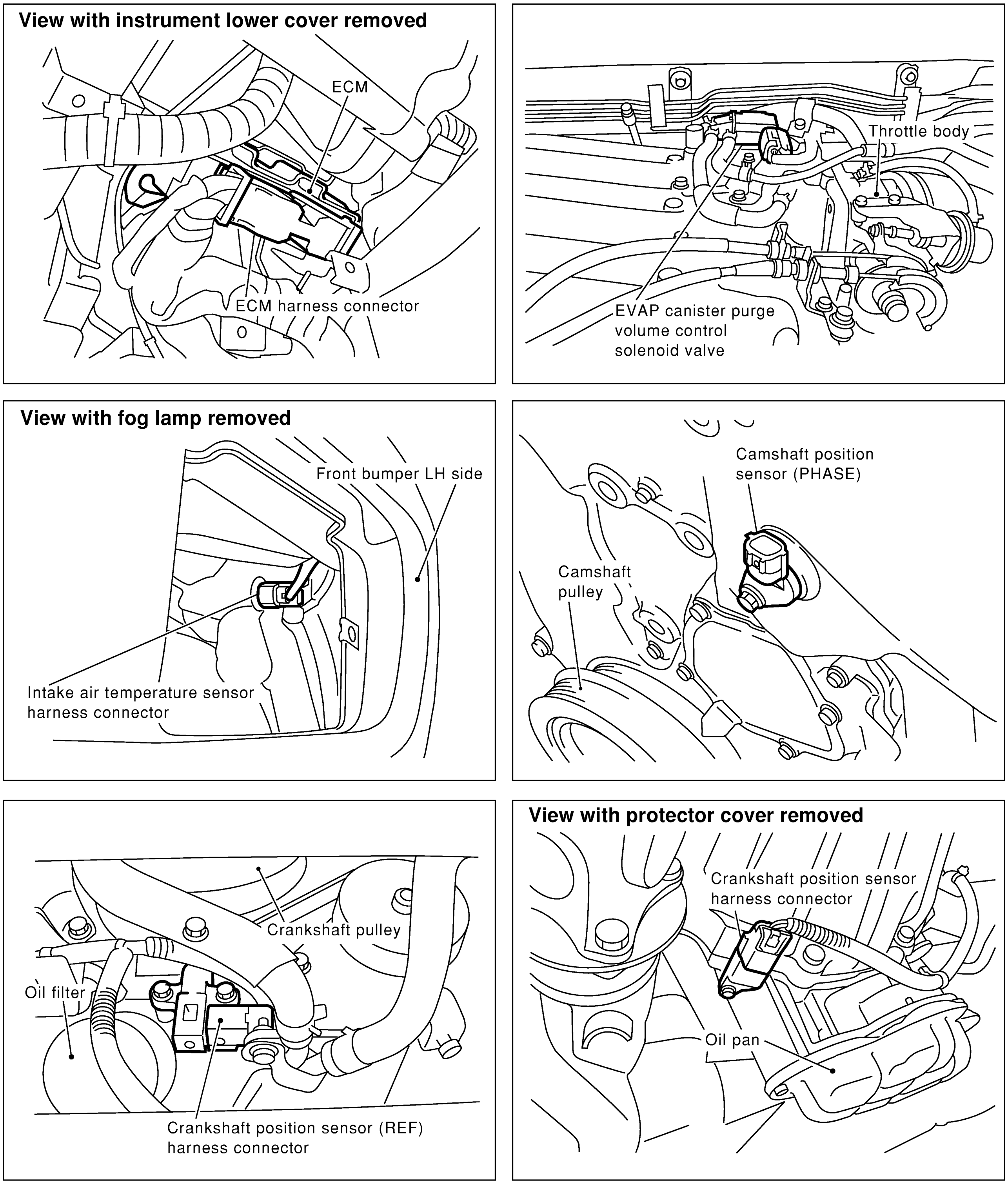
Tool name (Kent-Moore No.)	Description	
Socket wrench	 NT705	Removing and installing engine coolant temperature sensor
Oxygen sensor thread cleaner (J-43897-18) (J-43897-12)	 NT828	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: J-43897-18 18 mm diameter with pitch 1.5 mm, for Zirconia Oxygen Sensor** **b: J-43897-12 12 mm diameter with pitch 1.25 mm, for Titania Oxygen Sensor**
Anti-seize lubricant (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 NT779	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

Engine Control Component Parts Location

NAEC0009



SEF929Y



SEF034Z

GI
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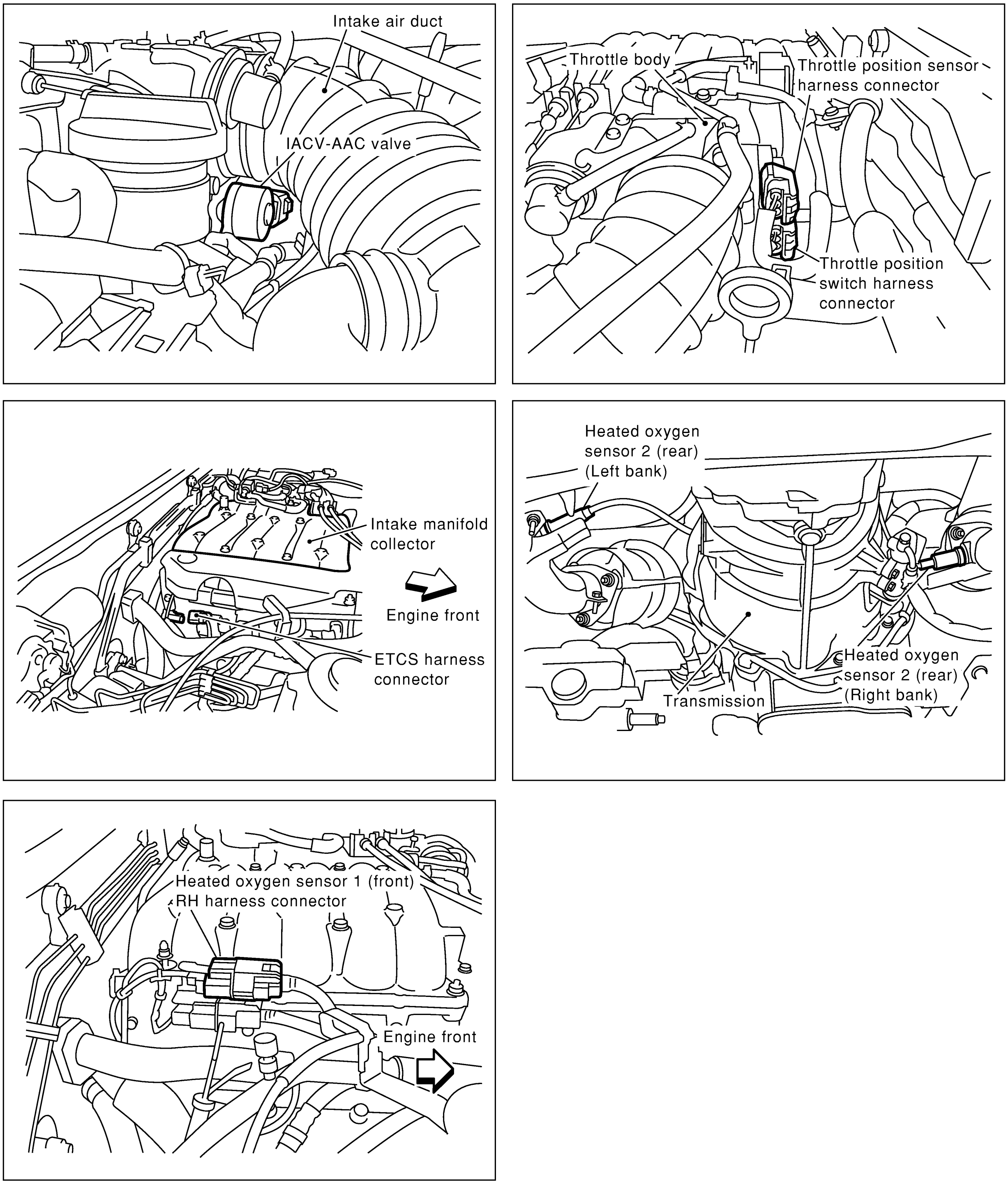
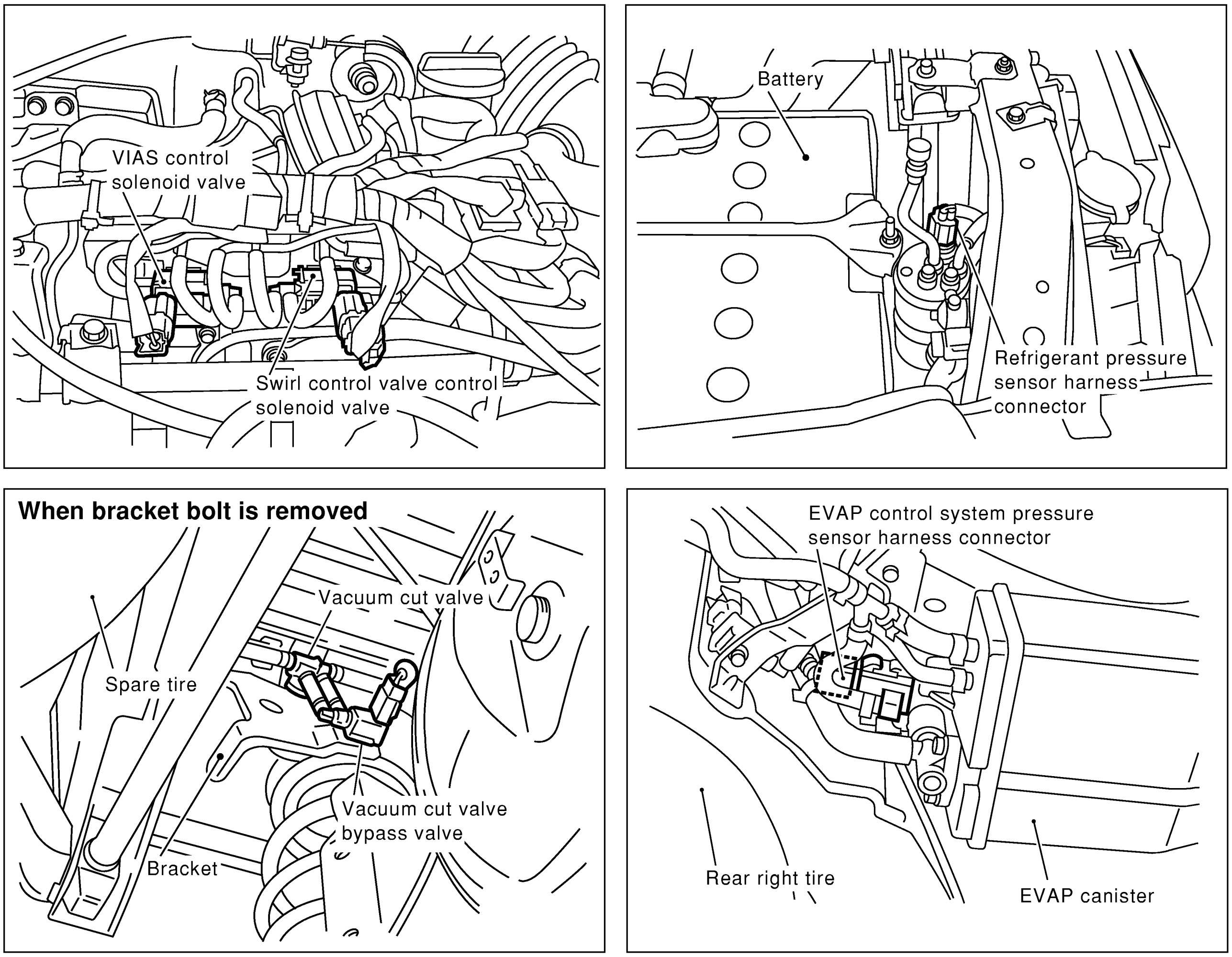
EL
IDX


Intake air duct
IACV-AAC valve
Throttle body
Throttle position sensor harness connector
Throttle position switch harness connector
Intake manifold collector
Engine front
ETCS harness connector
Heated oxygen sensor 2 (rear) (Left bank)
Transmission
Heated oxygen sensor 2 (rear) (Right bank)
Heated oxygen sensor 1 (front) RH harness connector
Engine front

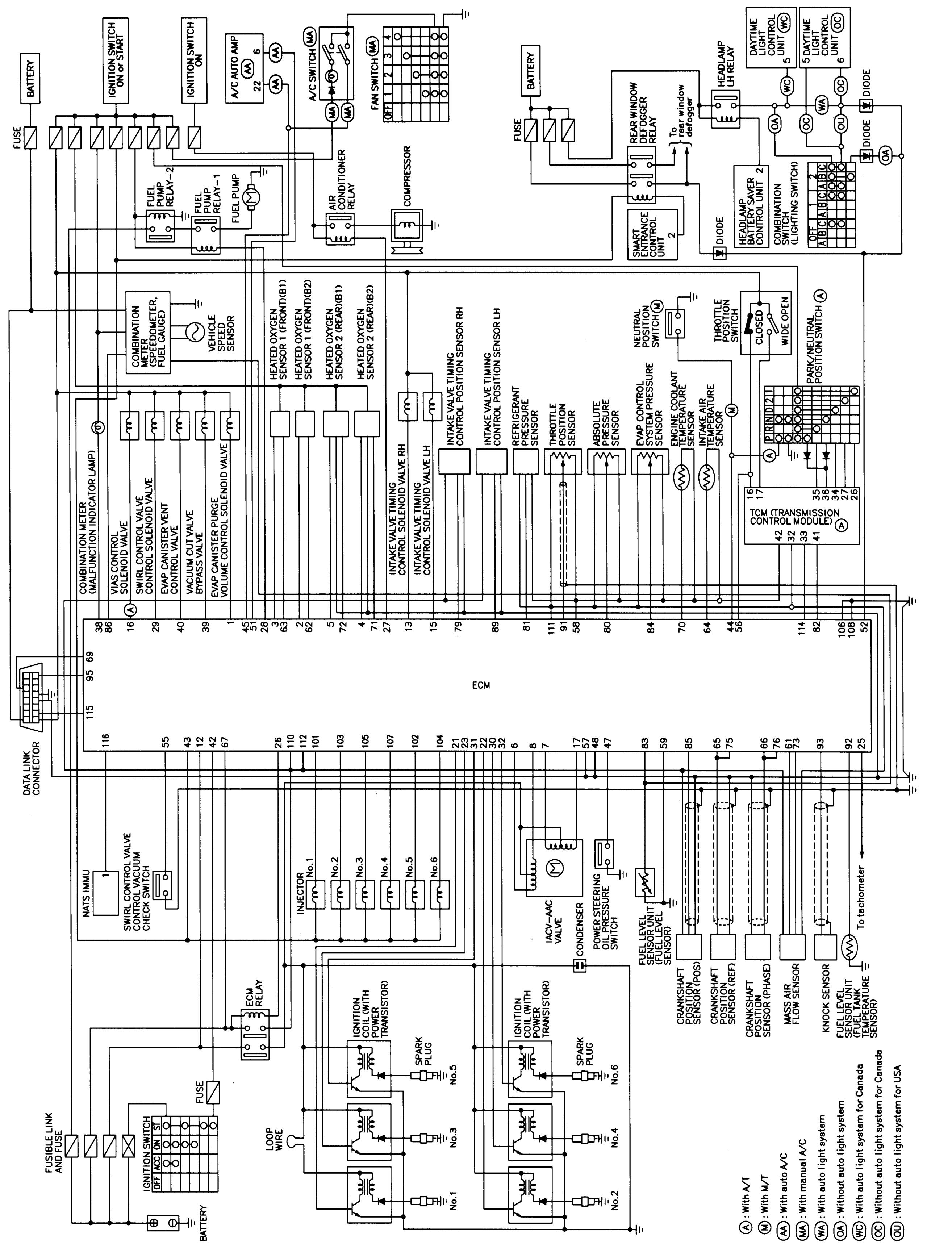
SEF584Z


VIAS control solenoid valve
Swirl control valve control solenoid valve
Battery
Refrigerant pressure sensor harness connector
When bracket bolt is removed
Vacuum cut valve
Spare tire
Vacuum cut valve bypass valve
Bracket
EVAP control system pressure sensor harness connector
Rear right tire
EVAP canister

SEF036Z

Circuit Diagram

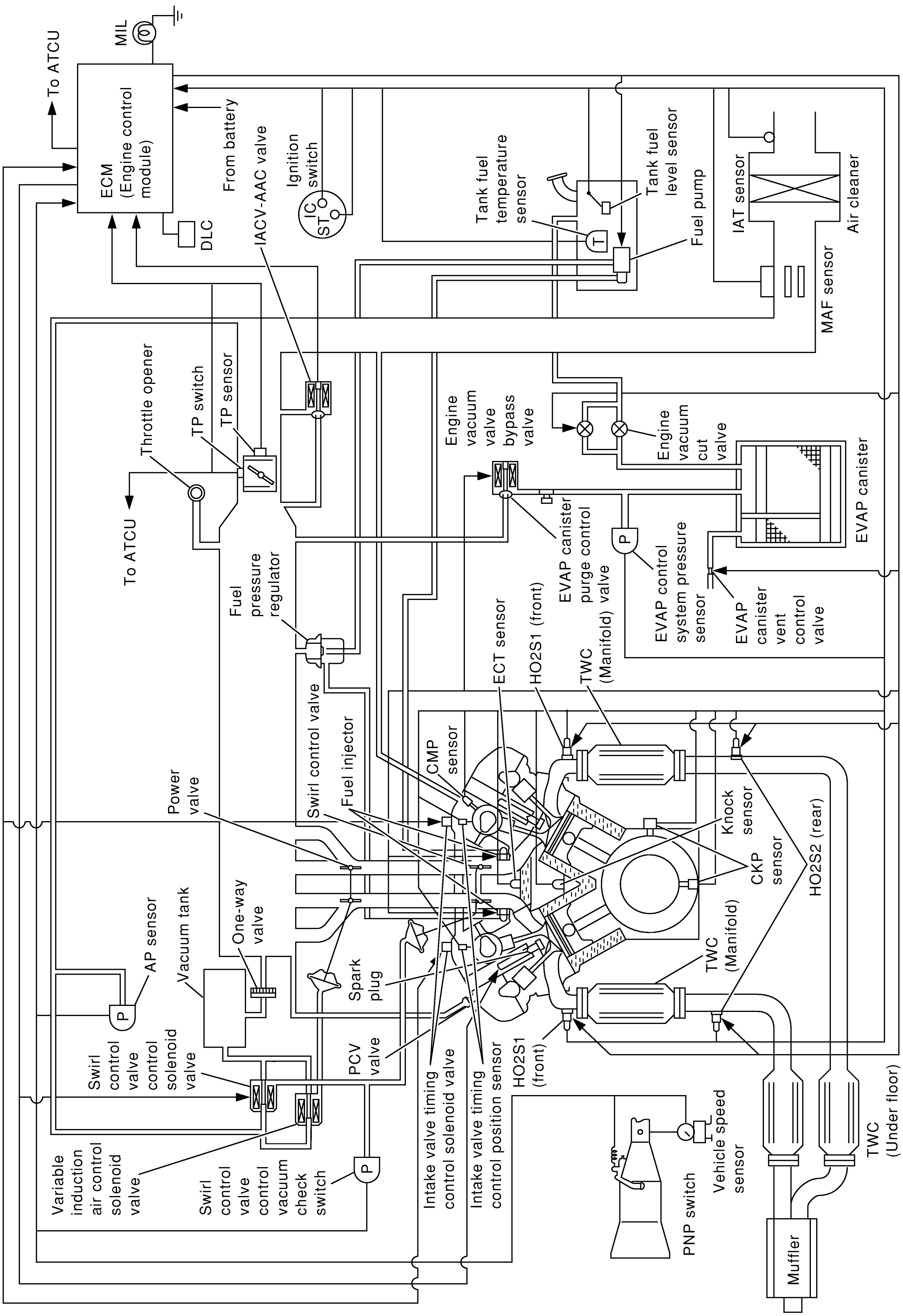
NAEC0010



MEC012D

System Diagram

NAEC0011

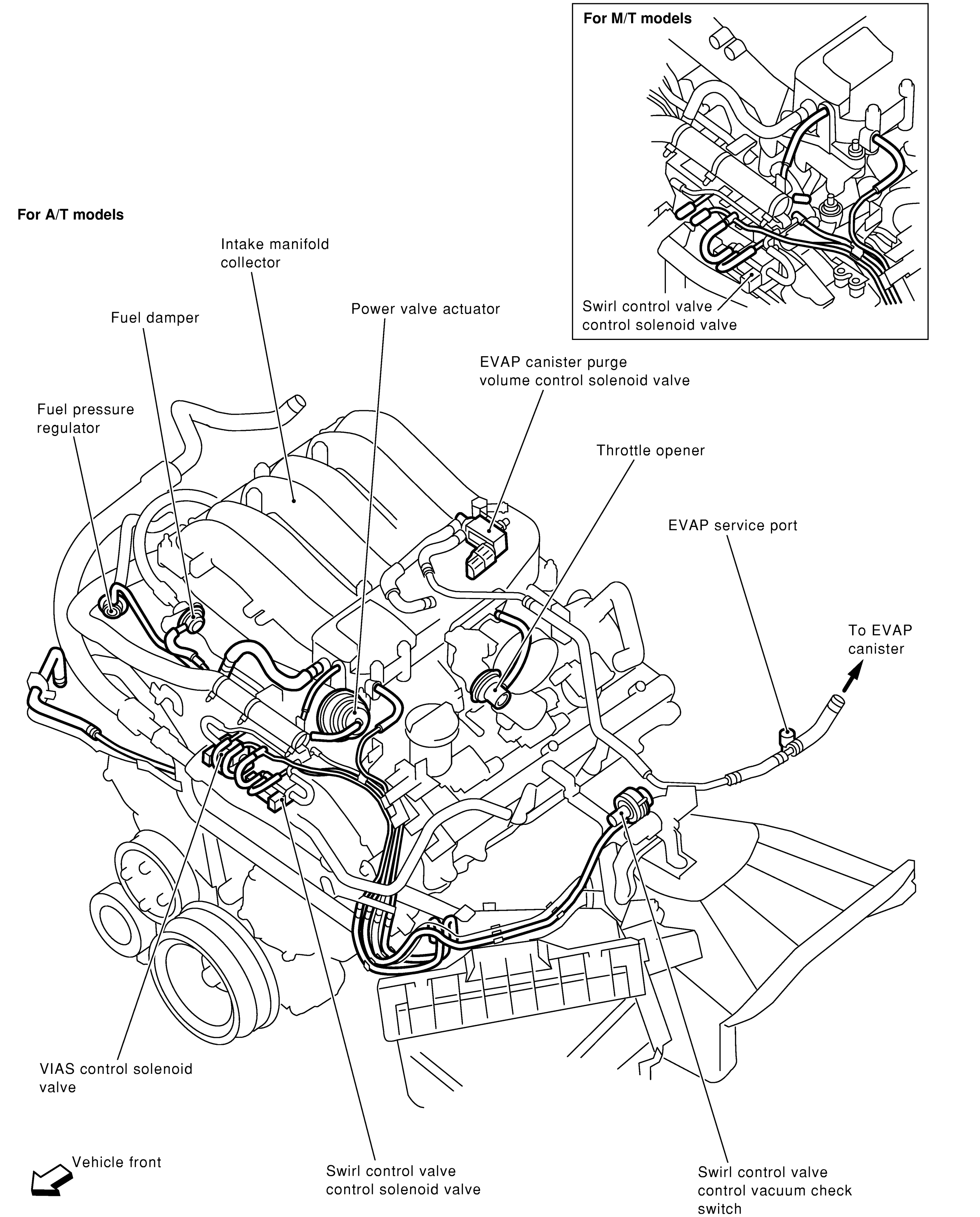


SEF930Y

Vacuum Hose Drawing

NAEC0012

Refer to "System Diagram", EC-25 for Vacuum Control System.



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

SEF037Z

System Chart

NAEC0013

<table>
<tr><th>Input (Sensor)</th><th>ECM Function</th><th>Output (Actuator)</th></tr>
<tr><td rowspan="14">● Camshaft position sensor (PHASE)
● Crankshaft position sensor (REF)
● Mass air flow sensor
● Engine coolant temperature sensor
● Heated oxygen sensor 1 (front)
● Ignition switch
● Throttle position sensor
● Closed throttle position switch *3
● Park/neutral position (PNP) switch
● Air conditioner switch
● Knock sensor
● Intake air temperature sensor
● Absolute pressure sensor
● EVAP control system pressure sensor *1
● Battery voltage
● Power steering oil pressure switch
● Vehicle speed sensor
● Fuel tank temperature sensor *1
● Crankshaft position sensor (POS)
● Heated oxygen sensor 2 (rear)*2
● TCM (Transmission control module)
● Refrigerant pressure sensor
● Electrical load
● Fuel level sensor*1</td><td>Fuel injection & mixture ratio control</td><td>Injectors</td></tr>
<tr><td>Electronic ignition system</td><td>Power transistor</td></tr>
<tr><td>Idle air control system</td><td>IACV-AAC valve</td></tr>
<tr><td>Fuel pump control</td><td>Fuel pump relay</td></tr>
<tr><td>On board diagnostic system</td><td>MIL (On the instrument panel)</td></tr>
<tr><td>Swirl control valve control</td><td>Swirl control valve control solenoid valve</td></tr>
<tr><td>Power valve control</td><td>VIAS control solenoid valve</td></tr>
<tr><td>Heated oxygen sensor 1 heater (front) control</td><td>Heated oxygen sensor 1 heater (front)</td></tr>
<tr><td>Heated oxygen sensor 2 heater (rear) control</td><td>Heated oxygen sensor 2 heater (rear)</td></tr>
<tr><td>EVAP canister purge flow control</td><td>EVAP canister purge volume control solenoid valve</td></tr>
<tr><td>Air conditioning cut control</td><td>Air conditioner relay</td></tr>
<tr><td>ON BOARD DIAGNOSIS for EVAP system</td><td>● EVAP canister vent control valve
● Vacuum cut valve bypass valve</td></tr>
</table>

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

Multiport Fuel Injection (MFI) System

DESCRIPTION

NAEC0014

Input/Output Signal Chart

NAEC0014S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Fuel injection & mixture ratio control	Injectors
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position Throttle valve idle position		
Park/neutral position (PNP) switch	Gear position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Air conditioner switch	Air conditioner operation		
Knock sensor	Engine knocking condition		
Battery	Battery voltage		
Absolute pressure sensor	Ambient air barometric pressure		
Power steering oil pressure switch	Power steering operation		
Heated oxygen sensor 2 (rear)*	Density of oxygen in exhaust gas		

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

Basic Multiport Fuel Injection System

NAEC0014S02

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 crankshaft position sensor and the mass air flow sensor.

Various Fuel Injection Increase/Decrease Compensation

NAEC0014S03

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

<Fuel increase>

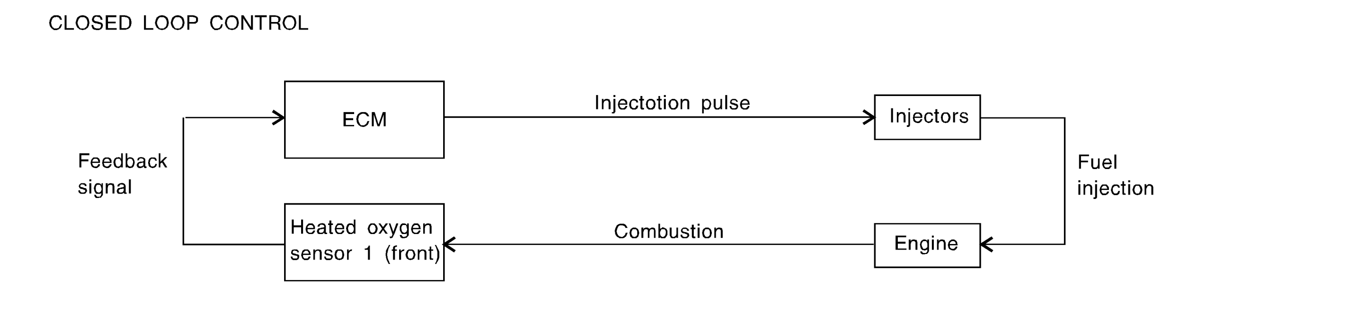
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever is changed from “N” to “D”
- High-load, high-speed operation

<Fuel decrease>

- During deceleration
- During high engine speed operation

Mixture Ratio Feedback Control (Closed loop control)

NAEC0014S04



SEF336WA

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The warm-up three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a heated oxygen sensor 1 (front) in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the heated oxygen sensor 1 (front), refer to EC-194. 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 (rear) is located downstream of the warm-up three way catalyst. Even if the switching characteristics of the heated oxygen sensor 1 (front) shift, the air-fuel ratio is controlled to stoichiometric by the signal from the heated oxygen sensor 2 (rear).

Open Loop Control

NAEC0014S05

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 (front) or its circuit
- Insufficient activation of heated oxygen sensor 1 (front) at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from “N” to “D”
- When starting the engine

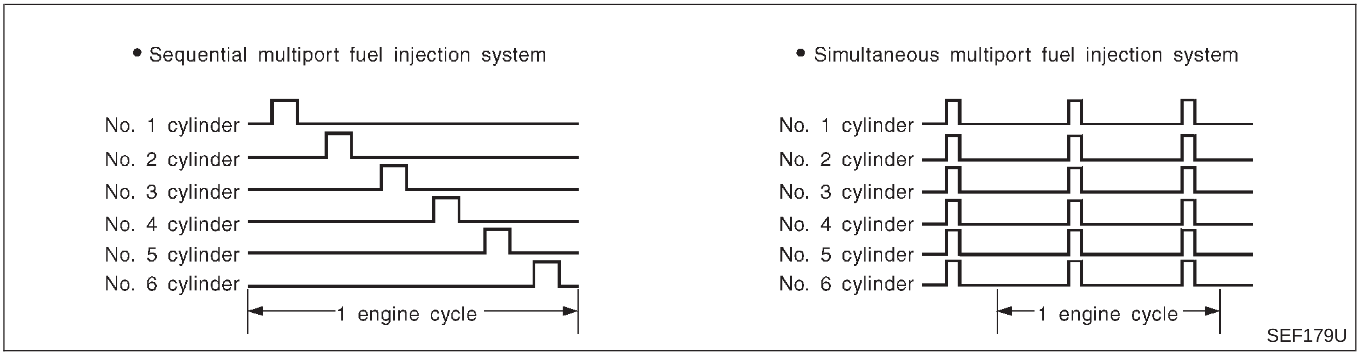
Mixture Ratio Self-learning Control

NAEC0014S06

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the heated oxygen sensor 1 (front). This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the heated oxygen sensor 1 (front) 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

NAEC0014S07



Two types of systems are used.

Sequential Multiport Fuel Injection System

NAEC0014S0701

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

NAEC0014S0702

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

NAEC0014S08

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

Electronic Ignition (EI) System

DESCRIPTION

NAEC0015

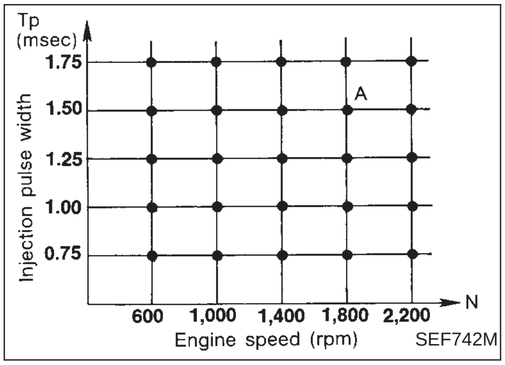
Input/Output Signal Chart

NAEC0015S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Ignition timing control	Power transistor
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Camshaft position sensor (PHASE)	Piston position		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position Throttle valve idle position		
Vehicle speed sensor	Vehicle speed		
Ignition switch	Start signal		
Knock sensor	Engine knocking		
Park/neutral position (PNP) switch	Gear position		
Battery	Battery voltage		

System Description

NAEC0015S02



The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
e.g., N: 1,800 rpm, Tp: 1.50 msec
A °BTDC
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Air Conditioning Cut Control

DESCRIPTION

NAEC0016

Input/Output Signal Chart

NAEC0016S01

Sensor	Input Signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner "ON" signal	Air conditioner cut control	Air conditioner relay
Throttle position sensor	Throttle valve opening angle		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Vehicle speed sensor	Vehicle speed		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering oil pressure switch	Power steering operation		

System Description

NAEC0016S02

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.

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

- 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 & high engine speed)

DESCRIPTION

NAEC0017

Input/Output Signal Chart

NAEC0017S01

Sensor	Input Signal to ECM	ECM function	Actuator
Vehicle speed sensor	Vehicle speed	Fuel cut control	Injectors
Park/neutral position (PNP) switch	Neutral position		
Throttle position sensor	Throttle position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		

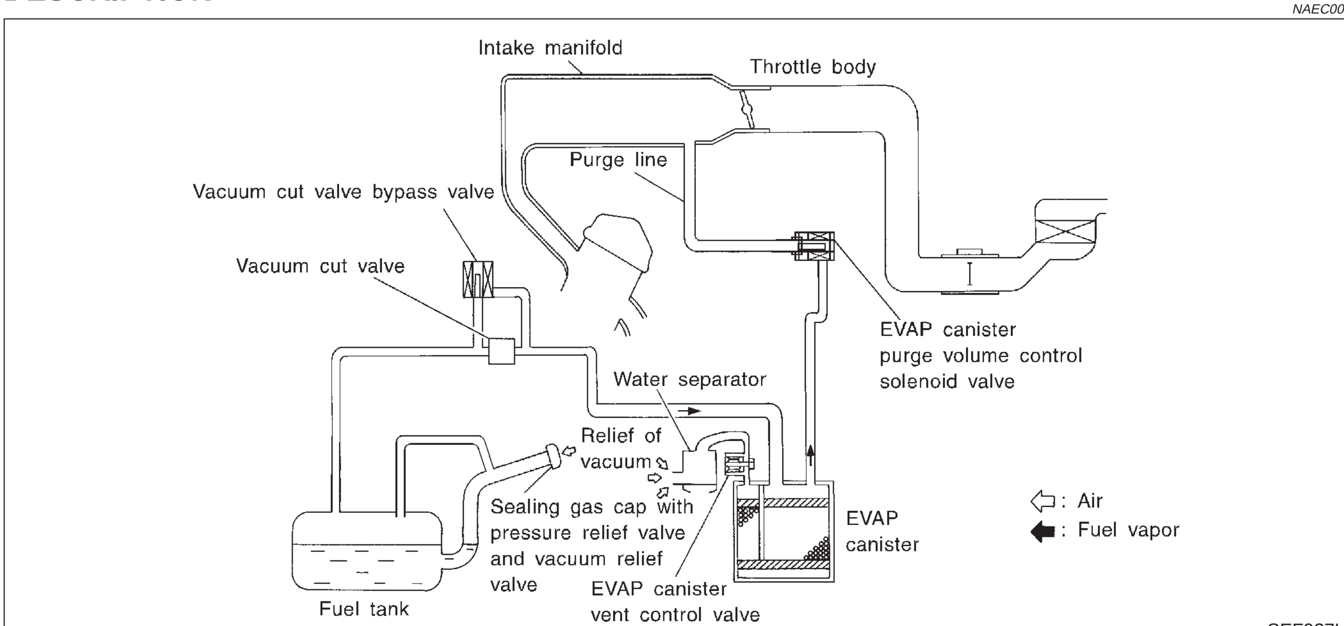
If the engine speed is above 1,800 rpm with no load (for example, in neutral and engine speed over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-28.

Evaporative Emission System

DESCRIPTION

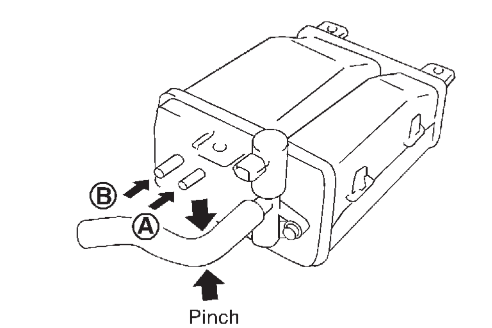
NAEC0018



SEF927U

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.



SEF428T

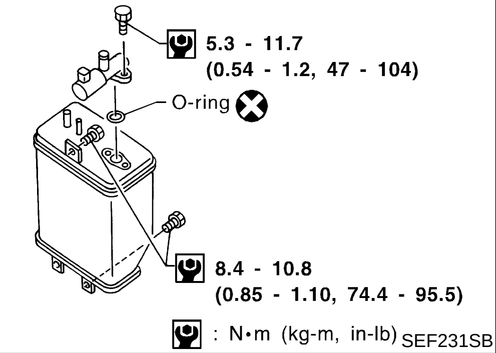
INSPECTION

NAEC0019

EVAP Canister

NAEC0019S01

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

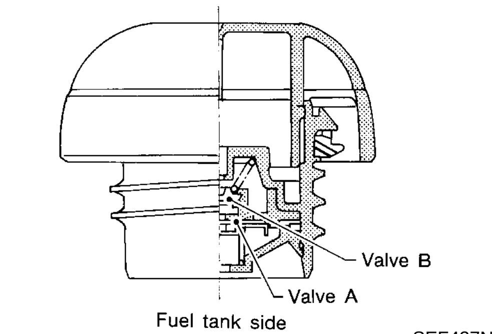


SEF231SB

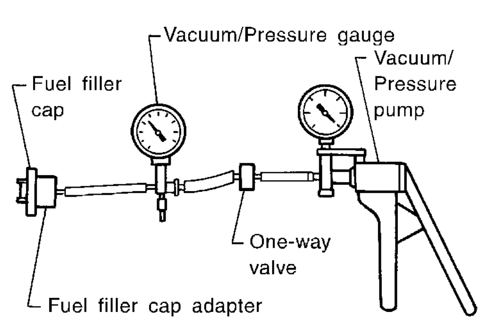
Tightening Torque

NAEC0019S02

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



SEF427N



SEF943S

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

NAEC0019S03

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

Pressure:
15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
Vacuum:
−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)

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

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

Vacuum Cut Valve and Vacuum Cut Valve Bypass Valve
NAEC0019S04

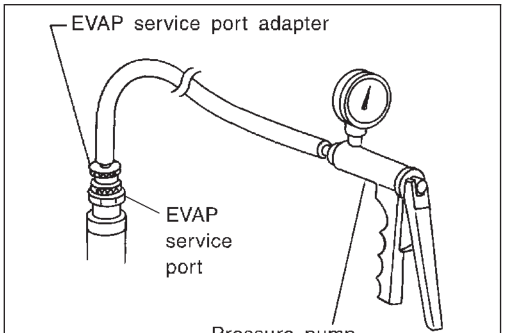
Refer to EC-593.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve
NAEC0019S05

Refer to EC-369.

Fuel Tank Temperature Sensor
NAEC0019S06

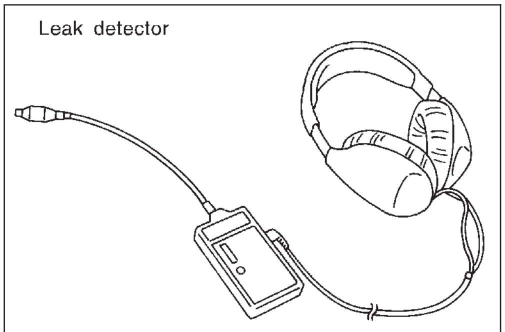
Refer to EC-311.



SEF462UA

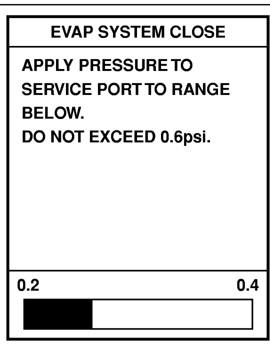
Evap Service Port
NAEC0019S07

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



SEF200U

PEF838U



PEF917U

How to Detect Fuel Vapor Leakage
NAEC0019S08

CAUTION:

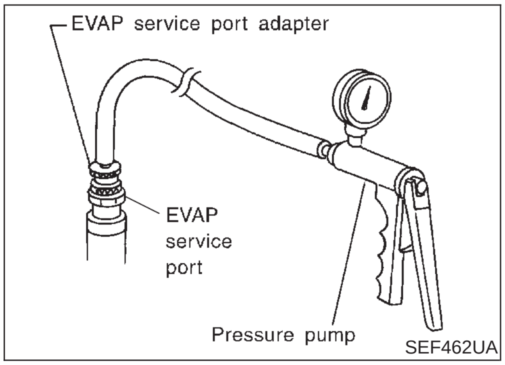
- **Never use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

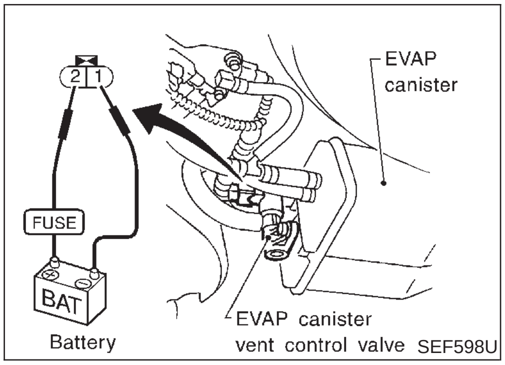
NOTE:

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

With CONSULT-II
NAEC0019S0801

1) Attach the EVAP service port adapter securely to the EVAP service port.
2) Also attach the pressure pump and hose to the EVAP service port adapter.
3) Turn ignition switch "ON".
4) Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT-II.
5) Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
6) Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7) Remove EVAP service port adapter and hose with pressure pump.
8) Locate the leak using a leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.





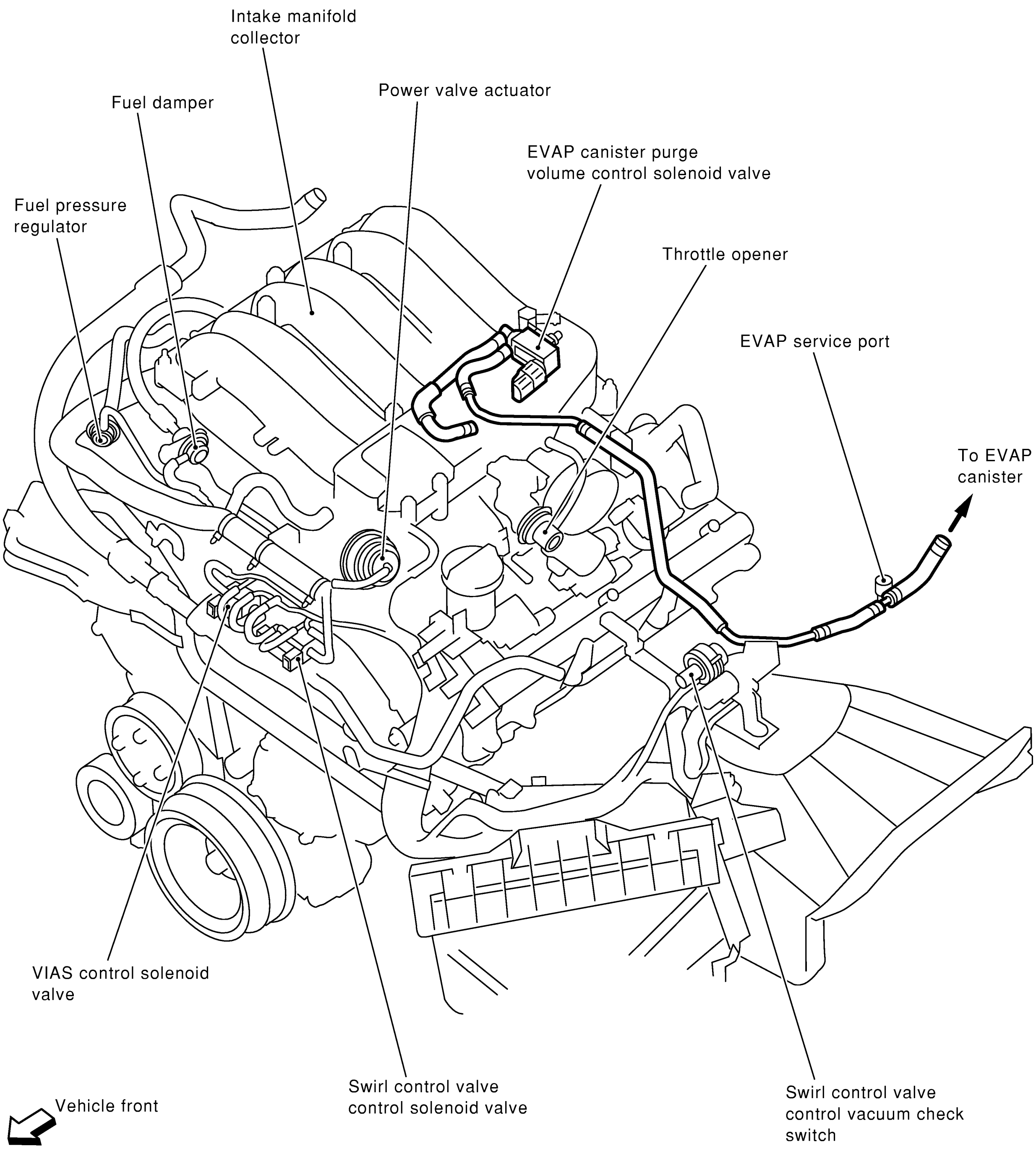
Without CONSULT-II

NAEC0019S0802

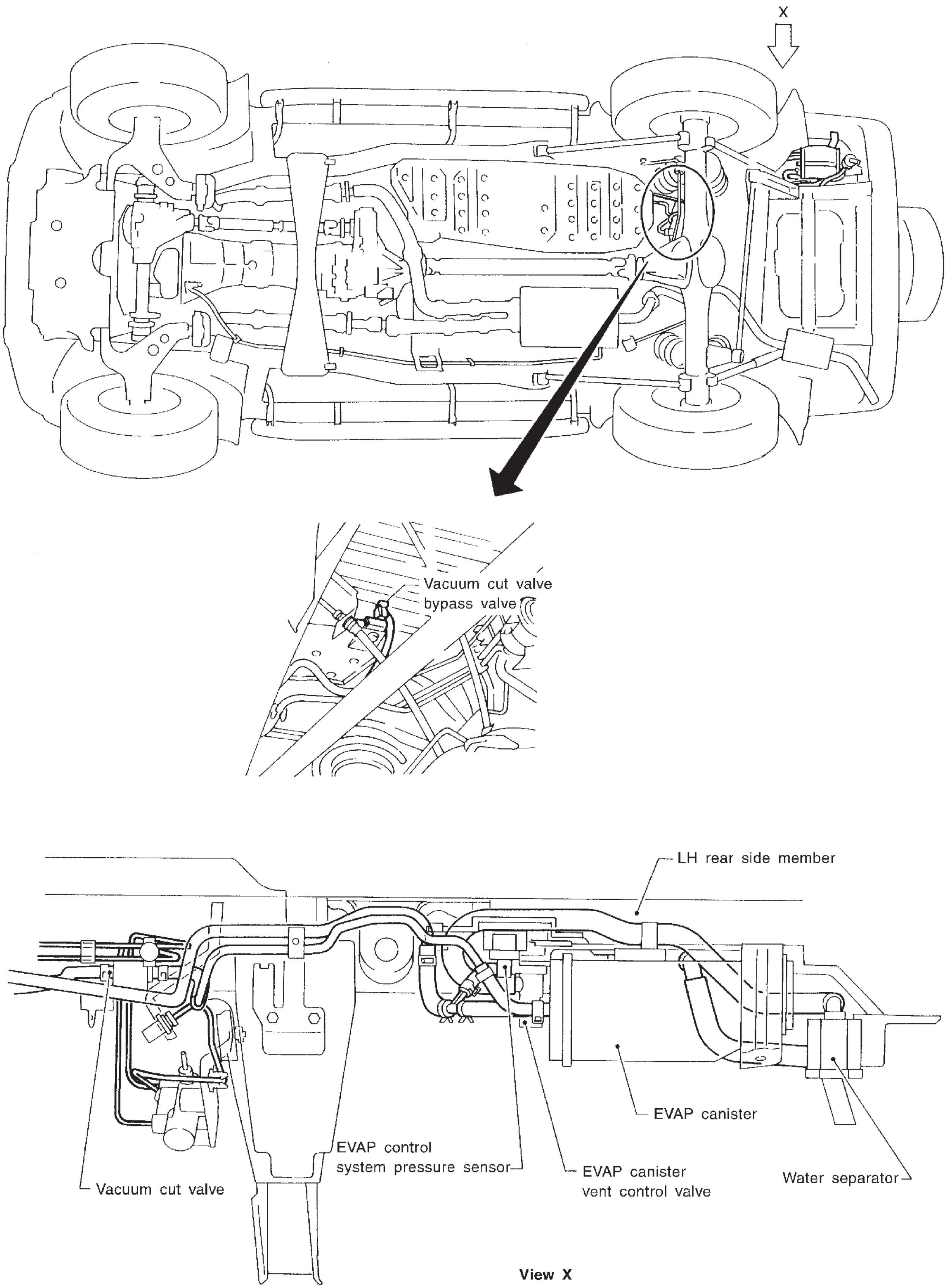
1) Attach the EVAP service port adapter securely to the EVAP service port.
2) Also attach the pressure pump with pressure gauge to the EVAP service port adapter.
3) Apply battery voltage to between the terminals of both EVAP canister vent control valve and vacuum cut valve bypass valve to make a closed EVAP system.
4) To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi).
5) Remove EVAP service port adapter and hose with pressure pump.
6) Locate the leak using a leak detector. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.

EVAPORATIVE EMISSION LINE DRAWING

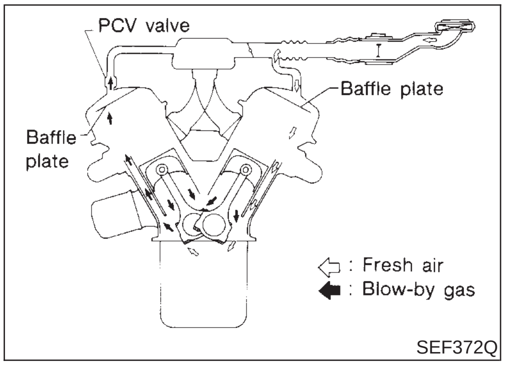
NAEC0020



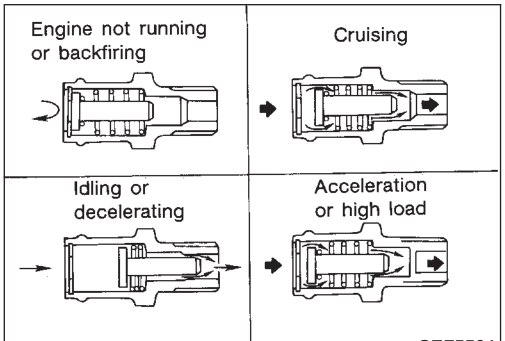
SEF932Y


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

SEF870T



SEF372Q



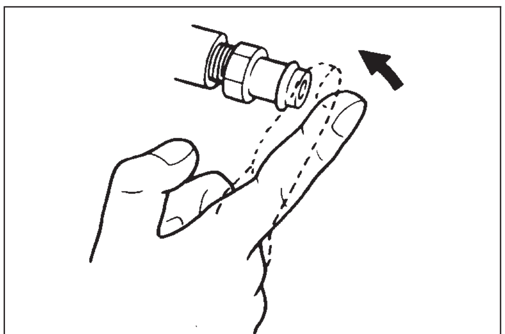
SEF559A

Positive Crankcase Ventilation

DESCRIPTION

NAEC0021

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

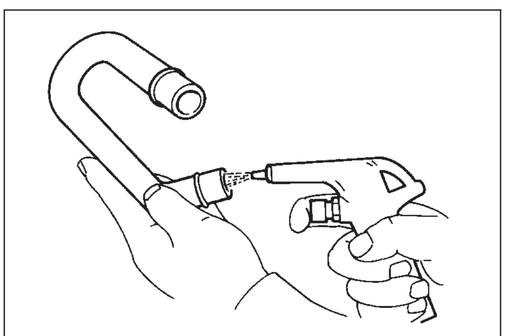
INSPECTION

NAEC0022

PCV (Positive Crankcase Ventilation) Valve

NAEC0022S01

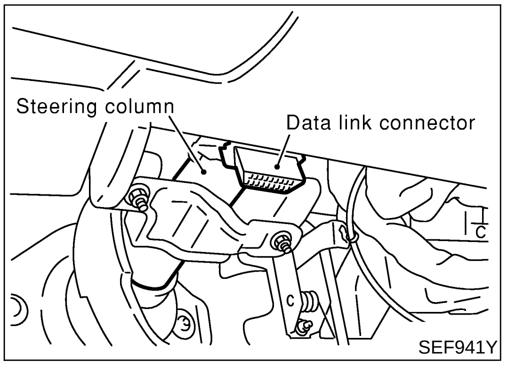
With engine running at idle, remove PCV valve ventilation hose from PCV valve; if the valve is working properly, a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.


ET277

PCV Valve Ventilation Hose

NAEC0022S02

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.



SEF941Y

Fuel Pressure Release

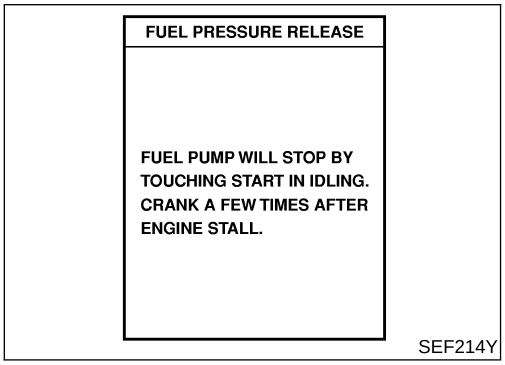
NAEC0023

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

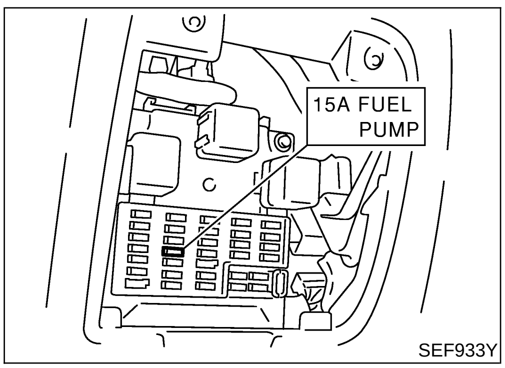
WITH CONSULT-II

NAEC0023S01

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”.



SEF214Y

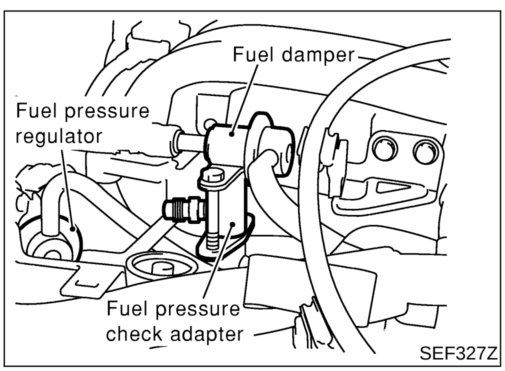


SEF933Y

WITHOUT CONSULT-II

NAEC0023S02

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.



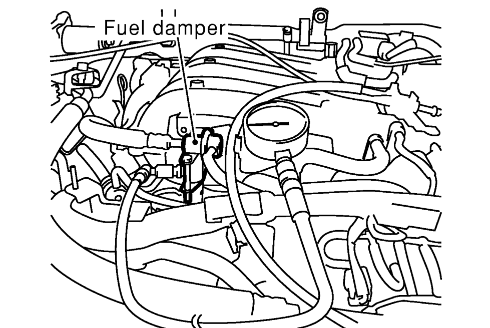
SEF327Z

Fuel Pressure Check

NAEC0024

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

1. Release fuel pressure to zero.
2. Disconnect fuel tube joint between fuel damper and injector tube and set fuel pressure check adapter (J44321).



SEF328Z

3. Install pressure gauge to the fuel pressure check adapter as shown in the figure.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

At idling:

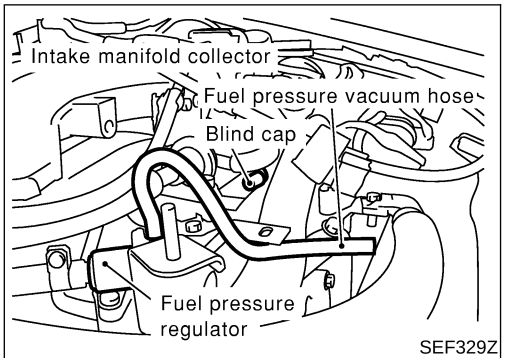
With vacuum hose connected

Approximately 235 kPa (2.4 kg/cm^2, 34 psi)

With vacuum hose disconnected

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

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

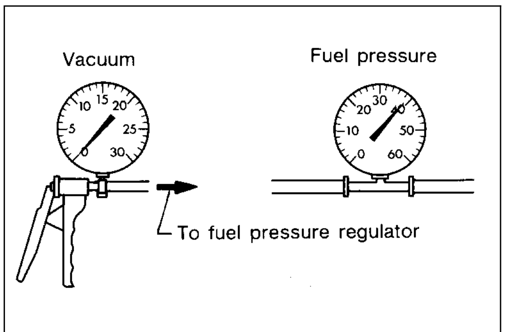


SEF329Z

Fuel Pressure Regulator Check

NAEC0025

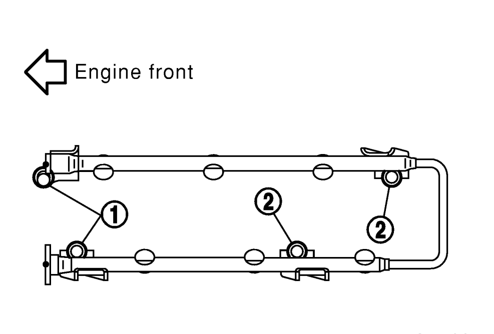
1. Stop engine and disconnect fuel pressure regulator vacuum hose from vacuum gallery.
2. Plug vacuum gallery with a blind cap.
3. Connect variable vacuum source to fuel pressure regulator.



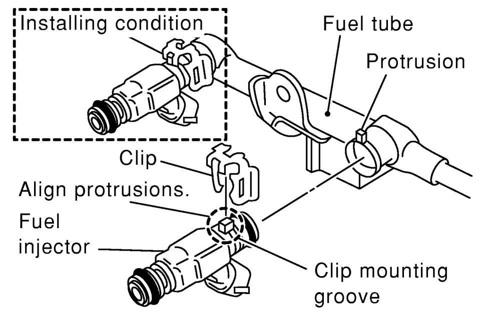
SEF718BA

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

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



SEF937Y



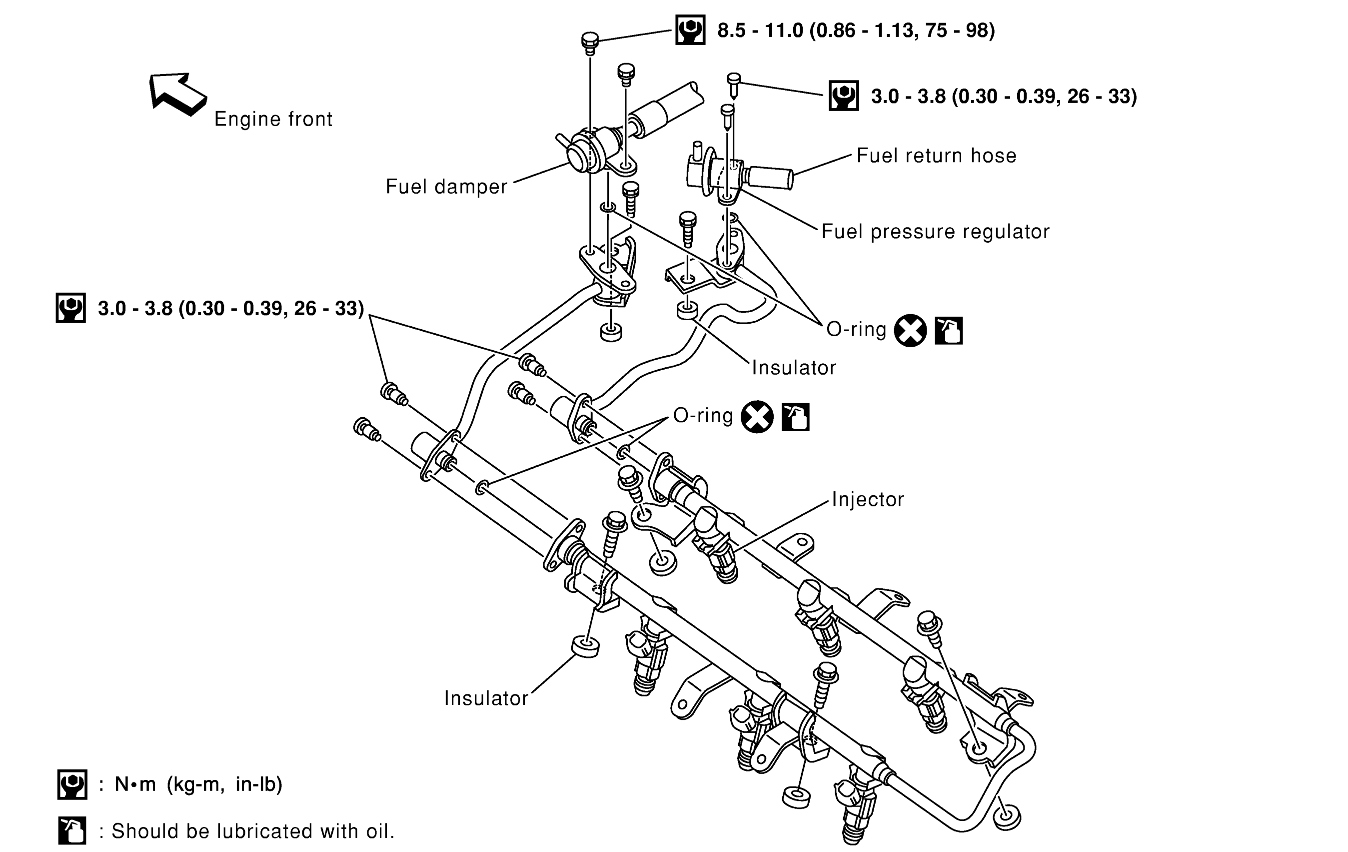
SEF703X

Injector

REMOVAL AND INSTALLATION

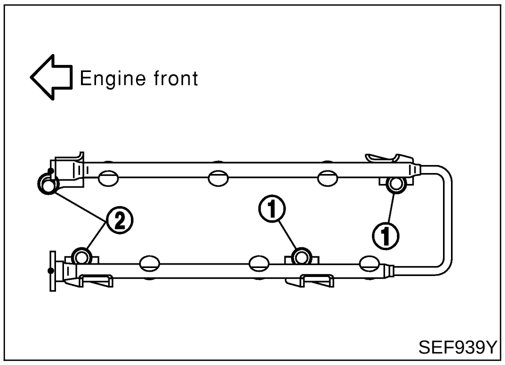
NAEC0026

1. Release fuel pressure to zero.
2. Remove intake manifold collector. Refer to EM-20, “TIMING CHAIN”.
3. Remove fuel tube assemblies in numerical sequence as shown in the figure at left.
4. Expand and remove clips securing fuel injectors.
5. Extract fuel injectors straight from fuel tubes.
- **Be careful not to damage injector nozzles during removal.**
- **Do not bump or drop fuel injectors.**
6. Carefully install O-rings, including the one used with the pressure regulator.
- **Lubricate O-rings with a smear of engine 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.**
7. Position clips in grooves on fuel injectors.
- **Make sure that protrusions of fuel injectors are aligned with cutouts of clips after installation.**



SEF938Y

8. Align protrusions of fuel tubes with those of fuel injectors. Insert fuel injectors straight into fuel tubes.
9. 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 tubes are engaged with clips.



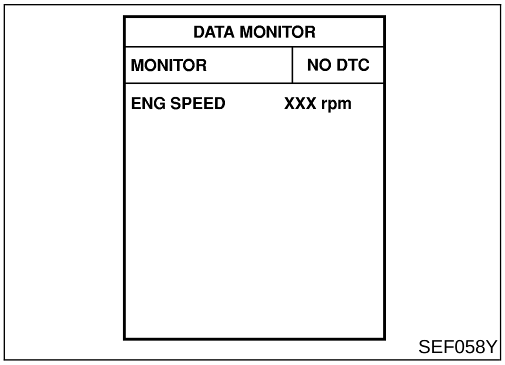
SEF939Y

10. 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:
    9.3 - 10.8 (1.0 - 1.1, 6.9 - 7.9)
    2nd stage:
    20.6 - 26.5 (2.1 - 2.7, 16 - 19)
11. Install all parts removed in reverse order of removal.

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

How to Check Idle Speed and Ignition Timing
NAEC0607

IDLE SPEED
NAEC0607S01

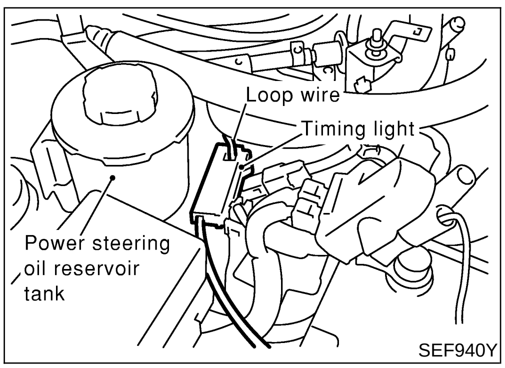


SEF058Y

- **Using CONSULT-II**

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

IGNITION TIMING
NAEC0607S02

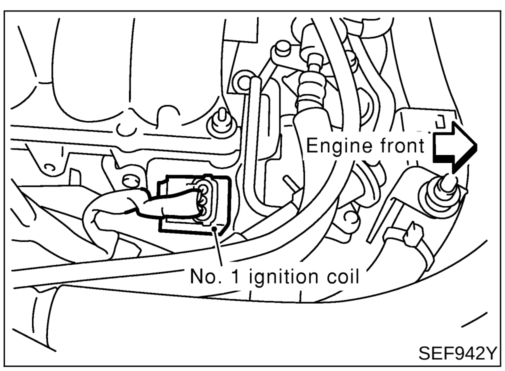


SEF940Y

Any of following two methods may be used.

- **Method A**

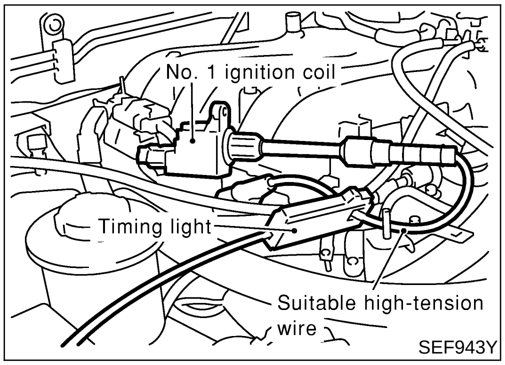
a) Attach timing light to loop wire as shown.
b) Check ignition timing.

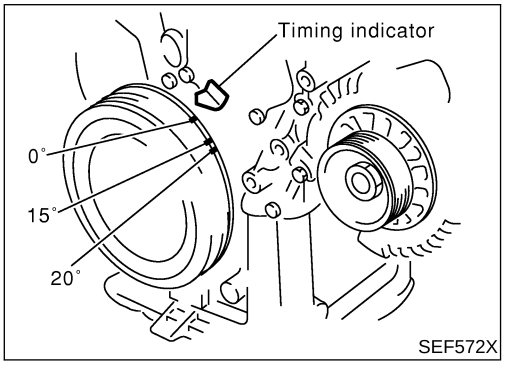


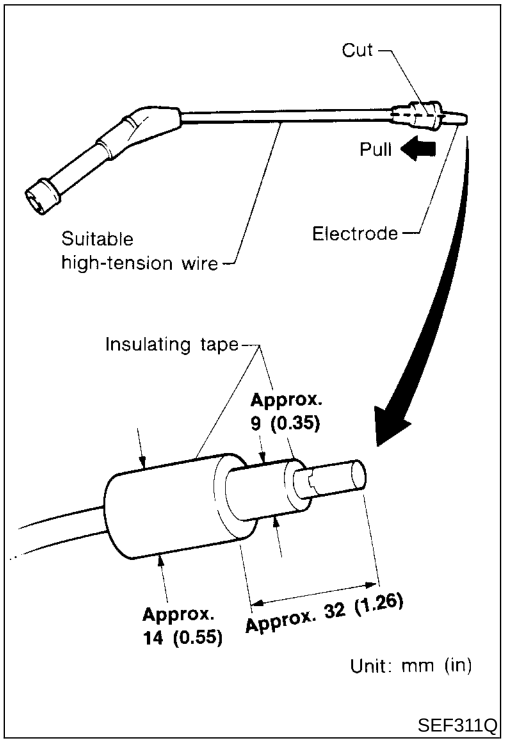
SEF942Y

- **Method B**

a) Remove No. 1 ignition coil.







b) 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.

c) Check ignition timing.

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

NAEC0028

PREPARATION

NAEC0028S01

1) Make sure that the following parts are in good order.

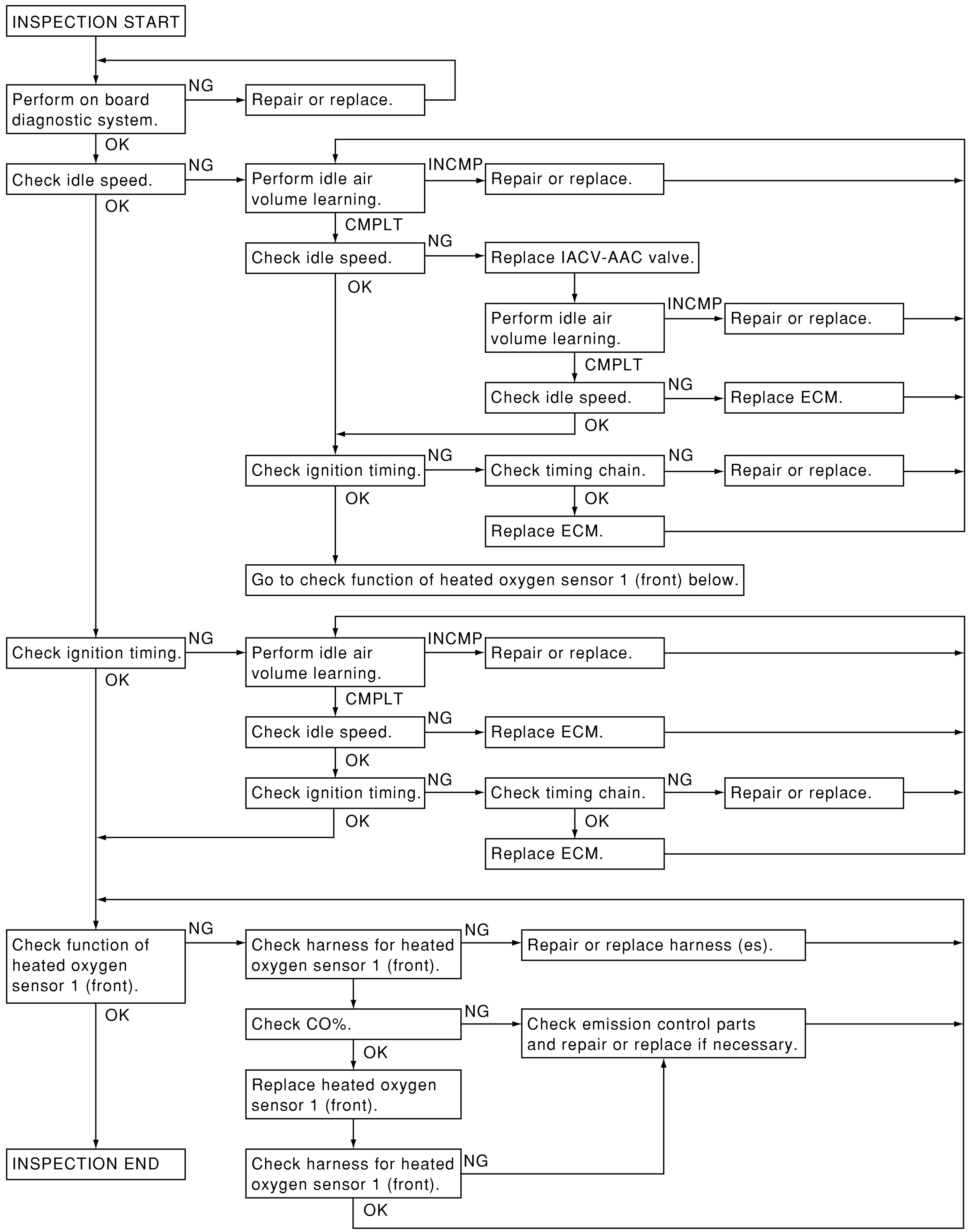
- Battery
- Ignition system
- Engine oil and coolant levels
- Fuses
- ECM harness connector
- Vacuum hoses

- Air intake system
  (Oil filler cap, oil level gauge, etc.)
- Fuel pressure
- Engine compression
- Throttle valve
- Evaporative emission system

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

Overall Inspection Sequence

NAEC0028S0101



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

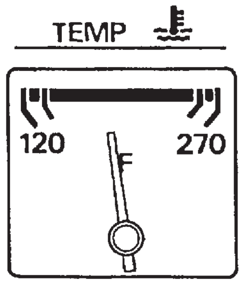
SEC141C

INSPECTION PROCEDURE

=NAEC0028S02

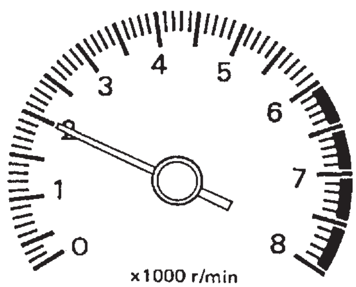
1	INSPECTION START

1. Visually check the following:
- Air cleaner clogging
- Hoses and ducts for leaks
- Electrical connectors
- Gasket
- Throttle valve and throttle position sensor operation
2. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Ensure engine stays below 1,000 rpm.



SEF976U

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



SEF977U

4. Make sure that no DTC is displayed with CONSULT-II or GST.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	REPAIR OR REPLACE

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

	▶	GO TO 3.

3	CHECK TARGET IDLE SPEED	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)**		
OK or NG		
OK	▶	GO TO 12.
NG	▶	GO TO 4.

4	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-58. **Which is the result CMPLT or INCMP?**		
CMPLT or INCMP		
CMPLT	▶	GO TO 5.
INCMP	▶	1. Follow the construction of "Idle Air Volume Leaning". 2. GO TO 4.

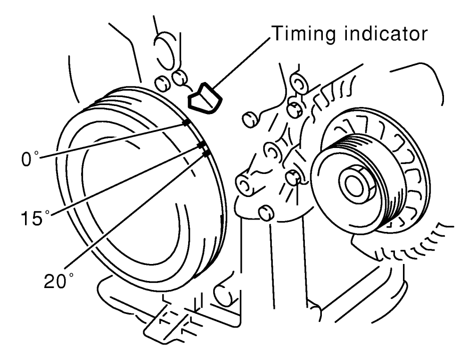
5	CHECK TARGET IDLE SPEED AGAIN	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)**		
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)**		
OK or NG		
OK	▶	GO TO 10.
NG	▶	GO TO 6.

6	REPLACE IACV-AAC VALVE	
Replace IACV-AAC valve.		
	▶	GO TO 7.

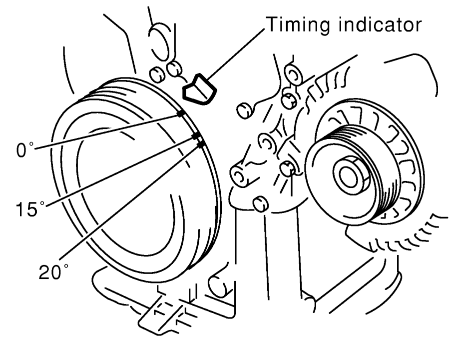
7	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-58. **Which is the result CMPLT or INCMP?** **CMPLT or INCMP**	
CMPLT ▶	GO TO 8.
INCMP ▶	1. Follow the construction of "Idle Air Volume Learning". 2. GO TO 4.

8	CHECK TARGET IDLE SPEED AGAIN
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)** **OK or NG**	
OK ▶	GO TO 10.
NG ▶	GO TO 9.

9	CHECK ECM FUNCTION
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.) 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)", EC-75.	
▶	GO TO 4.

10	CHECK IGNITION TIMING
1. Start engine and warm it up to normal operating temperature. 2. Check ignition timing at idle using a timing light.  SEF572X **M/T: 15°±5° BTDC** **A/T: 15°±5° BTDC (in "P" or "N" position)** **OK or NG**	
OK ▶	GO TO 18.
NG ▶	GO TO 11.

11	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM-29, "Installation".	
OK or NG	
OK ▶	GO TO 9.
NG ▶	1. Repair the timing chain installation. 2. GO TO 4.

12	CHECK IGNITION TIMING
1. Start engine and let it idle. 2. Check ignition timing at idle using a timing light.  SEF572X **M/T: 15°±5° BTDC** **A/T: 15°±5° BTDC (in "P" or "N" position)**	
OK or NG	
OK ▶	GO TO 18.
NG ▶	GO TO 13.

13	PERFORM IDLE AIR VOLUME LEARNING
Refer to "Idle Air Volume Learning", EC-58. **Which is the result CMPLT or INCMP?**	
CMPLT or INCMP	
CMPLT ▶	GO TO 14.
INCMP ▶	1. Follow the construction of "Idle Air volume Learning". 2. GO TO 13.

14	CHECK TARGET IDLE SPEED AGAIN
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)**	
OK or NG	
OK ▶	GO TO 16.
NG ▶	GO TO 15.

15	CHECK ECM FUNCTION
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.) 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)", EC-75.	
▶	GO TO 13.

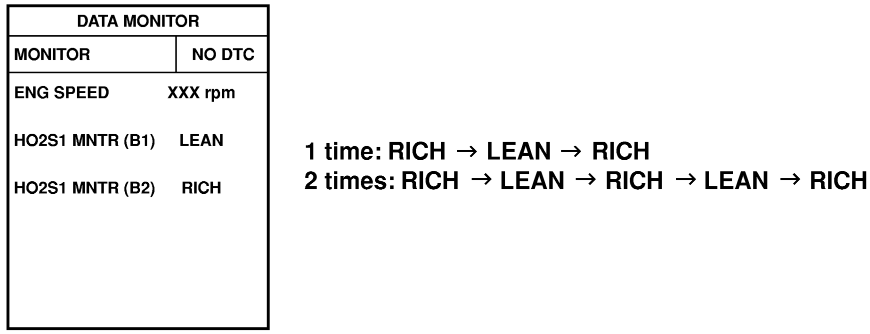
16	CHECK IGNITION TIMING AGAIN
Check ignition timing again. Refer to Test No. 12. **OK or NG**	
OK ▶	GO TO 18.
NG ▶	GO TO 17.

17	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM-29, "Installation". **OK or NG**	
OK ▶	GO TO 15.
NG ▶	1. Repair the timing chain installation. 2. GO TO 13.

18	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-73 and AT-35, "HOW TO ERASE DTC".	
With CONSULT-II ▶	GO TO 19.
Without CONSULT-II ▶	GO TO 20.

19	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2) SIGNAL

With CONSULT-II
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. See "HO2S1 MNTR (B2)" in "DATA MONITOR" mode.
3. Running engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.



SEF945Y

OK or NG

OK	▶	GO TO 23.
NG (Monitor does not fluctuate.)	▶	GO TO 28.
NG (Monitor fluctuates less than 5 times.)	▶	GO TO 21.

20	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2) SIGNAL

Without CONSULT-II
1. Run engine at about 2,000 rpm for about 2 minutes under no-load.
2. Set voltmeter probe between ECM terminal 62 and ground.
3. Make sure that the voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   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

OK or NG

OK	▶	GO TO 23.
NG (Voltage does not fluctuate.)	▶	GO TO 28.
NG (Voltage fluctuates less than 5 times.)	▶	GO TO 21.

21	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2) SIGNAL

With CONSULT-II
1. Stop engine.
2. Replace heated oxygen sensor 1 (front) (bank 2).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. See "HO2S1 MNTR (B2)" in "DATA MONITOR" mode.
6. Running engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II
1. Stop engine.
2. Replace heated oxygen sensor 1 (front) (bank 2).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. Set voltmeter probe between ECM terminal 62 and ground.
6. Make sure that the voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   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

OK or NG

OK (With CONSULT-II)	▶	GO TO 23.
OK (Without CONSULT-II)	▶	GO TO 24.
NG	▶	GO TO 22.

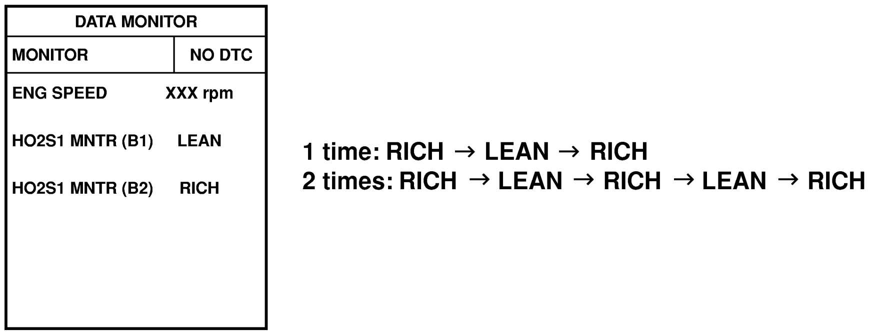
22	DETECT MALFUNCTIONING PART

Check the following.
1. Check fuel pressure regulator. Refer to EC-40.
2. Check mass air flow sensor and its circuit. Refer to EC-152.
3. Check injector and its circuit. Refer to EC-619.
   Clean or replace if necessary.
4. Check engine coolant temperature sensor and its circuit. Refer to EC-189.
5. Check ECM function by substituting another known-good ECM.
   (ECM may be the cause of a problem, but this is rarely the case.)

	▶	GO TO 3.

23	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1) SIGNAL

With CONSULT-II
1. See "HO2S1 MNTR (B1)" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.



SEF945Y

OK or NG

OK	▶	**INSPECTION END**
NG (Monitor does not fluctuate.)	▶	GO TO 27.
NG (Monitor fluctuates less than 5 times.)	▶	GO TO 25.

24	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1) SIGNAL

Without CONSULT-II
1. Set voltmeter probe between ECM terminal 63 and ground.
2. Make sure that the voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   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

OK or NG

OK	▶	**INSPECTION END**
NG (Voltage does not fluctuate.)	▶	GO TO 27.
NG (Voltage fluctuates less than 5 times.)	▶	GO TO 25.

25	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1) SIGNAL

With CONSULT-II
1. Stop engine.
2. Replace heated oxygen sensor 1 (front) (bank 1).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. See “HO2S1 MNTR (B1)” in “DATA MONITOR” mode.
6. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between “LEAN” and “RICH” more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II
1. Stop engine.
2. Replace heated oxygen sensor 1 (front) (bank 1).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. Set voltmeter probe between ECM terminal 63 and ground.
6. Make sure that the voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   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

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 26.

26	DETECT MALFUNCTIONING PART

Check the following.
- Check fuel pressure regulator. Refer to EC-40.
- Check mass air flow sensor and its circuit. Refer to EC-152.
- Check injector and its circuit. Refer to EC-619.
  Clean or replace if necessary.
- Check engine coolant temperature sensor and its circuit. Refer to EC-189.
- Check ECM function by substituting another known-good ECM.
  (ECM may be the cause of a problem, but this is rarely the case.)

	▶	GO TO 3.

27	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1) HARNESS

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 (front) (bank 1) harness connector.
4. Check harness continuity between ECM terminal 63 and heated oxygen sensor 1 (front) (bank 1) harness connector terminal 1.
   Refer to Wiring Diagram, EC-198.
   Continuity should exist.

OK or NG

OK	▶	GO TO 30.
NG	▶	GO TO 29.

28	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 2) HARNESS

1. Turn off engine and disconnect battery ground cable.
2. Disconnect ECM harness connector.
3. Disconnect heated oxygen sensor 1 (front) (bank 2) harness connector.
4. Check harness continuity between ECM terminal 62 and front heated oxygen sensor LH harness connector terminal 1. Refer to Wiring Diagram, EC-199.
   Continuity should exist.

OK or NG

OK ▶	GO TO 30.
NG ▶	GO TO 29.

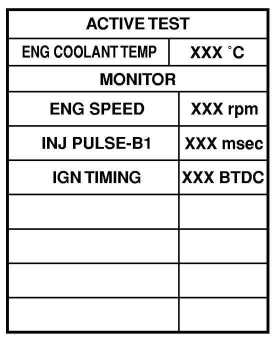
29	REPAIR OR REPLACE

Repair or replace harness between ECM and heated oxygen sensor 1 (front).

▶	GO TO 3.

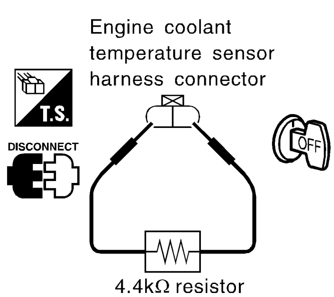
30	PREPARATION FOR "CO" % CHECK

With CONSULT-II
1. Reconnect ECM harness connector.
2. Turn ignition switch "ON".
3. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
4. Set "ENG COOLANT TEMP" to 5°C (41°F) by touching "DOWN" and "Qd".



SEF172Y

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



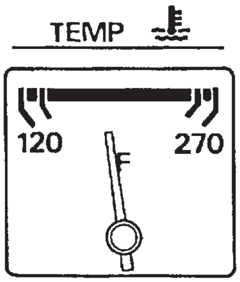
SEF982UA

▶	GO TO 31.

31 CHECK "CO" %

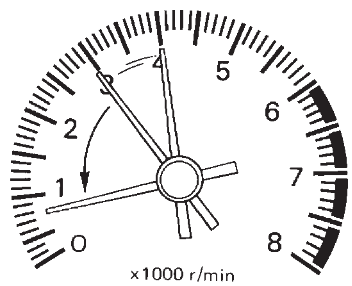
With CONSULT-II

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



SEF976U

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



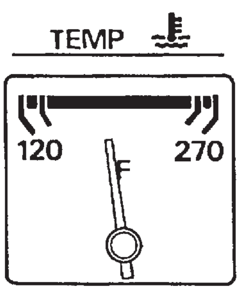
SEF978U

3. Check "CO" %.

Idle CO: 1.0 - 9.5%

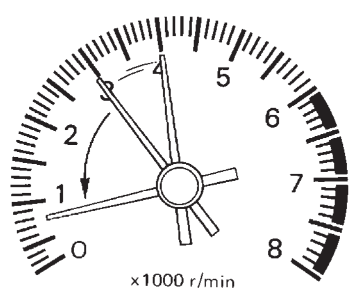
Without CONSULT-II

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



SEF976U

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



SEF978U

3. Check "CO" %.
4. After checking CO%,

a. Disconnect the resistor from terminals of engine coolant temperature sensor.
b. Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

OK or NG

OK	▶	GO TO 32.
NG	▶	GO TO 33.

GI
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IDX

32	CHECK HEATED OXYGEN SENSOR 1 (FRONT) (BANK 1)/(BANK 2) SIGNAL

With CONSULT-II
1. Stop engine.
2. Replace heated oxygen sensor 1 (front) (bank 1)/(bank 2).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. See "HO2S1 MNTR (B1)/(B2)" in "DATA MONITOR" mode.
6. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 time: RICH → LEAN → RICH
   2 times: RICH → LEAN → RICH → LEAN → RICH

Without CONSULT-II
1. Stop engine.
2. Replace heated oxygen sensor 1 (front) (bank 1)/(bank 2).
3. Start engine and warm it up to normal operating temperature.
4. Run engine at approx. 2,000 rpm for approx. 2 minutes under no-load.
5. Set voltmeter probe between ECM terminal 63 or 62 and ground.
6. Make sure that voltage fluctuates between 0 - 0.3V and 0.6 - 1.0V more than 5 times during 10 seconds at 2,000 rpm.
   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

OK or NG

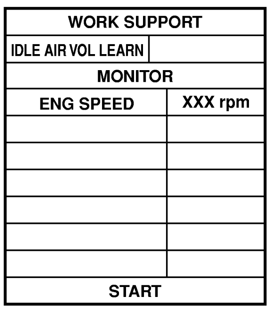
OK	▶	GO TO 3.
NG	▶	GO TO 33.

33	DETECT MALFUNCTIONING PART

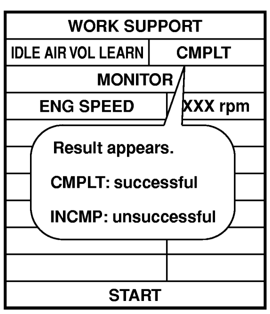
Check the following.
- Connect heated oxygen sensor 1 (front) harness connectors to heated oxygen sensors 1 (front).
- Check fuel pressure regulator. Refer to EC-40.
- Check mass air flow sensor and its circuit. Refer to EC-152.
- Check injector and its circuit. Refer to EC-619.
  Clean or replace if necessary.
- Check engine coolant temperature sensor and its circuit. Refer to EC-189.
- Check ECM function by substituting another known-good ECM.
  (ECM may be the cause of a problem, but this is rarely the case.)

	▶	GO TO 3.

SEF452Y



SEF454Y



SEF455Y

Idle Air Volume Learning

NAEC0642

DESCRIPTION

NAEC0642S01

“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 IACV-AAC valve, throttle body or ECM is replaced.
- Idle speed or ignition timing is out of specification.

PRE-CONDITIONING

NAEC0642S02

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 - 99°C (158 - 210°F)
- PNP switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)

On vehicles equipped with daytime running light systems, if the parking brake is applied before the engine is started the headlamp will not illuminate.

- Cooling fan motor: Not operating
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
  For A/T 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 and M/T models, drive vehicle for 10 minutes.

OPERATION PROCEDURE

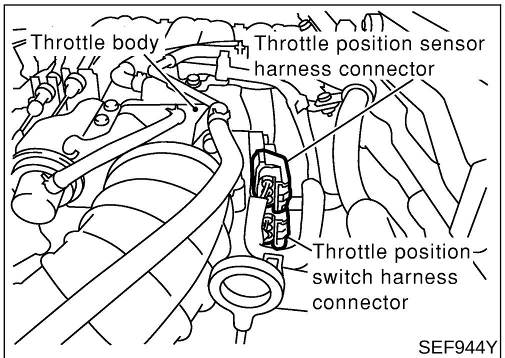
NAEC0642S03

With CONSULT-II

NAEC0642S0301

1. Turn ignition switch “ON” and wait at least 1 second.
2. Turn ignition switch “OFF” and wait at least 10 seconds.
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic “PRE-CONDITIONING” (previously mentioned) are in good order.
5. Turn ignition switch “OFF” and wait at least 10 seconds.
6. Start the engine and let it idle for at least 30 seconds.
7. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
8. Touch “START” and wait 20 seconds.
9. Make sure that “CMPLT” is displayed on CONSULT-II screen. If “INCMP” is displayed, “Idle Air Volume Learning” will not be carried out successfully. In this case, find the cause of the problem by referring to the NOTE below.
10. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 750±50 rpm A/T: 750±50 rpm (in “P” or “N” position)
Ignition timing	M/T: 15°±5° BTDC A/T: 15°±5° BTDC (in “P” or “N” position)



SEF944Y

Without CONSULT-II

NAEC0642S0302

1. Turn ignition switch "ON" and wait at least 1 second.
2. Turn ignition switch "OFF" and wait at least 10 seconds.
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic "PRE-CONDITIONING" (previously mentioned) are in good order.
5. Turn ignition switch "OFF" and wait at least 10 seconds.
6. Start the engine and let it idle for at least 30 seconds.
7. Disconnect throttle position sensor harness connector (brown), then reconnect it within 5 seconds.
8. Wait 20 seconds.
9. Make sure that idle speed is within specifications. If not, the result will be incomplete. In this case, find the cause of the problem by referring to the NOTE below.
10. Rev up the engine two or three times. Make sure that idle speed and ignition timing are within specifications.

ITEM	SPECIFICATION
Idle speed	M/T: 750±50 rpm A/T: 750±50 rpm (in "P" or "N" position)
Ignition timing	M/T: 15°±5° BTDC A/T: 15°±5° BTDC (in "P" or "N" position)

NOTE:
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) **Adjust closed throttle position switch and reset memory. (Refer to Basic Inspection, EC-102.)**
5) **When the above four items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the problem.**
   It is useful to perform "TROUBLE DIAGNOSIS — SPECIFICATION VALUE", EC-138.
6) **If any of the following conditions occur after the engine has started, eliminate the cause of the problem and perform "Idle air volume learning" all over again:**

- **Engine stalls.**
- **Erroneous idle.**
- **Blown fuses related to the IACV-AAC valve system.**

Introduction

NAEC0029

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

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

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

X: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-II	X	X	X	X	X	—
GST	X	X*1	X	—	X	X

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

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-119.)

Two Trip Detection Logic

NAEC0030

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

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

X: Applicable —: Not Exit

Items	MIL				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 (0701, 0605 — 0608) is being detected	X	—	—	—	—	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0605 — 0608) is being detected	—	—	X	—	—	X	—	—
Closed loop control — DTC: P1148 (0307), P1168 (0308)	—	X	—	—	X	—	X	—
Fail-safe items (Refer to EC-119.)	—	X	—	—	X*1	—	X*1	—
Except above	—	—	—	X	—	X	X	—

*1: Except “ECM”

Emission-related Diagnostic Information

NAEC0031

DTC AND 1ST TRIP DTC

NAEC0031S01

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-73.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-70. 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 SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in “Work Flow” procedure Step II, refer to EC-100. Then perform “DTC Confirmation Procedure” or “Overall Function Check” to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

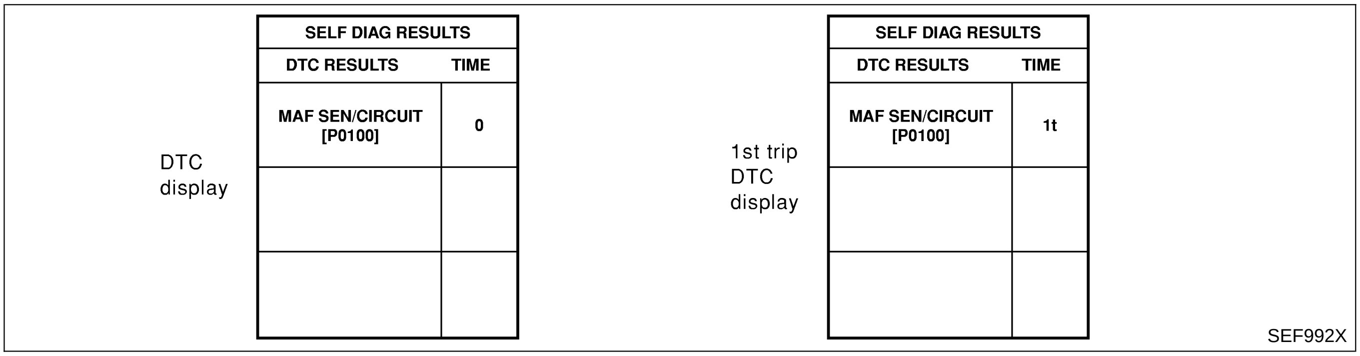
How to Read DTC and 1st Trip DTC

NAEC0031S0101

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, P1320, P0705, P0750, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-II also displays the malfunctioning component or system.)

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST does 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]”.



FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

NAEC0031S02

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed and absolute pressure at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data.

The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-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-86.
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0306 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.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-73.

SYSTEM READINESS TEST (SRT) CODE

NAEC0031S03

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.
If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating "INCMP", use the information in this Service Manual to set the SRT to "CMPLT".
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate "CMPLT" for each application system. Once set as "CMPLT", the SRT status remains "CMPLT" until the self-diagnosis memory is erased.
Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate "INCMP" for these items.

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.

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

SRT Item

=NAEC0031S0310

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

SRT item (CONSULT-II indication)	Performance Priority*	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	3	Three way catalyst function	P0420, P0430
EVAP SYSTEM	2	EVAP control system (small leak) (negative pressure)	P0440
	3	EVAP control system (very small leak) (negative pressure)/(positive pressure)	P1441
	3	EVAP control system purge flow monitoring	P1447
O2 SENSOR	3	Heated oxygen sensor 1 (front) (circuit)	P0130, P0150
		Heated oxygen sensor 1 (front) (lean shift monitoring)	P0131, P0151
		Heated oxygen sensor 1 (front) (rich shift monitoring)	P0132, P0152
		Heated oxygen sensor 1 (front) (response monitoring)	P0133, P0153
		Heated oxygen sensor 1 (front) (high voltage)	P0134, P0154
		Heated oxygen sensor 2 (rear) (min. voltage monitoring)	P0137, P0157
		Heated oxygen sensor 2 (rear) (max. voltage monitoring)	P0138, P0158
		Heated oxygen sensor 2 (rear) (response monitoring)	P0139, P0159
		Heated oxygen sensor 2 (rear) (high voltage)	P0140, P0160
O2 SEN HEATER	3	Heated oxygen sensor 1 heater (front)	P0135, P0155
		Heated oxygen sensor 2 heater (rear)	P0141, P0161

*: 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.

SRT Set Timing

=NAEC0031S0311

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 (= MIL "ON")
		SRT of EGR	"INCMP"	"INCMP"	"INCMP"	"CMPLT"

OK: Self-diagnosis is carried out and the result is OK.
NG: Self-diagnosis is carried out and the result is NG.
—: 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 of each self-diagnosis to be executed twice (Case 3) for the following reasons:

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

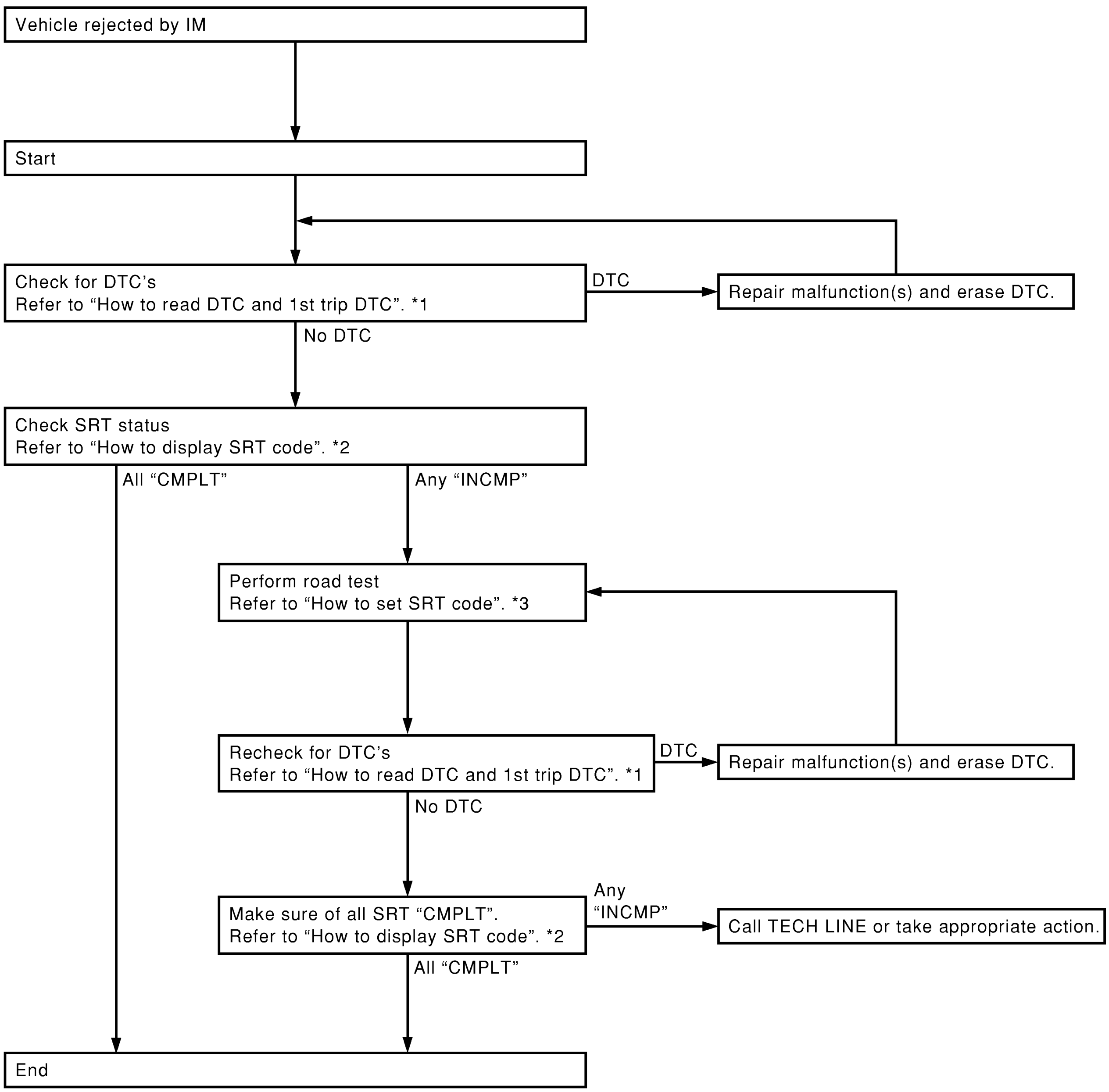
NOTE:
SRT can be set as "CMPLT" together with the DTC(s). Therefore, DTC check must always be carried out prior to the state emission inspection even though the SRT indicates "CMPLT".

SRT Service Procedure

NAEC0031S0312

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.

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



SEF170Z

*1 EC-61 *2 EC-65 *3 EC-66

How to Display SRT Code

NAEC0031S0301

With CONSULT-II

Selecting "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT-II.

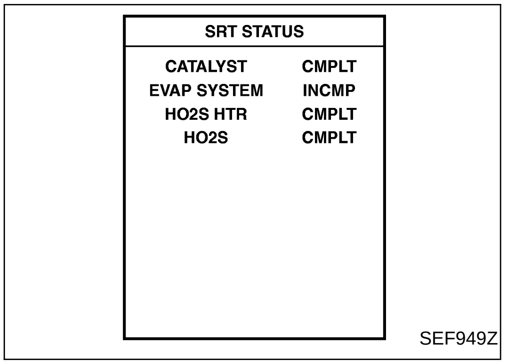
For items whose SRT codes are set, a "CMPLT" is displayed on the CONSULT-II screen; for items whose SRT codes are not set, "INCMP" is displayed.

With GST

Selecting Mode 1 with GST (Generic Scan Tool)

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

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



How to Set SRT Code

NAEC0031S0302

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

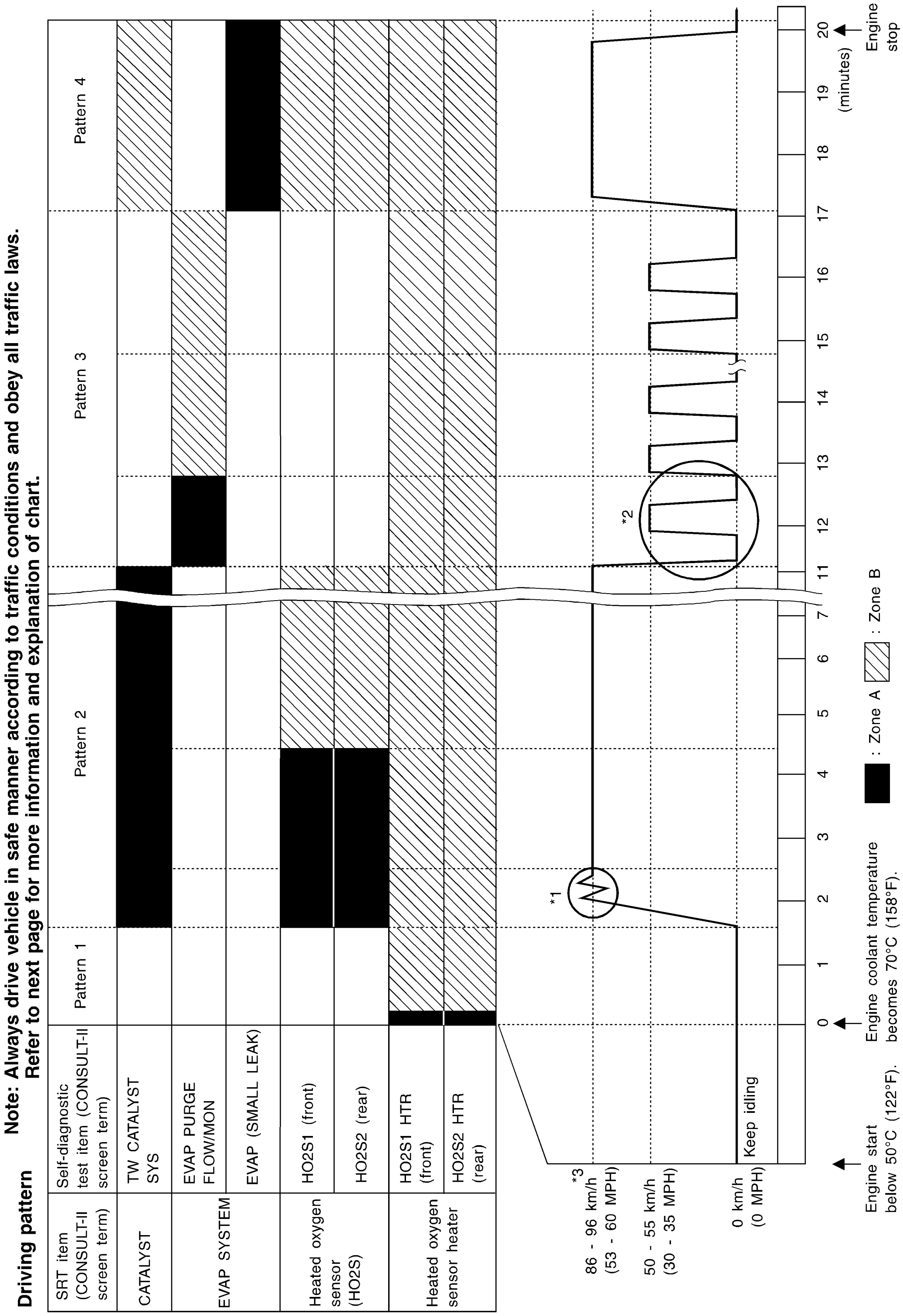
Perform corresponding DTC Confirmation Procedure one by one based on "Performance Priority" in the table on EC-63.

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.

Driving Pattern

NAEC0031S0303



SEF947Y

- 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 70 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 70 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 92 and ground is less than 4.1V).**

Pattern 2:

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

Pattern 3:

- The driving pattern outlined in *2 must be repeated at least 3 times.

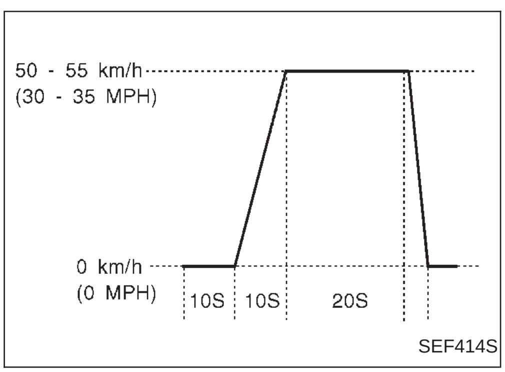
Pattern 4:

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

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

1) Decelerate vehicle to 0 km/h (0 MPH) and let engine idle.
2) Repeat driving pattern shown below at least 10 times.

- **During acceleration, hold the accelerator pedal as steady as possible.**



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

Suggested Transmission Gear Position for A/T Models

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

Suggested upshift speeds for M/T models

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

	For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:		For quick acceleration in low altitude areas and high altitude areas [over 1,219 m (4,000 ft)]:
Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)	km/h (MPH)
1st to 2nd	21 (13)	21 (13)	24 (15)
2nd to 3rd	37 (23)	26 (16)	40 (25)
3rd to 4th	53 (33)	44 (27)	64 (40)
4th to 5th	63 (39)	58 (36)	72 (45)

Suggested Maximum Speed in Each Gear

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

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

Gear	km/h (MPH)
1st	50 (30)
2nd	89 (55)
3rd	128 (80)
4th	—
5th	—

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

NAEC0031S04

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

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

Items for which these data (test value and test limit) are displayed are the same as SRT code items (30 test items).

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

X: Applicable —: Not applicable

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

SRT item	Self-diagnostic test item	Test value (GST display)		Test limit	Application
		TID	CID		
O2 SENSOR	Heated oxygen sensor 1 (front) (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 (front) (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 (rear) (bank 1)	19H	86H	Min.	X
		1AH	86H	Min.	X
		1BH	06H	Max.	X
		1CH	06H	Max.	X
	Heated oxygen sensor 2 (rear) (bank 2)	21H	87H	Min.	X
		22H	87H	Min.	X
		23H	07H	Max.	X
		24H	07H	Max.	X
O2 SENSOR HEATER	Heated oxygen sensor 1 (front) heater (bank 1)	29H	08H	Max.	X
		2AH	88H	Min.	X
	Heated oxygen sensor 1 (front) heater (bank 2)	2BH	09H	Max.	X
		2CH	89H	Min.	X
	Heated oxygen sensor 2 (rear) heater (bank 1)	2DH	0AH	Max.	X
		2EH	8AH	Min.	X
	Heated oxygen sensor 2 (rear) heater (bank 2)	2FH	0BH	Max.	X
		30H	8BH	Min.	X

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

NAEC0031S05

X: Applicable —: Not applicable

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.	**P0000**	—	—	—	—
MAF SEN/CIRCUIT	P0100	—	—	X	EC-152
ABSL PRES SEN/CIRC	P0105	—	—	X	EC-160
AIR TEMP SEN/CIRC	P0110	—	—	X	EC-166
COOLANT T SEN/CIRC	P0115	—	—	X	EC-171

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
THRTL POS SEN/CIRC	P0120	—	—	X	EC-176
*COOLAN T SEN/CIRC	P0125	—	—	X	EC-189
HO2S1 (B1)	P0130	X	X	X*2	EC-194
HO2S1 (B1)	P0131	X	X	X*2	EC-204
HO2S1 (B1)	P0132	X	X	X*2	EC-212
HO2S1 (B1)	P0133	X	X	X*2	EC-220
HO2S1 (B1)	P0134	X	X	X*2	EC-233
HO2S1 HTR (B1)	P0135	X	X	X*2	EC-242
HO2S2 (B1)	P0137	X	X	X*2	EC-249
HO2S2 (B1)	P0138	X	X	X*2	EC-259
HO2S2 (B1)	P0139	X	X	X*2	EC-269
HO2S2 (B1)	P0140	X	X	X*2	EC-279
HO2S2 HTR (B1)	P0141	X	X	X*2	EC-288
HO2S1 (B2)	P0150	X	X	X*2	EC-194
HO2S1 (B2)	P0151	X	X	X*2	EC-204
HO2S1 (B2)	P0152	X	X	X*2	EC-212
HO2S1 (B2)	P0153	X	X	X*2	EC-220
HO2S1 (B2)	P0154	X	X	X*2	EC-233
HO2S1 HTR (B2)	P0155	X	X	X*2	EC-242
HO2S2 (B2)	P0157	X	X	X*2	EC-249
HO2S2 (B2)	P0158	X	X	X*2	EC-259
HO2S2 (B2)	P0159	X	X	X*2	EC-269
HO2S2 (B2)	P0160	X	X	X*2	EC-279
HO2S2 HTR (B2)	P0161	X	X	X*2	EC-288
FUEL SYS-LEAN/BK1	P0171	—	—	X	EC-296
FUEL SYS-RICH/BK1	P0172	—	—	X	EC-304
FUEL SYS-LEAN/BK2	P0174	—	—	X	EC-296
FUEL SYS-RICH/BK2	P0175	—	—	X	EC-304
FUEL TEMP SEN/CIRC	P0180	—	—	X	EC-311
ENG OVER TEMP	P0217	—	—	X	EC-316
MULTI CYL MISFIRE	P0300	—	—	X	EC-322
CYL 1 MISFIRE	P0301	—	—	X	EC-322
CYL 2 MISFIRE	P0302	—	—	X	EC-322
CYL 3 MISFIRE	P0303	—	—	X	EC-322
CYL 4 MISFIRE	P0304	—	—	X	EC-322
CYL 5 MISFIRE	P0305	—	—	X	EC-322
CYL 6 MISFIRE	P0306	—	—	X	EC-322

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
KNOCK SEN/CIRC-B1	P0325	—	—	—	EC-330
CPS/CIRCUIT (POS)	P0335	—	—	X	EC-336
CAM PS/CIRC (PHS)	P0340	—	—	X	EC-344
TW CATALYST SYS-B1	P0420	X	X	X*2	EC-349
TW CATALYST SYS-B2	P0430	X	X	X*2	EC-349
EVAP SMALL LEAK	P0440	X	X	X*2	EC-354
PURG VOLUME CONT/V	P0443	—	—	X	EC-369
VENT CONTROL VALVE	P0446	—	—	X	EC-376
EVAP SYS PRES SEN	P0450	—	—	X	EC-383
EVAP GROSS LEAK	P0455	X	X	X*2	EC-396
FUEL LV SE (SLOSH)	P0460	—	—	X	EC-409
FUEL LEVEL SENSOR	P0461	—	—	X	EC-413
FUEL LEVEL SEN/CIRC	P0464	—	—	X	EC-415
VEH SPEED SEN/CIRC	P0500	—	—	X	EC-419
IACV/AAC VLV/CIRC	P0505	—	—	X	EC-424
CLOSED TP SW/CIRC	P0510	—	—	X	EC-433
A/T COMM LINE	P0600	—	—	—	EC-442
ECM	P0605	—	—	X	EC-446
PNP SW/CIRC	P0705	—	—	X	AT-99
ATF TEMP SEN/CIRC	P0710	—	—	X	AT-105
VEH SPD SEN/CIR AT	P0720	—	—	X	AT-111
ENGINE SPEED SIG	P0725	—	—	X	AT-116
A/T 1ST GR FNCTN	P0731	—	—	X	AT-120
A/T 2ND GR FNCTN	P0732	—	—	X	AT-126
A/T 3RD GR FNCTN	P0733	—	—	X	AT-132
A/T 4TH GR FNCTN	P0734	—	—	X	AT-138
TCC SOLENOID/CIRC	P0740	—	—	X	AT-148
A/T TCC S/V FNCTN	P0744	—	—	X	AT-153
L/PRESS SOL/CIRC	P0745	—	—	X	AT-162
SFT SOL A/CIRC	P0750	—	—	X	AT-168
SFT SOL B/CIRC	P0755	—	—	X	AT-172
INT/V TIM CONT-B1	P1110	—	—	X	EC-448
INT/V TIM V/CIR-B1	P1111	—	—	X	EC-453
SWIRL CONT SOL/V	P1130	—	—	X	EC-460
INT/V TIM CONT-B2	P1135	—	—	X	EC-448
INT/V TIM V/CIR-B2	P1136	—	—	X	EC-453
INTK TIM S/CIRC-B1	P1140	—	—	X	EC-484

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

Items (CONSULT-II screen terms)	DTC*1	SRT code	Test value/ Test limit (GST only)	1st trip DTC*1	Reference page
INTK TIM S/CIRC-B2	P1145	—	—	X	EC-484
CLOSED LOOP-B1	P1148	—	—	X	EC-493
SWL CON VC SW/CIRC	P1165	—	—	X	EC-495
CLOSED LOOP-B2	P1168	—	—	X	EC-493
ENG OVER TEMP	P1217	—	—	X	LC-25
IGN SIGNAL-PRIMARY	P1320	—	—	X	EC-501
CPS/CIRCUIT (REF)	P1335	—	—	X	EC-512
CPS/CIRC (POS) COG	P1336	—	—	X	EC-519
EVAP VERY SMALL LEAK	P1441	X	X	X*2	EC-528
PURG VOLUME CONT/V	P1444	—	—	X	EC-543
VENT CONTROL VALVE	P1446	—	—	X	EC-555
EVAP PURG FLOW/MON	P1447	X	X	X*2	EC-563
VENT CONTROL VALVE	P1448	—	—	X	EC-575
FUEL LEVEL SEN/CIRC	P1464	—	—	X	EC-584
VC/V BYPASS/V	P1490	—	—	X	EC-587
VC CUT/V BYPASS/V	P1491	—	—	X	EC-593
A/T DIAG COMM LINE	P1605	—	—	X	EC-605
TP SEN/CIRC A/T	P1705	—	—	X	AT-176
P-N POS SW/CIRCUIT	P1706	—	—	X	EC-606
O/R CLTCH SOL/CIRC	P1760	—	—	X	AT-185

*1: 1st trip DTC No. is the same as DTC No.
*2: These are not displayed with GST.

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

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

NAEC0031S06

How to Erase DTC (With CONSULT-II)

NAEC0031S0601

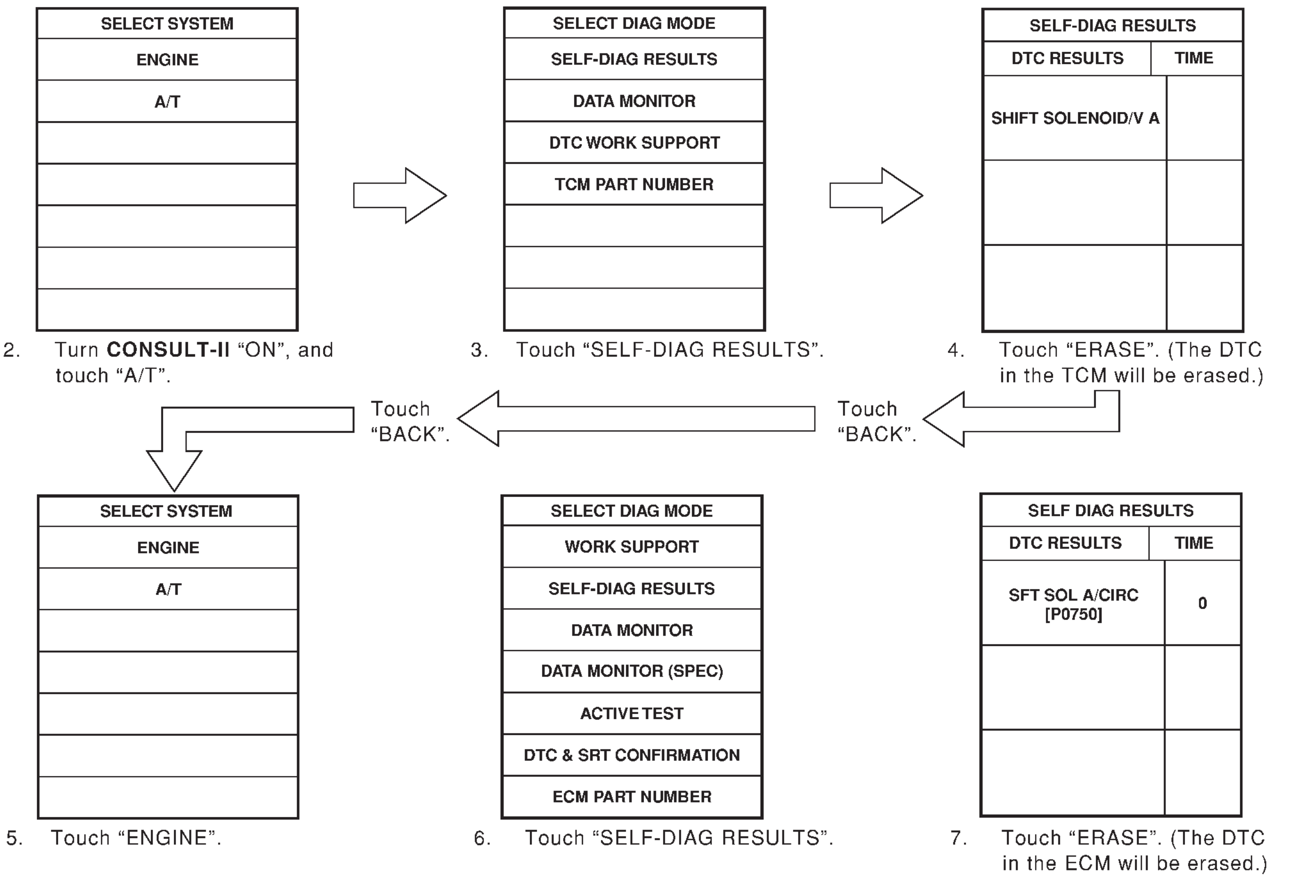
NOTE:
If the DTC is not for A/T related items (see EC-8), skip steps 2 through 4.

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 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.)

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

How to erase DTC (With CONSULT-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.



SEF823YA

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

How to Erase DTC (GST With GST)

NAEC0031S0602

NOTE:

If the DTC is not for A/T related items (see EC-8), skip step 2.

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 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).

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

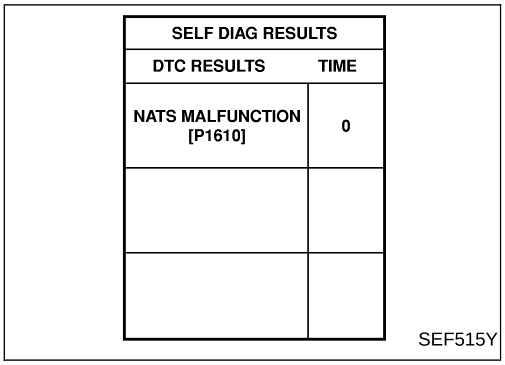
- **If the battery is disconnected, the emission-related diagnostic information will be lost after approx. 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

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.

NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)

NAEC0031S08



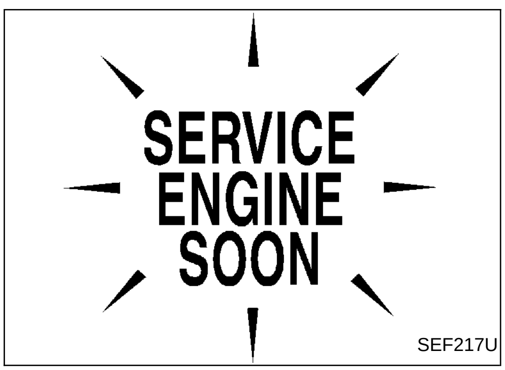
SEF515Y

- **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 "NVIS (Nissan Vehicle Immobilizer System — NATS)" in EL section.**
- **Confirm no self-diagnostic results of NVIS (NATS) is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT-II.**
- **When replacing ECM, initialization of NVIS (NATS) system and registration of all NVIS (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 NVIS (NATS) initialization and NVIS (NATS) ignition key ID registration, refer to CONSULT-II operation manual, IVIS/NVIS.

Malfunction Indicator Lamp (MIL)

DESCRIPTION

NAEC0032



SEF217U

The MIL is located on the instrument panel.

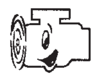
1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the MIL does not light up, refer to EL-134, "WARNING LAMPS" or see EC-653.
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.

On Board Diagnostic System Function

NAEC0032S01

The on board diagnostic system has the following two functions.

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

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 MIL bulb for damage (blown, open circuit, etc.). If the MIL does not come on, check MIL 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 MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip. ● Coolant overtemperature enrichment protection ● "Misfire (Possible three way catalyst damage)" ● "Closed loop control" ● Fail-safe mode

Diagnostic Test Mode I — Bulb Check

NAEC0032S03

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL-134, "WARNING LAMPS" or see EC-653.

Diagnostic Test Mode I — Malfunction Warning

NAEC0032S04

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

OBD System Operation Chart

NAEC0033

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

NAEC0033S01

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to "Two Trip Detection Logic" on EC-60.
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The "TIME" in "SELF-DIAGNOSTIC RESULTS" mode of CONSULT-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

NAEC0033S02

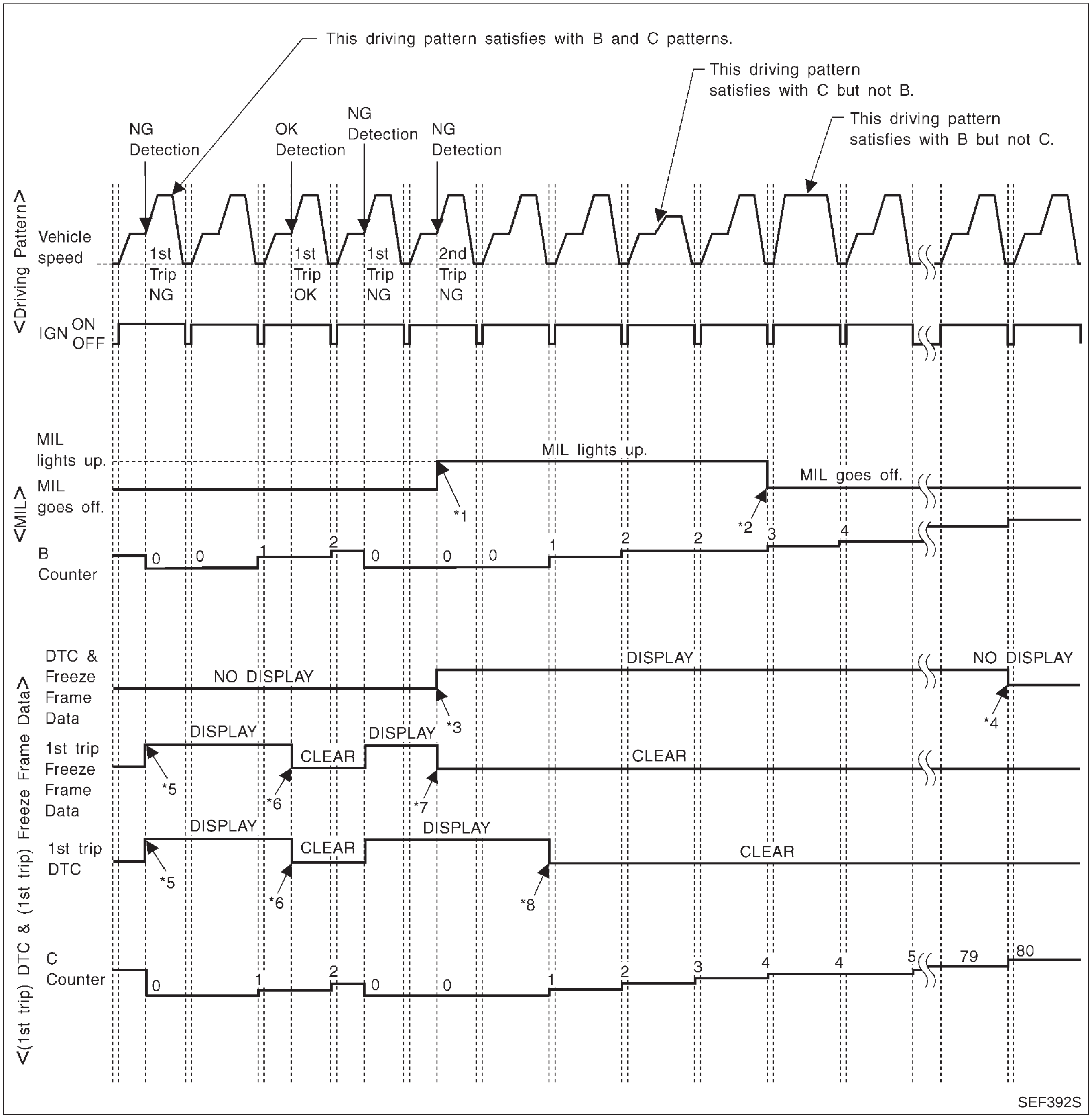
Items	Fuel Injection System	Misfire	Other
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)

Items	Fuel Injection System	Misfire	Other
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-79.
For details about patterns "A" and "B" under "Other", see EC-81.
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

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

=NAEC0033S03



SEF392S

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

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 80 times (pattern C) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: The 1st trip DTC and the 1st trip freeze frame data will be cleared at the moment OK is detected.

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

*8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.

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

NAEC0033S04

<Driving Pattern B>

NAEC0033S0401

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

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

<Driving Pattern C>

NAEC0033S0402

Driving pattern C means the vehicle operation as follows:

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

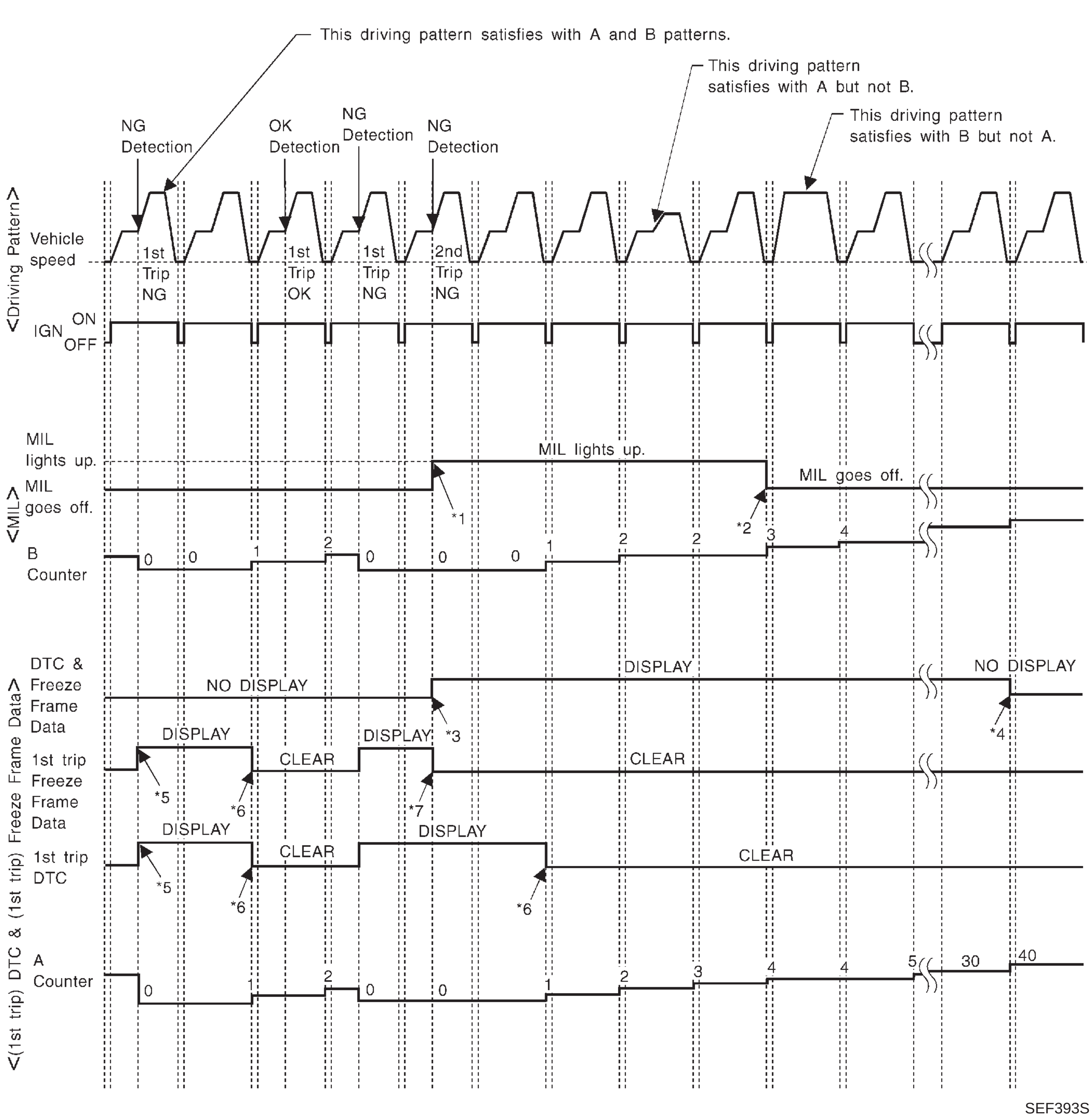
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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

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

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

NAEC0033S05



SEF393S

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

*2: MIL will go off after vehicle is driven 3 times (pattern B) without any malfunctions.

*3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction.
(The DTC and the freeze frame data still remain in ECM.)

*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

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

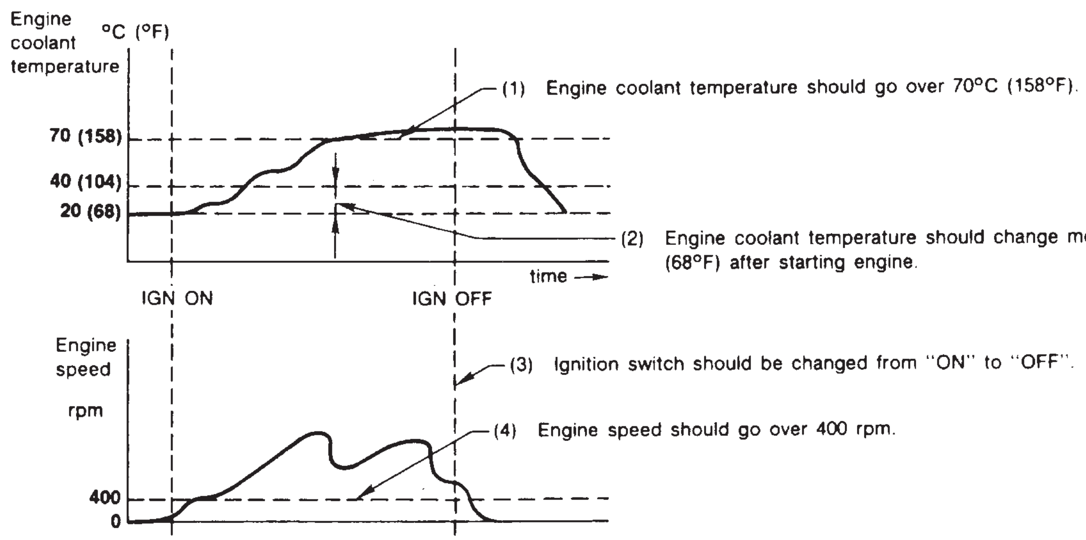
*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

NAEC0033S06

<Driving Pattern A>

NAEC0033S0601



AEC574

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

<Driving Pattern B>

NAEC0033S0602

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

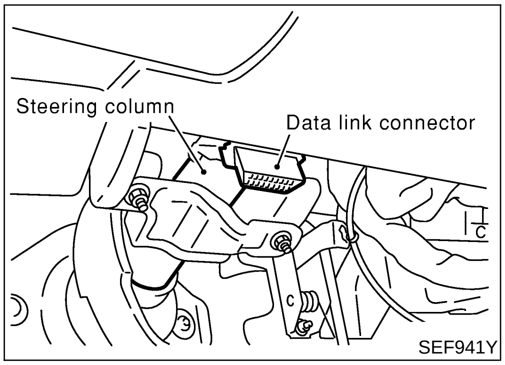
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in “OBD SYSTEM OPERATION CHART”).

CONSULT-II

=NAEC0034

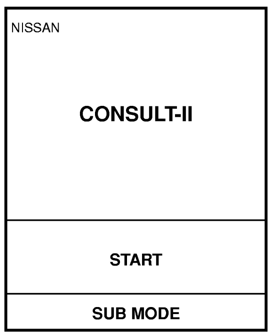
CONSULT-II INSPECTION PROCEDURE

NAEC0034S01



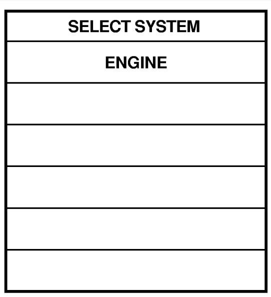
SEF941Y

1. Turn ignition switch OFF.
2. Connect CONSULT-II to data link connector, which is located under LH dash panel near the fuse box cover.



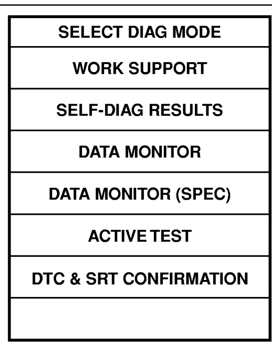
PBR455D

3. Turn ignition switch ON.
4. Touch “START”.



SEF948Y

5. Touch “ENGINE”.



SEF949Y

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

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

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

NAEC0034S02

			DIAGNOSTIC TEST MODE							
		Item	WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	DATA MONITOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		X	X	X	X			
		Crankshaft position sensor (REF)		X		X	X			
		Mass air flow sensor		X		X	X			
		Engine coolant temperature sensor		X	X	X	X	X		
		Heated oxygen sensor 1 (front)		X		X	X		X	X
		Heated oxygen sensor 2 (rear)		X		X	X		X	X
		Vehicle speed sensor		X	X	X	X			
		Throttle position sensor		X		X	X			
		Fuel tank temperature sensor		X		X	X	X		
		EVAP control system pressure sensor		X		X	X			
		Absolute pressure sensor		X		X	X			
		Intake air temperature sensor		X		X	X			
		Knock sensor		X						
		Ignition switch (start signal)				X	X			
		Closed throttle position switch		X		X	X			
		Closed throttle position switch (throttle position sensor signal)				X	X			
		Air conditioner switch				X	X			
		Park/neutral position (PNP) switch		X		X	X			
		Power steering oil pressure switch				X	X			
		Battery voltage				X	X			
		Ambient air temperature switch				X	X			
		Load signal				X	X			
		Swirl control valve control vacuum check switch		X		X	X			
		Fuel level sensor		X		X	X			
		Intake valve timing control position sensor		X		X	X			

Item			DIAGNOSTIC TEST MODE							
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS		DATA MONI-TOR	DATA MONI-TOR (SPEC)	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2				SRT STATUS	DTC WORK SUP-PORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Injectors				X	X	X		
		Power transistor (Ignition timing)		X (Ignition signal)		X	X	X		
		IACV-AAC valve		X		X	X	X		
		EVAP canister purge volume control solenoid valve		X		X	X	X		X
		Air conditioner relay				X	X			
		Fuel pump relay	X			X	X	X		
		Heated oxygen sensor 1 (front) heater		X		X	X		X	
		Heated oxygen sensor 2 (rear) heater		X		X	X		X	
		EVAP canister vent control valve		X		X	X	X		
		Vacuum cut valve bypass valve		X		X	X	X		X
		Swirl control valve control sole-noid valve		X		X	X	X		
		VIAS control solenoid valve				X	X	X		
		Intake valve timing control sole-noid valve		X		X	X	X		
		Calculated load value			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-61.

FUNCTION

=NAEC0034S03

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

WORK SUPPORT MODE

=NAEC0034S04

WORK ITEM	CONDITION	USAGE
TP SW/TP SEN IDLE POSI ADJ	● FOLLOW THE BASIC INSPECTION INSTRUCTION IN THE SERVICE MANUAL.	When adjusting the idle throttle position
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
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 clean the coefficient of self-learning control valve
EVAP SYSTEM CLOSE	OPEN THE VACUUM CUT VALVE BYPASS VALVE AND CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. ● IGN SW "ON" ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● TANK FUEL TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING "EVAP SYSTEM CLOSE" ● WHEN TRYING TO EXECUTE "EVAP SYSTEM CLOSE" UNDER THE CONDITION EXCEPT ABOVE, CONSULT-II WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE:** **WHEN STARTING ENGINE, CONSULT-II MAY DISPLAY "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN IN USING CHARGED BATTERY.**	When detecting EVAP vapor leak point of EVAP system
TARGET IGNITION TIMING ADJ*	● IDLE CONDITION	● When adjusting target ignition timing After adjustment, confirm target ignition timing with a timing light. ● If once the "TARGET IDLE RPM ADJ" has been done, the Idle Air Volume Learning procedure will not be completed.
TARGET IDLE RPM ADJ*	● IDLE CONDITION	When setting target idle speed

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

SELF-DIAGNOSTIC MODE

NAEC0034S05

DTC and 1st Trip DTC

NAEC0034S0501

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

Freeze Frame Data and 1st Trip Freeze Frame Data

NAEC0034S0502

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 "TROUBLE DIAGNOSIS — INDEX", EC-8.)

Freeze frame data item*1	Description
FUEL SYS-B1*2	● "Fuel injection system status" at the moment a malfunction is detected is displayed. ● One mode in the following is displayed. "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop
FUEL SYS-B2*2	
CAL/LD VALUE [%]	● The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	● The engine coolant temperature at the moment a malfunction is detected is displayed.
S-FUEL TRIM-B1 [%]	● "Short-term fuel trim" at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
S-FUEL TRIM-B2 [%]	
L-FUEL TRIM-B1 [%]	● "Long-term fuel trim" at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
L-FUEL TRIM-B2 [%]	
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH·P/S [% or degree]	● The throttle valve opening angle 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.
*2: Regarding R50 model, "-B1" indicates right bank and "-B2" indicates left bank.

DATA MONITOR MODE

=NAEC0034S06

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
ENG SPEED [rpm]	○	○	• Indicates the engine speed computed from the REF signal (120° signal) of the crankshaft position sensor (REF).	
CKPS·RPM (POS) [rpm]	○		• Indicates the engine speed computed from the POS signal (1° signal) of the crankshaft position sensor (POS).	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
POS COUNT	○		• Indicates the number of signal plate (Flywheel/Drive Plate) cogs (tooth) during one revolution of the engine.	
MAS A/F SE-B1 [V]	○	○	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
HO2S1 (B1) [V]	○	○	• The signal voltage of the front heated oxygen sensor is displayed.	
HO2S1 (B2) [V]	○	○		
HO2S2 (B1) [V]	○	○	• The signal voltage of the rear heated oxygen sensor is displayed.	
HO2S2 (B2) [V]	○	○		
HO2S1 MNTR (B1) [RICH/LEAN]	○		• Display of front heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture.	• After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
HO2S1 MNTR (B2) [RICH/LEAN]	○			
HO2S2 MNTR (B1) [RICH/LEAN]	○		• Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
HO2S2 MNTR (B2) [RICH/LEAN]	○			
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	• The throttle position sensor signal voltage is displayed.	
FUEL T/TMP SE [°C] or [°F]			• The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
INT/A TEMP SE [°C] or [°F]	○	○	● The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	
EVAP SYS PRES [V]	○		● The signal voltage of EVAP control system pressure sensor is displayed.	
ABSOL PRES/SE [V]	○		● The signal voltage of the absolute pressure sensor is displayed.	
FUEL LEVEL SE [V]	○		● The signal voltage of the fuel level sensor is displayed.	
START SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS [ON/OFF]	○	○	● Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal.	
CLSD THL/P SW [ON/OFF]	○		● Indicates mechanical contact [ON/OFF] condition of the closed throttle position switch.	
AIR COND SIG [ON/OFF]	○	○	● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the park/neutral position (PNP) switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	● [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating and/or lighting switch is on. OFF ... rear defogger is not operating and lighting switch is not on.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
SWRL CONT S/V [ON/OFF]	○		● The control condition of the swirl control valve control solenoid valve (determined by ECM according to the input signals) is indicated. ● ON ... Swirl control valve is closed. OFF ... Swirl control valve is opened.	
INJ PULSE-B1 [msec]		○	● Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	● When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2 [msec]				
B/FUEL SCHDL [msec]		○	● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
IGN TIMING [BTDC]		○	• Indicates the ignition timing computed by ECM according to the input signals.	• When the engine is stopped, a certain value is indicated.
IACV-AAC/V [step]		○	• Indicates the IACV-AAC valve control value computed by ECM according to the input signals.	
PURG VOL C/V [%]			• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
A/F ALPHA-B1 [%]		○	• 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. • This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]		○		
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
FUEL PUMP RLY [ON/OFF]		○	• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
VENT CONT/V [ON/OFF]			• The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated. • ON ... Closed OFF ... Open	
HO2S1 HTR (B1) [ON/OFF]			• Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals.	
HO2S1 HTR (B2) [ON/OFF]				
HO2S2 HTR (B1) [ON/OFF]			• Indicates [ON/OFF] condition of rear heated oxygen sensor heater determined by ECM according to the input signals.	
HO2S2 HTR (B2) [ON/OFF]				
VC/V BYPASS/V [ON/OFF]			• The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated. • ON ... Open OFF ... Closed	
CAL/LD VALUE [%]			• "Calculated load value" indicates the value of the current airflow divided by peak airflow.	
ABSOL TH·P/S [% or degree]			• "Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.	
MASS AIRFLOW [g·m/s]			• Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor.	

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
INT/V TIM (B1) [°CA]			● Indicate [°CA] of intake camshaft advanced angle.	
INT/V TIM (B2) [°CA]				
INT/V SOL (B1) [%]			● The control condition of the intake valve timing control solenoid valve is indicated.	
INT/V SOL (B2) [%]				
TRVL AFTER MIL [km] or [Mile]			● Distance traveled while MIL is activated	
VIAS S/V [ON/OFF]			● The control condition of the VIAS control solenoid valve (determined by ECM according to the input signal) is indicated. ● OFF ... VIAS control solenoid valve is not operating. ON ... VIAS control solenoid valve is operating.	
SWL CON VC SW			● Indicates [ON/OFF] condition from the swirl control valve control vacuum check switch. ON ... Swirl control valve is not operational. OFF ... Swirl control valve is operational.	
IDL A/V LEAN			● Display the condition of idle air volume learning YET ... Idle air volume learning has not been performed yet. CMPLT ... Idle air volume learning has already been performed successfully. INCMP ... Idle air volume learning has not been performed successfully.	
Voltage [V]			● Voltage measured by the voltage probe.	
Frequenty [msec] or [Hz] or [%]			● Pulse width, frequency or duty cycle measured by the pulse probe.	● Only "#" is displayed if item is unable to be measured. ● Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding R50 model, "-B1" indicates right bank and "-B2" indicates left bank.
- Bank 1 (-B1 or BK1) includes No. 1 cylinder.

DATA MONITOR (SPEC) MODE

NAEC0034S11

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
MAS A/F SE-B1 [V]	○	○	● The signal voltage of the mass air flow sensor specification is displayed.	● When the engine is running, specification range is indicated.
B/FUEL SCHDL [msec]			● "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	● When the engine is running, specification range is indicated.

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
A/F ALPHA-B1 [%]		○	● Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	● When the engine is running, specification range is indicated. ● This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]		○		

NOTE:
- Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
- Regarding R50 model, "B1" indicates bank 1 and "B2" indicates bank 2.

ACTIVE TEST MODE

NAEC0034S07

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Fuel injectors ● Heated oxygen sensor
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Adjust initial ignition timing
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● IACV-AAC valve
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch "OFF" ● Shift lever "N" ● Cut off each injector signal one at a time using CONSULT-II.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
FUEL PUMP RELAY	● Ignition switch: ON (Engine stopped) ● 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 connector ● Fuel pump relay
VIAS SOL VALVE	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
SWIRL CONT SOL VALVE	● Ignition switch: ON ● Turn solenoid valve "ON" and "OFF" with CONSULT-II and listen for operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
PURG VOL CONT/V	● Engine: After warming up, run engine at 1,500 rpm. ● Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-II.	Engine speed changes according to the opening percent.	● Harness and connector ● Solenoid valve

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL/T TEMP SEN	● Change the fuel tank temperature using CONSULT-II.		
VENT CONTROL/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
VC/V BYPASS/V	● Ignition switch: ON (Engine stopped) ● Turn solenoid valve "ON" and "OFF" with the CONSULT-II and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
TARGET INT/V TIM	● Engine: After warming up, hold engine speed at 1,500 to 2,000 rpm. ● Change the intake valve timing using CONSULT-II.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Intake valve timing control solenoid valve

DTC & SRT CONFIRMATION MODE

NAEC0034S08

SRT STATUS Mode

NAEC0034S0801

For details, refer to "SYSTEM READINESS TEST (SRT) CODE", EC-62.

SRT Work Support Mode

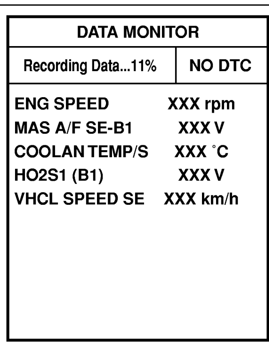
NAEC0034S0803

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

DTC Work Support Mode

NAEC0034S0802

Test mode	Test item	Condition	Reference page
EVAPORATIVE SYSTEM	EVAP SML LEAK P0440	Refer to corresponding trouble diagnosis for DTC.	EC-354
	EVAP VERY SML LEAK P1441		EC-528
	PURG VOL CN/V P1444		EC-543
	PURGE FLOW P1447		EC-563
	VC CUT/V BP/V P1491		EC-593
HEATED OXYGEN SENSOR 1 (FRONT)	HO2S1 (B1) P0130		EC-194
	HO2S1 (B1) P0131		EC-204
	HO2S1 (B1) P0132		EC-212
	HO2S1 (B1) P0133		EC-220
	HO2S1 (B2) P0150		EC-194
	HO2S1 (B2) P0151		EC-204
	HO2S1 (B2) P0152		EC-212
	HO2S1 (B2) P0153		EC-220
HEATED OXYGEN SENSOR 2 (REAR)	HO2S2 (B1) P0137		EC-249
	HO2S2 (B1) P0138		EC-259
	HO2S2 (B1) P0139		EC-269
	HO2S2 (B2) P0157		EC-249
	HO2S2 (B2) P0158		EC-259
	HO2S2 (B2) P0159		EC-269



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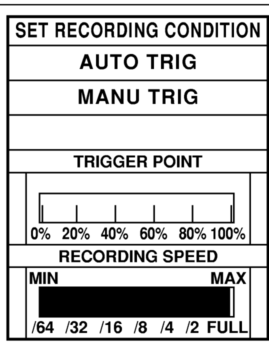


SEF707X

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

NAEC0034S10

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 left, 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.

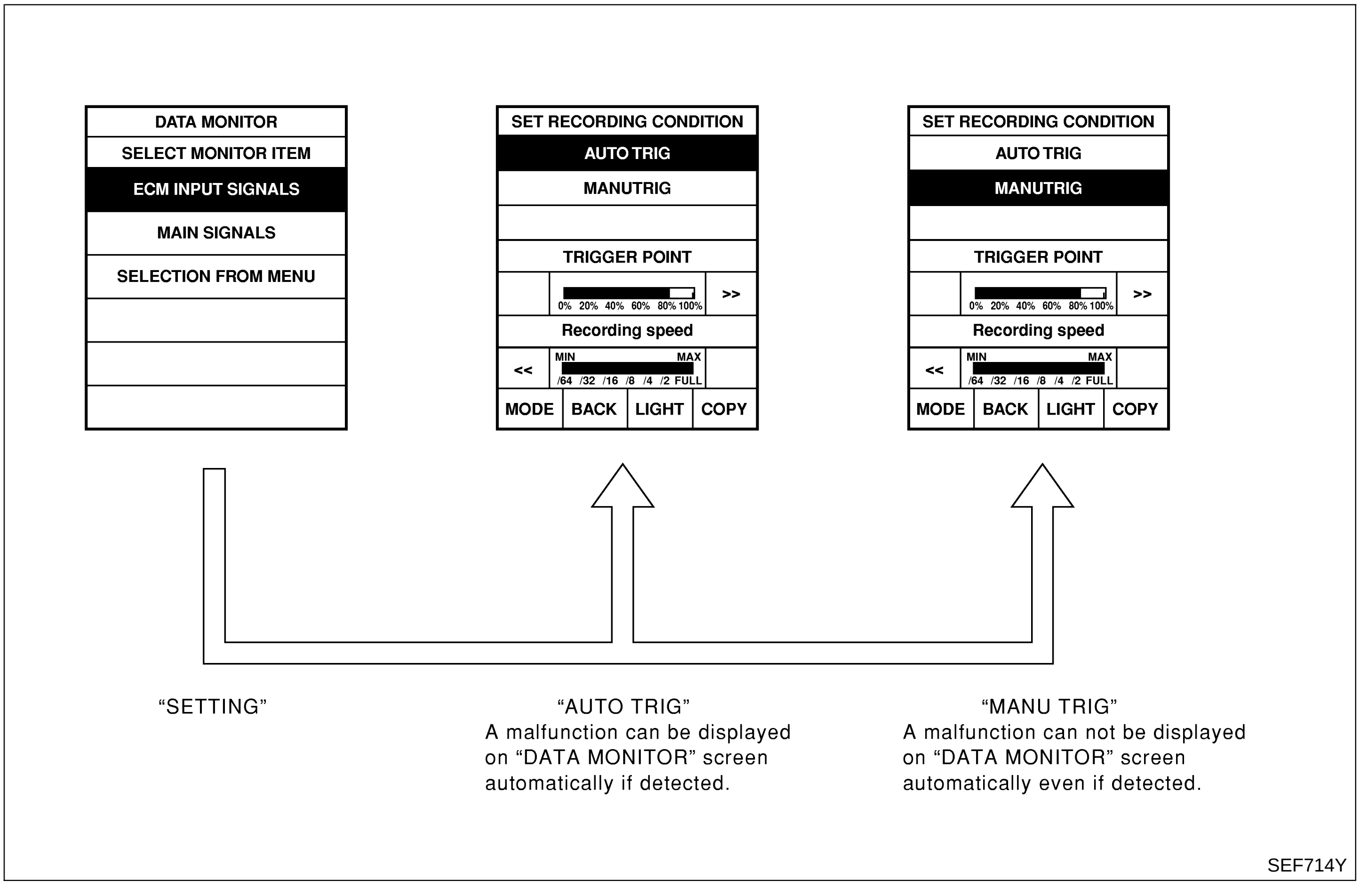
Use these triggers as follows:

1) "AUTO TRIG"

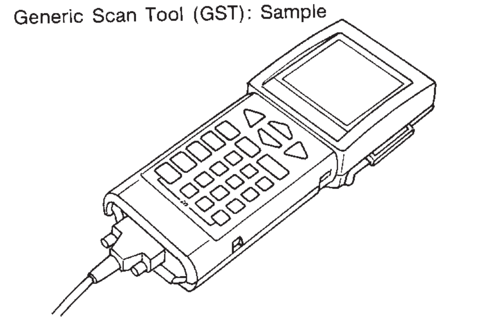
- While trying to detect the DTC/1st trip DTC by performing the "DTC Confirmation Procedure", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT-II should be set in "DATA MONITOR (AUTO 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 GI-25, "Incident Simulation Tests".)

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.



SEF714Y

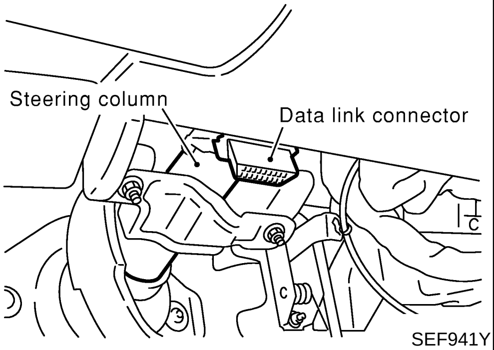


SEF139P

Generic Scan Tool (GST)
=NAEC0035

DESCRIPTION
NAEC0035S01

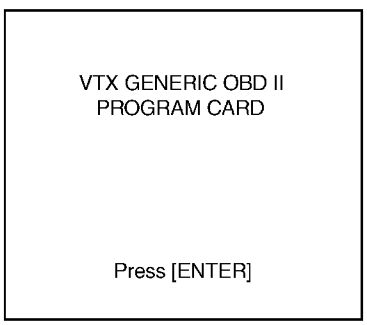
Generic Scan Tool (OBDII scan tool) complying with SAE J1978 has 8 different functions explained on the next page.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



SEF941Y

GST INSPECTION PROCEDURE
NAEC0035S02

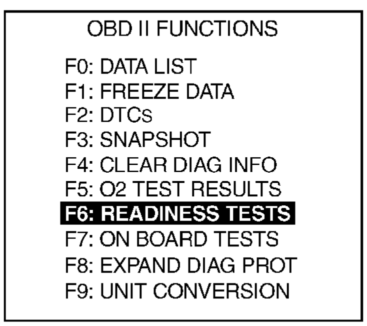
1. Turn ignition switch OFF.
2. Connect GST to data link connector, which is located under LH dash panel near the fuse box cover.



Sample screen*
SEF398S

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

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



Sample screen*
SEF416S

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

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

FUNCTION

NAEC0035S03

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to "Freeze Frame Data" (EC-86).]
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
MODE 6	(ON BOARD TESTS)	This mode accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
MODE 7	(ON BOARD TESTS)	This mode enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
MODE 8	—	This mode can close EVAP system in ignition switch "ON" position (Engine stopped). When this mode is performed, the following parts can be opened or closed. ● EVAP canister vent control valve open ● Vacuum cut valve bypass valve closed In the following conditions, this mode cannot function. ● Low ambient temperature ● Low battery voltage ● Engine running ● Ignition switch "OFF" ● Low fuel temperature ● Too much pressure is applied to EVAP system
MODE 9	(CALIBRATION ID)	This mode enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

Introduction

NAEC0036

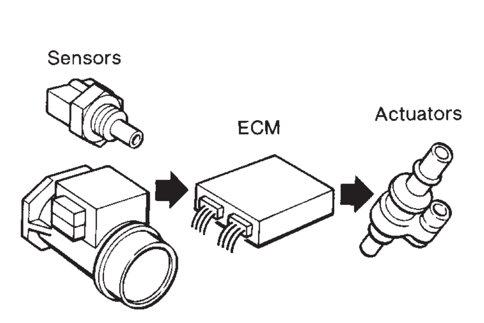
The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that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

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

A visual check only may not find the cause of the problems. A road test with CONSULT-II (or GST) or a circuit tester connected should be performed. Follow the “Work Flow” on EC-100.

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

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



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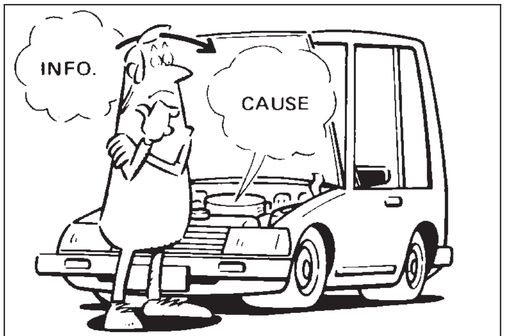

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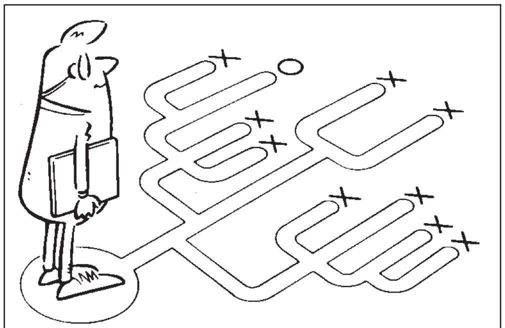

SEF234G

DIAGNOSTIC WORKSHEET

NAEC0036S01

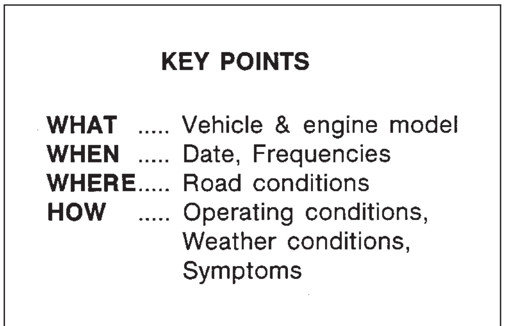
There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make trouble-shooting faster and more accurate.

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

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

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

- Vehicle ran out of fuel, which caused the engine to misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere.



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Worksheet Sample

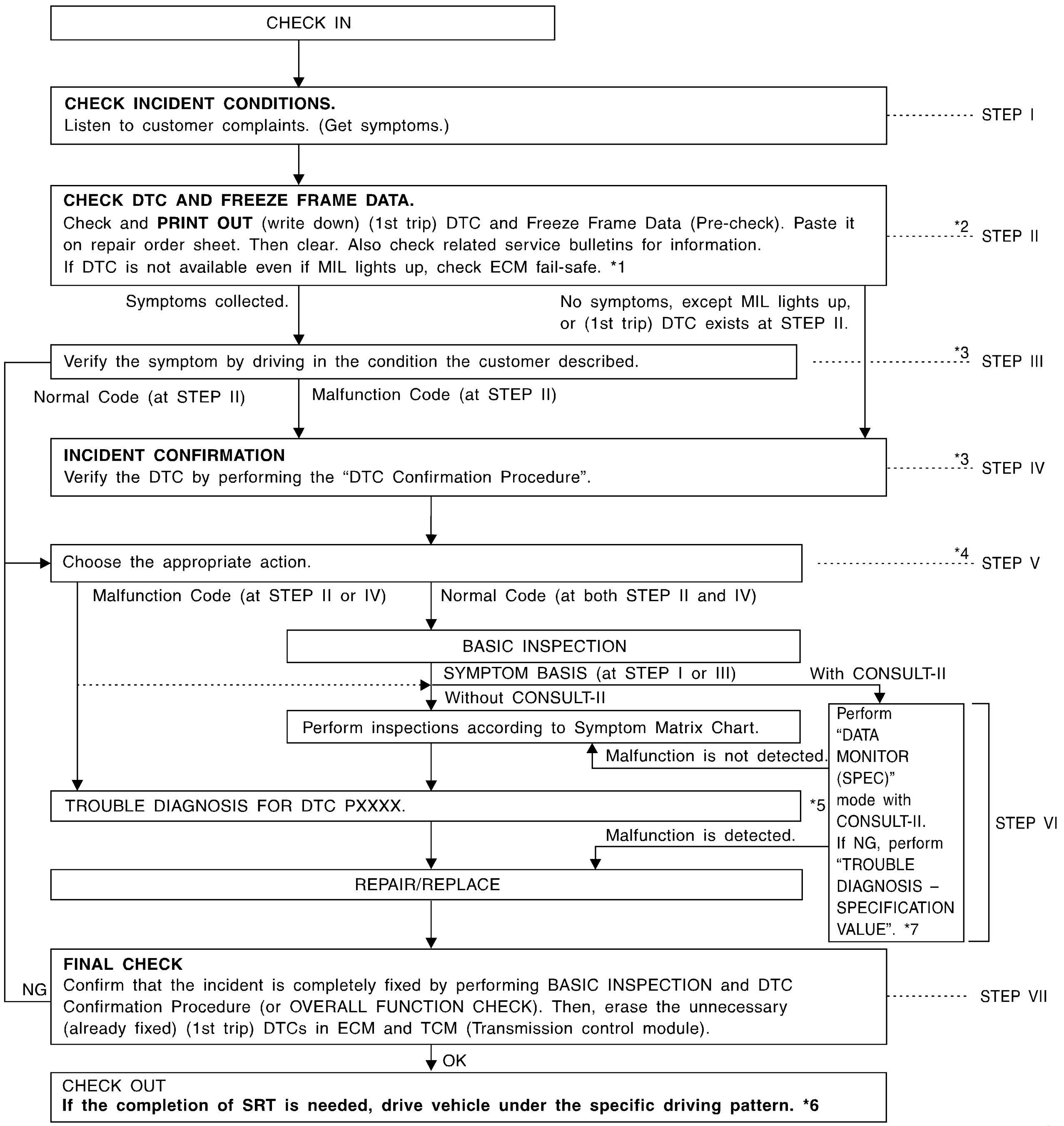
NAEC0036S0101

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

MTBL0017

Work Flow

NAEC0037



SEF510ZF

*1 EC-119

*2 If time data of “SELF-DIAG RESULTS” is other than “0” or “[1t]”, perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-142.

*3 If the incident cannot be verified, perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-142.

*4 If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to “TROUBLE DIAGNOSIS FOR POWER SUPPLY”, EC-144.

*5 If malfunctioning part cannot be detected, perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-142.

*6 EC-67

*7 EC-138

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DESCRIPTION FOR WORK FLOW

NAEC0037S01

STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-99.
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-73.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142. 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-120.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" and the freeze frame data are useful to verify the incident. Connect CONSULT-II to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142. 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. 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. If the incident cannot be verified, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142. In case the "DTC Confirmation Procedure" is not available, perform the "Overall Function Check" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "Overall Function Check" is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION. (Refer to EC-102.) If CONSULT-II is available, perform "DATA MONITOR (SPEC)" mode with CONSULT-II and proceed to the "TROUBLE DIAGNOSIS — SPECIFICATION VALUE", EC-138. (If malfunction is detected, proceed to "REPAIR REPLACE".) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-120.)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts". Gently shake the related connectors, components or wiring harness with CONSULT-II set in "DATA MONITOR (AUTO TRIG)" mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT-II. Refer to EC-124, 129. The "Diagnostic Procedure" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to GI-27, "Circuit Inspection". Repair or replace the malfunction parts. If malfunctioning part cannot be detected, perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the "DTC Confirmation Procedure" and confirm the normal code [DTC No. P0000] is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM and TCM (Transmission control module). (Refer to EC-73.)

Basic Inspection

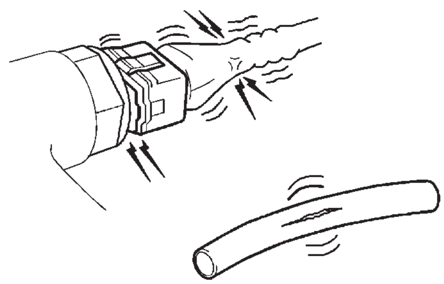
NAEC0038

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

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

1	INSPECTION START

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



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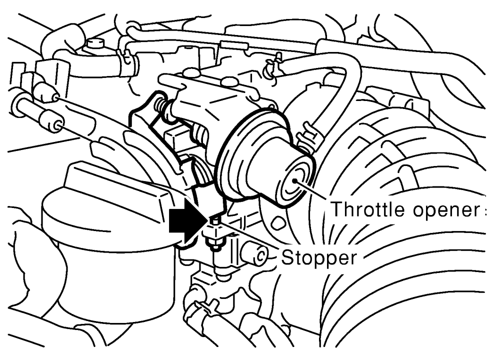
▶	GO TO 2.

2	CHECK THROTTLE OPENER OPERATION-I

Confirm that there is a clearance between throttle drum and stopper.



SEF950Y

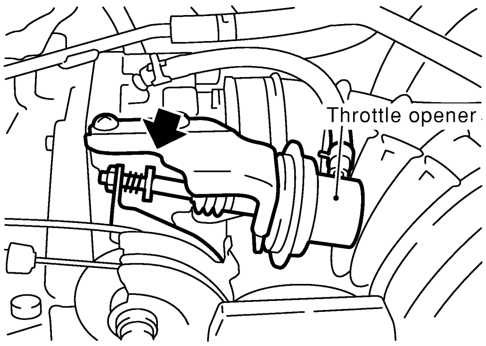
OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	CHECK THROTTLE OPENER FIXING BOLTS
Check throttle opener fixing bolts for loosening.	
OK or NG	
OK ▶	1. Repair or replace throttle body assembly. 2. GO TO 2.
NG ▶	1. Retighten the fixing bolts. 2. GO TO 2.

4	CHECK THROTTLE OPENER OPERATION-II

1. Start engine and let it idle.
2. Confirm that throttle opener rod moves backward and there is a clearance between throttle drum and throttle opener rod.



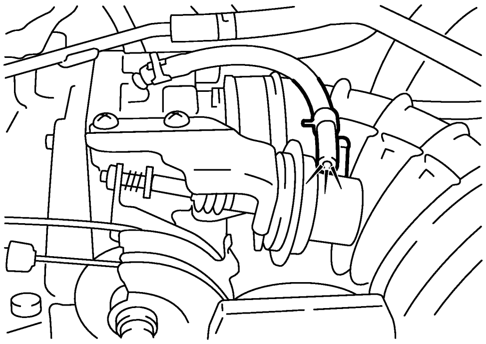
SEF951Y

OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 5.

5	CHECK VACUUM SOURCE FOR THROTTLE OPENER

1. Disconnect vacuum hose connected to throttle opener.
2. Check vacuum existance with engine running.

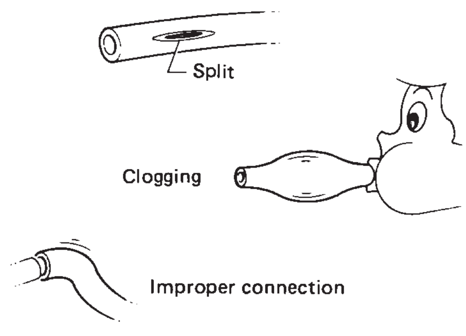


SEF952Y

OK or NG

OK ▶	1. Repair or replace throttle body assembly. 2. GO TO 4.
NG ▶	GO TO 6.

6	CHECK VACUUM HOSE	
1. Stop engine. 2. Remove the vacuum hose. 3. Check the vacuum hose for splits, kinks and clogging.		

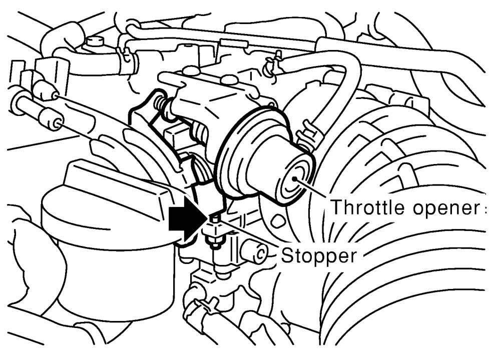


SEF109L

OK or NG

OK	▶	1. Clean vacuum port by blowing air. 2. GO TO 4.
NG	▶	1. Replace vacuum hose. 2. GO TO 4.

7	CHECK THROTTLE DRUM OPERATION
Confirm that throttle drum moves to contact the stopper.	



SEF950Y

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 8.

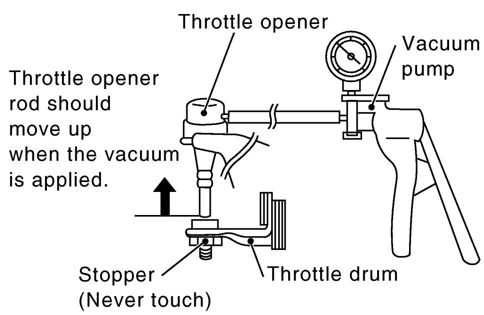
8	CHECK ACCELERATOR WIRE INSTALLATION
1. Stop engine. 2. Check accelerator wire for slack.	

OK or NG

OK	▶	GO TO 9.
NG	▶	1. Adjust accelerator wire. Refer to FE-3, "Adjusting Accelerator Wire". 2. GO TO 7.

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

9	CHECK THROTTLE VALVE OPERATION	
1. Remove intake air ducts. 2. Check throttle valve operation when moving throttle drum by hand. **OK or NG**		
OK	▶	1. Retighten the throttle drum fixing nuts. 2. GO TO 7.
NG	▶	1. Clean the throttle body and throttle valve. 2. GO TO 7.

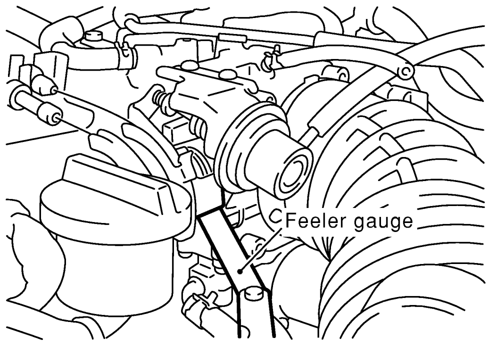
10	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-I	
NOTE: **Always check ignition timing before performing the following.** 1. Warm up engine to normal operating temperature. 2. Stop engine. 3. Remove the vacuum hose connected to the throttle opener. 4. Connect suitable vacuum hose to vacuum pump as shown below.  SEF793WA 5. Apply vacuum [more than −40.0 kPa (−300 mmHg, −11.81 inHg)] until the throttle drum is free from the throttle opener rod.		
With CONSULT-II	▶	GO TO 11.
Without CONSULT-II	▶	GO TO 15.

11	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

With CONSULT-II

1. Turn ignition switch "ON".
2. Select "TP SW/TP SEN IDLE POSI ADJ" in "WORK SUPPORT" mode with CONSULT-II.
3. Read "CLSD THL/P SW" signal under the following conditions.

- Insert a 0.05 mm (0.0020 in) and 0.15 mm (0.0059 in) feeler gauge alternately between stopper and throttle drum as shown in the figure and check the signal.



SEF953Y

TP SW/TP SEN IDLE POSI ADJ	
MONITOR	
COOLAN TEMP/S	XXX °C
CLSD THL POS	ON
CLSD THL/P SW	ON

SEF987Y

"CLSD THL/P SW" signal should remain "ON" while inserting 0.05 mm (0.0020 in) feeler gauge.
"CLSD THL/P SW" signal should remain "OFF" while inserting 0.15 mm (0.0059 in) feeler gauge.

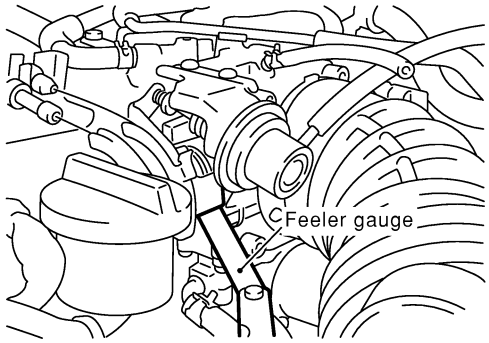
OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 12.

12	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

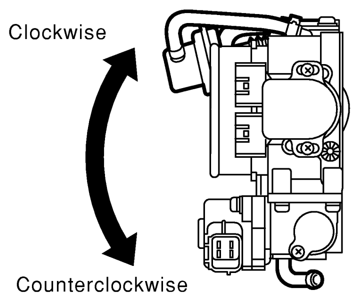
With CONSULT-II

1. Loosen throttle position sensor fixing bolts.
2. Confirm that proper vacuum is applied. Refer to test No. 10. During adjustment, vacuum should be applied.
3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.



SEF953Y

4. Turn throttle position sensor body counterclockwise until "CLSD THL/P SW" signal switches to "OFF".



SEF954Y

TP SW/TP SEN IDLE POJI ADJ	
MONITOR	
COOLAN TEMP/S	XXX °C
CLSD THL POS	ON
CLSD THL/P SW	OFF

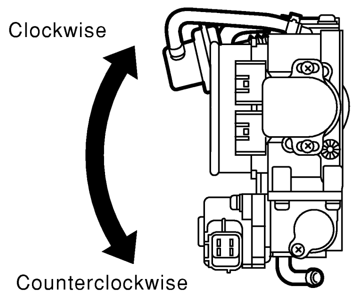
SEF007Z

▶	GO TO 13.

13	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-II

With CONSULT-II

1. Temporarily tighten sensor body fixing bolts as follows.
- **Gradually move the sensor body clockwise and stop it when “CLSD THL/P SW” signal switches from “OFF” to “ON”, then temporarily tighten sensor body fixing bolts.**



SEF954Y

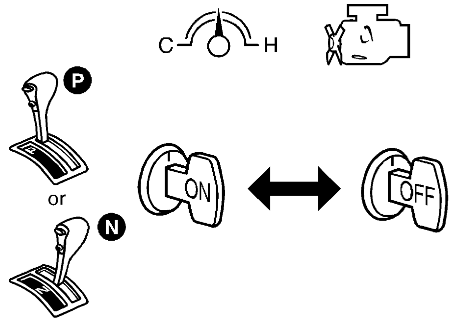
2. Make sure two or three times that the signal is “ON” when the throttle valve is closed and “OFF” when it is opened.
3. Remove 0.05 mm (0.0020 in) feeler gauge then insert 0.15 mm (0.0059 in) feeler gauge.
4. Make sure two or three times that the signal remains “OFF” when the throttle valve is closed.
5. Tighten throttle position sensor.
6. Check the “CLSD THL/P SW” signal again.
   The signal remains “OFF” while closing throttle valve.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 12.

14	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

With CONSULT-II
NOTE:
Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.
1. Confirm that proper vacuum is applied. Refer to Test No. 10.
2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
3. Start engine.
4. Warm up engine to normal operating temperature.
5. Select "TP SW/TP SEN IDLE POSI ADJ" in "WORK SUPPORT" mode.
6. Stop engine. (Turn ignition switch "OFF".)
7. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

8. Turn ignition switch "OFF" and wait at least 10 seconds.
9. Repeat steps 7 and 8 until "CLSD THL POS" signal changes to "ON".

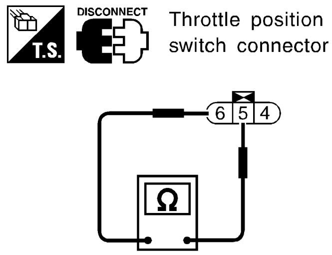
TP SW/TP SEN IDLE POSI ADJ	
MONITOR	
COOLAN TEMP/S	XXX °C
CLSD THL POS	ON
CLSD THL/P SW	ON

SEF987Y

▶ GO TO 19.

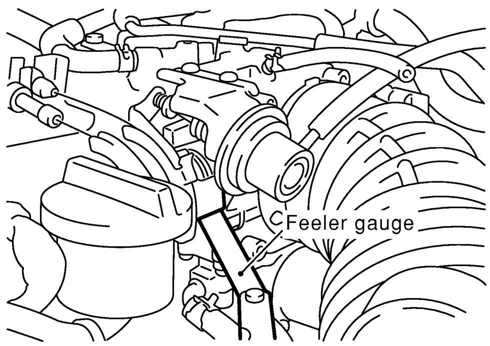
15	CHECK THROTTLE POSITION SWITCH CLOSED POSITION-II

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



SEF330Z

- Insert the 0.05 mm (0.0020 in) and 0.15 mm (0.0059 in) feeler gauge alternately between the stopper and throttle drum as shown in the figure.



SEF953Y

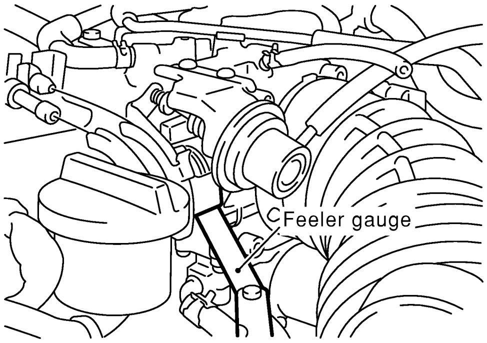
"Continuity should exist" while inserting 0.05 mm (0.0020 in) feeler gauge.
"Continuity should not exist" while inserting 0.15 mm (0.0059 in) feeler gauge.

OK or NG

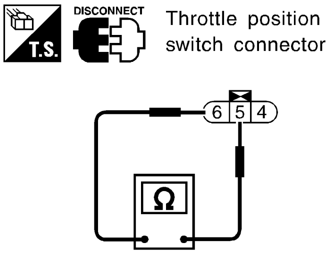
OK	▶	GO TO 18.
NG	▶	GO TO 16.

16	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-I

1. Loosen throttle position sensor fixing bolts.
2. Confirm that proper vacuum is applied. Refer to Test No. 10. During adjustment, vacuum should be applied.
3. Insert 0.05 mm (0.0020 in) feeler gauge between stopper and throttle drum as shown in the figure.

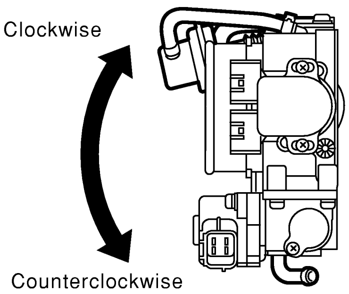


SEF953Y



SEF330Z

4. Turn throttle position sensor body counterclockwise until continuity does not exist.



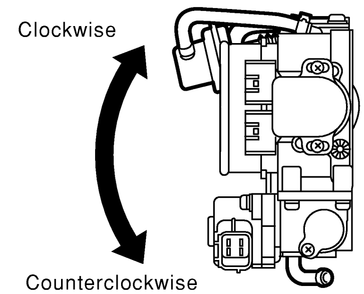
SEF954Y

▶ GO TO 17.

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

17	ADJUSTMENT THROTTLE POSITION SWITCH CLOSED POSITION-II

1. Temporarily tighten sensor body fixing bolts as follows.
- **Gradually move the sensor body clockwise and stop it when the continuity comes to exist, then temporarily tighten sensor body fixing bolts.**



SEF954Y

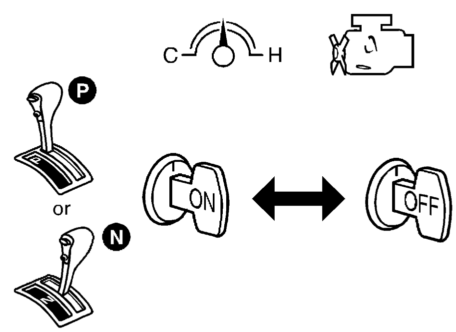
2. Make sure two or three times that the continuity exists when the throttle valve is closed and continuity does not exist when it is opened.
3. Remove 0.05 mm (0.0020 in) feeler gauge then insert 0.15 mm (0.0059 in) feeler gauge.
4. Make sure two or three times that the continuity does not exist when the throttle valve is closed.
5. Tighten throttle position sensor.
6. Check the continuity again.
   Continuity does not exist while closing the throttle valve.

OK or NG

OK ▶	GO TO 18.
NG ▶	GO TO 16.

18	RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY

NOTE:
Always warm up engine to normal operating temperature. If engine is cool, the throttle position sensor idle position memory will not be reset correctly.
1. Confirm that proper vacuum is applied. Refer to Test No. 10.
2. Attach blind cap to vacuum port from which vacuum hose to throttle opener was disconnected.
3. Start engine.
4. Warm up engine to normal operating temperature.
5. Stop engine. (Turn ignition switch "OFF".)
6. Turn ignition switch "ON" and wait at least 5 seconds.



SEF864V

7. Turn ignition switch "OFF" and wait at least 10 seconds.
8. Repeat steps 6 and 7, 20 times.

▶	GO TO 19.

19	CHECK (1ST TRIP) DTC	
1. Turn ignition switch "OFF". 2. Release vacuum from throttle opener. 3. Remove vacuum pump and vacuum hose from throttle opener. 4. Reinstall original vacuum hose to throttle opener securely. 5. Start engine and warm it up to normal operating temperature. 6. Rev (2,000 to 3,000 rpm) two or three times. 7. Make sure no (1st trip) DTC is displayed with CONSULT-II or GST. **OK or NG**		
OK	▶	GO TO 21.
NG	▶	GO TO 20.

20	REPAIR MALFUNCTION	
Repair or replace components as necessary according to corresponding "Diagnostic Procedure".		
	▶	GO TO 19.

21	CHECK TARGET IDLE SPEED	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)** **OK or NG**		
OK	▶	GO TO 30.
NG	▶	GO TO 22.

22	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-58. **Which is the result CMPLT or INCMP?** **CMPLT or INCMP**		
CMPLT	▶	GO TO 23.
INCMP	▶	1. Follow the construction of "Idle Air Volume Leaning". 2. GO TO 22.

23	CHECK TARGET IDLE SPEED AGAIN	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)** **OK or NG**		
OK	▶	GO TO 28.
NG	▶	GO TO 24.

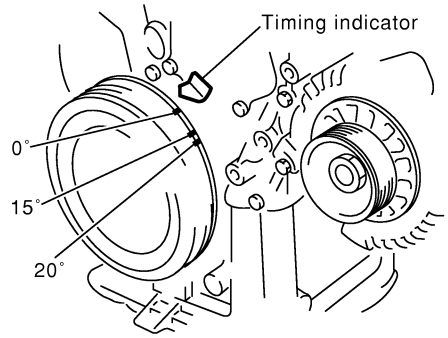
24	REPLACE IACV-AAC VALVE	
Replace IACV-AAC valve.		
	▶	GO TO 25.

25	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-58. **Which is the result CMPLT or INCMP?** **CMPLT or INCMP**		
CMPLT	▶	GO TO 26.
INCMP	▶	1. Follow the construction of "Idle Air Volume Learning". 2. GO TO 22.

26	CHECK TARGET IDLE SPEED AGAIN	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)** **OK or NG**		
OK	▶	GO TO 28.
NG	▶	GO TO 27.

27	CHECK ECM FUNCTION
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.) 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)", EC-75.	
▶	GO TO 22.

28	CHECK IGNITION TIMING
1. Start engine and warm it up to normal operating temperature. 2. Check ignition timing at idle using a timing light.	



SEF572X

Ignition timing:
M/T 15°±5° BTDC
A/T 15°±5° BTDC (in "P" or "N" position)

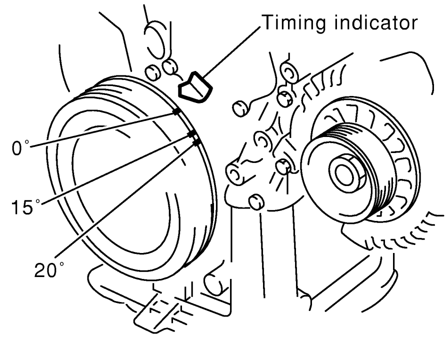
OK or NG

OK	▶	GO TO 36.
NG	▶	GO TO 29.

29	CHECK TIMING CHAIN INSTALLATION
Check timing chain installation. Refer to EM-29, "Installation".	

OK or NG

OK	▶	GO TO 27.
NG	▶	1. Repair the timing chain installation. 2. GO TO 22.

30	CHECK IGNITION TIMING	
1. Start engine and let it idle. 2. Check ignition timing at idle using a timing light.  SEF572X **Ignition timing:** **M/T 15°±5° BTDC** **A/T 15°±5° BTDC (in "P" or "N" position)** **OK or NG**		
OK	▶	GO TO 36.
NG	▶	GO TO 31.

31	PERFORM IDLE AIR VOLUME LEARNING	
Refer to "Idle Air Volume Learning", EC-58. **Which is the result CMPLT or INCMP?** **CMPLT or INCMP**		
CMPLT	▶	GO TO 32.
INCMP	▶	1. Follow the construction of "Idle Air volume Learning". 2. GO TO 31.

32	CHECK TARGET IDLE SPEED AGAIN	
With CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Select "ENG SPEED" in "DATA MONITOR" mode with CONSULT-II. 3. Check idle speed. **M/T: 750±50 rpm** **A/T: 750±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. **M/T: 750±50 rpm** **A/T: 750±50 rpm (in "P" or "N" position)** **OK or NG**		
OK	▶	GO TO 34.
NG	▶	GO TO 33.

33	CHECK ECM FUNCTION	
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of a problem, but this is rarely the case.) 2. Perform initialization of NVIS (NATS) system and registration of NVIS (NATS) ignition key IDs. Refer to "NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)", EC-75.		
	▶	GO TO 31.

GI
MA
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MT
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AX
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BR
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RS
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HA
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EL
IDX

34	**CHECK IGNITION TIMING AGAIN**	
Check ignition timing again. Refer to Test No. 30.		
OK or NG		
OK	▶	GO TO 36.
NG	▶	GO TO 35.

35	**CHECK TIMING CHAIN INSTALLATION**	
Check timing chain installation. Refer to EM-29, "Installation".		
OK or NG		
OK	▶	GO TO 33.
NG	▶	1. Repair the timing chain installation. 2. GO TO 31.

36	**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-73 and AT-35, "HOW TO ERASE DTC".		
	▶	**INSPECTION END**

DTC Inspection Priority Chart

NAEC0039

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

Priority	Detected items (DTC)
1	● P0100 Mass air flow sensor ● P0110 Intake air temperature sensor ● P0115 P0125 Engine coolant temperature sensor ● P0120 Throttle position sensor ● P0180 Fuel tank temperature sensor ● P0325 Knock sensor ● P0335 P1336 Crankshaft position sensor (POS) ● P0340 Camshaft position sensor (PHASE) ● P0460 P0461 P0464 P1464 Fuel level sensor ● P0500 Vehicle speed sensor ● P0605 ECM ● P1320 Ignition signal ● P1335 Crankshaft position sensor (REF) ● P1605 A/T diagnosis communication line ● P1706 Park/Neutral position (PNP) switch
2	● P0105 Absolute pressure sensor ● P0130-P0134, P0150-P0154 Heated oxygen sensor 1 (front) ● P0135 P0155 Heated oxygen sensor 1 heater (front) ● P0137-P0140, P0157-P0160 Heated oxygen sensor 2 (rear) ● P0141 P0161 Heated oxygen sensor 2 (rear) heater ● P0217 Coolant overtemperature enrichment protection ● P0443 P1444 EVAP canister purge volume control solenoid valve ● P0446 P1446 P1448 EVAP canister vent control valve ● P0450 EVAP control system pressure sensor ● P0510 Closed throttle position switch ● P0705-P0755 P1705 P1760 A/T related sensors, solenoid valves and switches ● P1111 Intake valve timing control solenoid valve ● P1140 Intake valve timing control position sensor ● P1165 Swirl control valve control vacuum check switch ● P1441 EVAP control system (VERY SMALL LEAK) ● P1447 EVAP control system purge flow monitoring ● P1490 P1491 Vacuum cut valve bypass valve
3	● P0171 P0172 P0174 P0175 Fuel injection system function ● P0306 - P0300 Misfire ● P0420 P0430 Three way catalyst function ● P0440 P1440 EVAP control system (SMALL LEAK) ● P0455 EVAP control system (GROSS LEAK) ● P0505 IACV-AAC valve ● P0600 A/T communication line ● P0731-P0734 P0744 A/T function ● P1110 Intake valve timing control ● P1130 Swirl control valve control solenoid valve ● P1148 P1168 Closed loop control

Fail-safe Chart

=NAEC0040

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

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0100</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="5">P0115</td><td rowspan="5">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”.
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)
(Depends on the time)</td></tr>
<tr><td rowspan="4">P0120</td><td rowspan="4">Throttle position sensor circuit</td><td colspan="2">Throttle position will be determined based on the injected fuel amount and the engine speed.
Therefore, acceleration will be poor.</td></tr>
<tr><td>Condition</td><td>Driving condition</td></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
<tr><td>P1335</td><td>Crankshaft position sensor (REF) circuit</td><td colspan="2">Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.</td></tr>
<tr><td rowspan="8">Unable to access ECM</td><td rowspan="8">ECM</td><td colspan="2">ECM fail-safe activating condition
The computing function of the ECM was judged to be malfunctioning.
When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MIL on the instrument panel lights to warn the driver.
However it is not possible to access ECM and DTC cannot be confirmed.
Engine control with fail-safe
When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.</td></tr>
<tr><td></td><td>ECM fail-safe operation</td></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is “ON” when engine is running and “OFF” when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td colspan="2">Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

Symptom Matrix Chart

NAEC0041

SYSTEM — BASIC ENGINE CONTROL SYSTEM

NAEC0041S01

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-628
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-40
	Injector circuit	1	1	2	3	2		2	2			2			EC-619
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-32
Air	Positive crankcase ventilation system												1		EC-38
	Incorrect idle speed adjustment						1	1	1	1		1			EC-102
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-424
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-102
	Ignition circuit	1	1	2	2	2		2	2			2			EC-501
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-144
Air conditioner circuit							3			3				2	HA section

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

(continued on next page)

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine control	Crankshaft position sensor (REF) circuit	2	2												EC-512
	Crankshaft position sensor (POS) circuit														EC-336, 519
	Camshaft position sensor (PHASE) circuit	3													EC-344
	Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-152
	Heated oxygen sensor 1 (front) circuit				3										EC-194
	Engine coolant temperature sensor circuit	1					3			3					EC-171, 189
	Throttle position sensor circuit						2			2					EC-176
	Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-102
	Vehicle speed sensor circuit		2	3		3						3			EC-419
	Knock sensor circuit			2											EC-330
	ECM	2	2	3	3	3	3	3	3	3	3				EC-446, 119
	Start signal circuit	2													EC-624
	Park/Neutral position switch circuit			3		3		3	3			3			EC-606
	Power steering oil pressure switch circuit		2												EC-637
	Electrical load signal circuit														EC-647

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

SYSTEM — ENGINE MECHANICAL & OTHER

NAEC0041S02

		SYMPTOM													Reference section
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FE section
	Fuel piping			5	5	5		5	5			5			
	Vapor lock		5												
	Valve deposit														
	Poor fuel (Heavy weight gasoline, Low octane)	5		5	5	5		5	5			5			—
Air	Air duct														
	Air cleaner														
	Air leakage from air duct (Mass air flow sensor — throttle body)		5	5		5		5	5			5			
	Throttle body, Throttle wire	5			5		5			5					FE section
	Air leakage from intake manifold/ Collector/Gasket														—
Cranking	Battery	1	1	1		1		1	1			1		1	
	Alternator circuit														EL section
	Starter circuit	3													
	Flywheel/Drive plate	6													EM section
	PNP switch	4													AT section

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

(continued on next page)

		SYMPTOM													Reference section
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine	Cylinder head	5	5	5	5	5		5	5			5			
	Cylinder head gasket										4		3		
	Cylinder block														
	Piston												4		
	Piston ring	6	6	6	6	6		6	6			6			
	Connecting rod														EM section
	Bearing														
	Crankshaft														
Valve mechanism	Timing chain														
	Camshaft	5	5	5	5	5		5	5			5			
	Intake valve												3		
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5	5	5		5					FE section
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			MA, EM, LC section
	Oil level (Low)/Filthy oil														LC section
Cooling	Radiator/Hose/Radiator filler cap														
	Thermostat									5					
	Water pump	5	5	5	5	5		5	5		4	5			
	Water gallery														
	Coolant level (low)/Contaminated coolant														MA section

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

	SYMPTOM													Reference section
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
NVIS (NISSAN Vehicle Immobilizer System — NATS)	1	1												EC-75 or EL section

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

CONSULT-II Reference Value in Data Monitor Mode

NAEC0042

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED CKPS·RPM (POS)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.		Almost the same speed as the CONSULT-II value.
POS COUNT	● Engine: Running		179 - 181
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	1.2 - 1.8V
		2,500 rpm	1.6 - 2.2V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
HO2S1 (B1) HO2S1 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1) HO2S1 MNTR (B2)			LEAN ⟷ RICH Changes more than 5 times during 10 seconds.
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ⟷ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ⟷ RICH

MONITOR ITEM	CONDITION		SPECIFICATION
VHCL SPEED SE	• Turn drive wheels and compare speedometer indication with the CONSULT-II value		Almost the same speed as the CONSULT-II value
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	• Engine: After warming up, idle the engine	Throttle valve: fully closed	0.15 - 0.85V
	• Engine: After warming up • Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	3.5 - 4.7V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS CLSD THL/P SW	• Engine: After warming up, idle the engine	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
P/N POSI SW	• Ignition switch: ON	Shift lever: "P" or "N"	ON
		Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
INJ PULSE-B2 INJ PULSE-B1	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 2.8 msec
B/FUEL SCHDL	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	2.0 - 3.2 msec
		2,000 rpm	1.4 - 2.6 msec
IGN TIMING	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	15°±5° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	2 - 10 step
		2,000 rpm	—
PURG VOL C/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	0 %
		2,000 rpm	—
A/F ALPHA-B2 A/F ALPHA-B1	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	54 - 155%
EVAP SYS PRES	• Ignition switch: ON		Approx. 3.4V
AIR COND RLY	• Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 5 seconds) • Engine running and cranking		ON
	Except as shown above		OFF

MONITOR ITEM	CONDITION		SPECIFICATION
VENT CONT/V	● Ignition switch: ON		OFF
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine speed: Below 3,600 rpm		ON
	● Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1) HO2S2 HTR (B2)	● Ignition switch: ON (Engine stopped) ● Engine speed: Above 3,200 rpm		OFF
	● Engine speed: Below 3,200 rpm [After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more]		ON
VC/V BYPASS/V	Ignition switch: ON		OFF
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	14.0 - 33.0%
		2,500 rpm	12.0 - 25.0%
ABSOL TH·P/S	● Engine: After warming up	Throttle valve: fully closed	0.0%
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	Approx. 80%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s
ABSOL PRES/SE	● Ignition switch: ON		Approx. 4.4V
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 55°C (131°F).	OFF
SWL CON VC SW	● Engine speed: Idle ● Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).		OFF
	● Engine speed: Idle ● Engine coolant temperature is above 55°C (131°F).		ON
INT/V TIM (B1) INT/V TIM (B2)	● Engine: After warming up ● Shift lever "N" ● Quickly depressed accelerator pedal ● No-load	Idle	0° CA
		2,000 rpm	Approximately 12 - 18° CA
INT/V SOL (B1) INT/V SOL (B2)	● Engine: After warming up ● Shift lever "N" ● Quickly depressed accelerator pedal ● No-load	Idle	0%
		2,000 rpm	Approximately 40%

Major Sensor Reference Graph in Data Monitor Mode

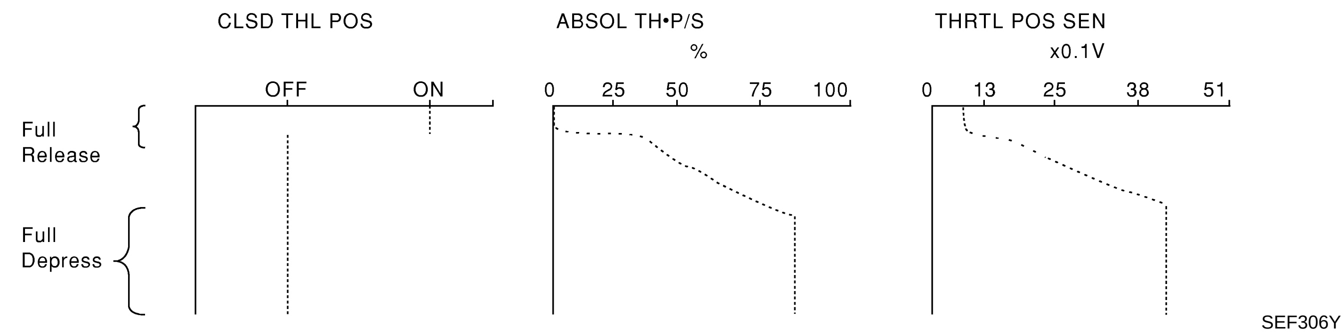
NAEC0043

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

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

NAEC0043S01

Below is the data for "THRTL POS SEN", "ABSOL TH·P/S" and "CLSD THL POS" when depressing the accelerator pedal with the ignition switch "ON".
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL POS" is changed from "ON" to "OFF".

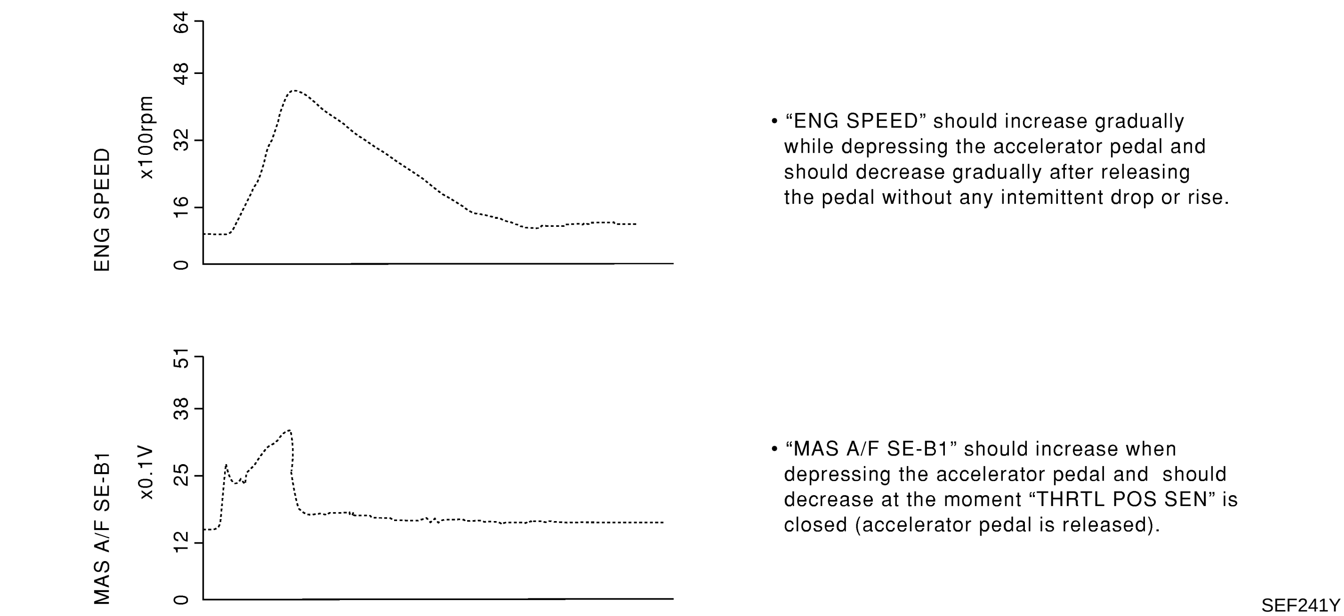


SEF306Y

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

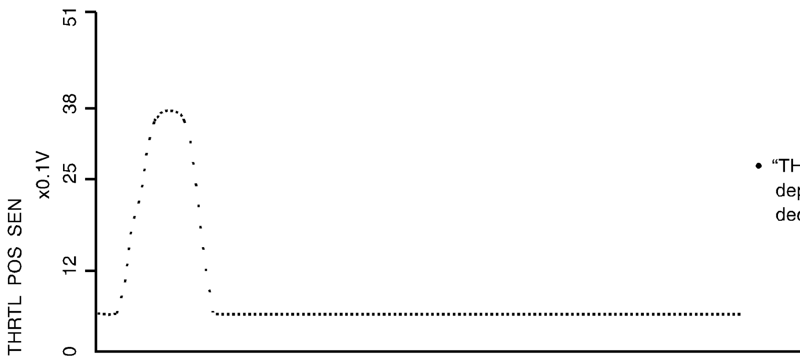
NAEC0043S02

Below is the data for "ENG SPEED", "MAS A/F SE-B1", "THRTL POS SEN", "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.

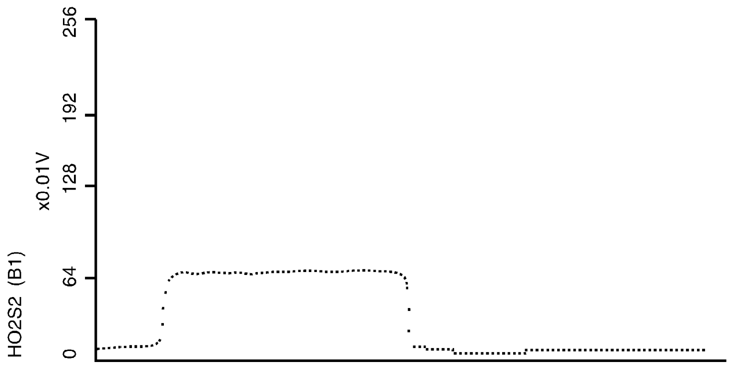


SEF241Y

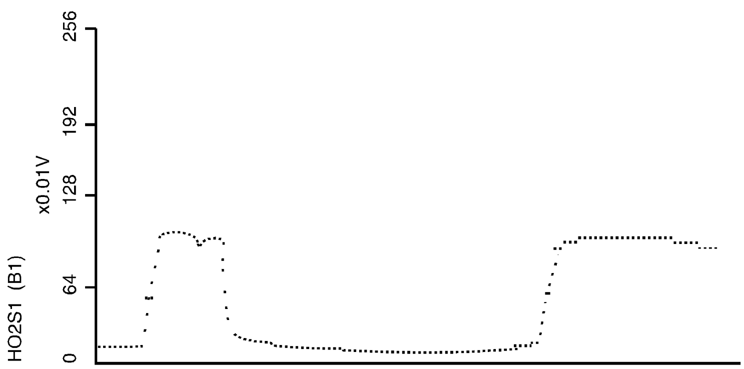
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



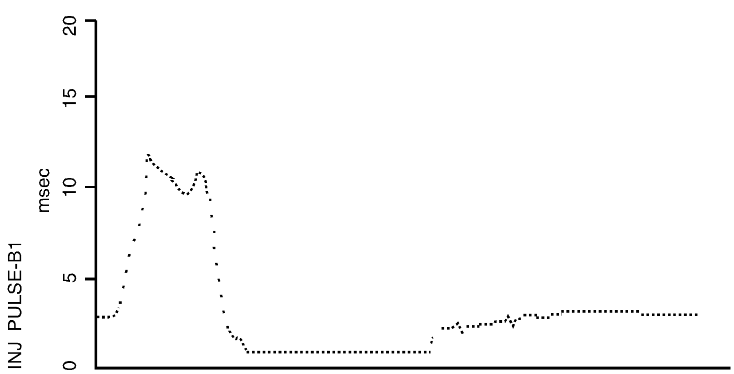
- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



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

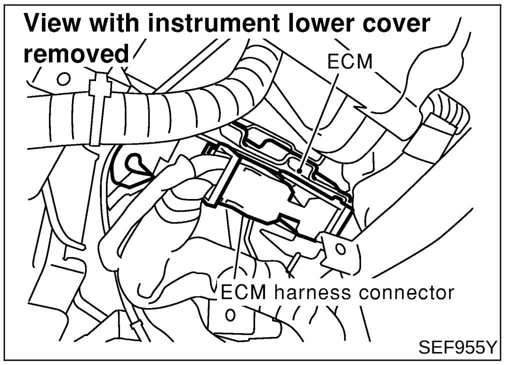


- "HO2S1 (B1)" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



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

SEF242YA



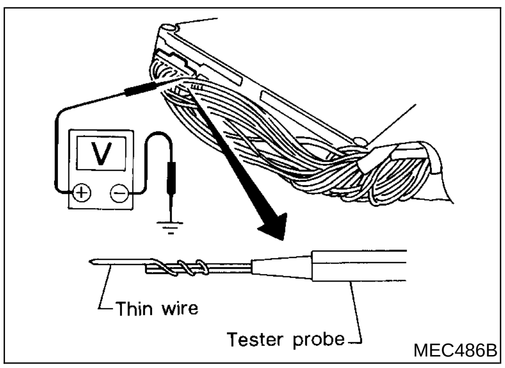
ECM Terminals and Reference Value

NAEC0044

PREPARATION

NAEC0044S01

1. ECM is located behind the instrument lower cover. For this inspection, remove instrument lower cover.
2. Remove ECM harness protector.

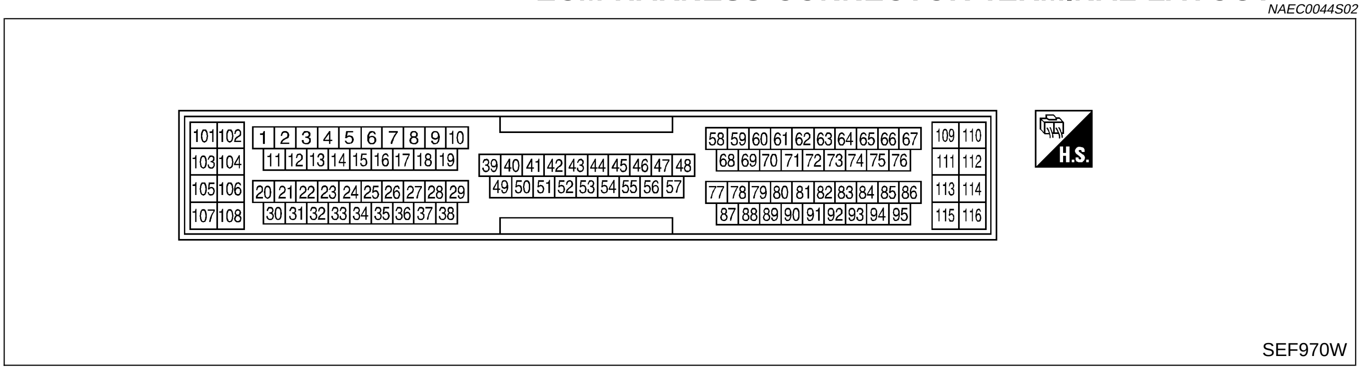


3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.

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

ECM HARNESS CONNECTOR TERMINAL LAYOUT

NAEC0044S02



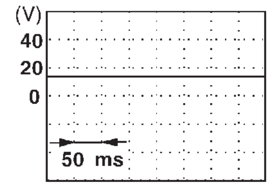
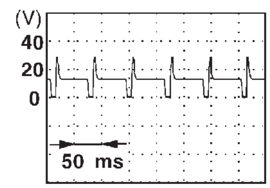
ECM INSPECTION TABLE

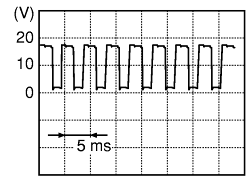
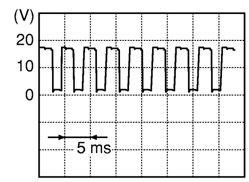
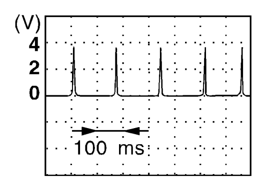
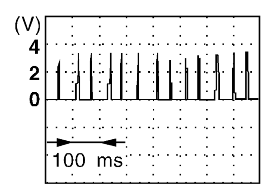
NAEC0044S03

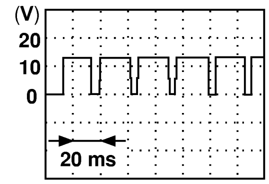
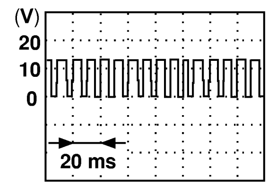
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

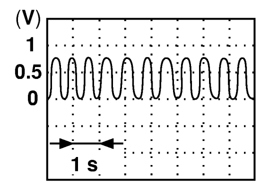
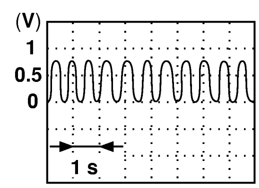
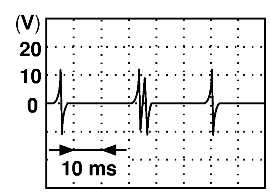
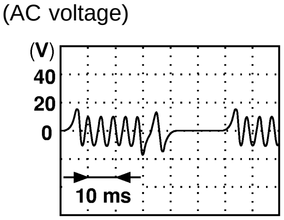
Do not use ECM ground terminals when measuring the input/output voltage. Doing so may result in damage to the ECM's transistor. Use ground other than the ECM terminals, such as the ground.

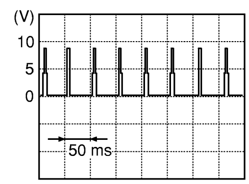
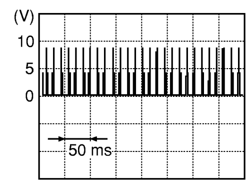
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	L/Y	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF994U
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	BATTERY VOLTAGE (11 - 14V)  SEF995U
2	R/G	Heated oxygen sensor 1 (front) (bank 2) heater	**[Engine is running]** ● Engine speed is below 3,600 rpm.	0 - 1.0V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
3	L/OR	Heated oxygen sensor 1 (front) (bank 1) heater	**[Engine is running]** ● Engine speed is below 3,600 rpm.	0 - 1.0V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
4	R/W	Heated oxygen sensor 2 (rear) (bank 2) heater	**[Engine is running]** ● Engine speed is below 3,200 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
5	P/B	Heated oxygen sensor 2 (rear) (bank 1) heater	**[Engine is running]** ● Engine speed is below 3,200 rpm. ● After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] ● Engine stopped **[Engine is running]** ● Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
6 7 8 17	PU/G GY Y GY/L	IACV-AAC valve	**[Engine is running]** ● Idle speed	0.1 - 14V

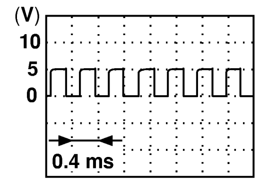
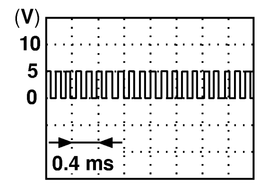
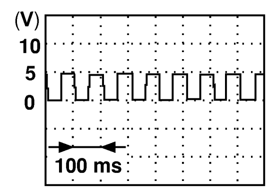
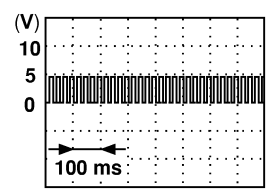
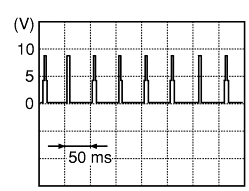
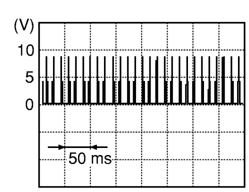
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	OR/B	Intake valve timing control solenoid valves (RH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Battery voltage
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	7 - 8V  SEF350Z
15	P/L	Intake valve timing control solenoid valves (LH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Battery voltage
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	7 - 8V  SEF350Z
16	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm.	0 - 1.0V
21 22 23 30 31 32	Y/R G/R L/R GY PU/W GY/R	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4 Ignition signal No. 5 Ignition signal No. 6	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.2V★  SEF399T
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	0.1 - 0.3V★  SEF645T

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	W/G	Tachometer	**[Engine is running]** ● **Warm-up condition** ● Idle speed	7 - 8V★  SEF579X
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	7 - 8V★  SEF580X
26	L/B	ECM relay (Self shutt-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.5V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
27	L/G	Air conditioner relay	**[Engine is running]** ● Both A/C switch and blower switch are "ON" (Compressor is operating).	0 - 1.0V
			[Engine is running] ● A/C switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
28	R/L	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.5V
			[Ignition switch "ON"] ● 1 second passed after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
29	G	Swirl control valve control solenoid valve	**[Engine is running]** ● Idle speed ● Engine coolant temperature is between 15 - 50°C (59 - 122°F).	0 - 1.0V
			[Engine is running] ● Idle speed ● Engine coolant temperature is above 55°C (131°F).	BATTERY VOLTAGE (11 - 14V)
38	OR	MIL	**[Ignition switch "ON"]**	0 - 1.0V
			[Engine is running] ● Idle speed	BATTERY VOLTAGE (11 - 14V)
39	G/W	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
40	G/Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V
43	R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
44	L	PNP switch	**[Ignition switch "ON"]** ● Gear position is "Neutral position" (M/T models). Gear position is "P" or "N" (A/T models).	Approximately 0V
			[Ignition switch "ON"] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)
45	B/R	Air conditioner switch signal	**[Engine is running]** ● Both A/C switch and blower switch are "ON".	Approximately 0V
			[Engine is running] ● A/C switch is "OFF".	Approximately 5V
47	R/B	Power steering oil pressure switch	**[Engine is running]** ● Steering wheel is being turned.	0 - 1.0V
			[Engine is running] ● Steering wheel is not being turned.	Approximately 5V
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
51	B/R	A/C cut signal	**[Engine is running]** ● Air conditioner is operating.	0 - 0.5V
52	PU	Electrical load signal	**[Engine is running]** ● Rear window defogger: ON ● Hi-beam headlamp: ON	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Electrical load: OFF	0V
55	W/B	Swirl control valve control vacuum check switch	**[Engine is running]** ● Idle speed ● Engine coolant temperature is between 15 - 50°C (59 - 122°F).	Approximately 5V
			[Engine is running] ● Idle speed ● Engine coolant temperature is above 55°C (131°F).	0 - 1.0V
56	OR/W	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Accelerator pedal depressed	Approximately 0V
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
58	B/P	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
59	B	Fuel level sensor ground	**[Engine is running]** ● Idle speed	Approximately 0V

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
61	OR	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.2 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.2V
62	G/B	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V
63	G	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V
64	Y/PU	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
65 75	LG LG	Crankshaft position sensor (REF)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.3V★ (AC voltage)  SEF581X
66 76	L L	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 4.2V★ (AC voltage)  SEF582X
12 67	W/R	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
70	LG/R	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
71	OR/L	Heated oxygen sensor 2 (rear) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
72	OR	Heated oxygen sensor 2 (rear) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
73	B/P	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
79	Y/G	Intake valve timing control position sensors (RH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.5V  SEF351Z
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	Approximately 0.5V  SEF352Z
80	L/R	Absolute pressure sensor	**[Ignition switch "ON"]**	Approximately 4.4V
81	W/PU	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	0.36 - 3.88V
82	W	Throttle position sensor signal output	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal fully released	Approximately 0.4V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	Approximately 4V
83	Y/PU	Fuel level sensor	**[Ignition switch "ON"]**	Approximately 0 - 4.8V Output voltage varies with fuel level.
84	L/G	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 3.4V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
85	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● Idle speed	Approximately 2.4V  SEF057V
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 2.3V  SEF058V
86	W/L	Vehicle speed sensor	**[Engine is running]** ● Jack up front wheels. ● In 1st gear position ● 10 km/h (6 MPH)	Approximately 2.5V  SEF583X
			[Engine is running] ● Jack up front wheels. ● In 2nd gear position ● 30 km/h (19 MPH)	Approximately 2.0V  SEF584X
89	OR	Intake valve timing control position sensors (LH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	approximately 0.5V  SEF351Z
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm	approximately 0.5V  SEF352Z

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TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
91	R	Throttle position sensor	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal fully released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V
92	G/B	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8V Output voltage varies with fuel tank temperature.
93	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V
101 102 103 104 105 107	R/B L/W R/W PU/R R/Y R/L	Injector No. 1 Injector No. 5 Injector No. 2 Injector No. 6 Injector No. 3 Injector No. 4	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
106 108	B B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	B/W B/W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)
111	P/B	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
114	G/R	Communication line (LAN)	**[Engine is running]** ● Idle speed	Approximately 2V
115	LG/R	Data link connector	**[Ignition switch "ON"]** ● CONSULT-II or GST is disconnected.	Approximately 2V

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

Description

NAEC0717

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:

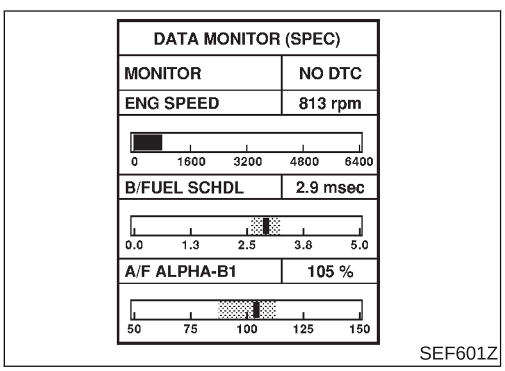
- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1 (The signal voltage of the mass air flow sensor)

Testing Condition

NAEC0718

- Vehicle driven distance: More than 5,000 km (3,100 miles)
- Barometric pressure: 101.3 kPa (760.0 mmHg, 29.92 inHg)±3 kPa (22.5 mmHg, 0.89 inHg)
- 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: For A/T models, after the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (A/T fluid temperature sensor signal) indicates less than 0.9V. For M/T models, drive vehicle for 10 minutes after the engine is warmed up to normal operating temperature.
*2: Rear window defogger switch, air conditioner switch, lighting switch are “OFF”. Cooling fans are not operating. Steering wheel is straight ahead.



SEF601Z

Inspection Procedure

NAEC0719

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

1. Perform “Basic Inspection”, EC-102.
2. Confirm that the testing conditions indicated above are met.
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, “A/F ALPHA-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 “Diagnostic Procedure”, EC-139.

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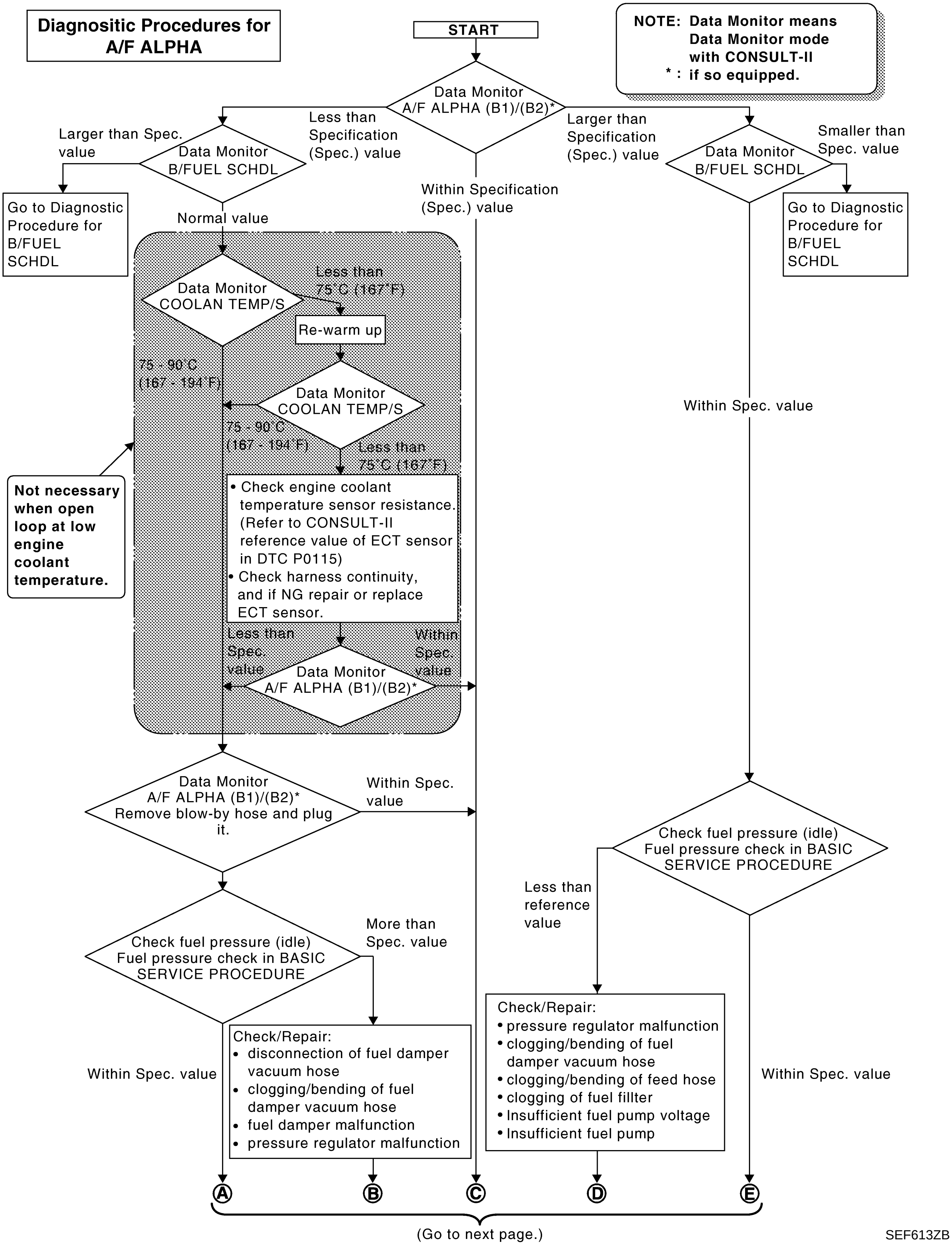
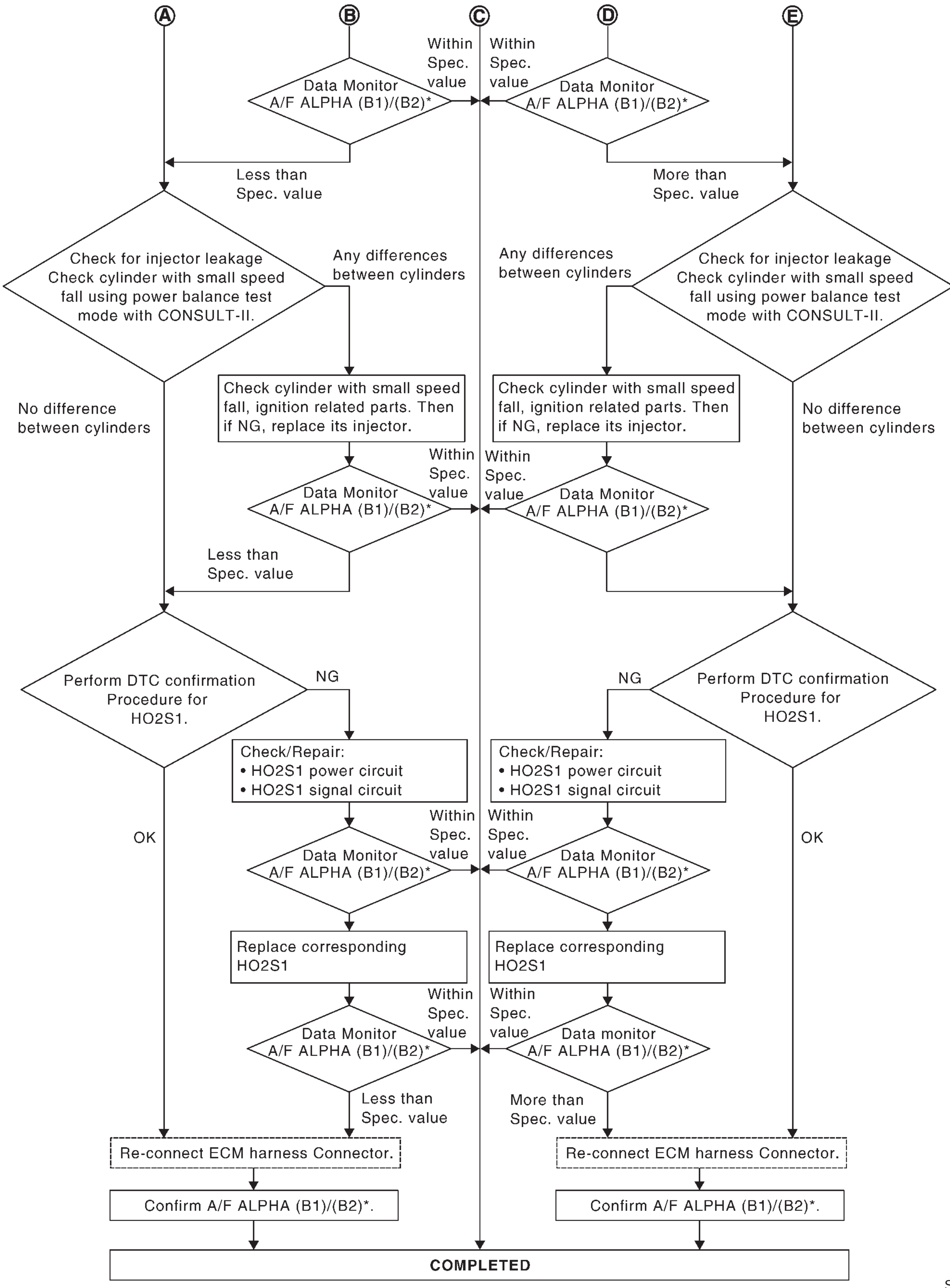
Diagnostic Procedure

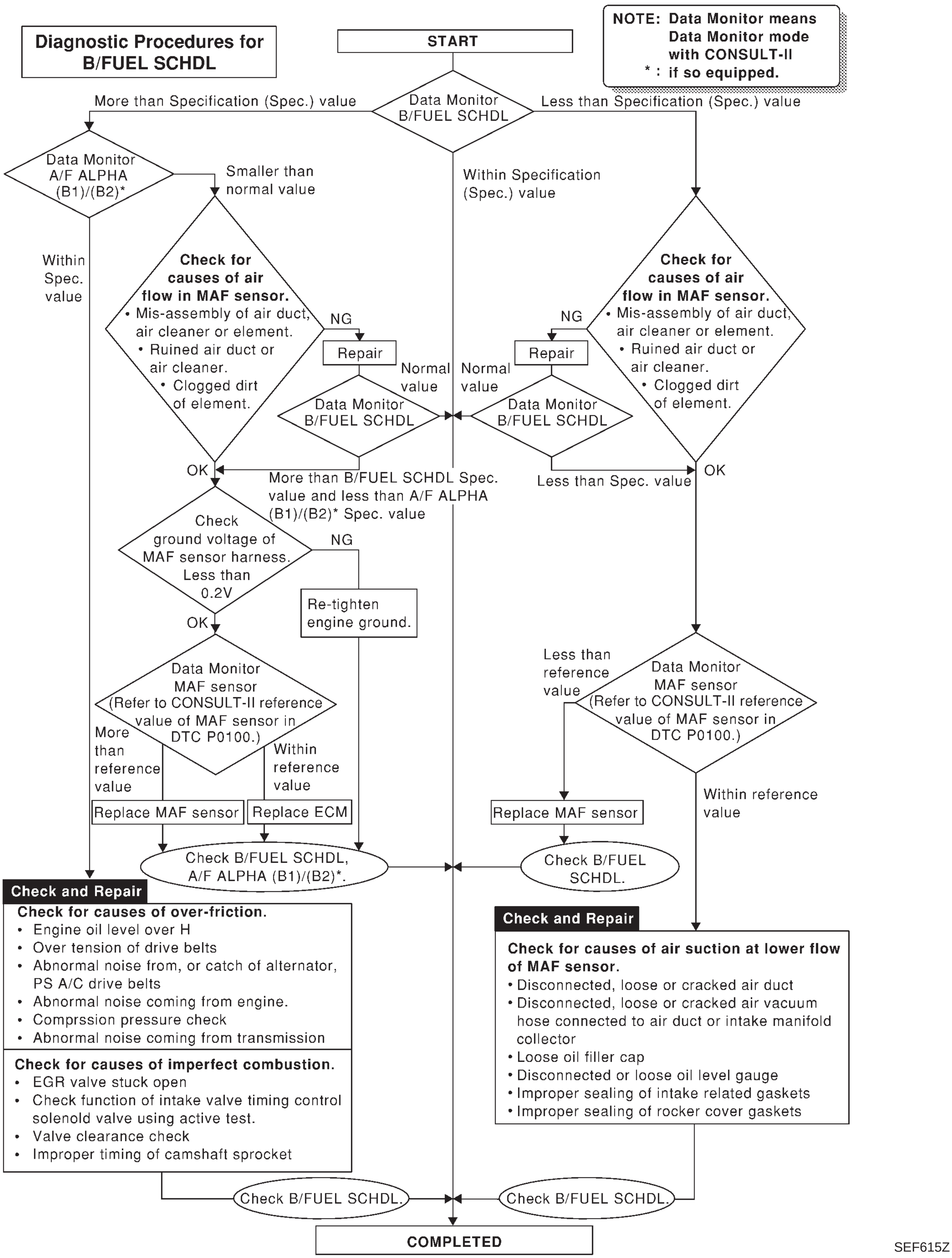
NAEC0720





A
B
C
D
E
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Any differences between cylinders
Any differences between cylinders
Check for injector leakage Check cylinder with small speed fall using power balance test mode with CONSULT-II.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
Check cylinder with small speed fall, ignition related parts. Then if NG, replace its injector.
No difference between cylinders
No difference between cylinders
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
Perform DTC confirmation Procedure for HO2S1.
NG
NG
Perform DTC confirmation Procedure for HO2S1.
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
Check/Repair:
• HO2S1 power circuit
• HO2S1 signal circuit
OK
OK
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data Monitor A/F ALPHA (B1)/(B2)*
Replace corresponding HO2S1
Replace corresponding HO2S1
Within Spec. value
Within Spec. value
Data Monitor A/F ALPHA (B1)/(B2)*
Data monitor A/F ALPHA (B1)/(B2)*
Less than Spec. value
More than Spec. value
Re-connect ECM harness Connector.
Re-connect ECM harness Connector.
Confirm A/F ALPHA (B1)/(B2)*.
Confirm A/F ALPHA (B1)/(B2)*.
COMPLETED

SEF768Z



Diagnostic Procedures for B/FUEL SCHDL
START
NOTE: Data Monitor means Data Monitor mode with CONSULT-II
* : if so equipped.
Data Monitor B/FUEL SCHDL
More than Specification (Spec.) value
Less than Specification (Spec.) value
Within Specification (Spec.) value
Data Monitor A/F ALPHA (B1)/(B2)*
Smaller than normal value
Within Spec. value
Check for causes of air flow in MAF sensor.
• Mis-assembly of air duct, air cleaner or element.
• Ruined air duct or air cleaner.
• Clogged dirt of element.
NG
Repair
Normal value
Data Monitor B/FUEL SCHDL
OK
More than B/FUEL SCHDL Spec. value and less than A/F ALPHA (B1)/(B2)* Spec. value
Less than Spec. value
Check ground voltage of MAF sensor harness. Less than 0.2V
Re-tighten engine ground.
Data Monitor MAF sensor (Refer to CONSULT-II reference value of MAF sensor in DTC P0100.)
More than reference value
Within reference value
Less than reference value
Replace MAF sensor
Replace ECM
Check B/FUEL SCHDL, A/F ALPHA (B1)/(B2)*.
Check B/FUEL SCHDL.
Check and Repair
Check for causes of over-friction.
• Engine oil level over H
• Over tension of drive belts
• Abnormal noise from, or catch of alternator, PS A/C drive belts
• Abnormal noise coming from engine.
• Comprssion pressure check
• Abnormal noise coming from transmission
Check for causes of imperfect combustion.
• EGR valve stuck open
• Check function of intake valve timing control solenold valve using active test.
• Valve clearance check
• Improper timing of camshaft sprocket
Check for causes of air suction at lower flow of MAF sensor.
• Disconnected, loose or cracked air duct
• Disconnected, loose or cracked air vacuum hose connected to air duct or intake manifold collector
• Loose oil filler cap
• Disconnected or loose oil level gauge
• Improper sealing of intake related gaskets
• Improper sealing of rocker cover gaskets
COMPLETED
SEF615Z

Description

NAEC0045

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

COMMON I/I REPORT SITUATIONS

NAEC0045S01

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 problem area.

Diagnostic Procedure

NAEC0046

1	INSPECTION START
Erase (1st trip) DTCs. Refer to "HOW TO ERASE EMISSION — RELATED INFORMATION", EC-73.	
▶	GO TO 2.

2	CHECK GROUND TERMINALS
Check ground terminals for corroding or loose connection. Refer to GI-30, "GROUND INSPECTION". **OK or NG**	
OK ▶	GO TO 3.
NG ▶	Repair or replace.

3	SEARCH FOR ELECTRICAL INCIDENT
Perform GI-25, "Incident Simulation Tests". **OK or NG**	
OK ▶	GO TO 4.
NG ▶	Repair or replace.

4	CHECK CONNECTOR TERMINALS
Refer to GI-22, "How to Check Enlarged Contact Spring of Terminal". **OK or NG**	
OK ▶	**INSPECTION END**
NG ▶	Repair or replace connector.

ECM Terminals and Reference Value

NAEC0648

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

CAUTION:

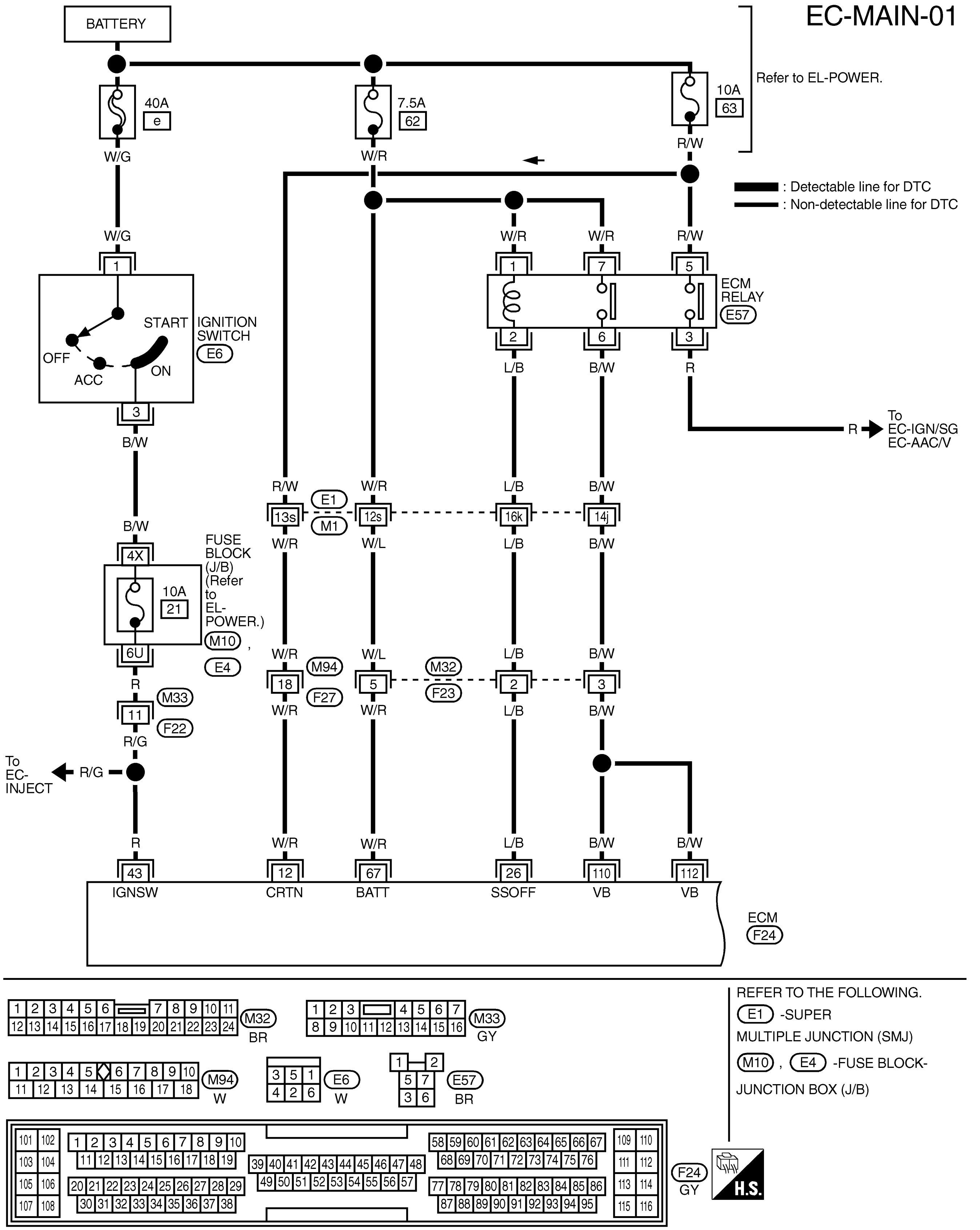
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
26	L/B	ECM relay (Self shutt-off)	**[Engine is running]** **[Ignition switch "OFF"]** ● For a few seconds after turning ignition switch "OFF"	0 - 1.5V
			[Ignition switch "OFF"] ● A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
43	R	Ignition switch	**[Ignition switch "OFF"]**	0V
			[Ignition switch "ON"]	BATTERY VOLTAGE (11 - 14V)
48	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground [Probe this terminal with (–) tester probe when measuring]
57	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
12 67	W/R	Power supply for ECM (Buck-up)	**[Ignition switch "OFF"]**	BATTERY VOLTAGE (11 - 14V)
108	B	ECM ground	**[Engine is running]** ● Idle speed	Engine ground
110 112	B/W B/W	Power supply for ECM	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

Main Power Supply and Ground Circuit

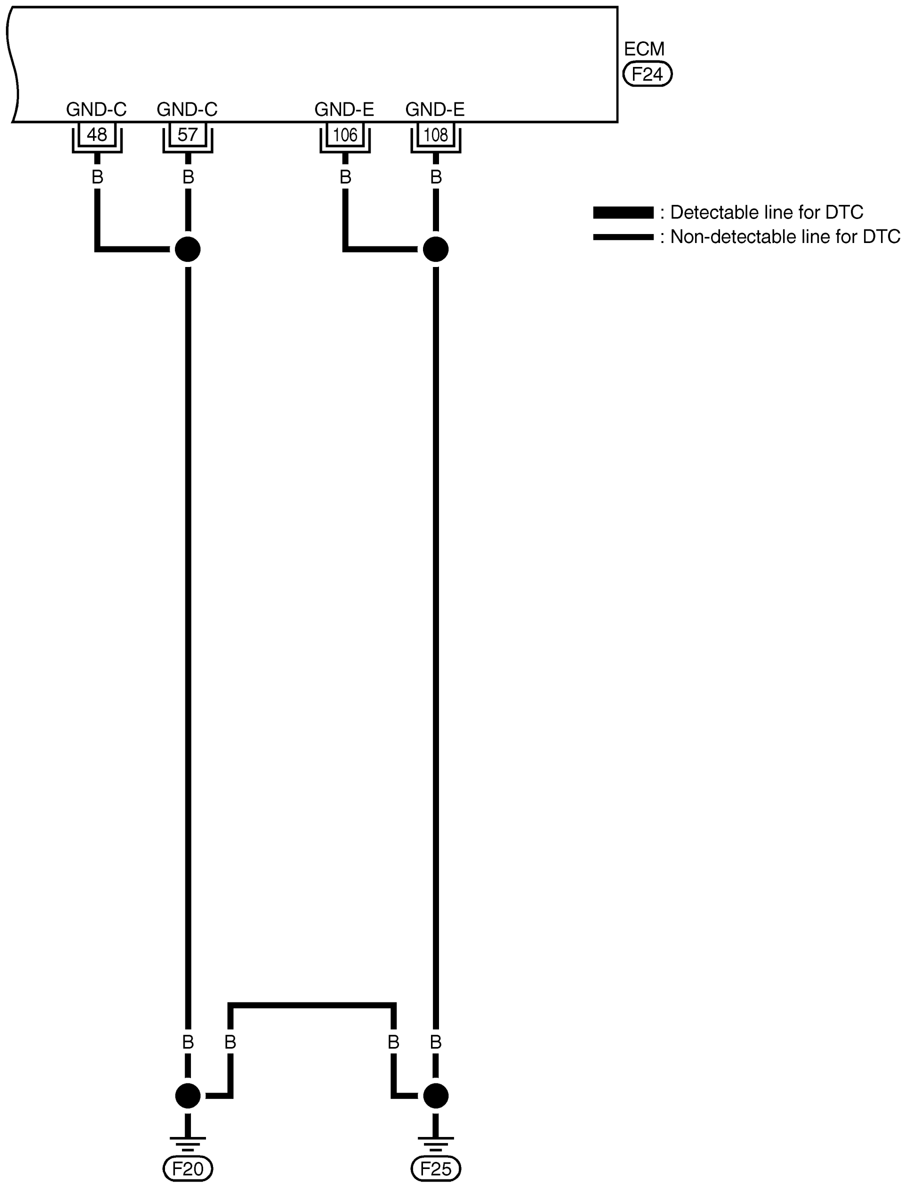
WIRING DIAGRAM

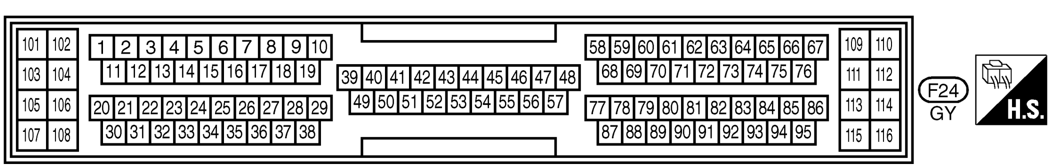
NAEC0047



MEC940C

EC-MAIN-02





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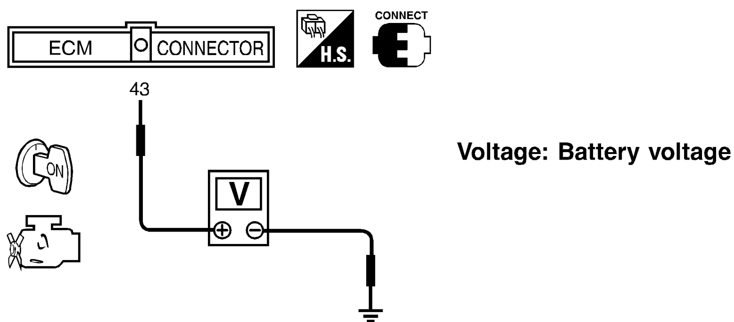
DIAGNOSTIC PROCEDURE

NAEC0049

1	INSPECTION START
Start engine. **Is engine running?** **Yes or No**	
Yes ▶	GO TO 9.
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 43 and ground with CONSULT-II or tester.	
OK ▶	GO TO 4.
NG ▶	GO TO 3.



SEF291X

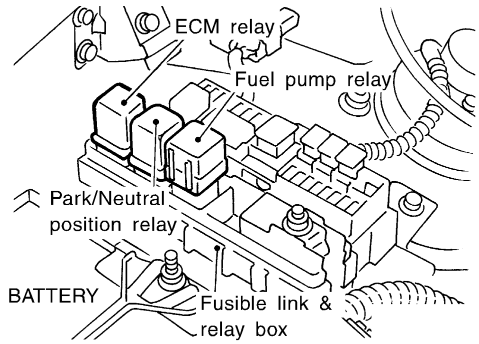
OK or NG

3	DETECT MALFUNCTIONING PART
Check the following. ● 10A fuse ● Harness connectors M33, F22 ● Harness for open or short between ECM and ignition switch	
▶	Repair harness or connectors.

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 48, 57, 106, 108 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 5.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

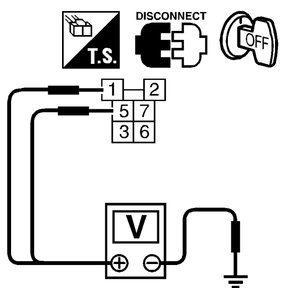
5	CHECK POWER SUPPLY-II

1. Disconnect ECM relay.



SEF681UB

2. Check voltage between ECM relay terminals 1, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF956Y

OK or NG

OK	▶	GO TO 7.
NG	▶	GO TO 6.

6	DETECT MALFUNCTIONING PART

Check the following.
- 7.5A and 10A fuses
- 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.

7	CHECK OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 26 and ECM relay terminal 2.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

OK	▶	Go to "DTC P1320 IGNITION SIGNAL", EC-501.
NG	▶	GO TO 8.

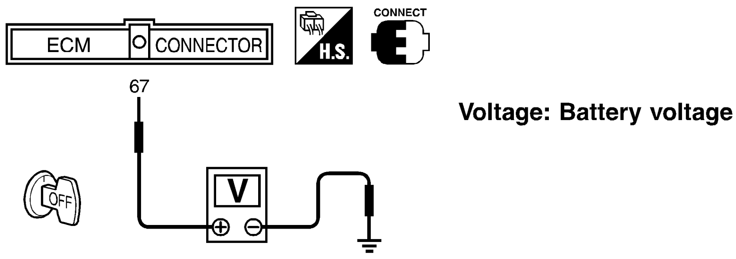
8	DETECT MALFUNCTIONING PART

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

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

9	CHECK ECM POWER SUPPLY CIRCUIT-II

1. Stop engine.
2. Check voltage between ECM terminal 67 and ground with CONSULT-II or tester.



SEF293X

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

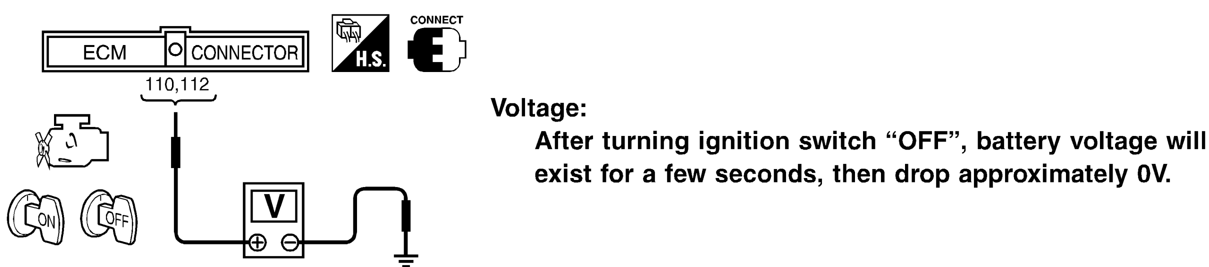
10	DETECT MALFUNCTIONING PART

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

	▶	Repair harness or connectors.

11	CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals 110, 112 and ground with CONSULT-II or tester.



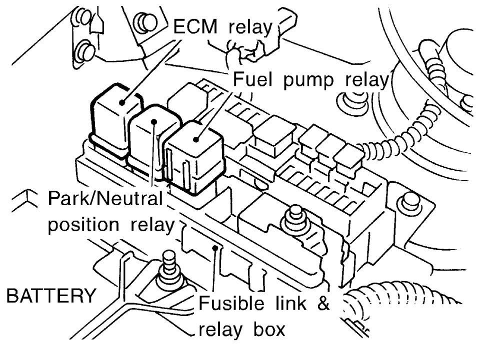
SEF294X

OK or NG

OK	▶	GO TO 17.
NG (Battery voltage does not exist.)	▶	GO TO 12.
NG (Battery voltage exists for more than a few seconds.)	▶	GO TO 14.

12	CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Disconnect ECM relay.



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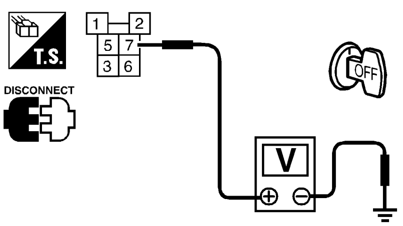
2. Check voltage between ECM relay terminal 7 and ground with CONSULT-II or tester.



SEF957Y

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

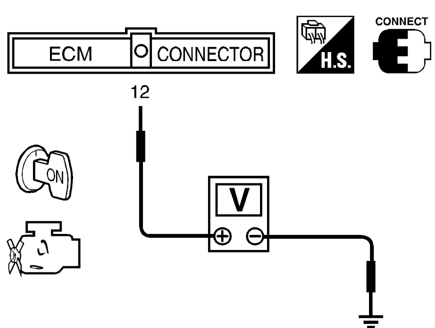
13	DETECT MALFUNCTIONING PART

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

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

14	CHECK ECM POWER SUPPLY-V

1. Turn ignition switch "OFF" and then "ON".
2. Check voltage between ECM terminal 12 and ground with CONSULT-II or tester.



SEF331Z

OK or NG

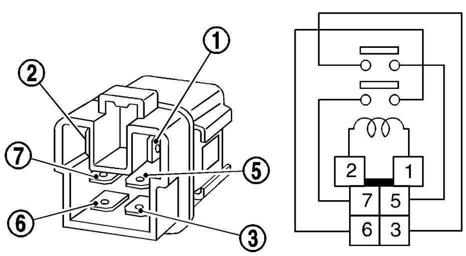
OK	▶	GO TO 16.
NG	▶	GO TO 15.

15	DETECT MALFUNCTIONING PART
Check the following: ● Harness connectors E1, M1 ● Harness connectors M94, F27 ● 10A fuse.	
▶	Repair harness or connectors.

16	CHECK HARNESS CONTINUITY BETWEEN ECM RELAY AND ECM FOR OPEN AND SHORT
1. Check harness continuity between ECM terminals 110, 112 and ECM relay terminal 6. 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 18.
NG ▶	GO TO 17.

17	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E1, M1 and M32, F23 ● 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.

18	CHECK 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

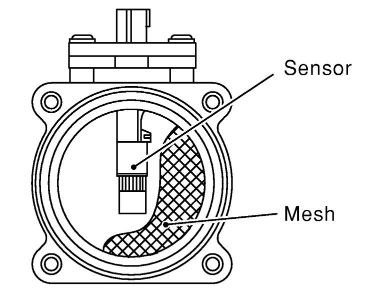
SEF296X

OK or NG

OK ▶	GO TO 19.
NG ▶	Replace ECM relay.

19	CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 48, 57, 106, 108 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 20.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

20	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	INSPECTION END



SEF958Y

Component Description

NAEC0050

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

NAEC0051

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	1.2 - 1.8V
		2,500 rpm	1.6 - 2.2V
CAL/LD VALUE	ditto	Idle	14.0 - 33.0%
		2,500 rpm	12.0 - 25.0%
MASS AIRFLOW	ditto	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s

ECM Terminals and Reference Value

NAEC0649

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)
61	OR	Mass air flow sensor	**[Engine is running]** ● **Warm-up condition** ● Idle speed	1.2 - 1.8V
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	1.6 - 2.2V
73	B/P	Mass air flow sensor ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
111	P/B	Sensors’ power supply	**[Ignition switch “ON”]**	Approximately 5V

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

On Board Diagnosis Logic

NAEC0053

Malfunction is detected when
(Malfunction A) an excessively high voltage from the sensor is sent to ECM when engine is not running,
(Malfunction B) an excessively low voltage from the sensor is sent to ECM when engine is running,
(Malfunction C) a high voltage from the sensor is sent to ECM under light load driving condition,
(Malfunction D) a low voltage from the sensor is sent to ECM under heavy load driving condition,
(Malfunction E) a voltage from the sensor is constantly approx. 1.0V when engine is running.

FAIL-SAFE MODE

NAEC0053S02

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

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

Possible Cause

NAEC0426

MALFUNCTION A OR C

NAEC0426S01

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Mass air flow sensor

MALFUNCTION B, D OR E

NAEC0426S02

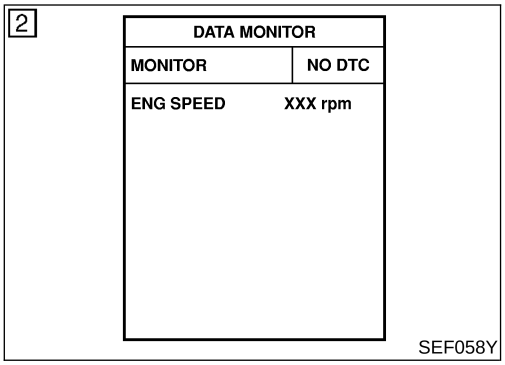
- Harness or connectors
  (The sensor circuit is open or shorted.)
- Intake air leaks
- Mass air flow sensor

DTC Confirmation Procedure

NAEC0054

Perform “PROCEDURE FOR MALFUNCTION A” first.
If the 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B AND E”.
If there is no problem on “PROCEDURE FOR MALFUNCTION B AND E”, perform “PROCEDURE FOR MALFUNCTION C”.
If there is no problem on ”PROCEDURE FOR MALFUNCTION C”, perform “PROCEDURE FOR MALFUNCTION D”.

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



PROCEDURE FOR MALFUNCTION A

NAEC0054S01

With CONSULT-II

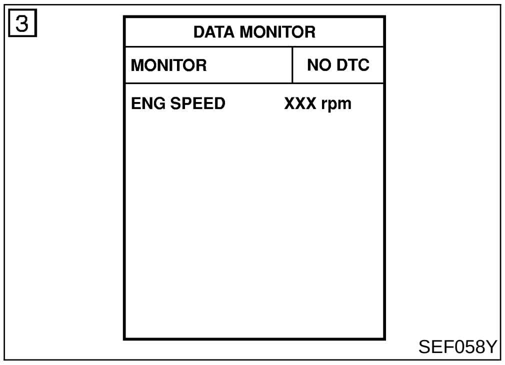
NAEC0054S0101

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 6 seconds.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-157.

With GST

NAEC0054S0102

Follow the procedure "With CONSULT-II" above.



PROCEDURE FOR MALFUNCTION B AND E

NAEC0054S02

With CONSULT-II

NAEC0054S0201

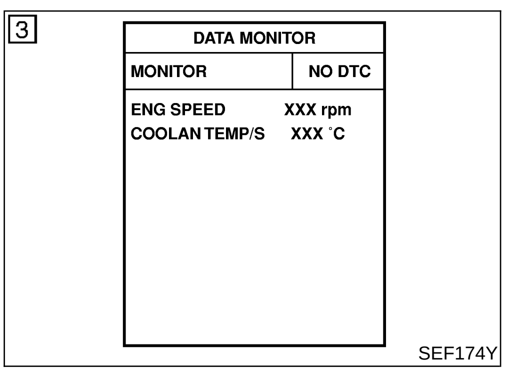
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and wait 5 seconds at most.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-157.

With GST

NAEC0054S0202

Follow the procedure "With CONSULT-II" above.

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



PROCEDURE FOR MALFUNCTION C

NAEC0054S03

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

With CONSULT-II

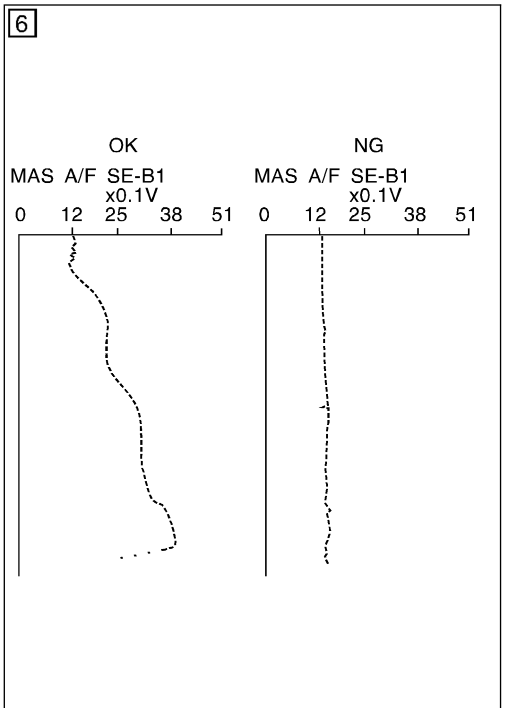
NAEC0054S0301

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and warm it up to normal operating temperature.
4) Run engine for at least 10 seconds at idle speed.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-157.

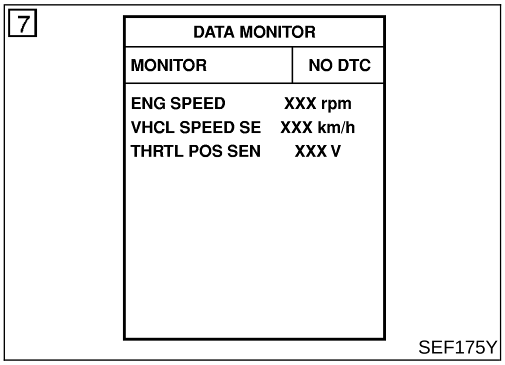
With GST

NAEC0054S0302

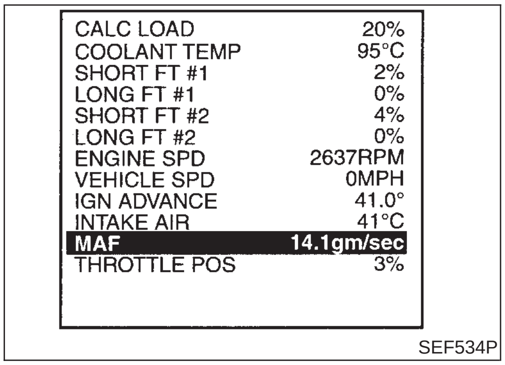
Follow the procedure "With CONSULT-II" above.



SEF243Y



SEF175Y



SEF534P

PROCEDURE FOR MALFUNCTION D

NAEC0054S04

CAUTION:
Always drive vehicle at a safe speed.

With CONSULT-II

NAEC0054S0402

1) Turn ignition switch "ON".
2) Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to "Diagnostic Procedure", EC-157.
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Check the voltage of MAS AIR/FL SE with "DATA MONITOR".
5) Increases engine speed to about 4,000 rpm.
6) Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to "Diagnostic Procedure", EC-157.
   If OK, go to following step.
7) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
THRTL POS SEN	More than 3V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

8) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-157.

Overall Function Check

NAEC0055

PROCEDURE FOR MALFUNCTION D

NAEC0055S01

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

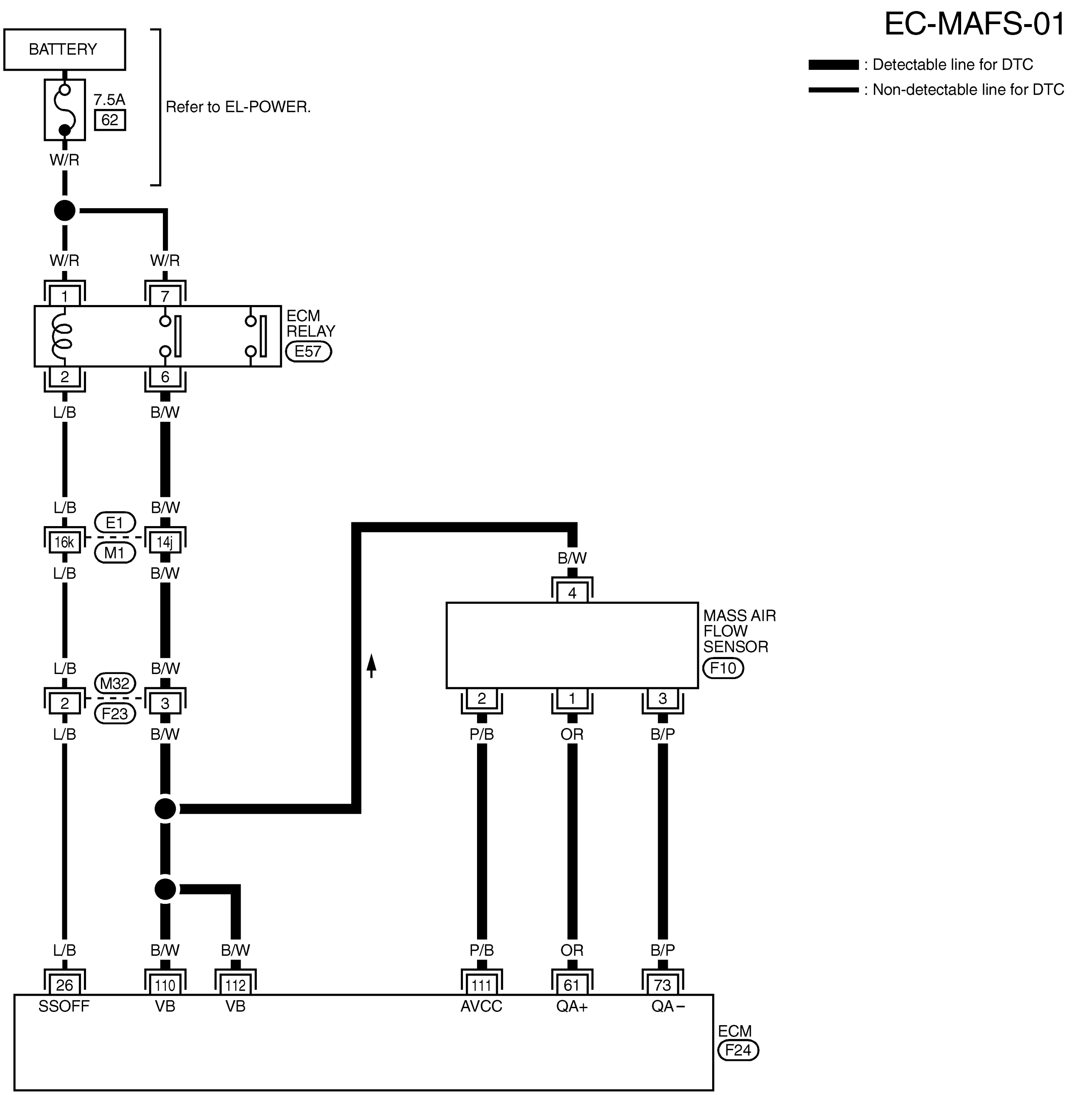
With GST

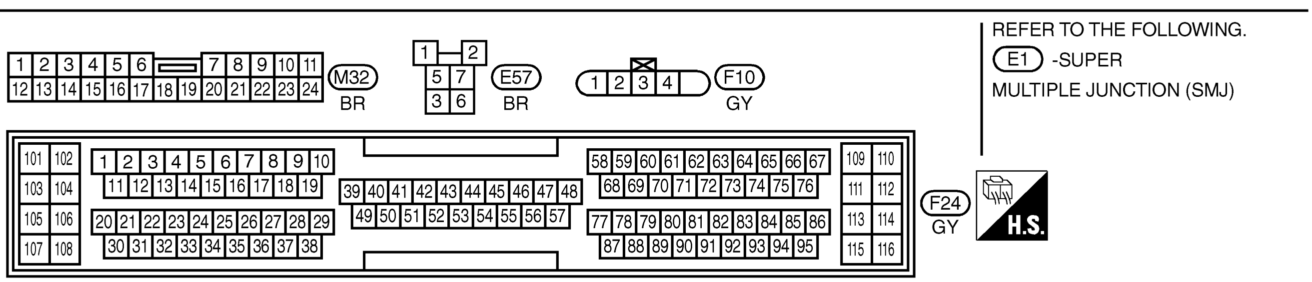
NAEC0055S0101

1) Start engine and warm it up to normal operating temperature.
2) Select "MODE 1" with GST.
3) Check the mass air flow sensor signal with "MODE 1".
4) Check for linear mass air flow sensor signal value rise in response to increases to about 4,000 rpm in engine speed.
5) If NG, go to "Diagnostic Procedure", EC-157.

Wiring Diagram

NAEC0056





MEC942C

Diagnostic Procedure

NAEC0057

1	INSPECTION START

Which malfunction (A, B, C, D or E) is duplicated?

MALFUNCTION	Type
A and/or C	I
B, D and/or E	II

MTBL0373

Type I or Type II

Type I ▶	GO TO 3.
Type II ▶	GO TO 2.

2	CHECK INTAKE SYSTEM

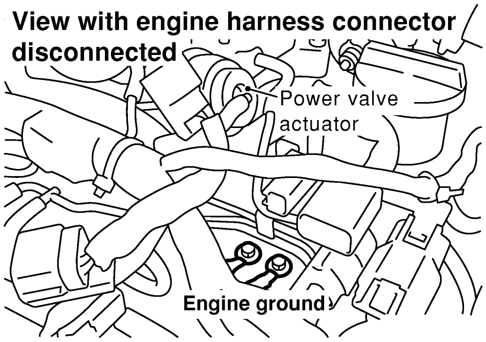
Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold collector

OK or NG

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

3	RETIGHTEN GROUND SCREWS

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



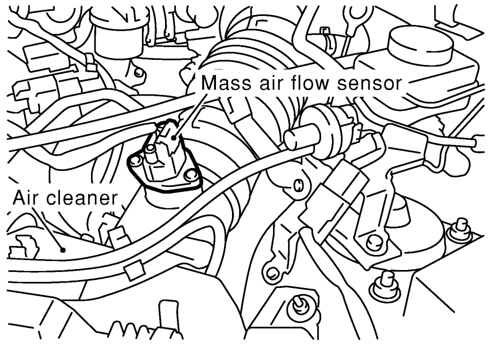
SEF959Y

▶	GO TO 4.

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

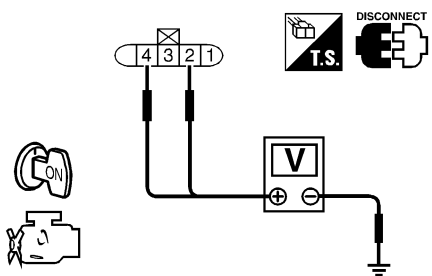
4	CHECK MAFS POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor (MAFS) harness connector.



SEF960Y

2. Turn ignition switch “ON”.
3. Check voltage between MAFS terminals 2, 4 and ground with CONSULT-II or tester.



Terminal	Voltage
2	Approximately 5
4	Battery voltage

SEF297X

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

	▶	Repair harness or connectors.

6	CHECK MAFS GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between MAFS terminal 3 and ECM terminal 73.
   Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

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

7	CHECK MAFS INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

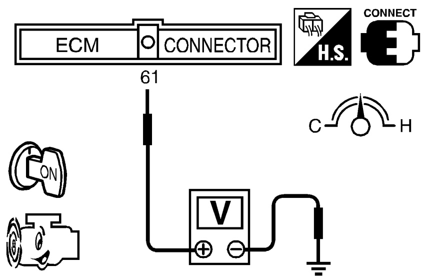
1. Check harness continuity between MAFS terminal 1 and ECM terminal 61.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to ground and short to power.

OK or NG

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

8	CHECK 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 61 (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.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

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

SEF298X

4. If the voltage is out of specification, disconnect MAFS harness connector and connect it again.
   Then repeat above check.

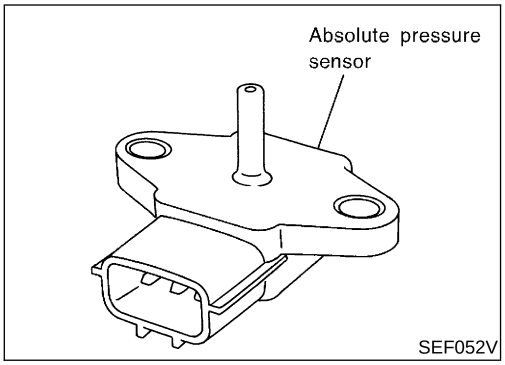
OK or NG

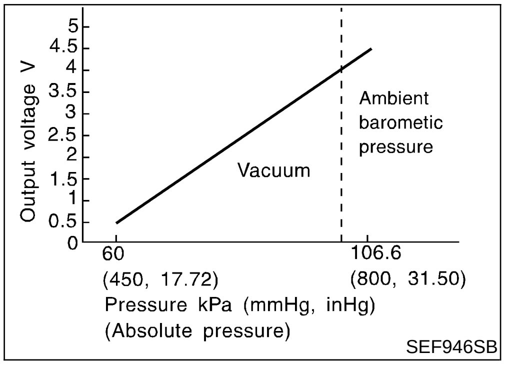
OK ▶	GO TO 9.
NG ▶	Replace mass air flow sensor.

9	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**





Component Description

NAEC0725

The absolute pressure sensor detects ambient barometric pressure and sends the voltage signal to the ECM. As the pressure increases, the voltage rises.

ECM Terminals and Reference Value

NAEC0726

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)
80	L/R	Absolute pressure sensor	**[Ignition switch "ON"]**	Approximately 4.4V
111	P/B	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
58	B/P	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NAEC0727

Malfunction is detected when an excessively low or high voltage from the sensor is sent to ECM.

Possible Cause

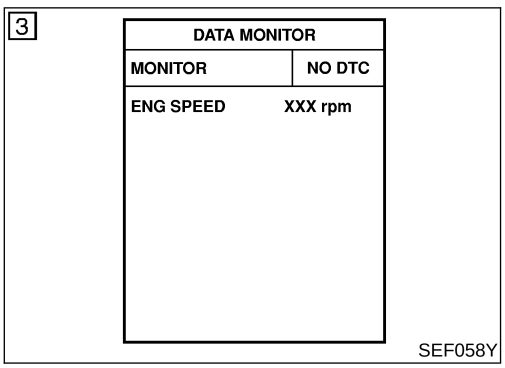
NAEC0728

- Harness or connectors
  (Absolute pressure sensor circuit is open or shorted.)
- Absolute pressure sensor

DTC Confirmation Procedure

NAEC0729

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

NAEC0729S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 10 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-163.

WITH GST

NAEC0729S02

Follow the procedure “WITH CONSULT-II” above.

GI
MA
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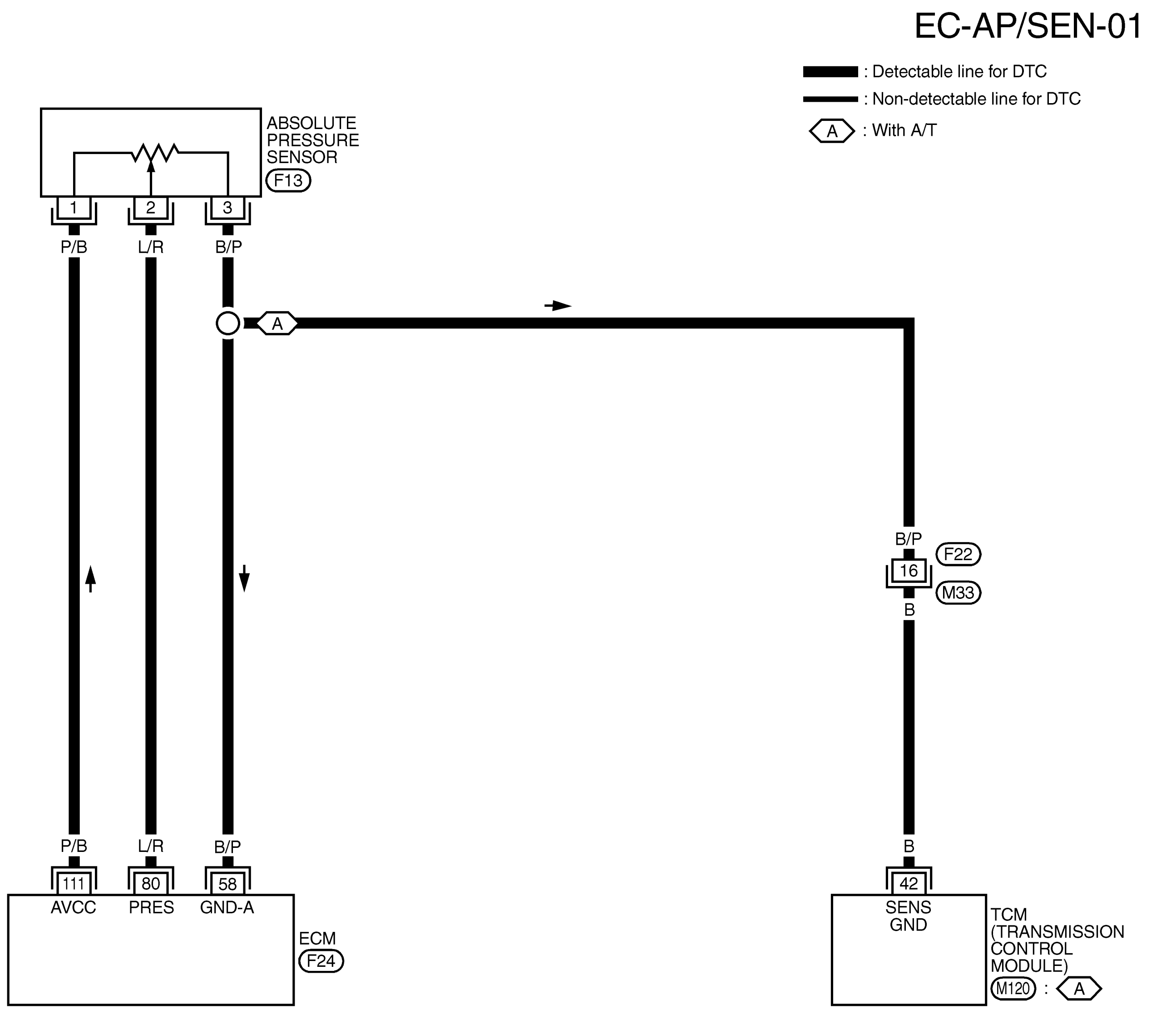
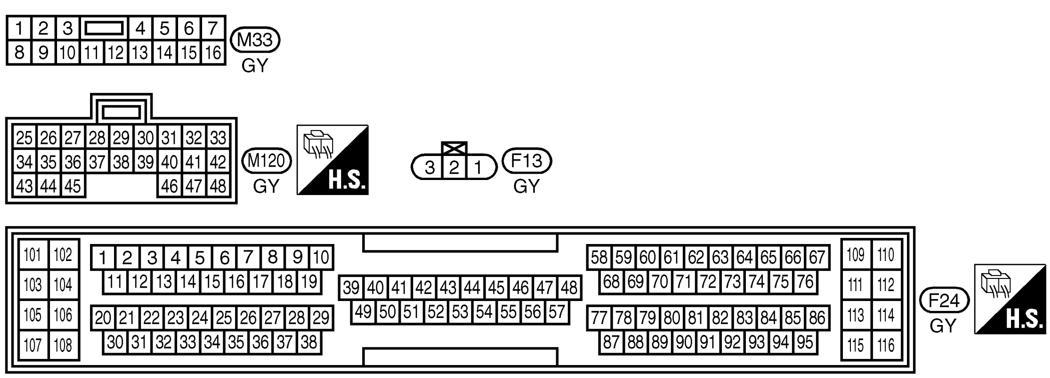
EL
IDX

Wiring Diagram

=NAEC0730

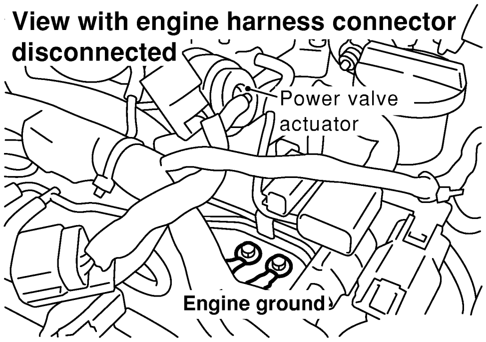


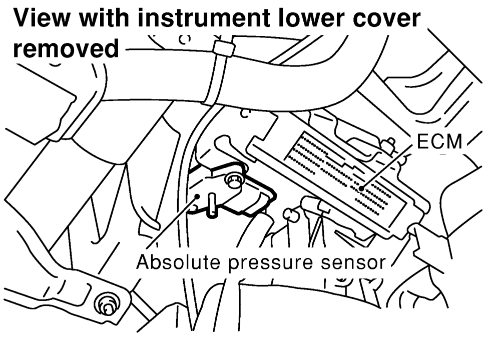


MEC013D

Diagnostic Procedure

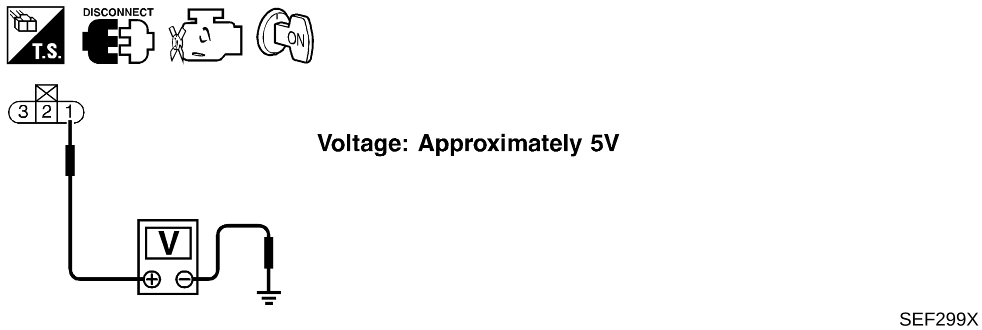
NAEC0731

1	RETIGHTEN GROUND SCREWS
1. Turn ignition switch “OFF”. 2. Loosen and retighten engine ground screws.  SEF959Y	
▶	GO TO 2.

2	CHECK ABSOLUTE PRESSURE SENSOR CONNECTOR FOR WATER
1. Disconnect absolute pressure sensor harness connector.  SEF961Y 2. Check sensor harness connector for water. **Water should not exist.** **OK or NG**	
OK ▶	GO TO 3.
NG ▶	Repair or replace harness connector.

3	CHECK ABSOLUTE PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between absolute pressure sensor terminal 1 and ground with CONSULT-II or tester.



OK or NG

OK	▶	GO TO 4.
NG	▶	Repair harness or connectors.

4	CHECK ABSOLUTE PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between absolute pressure sensor terminal 3 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 for open or short between ECM and absolute pressure sensor
- Harness for open or short between TCM (Transmission Control Module) and absolute pressure sensor

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

6	CHECK ABSOLUTE PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

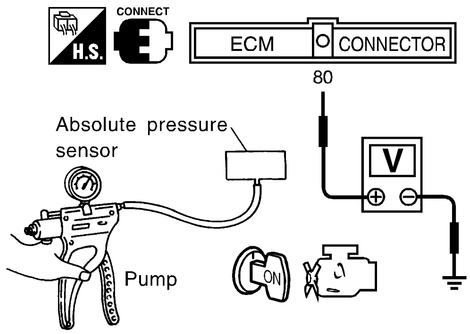
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 80 and absolute pressure sensor terminal 2.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

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 ABSOLUTE PRESSURE SENSOR

1. Remove absolute pressure sensor with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Install a vacuum pump to absolute pressure sensor.
4. Turn ignition switch "ON" and check output voltage between ECM terminal 80 and engine ground under the following conditions.



Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
−26.7 (−200, −7.87)	1.0 to 1.4 lower than above value

SEF300XA

CAUTION:
- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below −93.3 kPa (−700 mmHg, −27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

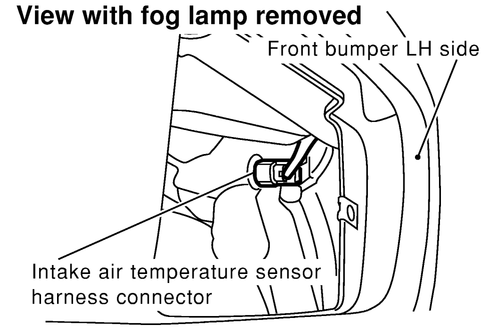
OK or NG

OK ▶	GO TO 8.
NG ▶	Replace absolute pressure sensor.

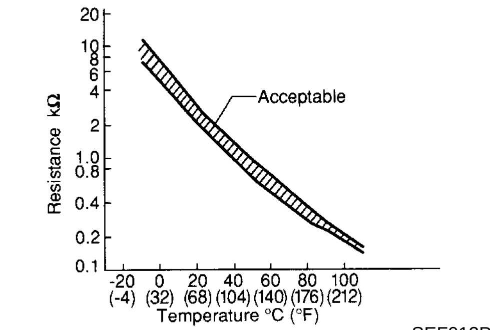
8	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**



SEF962Y



SEF012P

Component Description

NAEC0064

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

<Reference data>

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

*: These data are reference values and are measured between ECM terminal 64 (Intake air temperature sensor) 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.

On Board Diagnosis Logic

NAEC0065

Malfunction is detected when
(Malfunction A) an excessively low or high voltage from the sensor is sent to ECM,
(Malfunction B) rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.

Possible Cause

NAEC0428

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Intake air temperature sensor

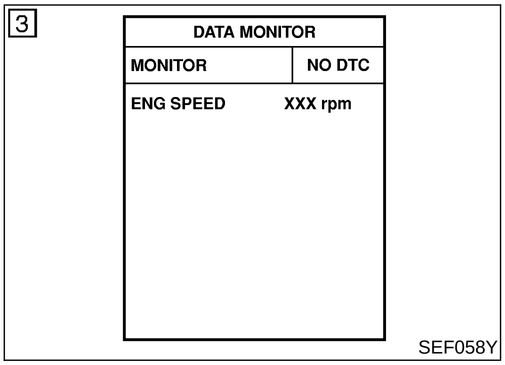
DTC Confirmation Procedure

NAEC0066

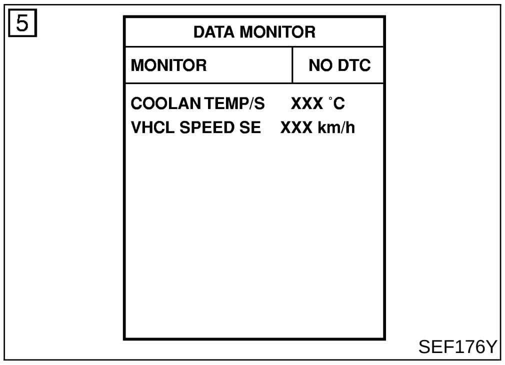
Perform "PROCEDURE FOR MALFUNCTION A" first. If 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".

NOTE:

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



SEF058Y



SEF176Y

PROCEDURE FOR MALFUNCTION A

NAEC0066S01

With CONSULT-II

NAEC0066S0101

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 "Diagnostic Procedure", EC-169.

With GST

NAEC0066S0102

Follow the procedure "With CONSULT-II" above.

PROCEDURE FOR MALFUNCTION B

NAEC0066S02

CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

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

With CONSULT-II

NAEC0066S0201

1) Wait until engine coolant temperature is less than 90°C (194°F).
a) Turn ignition switch "ON".
b) Select "DATA MONITOR" mode with CONSULT-II.
c) Check the engine coolant temperature.
d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
2) Turn ignition switch "ON".
3) Select "DATA MONITOR" mode with CONSULT-II.
4) Start engine.
5) Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-169.

With GST

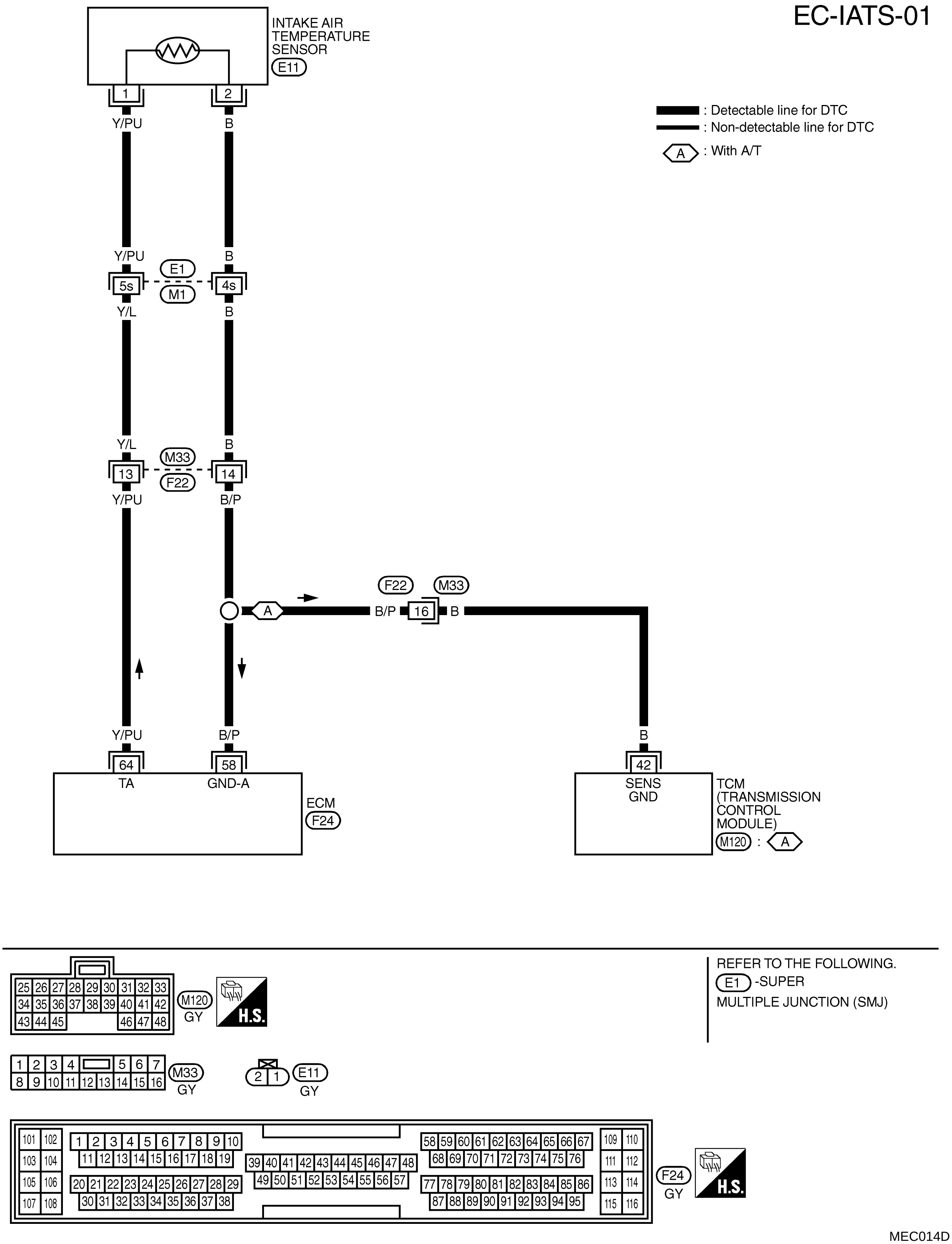
NAEC0066S0202

Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NAEC0067

EC-IATS-01

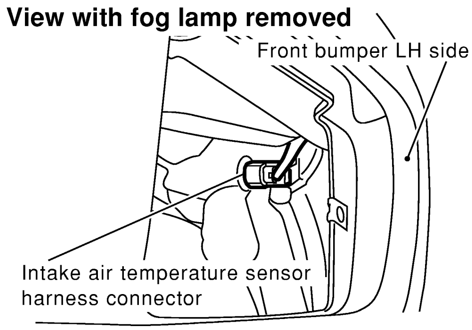


Diagnostic Procedure

NAEC0068

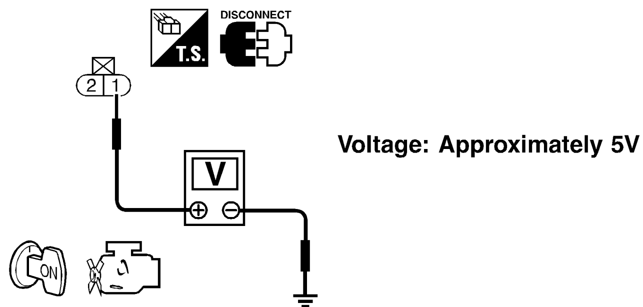
1	CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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



SEF962Y

3. Turn ignition switch “ON”.
4. Check voltage between terminal 1 and ground.



SEF301X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

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

	▶	Repair harness or connectors.

3	CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between sensor terminal 2 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

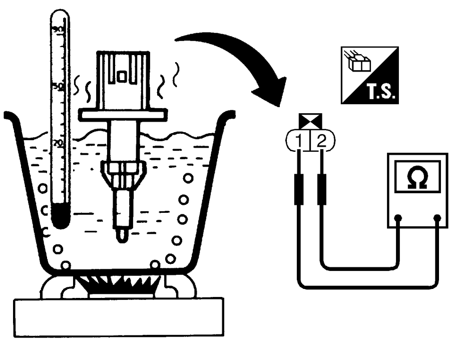
OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	**DETECT MALFUNCTIONING PART**
Check the following. ● Harness connectors E1, M1 ● Harness connectors M33, F22 ● Harness for open between ECM and intake air temperature sensor ● Harness for open between TCM (Transmission Control Module) and intake air temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

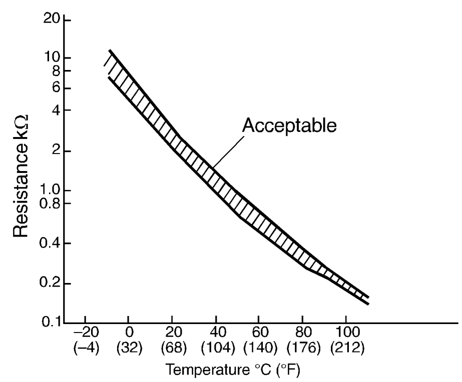
5	**CHECK INTAKE AIR TEMPERATURE SENSOR**

Check resistance between intake air temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

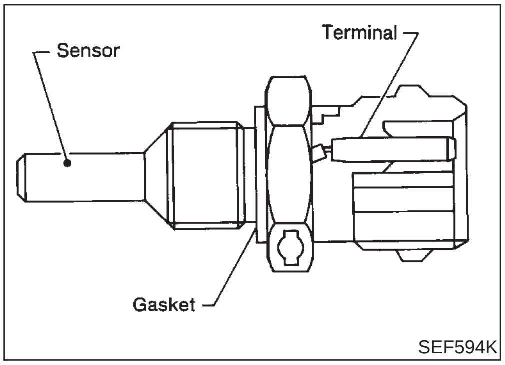


SEF302X

OK or NG

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

6	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

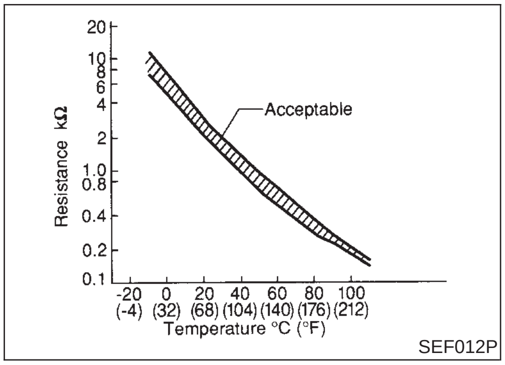


SEF594K

Component Description

NAEC0069

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



SEF012P

<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
−10 (14)	4.4	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 70 (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

NAEC0070

Malfunction is detected when an excessively high or low voltage from the sensor is sent to ECM.

FAIL-SAFE MODE

NAEC0070S02

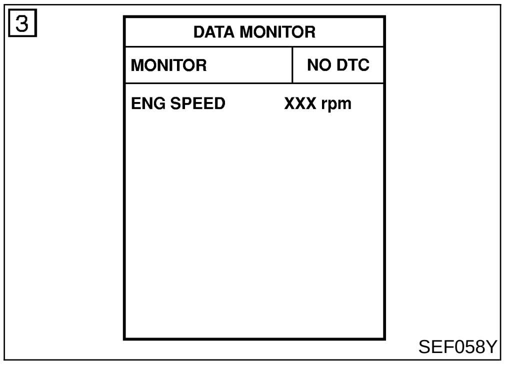
When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

<table>
<tr><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><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”.
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)
(Depends on the time)</td></tr>
</table>

Possible Cause

NAEC0429

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Engine coolant temperature sensor



SEF058Y

DTC Confirmation Procedure

NAEC0071

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

NAEC0071S01

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 “Diagnostic Procedure”, EC-174.

WITH GST

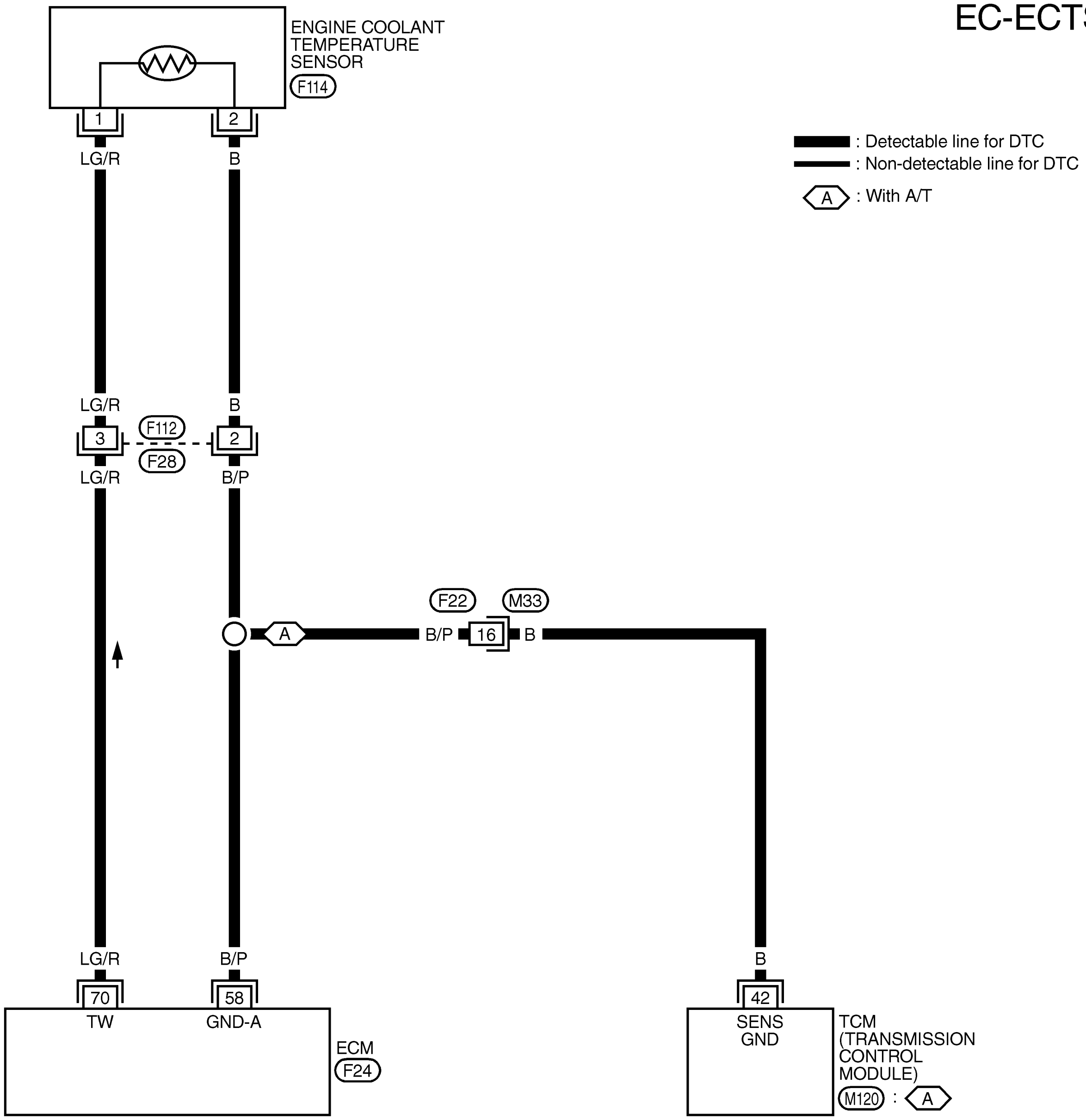
NAEC0071S02

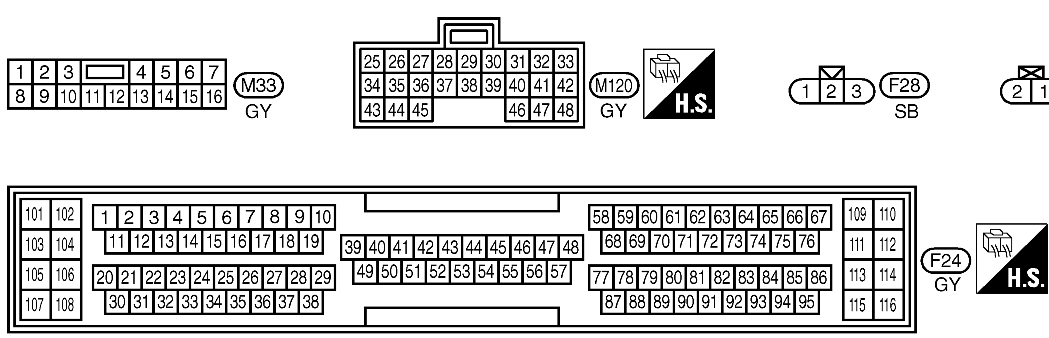
Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0072

EC-ECTS-01





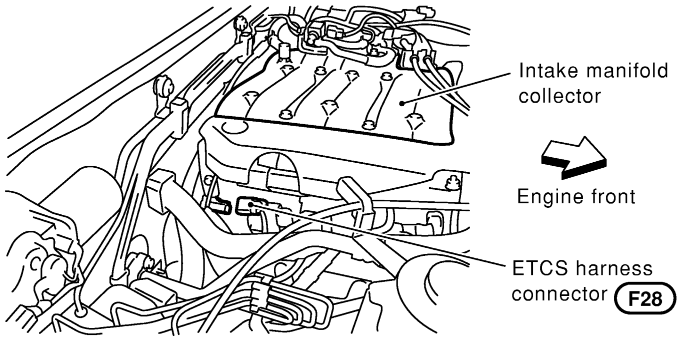
MEC015D

Diagnostic Procedure

NAEC0073

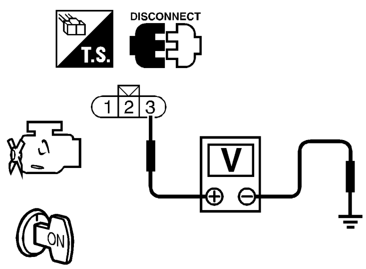
1	CHECK ECTS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor (ECTS) harness connectors F112, F28.



SEF370Z

3. Turn ignition switch “ON”.
4. Check voltage between ECTS harness connector F28 terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF371Z

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

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

	▶	Repair harness or connectors.

3	CHECK ECTS GROUND CIRCUIT FOR OPEN AND CIRCUIT

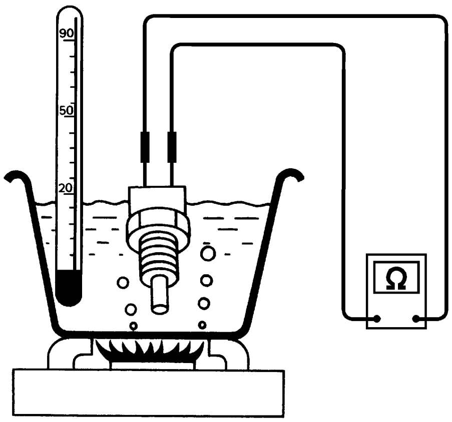
1. Turn ignition switch “OFF”.
2. Check harness continuity between ECTS terminal 2 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

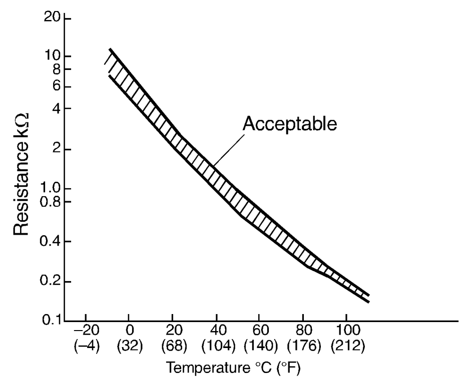
4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F112, F28 ● Harness for open between ECM and engine coolant temperature sensor ● Harness for open between TCM (Transmission Control Module) and engine coolant temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

5	CHECK ENGINE COOLANT TEMPERATURE SENSOR
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 6.
NG	▶	Replace engine coolant temperature sensor.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

Description

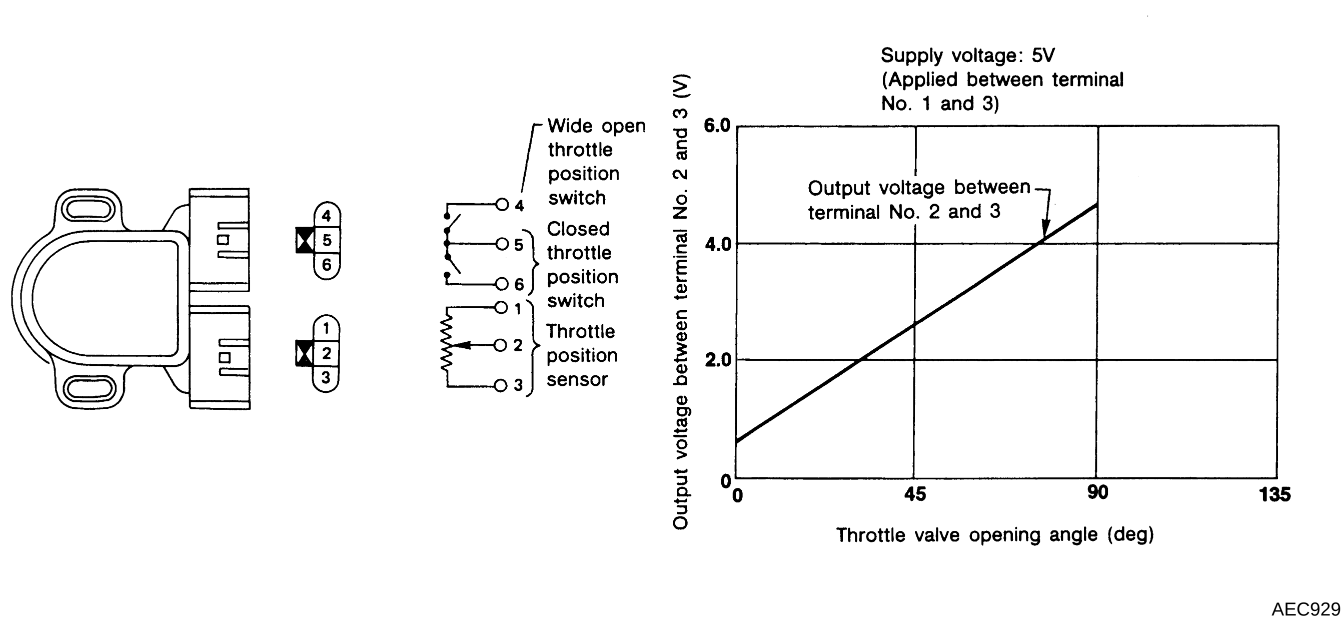
NAEC0074

NOTE:
If DTC P0120 is displayed with DTC P0510, first perform the trouble diagnosis for DTC P0510. Refer to EC-433.

COMPONENT DESCRIPTION

NAEC0074S01

The throttle position sensor responds to the accelerator pedal movement. This sensor is a kind of potentiometer which transforms the throttle position into output voltage, and emits the voltage signal to the ECM. In addition, the sensor detects the opening and closing speed of the throttle valve and feeds the voltage signal to the ECM.
Idle position of the throttle valve is determined by the ECM receiving the signal from the throttle position sensor. This sensor controls engine operation such as fuel cut. On the other hand, the “Wide open and closed throttle position switch”, which is built into the throttle position sensor unit, is not used for engine control.



CONSULT-II Reference Value in Data Monitor Mode

NAEC0075

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Engine: After warming up, idle the engine	Throttle valve: fully closed	0.15 - 0.85V
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	3.5 - 4.7V
ABSOL TH·P/S	● Engine: After warming up, idle the engine	Throttle valve: fully closed	0.0%
	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully opened	Approx. 80%

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

ECM Terminals and Reference Value

=NAEC0651

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)
91	R	Throttle position sensor	**[Engine is running]** ● **Warm-up condition** ● Accelerator pedal fully released	0.15 - 0.85V
			[Ignition switch "ON"] ● Accelerator pedal fully depressed	3.5 - 4.7V
111	P/B	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V
58	B/P	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V

On Board Diagnosis Logic

NAEC0077

Malfunction is detected when

(Malfunction A) an excessively low or high voltage from the sensor is sent to ECM,

(Malfunction B) a high voltage from the sensor is sent to ECM under light load driving conditions,

(Malfunction C) a low voltage from the sensor is sent to ECM under heavy load driving conditions.

FAIL-SAFE MODE

NAEC0077S02

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

Detected items	Engine operating condition in fail-safe mode	
Throttle position sensor circuit	Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.	
	Condition	Driving condition
	When engine is idling	Normal
	When accelerating	Poor acceleration

Possible Cause

NAEC0430

MALFUNCTION A

NAEC0430S01

- Harness or connectors
  (The throttle position sensor circuit is open or shorted.)
- Throttle position sensor

MALFUNCTION B

NAEC0430S02

- Harness or connectors
  (The throttle position sensor circuit is open or shorted.)
- Throttle position sensor
- Fuel injector

- Crankshaft position sensor (REF)
- Crankshaft position sensor (POS)
- Mass air flow sensor

MALFUNCTION C

NAEC0430S03

- Harness or connectors
  (The throttle position sensor circuit is open or shorted.)
- Intake air leaks
- Throttle position sensor

DTC Confirmation Procedure

NAEC0078

NOTE:

- **Perform "PROCEDURE FOR MALFUNCTION A" first. If the 1st trip DTC cannot be confirmed, perform "PROCEDURE FOR MALFUNCTION B".**
  If there is no problem on "PROCEDURE FOR MALFUNCTION B", perform "PROCEDURE FOR MALFUNCTION C".
- If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

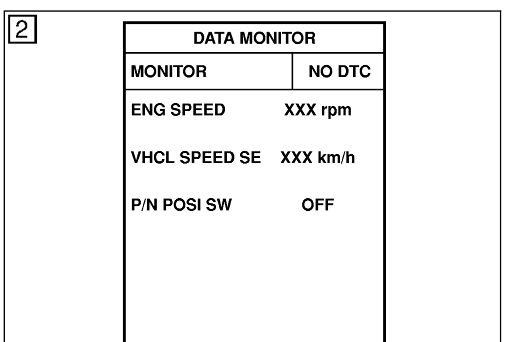
PROCEDURE FOR MALFUNCTION A

NAEC0078S01

CAUTION:
Always drive vehicle at a safe speed.

TESTING CONDITION:

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



SEF065Y

With CONSULT-II

NAEC0078S0101

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and maintain the following conditions for at least 5 consecutive seconds.

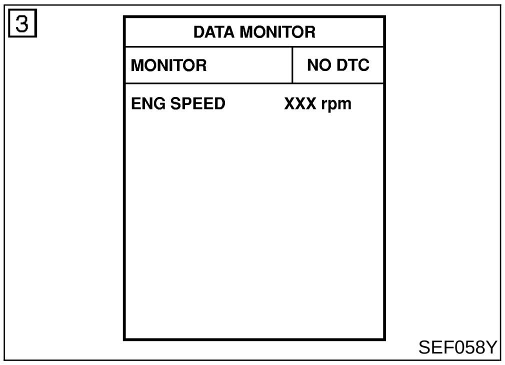
Vehicle speed	More than 5 km/h (3 MPH)
Selector lever	Suitable position except "P" or "N" position

3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-183.

With GST

NAEC0078S0102

Follow the procedure "With CONSULT-II" above.



SEF058Y

PROCEDURE FOR MALFUNCTION B

NAEC0078S02

With CONSULT-II

NAEC0078S0201

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

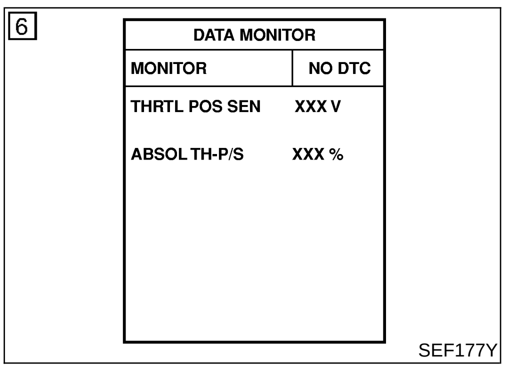
Selector lever	Suitable position except “P” or “N”
Brake pedal	Depressed
Vehicle speed	0 km/h (0 MPH)

4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-183.

With GST

NAEC0078S0202

Follow the procedure “With CONSULT-II” above.



SEF177Y

PROCEDURE FOR MALFUNCTION C

NAEC0078S03

CAUTION:

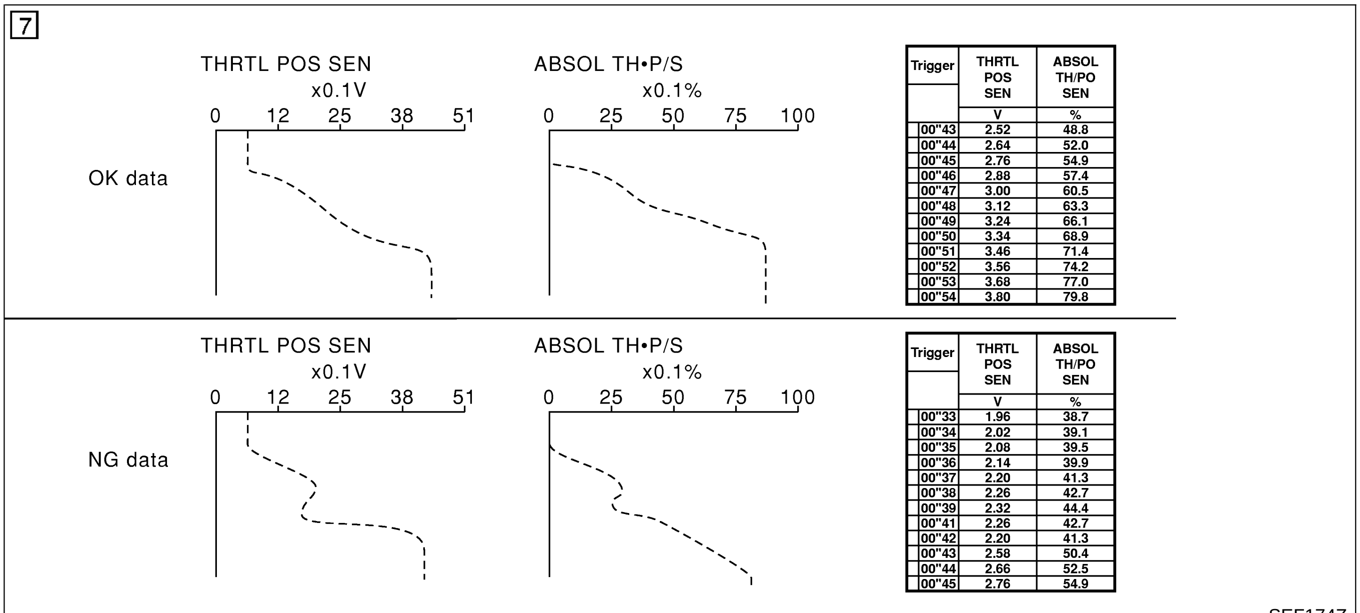
Always drive vehicle at a safe speed.

With CONSULT-II

NAEC0078S0301

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 “MANU TRIG” in “DATA MONITOR” mode with CONSULT-II.
5) Select “THRTL POS SEN” and “ABSOL TH·P/S” in “DATA MONITOR” mode with CONSULT-II.
6) Press RECORD on CONSULT-II SCREEN at the same time accelerator pedal is depressed.
7) Print out the recorded graph and check the following:

- The voltage rise is linear in response to accelerator pedal depression.
- The voltage when accelerator pedal is fully depressed is approximately 4V.
  If NG, go to “Diagnostic Procedure”, EC-183.
  If OK, go to following step.



OK data:

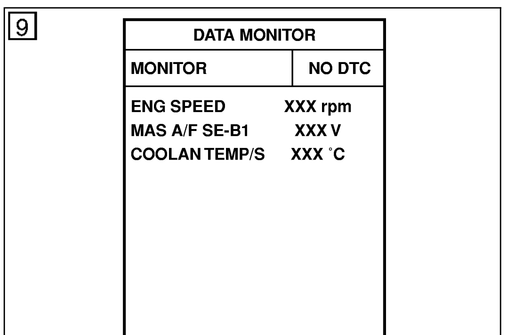
Trigger	THRTL POS SEN (V)	ABSOL TH/PO SEN (%)
00"43	2.52	48.8
00"44	2.64	52.0
00"45	2.76	54.9
00"46	2.88	57.4
00"47	3.00	60.5
00"48	3.12	63.3
00"49	3.24	66.1
00"50	3.34	68.9
00"51	3.46	71.4
00"52	3.56	74.2
00"53	3.68	77.0
00"54	3.80	79.8

NG data:

Trigger	THRTL POS SEN (V)	ABSOL TH/PO SEN (%)
00"33	1.96	38.7
00"34	2.02	39.1
00"35	2.08	39.5
00"36	2.14	39.9
00"37	2.20	41.3
00"38	2.26	42.7
00"39	2.32	44.4
00"41	2.26	42.7
00"42	2.20	41.3
00"43	2.58	50.4
00"44	2.66	52.5
00"45	2.76	54.9

SEF174Z

8) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT-II.

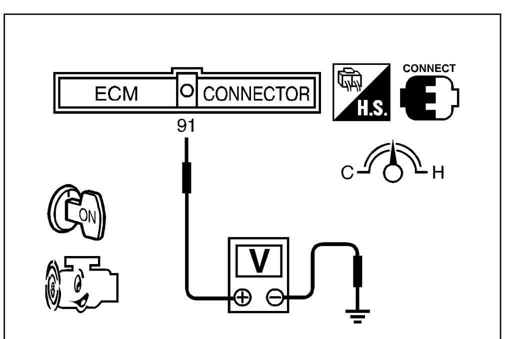


SEF178Y

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

ENG SPEED	More than 2,000 rpm
MAS A/F SE-B1	More than 3.2V
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

10) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-183.



SEF305X

With GST

NAEC0078S0302

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

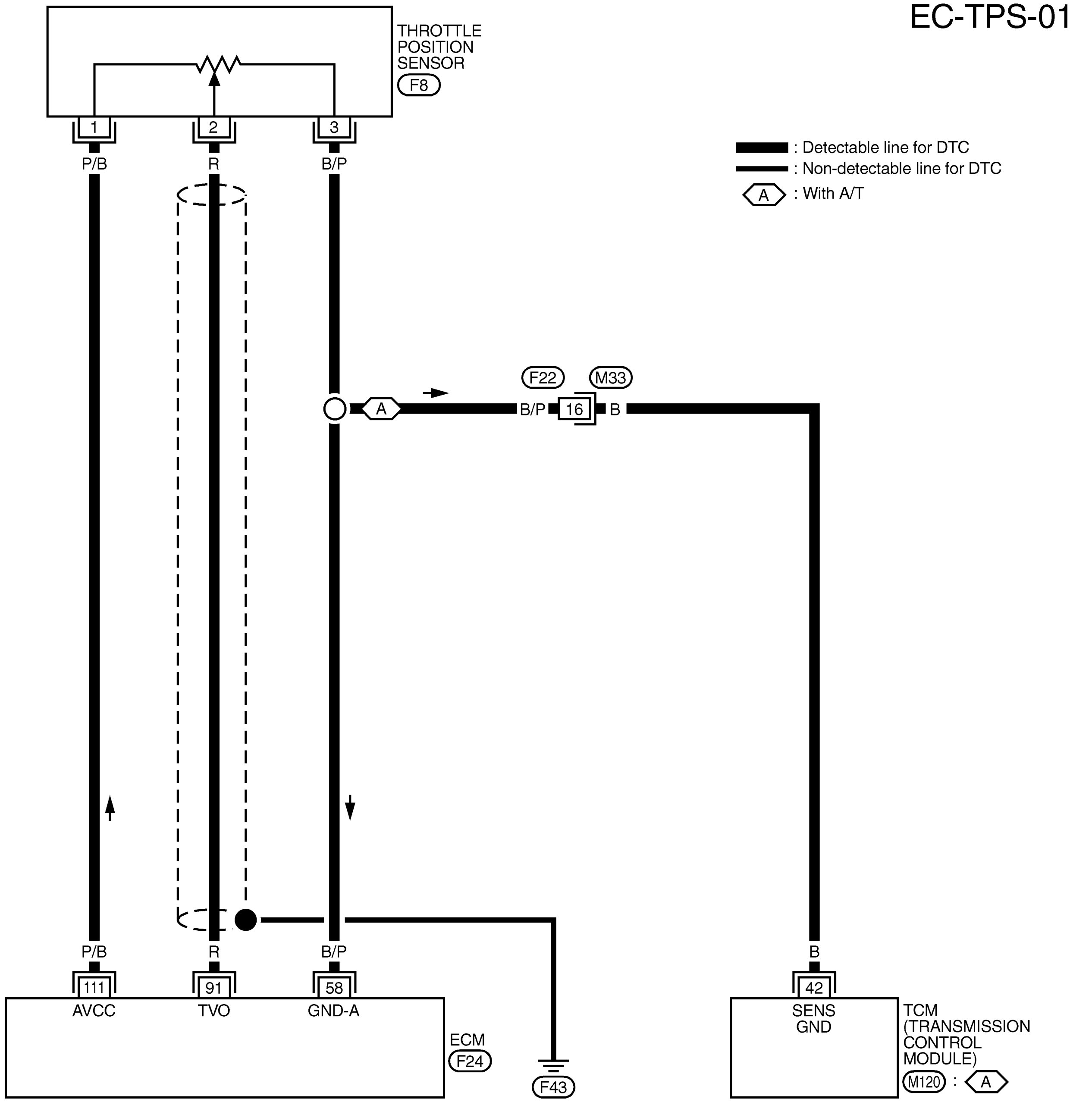
Gear position	Suitable position
Engine speed	More than 2,000 rpm
Engine coolant temperature	More than 70°C (158°F)

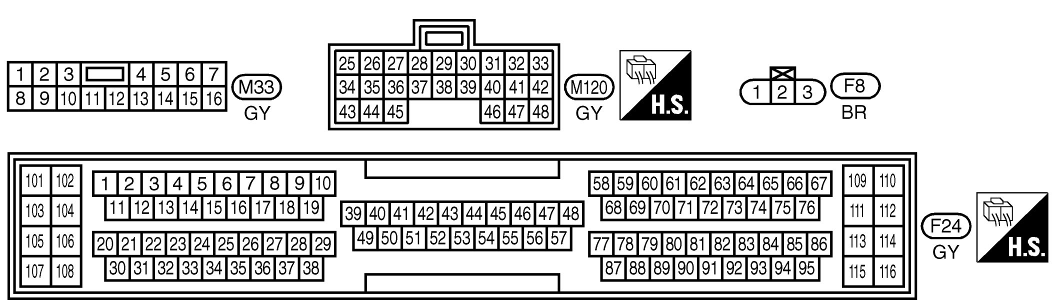
Voltage between ECM terminal 91 (Mass air flow sensor signal) and ground	More than 3.2V

3) Select "MODE 7" with GST.
4) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-183.

Wiring Diagram

NAEC0079





MEC016D

Diagnostic Procedure

NAEC0080

1 INSPECTION START

Which malfunction A, B or C is duplicated?

MALFUNCTION	Type
A	A
B	B
C	C

MTBL0066

Type A, B or C

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

2 ADJUST THROTTLE POSITION SENSOR

Check the following items. Refer to "Basic Inspection", EC-102.

Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

MTBL0653

	▶	GO TO 3.

3 CHECK INTAKE SYSTEM.

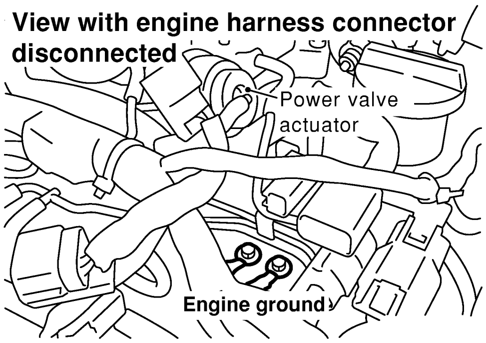
1. Turn ignition switch "OFF".
2. Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct to intake manifold collector

OK or NG

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

4 RETIGHTEN GROUND SCREWS

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

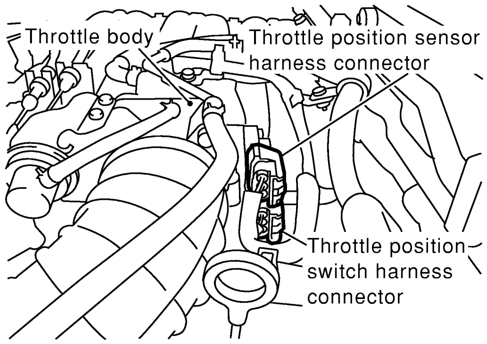


SEF959Y

	▶	GO TO 5.

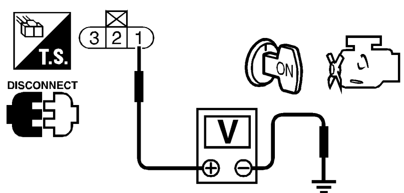
5	CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect throttle position sensor harness connector.



SEF944Y

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



Voltage: Approximately 5V

SEF964Y

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 THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between sensor terminal 3 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and throttle position sensor
- Harness for open or short between TCM (Transmission Control Module) and throttle position sensor

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

8	CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 91 and throttle position sensor terminal 2.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

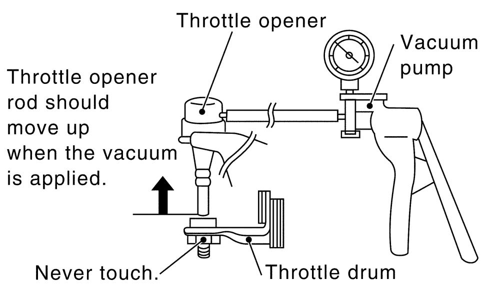
OK or NG

OK (With CONSULT-II)	▶	GO TO 9.
OK (Without CONSULT-II)	▶	GO TO 10.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

9	CHECK THROTTLE POSITION SENSOR

With CONSULT-II

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



SEF793W

6. Turn ignition switch ON.
7. Select "DATA MONITOR" mode with CONSULT-II.
8. Check voltage of "THRTL POS SEN" under the following conditions.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

DATA MONITOR	
MONITOR	NO DTC
ENG SPEED	XXX rpm
COOLAN TEMP/S	XXX °C
THRTL POS SEN	XXX V

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

SEF062Y

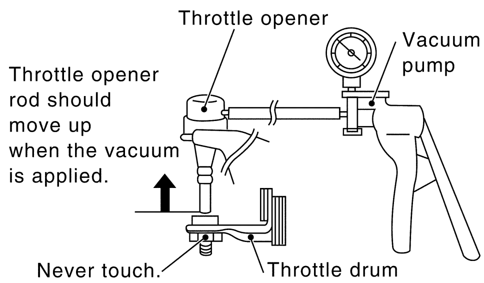
OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

10	CHECK THROTTLE POSITION SENSOR

Without CONSULT-II

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



SEF793W

6. Turn ignition switch ON.
7. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

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

MTBL0231

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	ADJUST CLOSED THROTTLE POSITION SWITCH

Adjust closed throttle position switch. Refer to "Basic Inspection", EC-102.

Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

MTBL0653

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-102.

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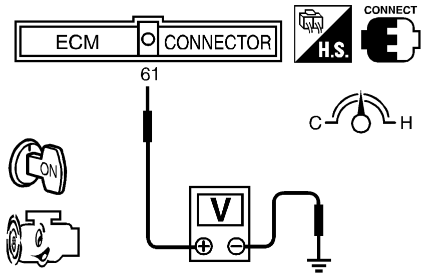
12	CHECK MASS AIR FLOW SENSOR

1. Reconnect harness connectors disconneted.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 61 (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.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

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

SEF298X

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

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace mass air flow sensor.

13	CHECK CRANKSHAFT POSITION SENSOR (POS)

1. Install all removed parts.
2. Perform "DTC Confirmation Procedure" for DTC P0335 and P1336. Refer to EC-338, 521.

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace crankshaft position sensor (POS).

14	CHECK CRANKSHAFT POSITION SENSOR (REF)

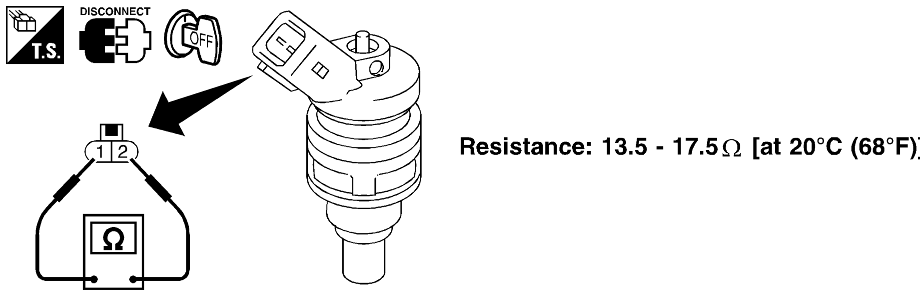
Perform "DTC Confirmation Procedure" for DTC P1335. Refer to EC-513.

OK or NG

OK	▶	GO TO 15.
NG	▶	Replace crankshaft position sensor (REF).

15	CHECK FUEL INJECTOR

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



SEF964XB

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace fuel injector.

16	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

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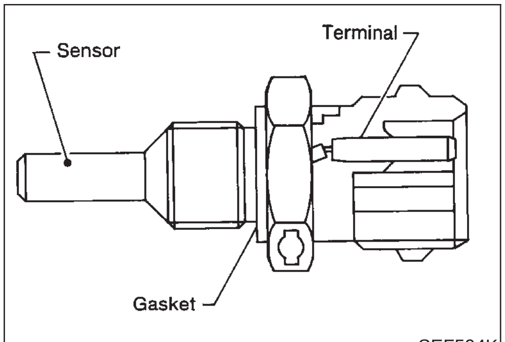
Description

NAEC0081

NOTE:
If DTC P0125 is displayed with P0115, first perform the trouble diagnosis for DTC P0115. Refer to EC-171.

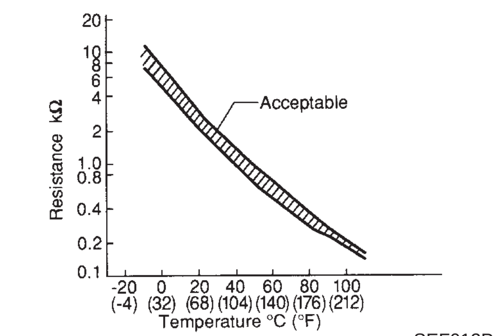


SEF594K

COMPONENT DESCRIPTION

NAEC0081S01

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



SEF012P

<Reference data>

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

*: These data are reference values and are measured between ECM terminal 70 (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

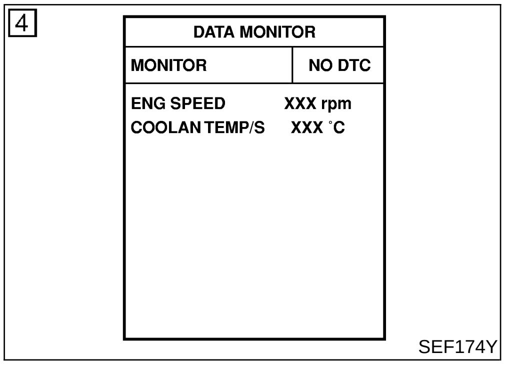
NAEC0082

Malfunction is detected when voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine, or engine coolant temperature is insufficient for closed loop fuel control.

Possible Cause

NAEC0431

- Harness or connectors
  (High resistance in the circuit)
- Engine coolant temperature sensor
- Thermostat



DTC Confirmation Procedure

NAEC0083

CAUTION:
Be careful not to overheat engine.

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

WITH CONSULT-II

NAEC0083S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Check that “COOLAN TEMP/S” is above 10°C (50°F).
   If it is above 10°C (50°F), the test result will be OK.
   If it is below 10°C (50°F), go to following step.
4) Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-192.

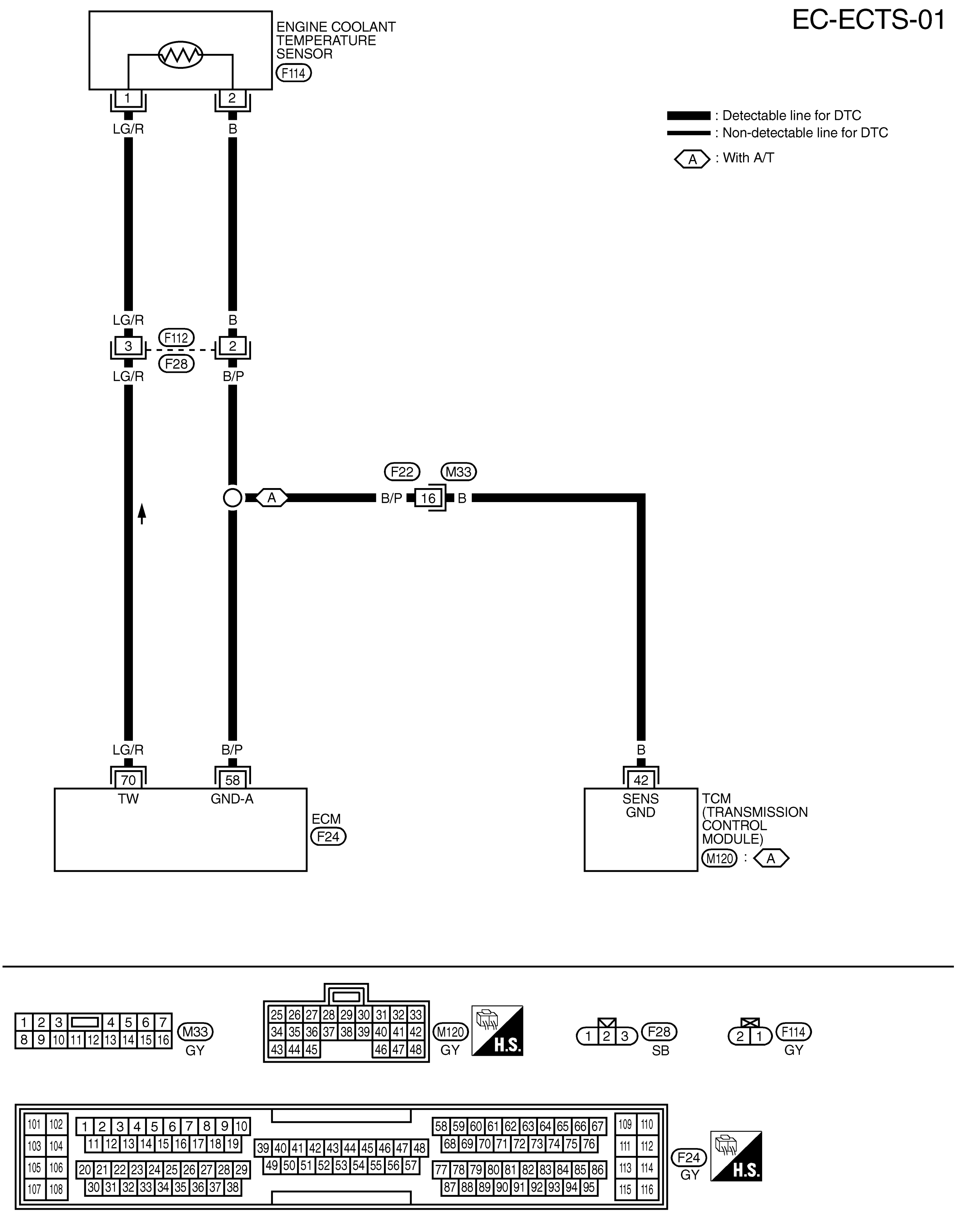
WITH GST

NAEC0083S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0084



MEC015D

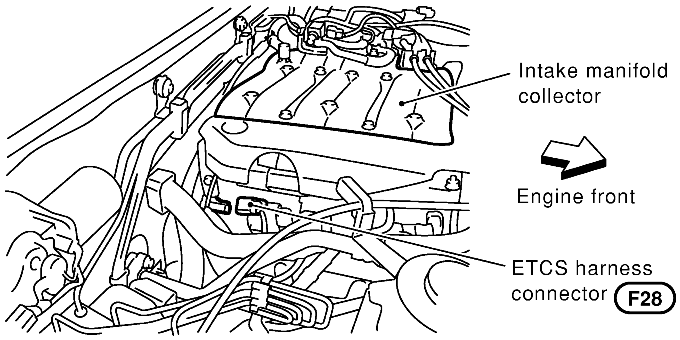
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX

Diagnostic Procedure

NAEC0085

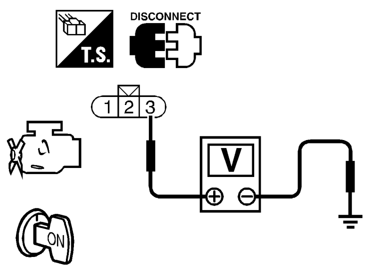
1 CHECK ECTS POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect engine coolant temperature sensor harness connectors F112, F28.



SEF370Z

3. Turn ignition switch “ON”.
4. Check voltage between ECTS harness connector F28 terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF371Z

OK or NG

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

2 DETECT MALFUNCTIONING PART

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

	▶	Repair harness or connectors.

3 CHECK ECTS GROUND CIRCUIT FOR OPEN AND SHORT

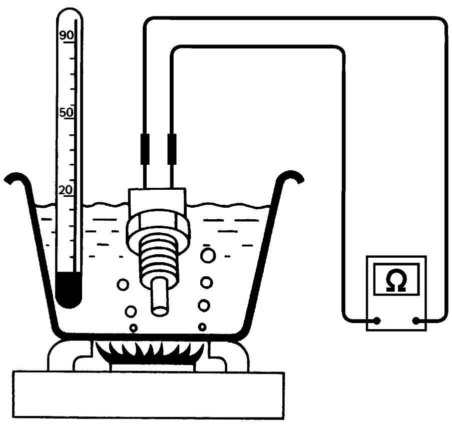
1. Turn ignition switch “OFF”.
2. Check harness continuity between ECTS terminal 2 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

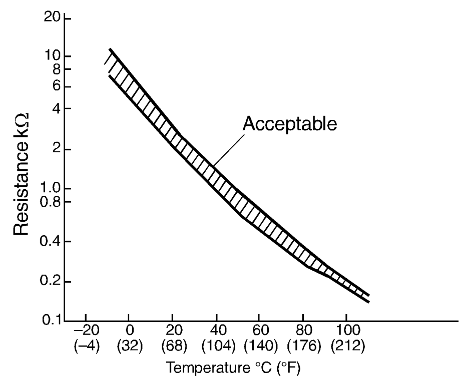
4	**DETECT MALFUNCTIONING PART**
Check the following. ● Harness connectors F112, F28 ● Harness for short between ECM and engine coolant temperature sensor ● Harness for short between TCM (Transmission Control Module) and engine coolant temperature sensor	
▶	Repair open circuit or short to power in harness or connectors.

5	**CHECK ENGINE COOLANT TEMPERATURE SENSOR**
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

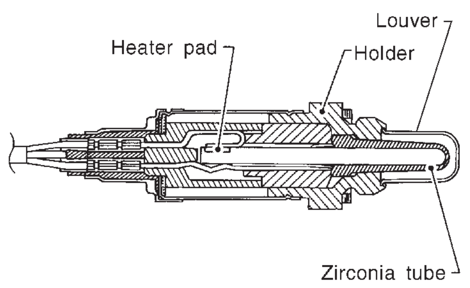
OK	▶	GO TO 6.
NG	▶	Replace engine coolant temperature sensor.

6	**CHECK THERMOSTAT OPERATION**
When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant does not flow.	

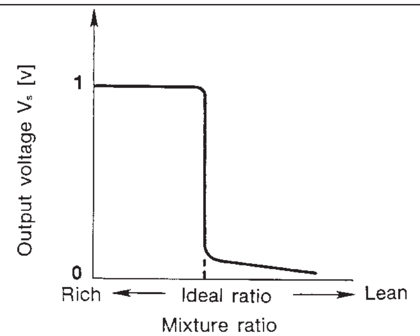
OK or NG

OK	▶	GO TO 7.
NG	▶	Repair or replace thermostat. Refer to LC-17, "Thermostat".

7	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NAEC0086

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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

NAEC0087

Specification data are reference values.

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

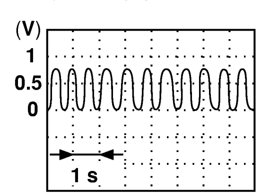
ECM Terminals and Reference Value

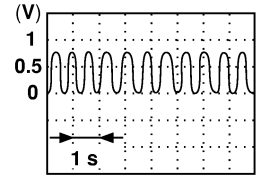
NAEC0652

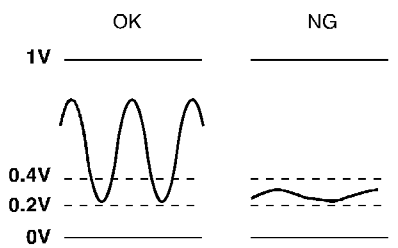
Specification data are reference values and are measured between each terminal and ground.

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)
63	G	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	G/B	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V



SEF237U

On Board Diagnosis Logic

NAEC0089

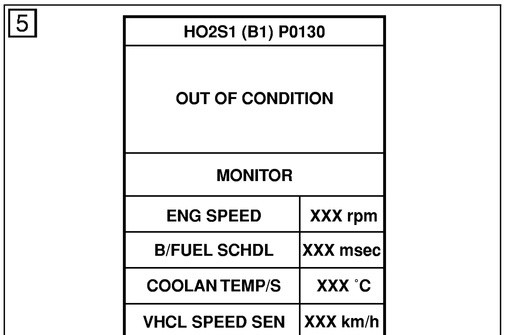
Under the condition in which the heated oxygen sensor 1 (front) signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately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

Possible Cause

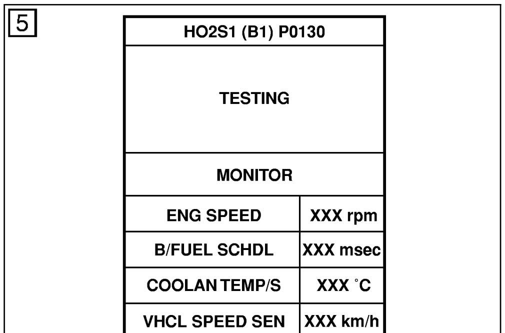
NAEC0432

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)

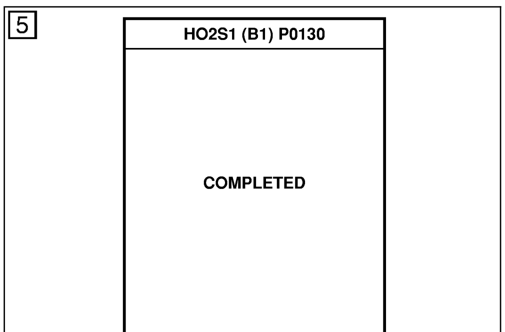
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX



SEF332Z



SEF333Z



SEF645Y

DTC Confirmation Procedure

NAEC0090

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

NAEC0090S01

1) Start engine and warm it up to normal operating temperature.
2) Select “HO2S1 (B1)/(B2) P0130/P0150” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-II.
3) Touch “START”.
4) Let it idle for at least 3 minutes.

NOTE:

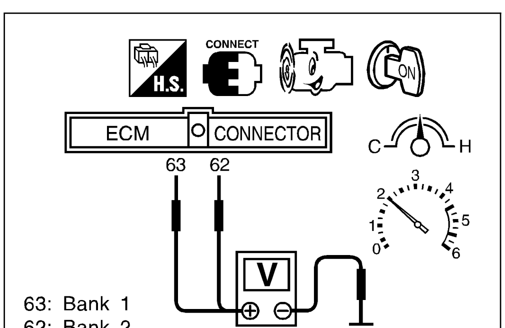
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 4.

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	1,500 - 2,800 rpm
Vehicle speed	70 - 100 km/h (43 - 62 MPH)
B/FUEL SCHDL	3.0 - 10 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 “Diagnostic Procedure”, EC-200.
During this test, P1148 and P1168 may be stored in ECM.



SEF308XB

Overall Function Check

NAEC0091

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

WITH GST

NAEC0091S01

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left signal) and engine ground.

3) Check the following with engine speed held at 2,000 rpm constant under no load.
- The voltage does not remain in the range of 0.2 - 0.4V.

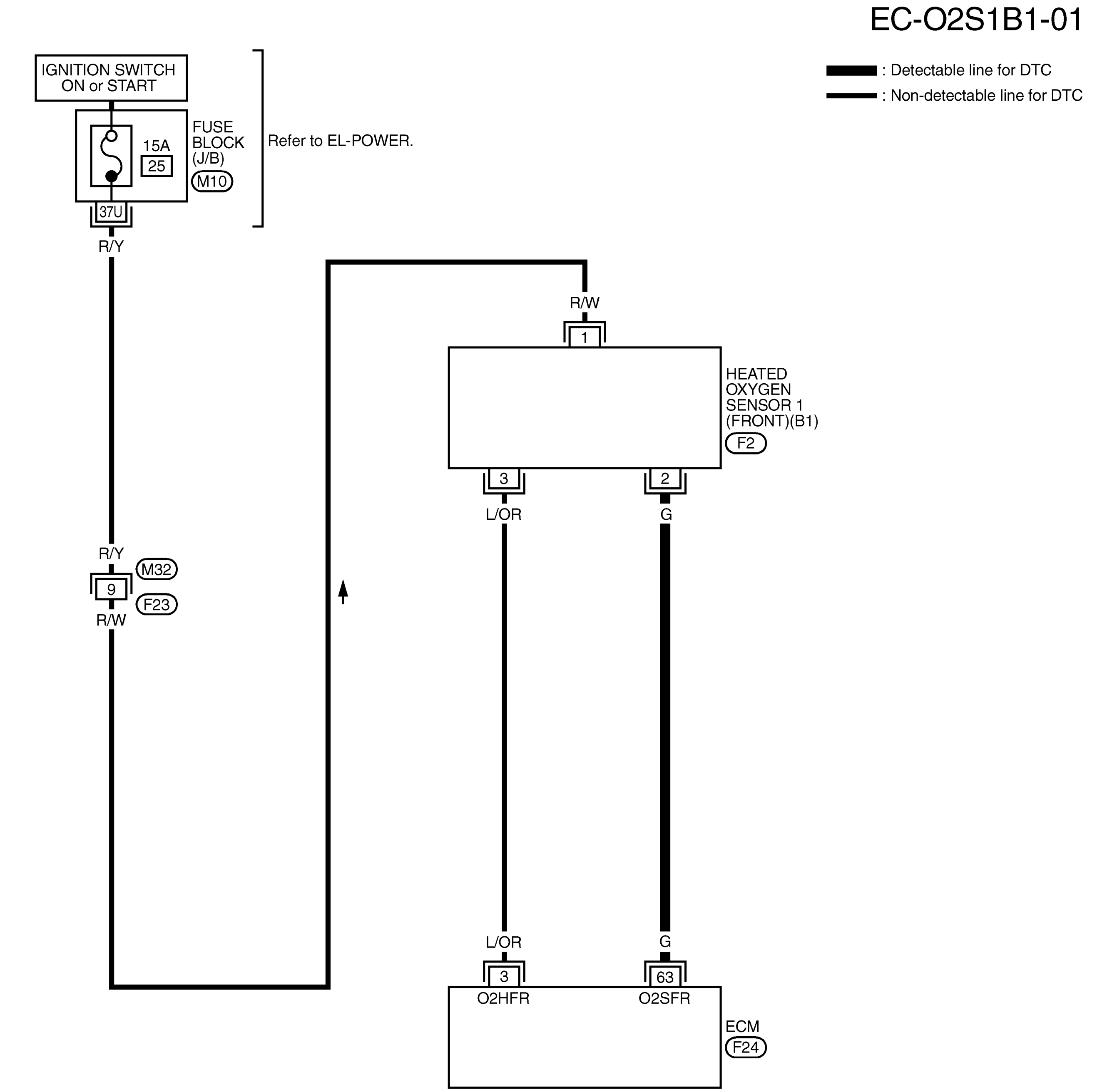
4) If NG, go to "Diagnostic Procedure", EC-200.

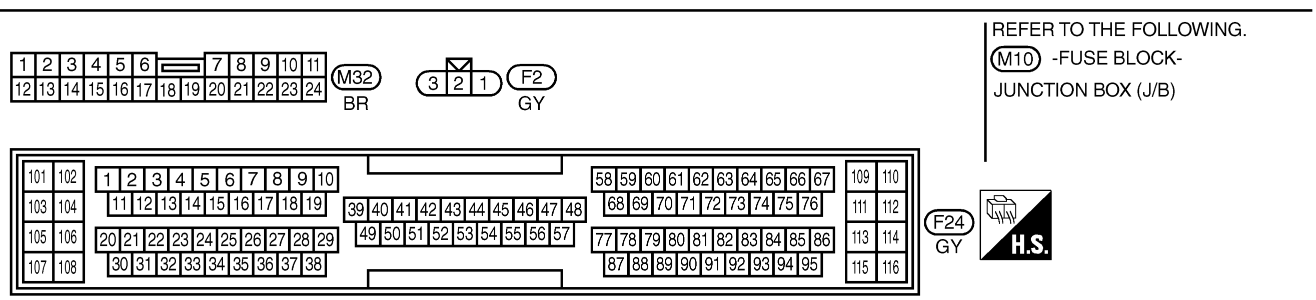
Wiring Diagram

=NAEC0092

RIGHT BANK

NAEC0092S01

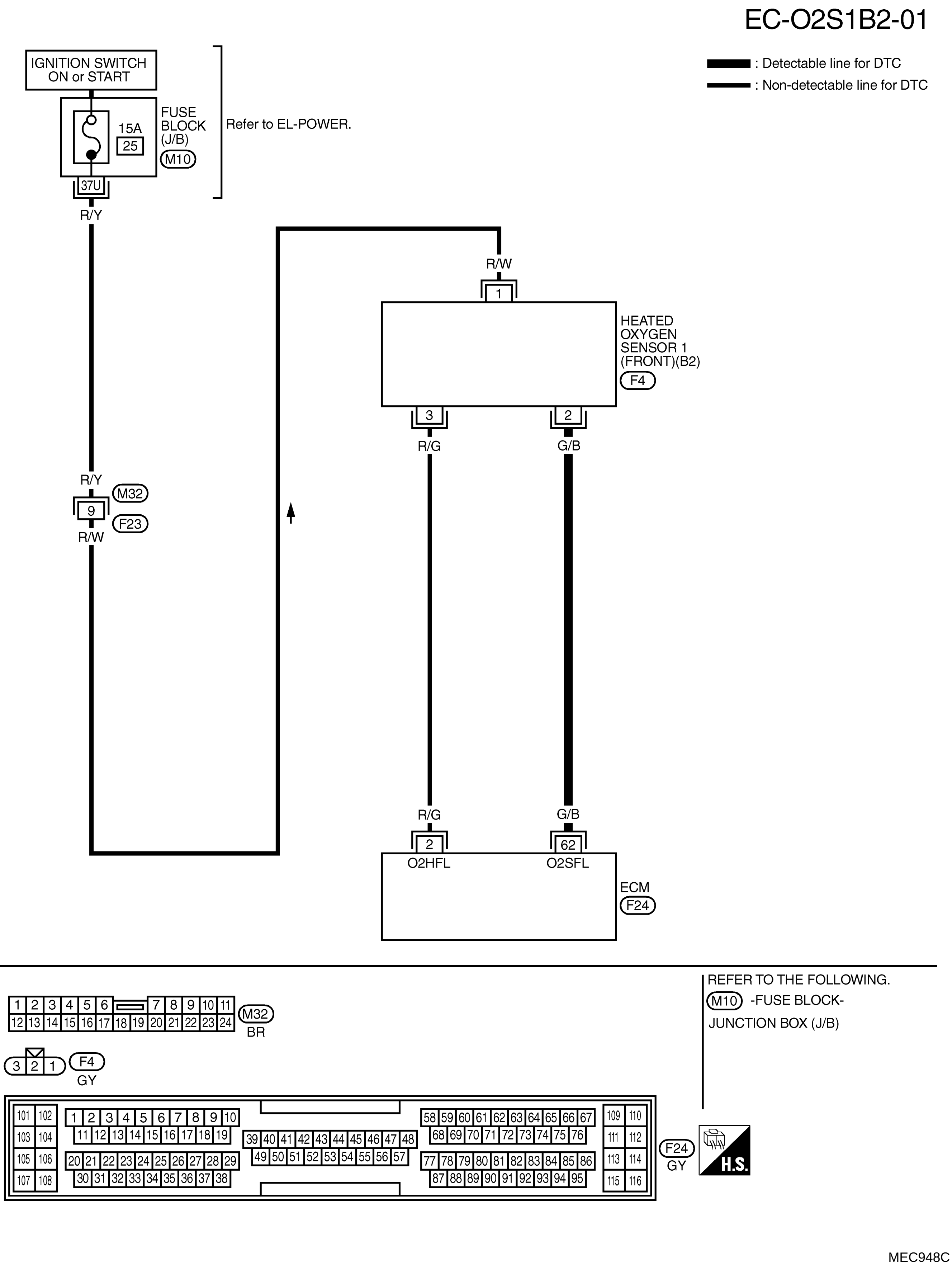




MEC947C

LEFT BANK

NAEC0092S02

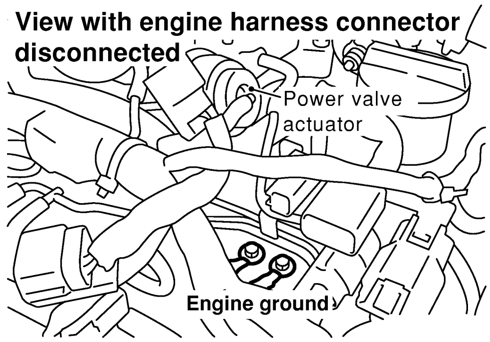


Diagnostic Procedure

NAEC0093

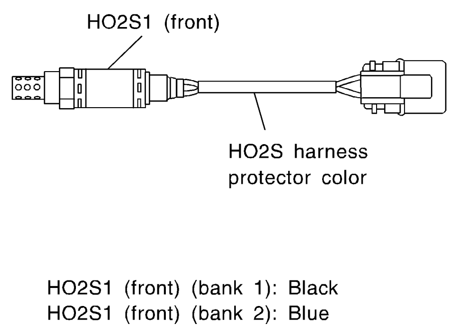
1	INSPECTION START

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

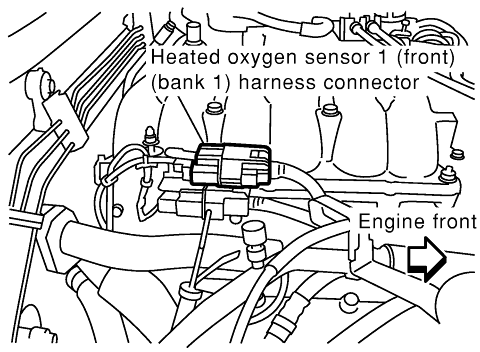


SEF959Y

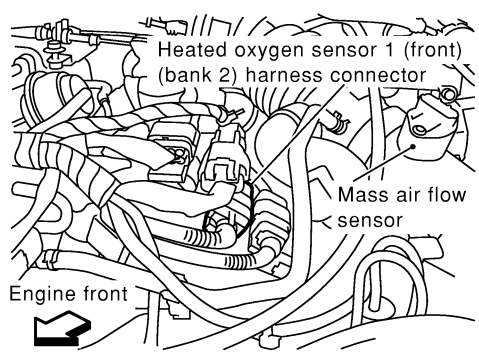
3. Make sure HO2S1 (front) harness protector color, and disconnect corresponding heated oxygen sensor 1 (front) harness connector.



SEF505Y



SEF965Y



SEF966Y

▶	GO TO 2.

2	CHECK HO2S1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Terminals		Bank
	ECM	Sensor	
P0130	63	2	Bank 1 (Right)
P0150	62	2	Bank 2 (Left)

MTBL0471

Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0130	63 or 2	Ground	Bank 1 (Right)
P0150	62 or 2	Ground	Bank 2 (Left)

MTBL0472

Continuity should not exist.

4. Also check harness for short to power.

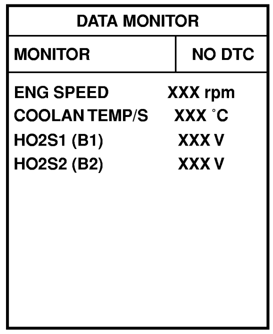
OK or NG

OK (With CONSULT-II)	▶	GO TO 3.
OK (Without CONSULT-II)	▶	GO TO 4.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

3 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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.



SEF967Y

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 below.

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

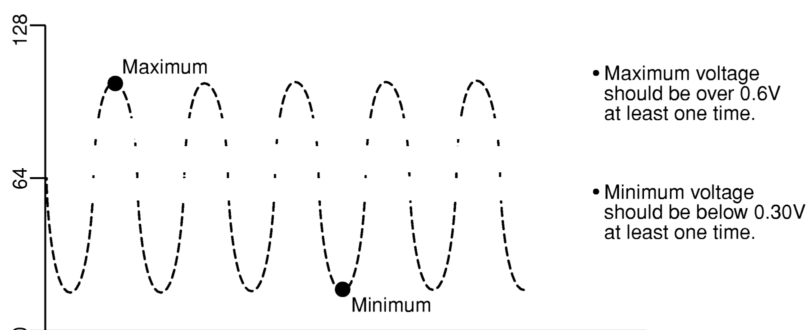
Bank 2
cycle | 1 | 2 | 3 | 4 | 5 |
HO2S1 MNTR (B2) R-L-R-L-R-L-R-L-R-L-R

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

SEF647Y

- "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

CAUTION:

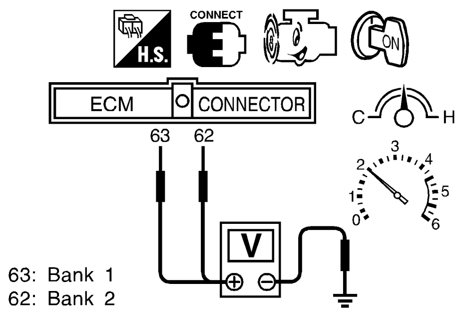
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

4	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left 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 → 0 - 0.3V

SEF967XA

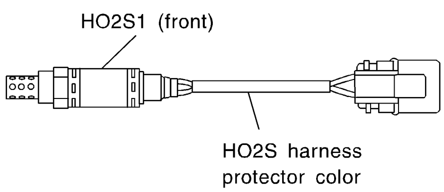
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

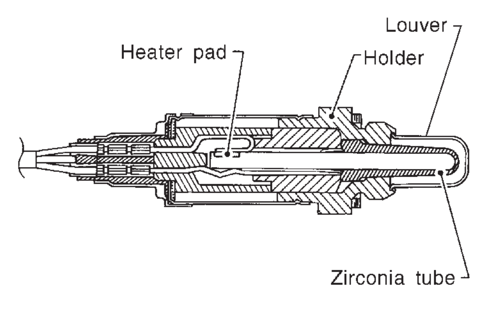
6	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

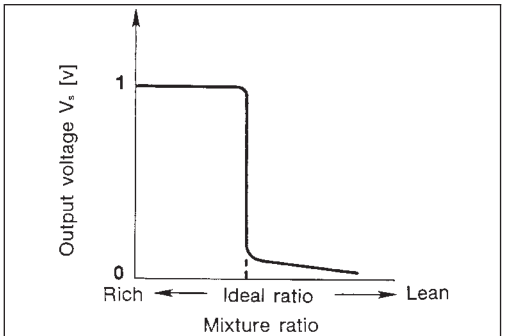
	▶	**INSPECTION END**

Component Description

NAEC0094



SEF463R



SEF288D

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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

NAEC0095

Specification data are reference values.

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

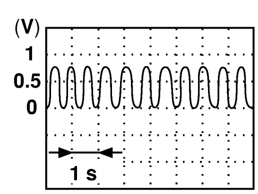
ECM Terminals and Reference Value

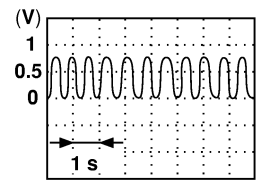
NAEC0653

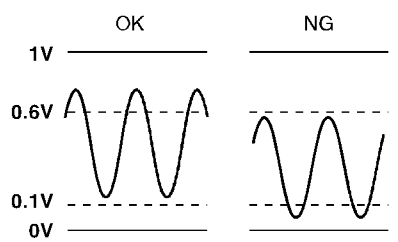
Specification data are reference values and are measured between each terminal and ground.

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)
63	G	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	G/B	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V



SEF300U

On Board Diagnosis Logic

NAEC0097

To judge the malfunction, the output from the heated oxygen sensor 1 (front) 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.
Malfunction is detected when the maximum and minimum voltage from the sensor are not reached to the specified voltages.

Possible Cause

NAEC0433

- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)
- Fuel pressure
- Injectors
- Intake air leaks

DTC Confirmation Procedure

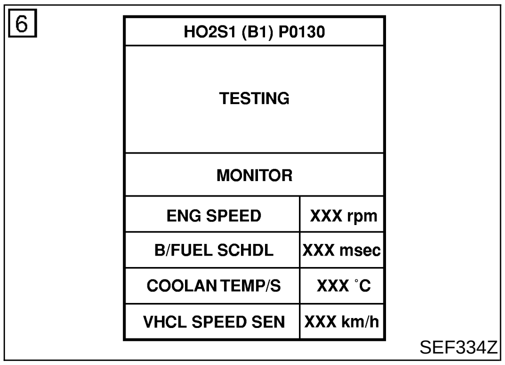
NAEC0098

CAUTION:
Always drive vehicle at a safe speed.

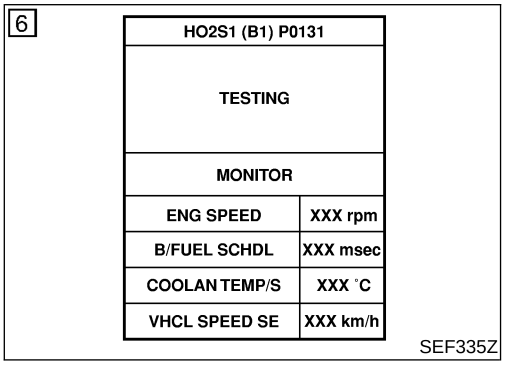
NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

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.**

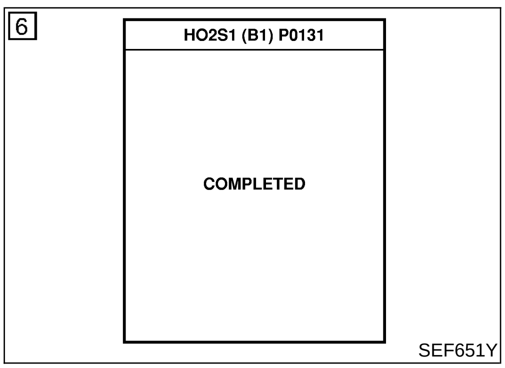
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX



SEF334Z



SEF335Z



SEF651Y

WITH CONSULT-II

NAEC0098S01

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)/(B2) P0131/P0150" 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.

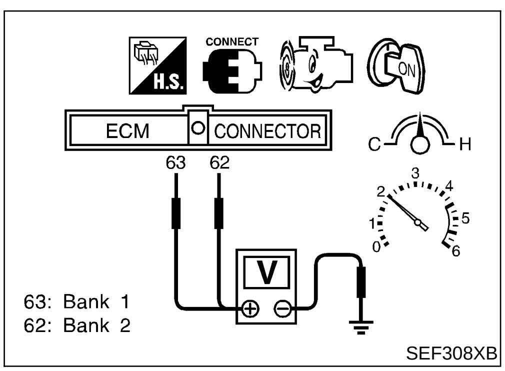
NOTE:
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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	1,300 - 2,800 rpm
Vehicle speed	80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL	3 - 10 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-207.



SEF308XB

Overall Function Check

NAEC0099

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

WITH GST

NAEC0099S01

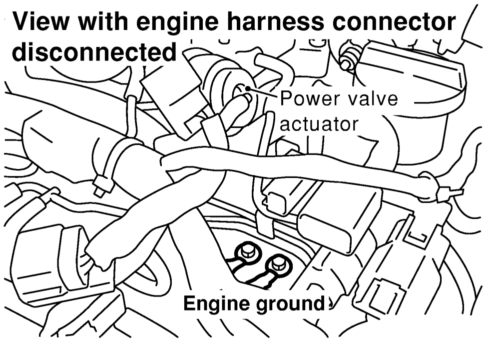
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (Right bank HO2S1 signal) or 62 (Left bank HO2S1 signal) and engine ground.
3) Check one of the following with engine speed held at 2,000 rpm constant under no load.

- 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 "Diagnostic Procedure", EC-207.

Diagnostic Procedure

NAEC0100

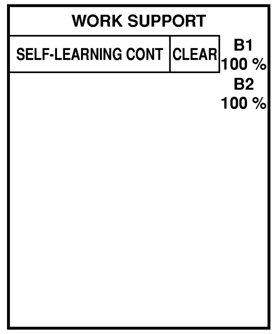
1	RETIGHTEN GROUND SCREWS
	1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.  SEF959Y
▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
	Loosen and retighten corresponding heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**
▶	GO TO 3.

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".



SEF968Y

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

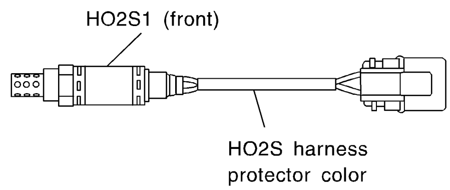
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-73.
7. Make sure 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-296.
No	▶	GO TO 4.

4	CHECK HEATED OXYGEN SENSOR HEATER 1 (FRONT)

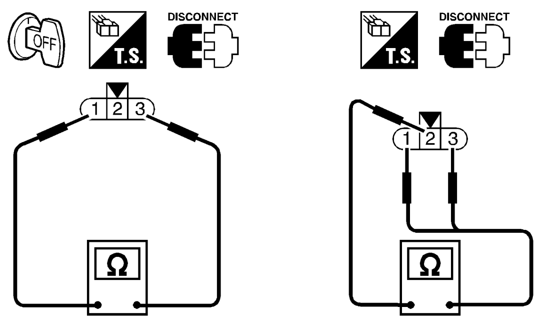
1. Stop engine.
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

3. Disconnect HO2S1 harness connector.
4. Check resistance between HO2S1 terminals as follows.



Terminals	Resistance
1 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 2 and 3	∞Ω (Continuity should not exist.)

SEF969Y

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.

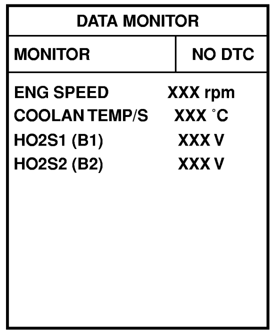
OK or NG

OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	GO TO 7.

5	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

With CONSULT-II

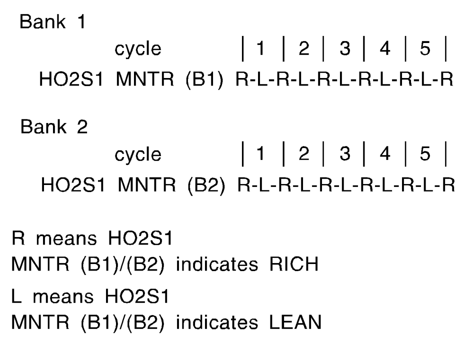
1. Start engine and warm it up to normal operating temperature.
2. Select “MANU TRIG” and adjust “TRIGGER POINT” to 100% in “DATA MONITOR” mode with CONSULT-II.
3. Select “HO2S1 (B1)/(B2)” and “HO2S1 MNTR (B1)/(B2)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch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



SEF967Y

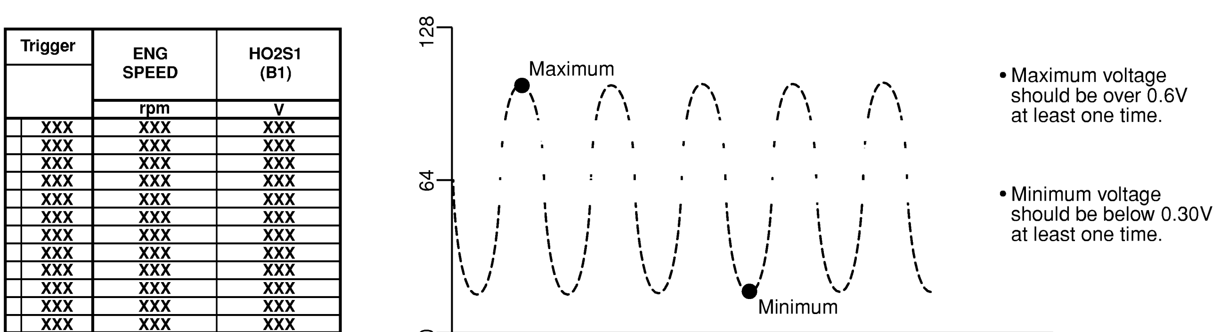
6. Check the following.

- “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 below.



SEF647Y

- “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.



SEF648Y

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.

OK or NG

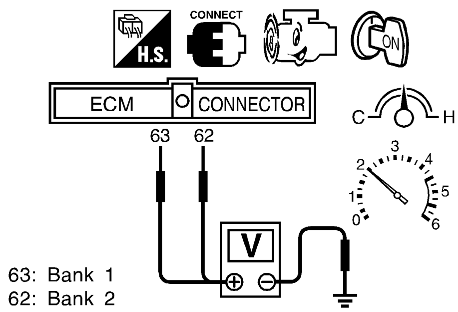
OK	▶	GO TO 8.
NG	▶	GO TO 7.

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

6 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left 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 → 0 - 0.3V

SEF967XA

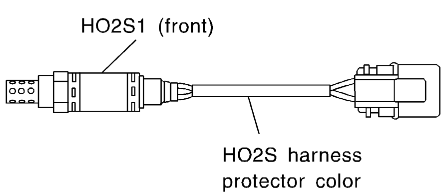
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK ▶	GO TO 8.
NG ▶	GO TO 7.

7 REPLACE FRONT HEATED OXYGEN SENSOR

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

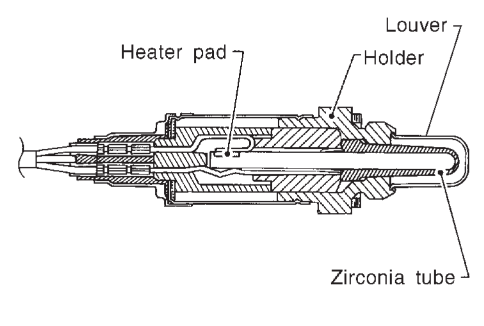
CAUTION:
Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

▶	Replace malfunctioning heated oxygen sensor 1 (front).

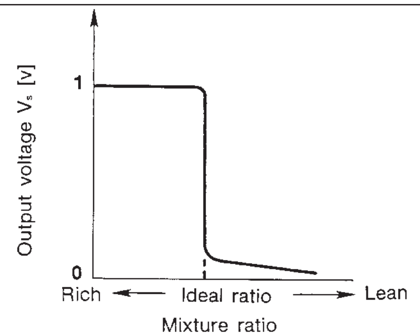
8 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.
For circuit, refer to "DTC P0130 (RIGHT BANK 1), P0150 (LEFT BANK 2) HEATED OXYGEN SENSOR 1 (FRONT) [HO2S1 (FRONT) (BANK 1)/(BANK 2)] (CIRCUIT)", EC-194.

▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NAEC0101

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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

NAEC0102

Specification data are reference values.

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

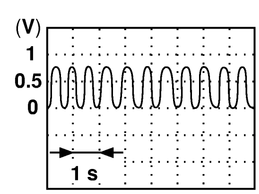
ECM Terminals and Reference Value

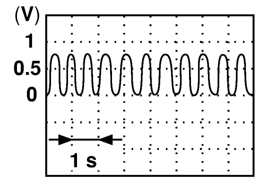
NAEC0654

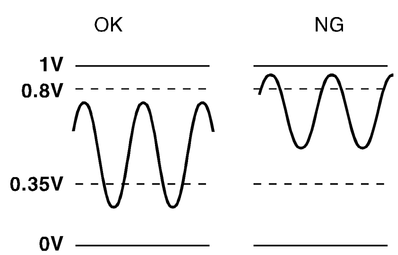
Specification data are reference values and are measured between each terminal and ground.

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)
63	G	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	G/B	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V



SEF299U

On Board Diagnosis Logic

NAEC0104

To judge the malfunction, the output from the heated oxygen sensor 1 (front) 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.
Malfunction is detected when the maximum and minimum voltages from the sensor are beyond the specified voltages.

Possible Cause

NAEC0434

- Heated oxygen sensor 1 (front)
- Fuel pressure
- Injectors
- Heated oxygen sensor 1 heater (front)

DTC Confirmation Procedure

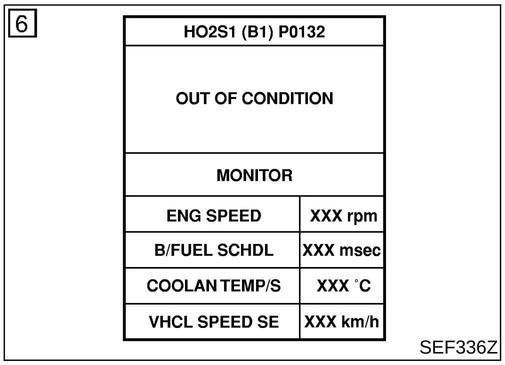
NAEC0105

CAUTION:
Always drive vehicle at a safe speed.

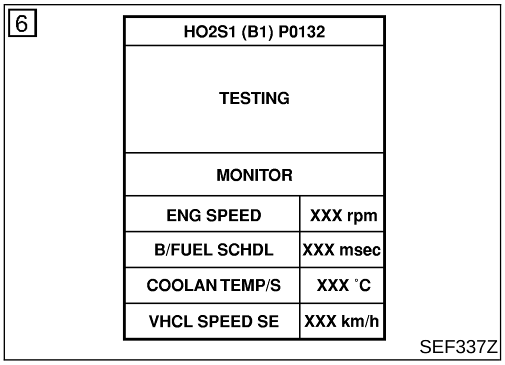
NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

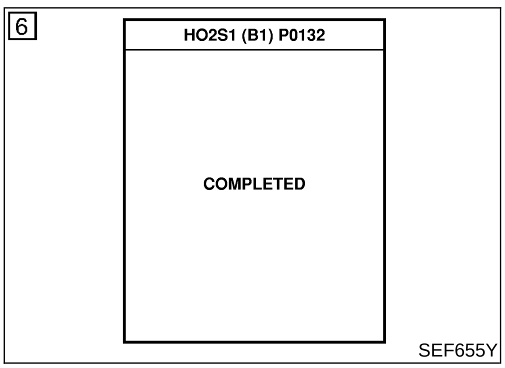
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**



SEF336Z



SEF337Z



SEF655Y

WITH CONSULT-II

NAEC0105S01

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)/(B2) P0132/ P0152" 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.

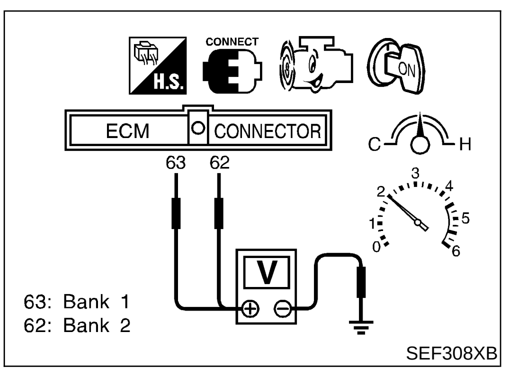
NOTE:
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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	1,300 - 2,800 rpm
Vehicle speed	80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL	3 - 10 msec
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-215.



SEF308XB

Overall Function Check

NAEC0106

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

WITH GST

NAEC0106S01

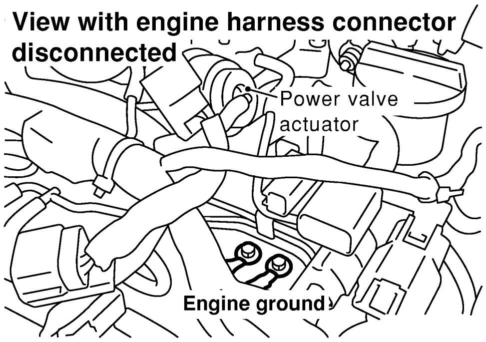
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left signal) and engine ground.
3) Check one of the following with engine speed held at 2,000 rpm constant under no load.

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

4) If NG, go to "Diagnostic Procedure", EC-215.

Diagnostic Procedure

NAEC0107

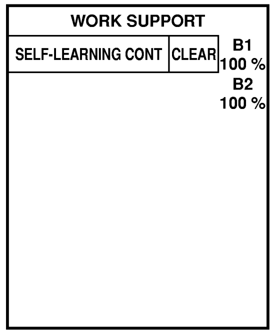
1	RETIGHTEN GROUND SCREWS
1. Turn ignition switch “OFF”. 2. Loosen and retighten engine ground screws.  SEF959Y	
▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
Loosen and retighten corresponding heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	GO TO 3.

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".



SEF968Y

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

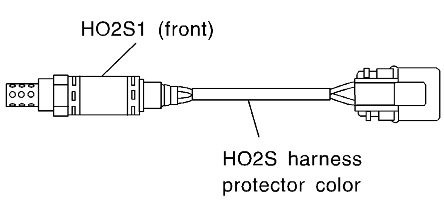
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-73.
7. Make sure 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-304.
No	▶	GO TO 4.

4 CHECK HO2S 1 (FRONT) CONNECTOR FOR WATER

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

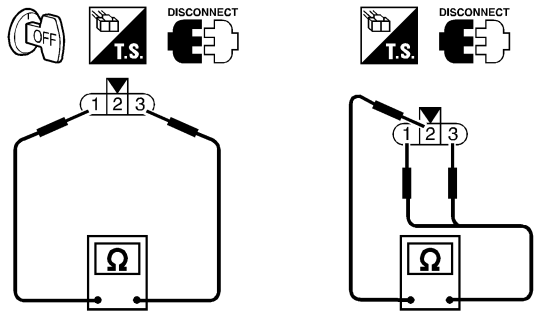
3. Disconnect heated oxygen sensor 1 (front) harness connector.
4. Check connectors for water.
   Water should not exist.

OK or NG

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

5	CHECK HEATED OXYGEN SENSOR 1 (FRONT) HEATER

Check resistance between HO2S1 terminals as follows.



Terminals	Resistance
1 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 2 and 3	∞Ω (Continuity should not exist.)

SEF969Y

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.

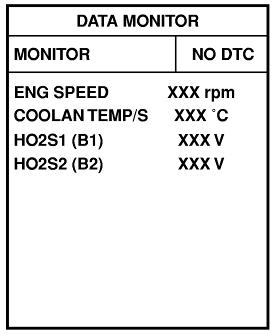
OK or NG

OK (With CONSULT-II)	▶	GO TO 6.
OK (Without CONSULT-II)	▶	GO TO 7.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

With CONSULT-II

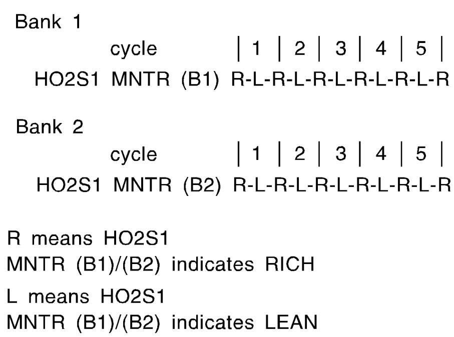
1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and adjust "TRIGGER POINT" to 100% in "DATA MONITOR" mode with CONSULT-II.
3. Select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch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



SEF967Y

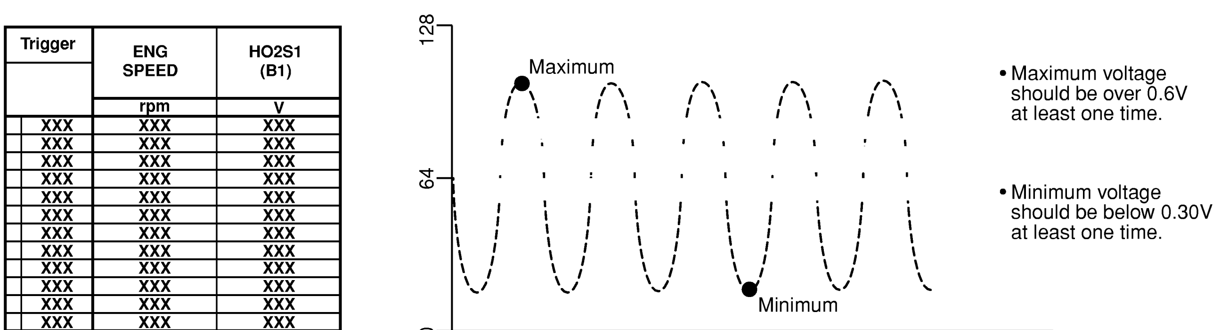
6. Check the following.

- "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 below.



SEF647Y

- "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.



SEF648Y

CAUTION:

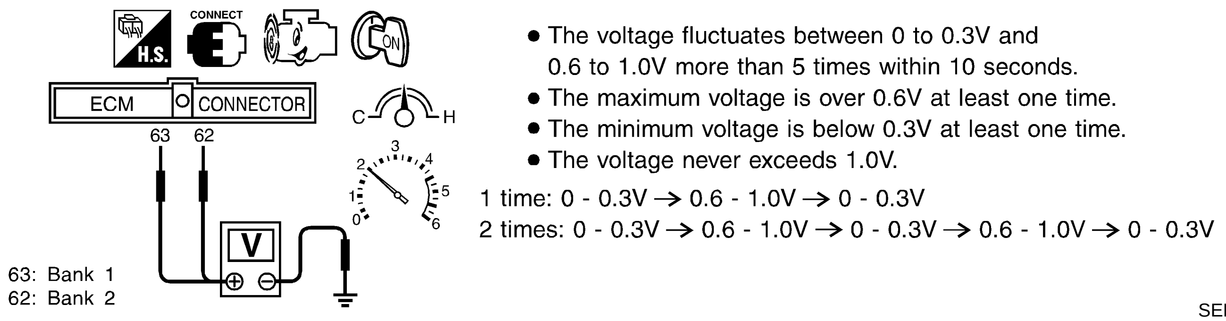
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

7	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left signal) and engine ground.
3. Check the following with engine speed held at 2,000 rpm constant under no load.



SEF967XA

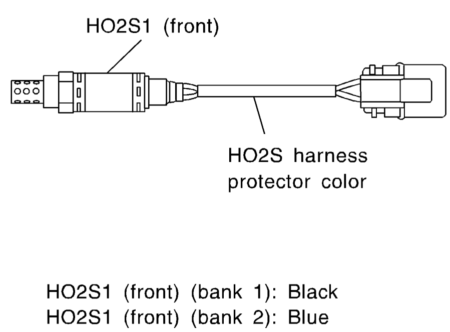
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



SEF505Y

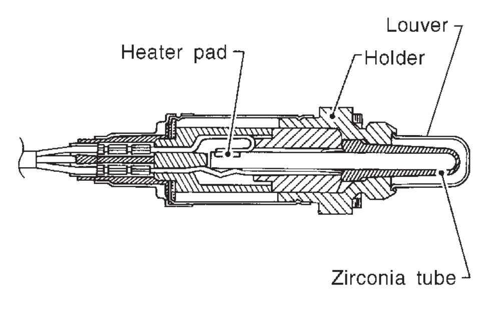
CAUTION:
Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

	▶	Replace malfunctioning heated oxygen sensor 1 (front).

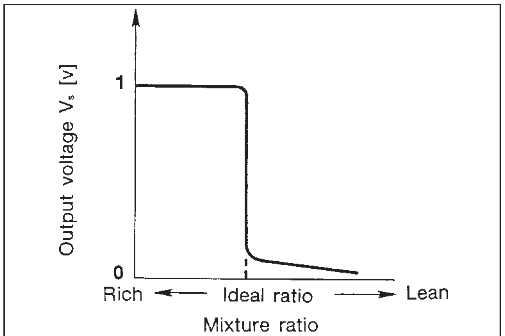
9	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.
For circuit, refer to "DTC P0130 (RIGHT BANK, -B1), P0150 (LEFT BANK, -B2) HEATED OXYGEN SENSOR 1 [HO2S1 (FRONT) (BANK 1)/(BANK 2)] (CIRCUIT)", EC-194.

	▶	**INSPECTION END**



SEF463R



SEF288D

Component Description

NAEC0108

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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

NAEC0109

Specification data are reference values.

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

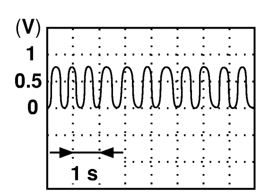
ECM Terminals and Reference Value

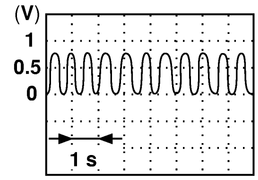
NAEC0655

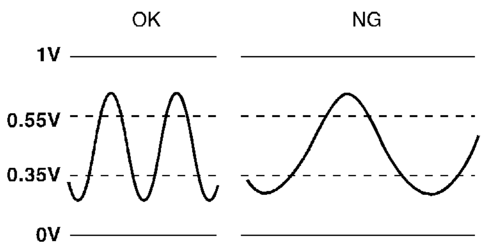
Specification data are reference values and are measured between each terminal and ground.

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)
63	G	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	G/B	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V



SEF010V

On Board Diagnosis Logic

NAEC0111

To judge the malfunction of heated oxygen sensor 1 (front), this diagnosis measures response time of heated oxygen sensor 1 (front) signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 (front) temperature index. Judgment is based on whether the compensated time [heated oxygen sensor 1 (front) cycling time index] is inordinately long or not.
Malfunction is detected when the response of the voltage signal from the sensor takes more than the specified time.

Possible Cause

NAEC0435

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)
- Fuel pressure
- Injectors
- Intake air leaks
- Exhaust gas leaks
- PCV valve
- Mass air flow sensor

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

DTC Confirmation Procedure

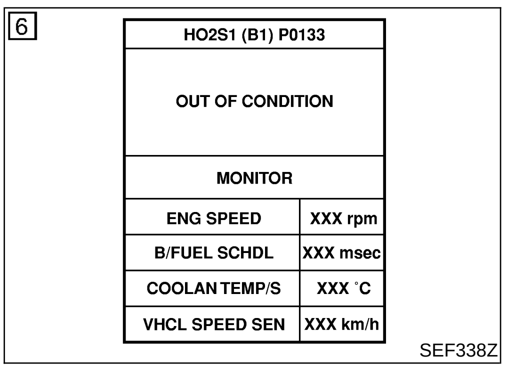
NAEC0112

CAUTION:
Always drive vehicle at a safe speed.

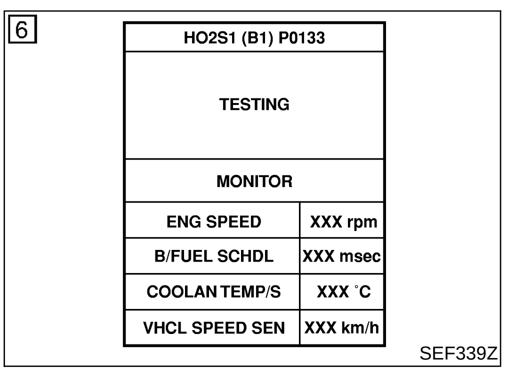
NOTE:
If "DTC Confirmation Procedure" has been previously conducted, always turn ignition switch "OFF" and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

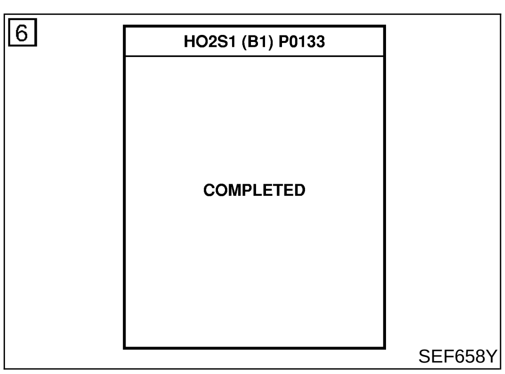
- **Always perform at a temperature above −10°C (14°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**



SEF338Z



SEF339Z



SEF658Y

WITH CONSULT-II

NAEC0112S01

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)/(B2) P0133/ P0153" 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.

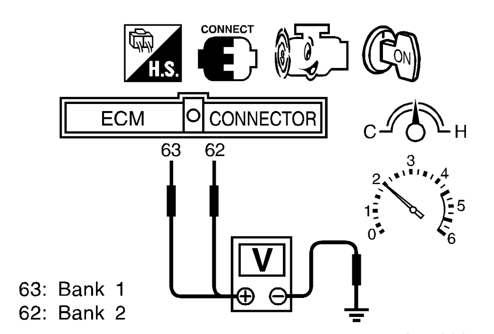
NOTE:
Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.

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 40 to 50 seconds.)

ENG SPEED	1,600 - 3,100 rpm (A/T) 1,800 - 3,100 rpm (M/T)
Vehicle speed	80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL	5 - 12 msec (A/T) 5 - 15 msec (M/T)
Selector lever	Suitable position

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-226.



SEF308XB

Overall Function Check

NAEC0113

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

WITH GST

NAEC0113S01

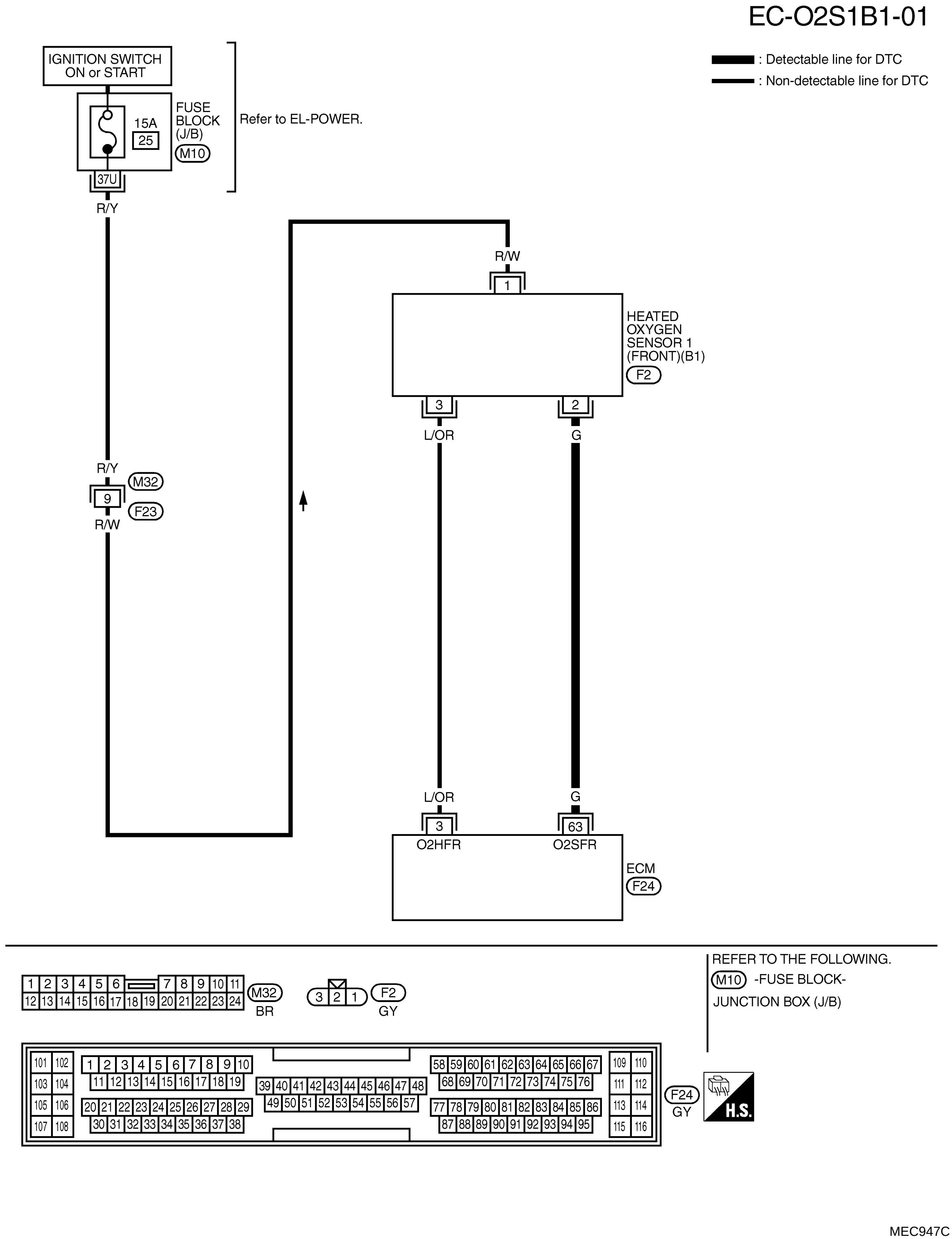
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left signal) and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.
- The voltage fluctuates between 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 “Diagnostic Procedure”, EC-226.

Wiring Diagram

NAEC0114

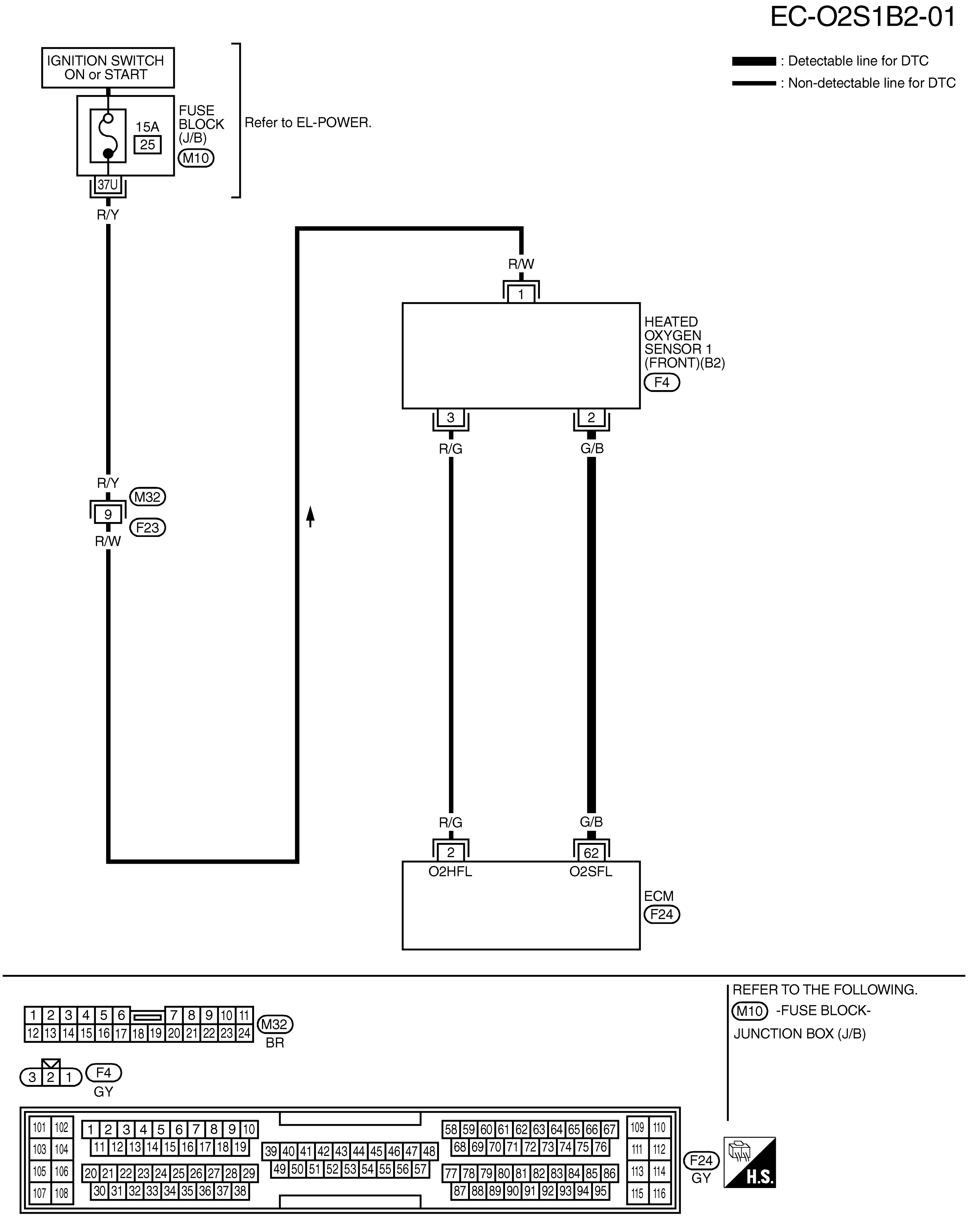
RIGHT BANK

NAEC0114S01



LEFT BANK

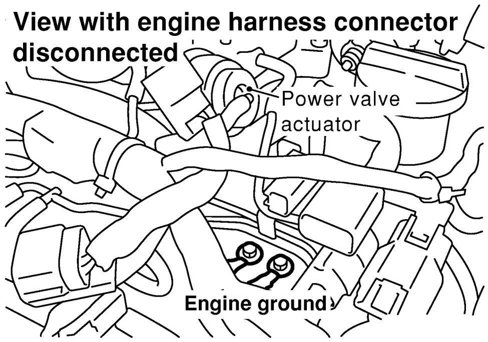
NAEC0114S02



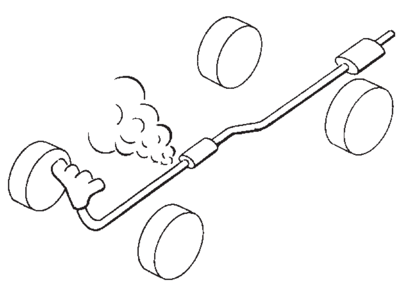
MEC948C

Diagnostic Procedure

NAEC0115

1	RETIGHTEN GROUND SCREWS
1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.  SEF959Y	
▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)
Loosen and retighten corresponding heated oxygen sensor 1 (front). **Tightening torque:** **40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)**	
▶	GO TO 3.

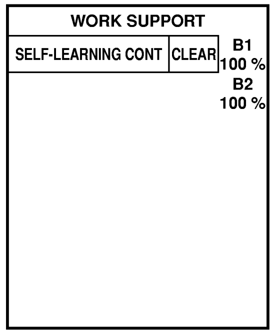
3	CHECK FOR EXHAUST AIR LEAK
1. Start engine and run it at idle. 2. Listen for an exhaust air leak before three way catalyst.  SEF099P **OK or NG**	
OK ▶	GO TO 4.
NG ▶	Repair or replace.

4	CHECK FOR INTAKE AIR LEAK
Listen for an intake air leak after the mass air flow sensor. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	Repair or replace.

5	CLEAR THE SELF-LEARNING DATA

With CONSULT-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”.



SEF968Y

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

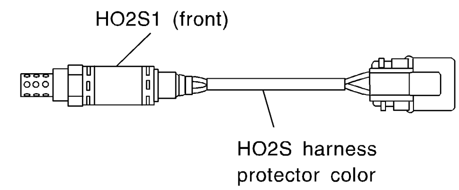
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-73.
7. Make sure 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-296, 304.
No	▶	GO TO 6.

6 CHECK HO2S1 (FRONT) HARNESS PROTECTOR COLOR

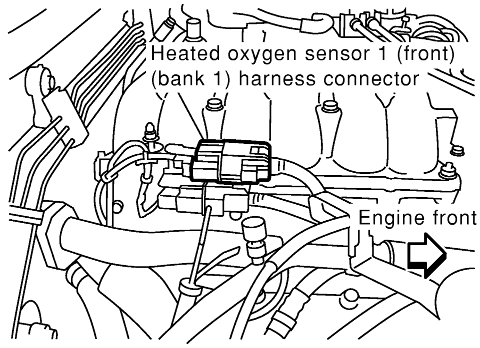
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector.



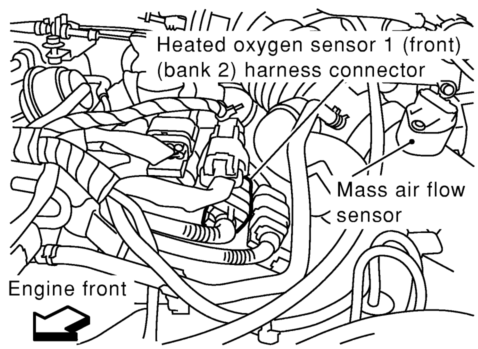
HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.



SEF965Y



SEF966Y

▶ GO TO 7.

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

7	CHECK HO2S1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal and front HO2S terminal as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0133	63	2	Bank 1 (Right)
P0153	62	2	Bank 2 (Left)

MTBL0473

Continuity should exist.

3. Check harness continuity between ECM terminal or FRONT HO2S terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0133	63 or 2	Ground	Bank 1 (Right)
P0153	62 or 2	Ground	Bank 2 (Left)

MTBL0474

Continuity should not exist.

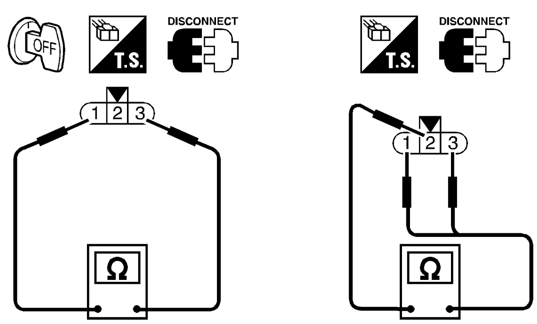
4. Also check harness for short to power.

OK or NG

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

8	CHECK HEATED OXYGEN SENSOR 1 HEATER (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
1 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 2 and 3	∞Ω (Continuity should not exist.)

SEF969Y

CAUTION:

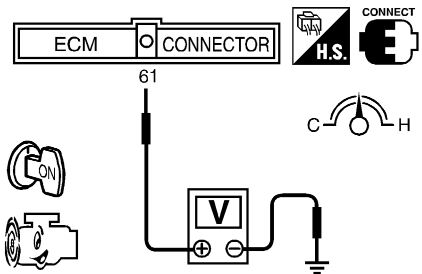
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 13.

9 CHECK 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 61 (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.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

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

SEF298X

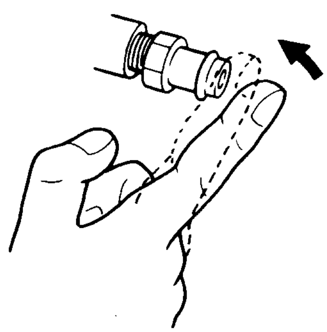
4. If the voltage is out of specification, disconnect mass air flow sensor harness connector and connect it again. Then repeat above check.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace mass air flow sensor.

10 CHECK PCV VALVE

1. Install all removed parts.
2. Start engine and let it idle.
3. Remove PCV valve ventilation hose from PCV valve.
4. Make sure that a hissing noise will be heard as air passes through it and a strong vacuum should be felt immediately when a finger is placed over valve inlet.



SEC137A

OK or NG

OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Replace PCV valve.

11	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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
COOLAN TEMP/S	XXX ˚C
HO2S1 (B1)	XXX V
HO2S2 (B2)	XXX V

SEF967Y

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 below.

```
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
```

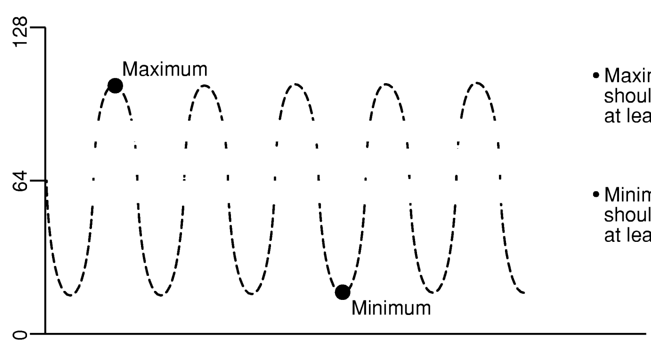
R means HO2S1 MNTR (B1)/(B2) indicates RICH

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

SEF647Y

- "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



- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.30V at least one time.

SEF648Y

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.

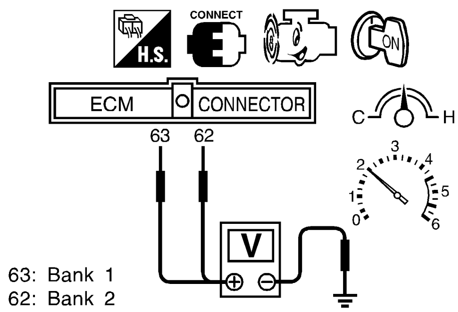
OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left 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 → 0 - 0.3V

SEF967XA

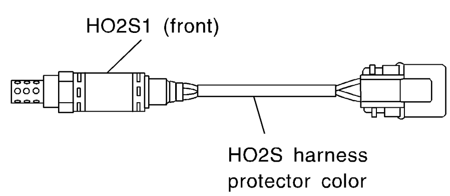
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK ▶	GO TO 14.
NG ▶	GO TO 13.

13	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

▶	Replace malfunctioning heated oxygen sensor 1 (front).

14	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**

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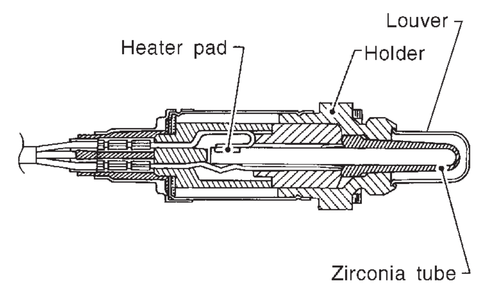
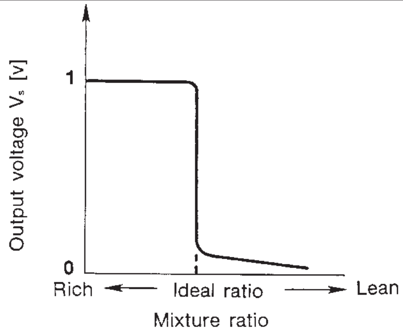
IDX

Component Description

NAEC0116



SEF463R



SEF288D

The heated oxygen sensor 1 (front) is placed into the front tube. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 (front) 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 (front) 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

NAEC0117

Specification data are reference values.

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

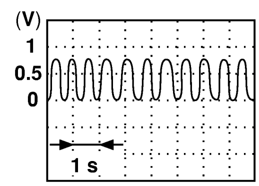
ECM Terminals and Reference Value

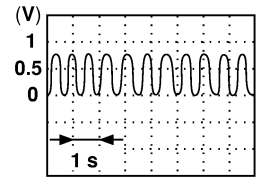
NAEC0656

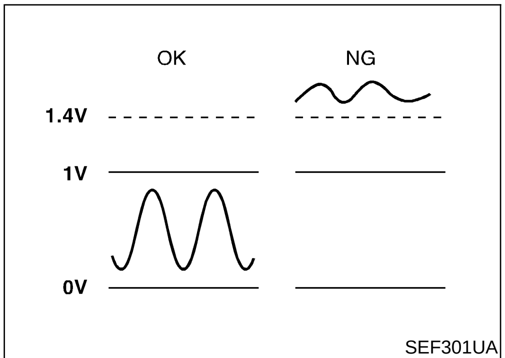
Specification data are reference values and are measured between each terminal and ground.

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)
63	G	Heated oxygen sensor 1 (front) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
62	G/B	Heated oxygen sensor 1 (front) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V (Periodically change)  SEF059V



SEF301UA

On Board Diagnosis Logic

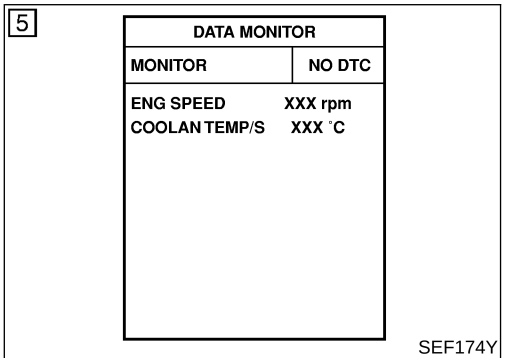
NAEC0119

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 (front) output is not inordinately high.
Malfunction is detected when an excessively high voltage from the sensor is sent to ECM.

Possible Cause

NAEC0436

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 1 (front)



SEF174Y

DTC Confirmation Procedure

NAEC0120

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

NAEC0120S01

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 25 seconds.
6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-238.

GST WITH GST

NAEC0120S02

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 25 seconds.
4) Turn ignition switch "OFF" and wait at least 10 seconds.
5) Restart engine and let it idle for 25 seconds.
6) Select "MODE 3" with GST.
7) If DTC is detected, go to "Diagnostic Procedure", EC-238.

- **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.**

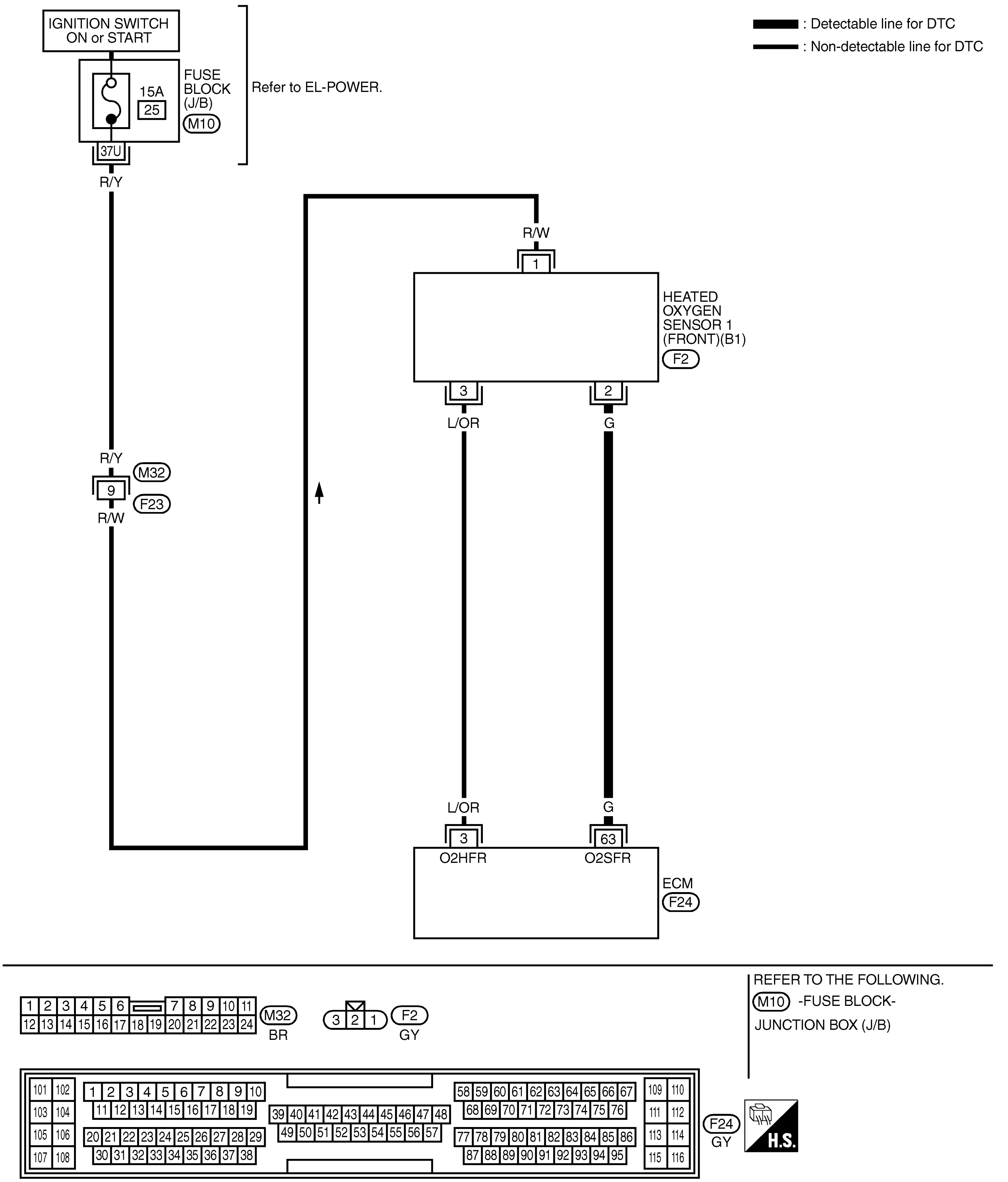
Wiring Diagram

NAEC0121

RIGHT BANK

NAEC0121S01

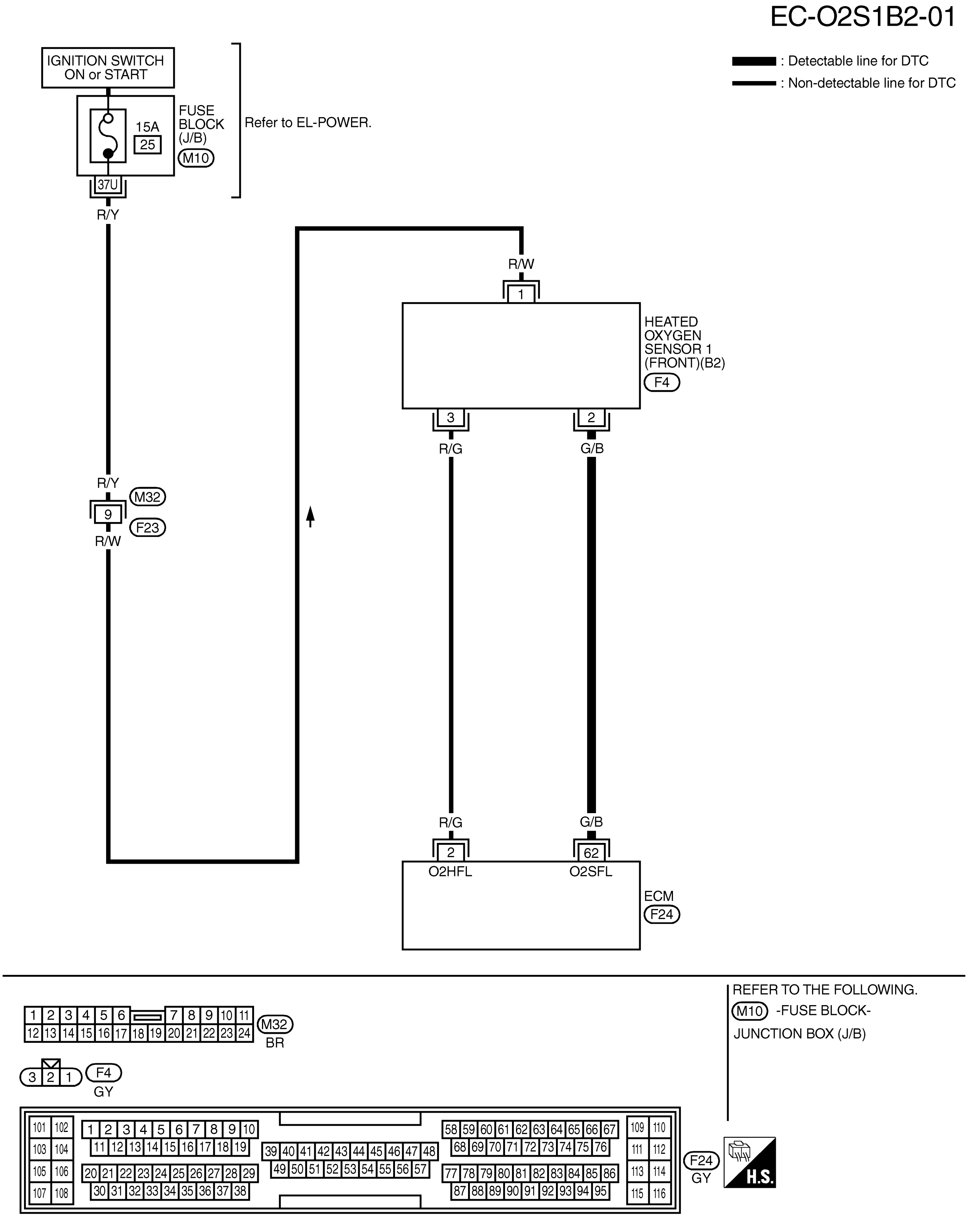
EC-O2S1B1-01



MEC947C

LEFT BANK

NAEC0121S02



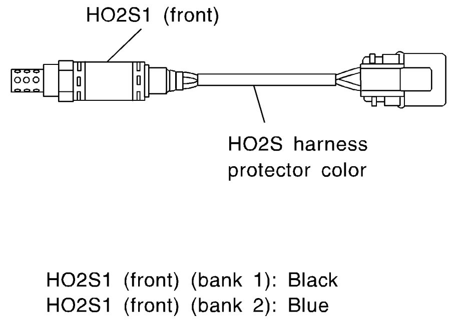
MEC948C

Diagnostic Procedure

NAEC0122

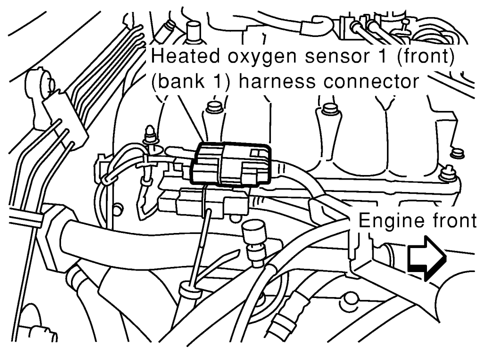
1	INSPECTION START

1. Turn ignition switch “OFF”.
2. Check heated oxygen sensor 1 (front) harness protector color.

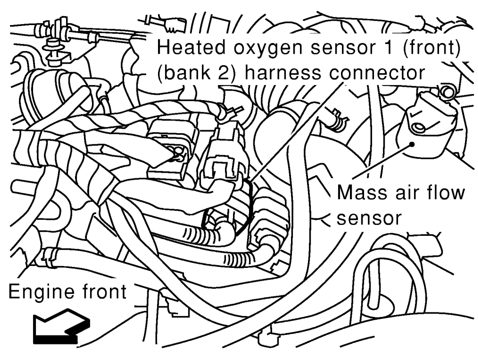


SEF505Y

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.



SEF965Y



SEF966Y

▶	GO TO 2.

2	RETIGHTEN HEATED OXYGEN SENSOR 1 (FRONT)

Loosen and retighten corresponding heated oxygen sensor 1 (front).

Tightening torque:

40 - 60 N·m (4.1 - 6.1 kg-m, 30 - 44 ft-lb)

▶	GO TO 3.

3	CHECK HO2S1 (FRONT) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Terminals		Bank
	ECM	Sensor	
P0134	63	2	Bank 1 (Right)
P0154	62	2	Bank 2 (Left)

MTBL0475

Continuity should exist.

3. Check harness continuity between ECM terminal or HO2S1 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0134	63 or 2	Ground	Bank 1 (Right)
P0154	62 or 2	Ground	Bank 2 (Left)

MTBL0476

Continuity should not exist.

4. 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 HO2S1 (FRONT) CONNECTOR FOR WATER

1. Disconnect heated oxygen sensor 1 (front) harness connector.
2. Check connectors for water.
   Water should not exist.

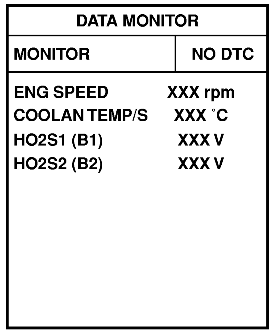
OK or NG

OK (With CONSULT-II) ▶	GO TO 5.
OK (Without CONSULT-II) ▶	GO TO 6.
NG ▶	Repair or replace harness or connectors.

5 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

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.



SEF967Y

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 left:

```
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
```

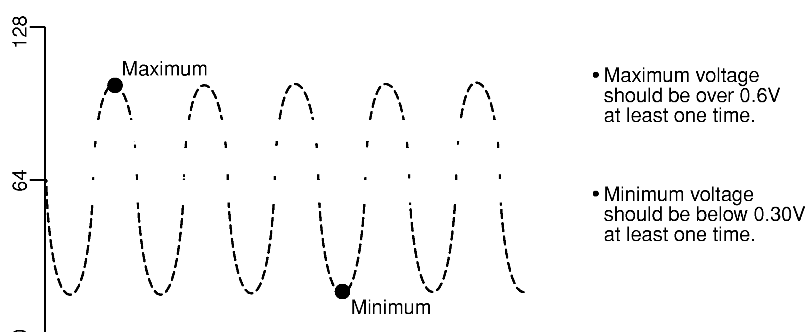
R means HO2S1 MNTR (B1)/(B2) indicates RICH

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

SEF647Y

- "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

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.

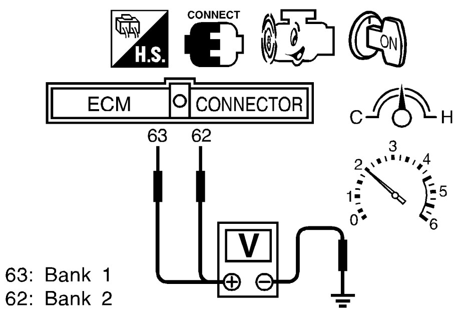
OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

6 CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left 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 → 0 - 0.3V

SEF967XA

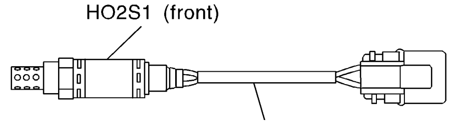
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK ▶	GO TO 8.
NG ▶	GO TO 7.

7 REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

CAUTION:
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.

▶	Replace malfunctioning heated oxygen sensor 1 (front).

8 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**

Description

NAEC0123

SYSTEM DESCRIPTION

NAEC0123S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater (front) control	Heated oxygen sensor 1 heaters (front)
Crankshaft position sensor (REF)			

The ECM performs ON/OFF control of the heated oxygen sensor 1 heaters (front) corresponding to the engine speed.

OPERATION

NAEC0123S02

Engine speed rpm	Heated oxygen sensor 1 heaters (front)
Above 3,600	OFF
Below 3,600	ON

CONSULT-II Reference Value in Data Monitor Mode

NAEC0124

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S1 HTR (B1) HO2S1 HTR (B2)	● Engine speed: Below 3,600 rpm	ON
	● Engine speed: Above 3,600 rpm	OFF

ECM Terminals and Reference Value

NAEC0657

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)
3	L/OR	Heated oxygen sensor 1 heater (front) (bank 1)	**[Engine is running]** ● Engine speed is below 3,600 rpm.	0 - 1.0V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
2	R/G	Heated oxygen sensor 1 heater (front) (bank 2)	**[Engine is running]** ● Engine speed is below 3,600 rpm.	0 - 1.0V
			[Engine is running] ● Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

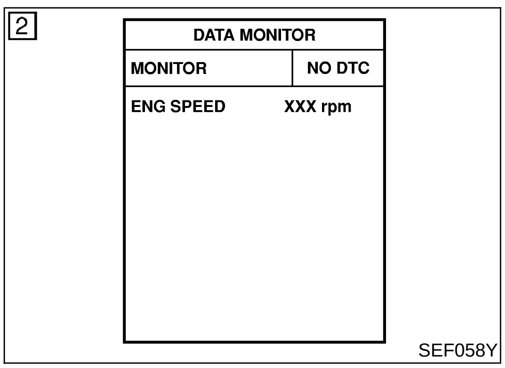
NAEC0126

Malfunction is detected when the current amperage in the heated oxygen sensor 1 heater (front) circuit is out of the normal range.
[An improper voltage drop signal is sent to ECM through the heated oxygen sensor 1 heater (front).]

Possible Cause

NAEC0437

- Harness or connectors
  (The heated oxygen sensor 1 heater (front) circuit is open or shorted.)
- Heated oxygen sensor 1 heater (front)



DTC Confirmation Procedure

NAEC0127

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.

WITH CONSULT-II

NAEC0127S01

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 6 seconds at idle speed.
3) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-246.

WITH GST

NAEC0127S02

1) Start engine and run it for at least 6 seconds at idle speed.
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) Select "MODE 3" with GST.
5) If DTC is detected, go to "Diagnostic Procedure", EC-246.

- **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.**

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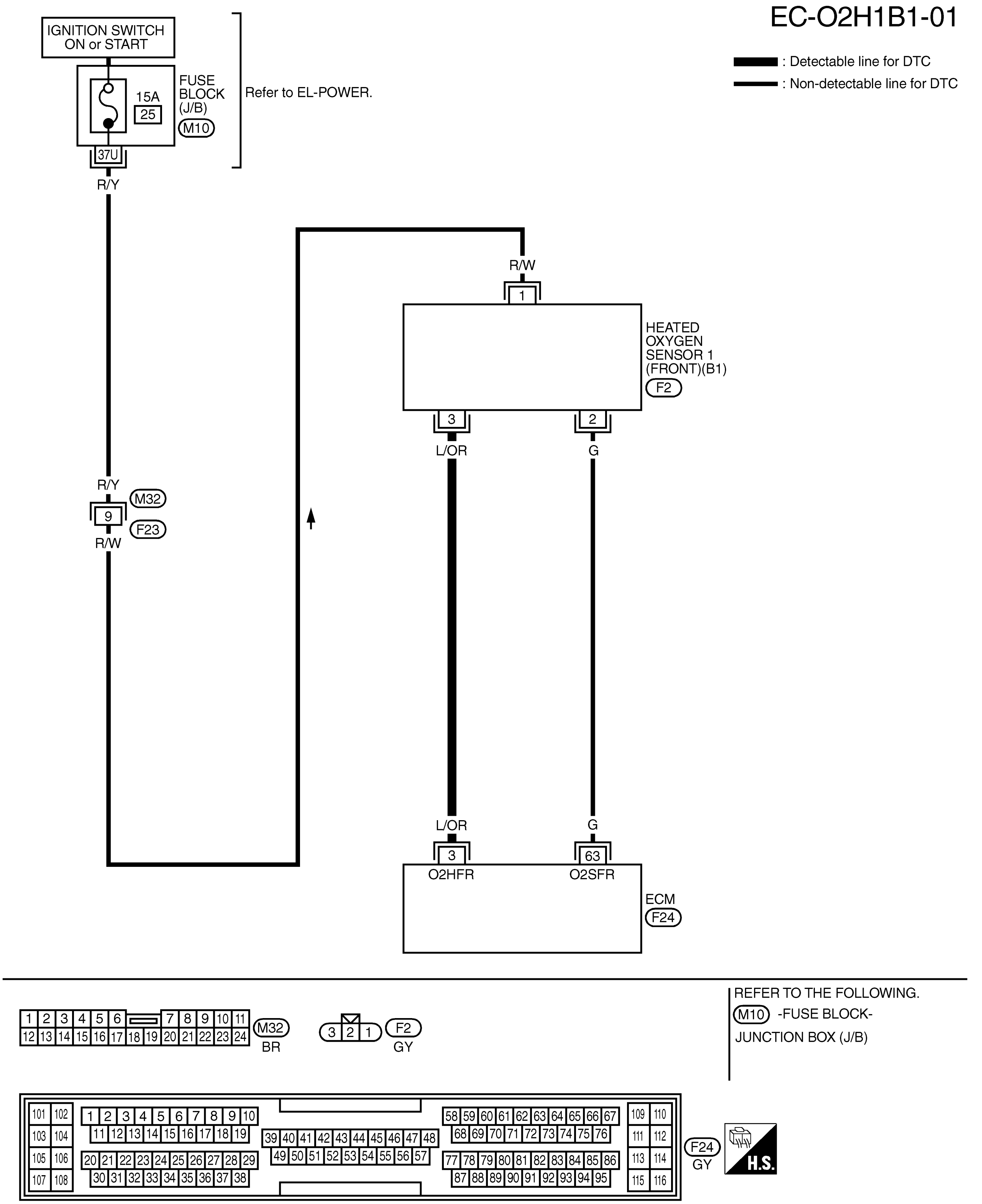
Wiring Diagram

NAEC0128

RIGHT BANK

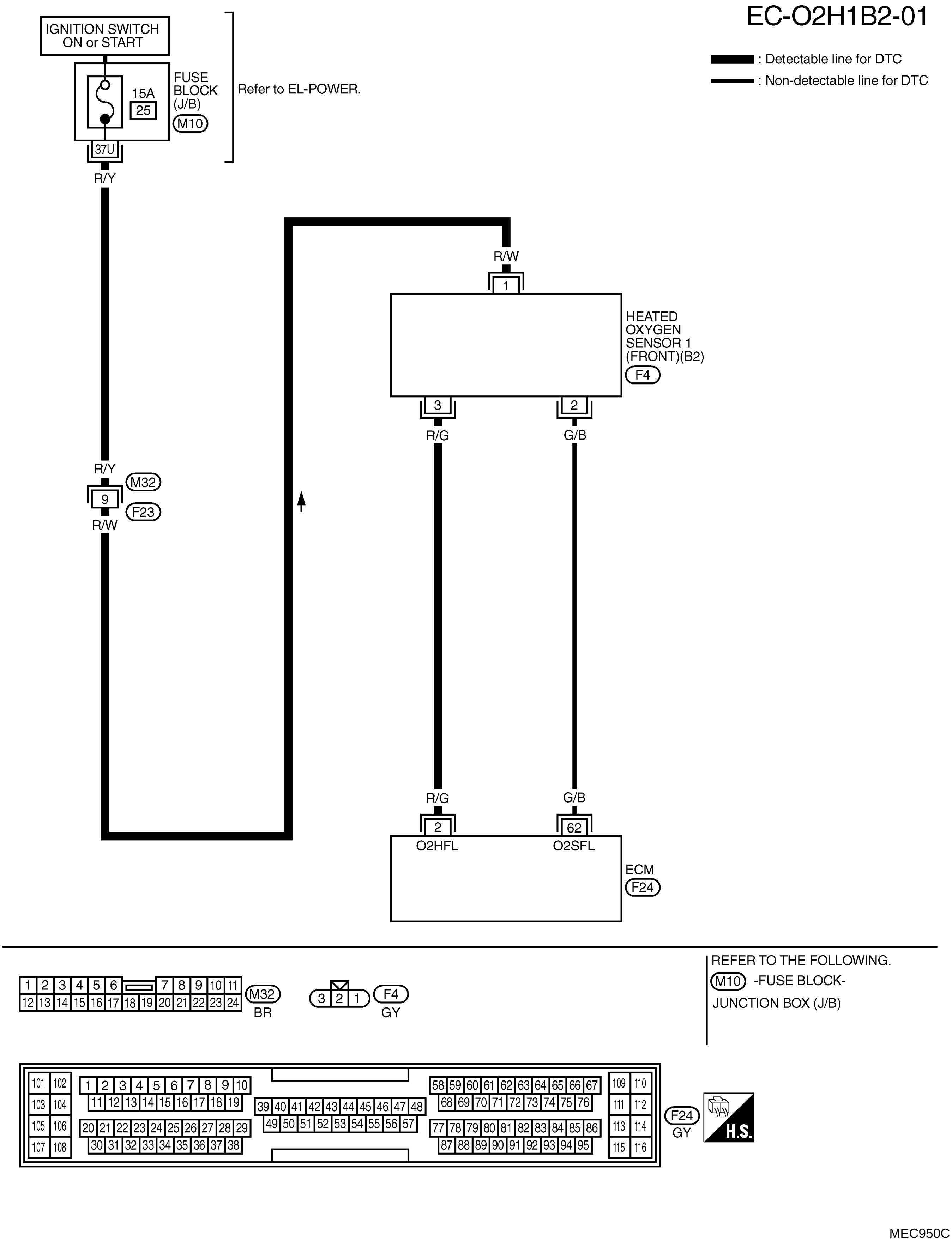
NAEC0128S01



MEC949C

LEFT BANK

NAEC0128S02

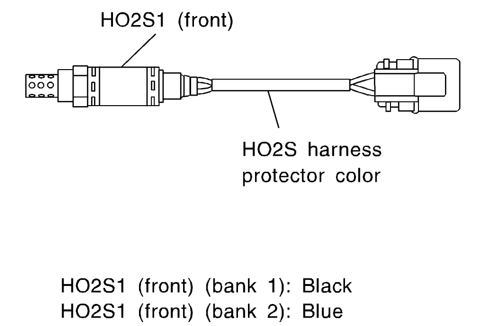


Diagnostic Procedure

NAEC0129

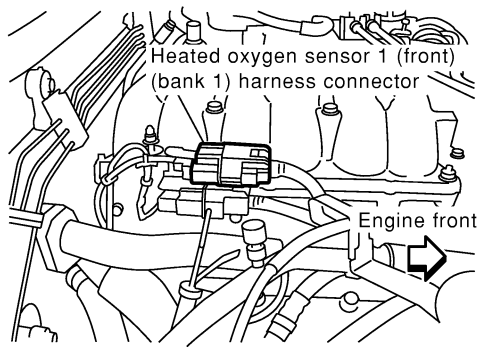
1	CHECK HO2S1 (FRONT) POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.

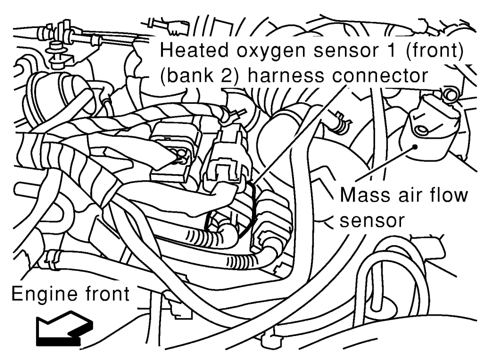


SEF505Y

3. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.

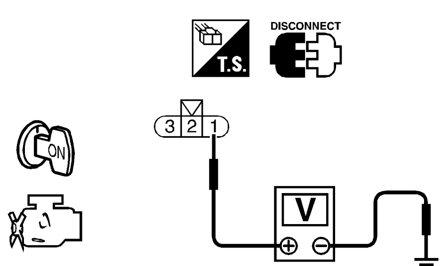


SEF965Y



SEF966Y

4. Turn ignition switch "ON".
5. Check voltage between HO2S1 (front) terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF970Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- Fuse block (J/B) connector M10
- 15A fuse
- Harness for open or short between heated oxygen sensor 1 (front) and fuse

▶	Repair harness or connectors.

3	CHECK HO2S1 (FRONT) OUTPUT 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	
P0135	3	3	Bank 1 (Right)
P0155	2	3	Bank 2 (Left)

MTBL0520

Continuity should exist.

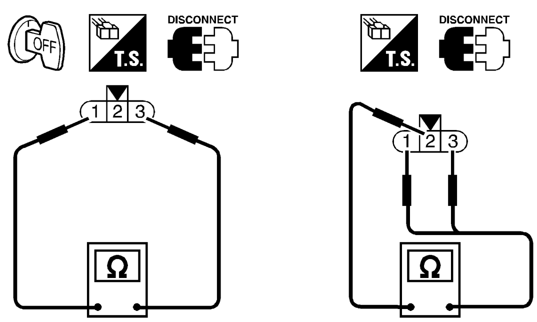
4. Also check harness for short to ground and short to power.

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 (FRONT)

Check resistance between HO2S1 (front) terminals as follows.



Terminals	Resistance
1 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2 2 and 3	∞Ω (Continuity should not exist.)

SEF969Y

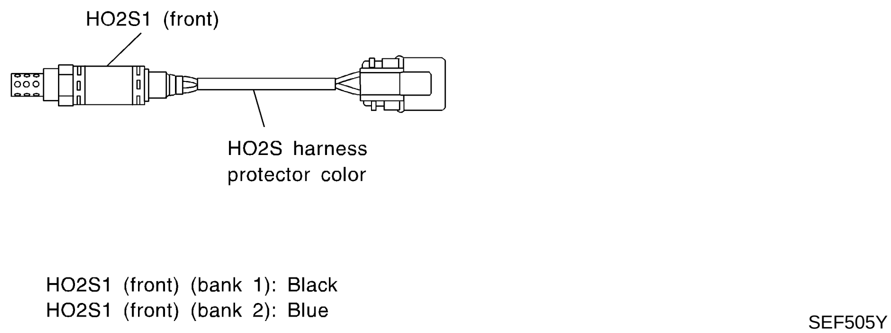
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



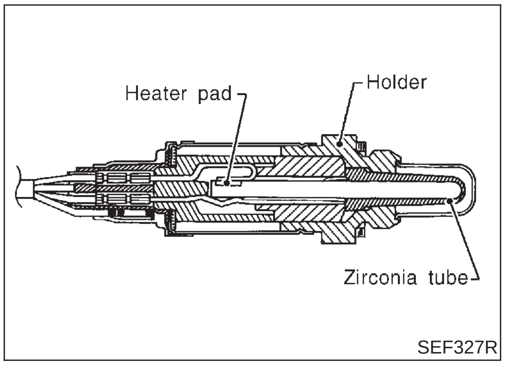
CAUTION:
Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12 and approved anti-seize lubricant.

▶	Replace malfunctioning heated oxygen sensor 1 (front).

6	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**



SEF327R

Component Description

NAEC0130

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

CONSULT-II Reference Value in Data Monitor Mode

NAEC0131

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

ECM Terminals and Reference Value

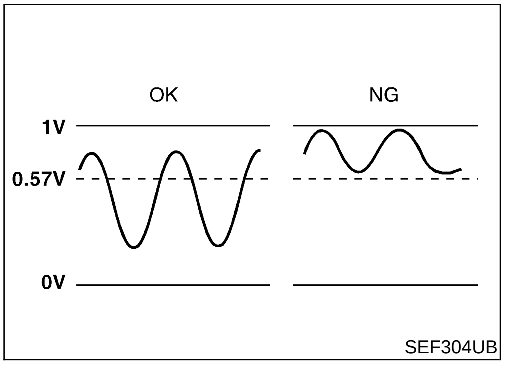
NAEC0658

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)
72	OR	Heated oxygen sensor 2 (rear) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
71	OR/L	Heated oxygen sensor 2 (rear) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V



SEF304UB

On Board Diagnosis Logic

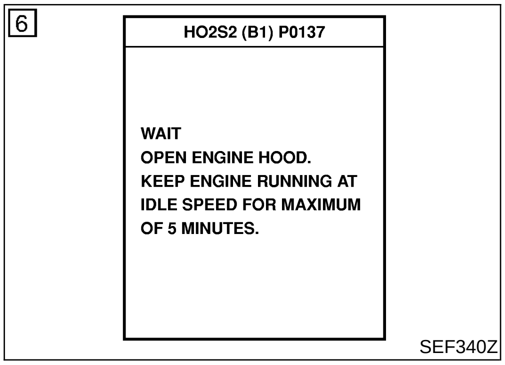
NAEC0133

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the minimum voltage of sensor is sufficiently low during the various driving condition such as fuel-cut.
Malfunction is detected when the minimum voltage from the sensor is not reached to the specified voltage.

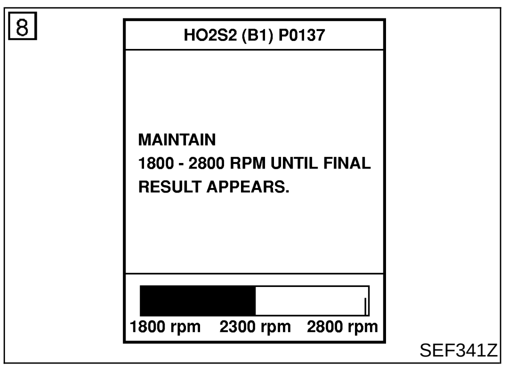
Possible Cause

NAEC0438

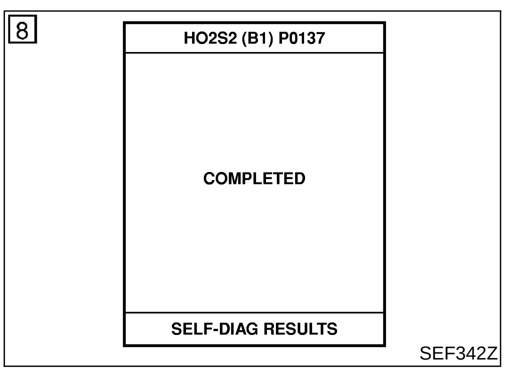
- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors



SEF340Z



SEF341Z



SEF342Z

DTC Confirmation Procedure

NAEC0134

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.

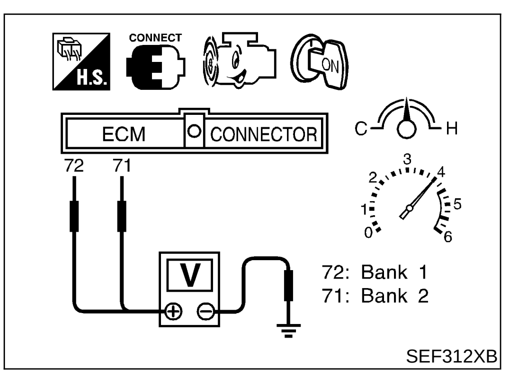
TESTING CONDITION:
Open engine hood before conducting following procedure.

WITH CONSULT-II

NAEC0134S01

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) Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
6) Select “HO2S2 (B1)/(B2) P0137/P0157” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
7) Start engine and follow the instruction of CONSULT-II.
8) Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If NG is displayed, refer to “Diagnostic Procedure”, EC-254.
   If “CANNOT BE DIAGNOSED” is displayed, perform the following.

a) Stop engine and cool down until “COOLAN TEMP/S” indicates less than 70°C (158°F).
b) Turn ignition switch “ON”.
c) Select “DATA MONITOR” mode with CONSULT-II.
d) Start engine.
e) Return to step 6 again when the “COOLAN TEMP/S” reaches to 70°C (158°F).



SEF312XB

Overall Function Check

NAEC0135

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NAEC0135S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank

1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.

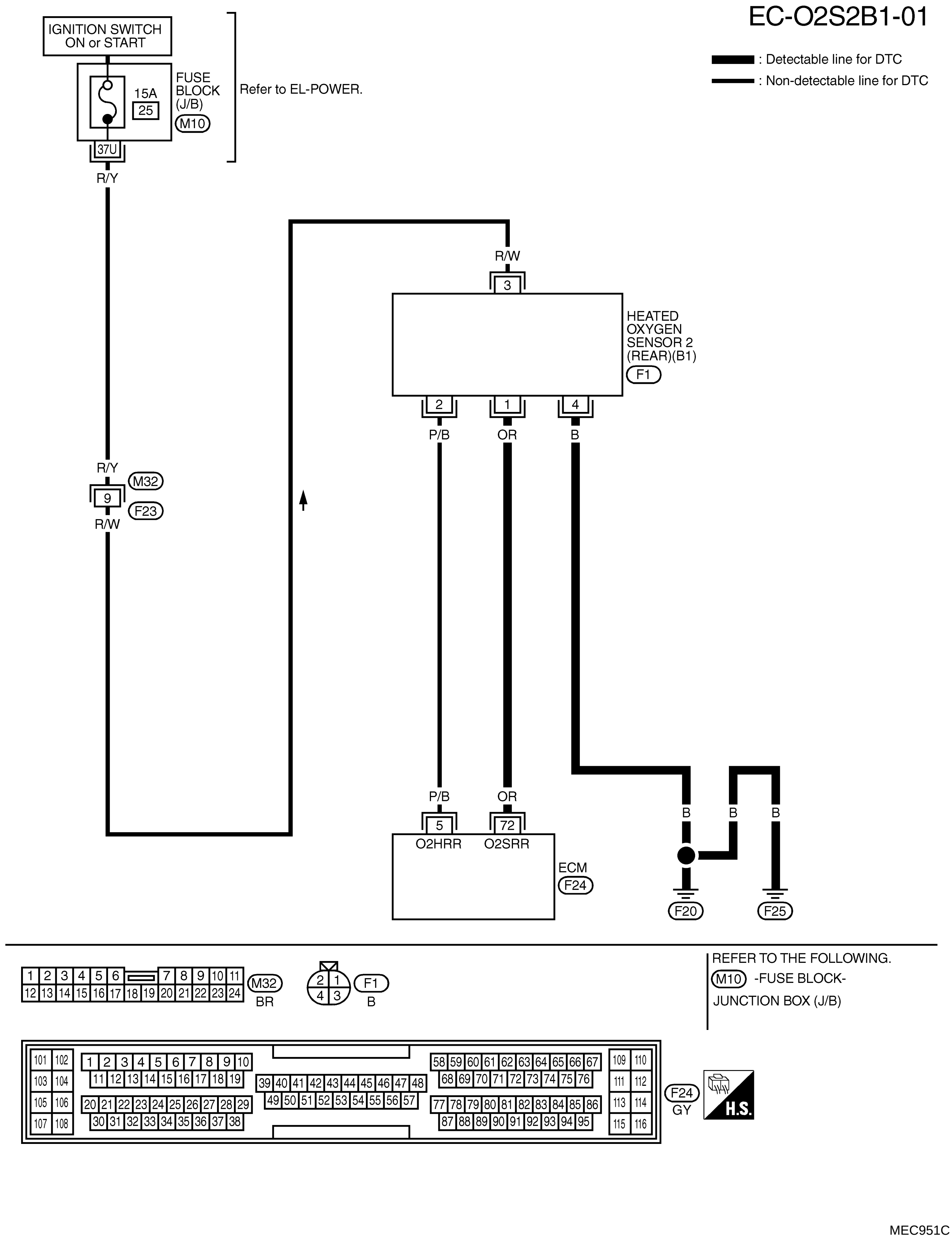
4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be below 0.57V at least once during this procedure.
If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should be below 0.57V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-254.

Wiring Diagram

=NAEC0136

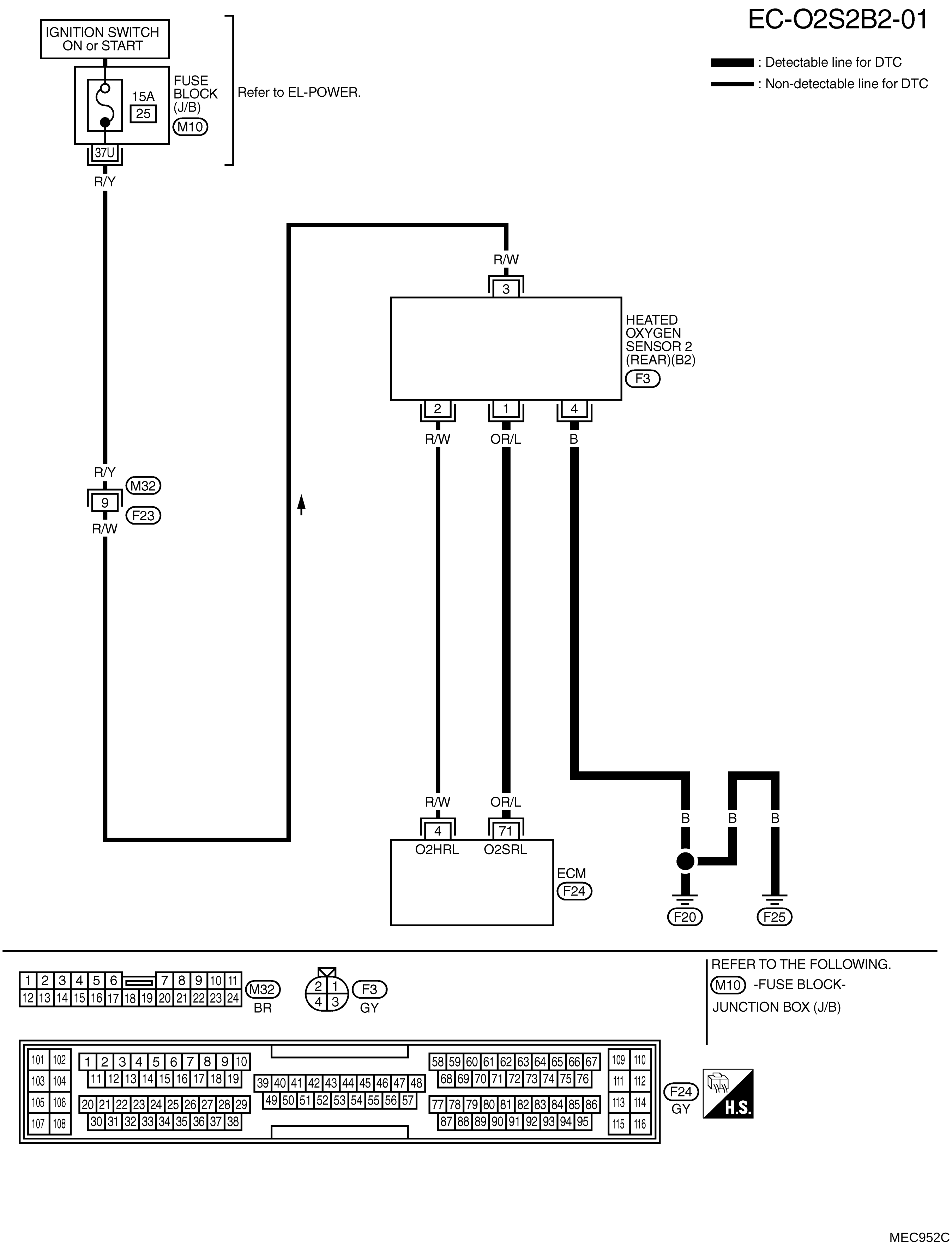
RIGHT BANK

NAEC0136S01



LEFT BANK

NAEC0136S02

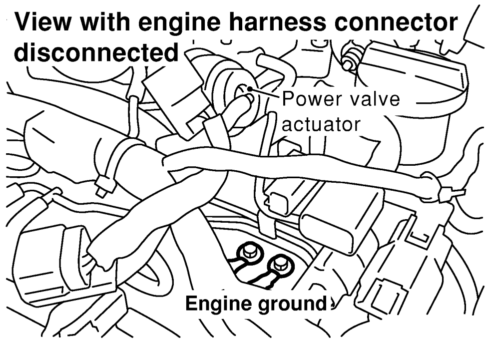


Diagnostic Procedure

NAEC0137

1	RETIGHTEN GROUND SCREWS

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



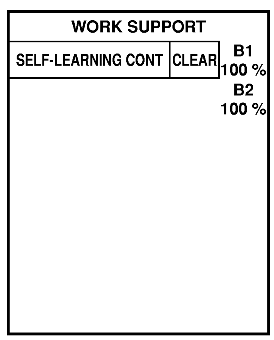
SEF959Y

▶	GO TO 2.

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”.



SEF968Y

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

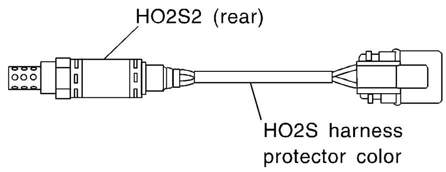
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-73.
7. Make sure 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-304.
No	▶	GO TO 3.

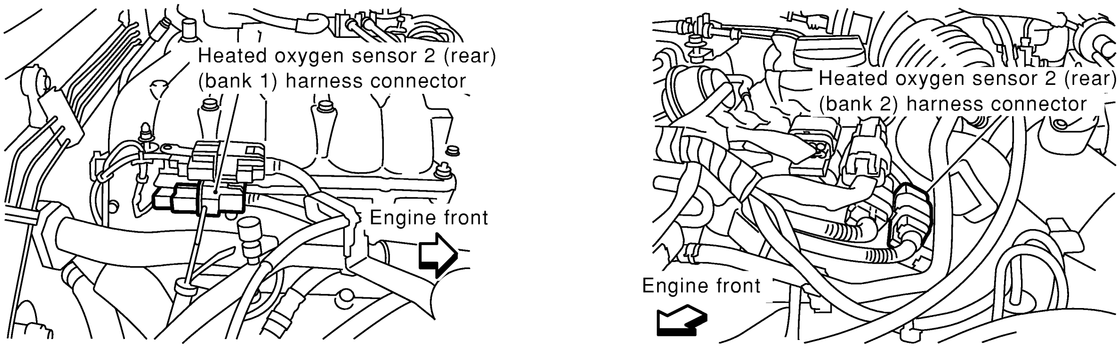
3	CHECK HO2S2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



SEF372Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF971Y

4. Disconnect ECM harness connector.
5. Check harness continuity between ECM terminal and rear HO2S terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	72	1	Bank 1 (Right)
P0157	71	1	Bank 2 (Left)

MTBL0521

Continuity should exist.

6. Check harness continuity between ECM terminal or HO2S2 terminal and ground as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0137	72 or 1	Ground	Bank 1 (Right)
P0157	71 or 1	Ground	Bank 2 (Left)

MTBL0522

Continuity should not exist.

7. 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 HO2S2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

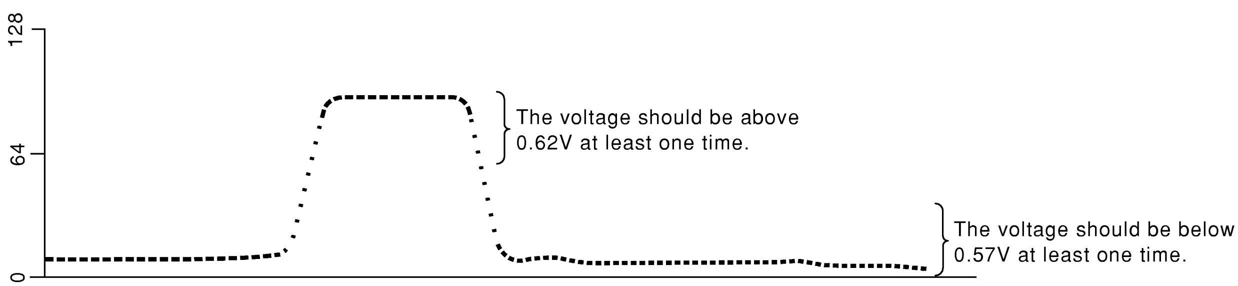
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF972Y

"HO2S2 (B1)/(B2)" should be above 0.62V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.57V 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.

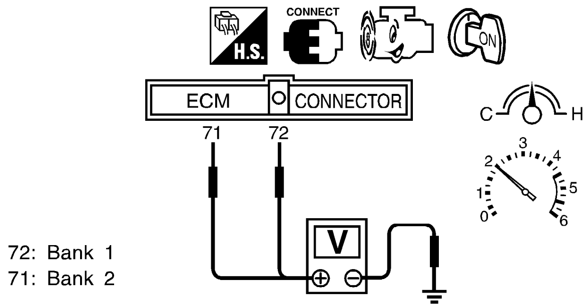
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.
4. Check the voltage when rewing 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 0.62V at least once during this procedure.

SEF313XA

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

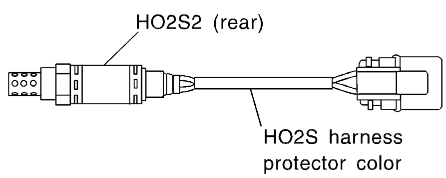
Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should go below 0.57V at least once during this procedure.
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignitioin switch OFF.
2. Check heated oxygen sensor 2 (rear) harness protector color.



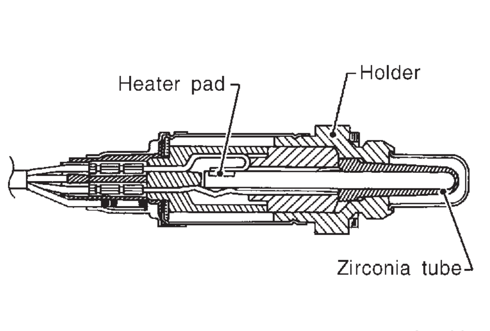
HO2S2 (rear) (bank 1): White or Gray
HO2S2 (rear) (bank 2): Red or Red/Brown

SEF372Z

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

9	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



SEF327R

Component Description

NAEC0138

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

CONSULT-II Reference Value in Data Monitor Mode

NAEC0139

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

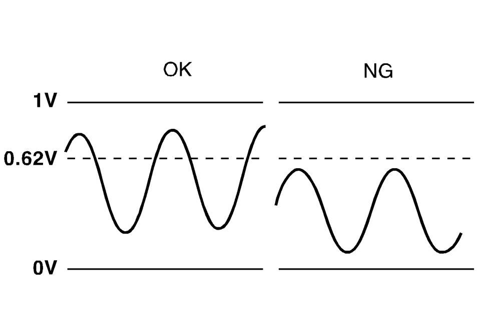
ECM Terminals and Reference Value

NAEC0659

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)
72	OR	Heated oxygen sensor 2 (rear) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
71	OR/L	Heated oxygen sensor 2 (rear) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V



SEF303UB

On Board Diagnosis Logic

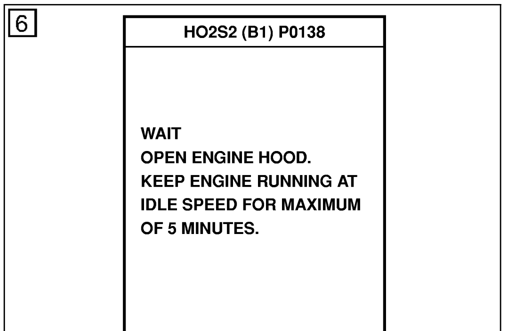
NAEC0141

The heated oxygen sensor 2 (rear) has a much longer switching time between rich and lean than the heated oxygen sensor 1 (front). The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2 (rear), ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.
Malfunction is detected when the maximum voltage from the sensor is not reached to the specified voltage.

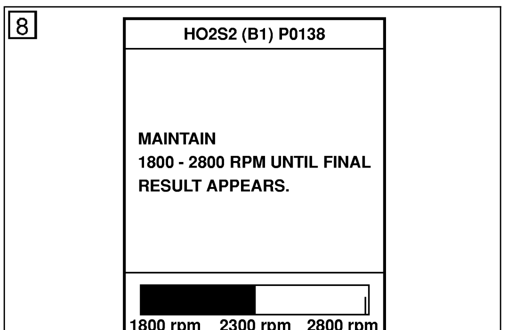
Possible Cause

NAEC0439

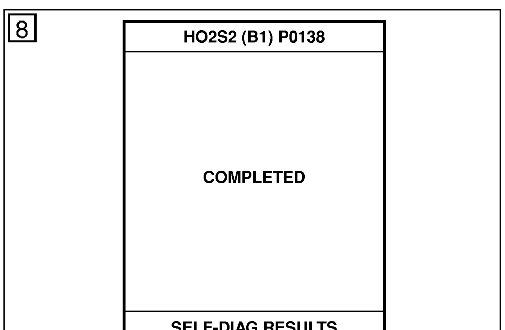
- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors
- Intake air leaks



SEF663Y



SEF664Y



SEF665Y

DTC Confirmation Procedure

NAEC0142

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.

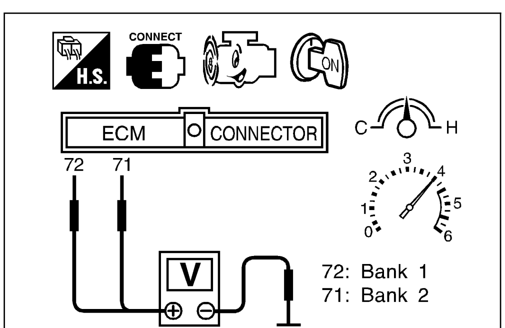
TESTING CONDITION:
Open engine hood before conducting following procedure.

WITH CONSULT-II

NAEC0142S01

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) Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
6) Select “HO2S2 (B1)/(B2) P0138/P0158” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
7) Start engine and follow the instruction of CONSULT-II.
8) Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If NG is displayed, refer to “Diagnostic Procedure”, EC-264.
   If “CANNOT BE DIAGNOSED” is displayed, perform the following.

a) Stop engine and cool down until “COOLAN TEMP/S” indicates less than 70°C (158°F).
b) Turn ignition switch “ON”.
c) Select “DATA MONITOR” mode with CONSULT-II.
d) Start engine.
e) Return to step 6 again when the “COOLAN TEMP/S” reaches to 70°C (158°F).



SEF312XB

Overall Function Check

NAEC0143

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NAEC0143S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank

1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.

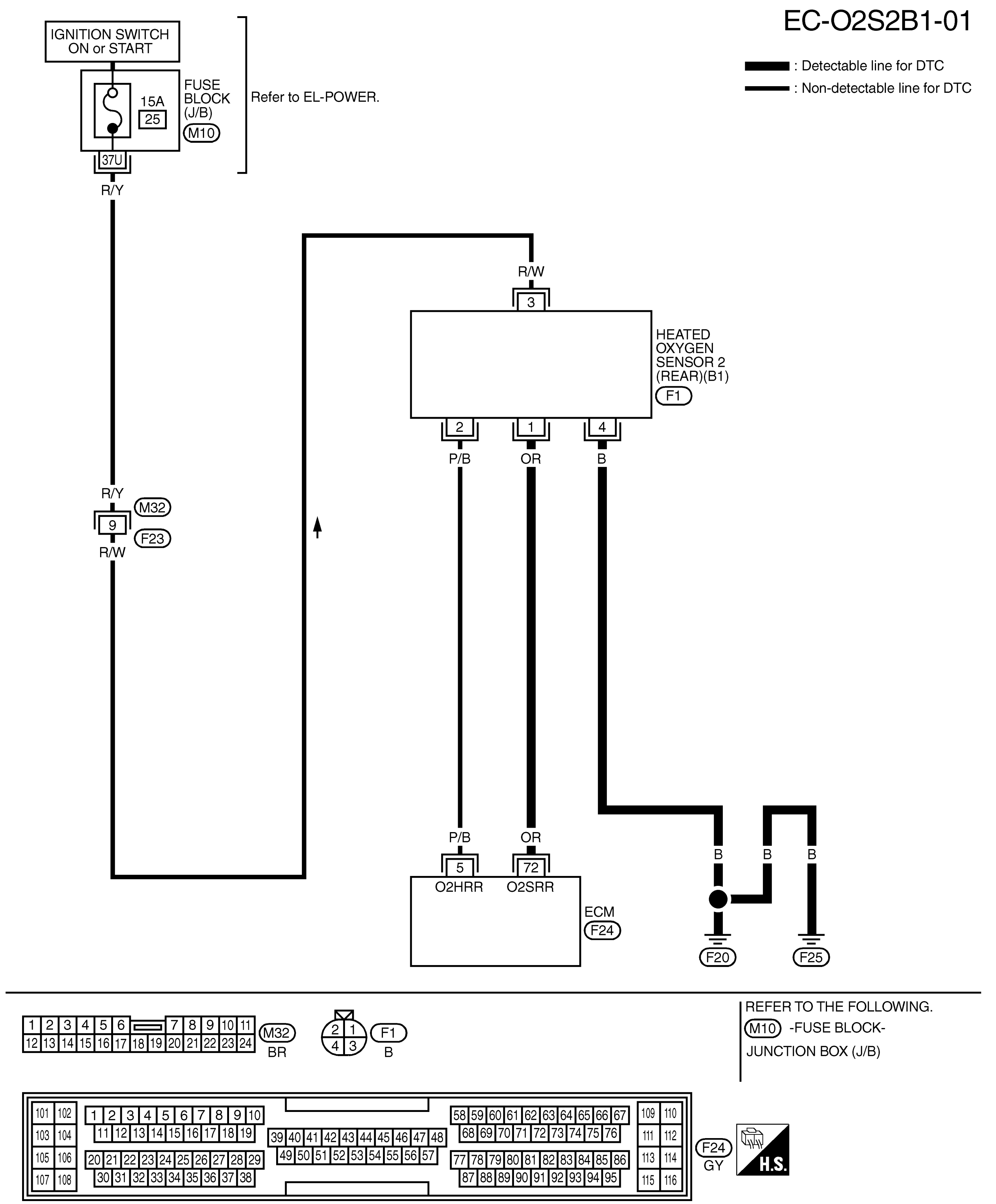
4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be above 0.62V at least once during this procedure.
If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should be above 0.62V at least once during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-264.

Wiring Diagram

=NAEC0144

RIGHT BANK

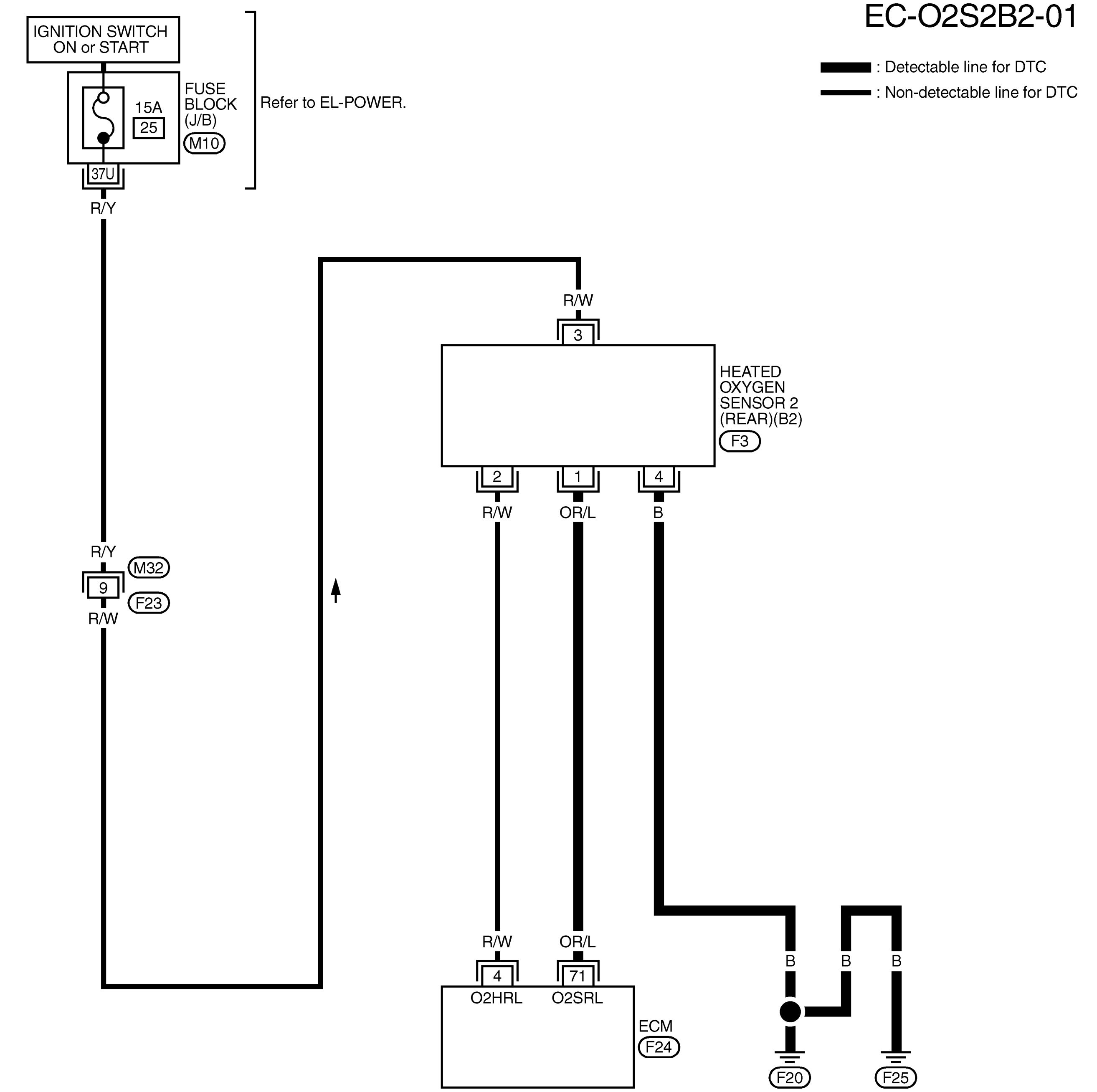
NAEC0144S01

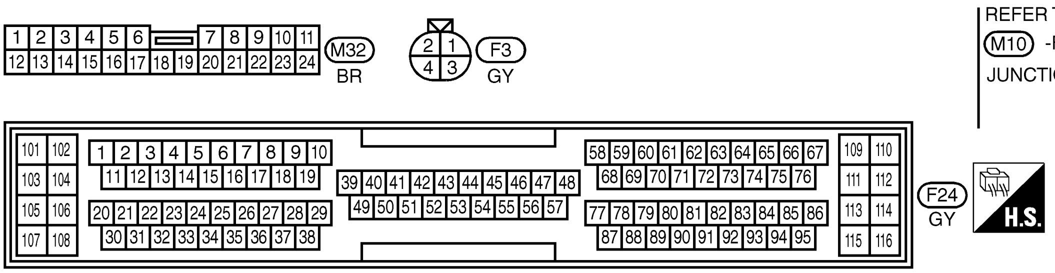


MEC951C

LEFT BANK

NAEC0144S02





REFER TO THE FOLLOWING.
M10 -FUSE BLOCK-
JUNCTION BOX (J/B)

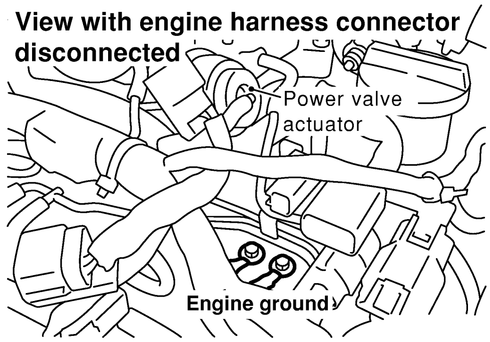
MEC952C

Diagnostic Procedure

NAEC0145

1 RETIGHTEN GROUND SCREWS

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



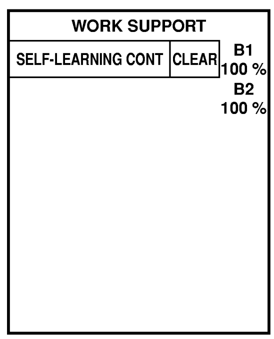
SEF959Y

▶ GO TO 2.

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".



SEF968Y

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

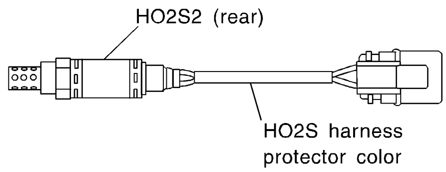
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC P0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION", EC-73.
7. Make sure 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-296.
No ▶	GO TO 3.

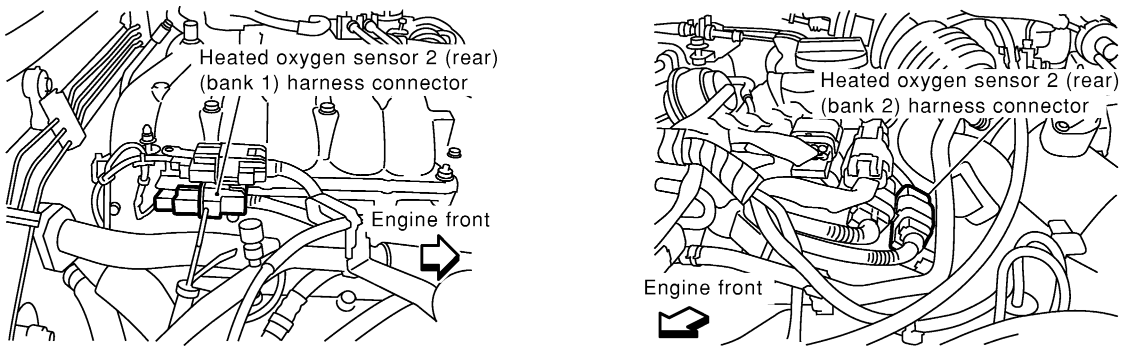
3	CHECK HO2S2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



SEF372Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF971Y

4. Disconnect ECM harness connector.
5. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	72	1	Bank 1 (Right)
P0158	71	1	Bank 2 (Left)

MTBL0523

Continuity should exist.

6. Check harness continuity between ECM terminal or HO2S2 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0138	72 or 1	Ground	Bank 1 (Right)
P0158	71 or 1	Ground	Bank 2 (Left)

MTBL0524

Continuity should not exist.

7. 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 HO2S2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

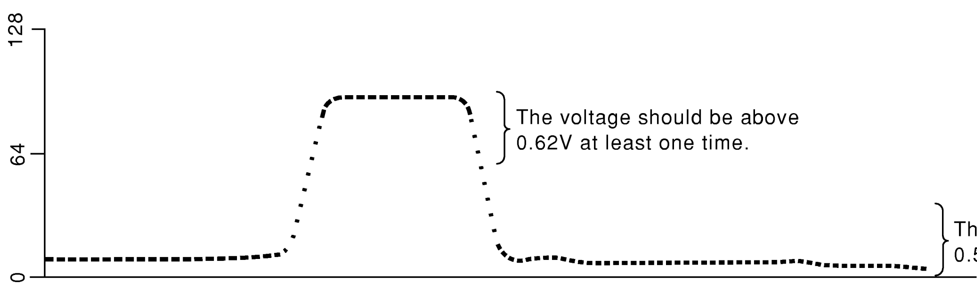
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.

(Reference data)



SEF972Y

"HO2S2 (B1)/(B2)" should be above 0.62V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.57V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

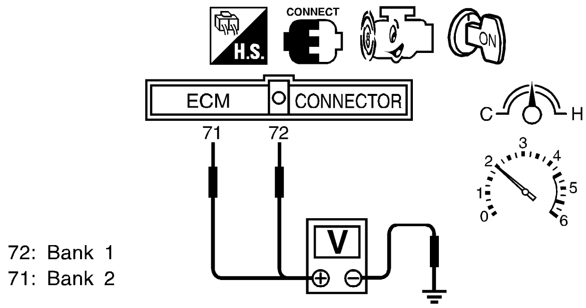
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 right signal) or 71 (HO2S bank 2 left signal) and engine ground.
4. 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 0.62V at least once during this procedure.

SEF313XA

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II

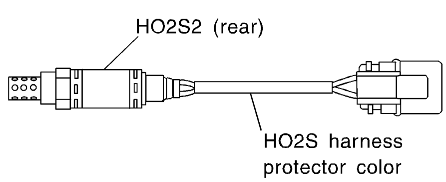
Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should go below 0.57V at least once during this procedure.
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

1. Stop vehicle and turn ignition switch "OFF".
2. Check rear heated oxygen sensor 2 (rear) harness protector color.



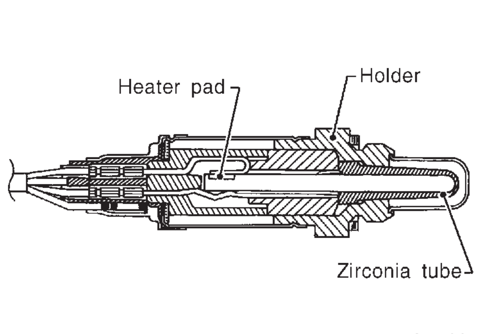
HO2S2 (rear) (bank 1): White or Gray
HO2S2 (rear) (bank 2): Red or Red/Brown

SEF372Z

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

9	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
▶	**INSPECTION END**	



SEF327R

Component Description

NAEC0146

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

CONSULT-II Reference Value in Data Monitor Mode

NAEC0147

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

ECM Terminals and Reference Value

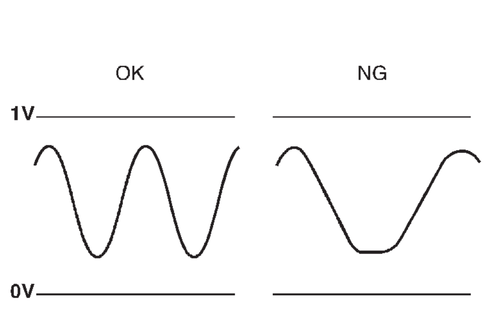
NAEC0660

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)
72	OR	Heated oxygen sensor 2 (rear) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
71	OR/L	Heated oxygen sensor 2 (rear) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V



SEF302U

On Board Diagnosis Logic

NAEC0149

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

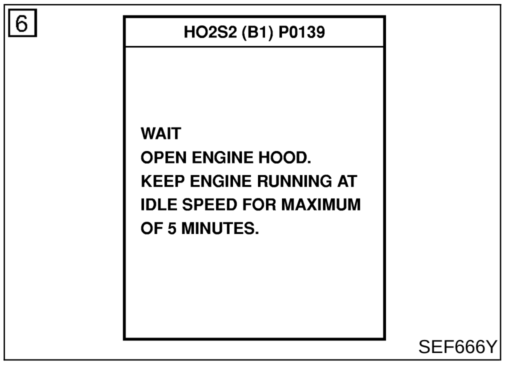
Possible Cause

NAEC0440

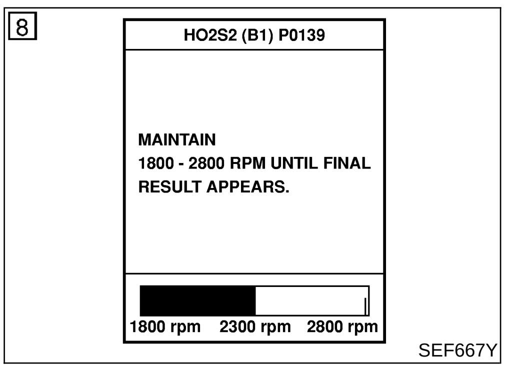
- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)
- Fuel pressure
- Injectors
- Intake air leaks

DTC Confirmation Procedure

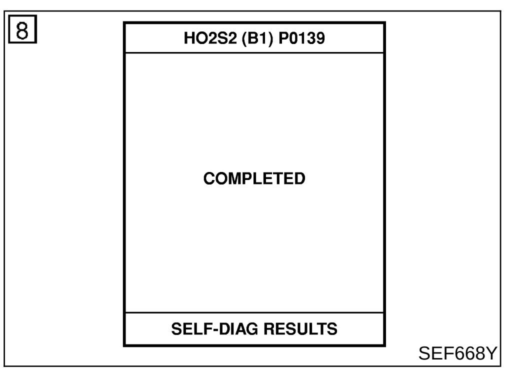
NAEC0150



SEF666Y



SEF667Y



SEF668Y

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:
Open engine hood before conducting following procedure.

WITH CONSULT-II

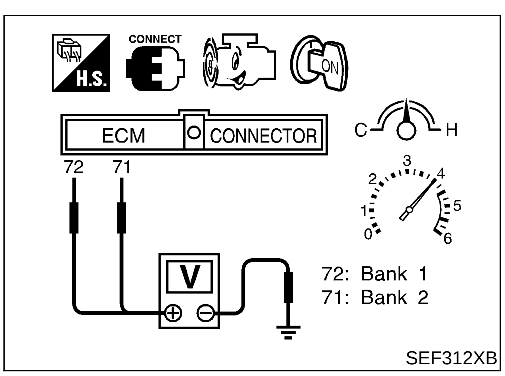
NAEC0150S01

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) Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
6) Select “HO2S2 (B1)/(B2) P0139/P0159” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-II.
7) Start engine and follow the instruction of CONSULT-II.
8) Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”.
   If NG is displayed, refer to “Diagnostic Procedure”, EC-274.
   If “CANNOT BE DIAGNOSED” is displayed, perform the following.

a) Stop engine and cool down until “COOLAN TEMP/S” indicates less than 70°C (158°F).
b) Turn ignition switch “ON”.
c) Select “DATA MONITOR” mode with CONSULT-II.
d) Start engine.
e) Return to step 6 again when the “COOLAN TEMP/S” reaches to 70°C (158°F).

Overall Function Check

NAEC0151



SEF312XB

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

WITH GST

NAEC0151S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank

1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.

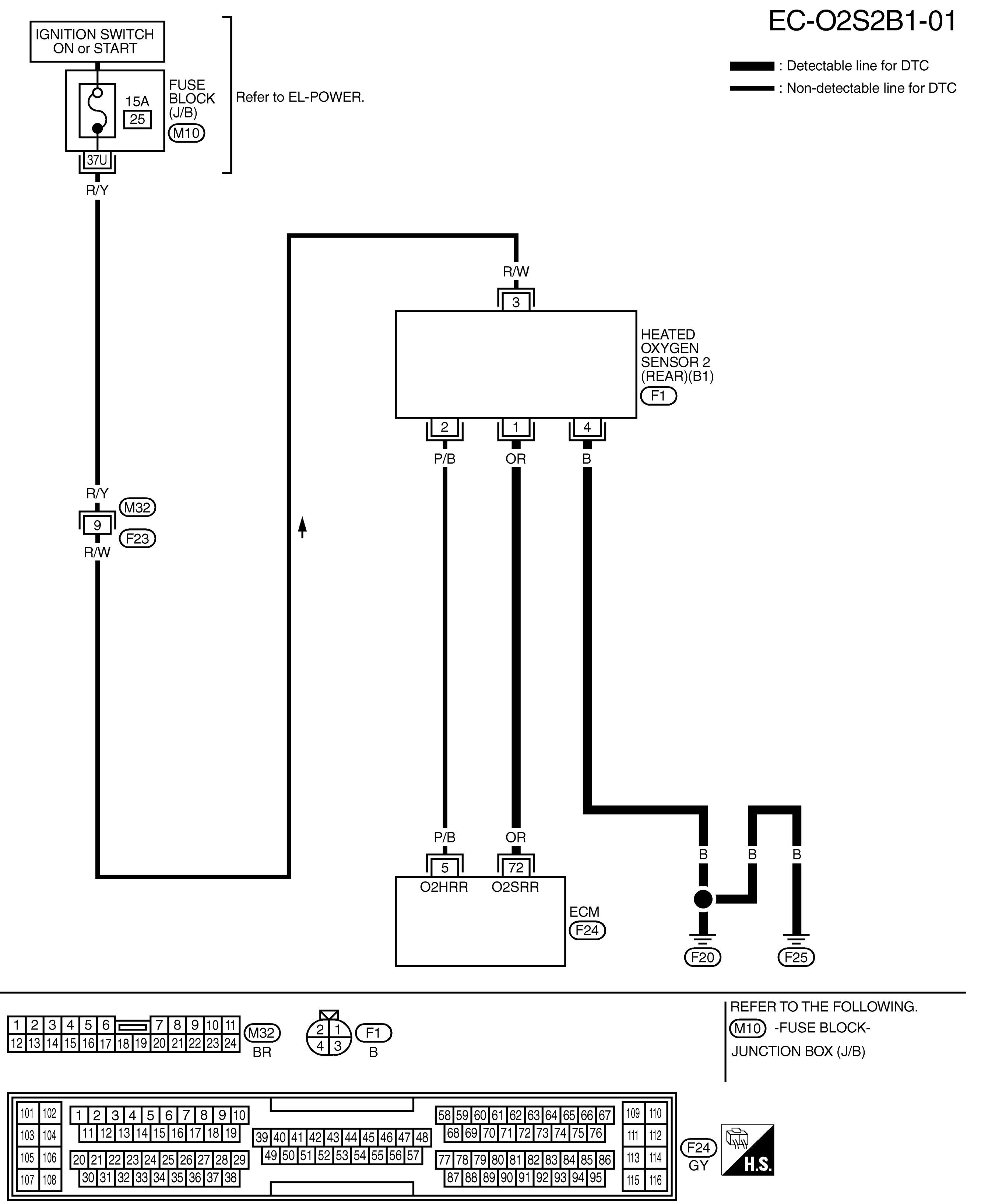
4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should change at more than 0.06V for 1 second during this procedure.
If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should change at more than 0.06V for 1 second during this procedure.
6) If NG, go to "Diagnostic Procedure", EC-274.

Wiring Diagram

=NAEC0152

RIGHT BANK

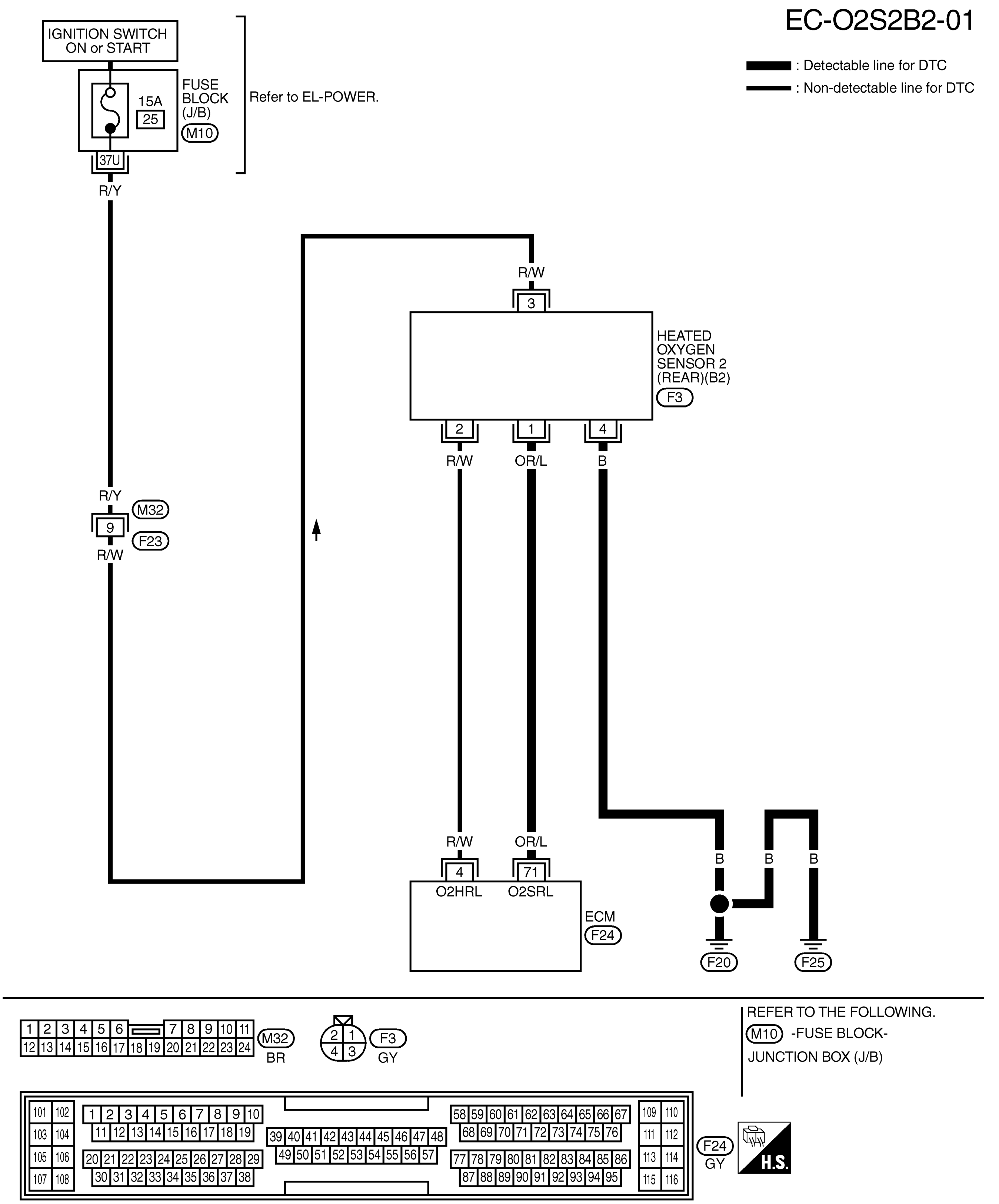
NAEC0152S01



MEC951C

LEFT BANK

NAEC0152S02



MEC952C

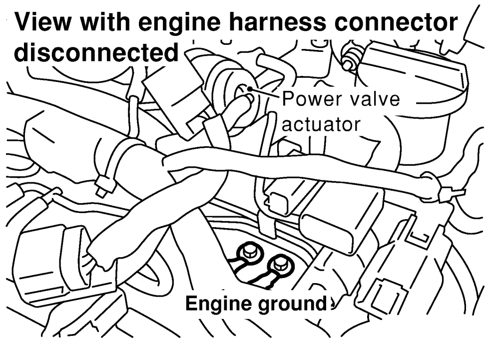
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX

Diagnostic Procedure

NAEC0153

1	RETIGHTEN GROUND SCREWS

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



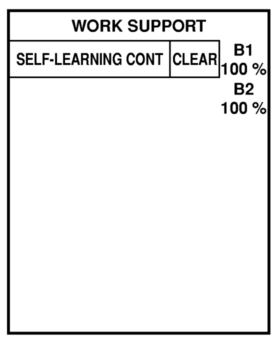
SEF959Y

▶	GO TO 2.

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”.



SEF968Y

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

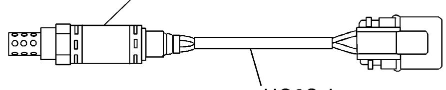
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch “OFF”.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC No. 0100 is displayed.
6. Erase the 1st trip DTC memory. Refer to “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”, EC-73.
7. Make sure DTC No. 0000 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-296, 304.
No	▶	GO TO 3.

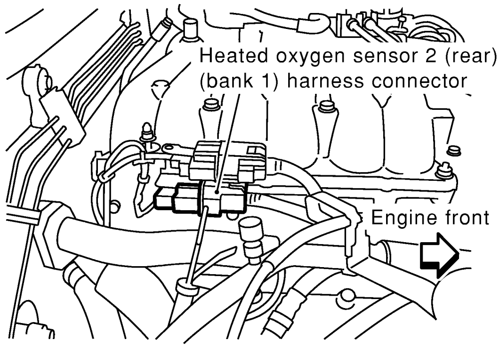
3	CHECK HO2S2 (REAR) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

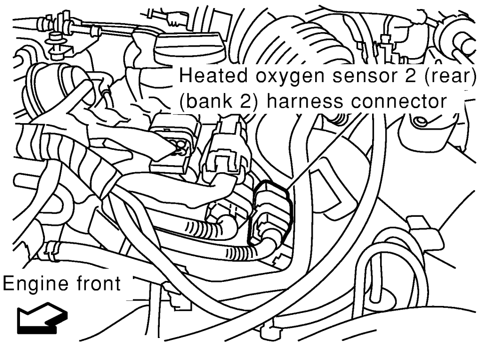
1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.



SEF372Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.





SEF971Y

4. Disconnect ECM harness connector.
5. Check harness continuity between ECM terminal and HO2S2 terminal as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	72	1	Bank 1 (Right)
P0159	71	1	Bank 2 (Left)

MTBL0525

Continuity should exist.

6. Check harness continuity between ECM terminal or HO2S2 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0139	72 or 1	Ground	Bank 1(Right)
P0159	71 or 1	Ground	Bank 2 (Left)

MTBL0526

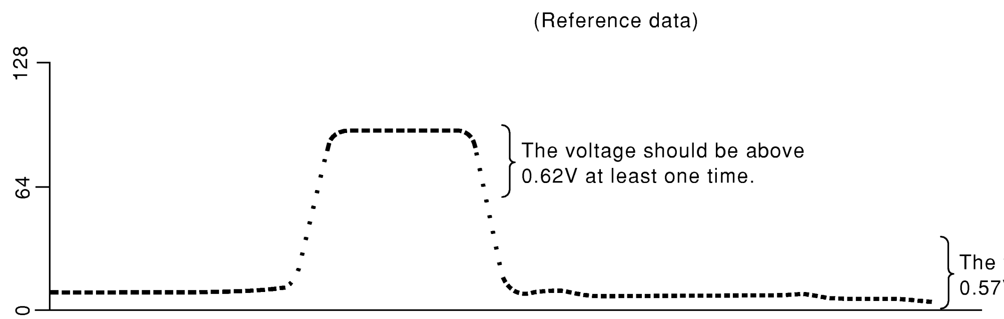
Continuity should not exist.

7. 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.

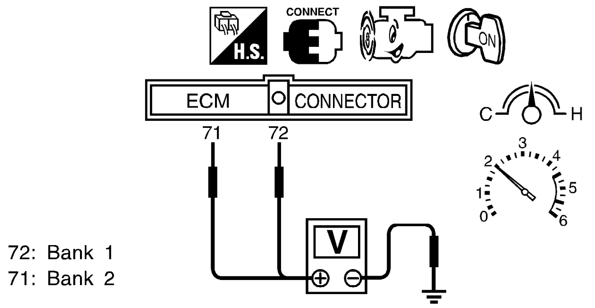
4	CHECK HO2S2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT	
1. Check harness continuity between HO2S2 terminal 4 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**		
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair open circuit or short to power in harness or connectors

5	CHECK REAR HEATED OXYGEN SENSOR	
With CONSULT-II 1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes. 2. Stop vehicle with engine running. 3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II. 4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.  SEF972Y **"HO2S2 (B1)/(B2)" should be above 0.62V at least once when the "FUEL INJECTION" is +25%.** **"HO2S2 (B1)/(B2)" should be below 0.57V 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.** **OK or NG**		
OK	▶	GO TO 9.
NG	▶	GO TO 8.

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

6	CHECK REAR HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II
1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.
4. 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.)



SEF313XA

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK REAR HEATED OXYGEN SENSOR 2 (REAR)-II

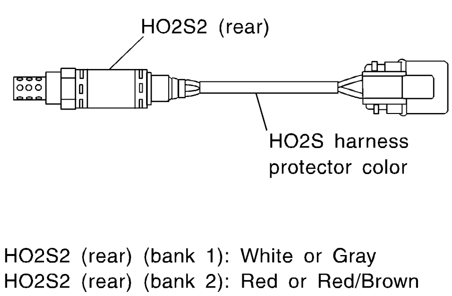
Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T).
The voltage should go below 0.57V at least once during this procedure.
CAUTION:
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE REAR HEATED OXYGEN SENSOR

1. Stop vehicle and turn ignition switch "OFF".
2. Check heated oxygen sensor 2 (rear) harness protector color.

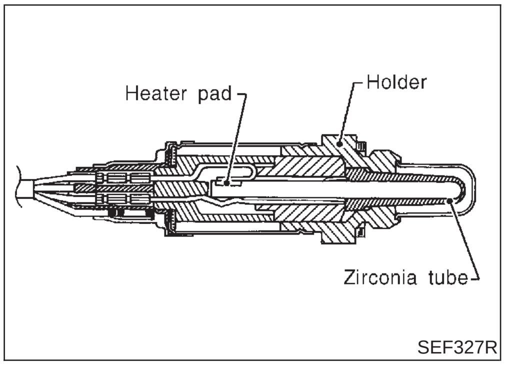


SEF372Z

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

9	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**



SEF327R

Component Description

NAEC0154

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

CONSULT-II Reference Value in Data Monitor Mode

NAEC0155

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	● Engine: After warming up	Revving engine from idle up to 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH

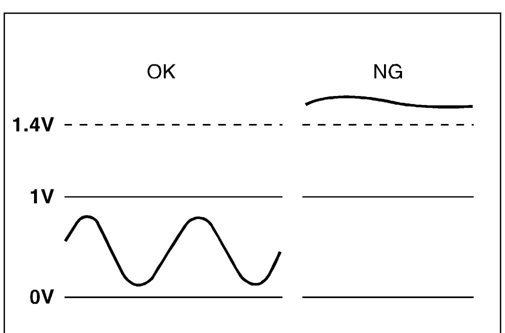
ECM Terminals and Reference Value

NAEC0661

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)
72	OR	Heated oxygen sensor 2 (rear) (bank 1)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V
71	OR/L	Heated oxygen sensor 2 (rear) (bank 2)	**[Engine is running]** ● **Warm-up condition** ● Engine speed is 2,000 rpm.	0 - Approximately 1.0V



SEF305UA

On Board Diagnosis Logic

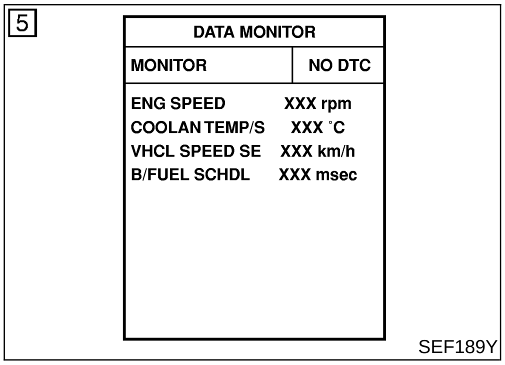
NAEC0157

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

Possible Cause

NAEC0441

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Heated oxygen sensor 2 (rear)



SEF189Y

DTC Confirmation Procedure

NAEC0158

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.

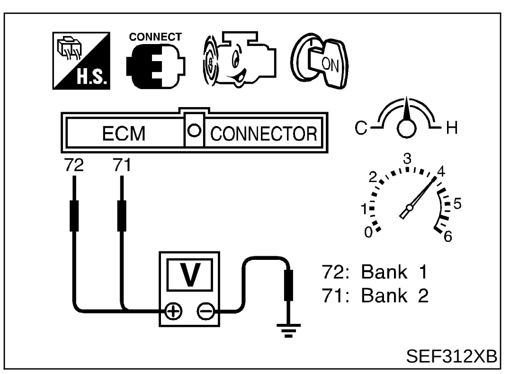
WITH CONSULT-II

NAEC0158S01

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Stop vehicle with engine running.
4) Let engine idle for 1 minute.
5) Maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	1,300 - 3,100 rpm
VHCL SPEED SE	64 - 130 km/h (40 - 80 MPH)
B/FUEL SCHDL	0.5 - 6.4 msec
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-284.



SEF312XB

Overall Function Check

NAEC0159

Use this procedure to check the overall function of the heated oxygen sensor 2 (rear) circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NAEC0159S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal 72 (HO2S2 bank

1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.

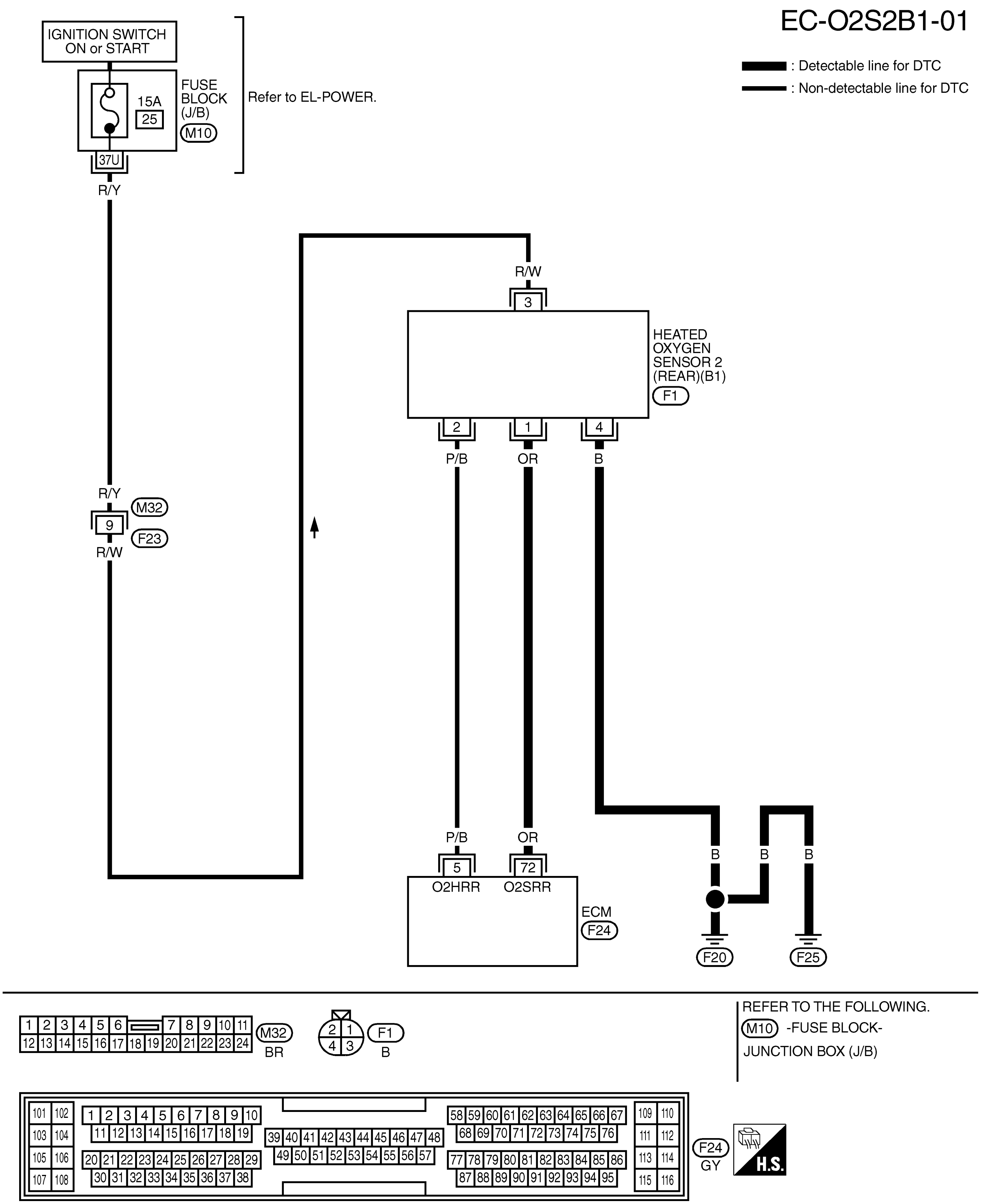
4) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(Depress and release accelerator pedal as soon as possible.)
The voltage should be below 1.4V during this procedure.
5) If NG, go to "Diagnostic Procedure", EC-284.

Wiring Diagram

NAEC0160

RIGHT BANK

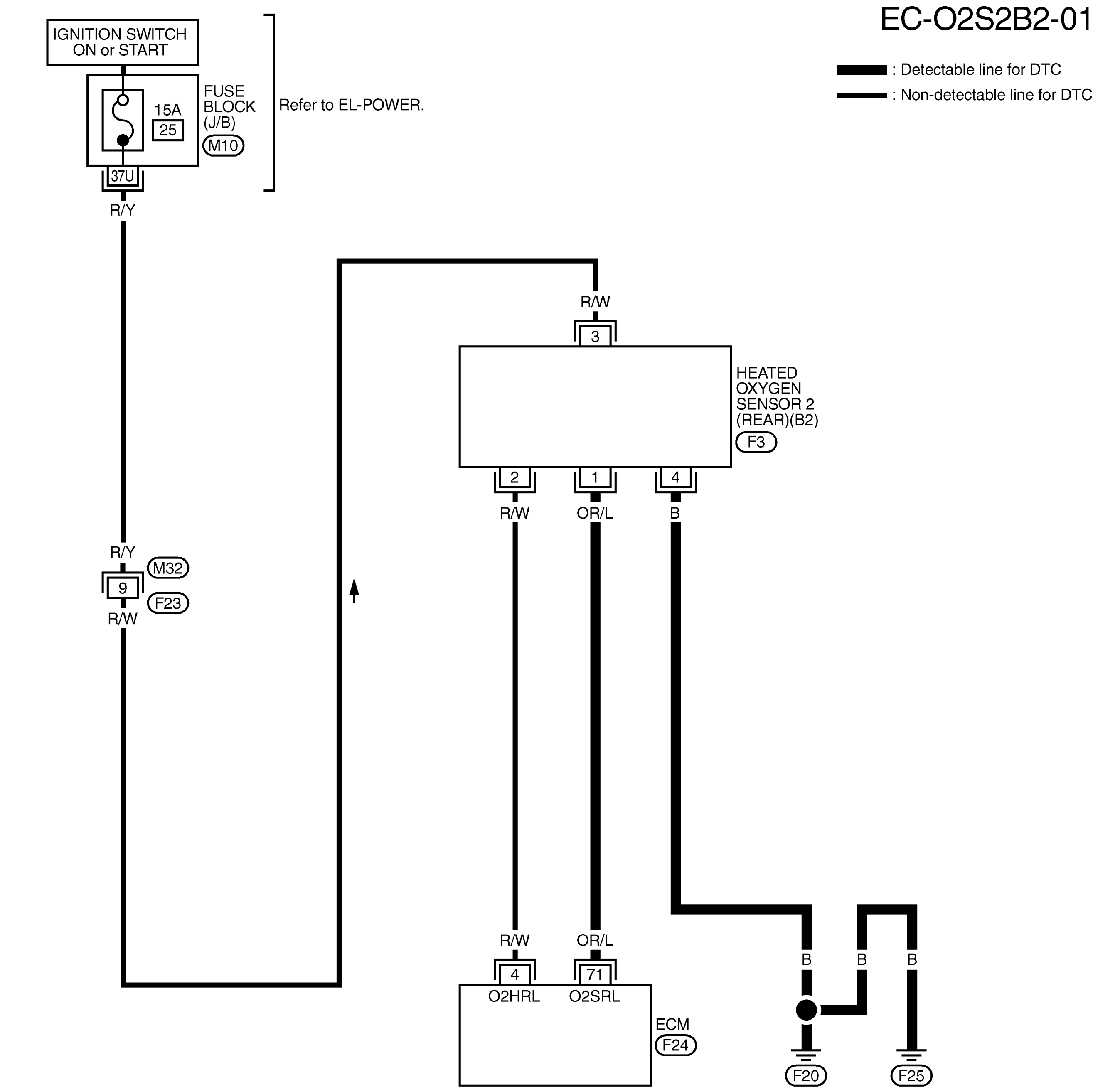
NAEC0160S01

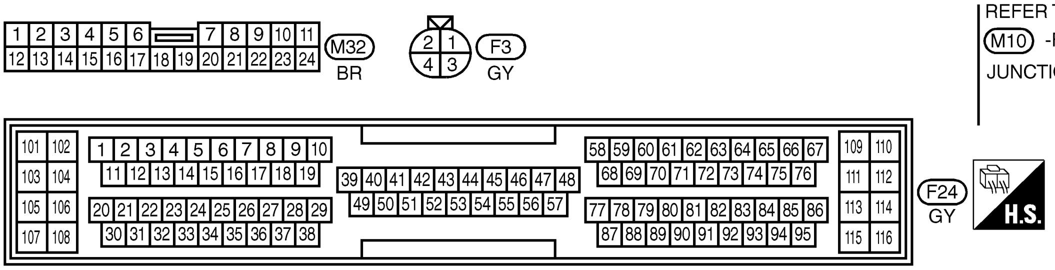


MEC951C

LEFT BANK

NAEC0160S02





REFER TO THE FOLLOWING.
M10 -FUSE BLOCK-
JUNCTION BOX (J/B)

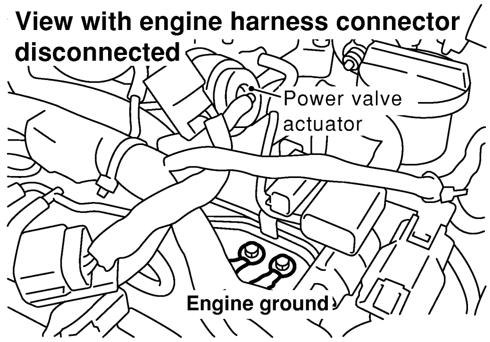
MEC952C

Diagnostic Procedure

NAEC0161

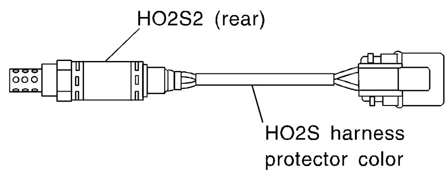
1	INSPECTION START

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



SEF959Y

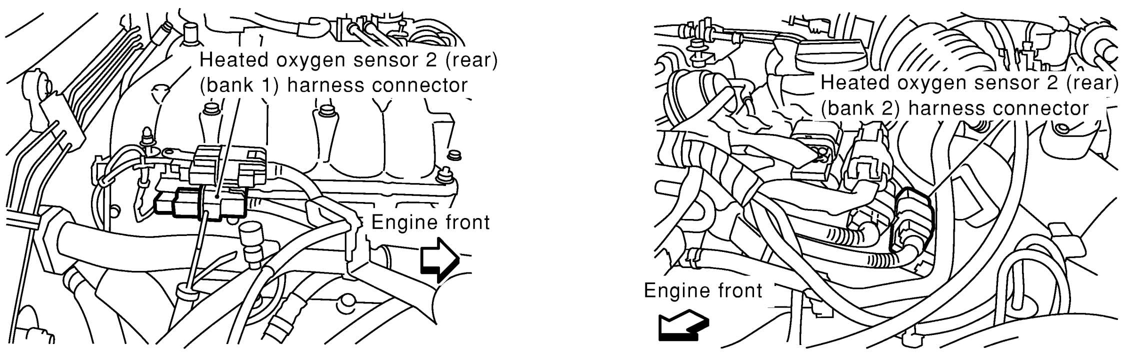
3. Check heated oxygen sensor 2 (rear) harness protector color.



HO2S2 (rear) (bank 1): White or Gray
HO2S2 (rear) (bank 2): Red or Red/Brown

SEF372Z

4. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF971Y

5. Disconnect ECM harness connector.

▶	GO TO 2.

2 CHECK HO2S2 (REAR) 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	
P0140	72	1	Bank 1 (Right)
P0160	71	1	Bank 2 (Left)

MTBL0527

Continuity should exist.

2. Check harness continuity between ECM terminal or HO2S2 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0140	72 or 1	Ground	Bank 1 (Right)
P0160	71 or 1	Ground	Bank 2 (Left)

MTBL0528

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

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

3 CHECK HO2S2 (REAR) GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S2 terminal 4 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

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

4 CHECK HO2S2 (REAR) CONNECTORS FOR WATER

Check heated oxygen sensor connector 2 (rear) and harness connector for water.
Water should not exist.

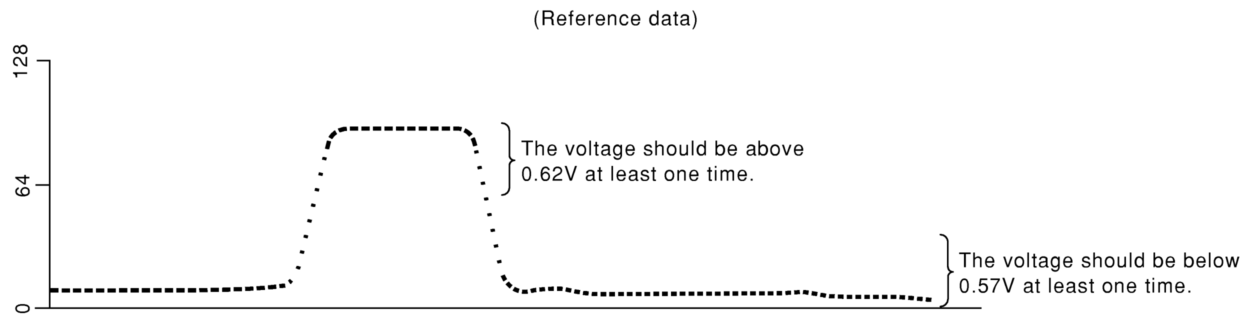
OK or NG

OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair or replace harness or connectors.

5	CHECK HEATED OXYGEN SENSOR 2 (REAR)

With CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-II.
4. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



SEF972Y

"HO2S2 (B1)/(B2)" should be above 0.62V at least once when the "FUEL INJECTION" is +25%.
"HO2S2 (B1)/(B2)" should be below 0.57V 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.

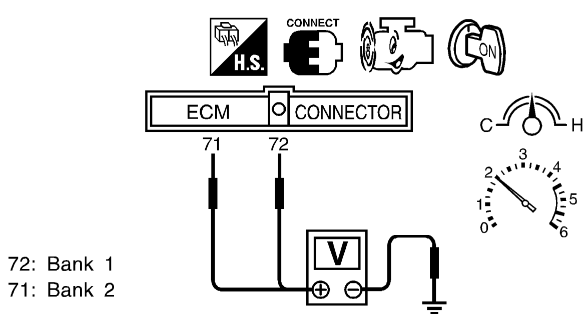
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

6	CHECK HEATED OXYGEN SENSOR 2 (REAR)-I

Without CONSULT-II

1. Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2. Stop vehicle with engine running.
3. Set voltmeter probes between ECM terminal 72 (HO2S2 bank 1 right signal) or 71 (HO2S2 bank 2 left signal) and engine ground.
4. 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 0.62V at least once during this procedure.

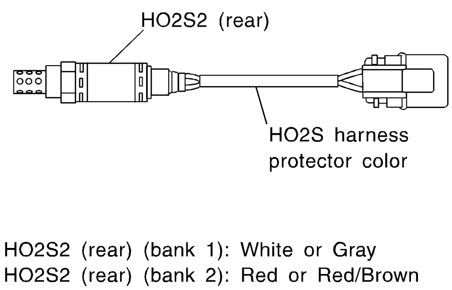
SEF313XA

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK HEATED OXYGEN SENSOR 2 (REAR)-II	
Idle vehicle for 10 minutes, then check voltage between the same terminals as in Test No. 6; or check voltage when coasting from 80 km/h (50 MPH) in 3rd gear position (M/T), "D" position with "OD" OFF (A/T). **The voltage should go below 0.57V at least once during this procedure.** **CAUTION:** **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.** **OK or NG**		
OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	REPLACE HEATED OXYGEN SENSOR 2 (REAR)	
1. Stop vehicle and turn ignition switch "OFF". 2. Check heated oxygen sensor 2 (rear) harness protector color.		



SEF372Z

CAUTION:
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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

9	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

Description

NAEC0162

SYSTEM DESCRIPTION

NAEC0162S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Crankshaft position sensor (REF)	Engine speed	Heated oxygen sensor heater 2 (rear) control	Heated oxygen sensor 2 heaters (rear)

The ECM performs ON/OFF control of the heated oxygen sensor 2 heaters (rear) corresponding to the engine speed.

OPERATION

NAEC0162S02

Engine speed rpm	Heated oxygen sensor 2 heaters (rear)
Above 3,200	OFF
Below 3,200	ON

CONSULT-II Reference Value in Data Monitor Mode

NAEC0163

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1) HO2S2 HTR (B2)	• Ignition switch: ON (Engine stopped) • Engine is running above 3,200 rpm.	OFF
	• Engine is running below 3,200 rpm after driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	ON

ECM Terminals and Reference Value

NAEC0662

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)
5	P/B	Heated oxygen sensor 2 heater (rear) (bank 1)	**[Engine is running]** • Engine speed is below 3,200 rpm. • After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] • Engine stopped **[Engine is running]** • Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
4	R/W	Heated oxygen sensor 2 heater (rear) (bank 2)	**[Engine is running]** • Engine speed is below 3,200 rpm. • After driving for 2 minutes at a speed of 70 km/h (43 MPH) or more.	0 - 1.0V
			[Ignition switch "ON"] • Engine stopped **[Engine is running]** • Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

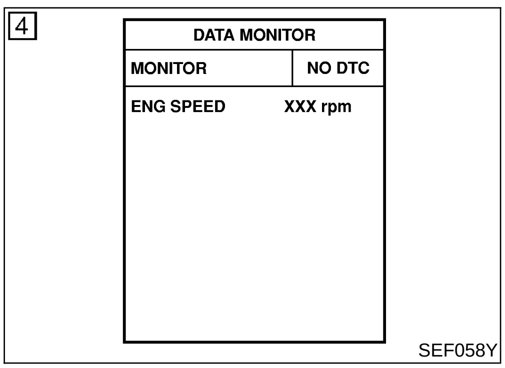
NAEC0165

Malfunction is detected when the current amperage in the heated oxygen sensor 2 heater (rear) circuit is out of the normal range.
[An improper voltage drop signal is sent to ECM through the heated oxygen sensor 2 heater (rear).]

Possible Cause

NAEC0442

- Harness or connectors
  [The heated oxygen sensor 2 heater (rear) circuit is open or shorted.]
- Heated oxygen sensor 2 heater (rear)



SEF058Y

DTC Confirmation Procedure

NAEC0166

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.

WITH CONSULT-II

NAEC0166S01

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Start engine.
3) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Stop vehicle and let engine idle for at least 6 seconds.
5) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-293.

WITH GST

NAEC0166S02

1) Start engine.
2) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Stop vehicle and let engine idle for at least 6 seconds.
4) Turn ignition switch "OFF" and wait at least 10 seconds.
5) Start engine.
6) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
7) Stop vehicle and let engine idle for at least 6 seconds.
8) Select "MODE 3" with GST.
9) If DTC is detected, go to "Diagnostic Procedure", EC-293.

- **When using GST, "DTC Confirmation Procedure" should be performed twice as much as when using CONSULT-II**

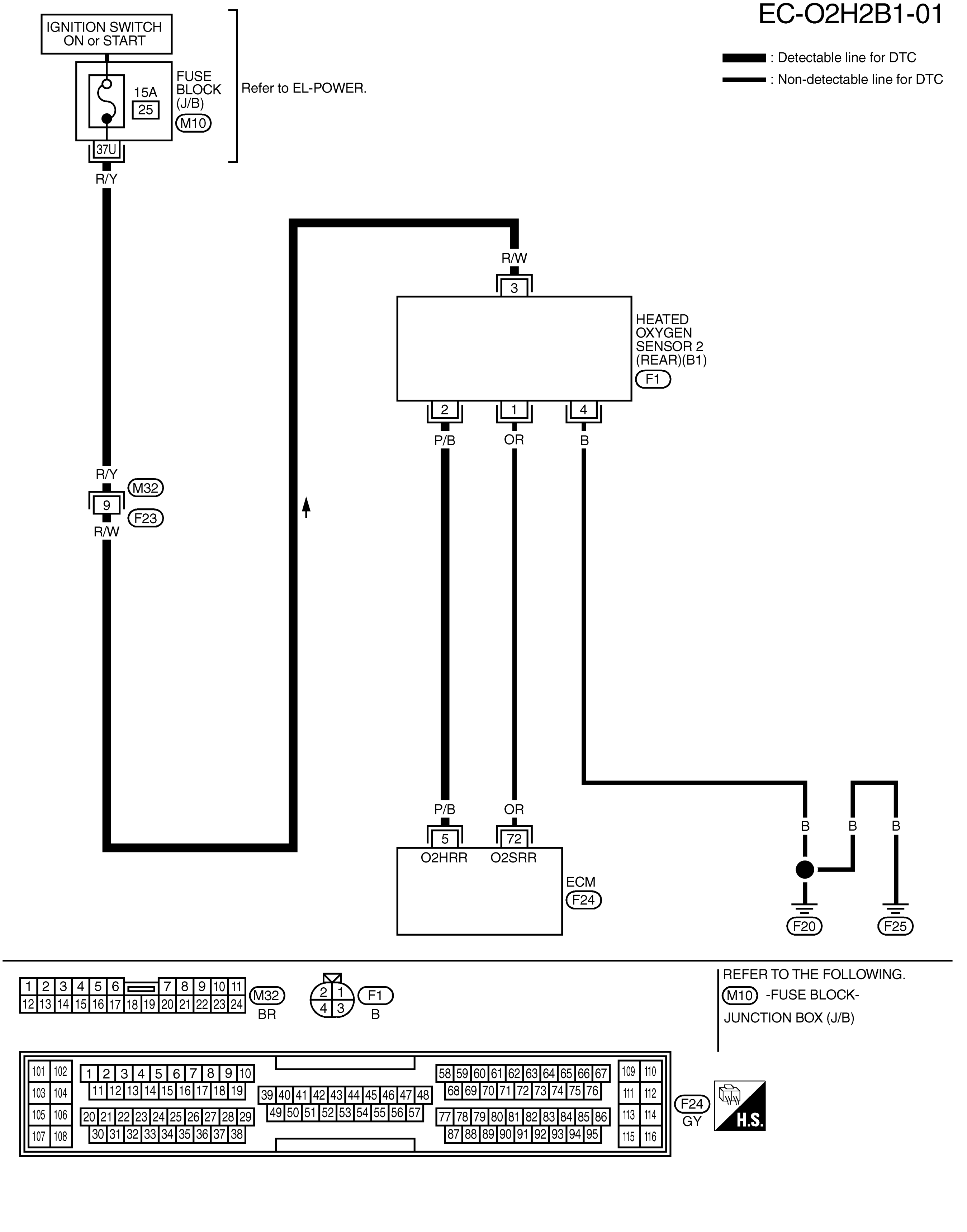
because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT-II is recommended.

Wiring Diagram

NAEC0167

RIGHT BANK

NAEC0167S01

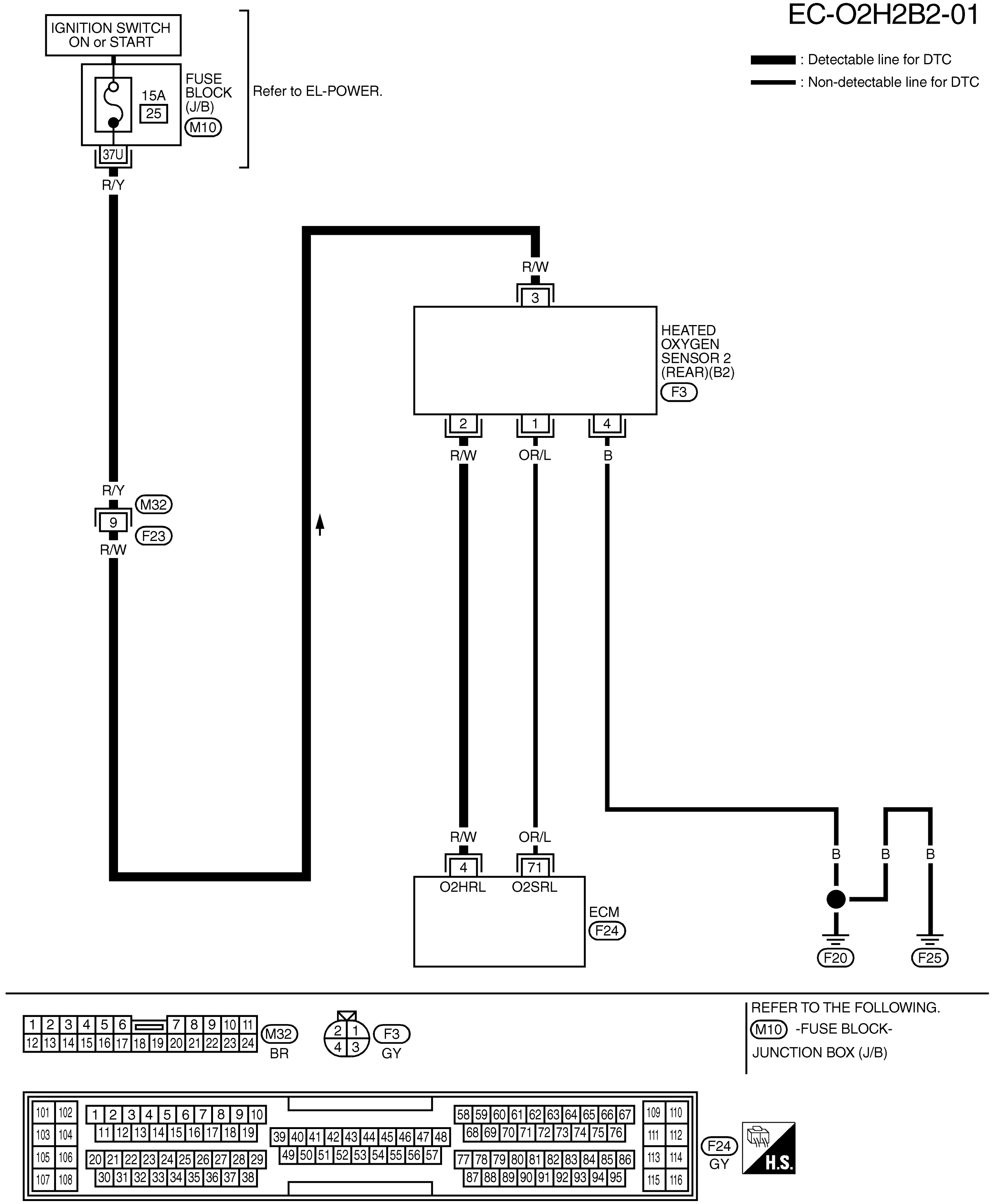


MEC953C

Wiring Diagram (Cont'd)

LEFT BANK

NAEC0167S02



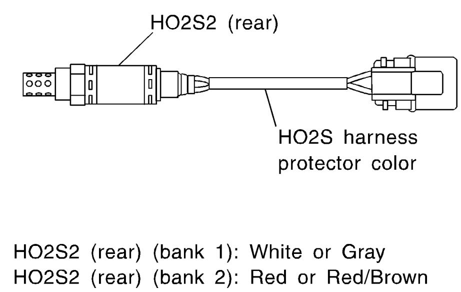
MEC954C

Diagnostic Procedure

NAEC0168

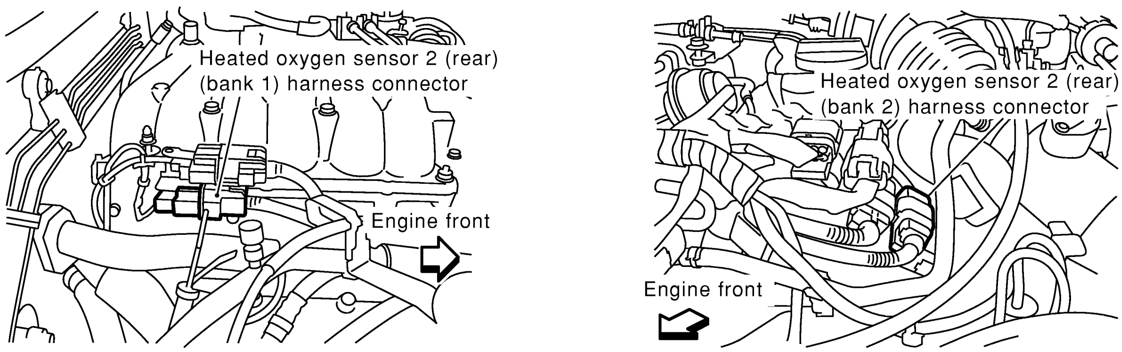
1	CHECK HO2S2 (REAR) POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor harness 2 (rear) protector color.



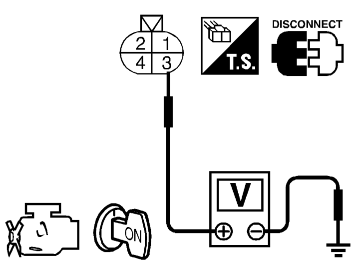
SEF372Z

3. Disconnect corresponding heated oxygen sensor 2 (rear) harness connector.



SEF971Y

4. Turn ignition switch "ON".
5. Check voltage between HO2S2 terminal 3 and ground.



Voltage: Battery voltage

SEF314X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- Fuse block (J/B) connector M10
- 15A fuse
- Harness for open or short between heated oxygen sensor 2 (rear) and fuse

	▶	Repair harness or connectors.

3	CHECK HO2S2 (REAR) OUTPUT 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	
P0141	5	2	Bank 1 (Right)
P0161	4	2	Bank 2 (Left)

MTBL0529

Continuity should exist.

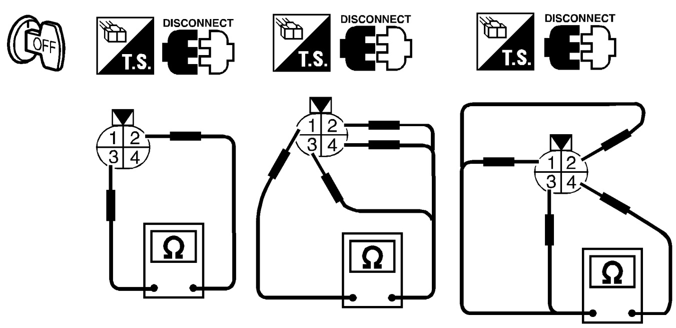
4. Also check harness for short to ground and short to power.

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 (REAR)

Check the resistance between HO2S2 terminals as follows.



Terminal No.	Resistance
2 and 3	2.3 - 4.3Ω at 25°C (77°F)
1 and 2, 3, 4	∞ Ω (Continuity should not exist.)
4 and 1, 2, 3	∞ Ω (Continuity should not exist.)

SEF315X

CAUTION:

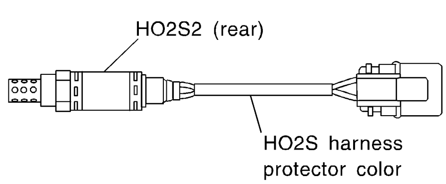
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	REPLACE HEATED OXYGEN SENSOR 2 (REAR)

Check rear heated oxygen sensor harness protector color.



HO2S2 (rear) (bank 1): White or Gray
HO2S2 (rear) (bank 2): Red or Red/Brown

SEF372Z

CAUTION:

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.

	▶	Replace malfunctioning heated oxygen sensor 2 (rear).

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	INSPECTION END

On Board Diagnosis Logic

NAEC0169

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 (front). The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

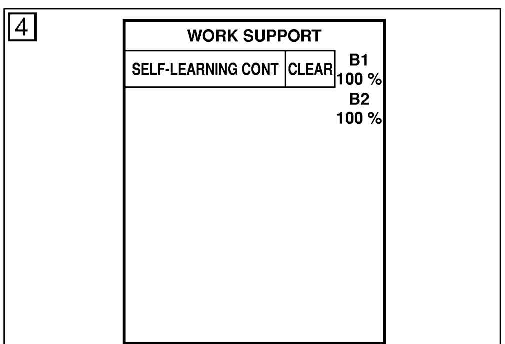
Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Injectors

Malfunction is detected when fuel injection system does not operate properly, the amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)

Possible Cause

NAEC0487

- Intake air leaks
- Heated oxygen sensor 1 (front)
- Injectors
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Mass air flow sensor



SEF968Y

DTC Confirmation Procedure

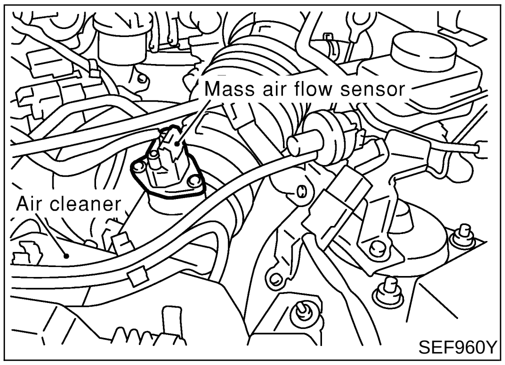
NAEC0170

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

NAEC0170S01

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-LEARN CONTROL” 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 “Diagnostic Procedure”, EC-300.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8) Crank engine while depressing accelerator pedal. If engine starts, go to “Diagnostic Procedure”, EC-300. If engine does not start, check exhaust and intake air leak visually.



SEF960Y

WITH GST

NAEC0170S02

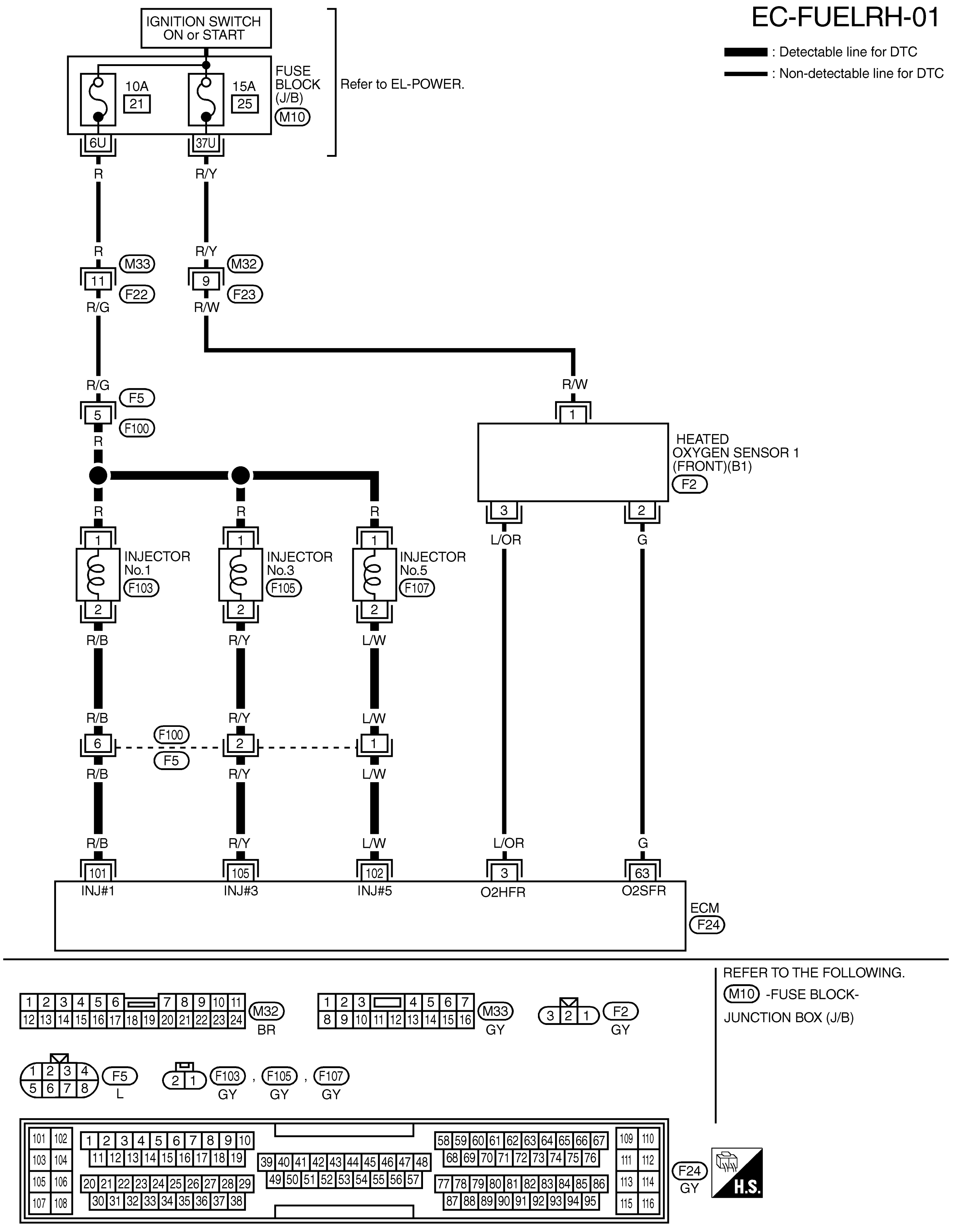
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
7) Start engine again and let it idle for at least 10 minutes.
8) Select "MODE 7" with GST. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-300.
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 "Diagnostic Procedure", EC-300. If engine does not start, check exhaust and intake air leak visually.

Wiring Diagram

NAEC0171

RIGHT BANK

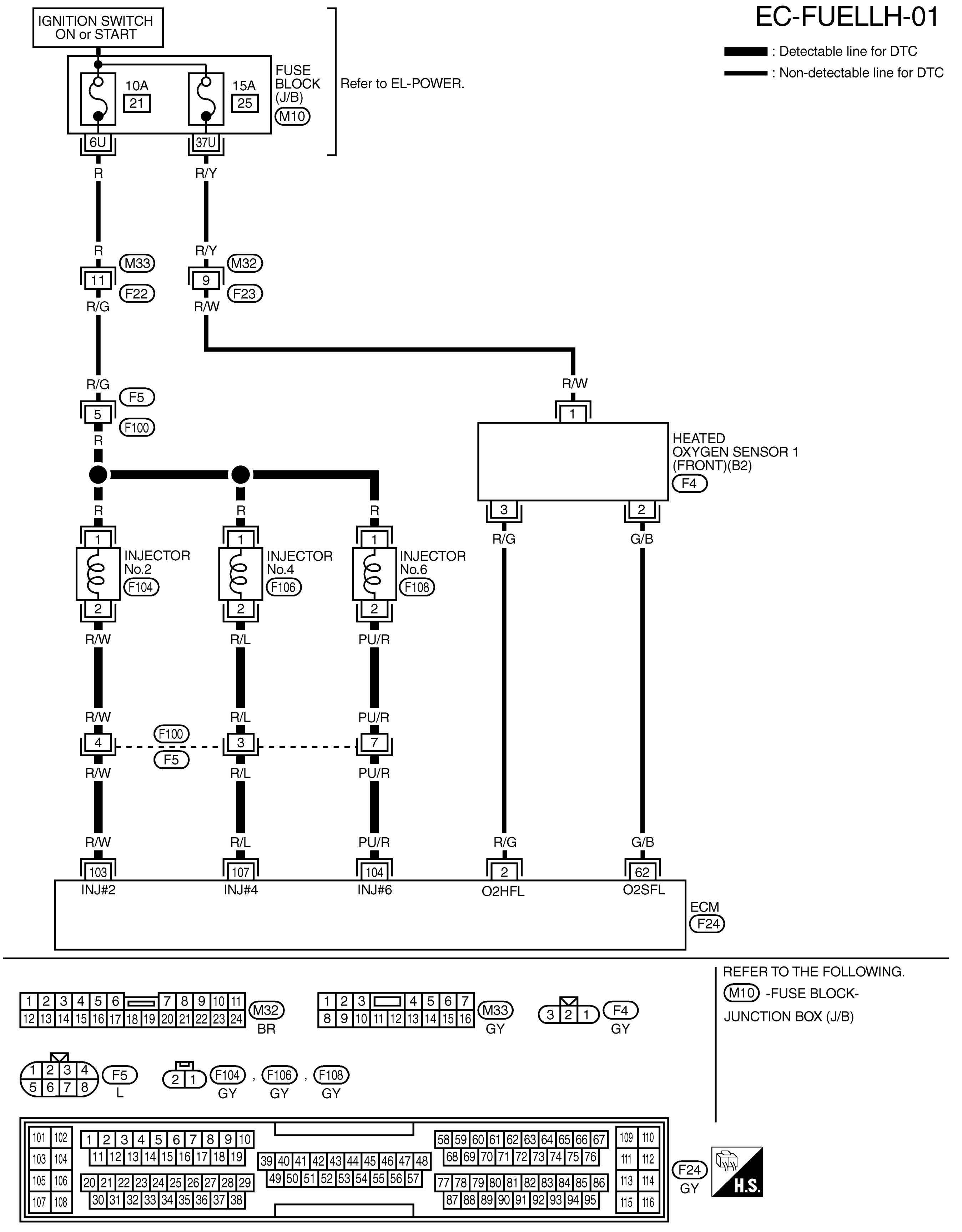
NAEC0171S01



MEC955C

LEFT BANK

NAEC0171S02



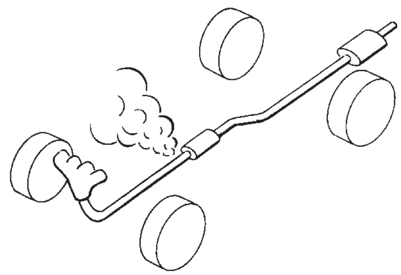
MEC956C

Diagnostic Procedure

NAEC0172

1	CHECK EXHAUST AIR LEAK

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



SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK FOR INTAKE AIR LEAK

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

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace.

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.
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	63	2	Bank 1 (Right)
P0174	62	2	Bank 2 (Left)

MTBL0477

Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S1 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0172	63 or 2	Ground	Bank 1 (Right)
P0175	62 or 2	Ground	Bank 2 (Left)

MTBL0478

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.

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

4	CHECK FUEL PRESSURE
1. Release fuel pressure to zero. Refer to EC-39. 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-39. **At idling:** **When fuel pressure regulator valve vacuum hose is connected.** **235 kPa (2.4 kg/cm^2, 34 psi)** **When fuel pressure regulator valve vacuum hose is disconnected.** **294 kPa (3.0 kg/cm^2, 43 psi)** **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-628.) ● Fuel pressure regulator (Refer to EC-40.) ● Fuel lines (Refer to MA-17, "Checking Fuel Lines".) ● Fuel filter for clogging	
▶	Repair or replace.

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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 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-152.

7	CHECK FUNCTION OF INJECTORS

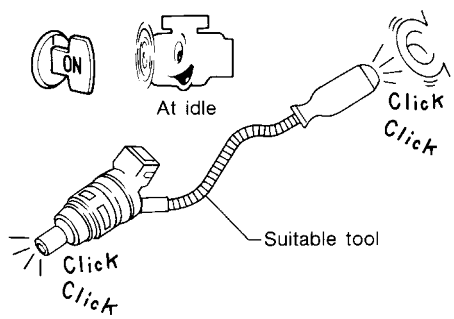
With CONSULT-II
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.

ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS AIF SE-B1	XXX V
IACV-AAC/V	XXX step

SEF070Y

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.



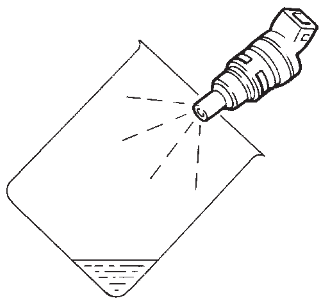
MEC703B

Clicking noise should be heard.

OK or NG

OK	▶	GO TO 8.
NG	▶	Perform trouble diagnosis for “INJECTORS”, EC-619.

8	CHECK INJECTOR	
1. Confirm that the engine is cooled down and there are no fire hazards near the vehicle. 2. Turn ignition switch "OFF". 3. Disconnect injector harness connectors on left bank (for DTC P0171), right bank (for DTC P0174). 4. Remove injector gallery assembly. Refer to EC-41. Keep fuel hose and all injectors connected to injector gallery. The injector harness connectors on right bank (for DTC P0171), left bank (for DTC P0174) should remain connected. 5. Disconnect all ignition coil harness connectors. 6. Prepare pans or saucers under each injector. 7. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.		



SEF595Q

Fuel should be sprayed evenly for each injector.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace injectors from which fuel does not spray out. Always replace O-ring with new ones.

9	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

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

On Board Diagnosis Logic

NAEC0173

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 (front). The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (The actual mixture ratio is too rich.), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).

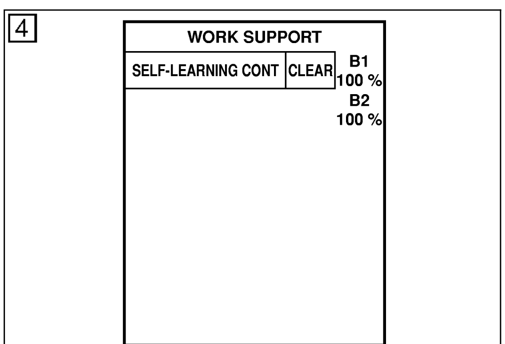
Sensor	Input Signal to ECM	ECM function	Actuator
Heated oxygen sensors 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Injectors

Malfunction is detected when fuel injection system does not operate properly, the amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)

Possible Cause

NAEC0488

- Heated oxygen sensor 1 (front)
- Injectors
- Exhaust gas leaks
- Incorrect fuel pressure
- Mass air flow sensor



SEF968Y

DTC Confirmation Procedure

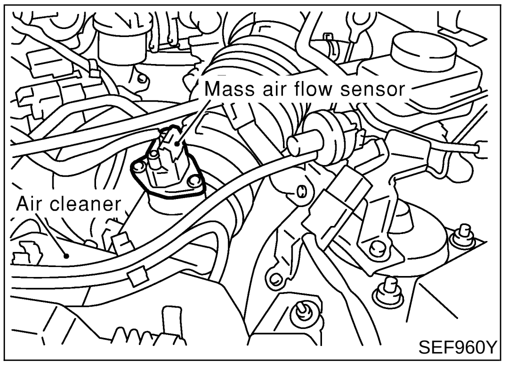
NAEC0174

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

NAEC0174S01

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-LEARN CONTROL” 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 “Diagnostic Procedure”, EC-308.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
8) Crank engine while depressing accelerator pedal.
   If engine starts, go to “Diagnostic Procedure”, EC-308. If engine does not start, remove ignition plugs and check for fouling, etc.



WITH GST

NAEC0174S02

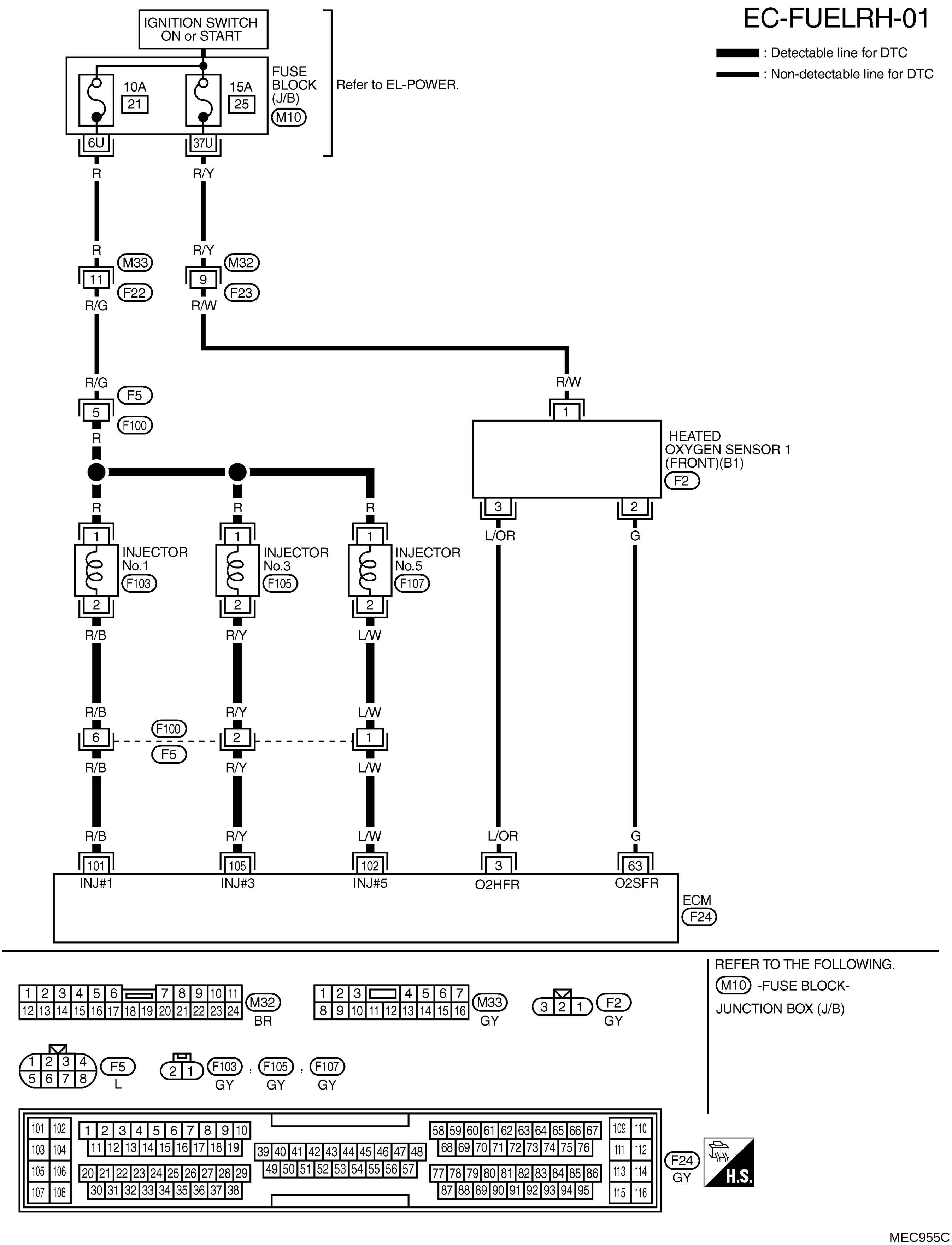
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 5 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
7) Start engine again and let it idle for at least 10 minutes.
8) Select "MODE 7" with GST. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to "Diagnostic Procedure", EC-308.
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 "Diagnostic Procedure", EC-308. If engine does not start, check exhaust and intake air leak visually.

Wiring Diagram

NAEC0175

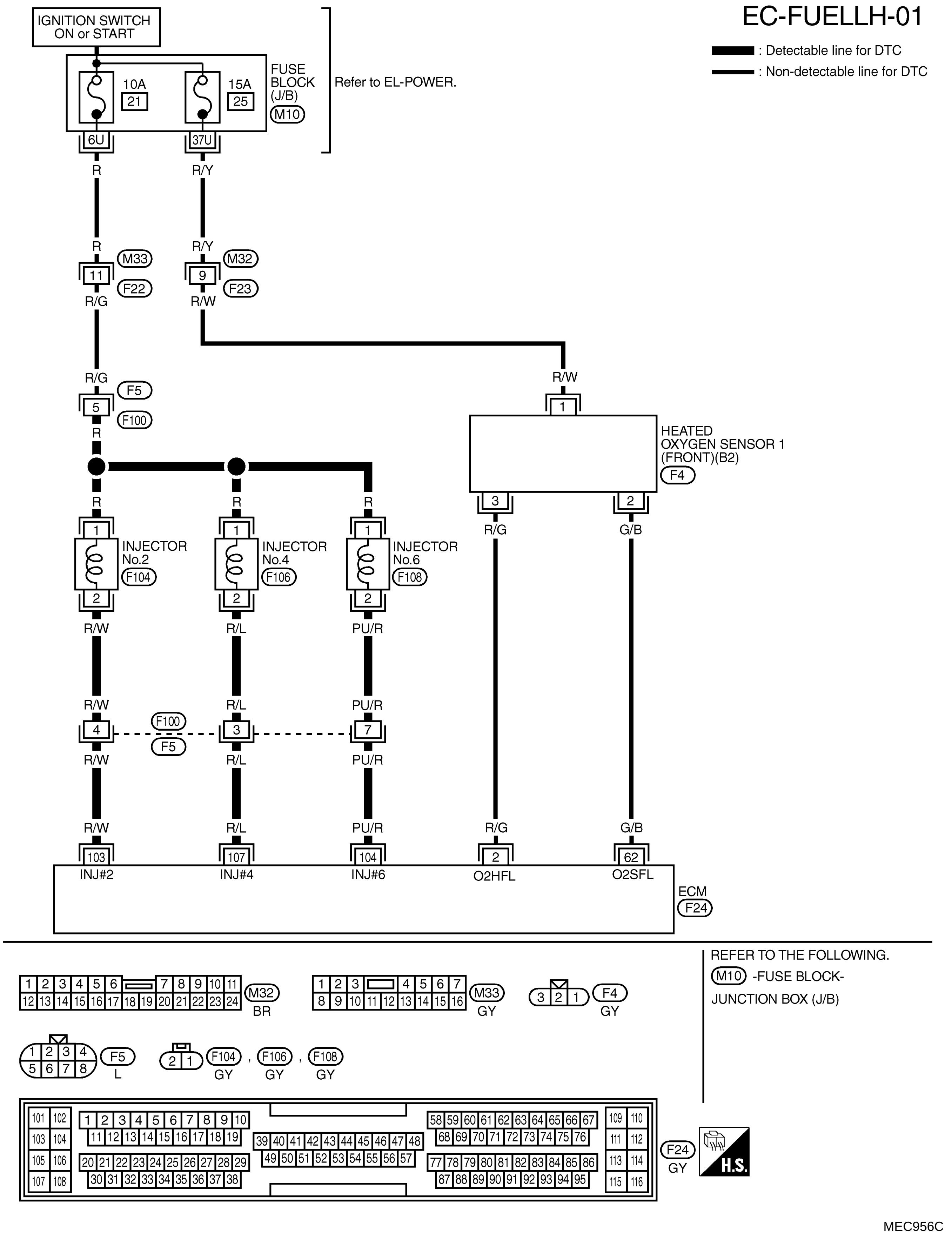
RIGHT BANK

NAEC0175S01



LEFT BANK

NAEC0175S02

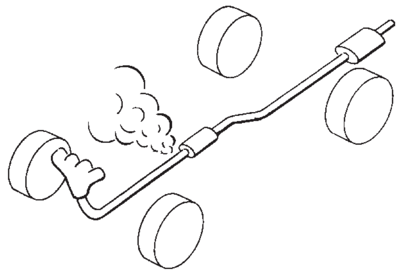


Diagnostic Procedure

NAEC0176

1	CHECK EXHAUST AIR LEAK

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



SEF099P

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or replace.

2	CHECK FOR INTAKE AIR LEAK

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

OK or NG

OK	▶	GO TO 3.
NG	▶	Repair or replace.

3	CHECK HEATED OXYGEN SENSOR 1 (FRONT) CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect corresponding heated oxygen sensor 1 (front) harness connector.
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	63	2	Bank 1 (Right)
P0175	62	2	Bank 2 (Left)

MTBL0479

Continuity should exist.

5. Check harness continuity between ECM terminal or HO2S1 terminal and ground as follows.
   Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM or Sensor	Ground	
P0172	63 or 2	Ground	Bank 1 (Right)
P0175	62 or 2	Ground	Bank 2 (Left)

MTBL0480

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-39. 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-39. **At idling:** **When fuel pressure regulator valve vacuum hose is connected.** **235 kPa (2.4 kg/cm^2, 34 psi)** **When fuel pressure regulator valve vacuum hose is disconnected.** **294 kPa (3.0 kg/cm^2, 43 psi)** **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Fuel pump and circuit (Refer to EC-628.) ● Fuel pressure regulator (Refer to EC-40.)	
▶	Repair or replace.

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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 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. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 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-152.

GI
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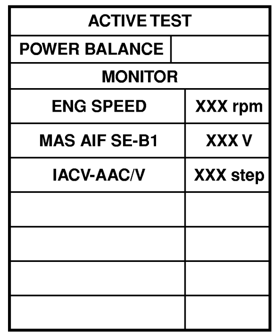
Diagnostic Procedure (Cont'd)

7 CHECK FUNCTION OF INJECTORS

With CONSULT-II

1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-II.

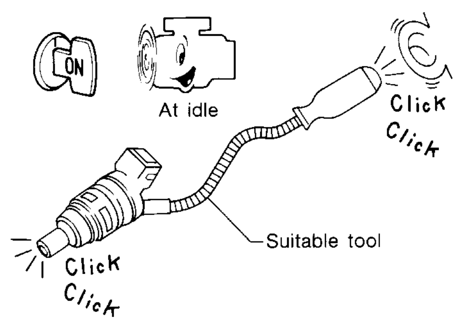


SEF070Y

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 "INJECTORS", EC-620.

8 CHECK INJECTOR

1. Remove injector assembly. Refer to EC-41.
   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 left bank (for DTC P0172), right bank (for P0175).
   The injector harness connectors on right bank (for P0172), left bank (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.

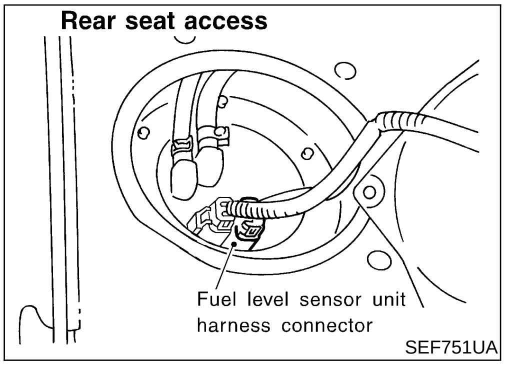
OK or NG

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 "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

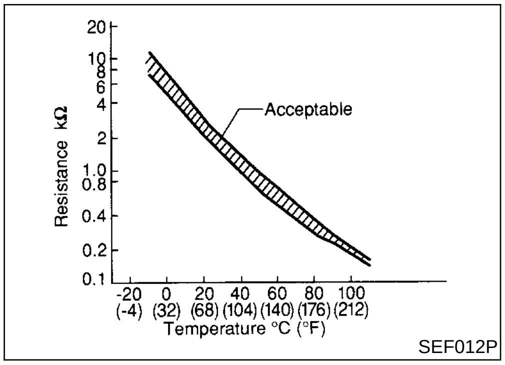
	▶	**INSPECTION END**



Component Description

NAEC0177

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



<Reference data>

Fuel temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal 92 (Fuel tank temperature sensor) 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.

On Board Diagnosis Logic

NAEC0178

Malfunction is detected when an excessively high or low voltage is sent to ECM, rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.

Possible Cause

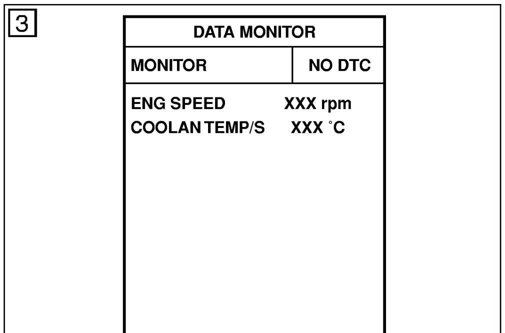
NAEC0489

- Harness or connectors
  (The sensor circuit is open or shorted.)
- Fuel tank temperature sensor

DTC Confirmation Procedure

NAEC0179

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.



SEF174Y

WITH CONSULT-II

NAEC0179S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Wait at least 10 seconds.
   If the result is NG, go to “Diagnostic Procedure”, EC-314.
   If the result is OK, go to following step.
4) Check “COOLAN TEMP/S” value.
   If “COOLAN TEMP/S” is less than 60°C (140°F), the result will be OK.
   If “COOLAN TEMP/S” is above 60°C (140°F), go to the following step.
5) Cool engine down until “COOLAN TEMP/S” is less than 60°C (140°F).
6) Wait at least 10 seconds.
7) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-314.

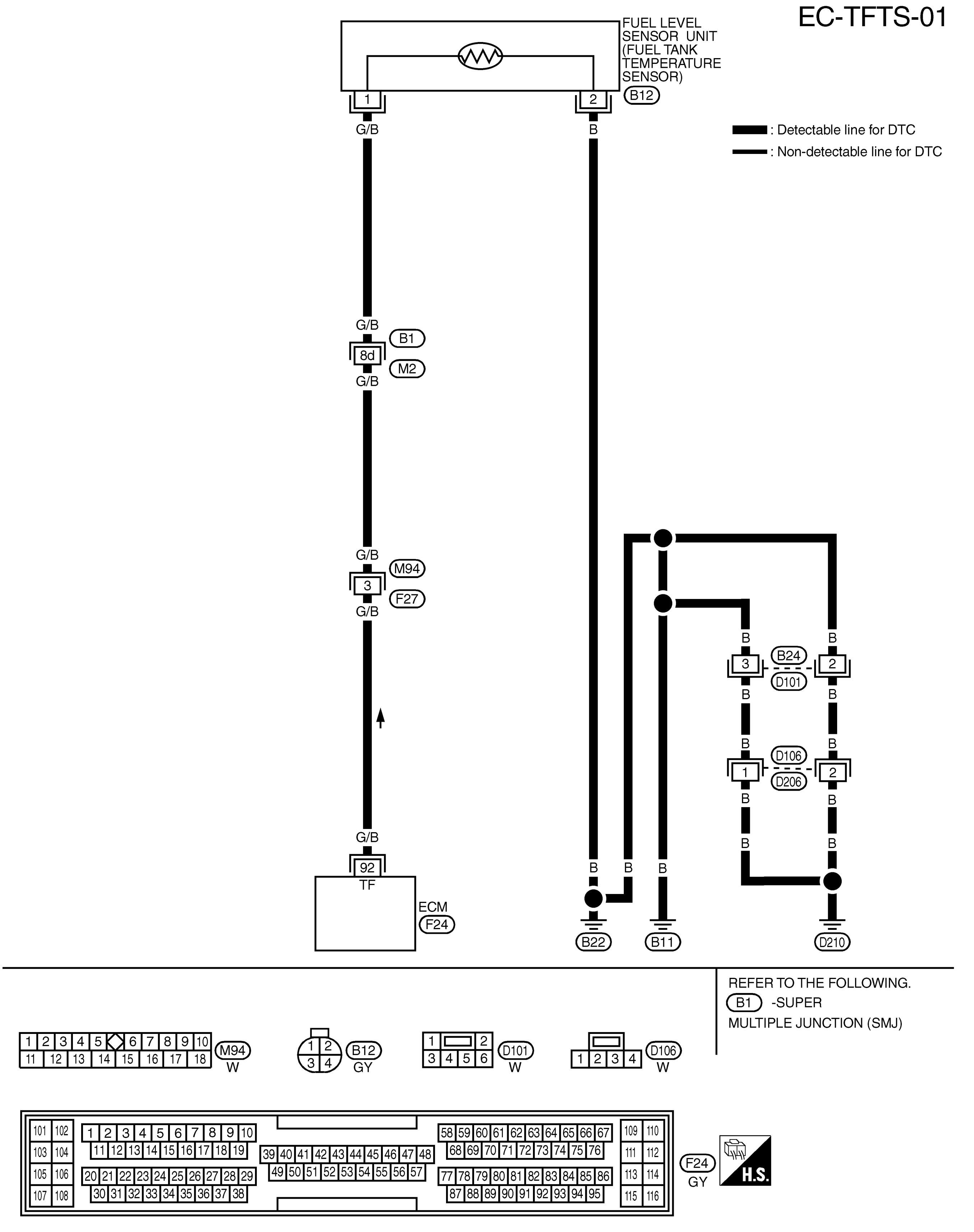
WITH GST

NAEC0179S02

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NAEC0180



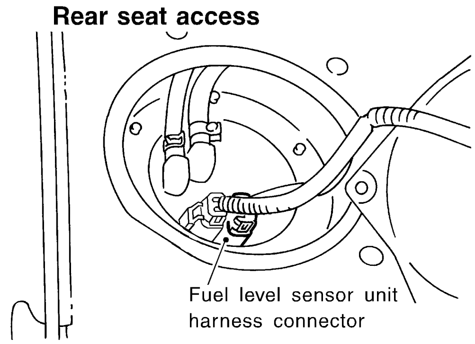
MEC957C

Diagnostic Procedure

NAEC0181

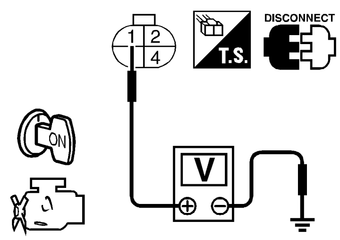
1 — CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF751UA

3. Turn ignition switch “ON”.
4. Check voltage between fuel level sensor unit terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF973Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2 — DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B1, M2
- Harness connectors M92, F27
- Harness for open or short between ECM and fuel level sensor unit and fuel pump

	▶	Repair harness or connector.

3 — CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

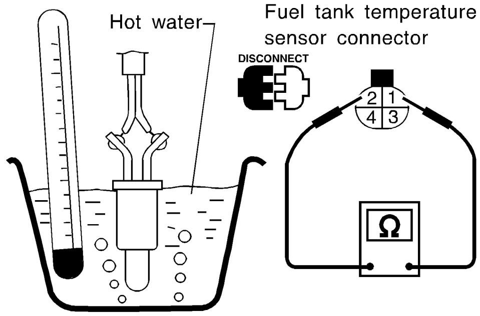
1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit and fuel pump terminal 2 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

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

4	CHECK FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 2 by heating with hot water or heat gun as shown in the figure.



Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

SEF974Y

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace fuel level sensor unit.

5	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

On Board Diagnosis Logic

NAEC0610

This diagnosis checks whether the engine coolant temperature is extraordinary high, even when the load is not heavy.
When malfunction is detected, the malfunction indicator lamp (MIL) will light up even in the first trip.
Malfunction is detected when engine coolant temperature is excessively high under normal engine speed.

Possible Cause

NAEC0611

- Thermostat
- Improper ignition timing
- Engine coolant temperature sensor
- Blocked radiator
- Blocked front end (Improper fitting of nose mask)
- Crushed vehicle frontal area (Vehicle frontal is collided but not repaired)
- Blocked air passage by improper installation of front fog lamp or fog lamps.
- Improper mixture ratio of coolant
- Damaged bumper

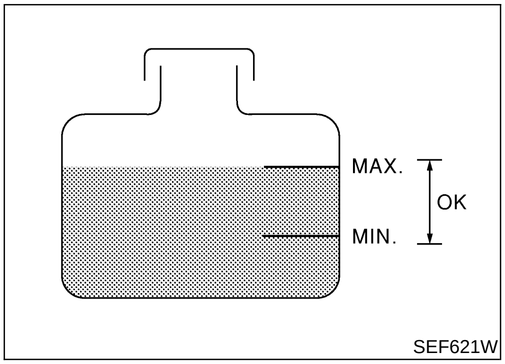
For more information, refer to “MAIN 12 CAUSES OF OVERHEATING”, EC-321.

Overall Function Check

NAEC0612

Use this procedure to check the overall function of the coolant overtemperature enrichment protection 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 the 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.



SEF621W

WITH CONSULT-II

NAEC0612S01

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 and/or radiator is below the proper range, go to “Diagnostic Procedure”, EC-318.
- If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure MA-15, “Changing Engine Coolant”.

a) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant from a kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA-13, "Anti-freeze Coolant Mixture Ratio".

b) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

c) After checking or replacing coolant, go to step 3 below.

2) Ask the customer if engine coolant has been added. If it has been added, go to "Diagnostic Procedure", EC-318. After repair, go to the next step.

3) Start engine and let it idle.

4) Make sure that A/C switch is "OFF" and air conditioner is not operating. If NG, check air conditioner circuit. Refer to HA-28 or HA-148, "TROUBLE DIAGNOSES". After repair, go to the next step.

5) Check for blocked coolant passage.

a) Warm up engine to normal operating temperature, then grasp radiator upper hose and lower hose and make sure that coolant flows.
If NG, go to "Diagnostic Procedure", EC-318. After repair, go to the next step.
Be extremely careful not to touch any moving or adjacent parts.

6) Check for blocked radiator air passage.

a) When market fog lamps have been installed, check for damaged fans and clogging in the condenser and radiator.

b) Check the front end for clogging caused by insects or debris.

c) Check for improper fitting of front-end cover, damaged radiator grille or bumper, damaged vehicle front.
If NG, take appropriate action and then go to the next step.

7) Check function of ECT sensor.
Refer to step 7 of "Diagnostic Procedure", EC-318.
If NG, replace ECT sensor and go to the next step.

8) Check ignition timing. Refer to basic inspection, EC-102.
Make sure that ignition timing is 15°±5° at idle.
If NG, adjust ignition timing and then recheck.

GST WITH GST

NAEC0612S02

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 and/or radiator is below the proper range, and go to "Diagnostic Procedure", EC-318.
- If the coolant mixture ratio is out of the range of 45 to 55%, replace the coolant in the following procedure MA-15, "Changing Engine Coolant".

a) Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant from a kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA-13, "Anti-freeze Coolant Mixture Ratio".

b) After refilling coolant, run engine to ensure that no water-flow noise is emitted.

c) After checking or replacing coolant, go to step 3 below.

2) Ask the customer if engine coolant has been added. If it has been added, go to "Diagnostic Procedure", EC-318. After repair, go to the next step.

3) Start engine and let it idle.

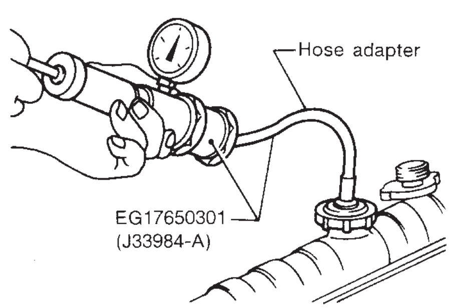
4) Make sure that A/C switch is "OFF" and air conditioner is not operating. If NG, check air conditioner circuit. Refer to HA-28 or HA-148, "TROUBLE DIAGNOSES". After repair, go to the next step.
5) Check for blocked coolant passage.
a) Warm up engine to normal operating temperature, then grasp radiator upper hose and lower hose and make sure that coolant flows.
If NG, go to "Diagnostic Procedure", EC-318. After repair, go to the next step.
Be extremely careful not to touch any moving or adjacent parts.
6) Check for blocked radiator air passage.
a) When market fog lamps have been installed, check for damaged fans and clogging in the condenser and radiator.
b) Check the front end for clogging caused by insects or debris.
c) Check for improper fitting of front-end cover, damaged radiator grille or bumper, damaged vehicle front.
If NG, take appropriate action and then go to the next step.
7) Check function of ECT sensor.
Refer to step 6 of "Diagnostic Procedure", EC-318.
If NG, replace ECT sensor and go to the next step.
8) Check ignition timing. Refer to basic inspection, EC-102.
Make sure that ignition timing is 15°±5° at idle.
If NG, adjust ignition timing and then recheck.

Diagnostic Procedure

NAEC0614

1	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.



SLC754A

Pressure should not drop.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

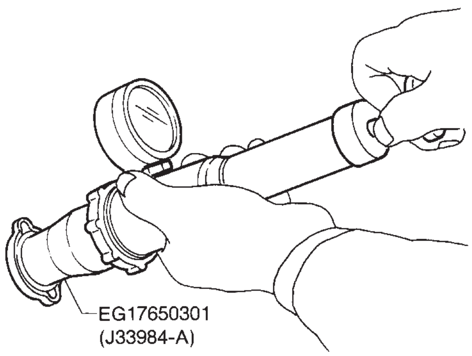
2	**DETECT MALFUNCTIONING PART**

Check the following for leak.
- Hose
- Radiator
- Water pump (Refer to LC-13, "Water Pump".)

▶	Repair or replace.

3	**CHECK RADIATOR CAP**

Apply pressure to cap with a tester and check radiator cap relief pressure.



SLC755A

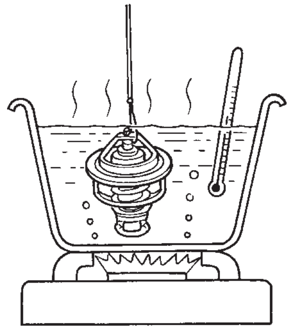
Radiator cap relief pressure:
59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi)

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace radiator cap.

4	**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:
76.5°C (170°F) [standard]
Valve lift:
More than 8.6 mm/90°C (0.339 in/194°F)

4. Check if valve is closed at 5°C (9°F) below valve opening temperature. For details, refer to LC-17, "Thermostat".

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace thermostat

GI
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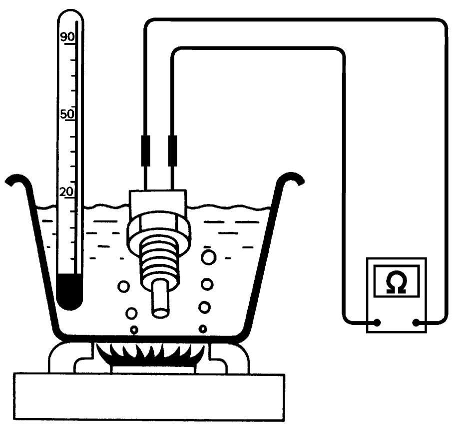
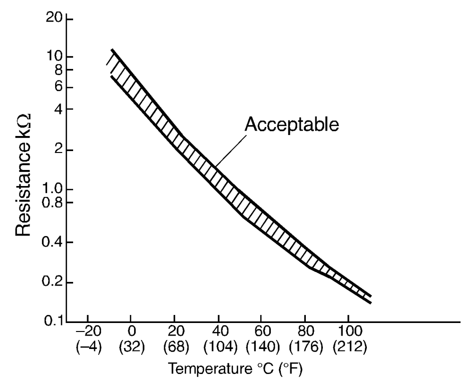
5	CHECK ENGINE COOLANT TEMPERATURE SENSOR

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 6.
NG	▶	Replace engine coolant temperature sensor.

6	CHECK MAIN 12 CAUSES

If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-321.

	▶	**INSPECTION END**

Main 12 Causes of Overheating

NAEC0615

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See MA-12, “RECOMMENDED FLUIDS AND LUBRICANTS”.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See MA-15, “Changing Engine Coolant”.
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See LC-12, “System Check”.
ON*2	5	● Coolant leaks	● Visual	No leaks	See LC-12, “System Check”.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See LC-17, “Thermostat” and LC-20, “Radiator”.
ON*1	7*5	● Cooling fan	● CONSULT-II	Operating	See trouble diagnosis for DTC P0217 (EC-316).
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 MA-15, “Changing Engine Coolant”.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See MA-14, “ENGINE MAINTENANCE”.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See EM-43, “Inspection”.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See EM-64, “Inspection”.

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
*5: Cooling fan is not applied to this vehicle.
For more information, refer to LC-25, “OVERHEATING CAUSE ANALYSIS”.

On Board Diagnosis Logic

NAEC0182

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the CKP sensor signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input Signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

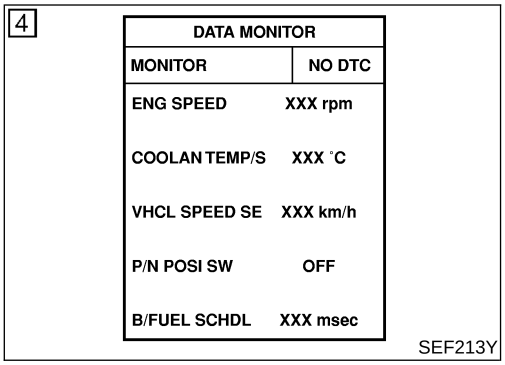
1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the first trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

Malfunction is detected when multiple cylinders misfire, No. 1 cylinder misfires, No. 2 cylinder misfires, No. 3 cylinder misfires, No. 4 cylinder misfires, No. 5 cylinder misfires and No. 6 cylinder misfires.

Possible Cause

NAEC0490

- Improper spark plug
- Insufficient compression
- Incorrect fuel pressure
- The injector circuit is open or shorted
- Injectors
- Intake air leak
- The ignition secondary circuit is open or shorted
- Lack of fuel
- Drive plate or flywheel
- Heated oxygen sensor 1 (front)



SEF213Y

DTC Confirmation Procedure

NAEC0183

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

NAEC0183S01

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 “Diagnostic Procedure”, EC-323.

WITH GST

NAEC0183S02

Follow the procedure “With CONSULT-II” above.

Diagnostic Procedure

NAEC0184

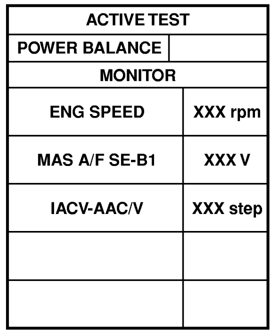
1	CHECK FOR INTAKE AIR LEAK
1. Start engine and run it at idle speed. 2. Listen for the sound of the intake air leak. **OK or NG**	
OK ▶	GO TO 2.
NG ▶	Discover air leak location and repair.

2	CHECK FOR EXHAUST SYSTEM CLOGGING
1. Stop engine and visually check exhaust tube, three way catalyst and muffler for dents. **OK or NG**	
OK ▶	GO TO 3.
NG ▶	Repair or replace it.

3 PERFORM POWER BALANCE TEST

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.

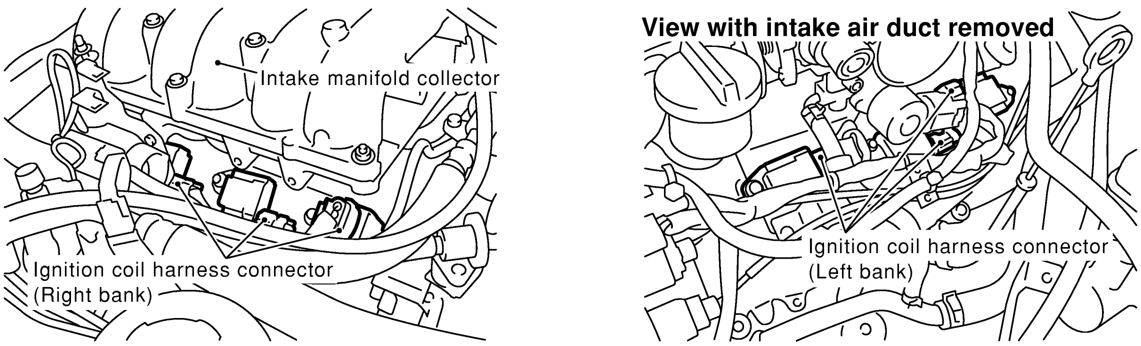


SEF190Y

2. Is there any cylinder which does not produce a momentary engine speed drop?

Without CONSULT-II

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



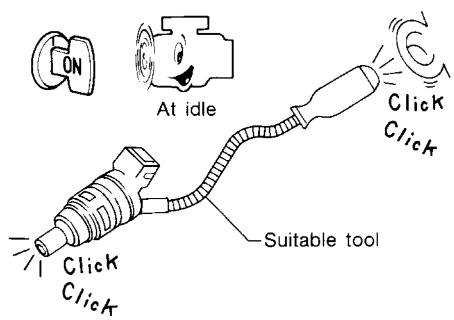
SEF975Y

Yes or No

Yes	▶	GO TO 5.
No	▶	GO TO 4.

4 CHECK INJECTOR

Does each injector make an operating sound at idle?



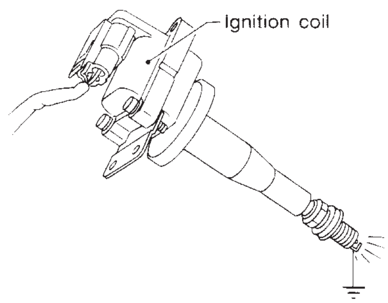
MEC703B

Yes or No

Yes	▶	GO TO 5.
No	▶	Check injector(s) and circuit(s). Refer to EC-619.

5	CHECK IGNITION SPARK

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



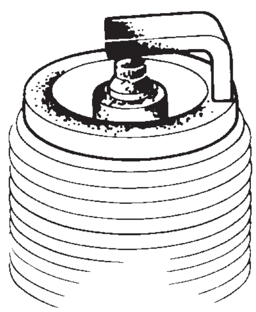
SEF575Q

OK or NG

OK	▶	GO TO 6.
NG	▶	Check ignition coil, power transistor and their circuits. Refer to "DTC P1320 IGNITION SIGNAL", EC-501

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-14, "ENGINE MAINTENANCE".

7	CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-14, "Measurement of Compression Pressure".

Standard:
1,275 kPa (13.0 kg/cm^2, 185 psi)/300 rpm
Minimum:
981 kPa (10.0 kg/cm^2, 142 psi)/300 rpm
Difference between each cylinder:
98 kPa (1.0 kg/cm^2, 14 psi)/300 rpm

OK or NG

OK	▶	GO TO 8.
NG	▶	Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

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

8	CHECK FUEL PRESSURE	
1. Install all removed parts. 2. Release fuel pressure to zero. Refer to EC-39. 3. Install fuel pressure gauge and check fuel pressure. Refer to EC-39. **At idle:** **Approx. 235 kPa (2.4 kg/cm^2, 34 psi)** **OK or NG**		
OK	▶	GO TO 10.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART	
Check the following. ● Fuel pump and circuit (Refer to EC-628.) ● Fuel pressure regulator (Refer to EC-40.) ● Fuel lines (Refer to MA-17, "Checking Fuel Lines".) ● Fuel filter for clogging		
	▶	Repair or replace.

10	CHECK IGNITION TIMING	
Check the following items. Refer to "Basic Inspection", EC-102.		

Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

MTBL0653

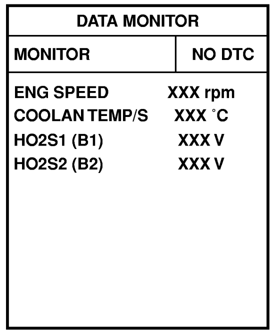
OK or NG

OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Follow the "Basic Inspection".

11	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

With CONSULT-II

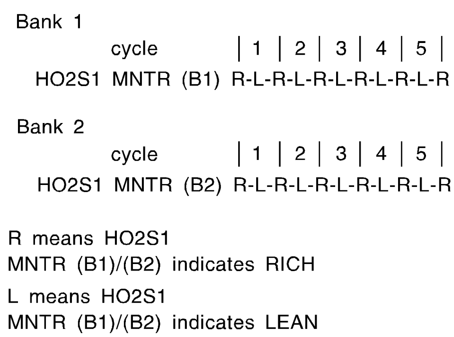
1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT-II, and select "HO2S1 (B1)/(B2)" and "HO2S1 MNTR (B1)/(B2)".
3. Hold engine speed at 2,000 rpm under no load during the following steps.
4. Touch "RECORD" on CONSULT-II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



SEF967Y

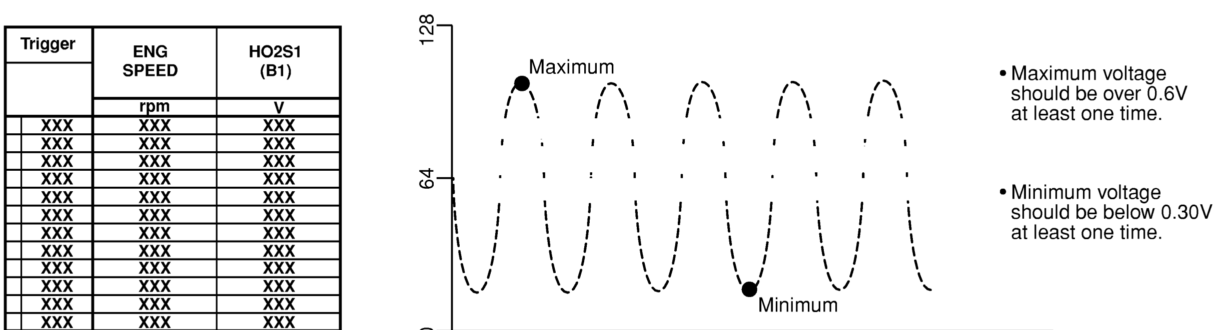
5. Check the following.

- "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 left:



SEF647Y

- "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.



SEF648Y

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.

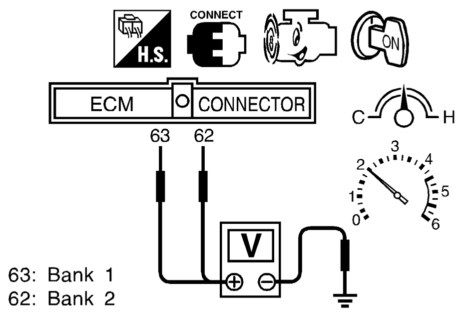
OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

12	CHECK HEATED OXYGEN SENSOR 1 (FRONT)

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM terminal 63 (HO2S1 bank 1 right signal) or 62 (HO2S1 bank 2 left 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 → 0 - 0.3V

SEF967XA

CAUTION:

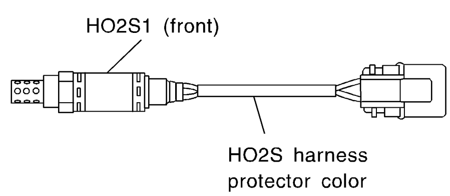
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	REPLACE HEATED OXYGEN SENSOR 1 (FRONT)

1. Turn ignition switch "OFF".
2. Check heated oxygen sensor 1 (front) harness protector color.



HO2S1 (front) (bank 1): Black
HO2S1 (front) (bank 2): Blue

SEF505Y

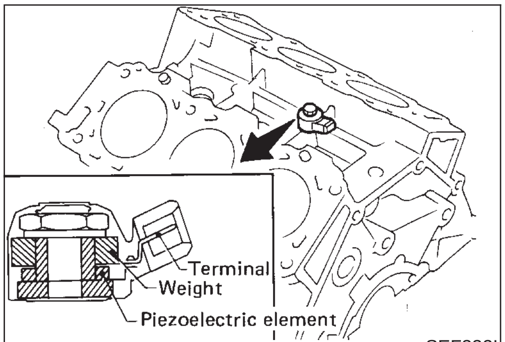
	▶	Replace malfunctioning heated oxygen sensor 1 (front).

14	CHECK MASS AIR FLOW SENSOR	
With CONSULT-II Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-II. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 g·m/sec: at 2,500 rpm**		
With GST Check mass air flow sensor signal in MODE 1 with GST. **2.0 - 6.0 g·m/sec: at idling** **7.0 - 20.0 g·m/sec: at 2,500 rpm** **OK or NG**		
OK	▶	GO TO 15.
NG	▶	Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-152.

15	CHECK SYMPTOM MATRIX CHART	
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-120. **OK or NG**		
OK	▶	GO TO 16.
NG	▶	Repair or replace.

16	ERASE THE 1ST TRIP DTC	
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-73. Some tests may cause a 1st trip DTC to be set.		
	▶	GO TO 17.

17	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**



SEF332I

Component Description

NAEC0185

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.
Freeze frame data will not be stored in the ECM for the knock sensor. The MIL will not light for knock sensor malfunction. The knock sensor has one trip detection logic.

ECM Terminals and Reference Value

NAEC0663

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)
93	W	Knock sensor	**[Engine is running]** ● Idle speed	Approximately 2.5V

On Board Diagnosis Logic

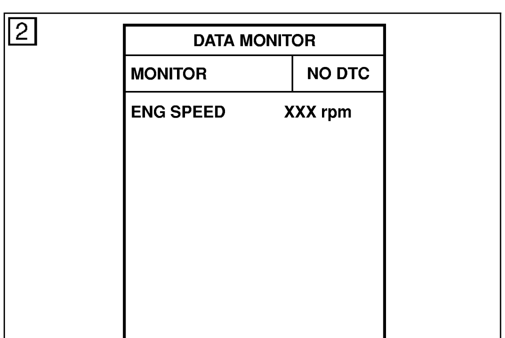
NAEC0187

Malfunction is detected when an excessively low or high voltage from the knock sensor is sent to ECM.

Possible Cause

NAEC0491

- Harness or connectors
  (The knock sensor circuit is open or shorted.)
- Knock sensor



SEF058Y

DTC Confirmation Procedure

NAEC0188

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.

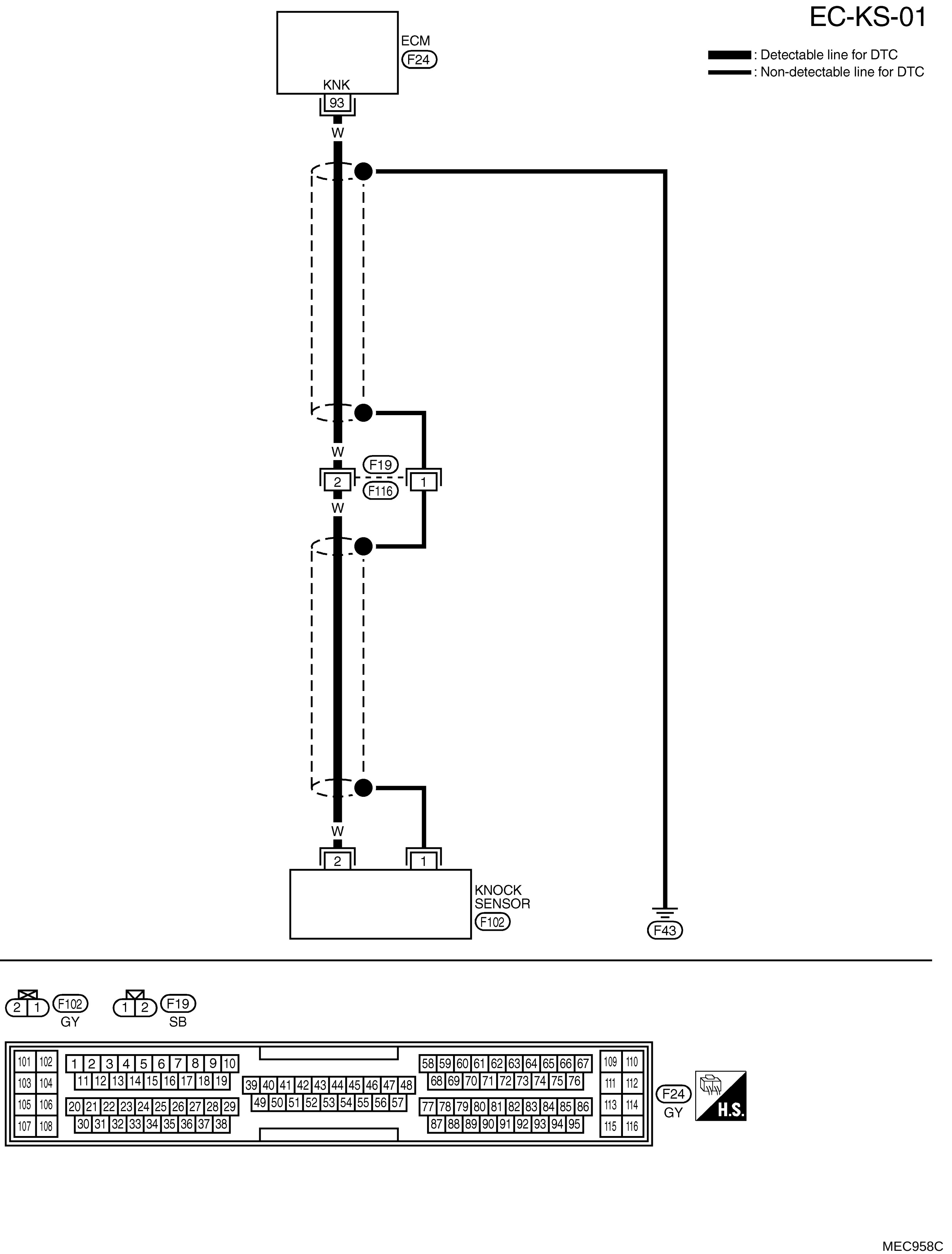
WITH CONSULT-II

NAEC0188S01

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 DTC is detected, go to “Diagnostic Procedure”, EC-333.

Wiring Diagram

NAEC0189

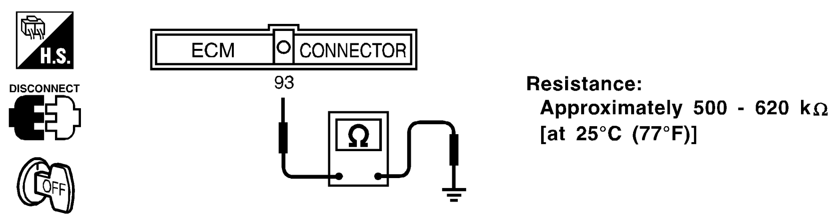


Diagnostic Procedure

NAEC0190

1	CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminal 93 and engine ground.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.



SEF321X

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

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 2.

2	CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between ECM terminal 93 and knock sensor 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 4.
NG	▶	GO TO 3.

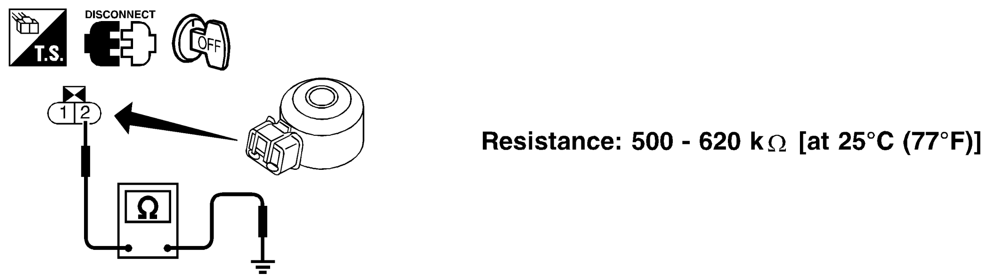
3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F19, F116
- Harness for open or short between ECM and knock sensor

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

4	CHECK KNOCK SENSOR

Check resistance between knock sensor terminal 2 and ground.
NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.



SEF976Y

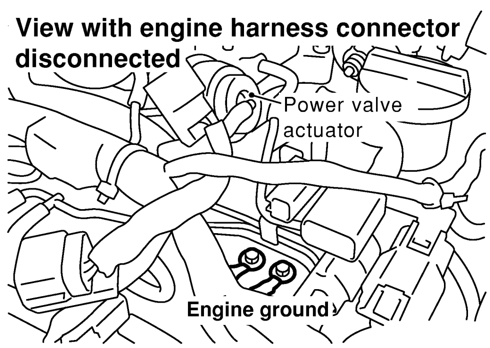
CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace knock sensor.

5	RETIGHTEN GROUND SCREWS

Loose and retighten engine ground screws.



SEF959Y

	▶	GO TO 6.

6	CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect harness connectors F19, F116.
2. Check harness continuity between harness connector F19 terminal 1 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

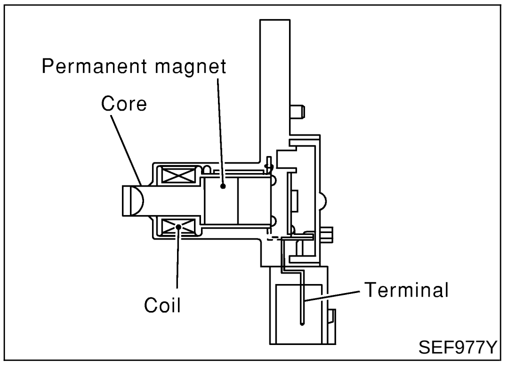
OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F19, F116
- Harness for open or short between harness connector F19 and engine ground

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

8	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	INSPECTION END



Component Description

NAEC0191

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT-II Reference Value in Data Monitor Mode

NAEC0492

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

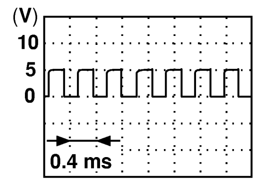
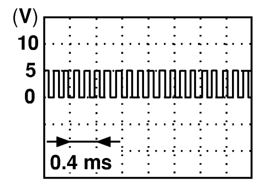
ECM Terminals and Reference Value

=NAEC0664

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)
85	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● Idle speed	Approximately 2.4V  SEF057V
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 2.3V  SEF058V

On Board Diagnosis Logic

NAEC0193

Malfunction is detected when 1° signal is not entered to ECM for the first few seconds during engine cranking, or 1° signal is not entered to ECM during engine running.

Possible Cause

NAEC0493

- Harness or connectors
  [The crankshaft position sensor (POS) circuit is open or shorted.]
- Crankshaft position sensor (POS)
- Starter motor (Refer to EL section.)
- Starting system circuit (Refer to EL section.)
- Dead (Weak) battery

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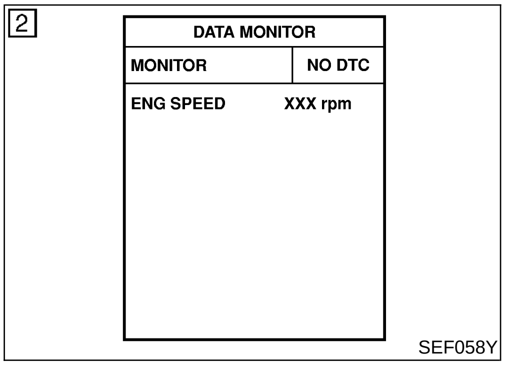


DTC Confirmation Procedure

NAEC0194

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 CONSULT-II

NAEC0194S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Crank engine for at least two seconds.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-340.

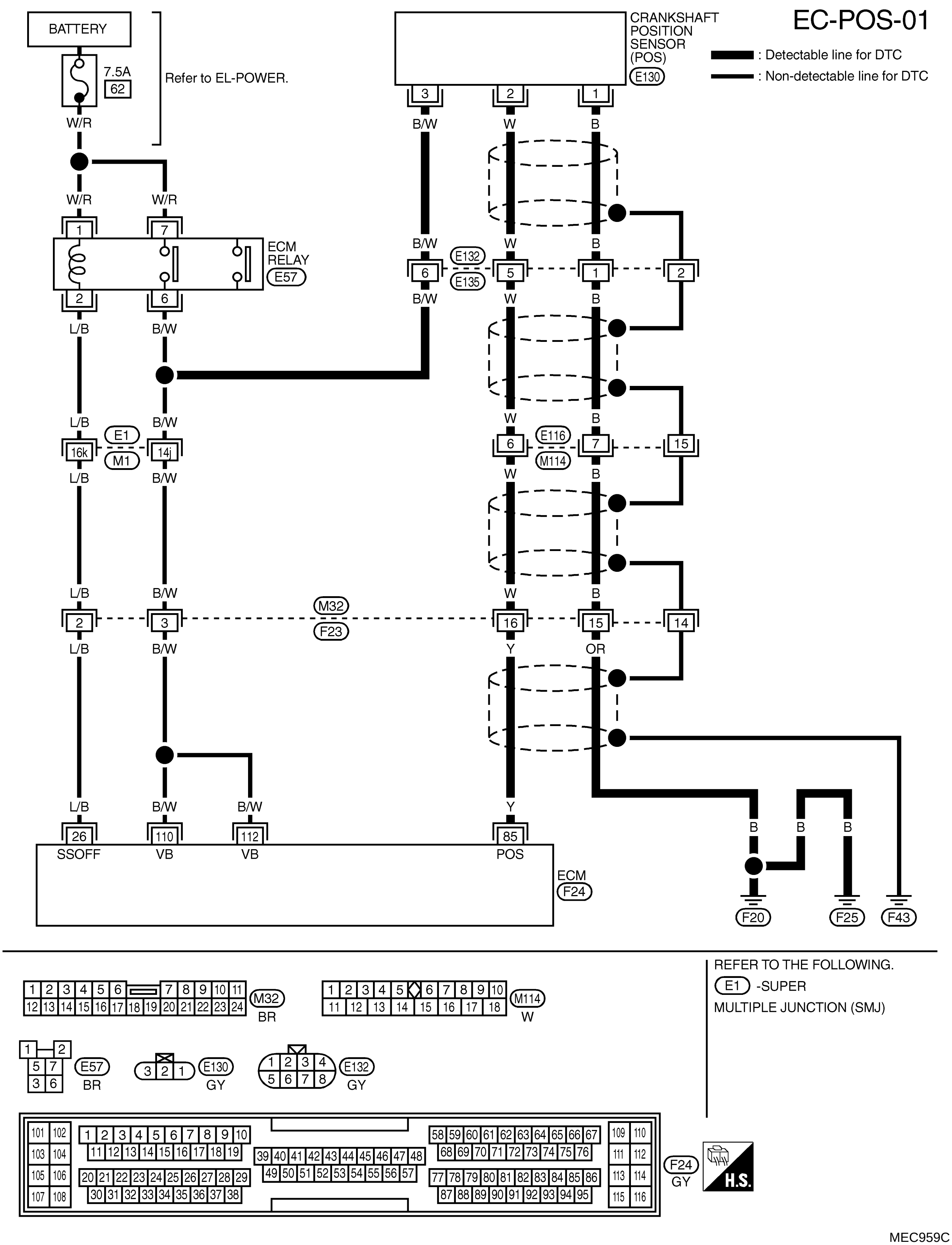
WITH GST

NAEC0194S02

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NAEC0195

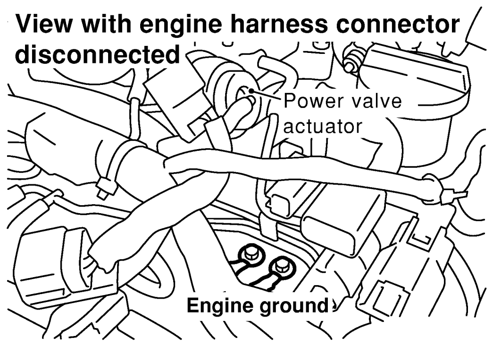


Diagnostic Procedure

NAEC0196

1	RETIGHTEN GROUND SCREWS

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

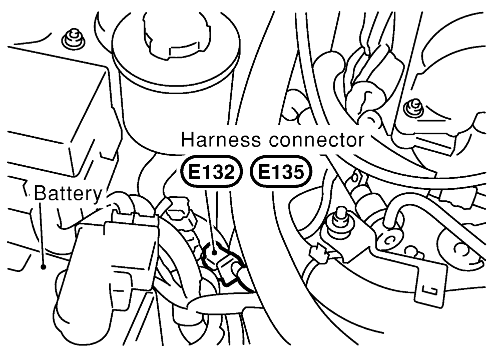


SEF959Y

▶	GO TO 2.

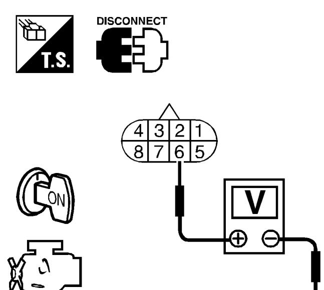
2	CHECK CKPS (POS) POWER SUPPLY CIRCUIT

1. Disconnect harness connectors E132, E135.



SEF978Y

2. Check voltage between harness connector E135 terminal 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF979Y

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

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

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

3	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E132, E135 ● Harness for open or short between ECM and crankshaft position sensor (POS) ● Harness for open or short between ECM relay and crankshaft position sensor (POS)		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT	
1. Check harness continuity between harness connector E135 terminal 1 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	GO TO 5.

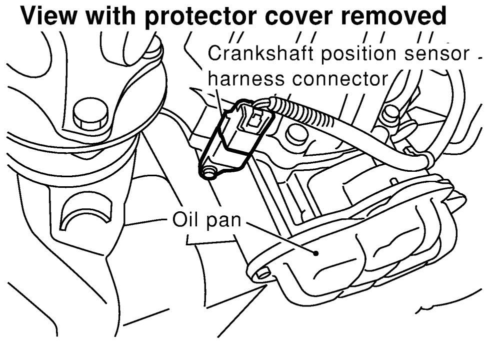
5	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E132, E135 ● Harness connectors E116, M114 ● Harness connectors M32, F23 ● Harness for open between crankshaft position sensor (POS) and ground		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK CKPS (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 85 and harness connector E135 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.

7	DETECT MALFUNCTIONING PART	
Check the following. ● Harness connectors E132, E135 ● Harness connectors E116, M114 ● Harness connectors M32, F23 ● Harness for open or short between ECM and crankshaft position sensor (POS)		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF980Y

2. Check harness continuity between CKPS (POS) terminals and harness connector E132 terminals as follows.

CKPS (POS) terminal	Harness connector E132 terminal
1	1
2	5
3	6

MTBL0618

Continuity should exist.

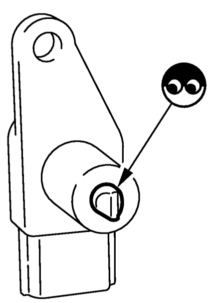
3. Also check harness for short to ground and short to power.

OK or NG

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

9	CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



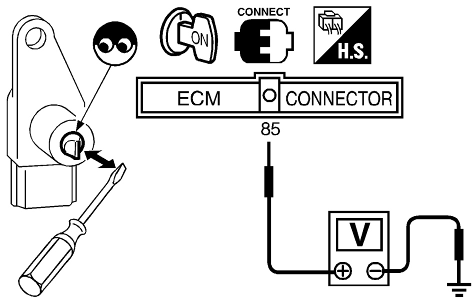
SEF981Y

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace crankshaft position sensor (POS).

10 CHECK CRANKSHAFT POSITION SENSOR (POS)-II

1. Reconnect disconnected harness connectors.
2. Turn ignition switch "ON".
3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdrivers.



ECM terminal	Condition	Voltage
85	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF343Z

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace crankshaft position sensor (POS).

11 CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect harness connectors E132, E135.
2. Check harness continuity between harness connector E135 terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12 DETECT MALFUNCTIONING PART

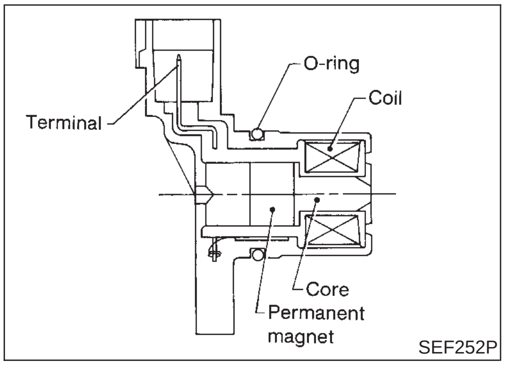
Check the following.
- Harness connectors E132, E135
- Harness connectors E116, M114
- Harness connectors M32, F23
- Harness for open between harness connector E135 and engine ground

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

13 CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**



Component Description

NAEC0197

The camshaft position sensor (PHASE) is located on the engine front cover facing the camshaft sprocket. It detects the cylinder No. signal.
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the camshaft sprocket will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the cylinder No. signal.

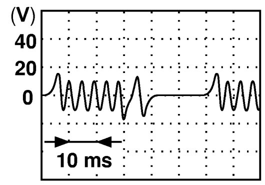
ECM Terminals and Reference Value

NAEC0665

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)
66 76	L L	Camshaft position sensor (PHASE)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 4.2V★ (AC voltage)  SEF582X

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

On Board Diagnosis Logic

NAEC0199

Malfunction is detected when
(Malfunction A) the cylinder No. signal is not sent to ECM for the first few seconds during engine cranking,
(Malfunction B) the cylinder No. signal is not sent to ECM during engine running,
(Malfunction C) the cylinder No. signal is not in the normal pattern during engine running.

Possible Cause

NAEC0494

- Harness or connectors
  [The camshaft position sensor (PHASE) circuit is open or shorted.]
- Camshaft position sensor (PHASE)
- Starter motor (Refer to SC section.)
- Starting system circuit (Refer to SC section.)
- Dead (Weak) battery

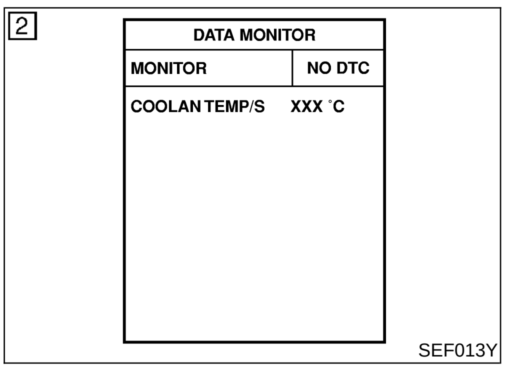
DTC Confirmation Procedure

NAEC0200

NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A” first. If 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B AND C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.



SEF013Y

PROCEDURE FOR MALFUNCTION A

NAEC0200S01

With CONSULT-II

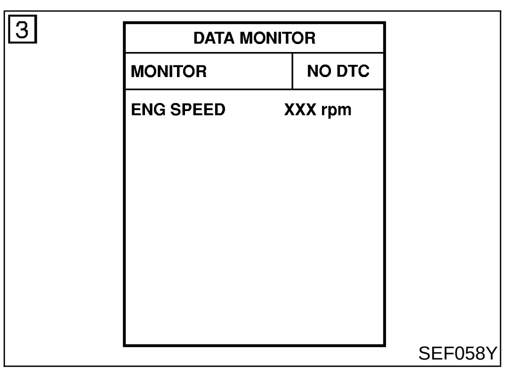
NAEC0200S0101

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Crank engine for at least 2 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-347.

With GST

NAEC0200S0102

Follow the procedure “With CONSULT-II” above.



SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NAEC0200S02

With CONSULT-II

NAEC0200S0201

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 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-347.

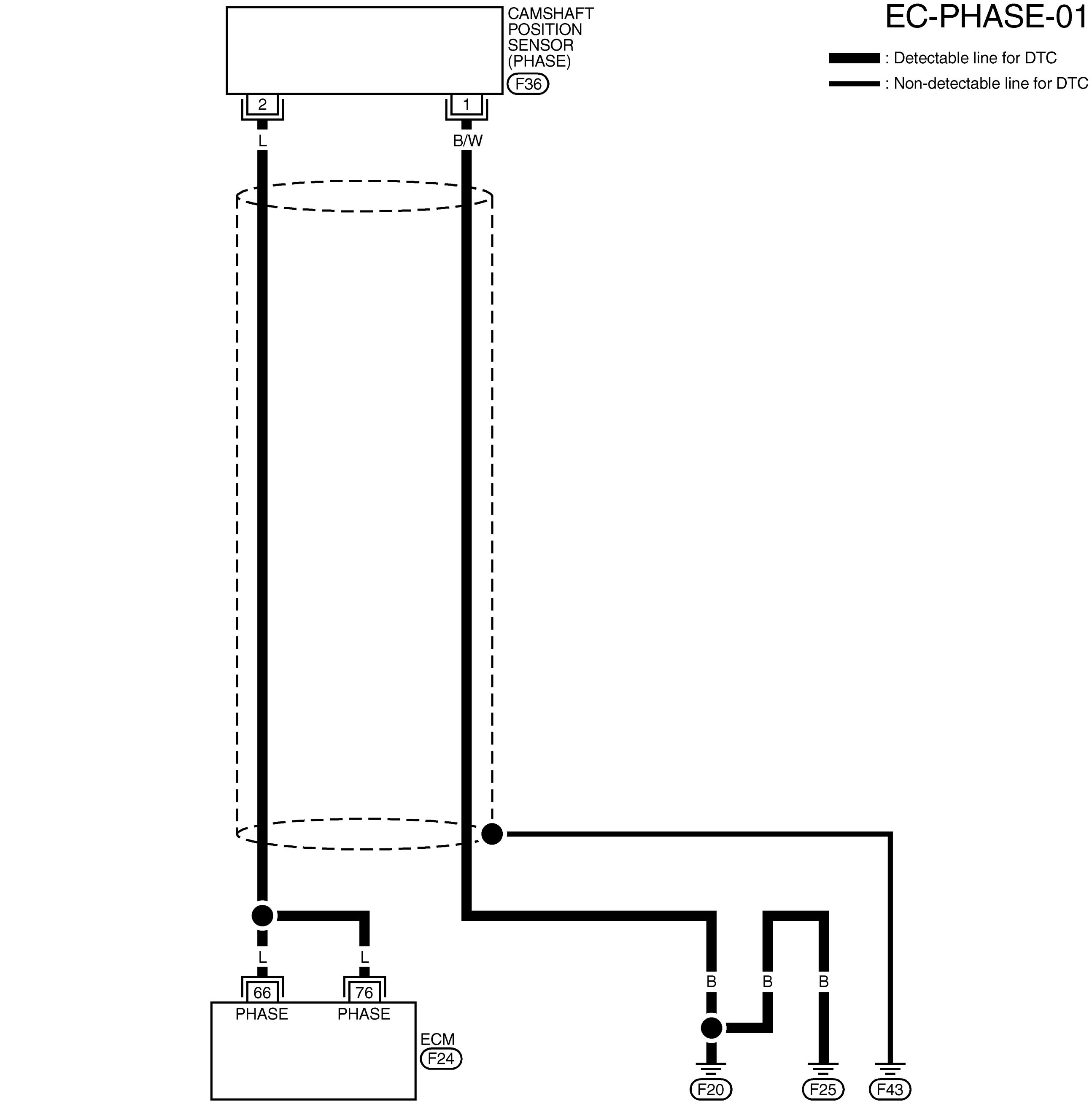
With GST

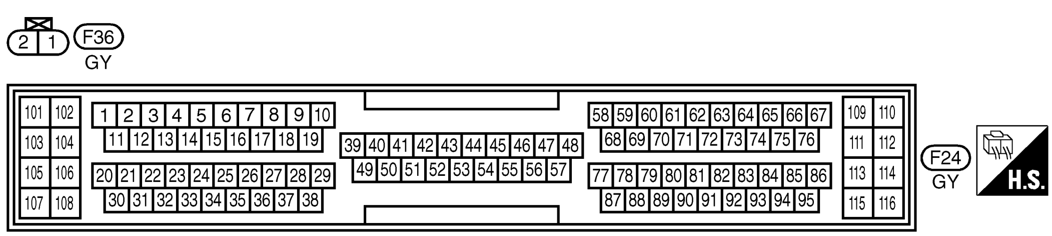
NAEC0200S0202

Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NAEC0201





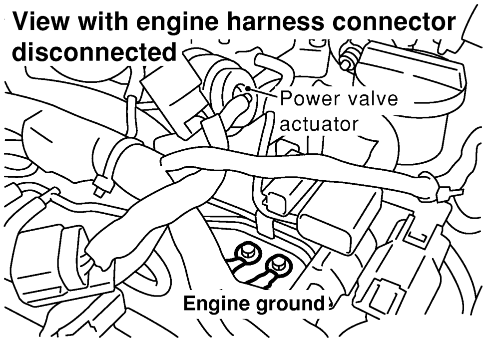
MEC961C

Diagnostic Procedure

NAEC0202

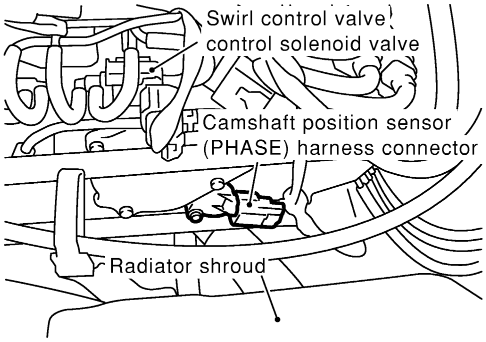
1	CHECK STARTING SYSTEM
Turn ignition switch to "START" position. **Does the engine turn over?** **Does the starter motor operate?** **Yes or No**	
Yes ▶	GO TO 2.
No ▶	Check starting system. (Refer to SC-10, "STARTING SYSTEM".)

2	RETIGHTEN GROUND SCREWS
1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.	
▶	GO TO 3.



SEF959Y

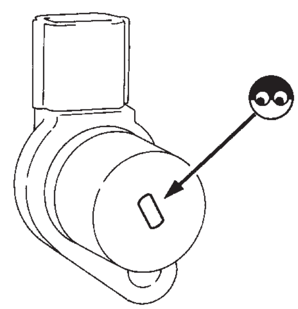
3	CHECK CMPS (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Disconnect ECM harness connector and CMPS (PHASE) harness connector.	

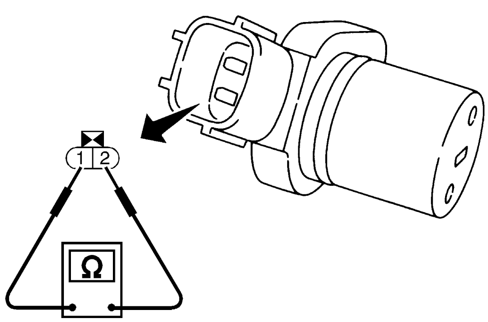


SEF982Y

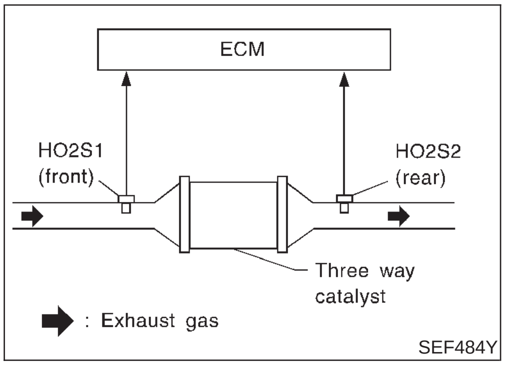
3. Check harness continuity between CMPS (PHASE) terminal 2 and ECM terminals 66, 76. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 4.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK CMPS (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between CMPS (PHASE) terminal 1 and engine ground. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	Repair open circuit or short to power in harness or connector.

5	CHECK CAMSHAFT POSITION SENSOR (PHASE)-I
1. Loosen the fixing bolt of the camshaft position sensor (PHASE). 2. Remove the CMPS (PHASE). 3. Visually check the CMPS (PHASE) for chipping.  SEF583P **OK or NG**	
OK ▶	GO TO 6.
NG ▶	Replace camshaft position sensor (PHASE).

6	CHECK CAMSHAFT POSITION SENSOR (PHASE)-II
Check resistance between CMPS (PHASE) terminals 1 and 2 as shown below.  **Resistance:** **Approximately 1,440 - 1,760 Ω at 20°C (68°F) (HITACHI make)** **Approximately 2,090 - 2,550 Ω at 20°C (68°F) (MITSUBISHI make)** SEF325X **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Replace camshaft position sensor (PHASE).

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



On Board Diagnosis Logic

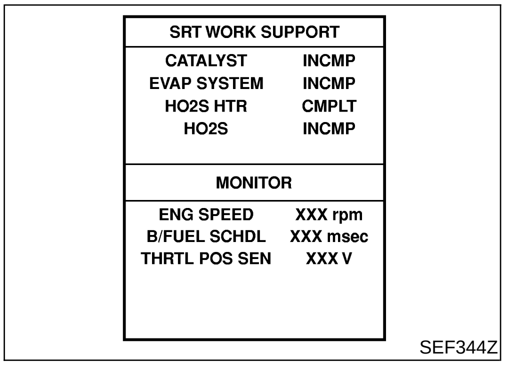
NAEC0214

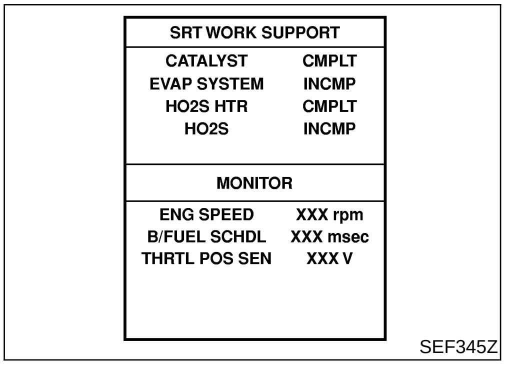
The ECM monitors the switching frequency ratio of heated oxygen sensors 1 (front) and 2 (rear).
A warm-up three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.
When the frequency ratio of front and rear heated oxygen sensors approaches a specified limit value, the warm-up three way catalyst malfunction is diagnosed.
Malfunction is detected when warm-up three way catalyst does not operate properly, warm-up three way catalyst does not have enough oxygen storage capacity.

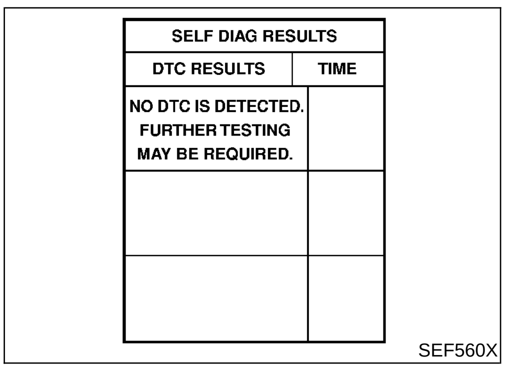
Possible Cause

NAEC0504

- Warm-up three way catalyst
- Exhaust tube
- Intake air leaks
- Injectors
- Injector leaks
- Spark plug
- Improper ignition timing







DTC Confirmation Procedure

NAEC0215

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.

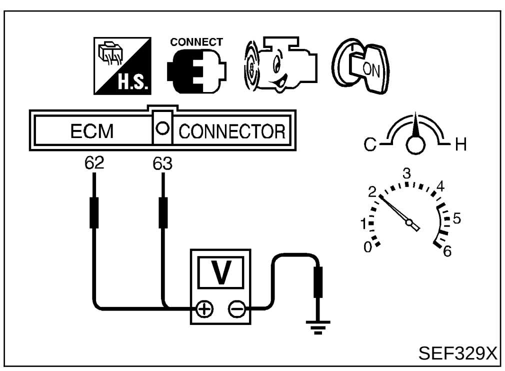
WITH CONSULT-II

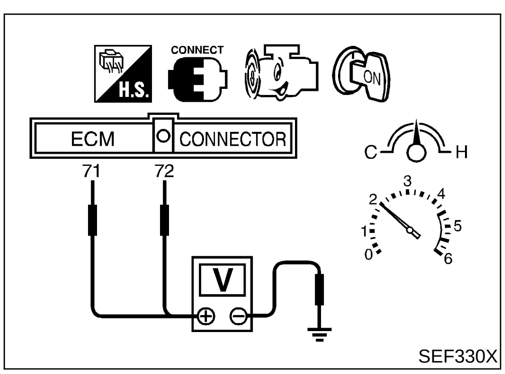
NAEC0215S01

TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **Do not hold engine speed for more than the specified minutes below.**

1) Turn ignition switch “ON”.
2) Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-II.
3) Start engine.
4) Rev engine up to 3,000±500 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
5) Wait 5 seconds at idle.
6) Rev engine up to 2,500±500 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.
7) Select “SELF-DIAG RESULTS” mode with CONSULT-II.
8) Confirm that the 1st trip DTC is not detected.
   If the 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-351.





Overall Function Check

NAEC0216

Use this procedure to check the overall function of the warm-up three way catalyst. During this check, a 1st trip DTC might not be confirmed.

CAUTION:

Always drive vehicle at a safe speed.

WITH GST

NAEC0216S01

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeters probes between ECM terminals 63 [heated oxygen sensor 1 (front) right bank signal], 62 [heated oxygen sensor 1 (front) left bank signal] and engine ground, and ECM terminals 72 [heated oxygen sensor 2 (rear) right bank signal], 71 [heated oxygen sensor 2 (rear) left bank signal] and engine ground.
4) Keep engine speed at 2,000 rpm constant under no load.
5) Make sure that the voltage switching frequency (high & low) between ECM terminals 72 and engine ground, or 71 and engine ground is very less than that of ECM terminals 63 and engine ground, or 62 and engine ground.
   Switching frequency ratio = A/B

A: Rear heated oxygen sensor voltage switching frequency
B: Front heated oxygen sensor voltage switching frequency
This ratio should be less than 0.75.
If the ratio is greater than above, it means warm-up three way catalyst does not operate properly. Go to "Diagnostic Procedure", EC-351.

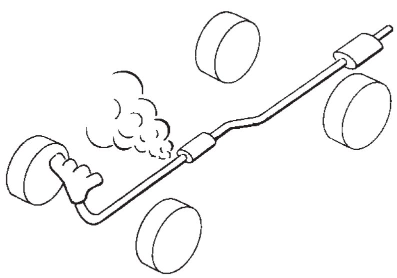
NOTE:
If the voltage at terminal 62 or 63 does not switch periodically more than 5 times within 10 seconds at step 5, perform trouble diagnosis for "DTC P0133, P0153" first. (See EC-220.)

Diagnostic Procedure

NAEC0217

1	CHECK EXHAUST SYSTEM
Visually check exhaust tubes and muffler for dent. **OK or NG**	
OK ▶	GO TO 2.
NG ▶	Repair or replace.

2	CHECK EXHAUST AIR LEAK
1. Start engine and run it at idle. 2. Listen for an exhaust air leak before the warm-up three way catalyst.	



SEF099P

OK or NG	
OK ▶	GO TO 3.
NG ▶	Repair or replace.

3	CHECK INTAKE AIR LEAK
Listen for an intake air leak after the mass air flow sensor. **OK or NG**	
OK ▶	GO TO 4.
NG ▶	Repair or replace.

4 CHECK IGNITION TIMING

Check the following items. Refer to "Basic Inspection", EC-102.

Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

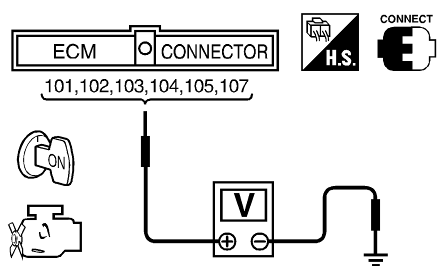
MTBL0653

OK or NG

OK ▶	GO TO 5.
NG ▶	Follow the "Basic Inspection".

5 CHECK INJECTORS

1. Refer to WIRING DIAGRAM for Injectors, EC-620.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals 101, 102, 103, 104, 105, 107 and ground with CONSULT-II or tester.



Battery voltage should exist.

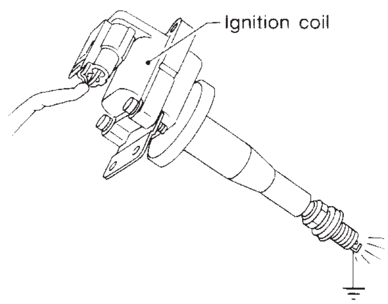
SEF331X

OK or NG

OK ▶	GO TO 6.
NG ▶	Perform "Diagnostic Procedure", "INJECTOR", EC-621.

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-501.

7	CHECK INJECTOR

1. Turn ignition switch "OFF".
2. Remove injector assembly.
   Refer to EC-41.
   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 "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

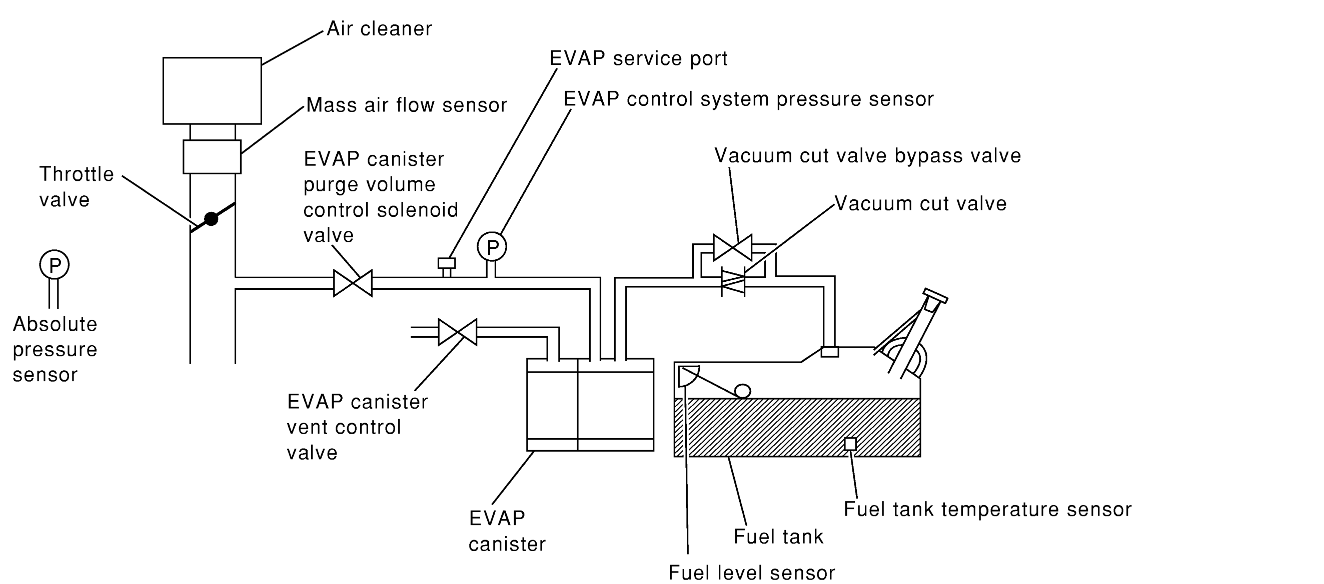
Trouble is fixed.	▶	**INSPECTION END**
Trouble is not fixed.	▶	Replace warm-up three way catalyst.

On Board Diagnosis Logic

NAEC0218

NOTE:
If DTC P0440 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-575.)

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



SEF373Z

Malfunction is detected when EVAP control system has a leak, EVAP control system does not operate properly.

CAUTION:

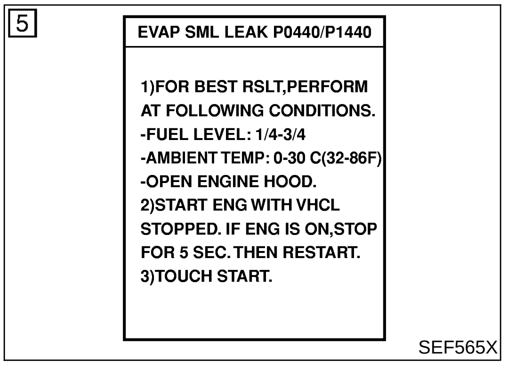
- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

Possible Cause

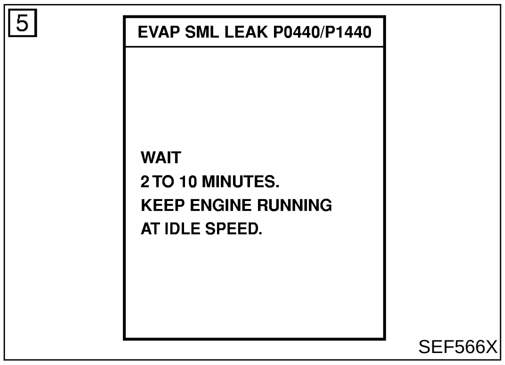
NAEC0510

- Incorrect fuel tank vacuum relief valve
- Incorrect fuel filler cap used
- Fuel filler cap remains open or fails to close.
- Foreign matter caught in fuel filler cap.
- Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.
- Foreign matter caught in EVAP canister vent control valve.
- EVAP canister or fuel tank leaks
- EVAP purge line (pipe and rubber tube) leaks

- EVAP purge line rubber tube bent.
- Blocked or bent rubber tube to EVAP control system pressure sensor
- Loose or disconnected rubber tube
- EVAP canister vent control valve and the circuit
- EVAP canister purge volume control solenoid valve and the circuit
- Absolute pressure sensor
- Fuel tank temperature sensor
- O-ring of EVAP canister vent control valve is missing or damaged.
- Water separator
- EVAP canister is saturated with water.
- EVAP control system pressure sensor
- Fuel level sensor and the circuit



SEF565X



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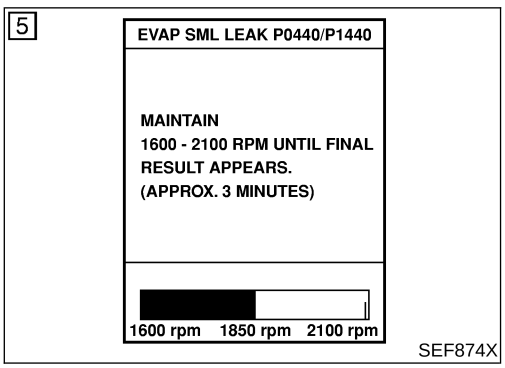
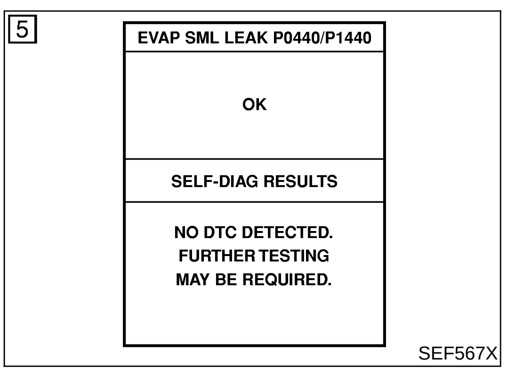


SEF874X



SEF567X

DTC Confirmation Procedure

NAEC0219

NOTE:

- **If DTC P0440 or P1440 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-575.)**
- 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:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedure.**

WITH CONSULT-II

NAEC0219S01

1) Turn ignition switch “ON”.
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) Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5) Select “EVAP SML LEAK P0440/P1440” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.

NOTE:
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to “Basic Inspection”, EC-102.

6) Make sure that “OK” is displayed.
   If “NG” is displayed, refer to “Diagnostic Procedure”, EC-357.

NOTE:
Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

WITH GST

NAEC0219S02

NOTE:
Be sure to read the explanation of “Driving Pattern” on EC-67 before driving vehicle.

1) Start engine.
2) Drive vehicle according to “Driving Pattern”, EC-67.
3) Stop vehicle.
4) Select “MODE 1” with GST.
- If SRT of EVAP system is not set yet, go to the following step.
- If SRT of EVAP system is set, the result will be OK.
5) Turn ignition switch “OFF” and wait at least 10 seconds.
6) Start engine.
   It is not necessary to cool engine down before driving.
7) Drive vehicle again according to the “Driving Pattern”, EC-67.
8) Stop vehicle.
9) Select “MODE 3” with GST.
- If P0440 or P1440 is displayed on the screen, go to “Diagnostic Procedure”, EC-357.
- If P1447 is displayed on the screen, go to “Diagnostic Procedure” for DTC P1447, EC-566.

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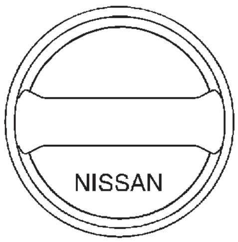
- If P0440, P1440 and P1447 are not displayed on the screen, go to the following step.

10) Select "MODE 1" with GST.
- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6.

Diagnostic Procedure

NAEC0220

1	CHECK FUEL FILLER CAP DESIGN	
1. Turn ignition switch "OFF". 2. Check for genuine NISSAN fuel filler cap design.		



SEF915U

OK or NG

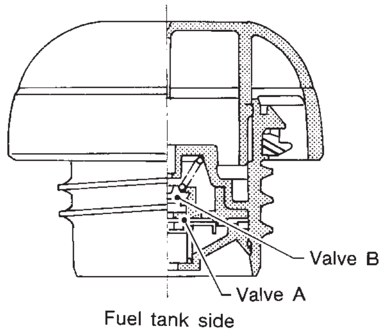
OK	▶	GO TO 2.
NG	▶	Replace with genuine NISSAN fuel filler cap.

2	CHECK FUEL FILLER CAP INSTALLATION	
Check that the cap is tightened properly by rotating the cap clockwise.		
OK or NG		
OK	▶	GO TO 3.
NG	▶	• Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. • Retighten until ratcheting sound is heard.

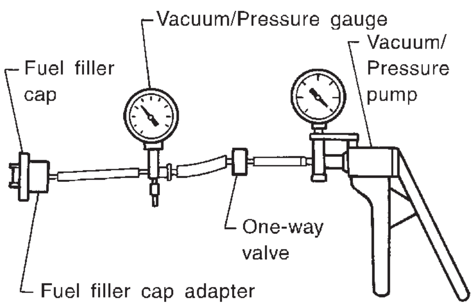
3	CHECK FUEL FILLER CAP FUNCTION	
Check for air releasing sound while opening the fuel filler cap.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	CHECK FUEL TANK VACUUM RELIEF VALVE

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



SEF427N



SEF943S

Pressure:
15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
Vacuum:
−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)

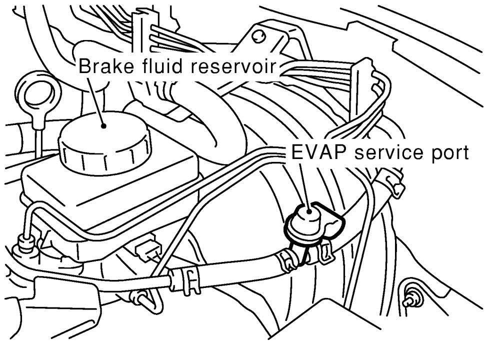
CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

OK or NG

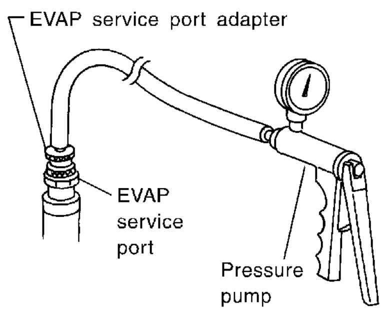
OK	▶	GO TO 5.
NG	▶	Replace fuel filler cap with a genuine one.

5	INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.



SEF983Y



SEF916U

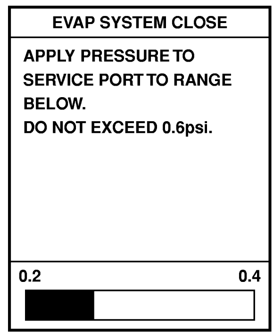
NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

Models with CONSULT-II ▶	GO TO 6.
Models without CONSULT-II ▶	GO TO 7.

6	CHECK FOR EVAP LEAK

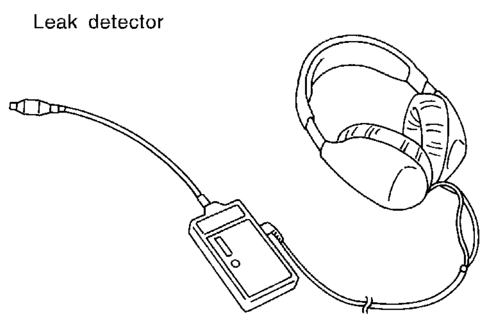
With CONSULT-II

1. Turn ignition switch "ON".
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-II.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**



PEF917U

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.



SEF200U

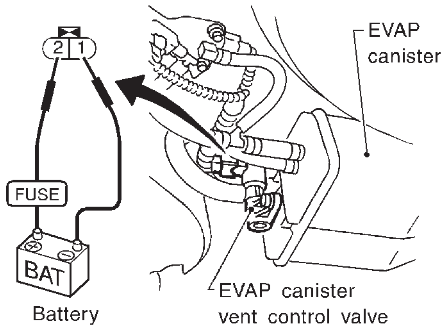
OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or replace.

7	CHECK FOR EVAP LEAK

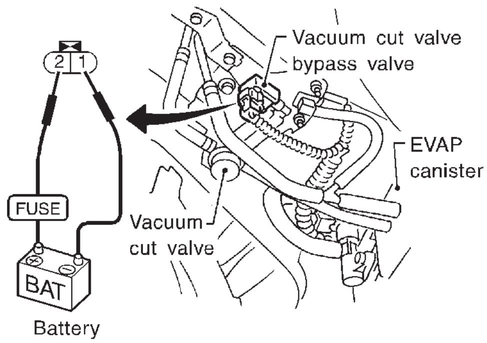
Without CONSULT-II

1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)



SEF598U

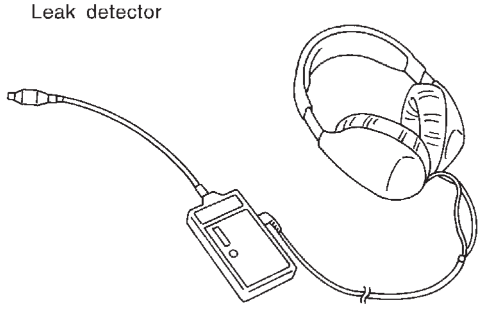
3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



SEF599U

4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**
5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.

Leak detector



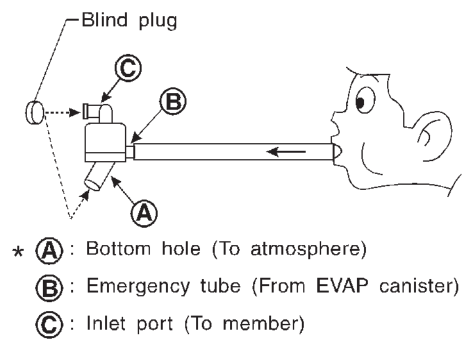
SEF200U

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or replace.

8	CHECK WATER SEPARATOR

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that **A** and **C** are not clogged by blowing air into **B** with **A**, and then **C** plugged.



SEF829T

5. In case of NG in items 2 - 4, replace the parts.

NOTE:
- Do not disassemble water separator.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace water separator.

9	CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

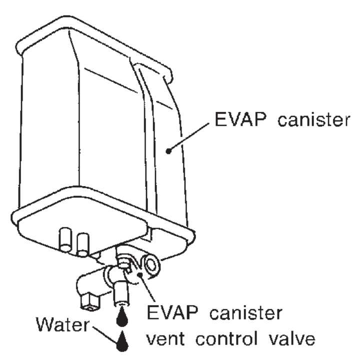
Refer to "DTC Confirmation Procedure", EC-377.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

10	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?



SEF596U

Yes or No

Yes	▶	GO TO 11.
No (With CONSULT-II)	▶	GO TO 13.
No (Without CONSULT-II)	▶	GO TO 14.

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11 CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK (With CONSULT-II)	▶	GO TO 13.
OK (Without CONSULT-II)	▶	GO TO 14.
NG	▶	GO TO 12.

12 DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and water separator for clogging or poor connection

	▶	Repair hose or replace EVAP canister.

13 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II
1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT-II screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

Vacuum should exist.

SEF984Y

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

14 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   Vacuum should exist.

OK or NG

OK	▶	GO TO 17.
NG	▶	GO TO 15.

15	CHECK VACUUM HOSE	
Check vacuum hoses for clogging or disconnection. Refer to “Vacuum Hose Drawing”, EC-26.		
OK or NG		
OK (With CONSULT-II)	▶	GO TO 16.
OK (Without CONSULT-II)	▶	GO TO 17.
NG	▶	Repair or reconnect the hose.

16	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE	

With CONSULT-II

1. Start engine.
2. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

SEF985Y

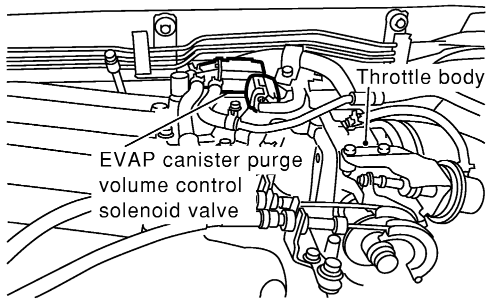
OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 17.

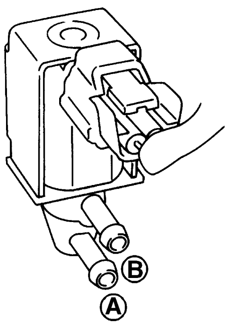
17	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y

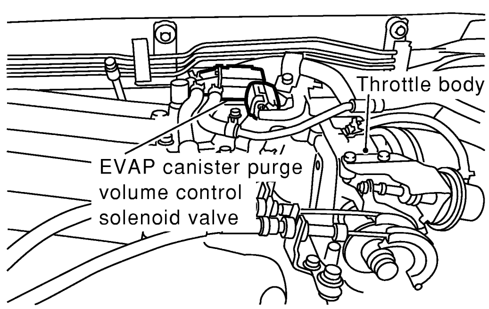


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

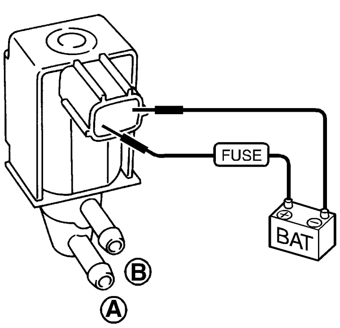
SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y



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

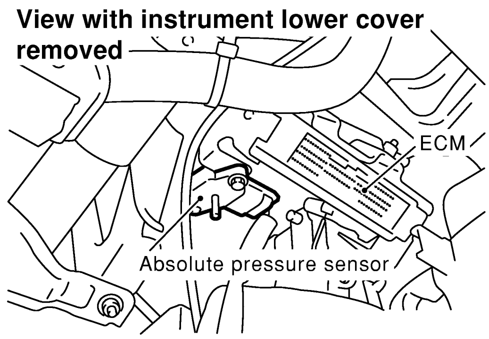
SEF335X

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

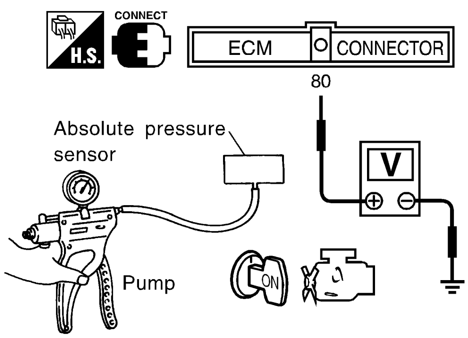
18 CHECK ABSOLUTE PRESSURE SENSOR

1. Remove absolute pressure sensor with its harness connector connected.



SEF961Y

2. Remove hose from absolute pressure sensor.
3. Install a vacuum pump to absolute pressure sensor.
4. Turn ignition switch "ON" and check output voltage between ECM terminal 80 and engine ground under the following conditions.



Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
−26.7 (−200, −7.87)	1.0 to 1.4 lower than above value

SEF300XA

CAUTION:

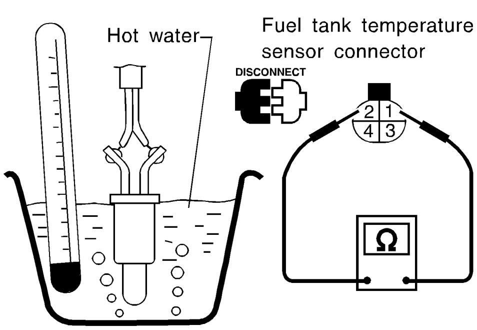
- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below −93.3 kPa (−700 mmHg, −27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

OK or NG

OK	▶	GO TO 19.
NG	▶	Replace absolute pressure sensor.

19 CHECK FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 2 by heating with hot water or heat gun as shown in the figure.



Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

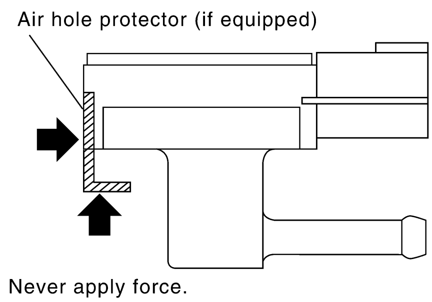
SEF974Y

OK or NG

OK	▶	GO TO 20.
NG	▶	Replace fuel level sensor unit.

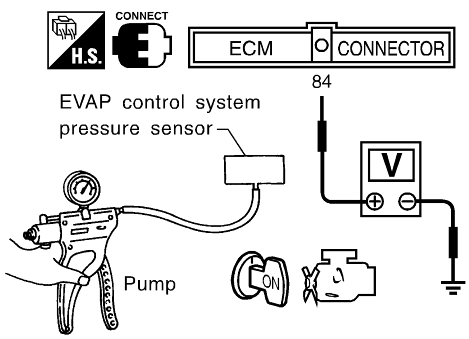
20	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure sensor which has been dropped from a height of more than 0.5m (19.7in) onto a hard surface such as a concrete floor; use a new one.**

OK or NG

OK ▶	GO TO 21.
NG ▶	Replace EVAP control system pressure sensor.

21	CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to "Evaporative Emission System", EC-32.

OK or NG

OK ▶	GO TO 22.
NG ▶	Repair or reconnect the hose.

22	CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

▶	GO TO 23.

23	**CHECK FUEL LEVEL SENSOR**	
Refer to EL-128, "Fuel Level Sensor Unit Check".		
	OK or NG	
OK	▶	GO TO 24.
NG	▶	Replace fuel level sensor unit.

24	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

Description

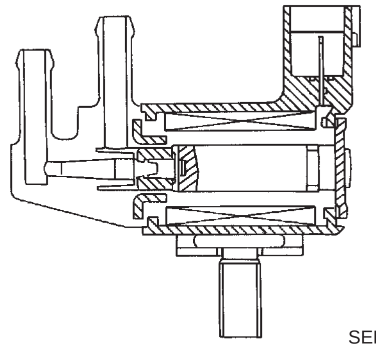
NAEC0221

SYSTEM DESCRIPTION

NAEC0221S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Throttle position switch	Closed throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



SEF337U

COMPONENT DESCRIPTION

NAEC0221S02

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

NAEC0222

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	• Engine: After warming up • Air conditioner switch “OFF” • Shift lever: “N” • No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

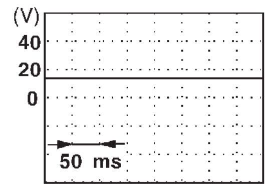
ECM Terminals and Reference Value

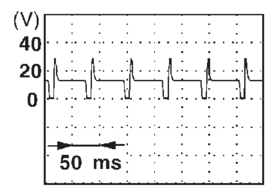
NAEC0666

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.

<table>
<tr><th>TERMINAL NO.</th><th>WIRE COLOR</th><th>ITEM</th><th>CONDITION</th><th>DATA (DC Voltage)</th></tr>
<tr><td rowspan="2">1</td><td rowspan="2">L/Y</td><td rowspan="2">EVAP canister purge volume control solenoid valve</td><td>[Engine is running]
● Idle speed</td><td>BATTERY VOLTAGE
(11 - 14V)


SEF994U</td></tr>
<tr><td>[Engine is running]
● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).</td><td>BATTERY VOLTAGE
(11 - 14V)


SEF995U</td></tr>
</table>

On Board Diagnosis Logic

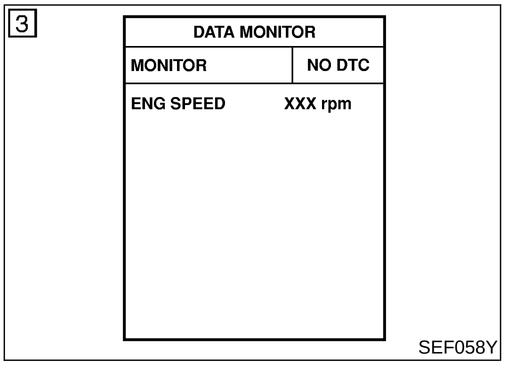
NAEC0224

Malfunction is detected when an improper voltage signal is sent to ECM through the valve.

Possible Cause

NAEC0511

- Harness or connectors
  (The valve circuit is open or shorted.)
- EVAP canister purge volume control solenoid valve



SEF058Y

DTC Confirmation Procedure

NAEC0225

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

NAEC0225S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and let it idle for at least 13 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-373.

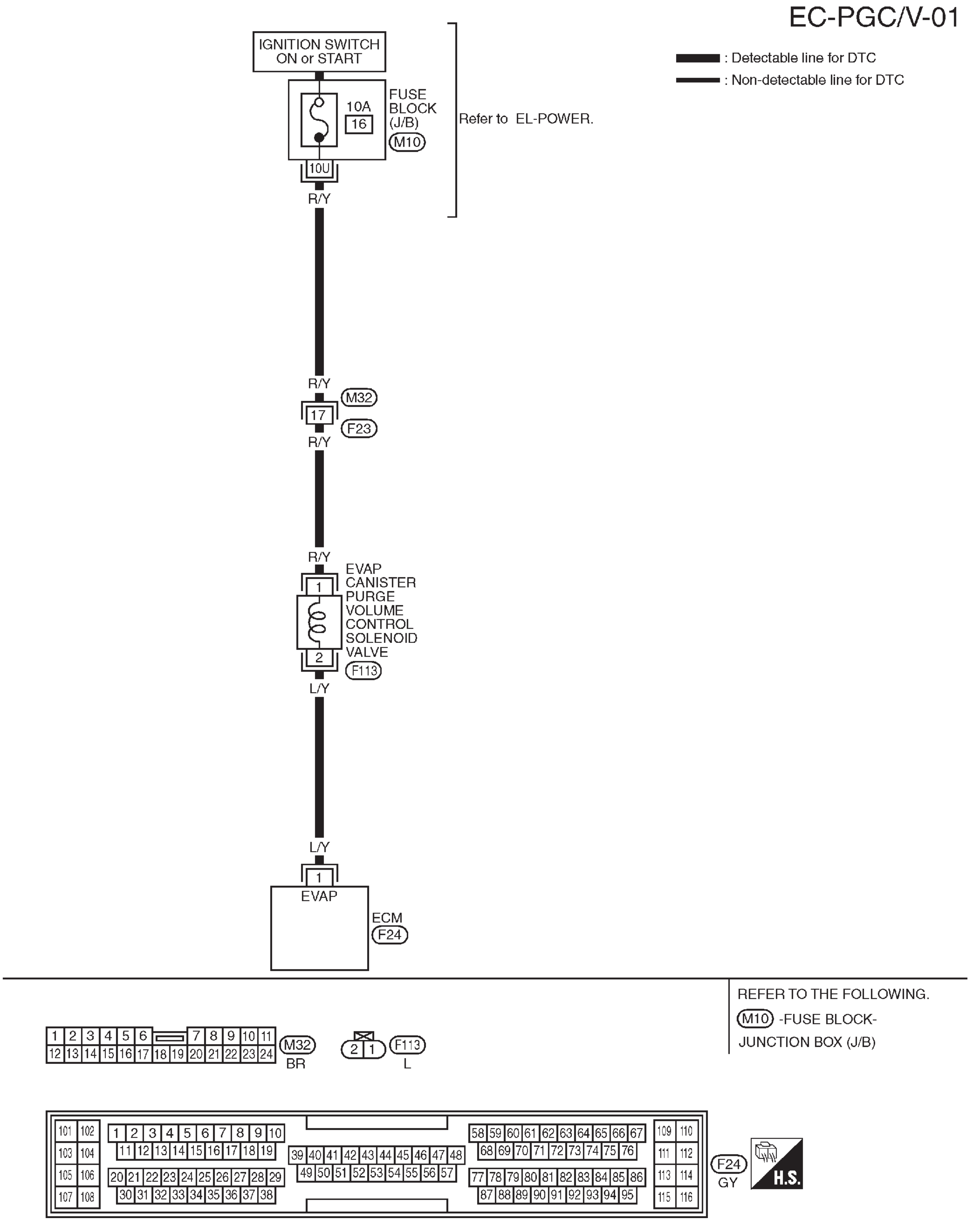
WITH GST

NAEC0225S02

Follow the proocedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0226



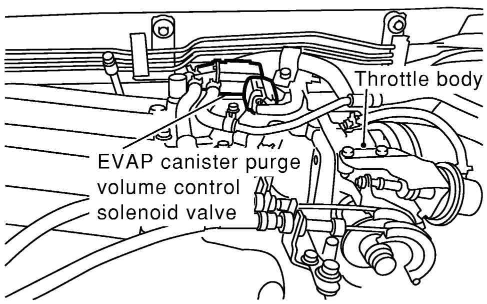
MEC962C

Diagnostic Procedure

NAEC0227

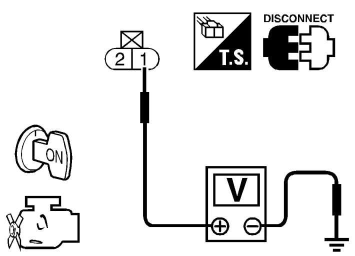
1	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF986Y

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.



Voltage: Battery voltage

SEF988Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- Fuse block (J/B) connector M10
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

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

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 1 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 and short to power in harness or connetors.

4	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II
1. Start engine.
2. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

SEF985Y

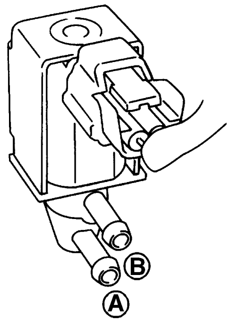
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	CHECK 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.

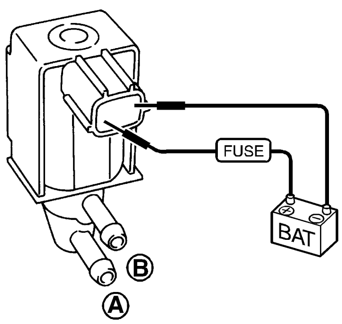


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



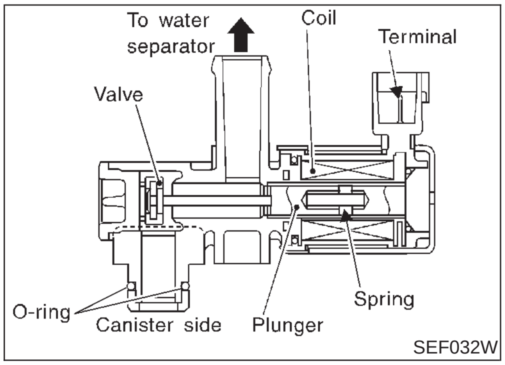
Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

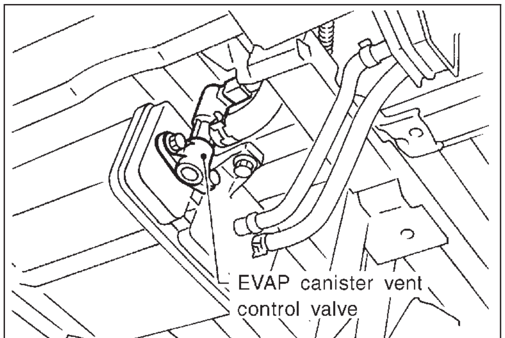
OK or NG

OK	▶	GO TO 6.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



SEF032W



SEF143S

Component Description

NAEC0228

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows “EVAP Control System (Small Leak)” diagnosis.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0229

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

ECM Terminals and Reference Value

NAEC0667

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)
40	G/Y	EVAP canister vent control valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NAEC0231

Malfunction is detected when an improper voltage signal is sent to ECM through EVAP canister vent control valve.

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

Possible Cause

NAEC0512

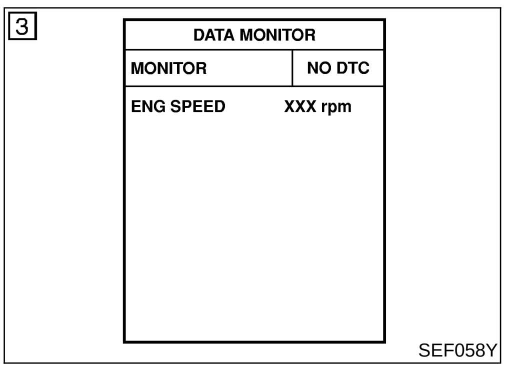
- Harness or connectors
  (The valve circuit is open or shorted.)
- EVAP canister vent control valve

DTC Confirmation Procedure

NAEC0232

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.



SEF058Y

WITH CONSULT-II

NAEC0232S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 8 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-379.

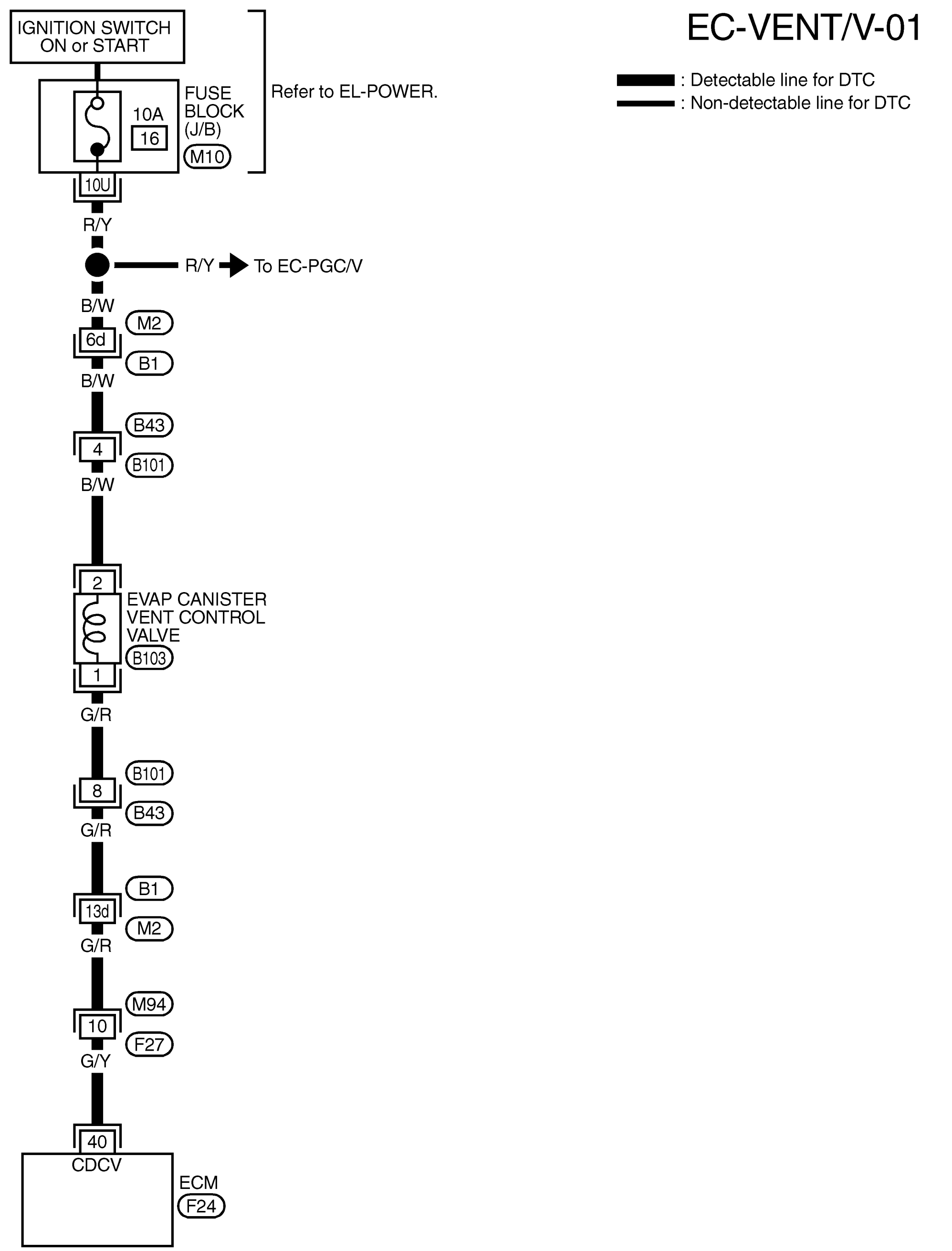
WITH GST

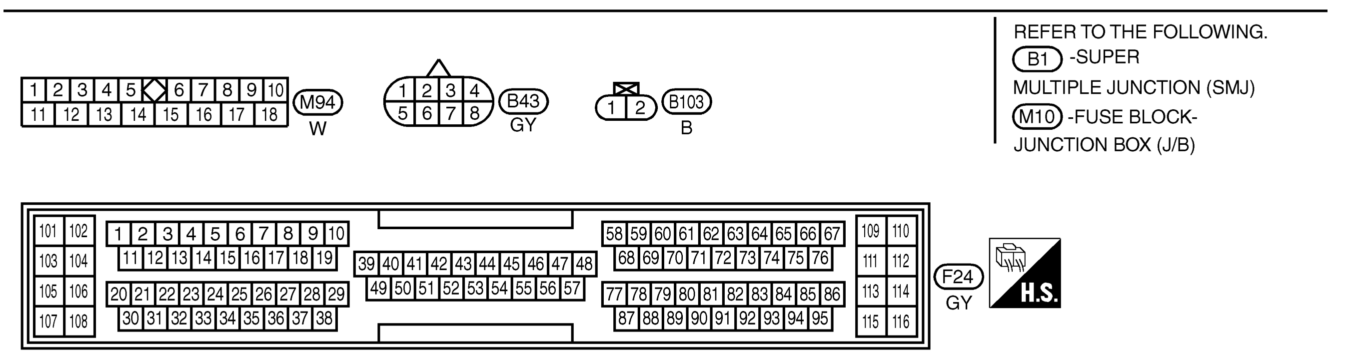
NAEC0232S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0233





MEC963C

Diagnostic Procedure

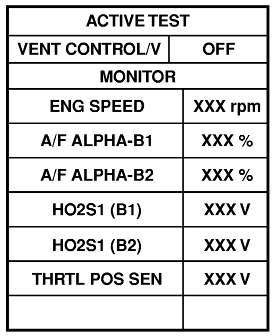
NAEC0234

1	INSPECTION START
1. Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch “OFF” and then turn “ON”.
2. Select “VENT CONTROL/V” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “ON/OFF” on CONSULT-II screen.



SEF989Y

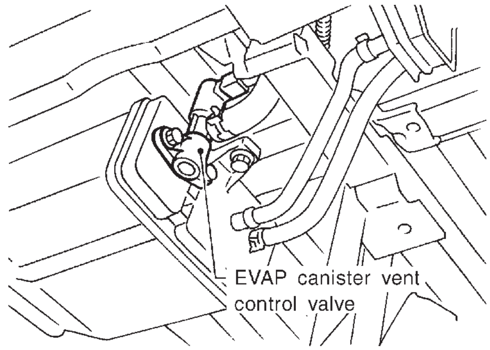
4. Check for operating sound of the valve.
   Clicking noise should be heard.

OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 3.

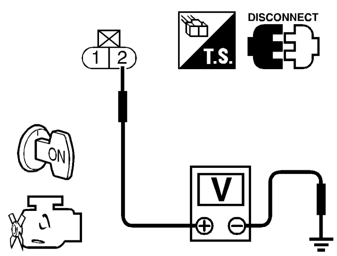
3	CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect EVAP canister vent control valve harness connector.



SEF143S

3. Turn ignition switch "ON".
4. Check voltage between EVAP canister vent control valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF990Y

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M2, B1 and B43, B101
- Fuse block (J/B) connector M10
- 10A fuse
- Harness for open or short between EVAP canister vent control valve and fuse

	▶	Repair harness or connectors.

5	CHECK EVAP CANISTER VENT CONTROL 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 40 and EVAP canister vent control valve 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 7.
NG	▶	GO TO 6.

GI
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LC
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CL
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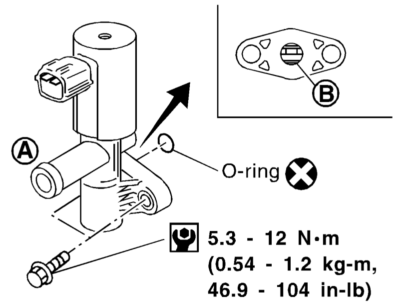
TF
PD
AX
SU
BR
ST
RS
BT
HA
SC
EL
IDX

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors B101, B43 ● Harness connectors B1, M2 and M94, F27 ● Harness for open or short between EVAP canister vent control valve and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK RUBBER TUBE FOR CLOGGING
1. Disconnect rubber tube connected to EVAP canister vent control valve. 2. Check the rubber tube for clogging. **OK or NG**	
OK ▶	GO TO 8.
NG ▶	Clean the rubber tube using an air blower.

8	CHECK EVAP CANISTER VENT CONTROL VALVE-I
1. Remove EVAP canister vent control valve from EVAP canister. 2. Check portion **B** of EVAP canister vent control valve for being rusted.	



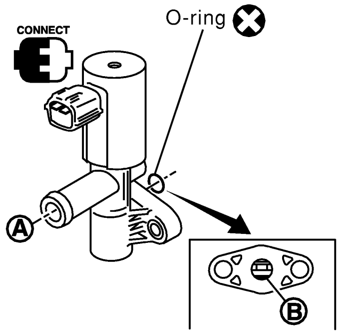
SEF337X

OK or NG

OK ▶	GO TO 9.
NG ▶	Replace EVAP canister vent control valve.

9	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II
1. Reconnect harness connectors disconnected.
2. Turn ignition switch "ON".
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.



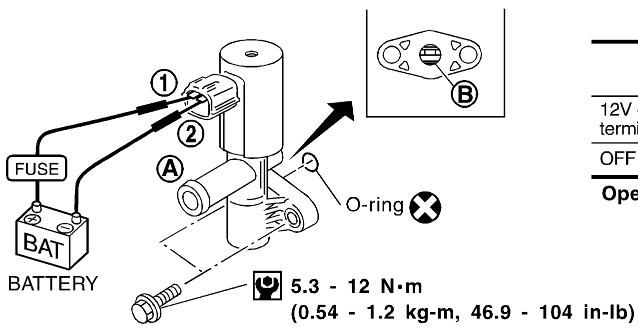
ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II
Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 11.
NG	▶	GO TO 10.

10	CHECK EVAP CANISTER VENT CONTROL VALVE-III

1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform Test No. 9 again.

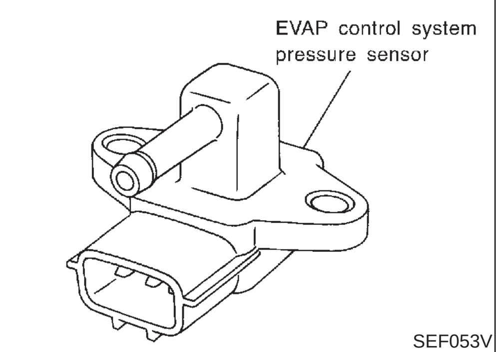
OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EVAP canister vent control valve.

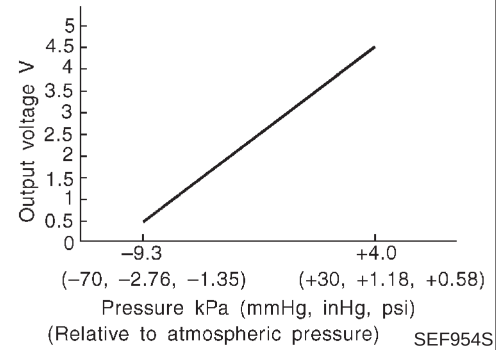
11	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**



SEF053V



SEF954S

Component Description

NAEC0235

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0236

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 3.4V

ECM Terminals and Reference Value

NAEC0668

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)
58	B/P	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
84	L/G	EVAP control system pressure sensor	**[Ignition switch "ON"]**	Approximately 3.4V
111	P/B	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V

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

On Board Diagnosis Logic

NAEC0238

Malfunction is detected when an improper voltage signal from EVAP control system pressure sensor is sent to ECM.

Possible Cause

NAEC0513

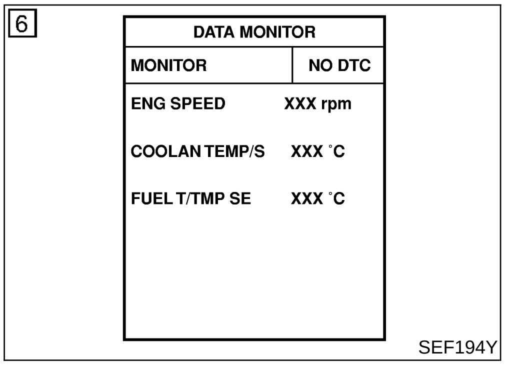
- Harness or connectors
  (The EVAP control system pressure sensor circuit is open or shorted.)
- Rubber hose to EVAP control system pressure sensor is clogged, vent, kinked, disconnected or improper connection.
- EVAP control system pressure sensor
- EVAP canister vent control valve
- EVAP canister purge volume control solenoid valve
- EVAP canister
- Rubber hose from EVAP canister vent control valve to water separator

DTC Confirmation Procedure

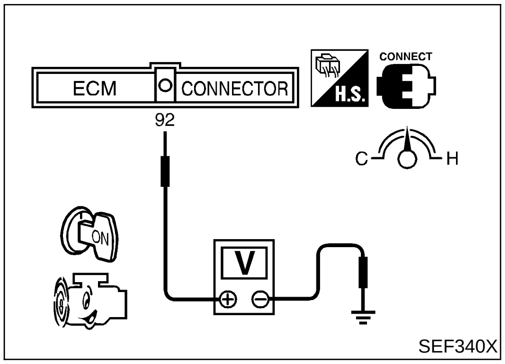
NAEC0239

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 test at a temperature of 5°C (41°F) or more.



SEF194Y



SEF340X

WITH CONSULT-II

NAEC0239S01

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) Make sure that “FUEL T/TEMP SE” is more than 0°C (32°F).
6) Start engine and wait at least 20 seconds.
7) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-387.

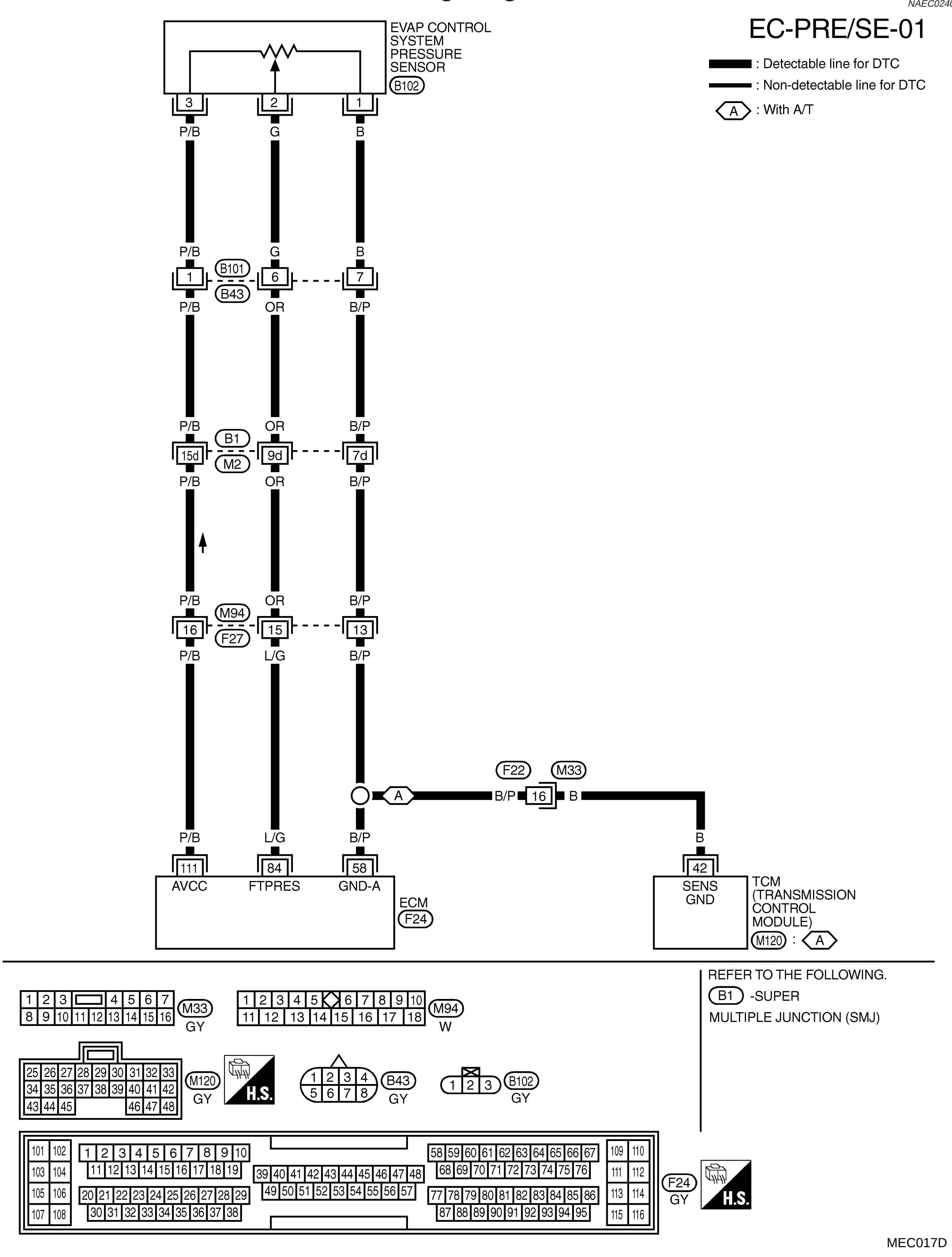
WITH GST

NAEC0239S02

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal 92 (Fuel tank temperature sensor signal) and ground is less than 4.2V.
3) Turn ignition switch “OFF” and wait at least 10 seconds.
4) Start engine and wait at least 20 seconds.
5) Select “MODE 7” with GST.
6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-387.

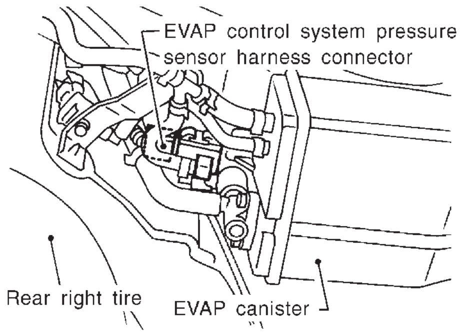
Wiring Diagram

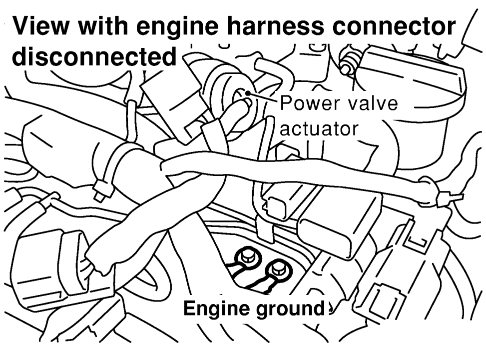
NAEC0240



Diagnostic Procedure

NAEC0241

1	CHECK RUBBER TUBE	
1. Turn ignition switch “OFF”. 2. Check rubber tube connected to the EVAP control system pressure sensor for clogging, vent, kink, disconnection or improper connection.  SEF495R **OK or NG**		
OK	▶	GO TO 2.
NG	▶	Reconnect, repair or replace.

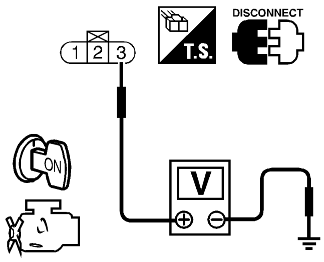
2	RETIGHTEN GROUND SCREWS	
Loosen and retighten engine ground screws.  SEF959Y		
	▶	GO TO 3.

3	CHECK CONNECTOR	
1. Disconnect EVAP control system pressure sensor harness connector. 2. Check sensor harness connector for water. **Water should not exist.** **OK or NG**		
OK	▶	GO TO 4.
NG	▶	Repair or replace harness connector.

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

4	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch "ON".
2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF992Y

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B101, B43
- Harness connectors B1, M2 and M94, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

▶	Repair harness or connectors.

6	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between EVAP control system pressure sensor terminal 1 and engine ground.
   Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B101, B43
- Harness connectors B1, M2 and M94, F27
- Harness for open between EVAP control system pressure sensor and ECM
- Harness for open between EVAP control system pressure sensor and TCM (Transmission Control Module)

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

8	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 84 and EVAP control system pressure sensor 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 (With CONSULT-II)	▶	GO TO 10.
OK (Without CONSULT-II)	▶	GO TO 11.
NG	▶	GO TO 9.

9	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B101, B43
- Harness connectors B1, M2 and M94, F27
- Harness for open or short between ECM and EVAP control system pressure sensor

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

10	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II
1. Start engine.
2. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

SEF985Y

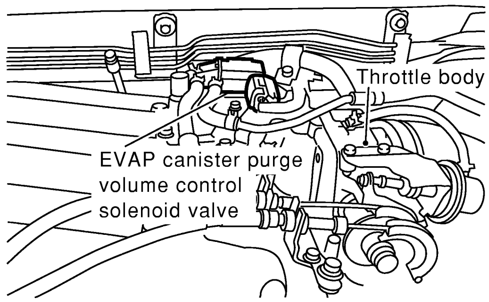
OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

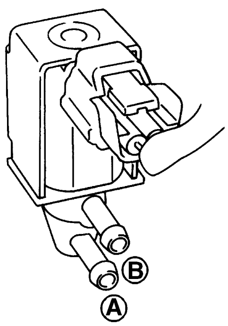
11	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y

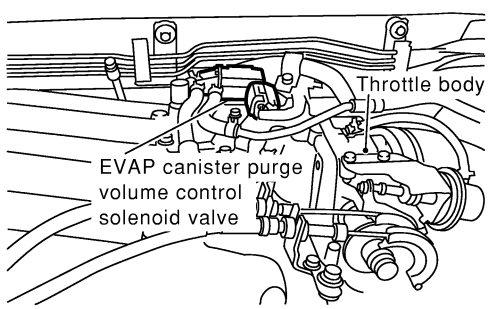


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

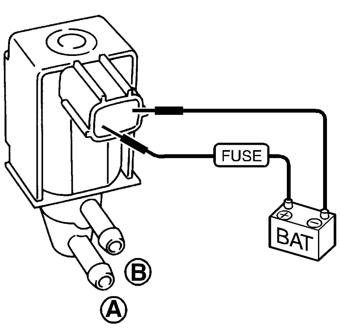
SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y



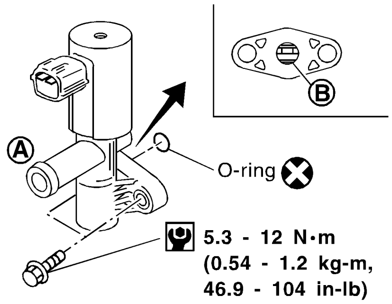
Condition	Air passage continuity between A and B
12V direct current supply between terminals 1 and 2	Yes
No supply	No

SEF335X

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

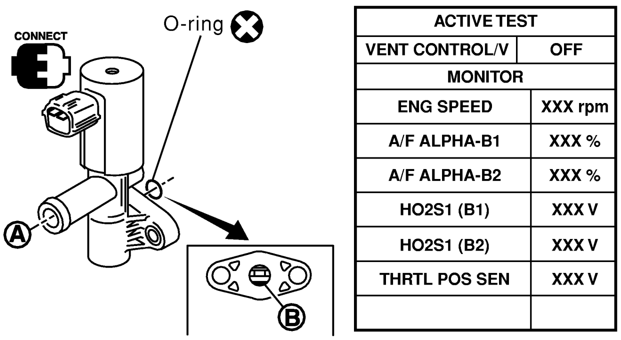
12	CHECK RUBBER TUBE FOR CLOGGING	
1. Disconnect rubber tube connected to EVAP canister vent control valve. 2. Check the rubber tube for clogging. **OK or NG**		
OK	▶	GO TO 13.
NG	▶	Clean the rubber tube using an air blower.

13	CHECK EVAP CANISTER VENT CONTROL VALVE-I	
1. Remove EVAP canister vent control valve from EVAP canister. 2. Check portion **B** of EVAP canister vent control valve for being rusted.  SEF337X **OK or NG**		
OK	▶	GO TO 14.
NG	▶	Replace EVAP canister vent control valve.

14	CHECK EVAP CANISTER VENT CONTROL VALVE

With CONSULT-II

1. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
2. Check air passage continuity and operation delay time under the following conditions.



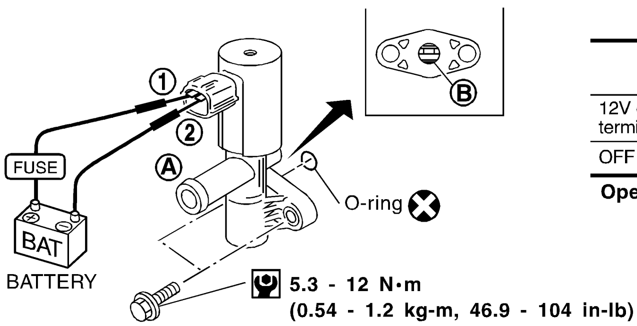
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK ▶	GO TO 16.
NG ▶	GO TO 15.

15	CHECK EVAP CANISTER VENT CONTROL VALVE-III

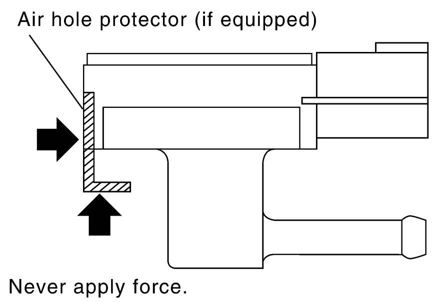
1. Clean the air passage (portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform Test No. 14 again.

OK or NG

OK ▶	GO TO 16.
NG ▶	Replace EVAP canister vent control valve.

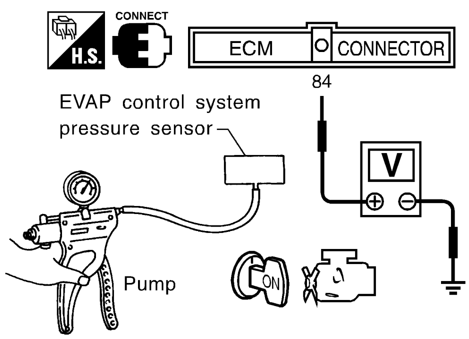
16	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure 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.**

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace EVAP control system pressure sensor.

17	CHECK RUBBER TUBE

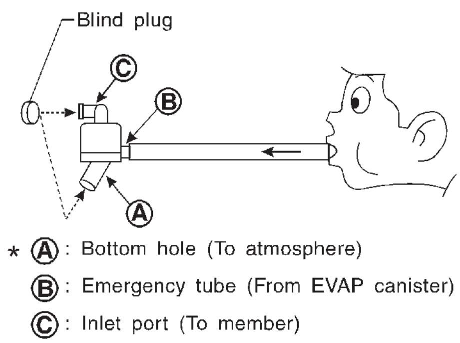
Check obstructed rubber tube connected to EVAP canister vent control valve.

OK or NG

OK	▶	GO TO 18.
NG	▶	Clean rubber tube using an air blower, repair or replace rubber tube.

18	CHECK WATER SEPARATOR

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that **A** and **C** are not clogged by blowing air into **B** with **A**, and then **C** plugged.



SEF829T

5. In case of NG in items 2 - 4, replace the parts.

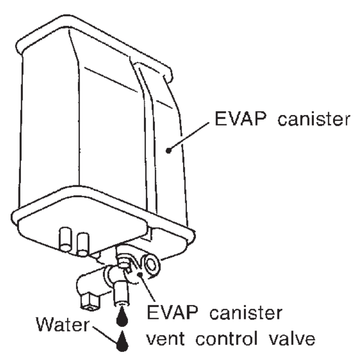
NOTE:
- Do not disassemble water separator.

OK or NG

OK	▶	GO TO 19.
NG	▶	Replace water separator.

19	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



SEF596U

Yes or No

Yes	▶	GO TO 20.
No	▶	GO TO 22.

20	CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK	▶	GO TO 22.
NG	▶	GO TO 21.

21	DETECT MALFUNCTIONING PART
Check the following. ● EVAP canister for damage ● EVAP hose between EVAP canister and water separator for clogging or poor connection	
▶	Repair hose or replace EVAP canister.

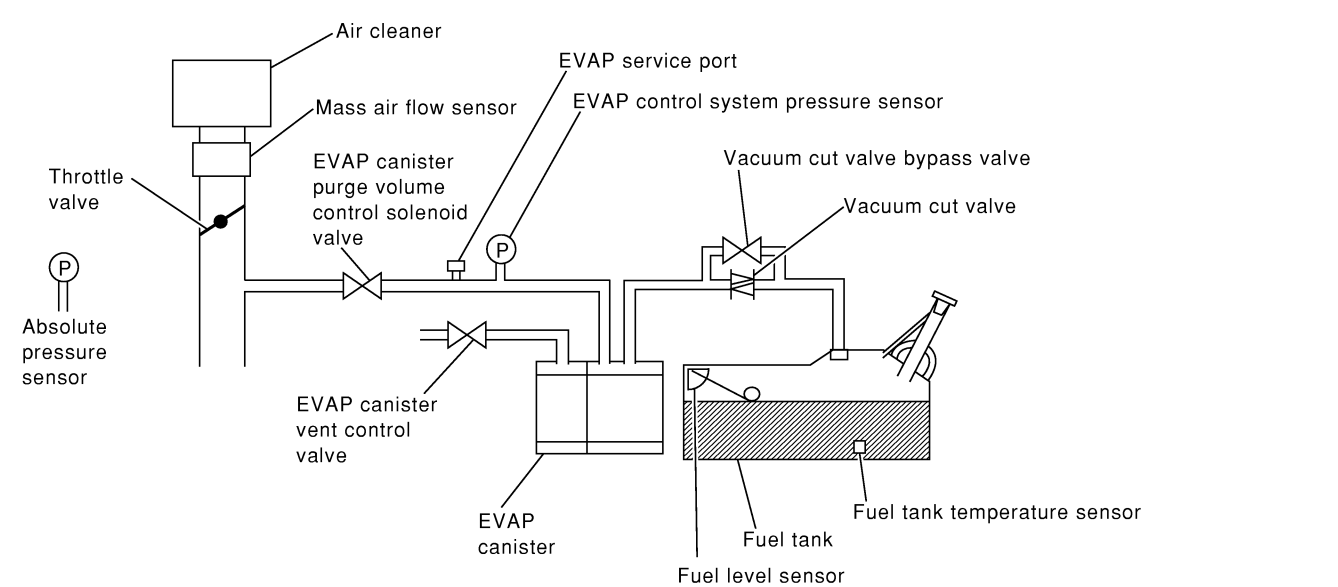
22	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NAEC0644

NOTE:
If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-575.)

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



SEF373Z

Malfunction is detected when EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.

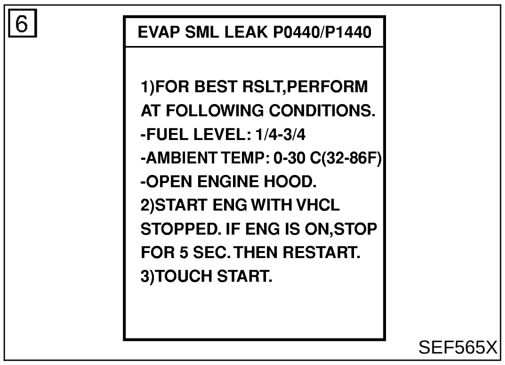
CAUTION:
- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

Possible Cause

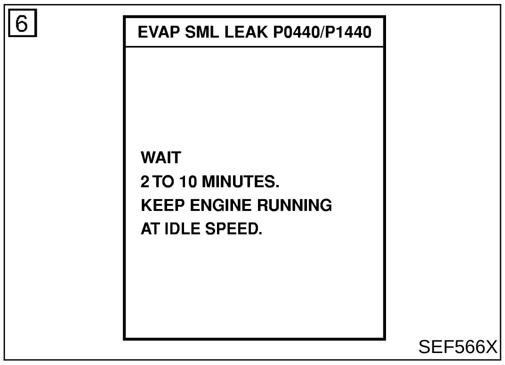
NAEC0645

- Fuel filler cap remains open or fails to close.
- Incorrect fuel tank vacuum relief valve
- Incorrect fuel filler cap used
- Foreign matter caught in fuel filler cap.
- Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.
- Foreign matter caught in EVAP canister vent control valve.
- EVAP canister or fuel tank leaks
- EVAP purge line (pipe and rubber tube) leaks

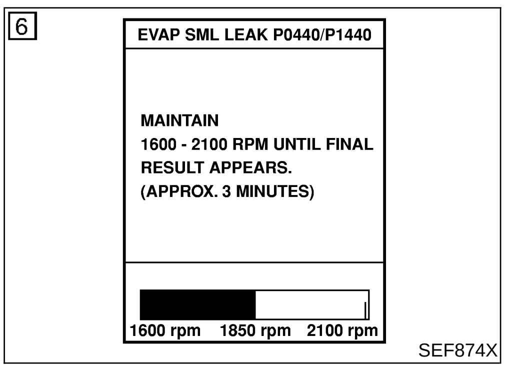
- EVAP purge line rubber tube bent.
- Blocked or bent rubber tube to EVAP control system pressure sensor
- Loose or disconnected rubber tube
- EVAP canister vent control valve and the circuit
- EVAP canister purge volume control solenoid valve and the circuit
- Absolute pressure sensor
- Fuel tank temperature sensor
- O-ring of EVAP canister vent control valve is missing or damaged.
- EVAP control system pressure sensor



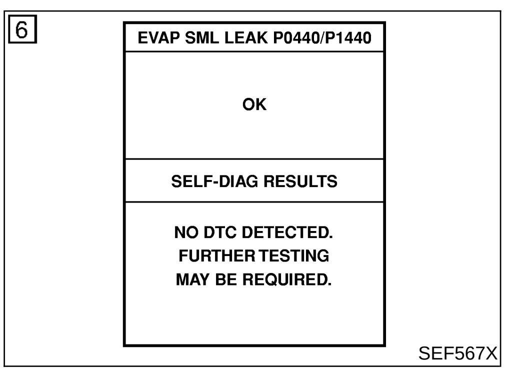
SEF565X



SEF566X



SEF874X



SEF567X

DTC Confirmation Procedure

NAEC0646

CAUTION:

Never remove fuel filler cap during the DTC Confirmation Procedure.

NOTE:

- **If DTC P0455 is displayed with P1448, perform trouble diagnosis for DTC P1448 first. (See EC-575.)**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedures.**

WITH CONSULT-II

NAEC0646S01

1) Tighten fuel filler cap securely until ratcheting sound is heard.
2) Turn ignition switch “ON”.
3) Turn ignition switch “OFF” and wait at least 10 seconds.
4) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
5) Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6) Select “EVAP SML LEAK P0440/P1440” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.

NOTE:

If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to “Basic Inspection”, EC-102.

7) Make sure that “OK” is displayed.
   If “NG” is displayed, select “SELF-DIAG RESULTS” mode and make sure that “EVAP GROSS LEAK [P0455]” is displayed. If it is displayed, refer to “Diagnostic Procedure”, EC-399.
   If P0440 is displayed, perform “Diagnostic Procedure” for DTC P0440.

WITH GST

NAEC0646S02

NOTE:

Be sure to read the explanation of “Driving Pattern” on EC-67 before driving vehicle.

1) Start engine.
2) Drive vehicle according to “Driving Pattern”, EC-67.
3) Stop vehicle.
4) Select “MODE 1” with GST.
- If SRT of EVAP system is not set yet, go to the following step.
- If SRT of EVAP system is set, the result will be OK.
5) Turn ignition switch “OFF” and wait at least 10 seconds.
6) Start engine.
   It is not necessary to cool engine down before driving.
7) Drive vehicle again according to the “Driving Pattern”, EC-67.

8) Stop vehicle.
9) Select "MODE 3" with GST.
- If P0455 is displayed on the screen, go to "Diagnostic Procedure", EC-399.
- If P0440 or P1440 is displayed on the screen, go to "Diagnostic Procedure", for DTC P0440, EC-357.
- If P1447 is displayed on the screen, go to "Diagnostic Procedure" for DTC P1447, EC-566.
- If P0455, P0440, P1440 and P1447 are not displayed on the screen, go to the following step.

10) Select "MODE 1" with GST.
- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6.

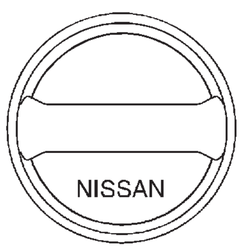
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX

Diagnostic Procedure

NAEC0647

1 CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch "OFF".
2. Check for genuine NISSAN fuel filler cap design.



SEF915U

OK or NG

OK	▶	GO TO 2.
NG	▶	Replace with genuine NISSAN fuel filler cap.

2 CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

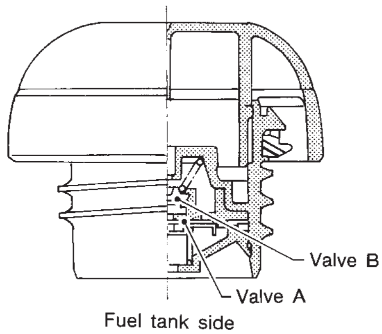
OK or NG

OK	▶	GO TO 3.
NG	▶	• Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. • Retighten until ratcheting sound is heard.

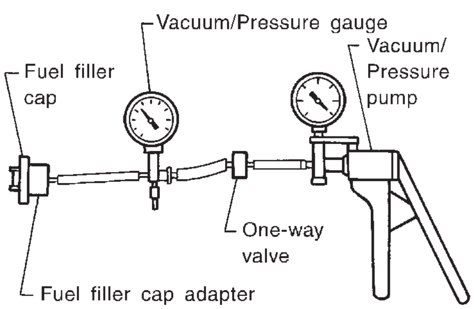
3	CHECK FUEL FILLER CAP FUNCTION	
Check for air releasing sound while opening the fuel filler cap.		
OK or NG		
OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	CHECK FUEL TANK VACUUM RELIEF VALVE	

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



SEF427N



SEF943S

Pressure:
15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
Vacuum:
−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)

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

OK or NG		
OK	▶	GO TO 5.
NG	▶	Replace fuel filler cap with a genuine one.

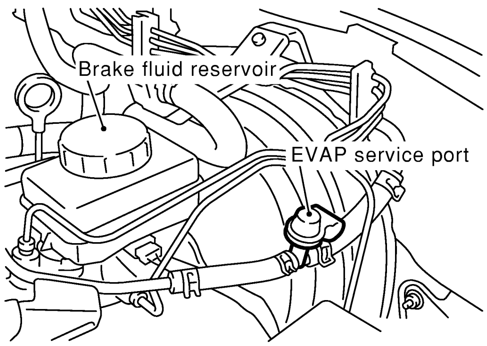
5	CHECK EVAP PURGE LINE	
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection. Refer to "Evaporative Emission System", EC-32.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	Repair or reconnect the hose.

6	CLEAN EVAP PURGE LINE
Clean EVAP purge line (pipe and rubber tube) using air blower.	
▶	GO TO 7.

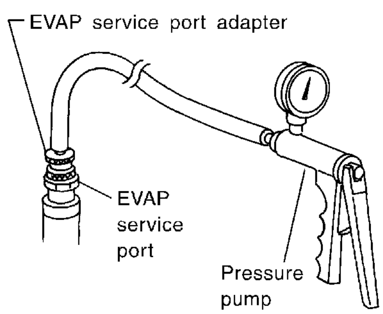
7	CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT
Refer to "DTC Confirmation Procedure", EC-377.	
OK or NG	
OK ▶	GO TO 8.
NG ▶	Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

8	INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.



SEF983Y



SEF916U

NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

Models with CONSULT-II ▶	GO TO 9.
Models without CONSULT-II ▶	GO TO 10.

GI
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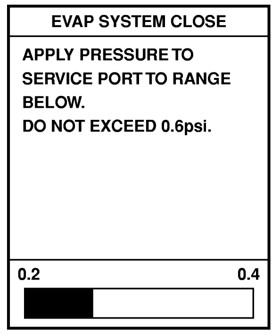
EL
IDX

9	CHECK FOR EVAP LEAK

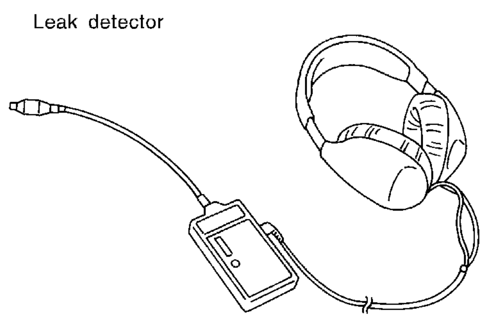
With CONSULT-II

1. Turn ignition switch "ON".
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-II.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**



PEF917U

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.



SEF200U

OK or NG

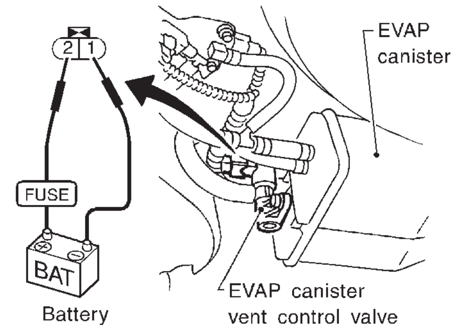
OK	▶	GO TO 11.
NG	▶	Repair or replace.

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

10	CHECK FOR EVAP LEAK

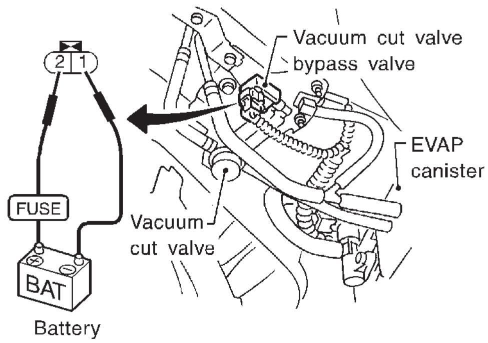
Without CONSULT-II

1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)



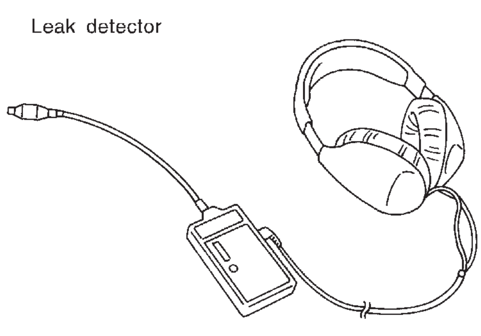
SEF598U

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



SEF599U

4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**
5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.



SEF200U

OK or NG

OK	▶	GO TO 12.
NG	▶	Repair or replace.

11	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT-II screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

Vacuum should exist.

SEF984Y

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

12	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

   Vacuum should exist.

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 13.

13	CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-26.

OK or NG

OK (With CONSULT-II)	▶	GO TO 14.
OK (Without CONSULT-II)	▶	GO TO 15.
NG	▶	Repair or reconnect the hose.

14	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

SEF985Y

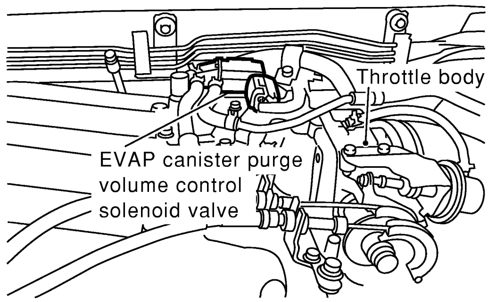
OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

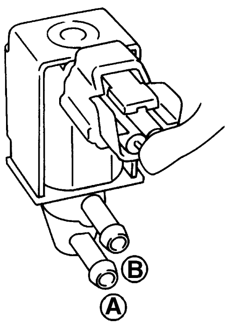
15	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y

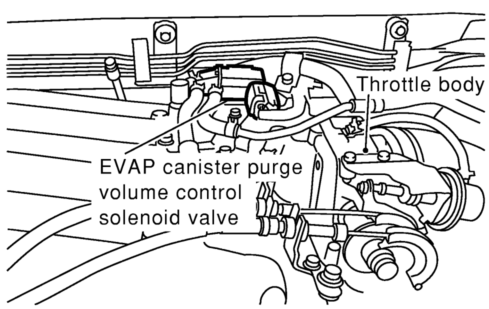


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

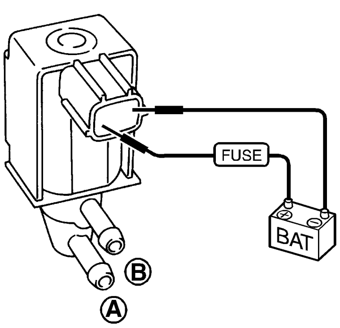
SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y



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

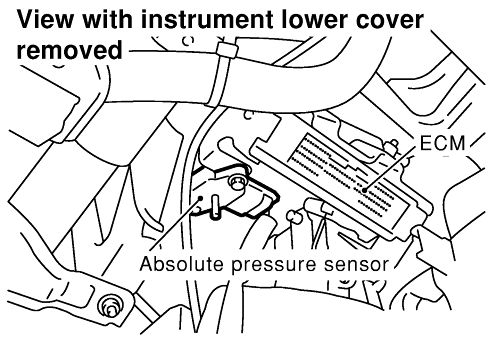
SEF335X

OK or NG

OK	▶	GO TO 16.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

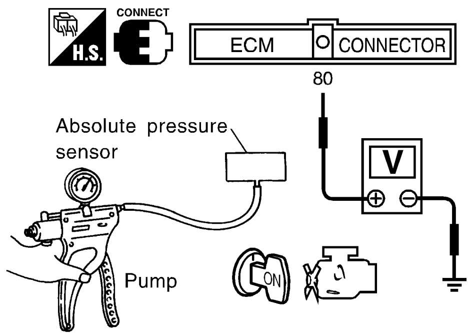
16	CHECK ABSOLUTE PRESSURE SENSOR

1. Remove absolute pressure sensor with its harness connector connected.



SEF961Y

2. Remove hose from absolute pressure sensor.
3. Install a vacuum pump to absolute pressure sensor.
4. Turn ignition switch "ON" and check output voltage between ECM terminal 80 and engine ground under the following conditions.



Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
−26.7 (−200, −7.87)	1.0 to 1.4 lower than above value

SEF300XA

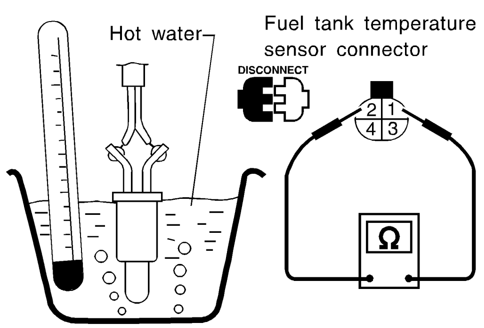
CAUTION:
- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below −93.3 kPa (−700 mmHg, −27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace absolute pressure sensor.

17	CHECK FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.



Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

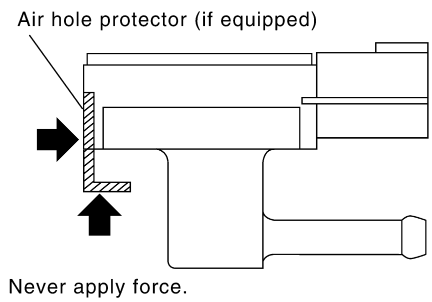
SEF974Y

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace fuel level sensor unit.

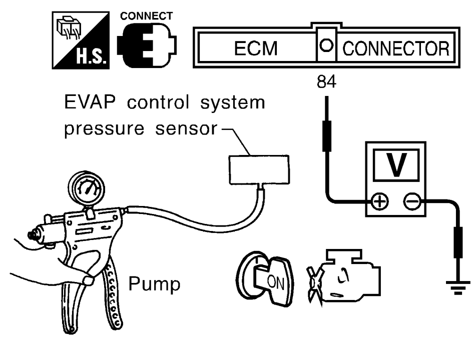
18	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure sensor which has been dropped from a height of more than 0.5m (19.7in) onto a hard surface such as a concrete floor; use a new one.**

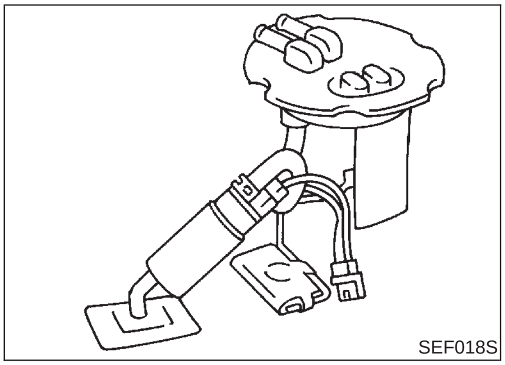
OK or NG

OK	▶	GO TO 19.
NG	▶	Replace EVAP control system pressure sensor.

19	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**


SEF018S

Component Description
NAEC0616

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.

It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

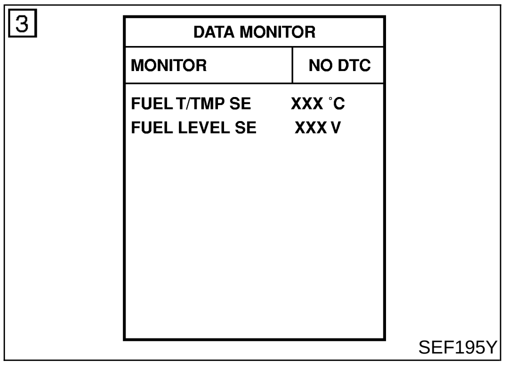
On Board Diagnostic Logic
NAEC0617

When the vehicle is parked, naturally the fuel level in the fuel tank is stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

Malfunction is detected when even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.

Possible Cause
NAEC0618

- Fuel level sensor circuit
  (The fuel level sensor circuit is open or shorted.)
- Fuel level sensor



SEF195Y

DTC Confirmation Procedure
NAEC0619

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
NAEC0619S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait maximum of 2 consecutive minutes.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-411.

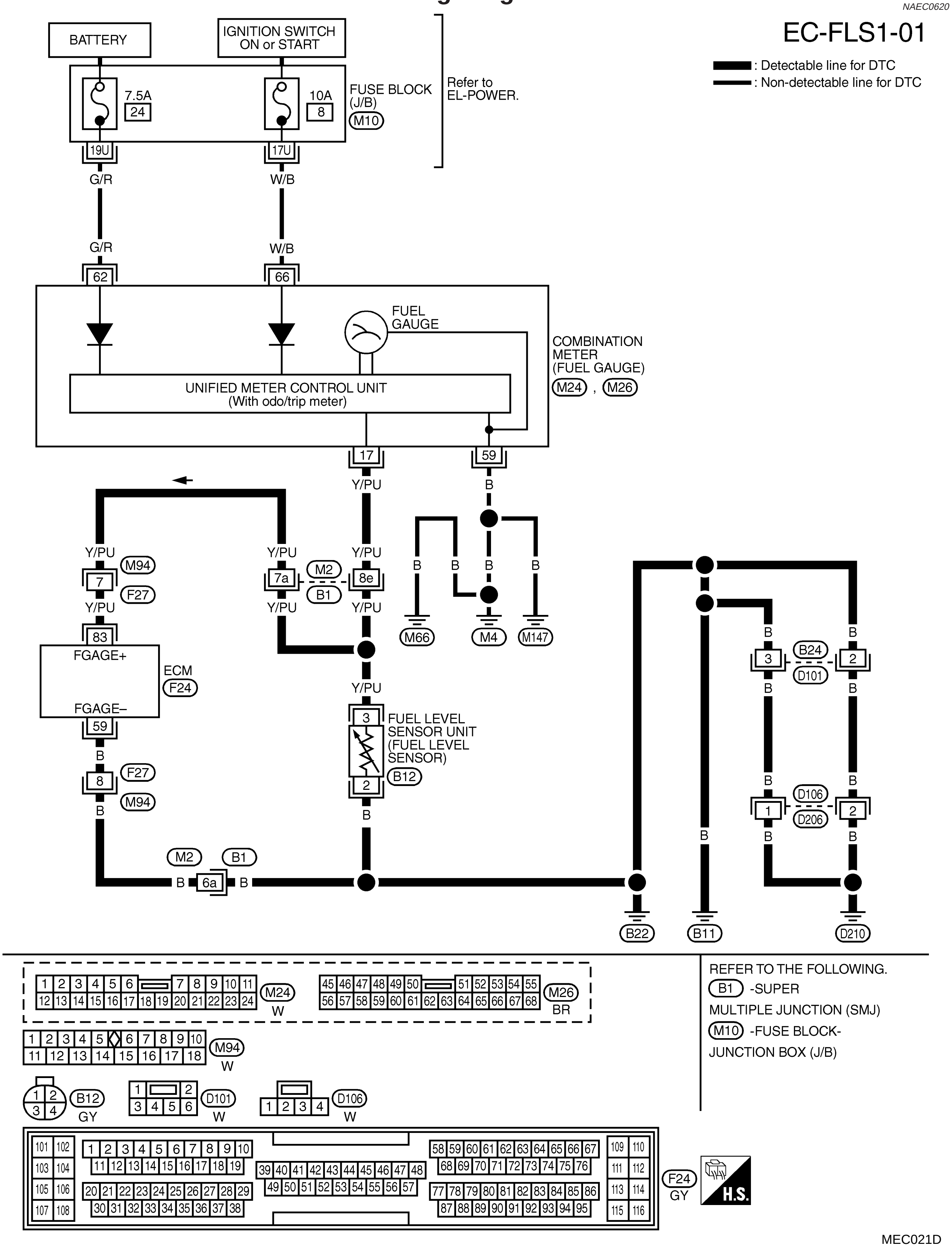
WITH GST
NAEC0619S02

Follow the procedure “WITH CONSULT-II” above.

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

Wiring Diagram

NAEC0620

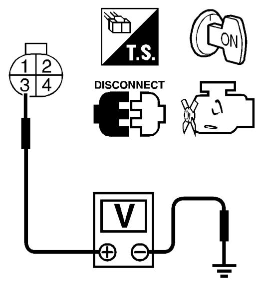


Diagnostic Procedure

=NAEC0621

1	CHECK FUEL LEVEL SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect fuel level sensor unit harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between fuel level sensor unit terminal 3 and ground with CONSULT-II or a tester.



Voltage: Approximately 12V

SEF993Y

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M2, B1
- Harness for open or short between combination meter and fuel level sensor unit

	▶	Repair or replace harness or connectors.

3	CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Check harness continuity between fuel level sensor unit terminal 2 and body ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

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

4	CHECK FUEL LEVEL SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 83 and fuel level sensor terminal 3, ECM terminal 59 and fuel level sensor unit terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

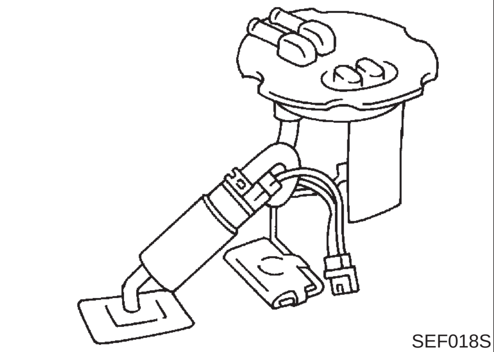
OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M2, B1 ● Harness connectors M94, F27 ● Harness for open or short between ECM and fuel level sensor	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK FUEL LEVEL SENSOR
Refer to EL-128, "Fuel Level Sensor Unit Check". **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Replace fuel level sensor unit.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



SEF018S

Component Description

=NAEC0622

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

On Board Diagnostic Logic

NAEC0623

Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.
Malfunction is detected when the output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.

Possible Cause

NAEC0624

- Harness or connectors
  (The level sensor circuit is open or shorted.)
- Fuel level sensor

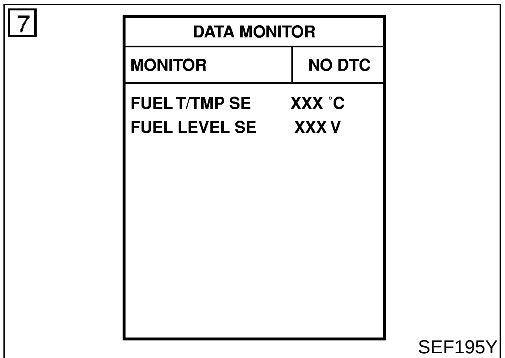
Overall Function Check

NAEC0625

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

WARNING:
When performing following procedure, be sure to observe the handling of the fuel. Refer to FE-5, “Fuel Tank”.

TESTING CONDITION:
Before starting overall function check, preparation of draining fuel and refilling fuel is required.



SEF195Y

WITH CONSULT-II

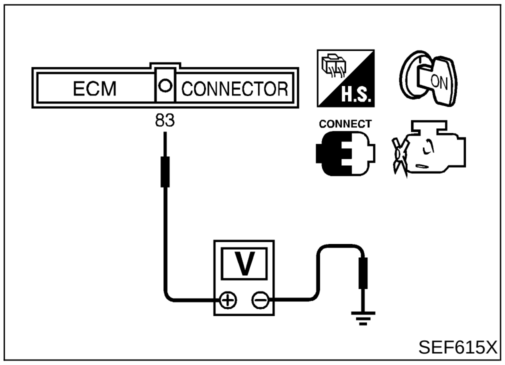
NAEC0625S01

NOTE:
Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1) Prepare a fuel container and a spare hose.
2) Release fuel pressure from fuel line, refer to “Fuel Pressure Release”, EC-39.
3) Remove the fuel feed hose on the fuel level sensor unit.
4) Connect a spare fuel hose where the fuel feed hose was removed.

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

5) Turn ignition switch “OFF” and wait at least 10 seconds then turn “ON”.
6) Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT-II.
7) Check “FUEL LEVEL SE” output voltage and note it.
8) Select “FUEL PUMP” in “ACTIVE TEST” mode with CONSULT-II.
9) Touch “ON” and drain fuel approximately 30ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10) Fill fuel into the fuel tank for 30ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11) Check “FUEL LEVEL SE” output voltage and note it.
12) Check “FUEL LEVEL SE” output voltage and confirm whether the voltage changes more than 0.03V during step 7 to 11.
    If NG, check the fuel level sensor, refer to EL-128, “FUEL LEVEL SENSOR UNIT CHECK”.



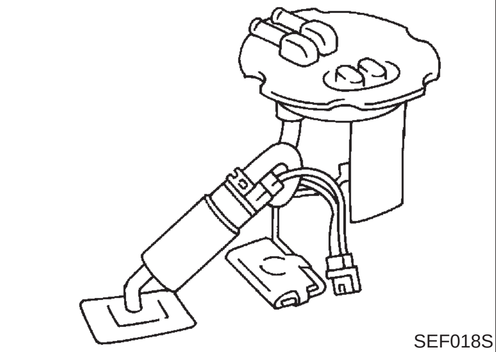
SEF615X

WITH GST

NAEC0625S02

NOTE:
Start from step 11, if it is possible to confirm that the fuel cannot be drained by 30ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1) Prepare a fuel container and a spare hose.
2) Release fuel pressure from fuel line, refer to “Fuel Pressure Release”, EC-39.
3) Remove the fuel feed hose on the fuel level sensor unit.
4) Connect a spare fuel hose where the fuel feed hose was removed.
5) Turn ignition switch “OFF”.
6) Set voltmeters probe between ECM terminal 83 (fuel level sensor signal) and ground.
7) Turn ignition switch “ON”.
8) Check voltage between ECM terminal 83 and ground and note it.
9) Drain fuel by 30ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
10) Fill fuel into the fuel tank for 30ℓ (7-7/8 US gal, 6-5/8 Imp gal).
11) Confirm that the voltage between ECM terminal 83 and ground changes more than 0.03V during step 8 - 10.
    If NG, check component of fuel level sensor, refer to EL-128, “FUEL LEVEL SENSOR UNIT CHECK”.


SEF018S

Component Description

NAEC0626

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

On Board Diagnostic Logic

NAEC0627

ECM receives two signals from the fuel level sensor circuit.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the former, to detect open or short circuit malfunction.
Malfunction is detected when an excessively low or high voltage is sent from the sensor is sent to ECM.

Possible Cause

NAEC0628

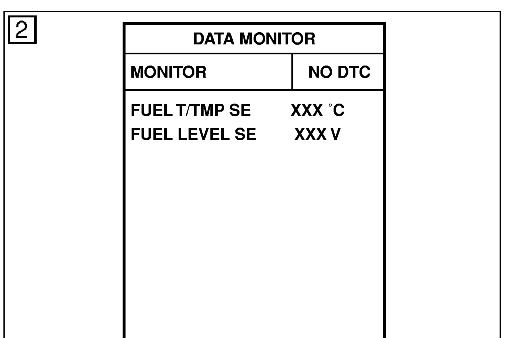
- Fuel level sensor circuit
  (The fuel level sensor circuit is open or shorted.)
- Fuel level sensor

DTC Confirmation Procedure

NAEC0629

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 ignition switch "ON".



SEF195Y

WITH CONSULT-II

NAEC0629S01

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 "Diagnostic Procedure", EC-417.

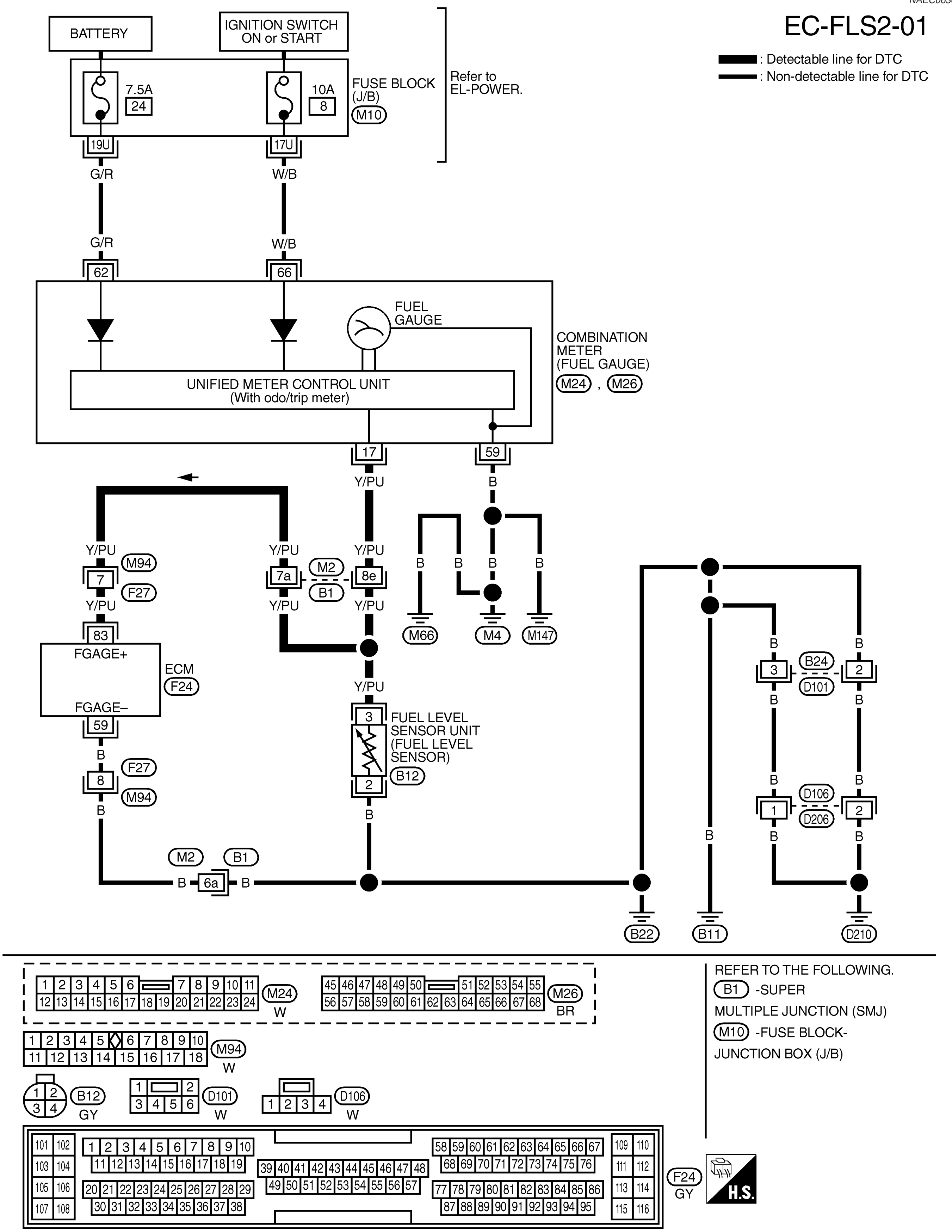
WITH GST

NAEC0629S02

Follow the procedure "WITH CONSULT-II" above.

Wiring Diagram

NAEC0630

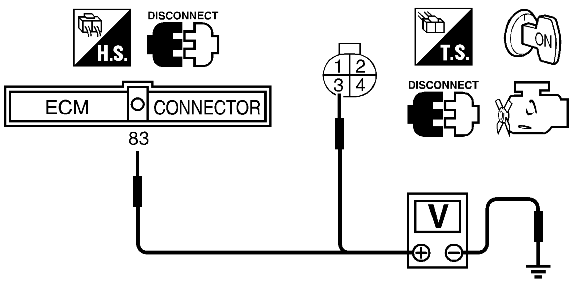


MEC022D

Diagnostic Procedure

=NAEC0631

1	CHECK FUEL LEVEL SENSOR POWER SUPPLY CIRCUIT
1. Turn ignition switch “OFF”. 2. Disconnect fuel level sensor unit harness connector. 3. Turn ignition switch “ON”. 4. Check voltage between fuel level sensor unit terminal 3 and ground, ECM terminal 83 and ground with CONSULT-II or tester.	



Voltage: Approximately 12V

SEF374Z

OK or NG

OK ▶	GO TO 3.
NG ▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M2, B1 and M94, F27 ● Harness for open or short between combination meter and fuel level sensor unit	
▶	Repair or replace harness or connectors.

3	CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”. 2. Check harness continuity between fuel level sensor unit terminal 2 and body ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power.	

OK or NG

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

4	CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 59 and fuel level sensor terminal 2. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power.	

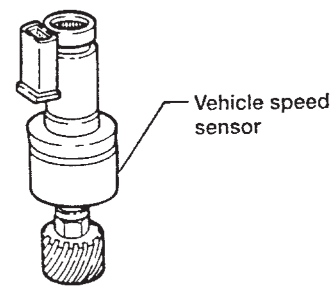
OK or NG

OK ▶	GO TO 6.
NG ▶	GO TO 5.

5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M2, B1 ● Harness connectors M94, F27 ● Harness for open between ECM and fuel level sensor	
▶	Repair open circuit or short to power in harness on connectors.

6	CHECK FUEL LEVEL SENSOR
Refer to EL-128, "Fuel Level Sensor Unit Check". **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Replace fuel level sensor unit.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



AEC110

Component Description

=NAEC0242

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

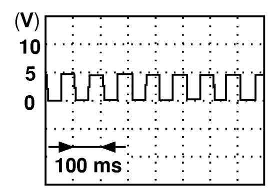
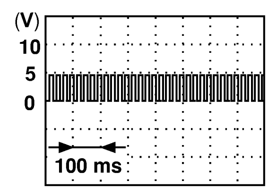
ECM Terminals and Reference Value

NAEC0669

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)
86	W/L	Vehicle speed sensor	**[Engine is running]** ● Jack up front wheels. ● In 1st gear position ● 10 km/h (6 MPH)	Approximately 2.5V  SEF583X
			[Engine is running] ● Jack up front wheels. ● In 2nd gear position ● 30 km/h (19 MPH)	Approximately 2.0V  SEF584X

On Board Diagnosis Logic

NAEC0244

Malfunction is detected when the almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.

Possible Cause

NAEC0514

- Harness or connector
  (The vehicle speed sensor circuit is open or shorted.)
- Vehicle speed sensor

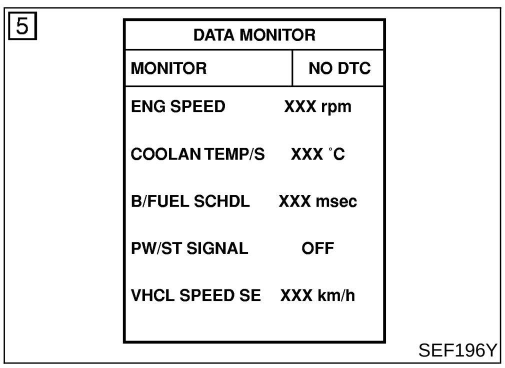
DTC Confirmation Procedure

NAEC0245

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.



SEF196Y

WITH CONSULT-II

NAEC0245S01

1) Start engine (TCS switch “OFF”).
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 “Diagnostic Procedure”, EC-423.
   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 10 consecutive seconds.

ENG SPEED	More than 1,800 rpm (A/T) More than 2,000 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	5.5 - 14.0 msec (A/T) 6.0 - 14.0 msec (M/T)
Selector lever	Suitable position
PW/ST SIGNAL	OFF

6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-423.

Overall Function Check

NAEC0246

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

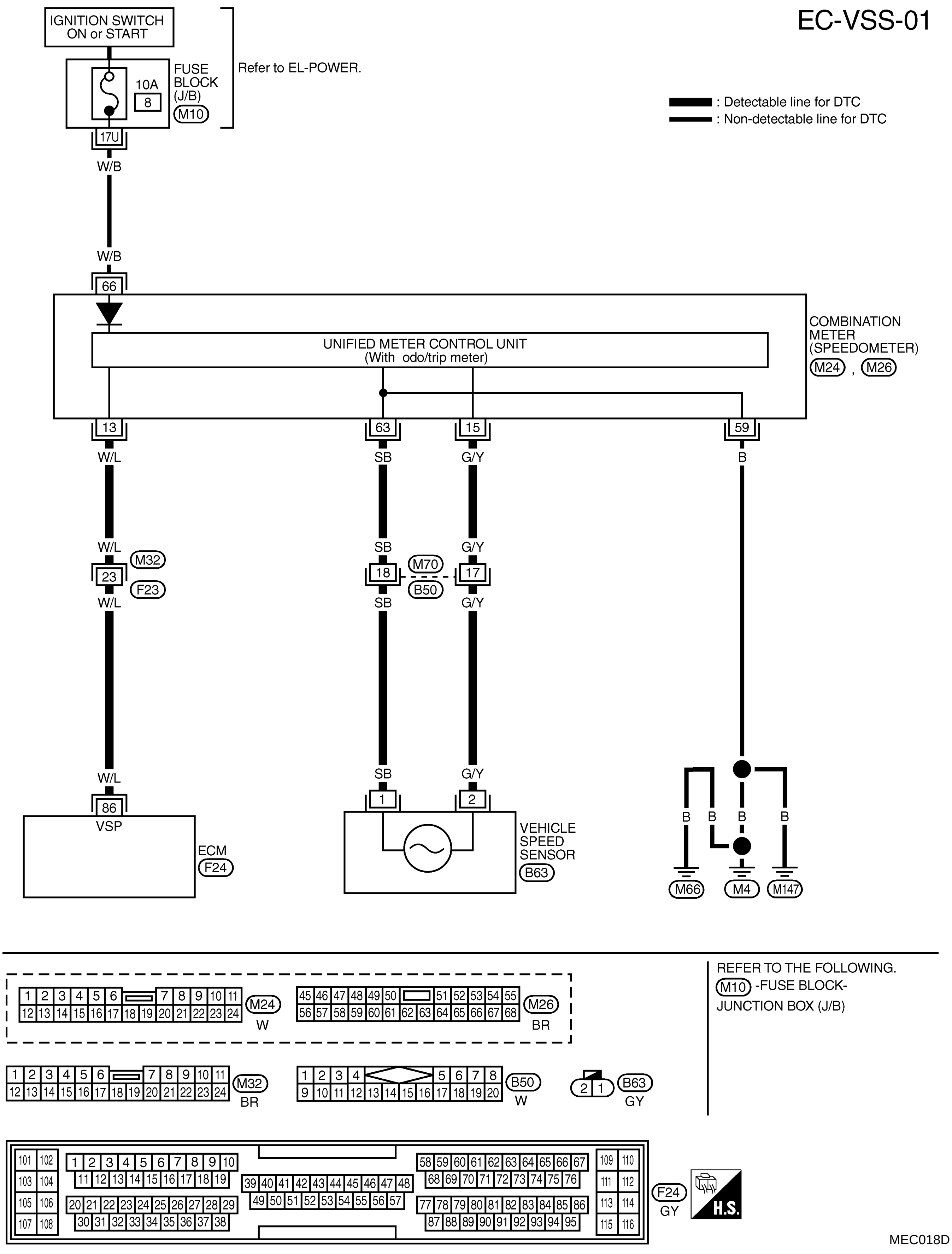
WITH GST

NAEC0246S01

1) Lift up drive wheels.
2) Start engine.
3) Read vehicle speed sensor signal in "MODE 1" with GST.
   The vehicle speed sensor on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4) If NG, go to "Diagnostic Procedure", EC-423.

Wiring Diagram

NAEC0247



Diagnostic Procedure

NAEC0248

1	CHECK VEHICLE SPEED SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”. 2. Disconnect ECM harness connector and combination meter harness connector. 3. Check harness continuity between ECM terminal 86 and combination meter terminal 13. Refer to Wiring Diagram. **Continuity should exist.** 4. Also check harness for short to power. **OK or NG**	
OK ▶	GO TO 3.
NG ▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M32, F23 ● Harness for open or short between ECM and combination meter	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

3	CHECK SPEEDOMETER FUNCTION
Make sure that speedometer functions properly. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	GO TO 4.

4	CHECK SPEEDOMETER CIRCUIT FOR OPEN AND SHORT
Check the following. ● Harness connectors M70, B50 ● Harness for open or short between combination meter and vehicle speed sensor ● Harness for open or short between vehicle speed sensor and ECM **OK or NG**	
OK ▶	Check combination meter and vehicle speed sensor. Refer to EL section.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

5	CHECK INTERMITTENT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-142.	
▶	**INSPECTION END**

Description

NAEC0249

SYSTEM DESCRIPTION

NAEC0249S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Idle air control	IACV-AAC valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Park/neutral position (PNP) switch	Park/neutral position		
Air conditioner switch	Air conditioner operation		
Power steering oil pressure switch	Power steering load signal		
Battery	Battery voltage		
Vehicle speed sensor	Vehicle speed		
Ambient air temperature switch	Ambient air temperature		
Intake air temperature sensor	Intake air temperature		
Absolute pressure sensor	Ambient barometic pressure		

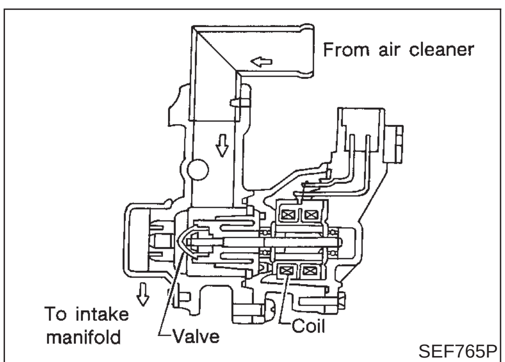
This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by takig into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).

COMPONENT DESCRIPTION

NAEC0249S02

IACV-AAC Valve

NAEC0249S0201



SEF765P

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in seqeunce. Each time the IACV-AAC valve opens or closes to change tha auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0250

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	14 - 20 step
		2,000 rpm	—

ECM Terminals and Reference Value

NAEC0670

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)
6 7 8 17	PU/G GY Y GY/L	IACV-AAC valve	**[Engine is running]** ● Idle speed	0.1 - 14V

On Board Diagnosis Logic

NAEC0252

Malfunction is detected when
(Malfunction A) the IACV-AAC valve does not operate properly,
(Malfunction B) the IACV-AAC valve does not operate properly.

Possible Cause

NAEC0515

MALFUNCTION A

NAEC0515S01

- Harness or connectors
  (The IACV-AAC valve circuit is open.)
- IACV-AAC valve

MALFUNCTION B

NAEC0515S02

- Harness or connectors
  (The IACV-AAC valve circuit is shorted.)
- Air control valve (Power steering)
- IACV-AAC valve

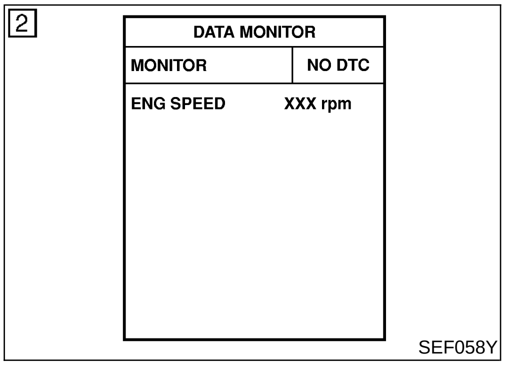
DTC Confirmation Procedure

NAEC0253

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

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



SEF058Y

PROCEDURE FOR MALFUNCTION A

NAEC0253S01

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5V with ignition switch "ON".

With CONSULT-II

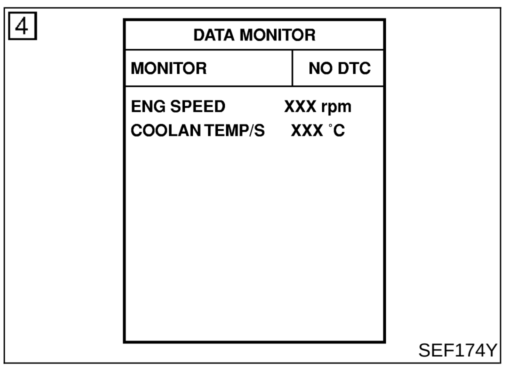
NAEC0253S0101

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 10 seconds.
3) Perform "Idle Air Volume Learning" (see EC-58).
4) Turn ignition switch "OFF" and wait at least 10 seconds.
5) Turn ignition switch "ON".
6) Select "DATA MONITOR" mode with CONSULT-II.
7) Start engine and let it idle.
8) Keep engine speed at 2,500 rpm for three seconds, then let it idle for three seconds.
   Do not rev engine to more than 3,000 rpm.
9) Perform step 4 once more.
10) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-428.

With GST

NAEC0253S0102

Follow the procedure "With CONSULT-II" above.



SEF174Y

PROCEDURE FOR MALFUNCTION B

NAEC0253S02

TESTING CONDITION:

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

With CONSULT-II

NAEC0253S0201

1) Open engine hood.
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch "OFF" and wait at least 10 seconds.
4) Perform "Idle Air Volume Learning (see EC-58).
5) Turn ignition switch "OFF" and wait at least 10 seconds.
6) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT-II
7) Start engine and run it for at least 1 minute at idle speed.
8) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-428.

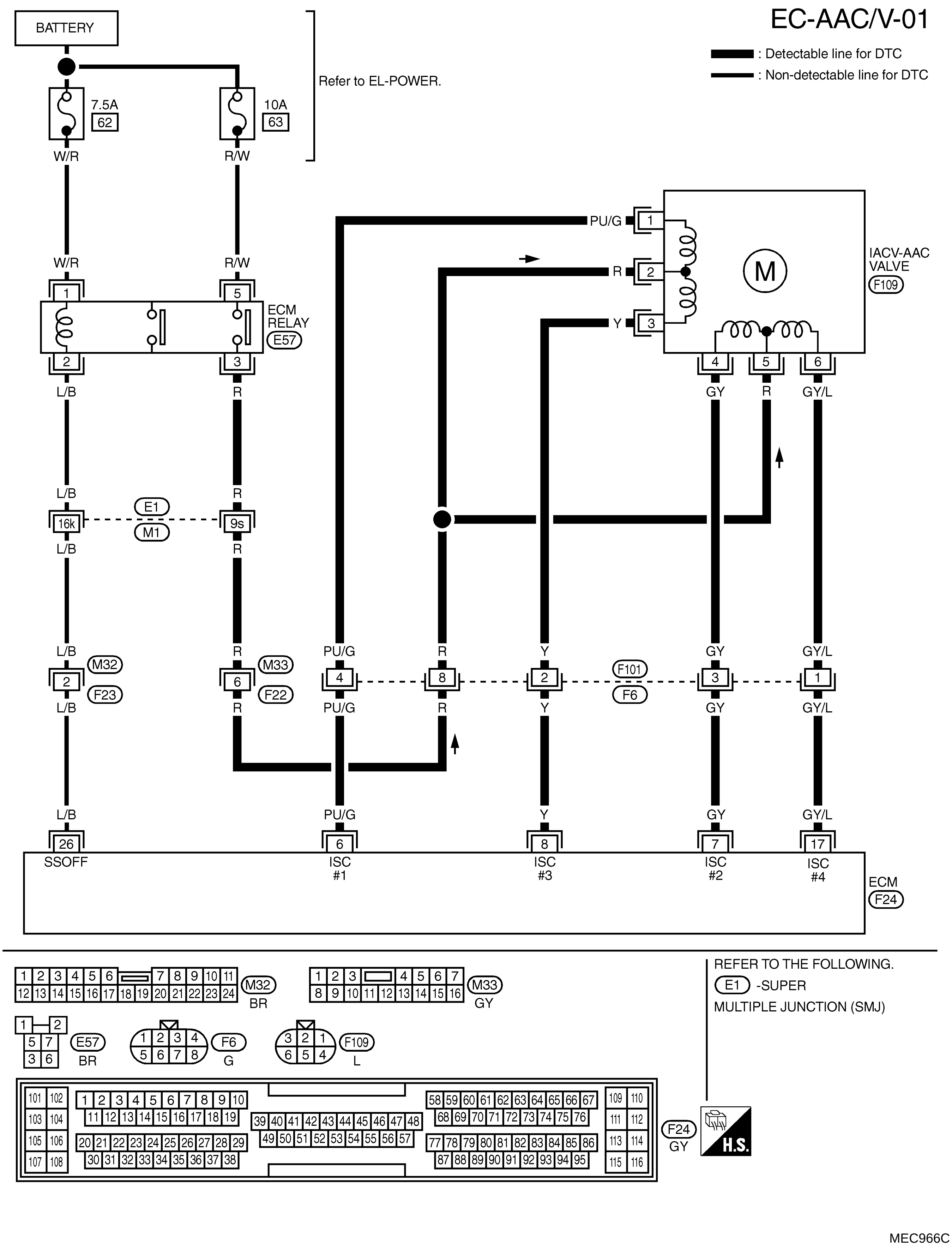
With GST

NAEC0253S0202

Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NAEC0254

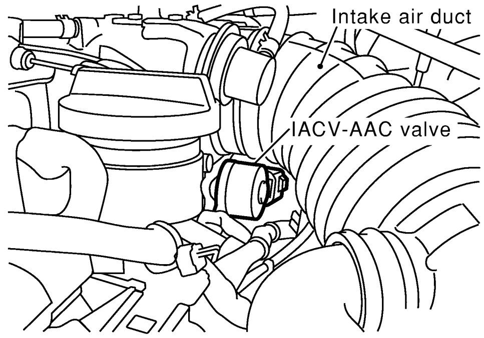


Diagnostic Procedure

NAEC0255

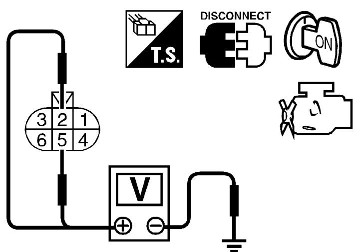
1	CHECK IACV-AAC VALVE POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.



SEF994Y

3. Turn ignition switch “ON”.
4. Check voltage between IACV-AAC valve terminals 2, 5 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF343X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1
- Harness connectors M33, F22
- Harness for open or short between IACV-AAC valve and ECM relay

	▶	Repair harness or connectors.

3	CHECK IACV-AAC VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals and IACV-AAC valve terminals as follows.
   Refer to Wiring Diagram.

ECM terminal	IACV-AAC valve terminal
6	1
7	4
8	3
17	6

MTBL0354

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.

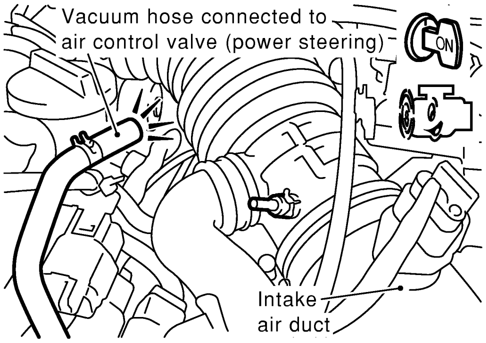
4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F101, F6
- Harness for open or short between IACV-AAC valve and ECM

▶	Repair harness connectors.

5	CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-I

1. Reconnect ECM harness connector and IACV-AAC valve harness connector.
2. Disconnect vacuum hose connected to air control valve (Power steering) at intake air duct.
3. Start engine and let it idle.
4. Check vacuum hose for vacuum existence.



SEF995Y

Vacuum slightly exists or does not exist.

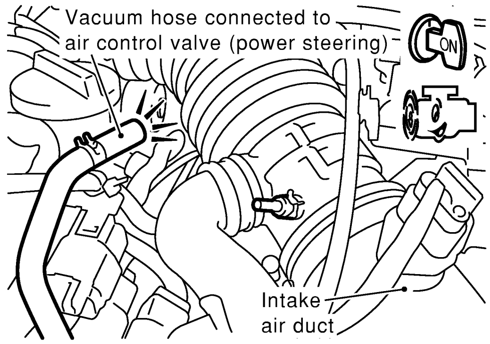
OK or NG

OK ▶	GO TO 6.
NG ▶	Replace air control valve (Power steering).

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

6	CHECK AIR CONTROL VALVE (POWER STEERING) OPERATION-II

Check vacuum hose for vacuum existence when steering wheel is turned.



SEF995Y

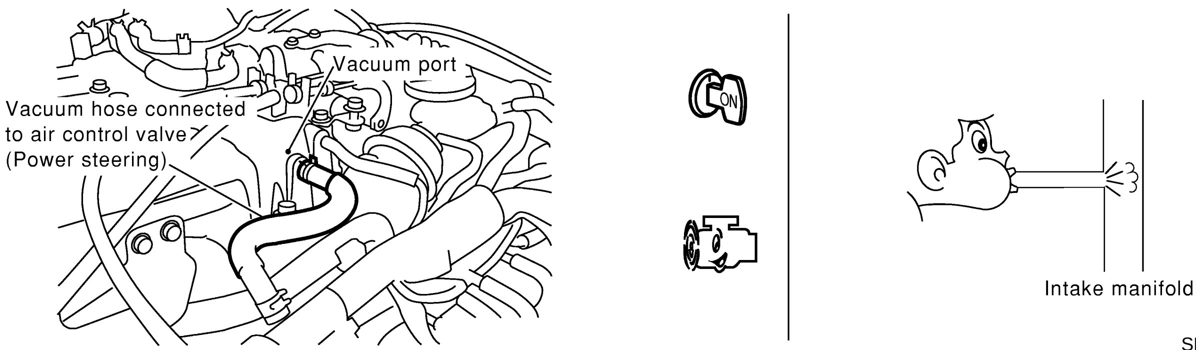
Vacuum should exist.

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 7.

7	CHECK VACUUM PORT

1. Stop engine.
2. Disconnect vacuum hose connected to air control valve (Power steering) at vacuum port.
3. Blow air into vacuum port.
4. Check that air flows freely.



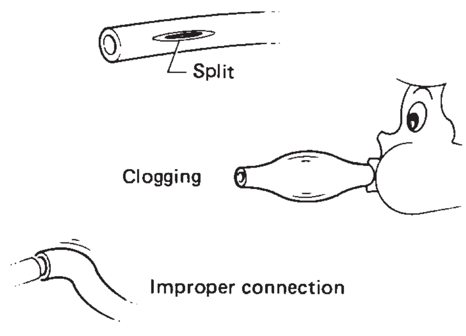
SEF996Y

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or clean vacuum port.

8	CHECK VACUUM HOSES AND TUBES

1. Disconnect vacuum hoses between air control valve (Power steering) and vacuum port, air control valve (Power steering) and intake air duct.
2. Check the hoses and tubes for crack, clogging, improper connection or disconnection.



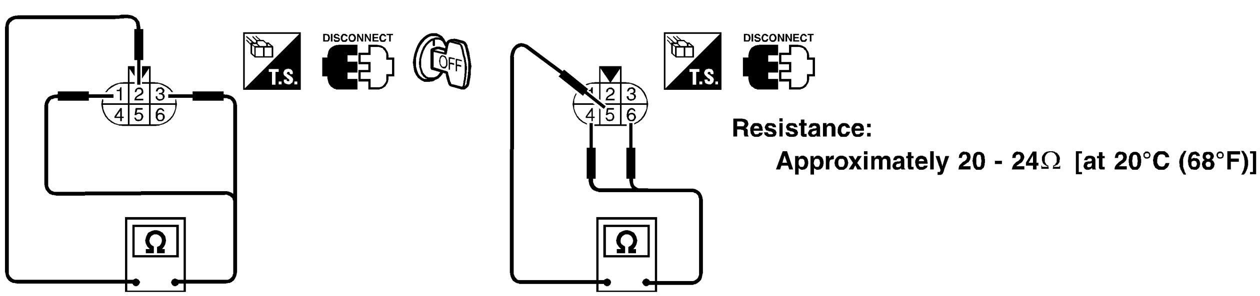
SEF109L

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair hoses or tubes.

9	CHECK IACV-AAC VALVE-I

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between IACV-AAC valve terminal 2 and terminals 1, 3, terminal 5 and terminals 4, 6.



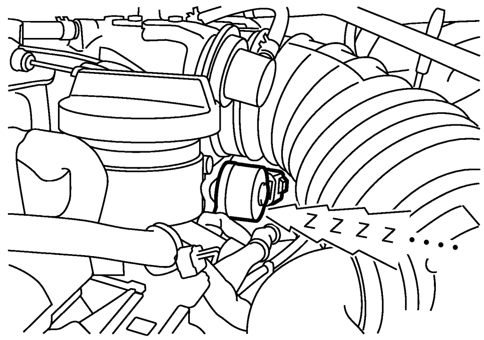
SEF344XA

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace IACV-AAC valve assembly.

10	CHECK IACV-AAC VALVE-II

1. Reconnect IACV-AAC valve harness connector and ECM harness connector.
2. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve makes operating sound according to the ignition switch position.



SEF997Y

OK or NG

OK	▶	GO TO 12.
NG	▶	GO TO 11.

11	REPLACE IACV-AAC VALVE

1. Replace IACV-AAC valve assembly.
2. Perform "Idle Air Volume Learning", EC-58.

Is the result CMPLT or INCMP?

CMPLT or INCMP

CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of "Idle Air Volume Learning".

12	CHECK TARGET IDLE SPEED

1. Turn ignition switch "OFF".
2. Reconnect all harness connectors and vacuum hoses.
3. Start engine and warm it up to normal operating temperature.
4. Also warm up transmission to normal operating temperature.

- For A/T 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 and M/T models, drive vehicle for 10 minutes.

5. Stop vehicle with engine running.
6. Check target idle speed.

M/T: 750±50 rpm
A/T: 750±50 rpm (in "P" or "N" position)

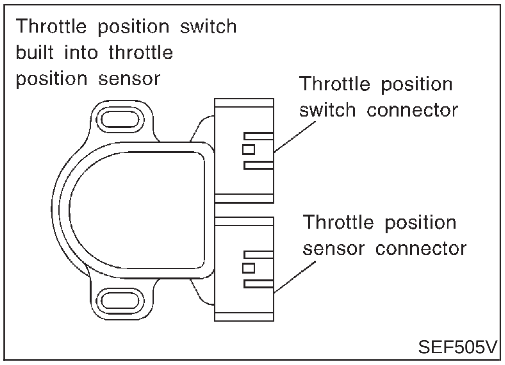
OK or NG

OK	▶	GO TO 13.
NG	▶	Perform "Idle Air Volume Learning", EC-58.

13	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**



Component Description

NAEC0256

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit. The wide open throttle position switch is used only for A/T control.
When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0257

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
CLSD THL/P SW	● Engine: After warming up, idle the engine	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

ECM Terminals and Reference Value

NAEC0671

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)
56	OR/L	Throttle position switch (Closed position)	**[Engine is running]** ● Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Accelerator pedal depressed	Approximately 0V

On Board Diagnosis Logic

NAEC0259

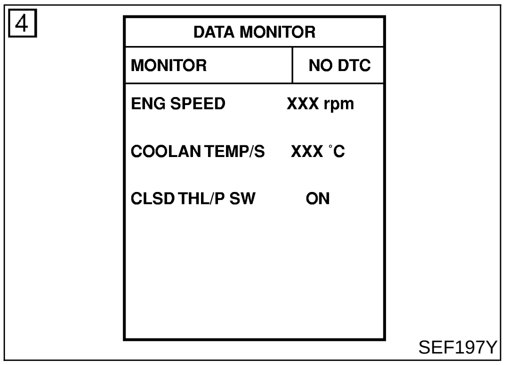
Malfunction is detected when battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.

Possible Cause

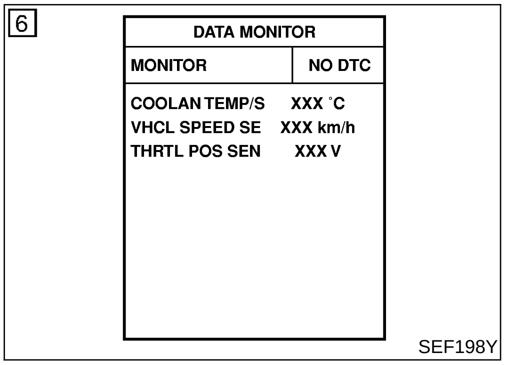
NAEC0516

- Harness or connectors
  (The closed throttle position switch circuit is shorted.)
- Closed throttle position switch
- Throttle position sensor

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



SEF197Y



SEF198Y

DTC Confirmation Procedure

NAEC0260

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

NAEC0260S01

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF", wait at least 10 seconds and then start engine.
3) Select "CLSD THL/P SW" in "DATA MONITOR" mode.
   If "CLSD THL/P SW" is not available, go to step 5.
4) Check the signal under the following conditions.

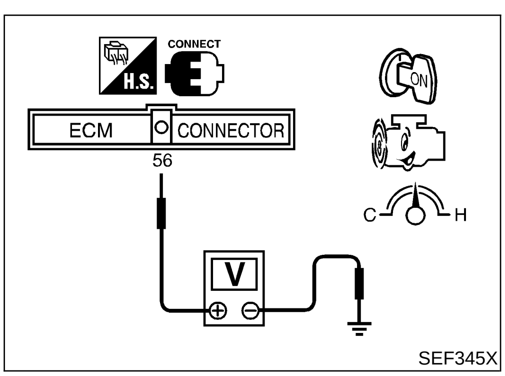
Condition	Signal indication
Throttle valve: Idle position	ON
Throttle valve: Slightly open	OFF

If the result is NG, go to "Diagnostic Procedure", EC-437.
If OK, go to following step.

5) Select "DATA MONITOR" mode with CONSULT-II.
6) Drive the vehicle for at least 5 consecutive seconds under the following condition.

THRTL POS SEN	More than 2.5V
VHCL SPEED SE	More than 5 km/h (3 MPH)
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

7) If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-437.



SEF345X

Overall Function Check

NAEC0261

Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NAEC0261S01

1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal 56 (Closed throttle position switch signal) and ground under the following conditions.

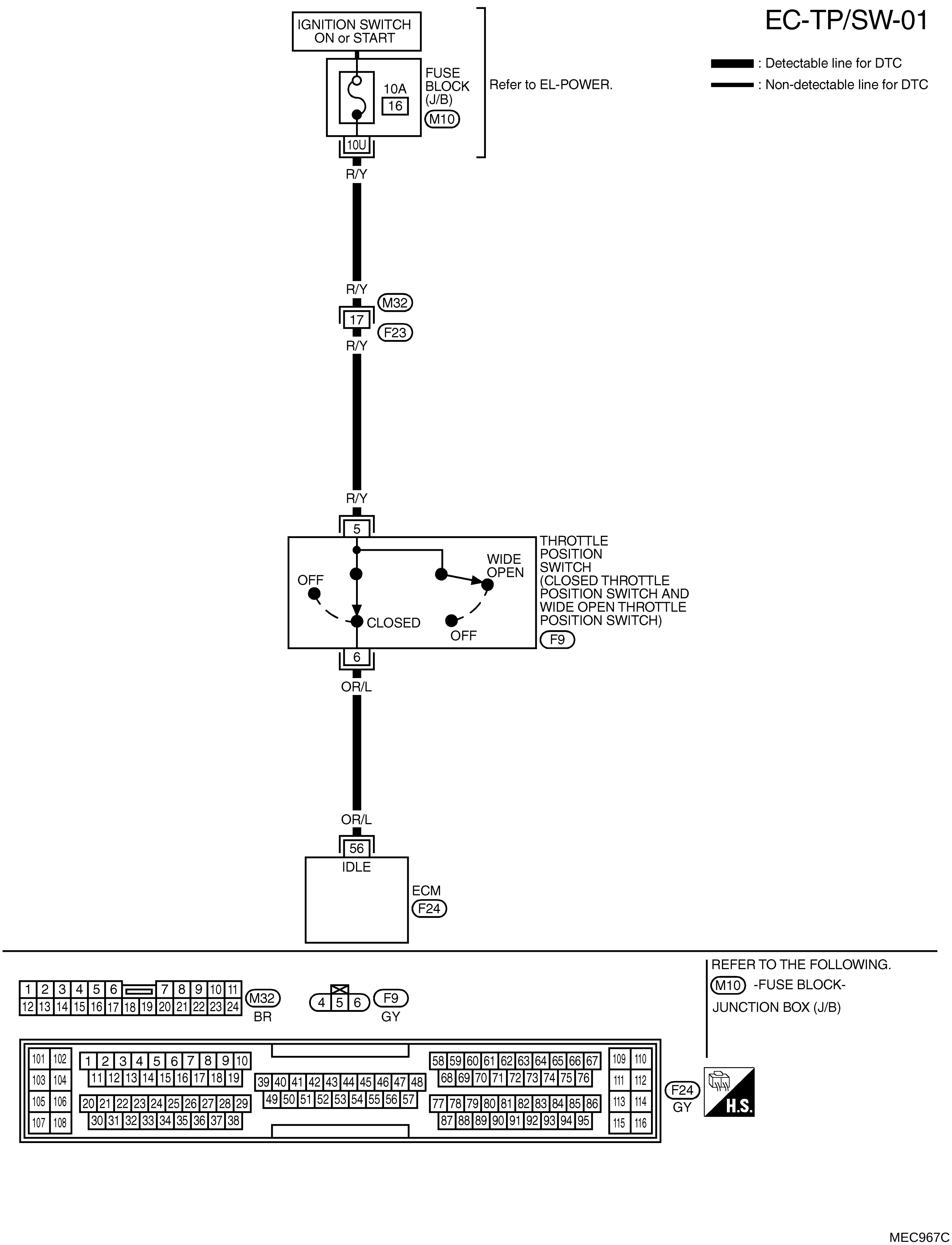
   At idle: Battery voltage

At 2,000 rpm: Approximately 0V

3) If NG, go to "Diagnostic Procedure", EC-437.

Wiring Diagram

=NAEC0262

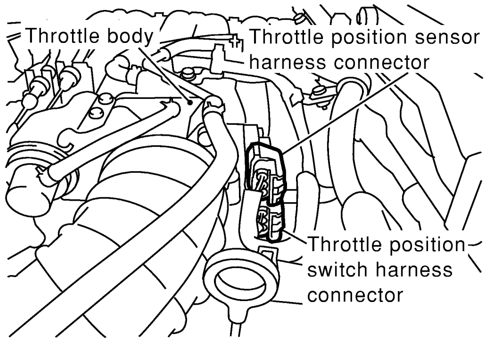


Diagnostic Procedure

NAEC0263

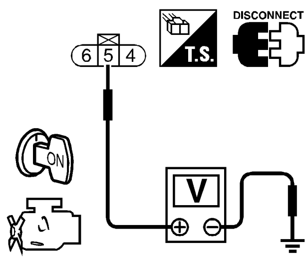
1 CHECK CLOSED THROTTLE POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect throttle position switch harness connector.



SEF944Y

3. Turn ignition switch “ON”.
4. Check voltage between throttle position switch terminal 5 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF346X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2 DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- Harness for open or short between throttle position switch and ECM

	▶	Repair harness or connectors.

3 CHECK CLOSED THROTTLE POSITION SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 56 and throttle position switch terminal 6.
   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 IGNITION TIMING AND ENGINE IDLE SPEED

Check the following items. Refer to "Basic Inspection", EC-102.

Items	Specifications
Ignition timing	M/T: 15° ± 5° BTDC A/T: 15° ± 5° BTDC
Idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

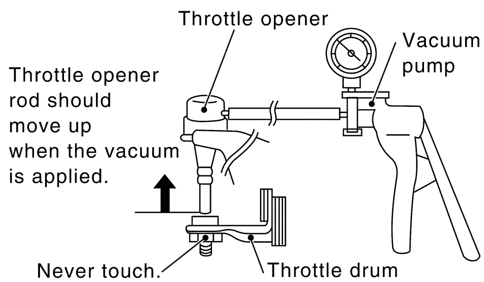
MTBL0654

Models with CONSULT-II	▶	GO TO 6.
Models without CONSULT-II	▶	GO TO 6.

5	CHECK THROTTLE POSITION SWITCH

With CONSULT-II

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



SEF793W

6. Turn ignition switch "ON".
7. Select "DATA MONITOR" mode with CONSULT-II.
8. Check indication of "CLSD THL/P SW" under the following conditions.
   Measurement must be made with throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

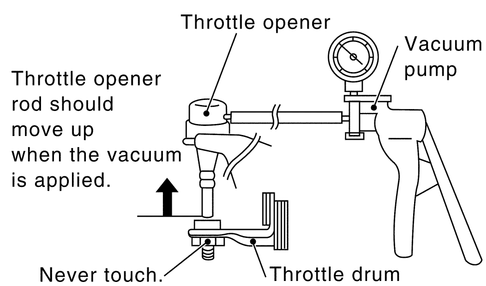
MTBL0355

OK or NG

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

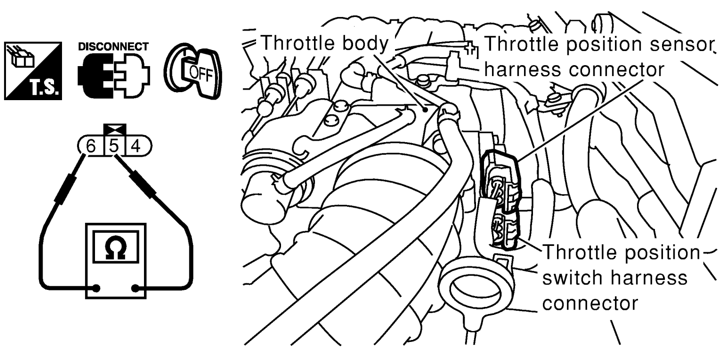
6	CHECK THROTTLE POSITION SWITCH

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



SEF793W

6. Disconnect closed throttle position switch harness connector.
7. Check continuity between closed throttle position switch terminals 6 and 5 under the following conditions.
   Resistance measurement must be made with throttle position switch installed in vehicle.



Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

SEF998Y

OK or NG

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

7	ADJUST THROTTLE POSITION SWITCH

Check the following items. Refer to “Basic Inspection”, EC-102.

Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in “P” or “N” position)

MTBL0653

Is it possible to adjust closed throttle position switch?

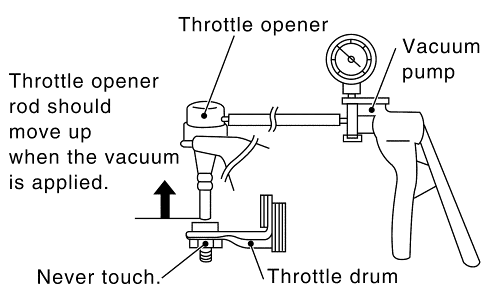
Yes or No

Yes (With CONSULT-II)	▶	GO TO 9.
Yes (Without CONSULT-II)	▶	GO TO 9.
No	▶	Replace throttle position switch.

8	CHECK THROTTLE POSITION SENSOR

With CONSULT-II

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



SEF793W

6. Turn ignition switch ON.
7. Select “DATA MONITOR” mode with CONSULT-II.
8. Check voltage of “THRTL POS SEN” under the following conditins.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

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

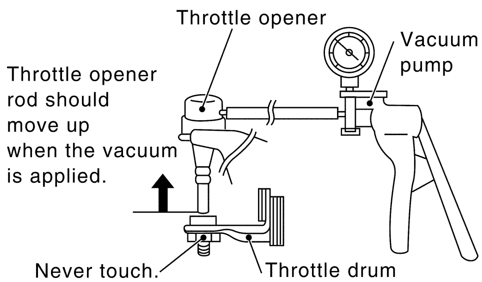
MTBL0230

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace throttle position sensor.

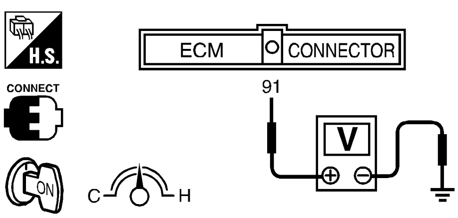
9	CHECK THROTTLE POSITION SENSOR

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



SEF793W

6. Turn ignition switch ON.
7. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.
Voltage measurement must be made with throttle position sensor installed in vehicle.



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

SEF348X

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace throttle position sensor.

10	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

System Description

NAEC0264

This circuit line (LAN) is used to control the smooth shifting up and down of A/T during the hard acceleration/deceleration.
Pulse signals are exchanged between ECM and TCM (Transmission Control Module).
Be sure to erase the malfunction information such as DTC not only in TCM but also ECM after the A/T related repair.

ECM Terminals and Reference Value

NAEC0672

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)
114	G/R	Communication line (LAN)	**[Engine is running]** ● Idle speed	Approximately 2V

On Board Diagnosis Logic

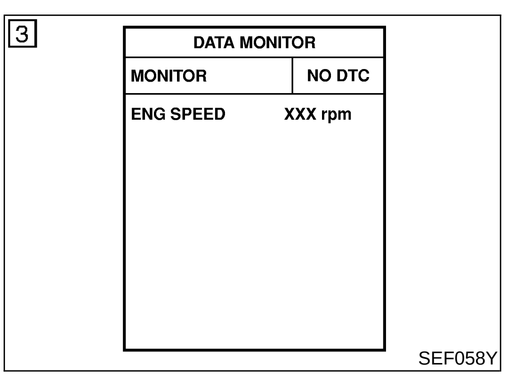
NAEC0266

Malfunction is detected when ECM receives incorrect voltage from TCM (Transmission Control Module) continuously.

Possible Cause

NAEC0517

- Harness or connectors
  [The communication line circuit between ECM and TCM (Transmission Control Module) is open or shorted.]
- TCM
- Dead (Weak) battery



SEF058Y

DTC Confirmation Procedure

NAEC0267

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 at idle.

WITH CONSULT-II

NAEC0267S01

1) Turn ignition switch "ON".

2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and let it idle for at least 2 seconds.
4) If DTC is detected, go to "Diagnostic Procedure", EC-445.

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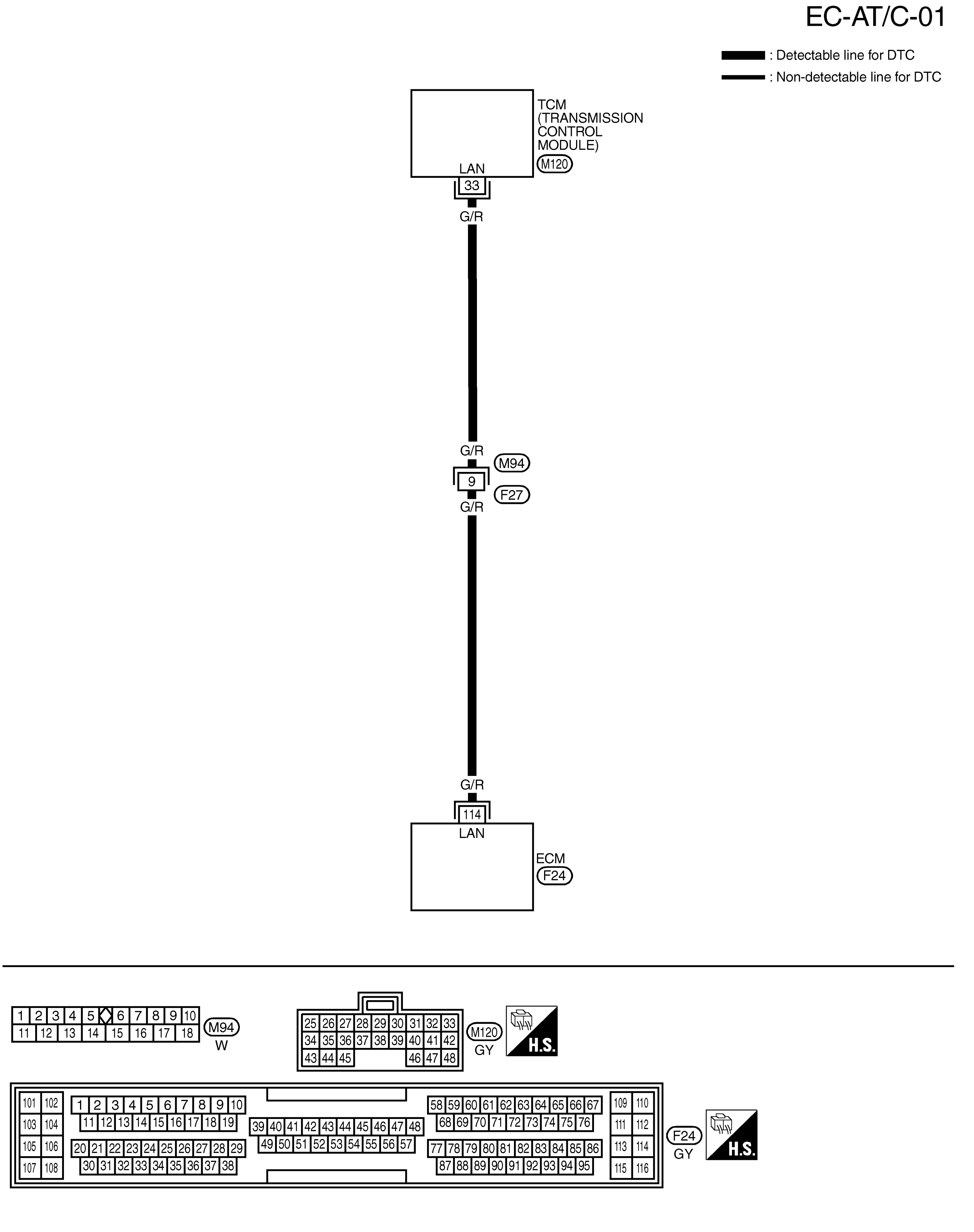
Wiring Diagram

NAEC0269



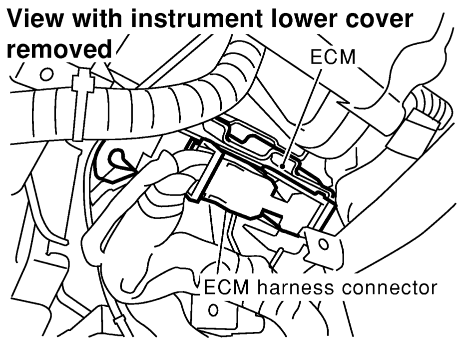
MEC968C

Diagnostic Procedure

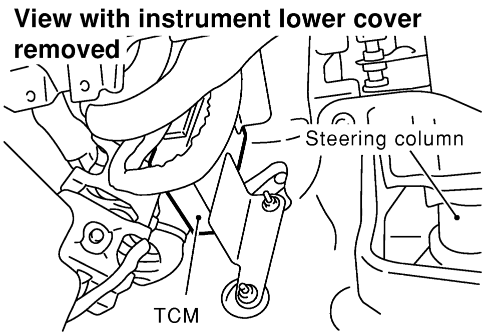
NAEC0270

1	CHECK A/T CONTROL INPUT SIGNAL CIRCUIT FOR OPEN

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector and TCM (Transmission Control Module) harness connector.



SEF955Y



SEF001Z

3. Check harness continuity between ECM terminal 114 and TCM terminal 33.
   Refer to Wiring Diagram.
   Continuity should exist.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTION PART

Check the following.
- Harness connectors M94, F27
- Harness for open or short between ECM and TCM (Transmission control module)

	▶	Repair harness or connectors.

3	CHECK A/T CONTROL INPUT SIGNAL CIRCUIT FOR SHORT

1. Check harness continuity between ECM terminal 114 and ground.
   Refer to Wiring Diagram.
   Continuity should not exist.
2. Also check harness for short to power.

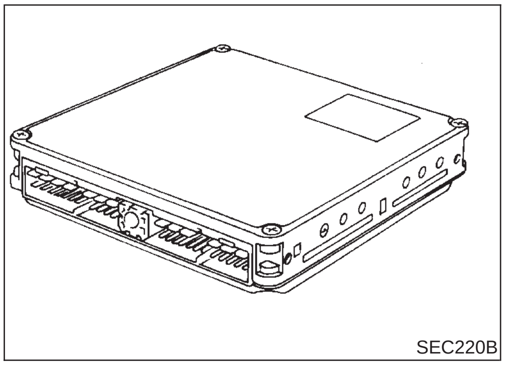
OK or NG

OK	▶	GO TO 4.
NG	▶	Repair short to ground or short to power in harness or connectos.

4	CHECK INTERMITTENT INCIDENT

Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-142.

	▶	**INSPECTION END**


SEC220B

Component Description
NAEC0271

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The unit controls the engine.

On Board Diagnosis Logic
NAEC0272

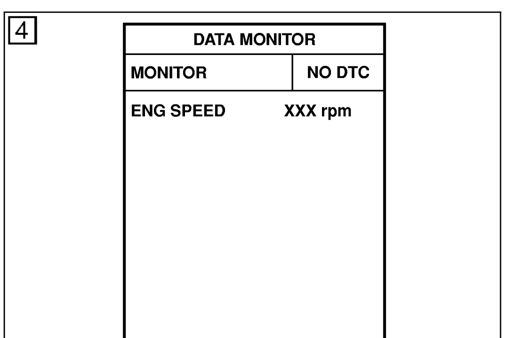
Malfunction is detected when ECM calculation function is malfunctioning.

Possible Cause
NAEC0518

- ECM

DTC Confirmation Procedure
NAEC0273

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
NAEC0273S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine.
4) Run engine for at least 30 seconds at idle speed.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-447.

WITH GST
NAEC0273S02

Follow the procedure “WITH CONSULT-II” above.

Diagnostic Procedure

NAEC0274

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-446. 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-446. 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 NVIS (NATS) system and registration of all NVIS (NATS) ignition key IDs. Refer to “NVIS (NISSAN VEHICLE IMMOBILIZER SYSTEM — NATS)”, EC-75. 3. Perform “Idle Air Volume Learning”, EC-58, **Is the result CMPLT or INCMP?** **CMPLT or INCMP**		
CMPLT	▶	**INSPECTION END**
INCMP	▶	Follow the construction of “Idle Air Volume Learning”.

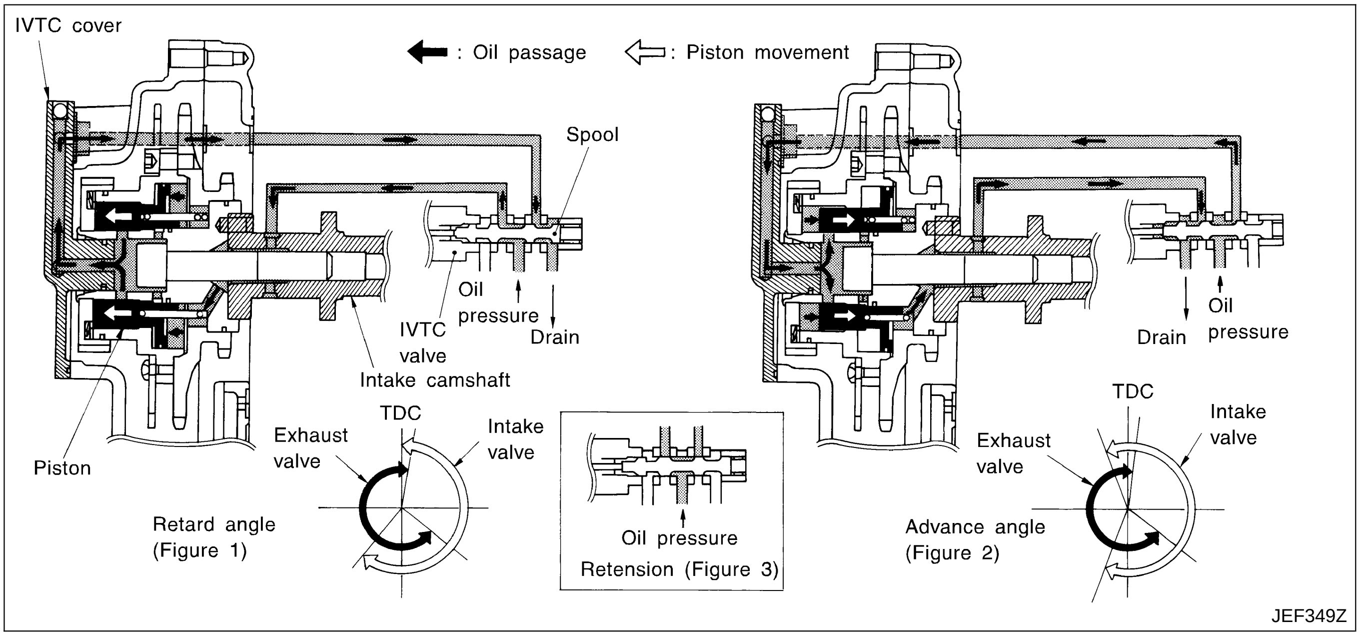
Description

NAEC0691

SYSTEM DESCRIPTION

NAEC0691S01

Sensor	Input signal to ECM function	ECM	Actuator
Crankshaft position sensor (POS)	Engine speed (POS)	Intake valve timing control	Intake valve timing control solenoid valve
Crankshaft position sensor (REF)	Engine speed (REF)		
Camshaft position sensor	Engine speed		
Engine coolant temperature sensor	Engine coolant temperature		
Vehicle speed sensor	Vehicle speed		



This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.
The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the camshaft timing control valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high-speed range.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0692

Specification data are reference values.

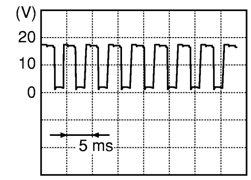
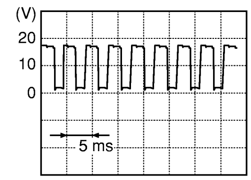
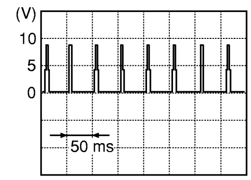
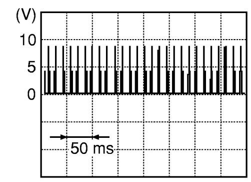
MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1) INT/V TIM (B2)	● Engine: After warming up ● Shift lever “N” ● Quickly depressed accelerator pedal ● No-load	Idle	0° CA
		2,000 rpm	Approximately 12 - 18° CA
INT/V SOL (B1) INT/V SOL (B2)	● Engine: After warming up ● Shift lever “N” ● Quickly depressed accelerator pedal ● No-load	Idle	0%
		2,000 rpm	Approximately 40%

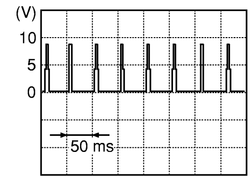
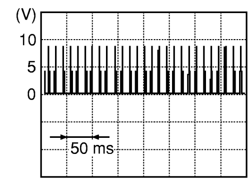
ECM Terminals and Reference Value

=NAEC0693

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 the ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	OR/B	Intake valve timing control solenoid valves (RH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Battery voltage
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	7 - 8V  SEF350Z
15	P/L	Intake valve timing control solenoid valves (LH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Battery voltage
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	7 - 8V  SEF350Z
79	Y/G	Intake valve timing control position sensors (RH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.5V  SEF351Z
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	Approximately 0.5V  SEF352Z

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
89	OR	Intake valve timing control position sensors (LH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.5V  SEF351Z
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	Approximately 0.5V  SEF352Z

On Board Diagnosis Logic

NAEC0694

Malfunction is detected when
(Malfunction A)
The alignment of the intake valve timing control has been misregistered.
(Malfunction B)
There is a gap between angle of target and phase-control angle degree.

FAIL-SAFE MODE

NAEC0694S01

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

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function.

Possible Cause

NAEC0695

MALFUNCTION A OR B

NAEC0695S01

- Harness or connectors
  (Intake valve timing control position sensor circuit is open or shorted.) Refer to EC-484.
- Crankshaft position sensor (REF)
- Crankshaft position sensor (POS)
- Camshaft position sensor (PHASE)

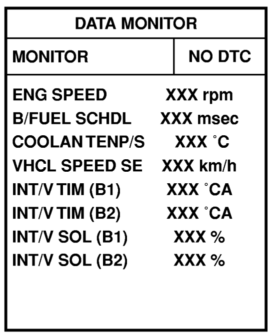
DTC Confirmation Procedure

NAEC0696

CAUTION:
Always drive at a safe speed.

NOTE:

- **If both DTC P1111 (B1), P1136 (B2) or P1140 (B1), P1145 (B2) and P1110 (B1), P1135 (B2) are displayed, perform trouble diagnosis for “DTC P1111 (B1), P1136 (B2) or P1140 (B1), P1145 (B2)” first. (See EC-453, EC-484.)**
- **If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.**



SEF353Z

PROCEDURE FOR MALFUNCTION A

NAEC0696S01

With CONSULT-II

NAEC0696S0101

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
COOLANT TEMPS	More than 70°C (158°F)
Selector lever	1st positon (A/T or M/T)
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

4) Maintain the following conditions for at least 20 consecutive seconds.

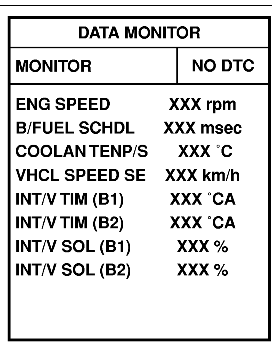
ENG SPEED	Idle
COOLANT TEMPS	More than 70°C (158°F)
Selector lever	“P” or “N” position

5) If 1st trip DTC is detected, go to “P1140, P1145 INTAKE VALVE TIMING CONTROL POSITION SENSOR”. Refer to EC-484.

With GST

NAEC0696S0102

Follow the procedure “With CONSULT-II” above.



SEF353Z

PROCEDURE FOR MALFUNCTION B

NAEC0696S02

With CONSULT-II

NAEC0696S0201

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Maintain the following conditions for at least 20 conecutive seconds.

ENG SPEED	2,000 - 3,000 rpm (A constant rotation is maintained.)
COOLANT TEMPS	70 - 90°C (158 - 194°F)

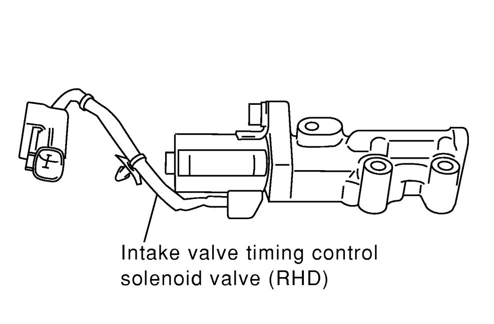
Selector lever	1st position (A/T or M/T)
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

4) If 1st trip DTC is detected, go to "P1140, P1145 INTAKE VALVE TIMING CONTROL POSITION SENSOR". Refer to EC-484.

GST With GST

NAEC0696S0202

Follow the procedure "With CONSULT-II" above.



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Component Description

NAEC0697

Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0698

Specification data are reference values.

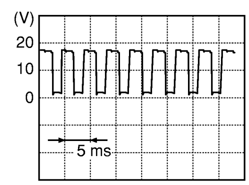
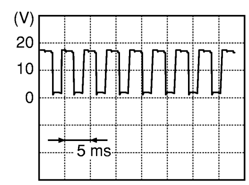
MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1) INT/V SOL (B2)	• Engine: After warming up • Shift lever "N" • Quickly depressed accelerator pedal • No-load	Idle	0%
		2,000 rpm	Approximately 40%

ECM Terminals and Reference Value

NAEC0699

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 (DC Voltage)
13	OR/B	Intake valve timing control solenoid valves (RH)	**[Engine is running]** • **Warm-up condition** • Idle speed	Battery voltage
			[Engine is running] • **Warm-up condition** • Engine speed is 2,000 rpm.	7 - 8V  SEF350Z
15	P/L	Intake valve timing control solenoid valves (LH)	**[Engine is running]** • **Warm-up condition** • Idle speed	Battery voltage
			[Engine is running] • **Warm-up condition** • Engine speed is 2,000 rpm.	7 - 8V  SEF350Z

On Board Diagnosis Logic

NAEC0700

Malfunction is detected when an improper voltage is sent to the ECM through intake valve timing control solenoid valve.

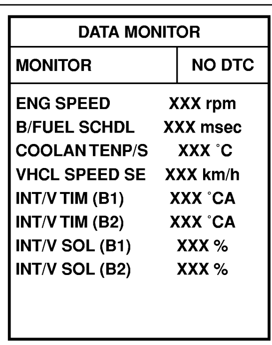
Possible Cause

NAEC0701

- Harness or connectors
  (Intake valve timing control solenoid valve circuit is open or shorted)
- Intake valve timing control solenoid valve.

DTC Confirmation Procedure

NAEC0702



SEF353Z

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

NAEC0702S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Maintain the following conditions for at least 5 seconds.

Engine speed	More than Idle speed
Selector lever	“P” or “N” position

4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-457.

WITH GST

NAEC0702S02

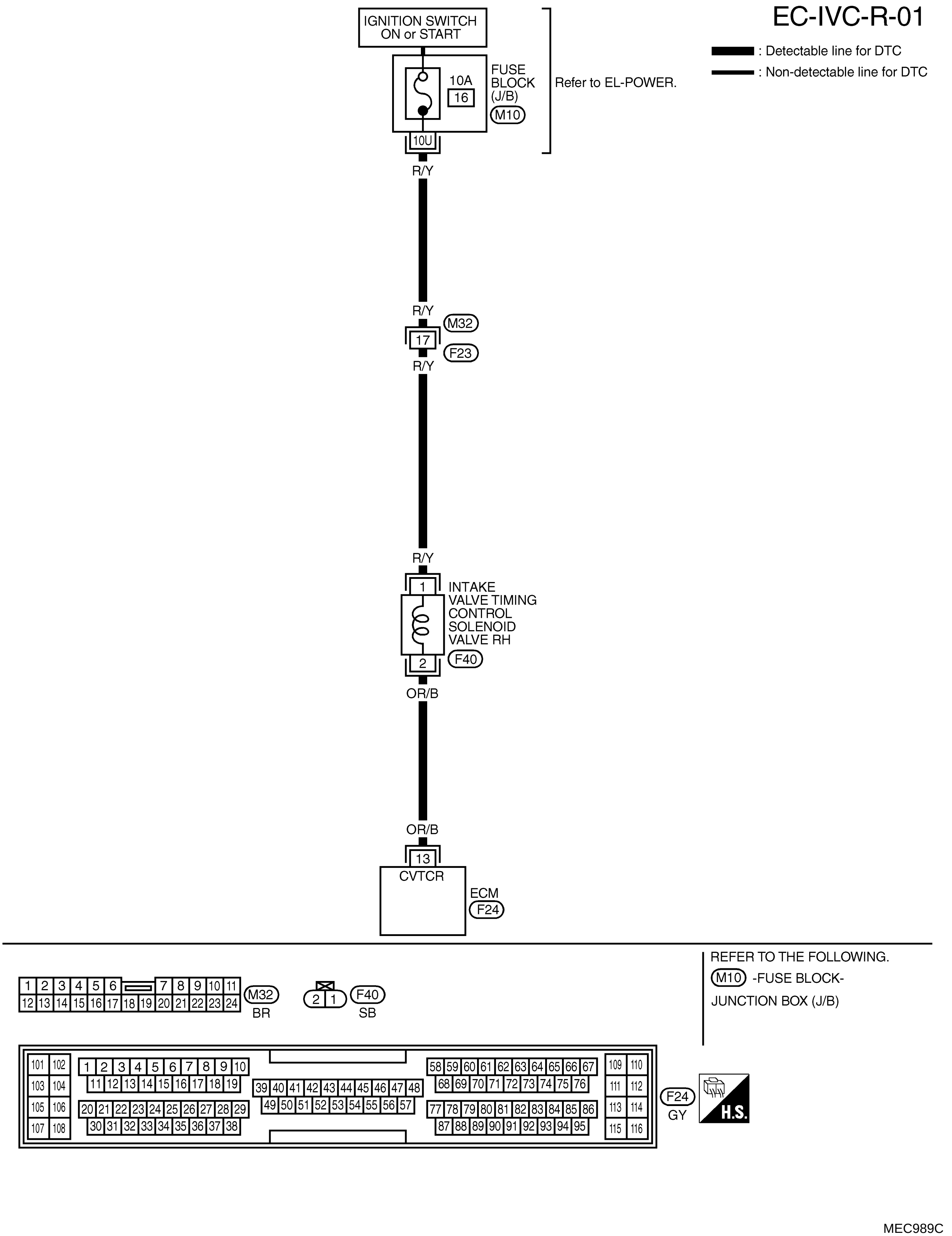
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NAEC0703

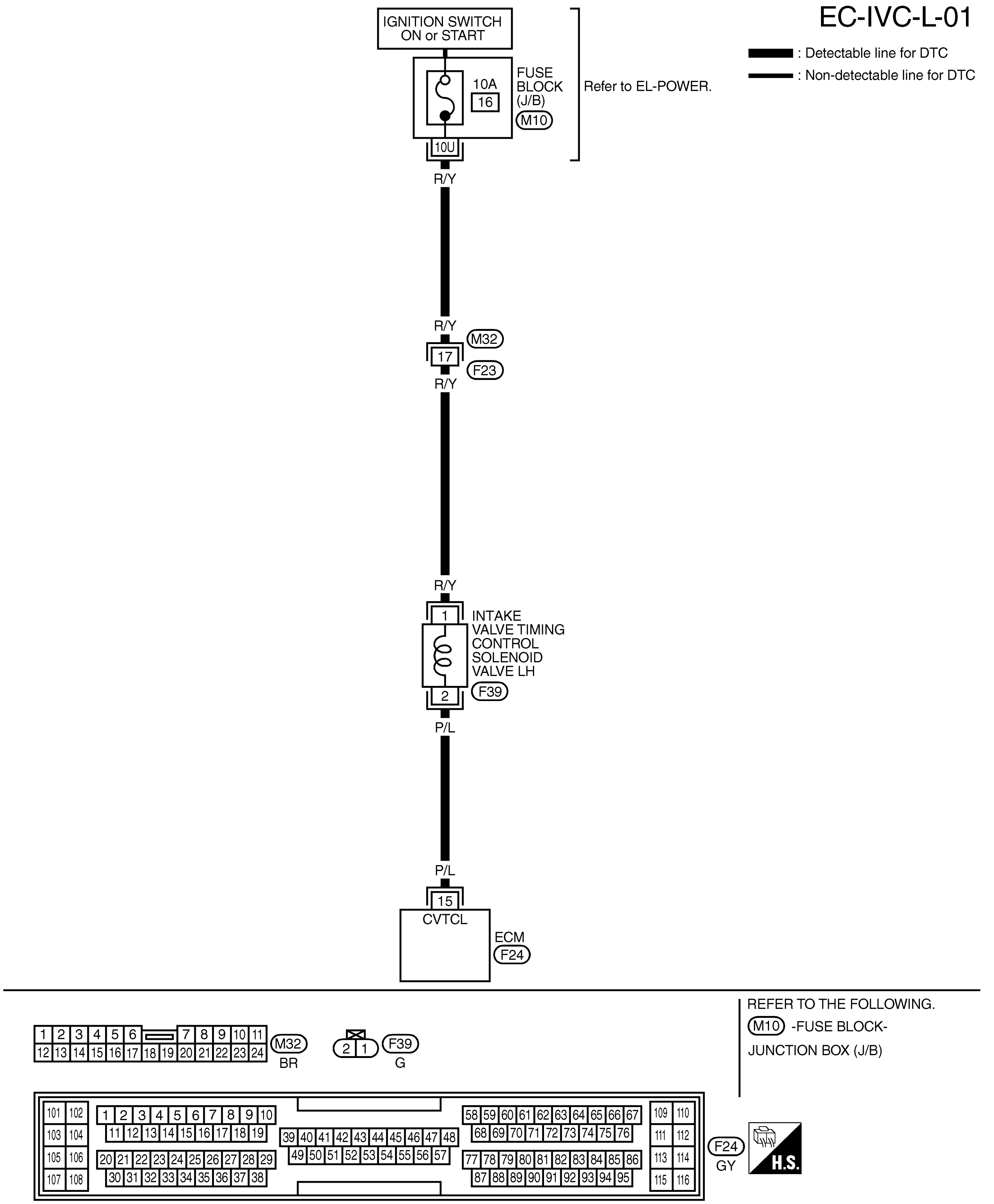
RIGHT BANK

NAEC0703S01



LEFT BANK

NAEC0703S02



MEC988C

Diagnostic Procedure

NAEC0704

1 CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Perform “TARGET INT/V TIM” in “ACTIVE TEST” mode with CONSULT-II.
3. Hold engine speed at 1,500 to 2,500 rpm under the following step.
4. Touch “UP” or “DOWN” on CONSULT-II screen.

ACTIVE TEST	
TARGET INT/V TIM	0°
MONITOR	
ENG SPEED	XXX rpm
INT/V TIM (B1)	XXX °CA
INT/V TIM (B2)	XXX °CA
INT/V SOL (B1)	XXX %
INT/V SOL (B2)	XXX %

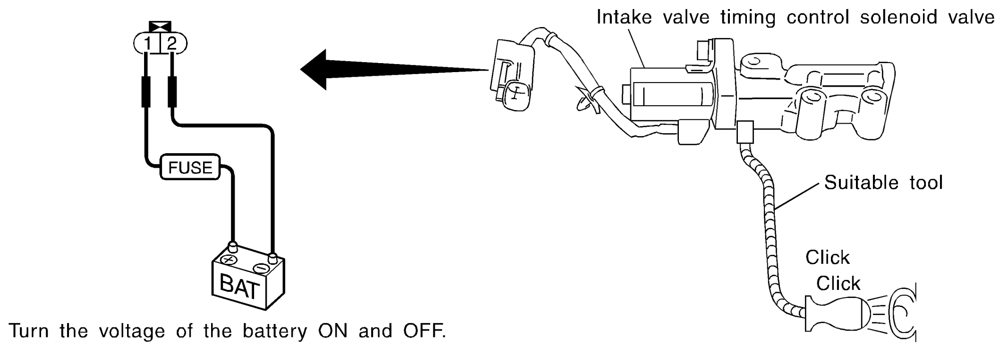
SEF355Z

5. Check the following.

- The angle of a corresponding INT/V TIM (B1)/(B2) to setting TARGET INT/V TIM confirms the variation.

Without CONSULT-II

1. Remove intake valve timing control solenoid valve.
2. Reconnect intake valve timing control solenoid valve harness connector.
3. Supply intake valve timing control solenoid valve terminals with battery voltage as shown below.



SEF356Z

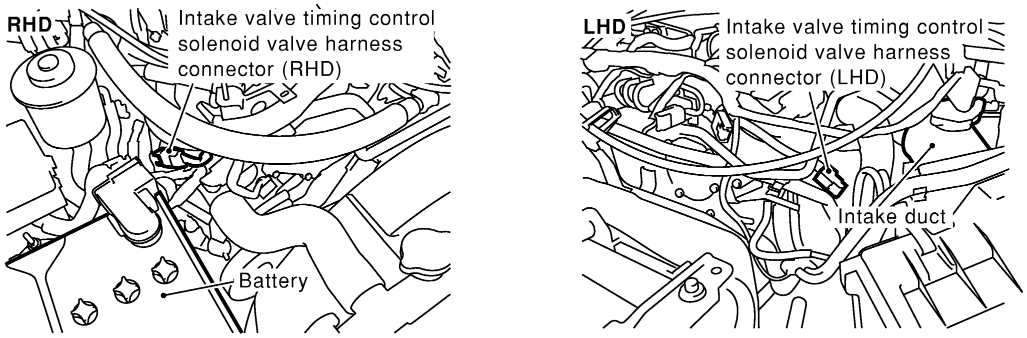
Clicking noise should be heard.

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

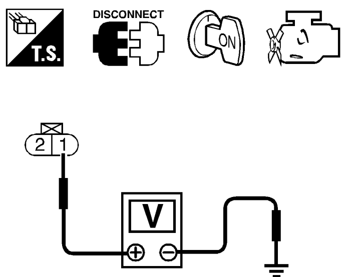
2 INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect intake valve timing control solenoid valve harness connector.



SEF357Z

3. Turn ignition switch “ON”.
4. Check voltage between terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF603X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3 DETECT MALFUNCTION PART

Check the following.
- Harness connectors M32, F23
- 10A fuse
- Harness continuity between fuse and intake valve timing control solenoid valve

	▶	Repair harness or connectors.

4 CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect ECM harness connector.
3. Check harness connectors continuity between ECM terminal 13 (Right) or 15 (Left) and terminal 2. Refer to Wiring Diagram.

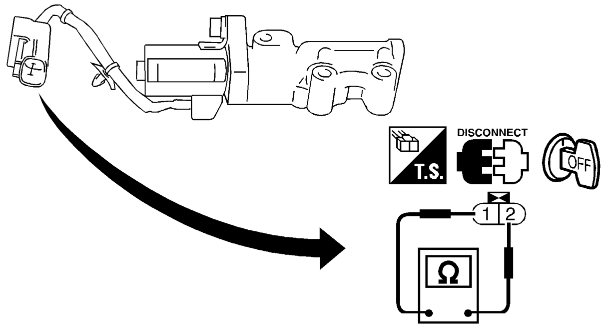
    Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

5	CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Check resistance between intake valve timing control solenoid valve terminals as follows.



Terminals	Resistance
1 and 2	5.5 - 9.2Ω at 20°C (68°F)
1 or 2 and ground	∞ Ω (Continuity should not exist.)

SEF358Z

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair intake valve timing control solenoid valve.

6	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

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

Description

NAEC0523

If DTC P1130 is displayed with P1165, first perform trouble diagnosis for DTC P1165, EC-495.

SYSTEM DESCRIPTION

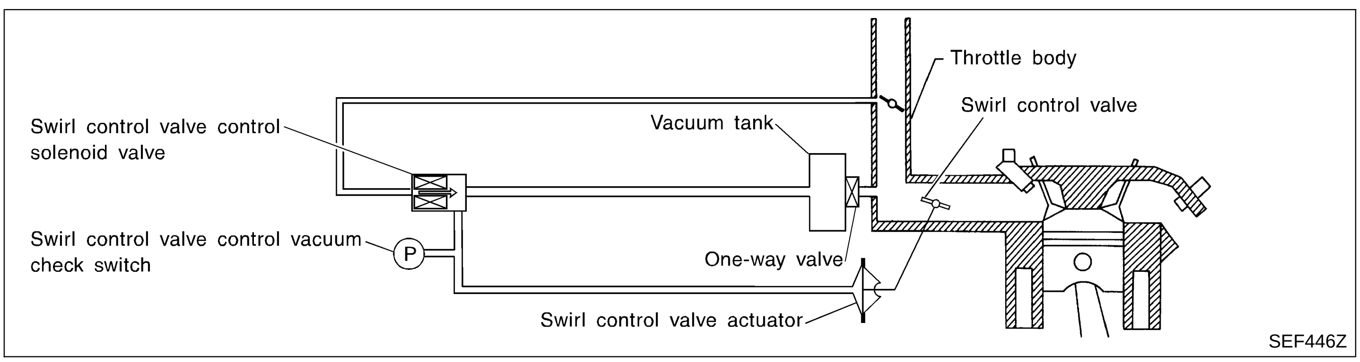
NAEC0523S01

Sensor	Input Signal to ECM	ECM function	Actuator
Throttle position sensor	Throttle position	Swirl control valve control	Swirl control valve control solenoid valve ↓ Vacuum signal Swirl control valve actuator ↓ Swirl control valve
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		

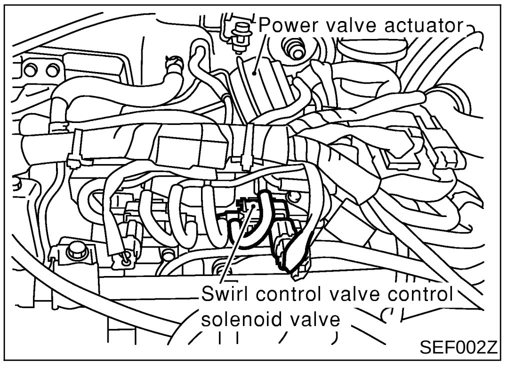
This system has a swirl control valve in the intake passage of each cylinder.
While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.
Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.
Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.
The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Throttle position sensor (Idle position)	Engine speed (A/T)	Engine speed (M/T)	Swirl control valve control solenoid valve	Swirl control valve
ON	Below 3,200 rpm	Below 2,400 rpm	ON	Closed
OFF	Less than 3,200 rpm	Less than 2,400 rpm	ON	Closed
	More than 3,600 rpm	More than 2,800 rpm	OFF	Open

When engine coolant temperature is below 10°C (50°F) and above 55°C (131°F), swirl control valve is kept open regardless of above condition.



SEF446Z



COMPONENT DESCRIPTION
NAEC0523S02

Swirl Control Valve Control Solenoid Valve
NAEC0523S0201

The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.

CONSULT-II Reference Value in Data Monitor Mode
NAEC0524

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
SWRL CONT S/V	● Engine speed: Idle	Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	ON
		Engine coolant temperature is above 55°C (131°F).	OFF

ECM Terminals and Reference Value
NAEC0673

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)
29	G	Swirl control valve control solenoid valve	**[Engine is running]** ● Idle speed ● Engine coolant temperature is between 15 to 50°C (59 to 122°F).	0 - 1.0V
			[Engine is running] ● Idle speed ● Engine coolant temperature is above 55°C (131°F).	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic
NAEC0526

Malfunction is detected when
(Malfunction A) An improper voltage signal is sent to ECM through swirl control valve control solenoid valve,
(Malfunction B) The vacuum signal is not sent to swirl control valve under specified driving conditions, even though swirl control valve control solenoid valve is ON,
(Malfunction C) The vacuum signal is sent to swirl control valve even though swirl control valve control solenoid valve is OFF.

Possible Cause

NAEC0527

MALFUNCTION A

NAEC0527S01

- Harness or connectors
  (The swirl control valve control solenoid valve circuit is open or shorted.)
- Swirl control valve control solenoid valve

MALFUNCTION B

NAEC0527S02

- Harness or connector
  (The swirl control valve control solenoid valve circuit is open.)
- Swirl control valve control solenoid valve
- Intake system
  (Intake air leaks)
- Hoses and tubes between intake manifold, vacuum tank and swirl control valve actuator
- Swirl control valve actuator
- Swirl control valve control vacuum check switch
- Mass air flow sensor
- Crankshaft position sensor (REF)
- Throttle position sensor

MALFUNCTION C

NAEC0527S03

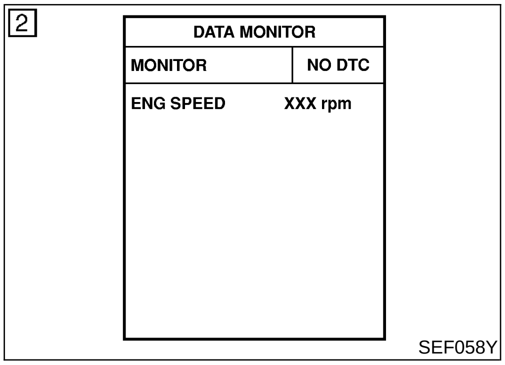
- Harness or connector
  (The swirl control valve control solenoid valve circuit is shorted.)
- Swirl control valve control vacuum check switch
- Crankshaft position sensor (REF)
- Throttle position sensor
- Hoses and tubes between air cleaner and swirl control valve vacuum check switch
- Swirl control valve control solenoid valve

DTC Confirmation Procedure

NAEC0528

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

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



SEF058Y

PROCEDURE FOR MALFUNCTION A

NAEC0528S01

With CONSULT-II

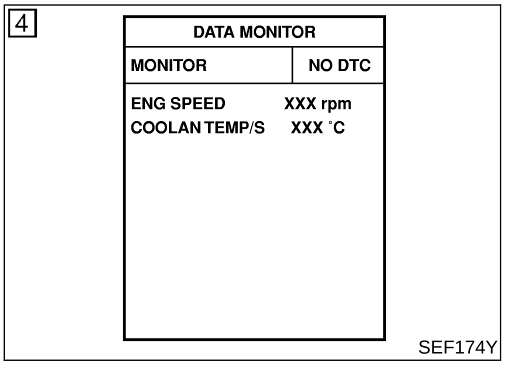
NAEC0528S0101

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Wait at least 5 seconds.
   If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-465.

With GST

NAEC0528S0102

Follow the procedure "With CONSULT-II" above.



SEF174Y

PROCEDURE FOR MALFUNCTION B

NAEC0528S02

TESTING CONDITION:

- **For best results, perform the test at a temperature above 5°C (41°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 10V at idle, then stop engine immediately.**

With CONSULT-II

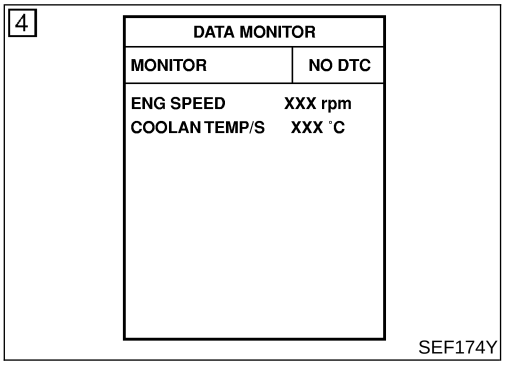
NAEC0528S0201

1) Turn ignition switch "OFF" and wait at least 10 seconds.
2) Turn ignition switch "ON".
3) Check "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-II.
4) Confirm COOLAN TEMP/S value is 40°C (104°F) or less. If the value is more than 40°C (104°F), park the vehicle in a cool place and retry from step 1.
5) Start engine and wait until COOLAN TEMP/S value increases to more than 55°C (131°F). If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-465.

With GST

NAEC0528S0202

Follow the procedure "With CONSULT-II" above.



SEF174Y

PROCEDURE FOR MALFUNCTION C

NAEC0528S03

TESTING CONDITION:

- **For best results, perform the test at a temperature above 5°C (41°F).**
- **Before performing the following procedure, confirm that battery voltage is more than 10V at idle.**

With CONSULT-II

NAEC0528S0301

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" again and select "DATA MONITOR" mode with CONSULT-II.
4) Start engine and let it idle for at least 20 seconds. If 1st trip DTC is detected, go to "Diagnostic Procedure", EC-465.

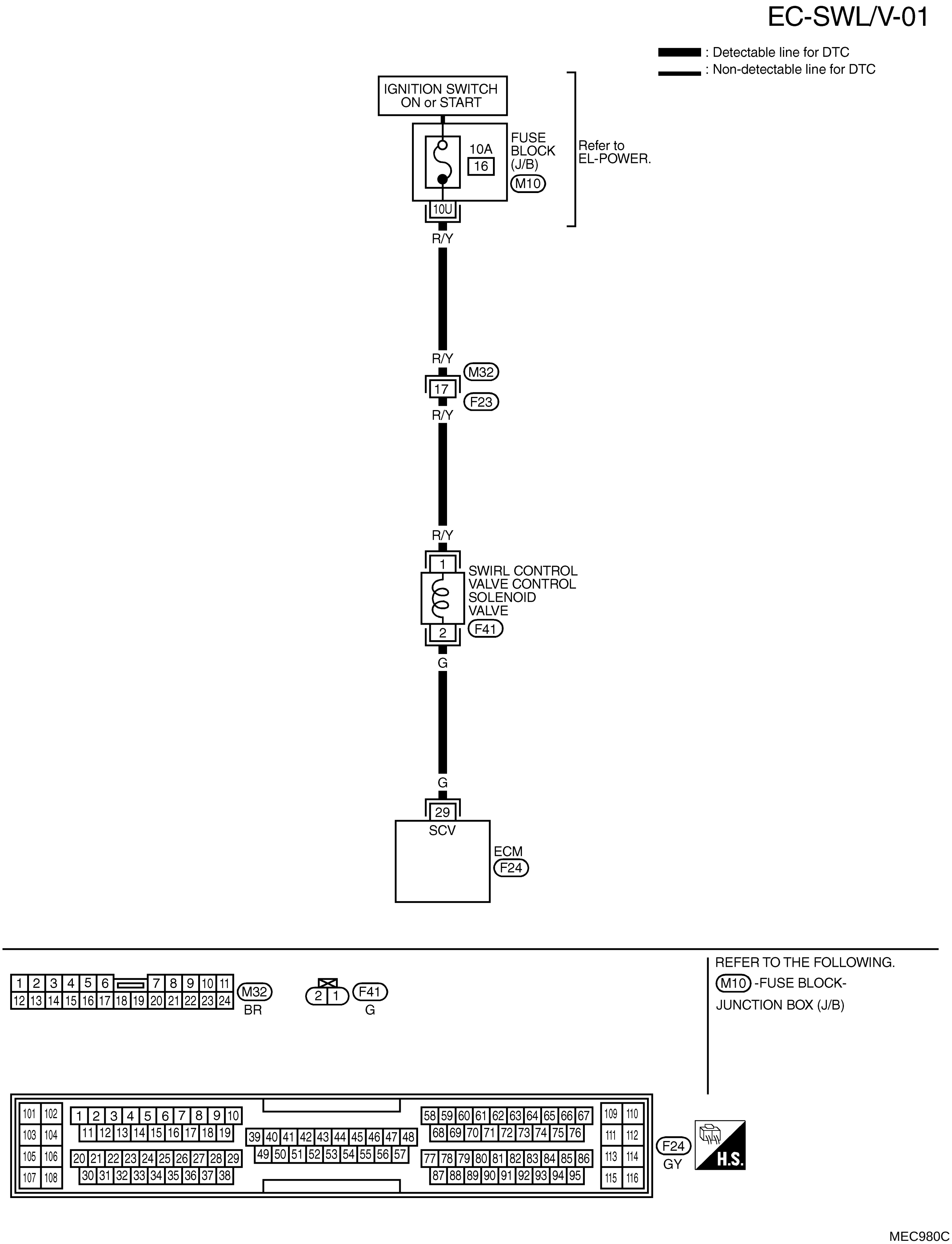
With GST

NAEC0528S0302

Follow the procedure "With CONSULT-II" above.

Wiring Diagram

NAEC0529



Diagnostic Procedure

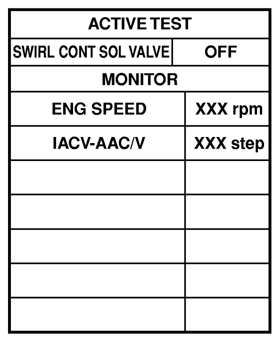
NAEC0530

PROCEDURE A

NAEC0530S01

1	**INSPECTION START**	
Do you have CONSULT-II?		
Yes or No		
Yes	▶	GO TO 2.
No	▶	GO TO 3.

2	**CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE CIRCUIT**	
With CONSULT-II 1. Turn ignition switch “ON”. 2. Select “SWIRL CONT SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II. 3. Touch “ON” and “OFF” on CONSULT-II screen.		

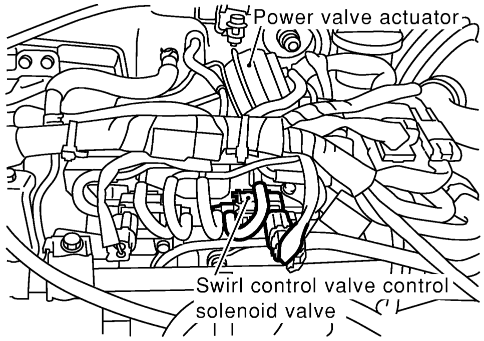


SEF003Z

4. Make sure that clicking sound is heard from the swirl control valve control solenoid valve.		
OK or NG		
OK	▶	GO TO 6.
NG	▶	GO TO 3.

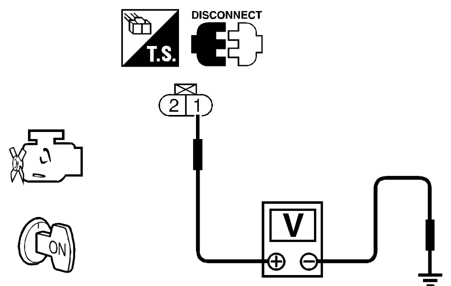
3	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



SEF002Z

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- 15A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair harness or connectors.

5	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

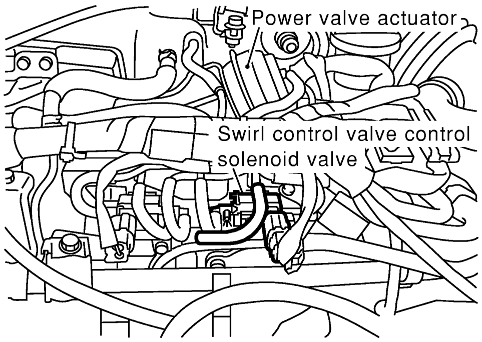
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and swirl control valve control solenoid valve terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

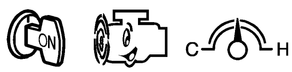
6	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

With CONSULT-II
1. Reconnect the disconnected harness connectors.
2. Start engine and let it idle.
3. Remove vacuum hose connected to swirl control valve actuator.
4. Select "SWIRL CONT SOL VALVE" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" on CONSULT-II screen.
6. Check vacuum existence and operation delay time under the following conditions.



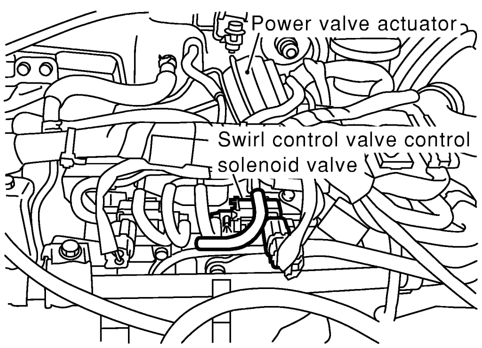
SWIRL CONT SOL/V	Vacuum
ON	Should exist.
OFF	Should not exist.

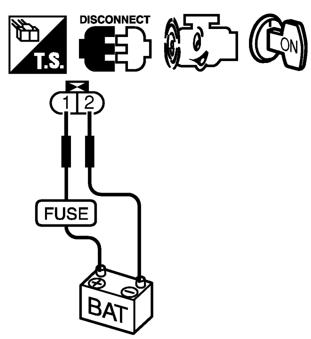
Operation takes less than 1 second.



SEF004Z

Without CONSULT-II
1. Reconnect ECM harness connector.
2. Remove vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
5. Check vacuum existence and operation delay time under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

SEF005Z

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace intake manifold collector assembly.

7	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

PROCEDURE B

NAEC0530S02

1	CHECK INTAKE SYSTEM

1. Start engine and let it idle.
2. Check intake air system for air leaks.

OK or NG

OK (With CONSULT-II)	▶	GO TO 2.
OK (Without CONSULT-II)	▶	GO TO 3.
NG	▶	Repair intake system.

2	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE CIRCUIT

With CONSULT-II

1. Select "SWIRL CONT SOL VALVE" in "ACTIVE TEST" mode with CONSULT-II.
2. Touch "ON" and "OFF" on CONSULT-II screen.

ACTIVE TEST	
SWIRL CONT SOL VALVE	OFF
MONITOR	
ENG SPEED	XXX rpm
IACV-AAC/V	XXX step

SEF003Z

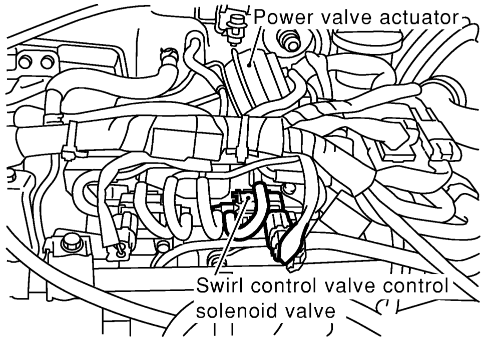
3. Make sure that clicking sound is heard from the swirl control valve control solenoid valve.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 3.

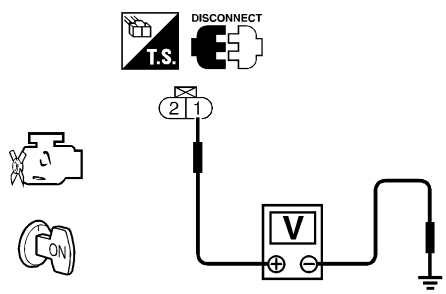
3	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



SEF002Z

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF619X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- 15A fuse
- Harness for open or short between swirl control valve control solenoid valve and fuse

	▶	Repair harness or connectors.

5	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

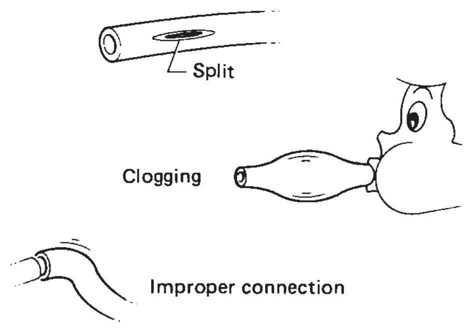
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and swirl control valve control solenoid valve terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit, short to ground or short to power in harness connectors.

6	CHECK HOSES

Check hoses and tubes between intake manifold, and swirl control valve actuator for crack, clogging, improper connection or disconnection.



SEF109L

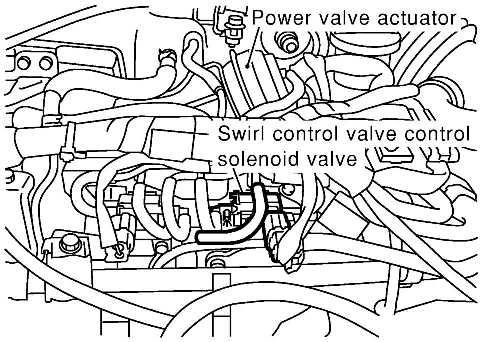
OK or NG

OK	▶	GO TO 7.
NG	▶	Repair hoses or tubes.

7	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

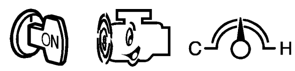
With CONSULT-II

1. Reconnect the disconnected harness connectors.
2. Start engine and let it idle.
3. Remove vacuum hose connected to swirl control valve actuator.
4. Select “SWIRL CONT SOL/V” in “ACTIVE TEST” mode with CONSULT-II.
5. Touch “ON” and “OFF” on CONSULT-II screen.
6. Check vacuum existence and operation delay time under the following conditions.



SWIRL CONT SOL/V	Vacuum
ON	Should exist.
OFF	Should not exist.

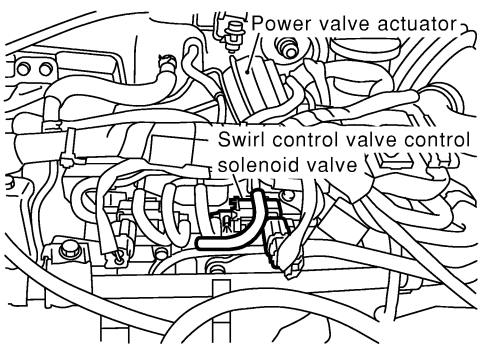
Operation takes less than 1 second.

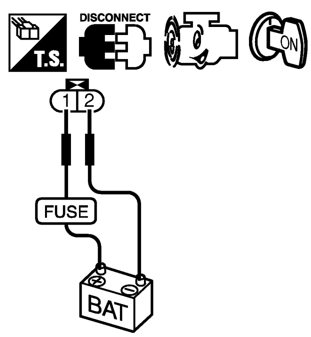


SEF004Z

Without CONSULT-II

1. Reconnect ECM harness connector.
2. Remove vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
5. Check vacuum existence and operation delay time under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

SEF005Z

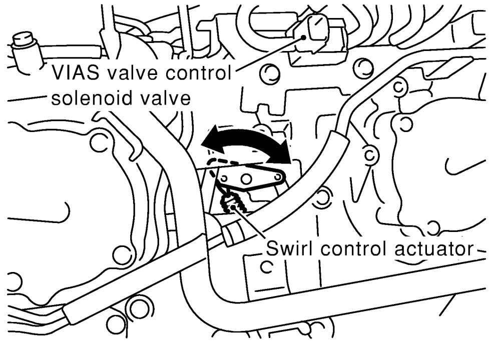
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace intake manifold collector assembly.

8	CHECK SWIRL CONTROL VALVE ACTUATOR

With CONSULT-II

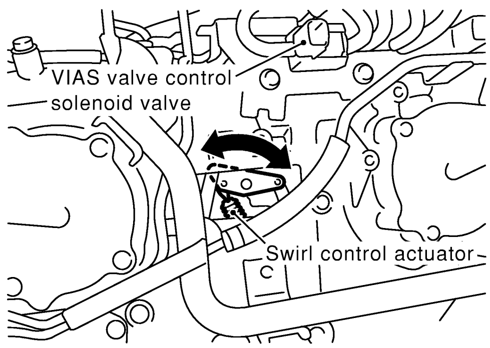
1. Reconnect vacuum hose between swirl control valve actuator and swirl control valve control solenoid valve.
2. Start engine and let it idle.
3. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode.
4. Touch "ON" and "OFF" on CONSULT-II screen.
5. Make sure that swirl control valve actuator rod moves according to "SWIRL CONT SOL/V indication.



SEF006Z

Without CONSULT-II

1. Reconnect vacuum hose between swirl control valve actuator and swirl control valve control solenoid valve.
2. Start engine and let it idle.
3. Apply 12V direct current between swirl control valve control solenoid valve terminals 1 and 2.
4. Make sure that swirl control valve actuator rod moves according to 12V direct current being applied.



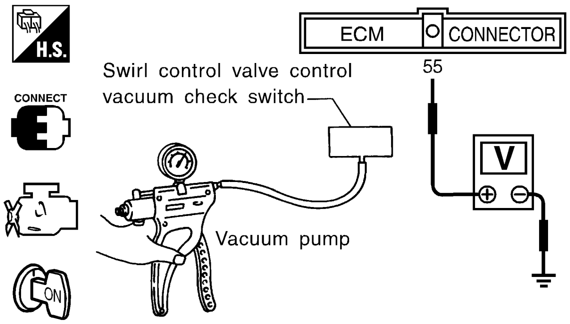
SEF006Z

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace swirl control valve and actuator.

9	CHECK SWIRL CONTROL VALVE CONTROL VACUUM CHECK SWITCH

1. Turn ignition switch "OFF".
2. Disconnect vacuum hose connected to swirl control valve control vacuum check switch.
3. Attach vacuum pump to swirl control valve control vacuum check switch.
4. Turn ignition switch "ON".
5. Check voltage between ECM terminal 55 and ground under the following conditions.



Applied pressure	Voltage V
More than –20.0 kPa (–150 mmHg, –5.91 inHg)	Engine ground
–20.0 to –23.0 kPa (–150 to –172 mmHg, –5.91 to –6.77 inHg)	Engine ground or Approx. 4.8
Less than –23.0 kPa (–172 mmHg, –6.77 inHg)	Approx. 4.8

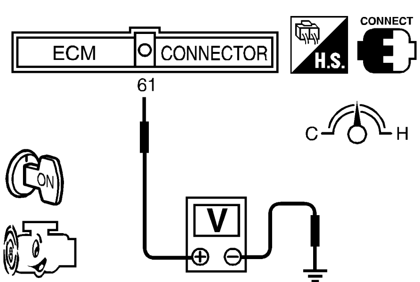
SEF709X

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace swirl control valve control vacuum check switch.

10	CHECK 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 61 (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.)	1.2 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.2
Idle to about 4,000 rpm*	1.2 - 1.8 to Approx. 4.0

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

SEF298X

4. If the voltage is out of specification, disconnect MAFS harness connector and connect it again. Then repeat above check.

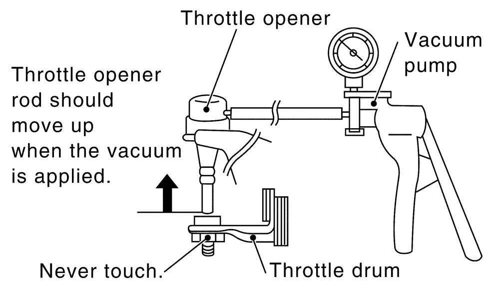
OK or NG

OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Replace mass air flow sensor.

11	CHECK THROTTLE POSITION SENSOR

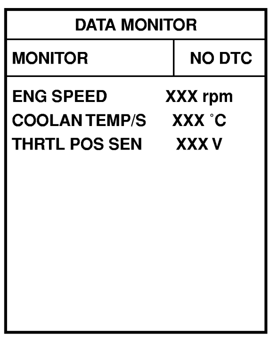
With CONSULT-II

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



SEF793W

6. Turn ignition switch ON.
7. Select "DATA MONITOR" mode with CONSULT-II.
8. Check voltage of "THRTL POS SEN" under the following conditions.
   Voltage measurement must be made with throttle position sensor installed in vehicle.



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

SEF062Y

OK or NG

OK ▶	GO TO 14.
NG ▶	GO TO 13.

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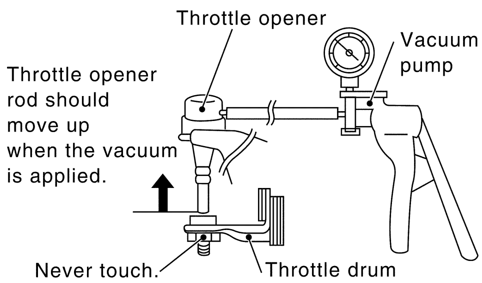
12	CHECK THROTTLE POSITION SENSOR

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Stop engine (ignition switch OFF).
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to the vacuum pump and the opener.
5. Apply vacuum [more than −40.0 kPa (−300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

6. Turn ignition switch ON.
7. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

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

MTBL0231

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	ADJUST CLOSED THROTTLE POSITION SWITCH

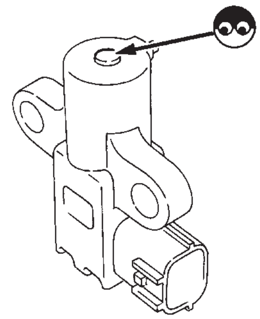
Adjust closed throttle position switch. Refer to “Basic Inspection”, EC-102.

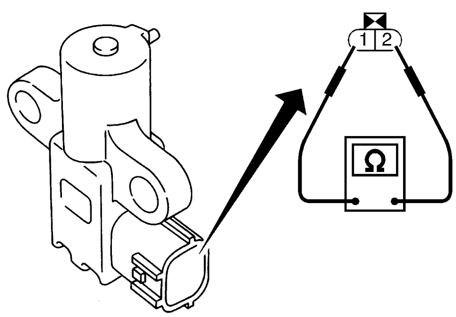
Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in “P” or “N” position)

MTBL0653

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace throttle position sensor. To adjust it, perform “Basic Inspection”, EC-102.

14	CHECK CRANKSHAFT POSITION SENSOR (REF)-I
1. Turn ignition switch "OFF". 2. Loosen the fixing bolts and remove the CKPS (REF). 3. Visually check the CKPS (REF) for chipping.  SEF585P **OK or NG**	
OK ▶	GO TO 15.
NG ▶	Replace crankshaft position sensor (REF).

15	CHECK CRANKSHAFT POSITION SENSOR (REF)-II
Check resistance between CKPS (REF) terminals 1 and 2.  **Resistance: Approximately 470 - 570 Ω [AT 20°C (68°F)]** SEF350X **OK or NG**	
OK ▶	GO TO 16.
NG ▶	Replace crankshaft position sensor (REF).

16	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

PROCEDURE C

NAEC0530S03

1	INSPECTION START
Do you have CONSULT-II? **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch "OFF".
2. Select "SWIRL CONT SOL VALVE" in "ACTIVE TEST" mode with CONSULT-II.
3. Touch "ON" and "OFF" on CONSULT-II screen.

ACTIVE TEST	
SWIRL CONT SOL VALVE	OFF
MONITOR	
ENG SPEED	XXX rpm
IACV-AAC/V	XXX step

SEF003Z

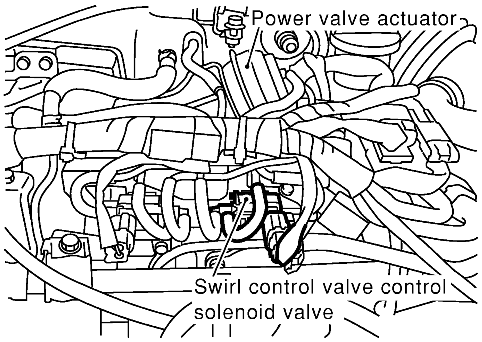
4. Make sure that clicking sound is heard from the swirl control valve control solenoid valve.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 3.

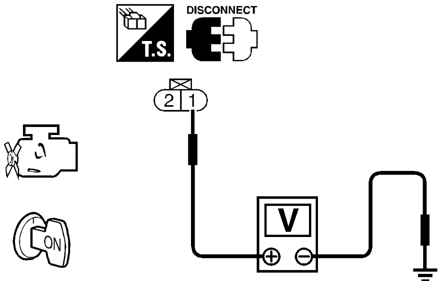
3	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect swirl control valve control solenoid valve harness connector.



SEF002Z

3. Turn ignition switch "ON".
4. Check voltage between swirl control valve control solenoid valve terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

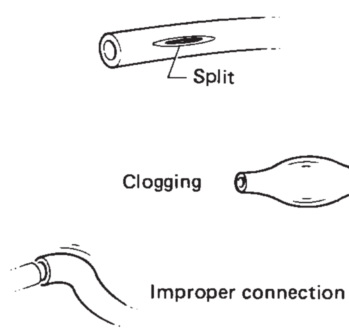
SEF619X

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors M32, F23 ● 15A fuse ● Harness for open or short between swirl control valve control solenoid valve and fuse	
▶	Repair harness or connectors.

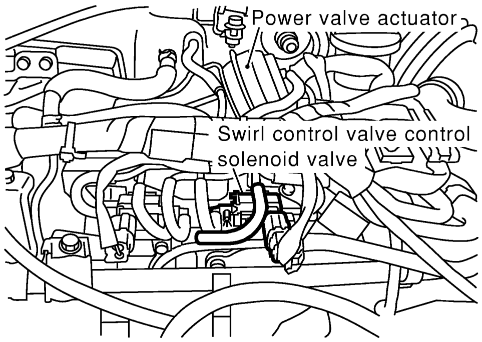
5	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”. 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 29 and terminal 2. Refer to Wiring Diagram. **Continuity should exist.** 4. Also, check harness for short to ground and short to power. **OK or NG**	
OK ▶	GO TO 6.
NG ▶	Repair open circuit, short to ground or short to power in harness connectors.

6	CHECK HOSES
Check hoses and tubes between air cleaner and swirl control valve vacuum check switch for clogging or improper connection.	
 SEF109L	
OK or NG	
OK ▶	GO TO 7.
NG ▶	Repair hoses or tubes.

7 CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

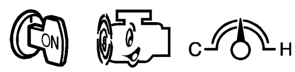
With CONSULT-II

1. Reconnect the disconnected harness connectors.
2. Start engine and let it idle.
3. Remove vacuum hose connected to swirl control valve actuator.
4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" on CONSULT-II screen.
6. Check vacuum existence and operation delay time under the following conditions.



SWIRL CONT SOL/V	Vacuum
ON	Should exist.
OFF	Should not exist.

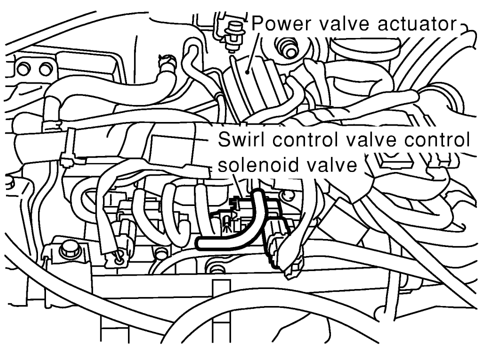
Operation takes less than 1 second.

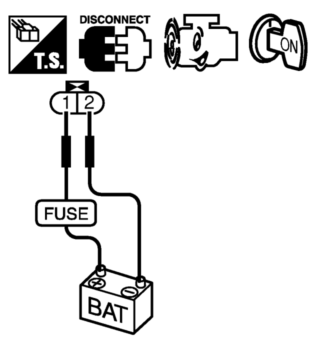


SEF004Z

Without CONSULT-II

1. Reconnect ECM harness connector.
2. Remove vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Apply 12V of direct current between swirl control valve control solenoid valve terminals 1 and 2.
5. Check vacuum existence and operation delay time under the following conditions.





Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

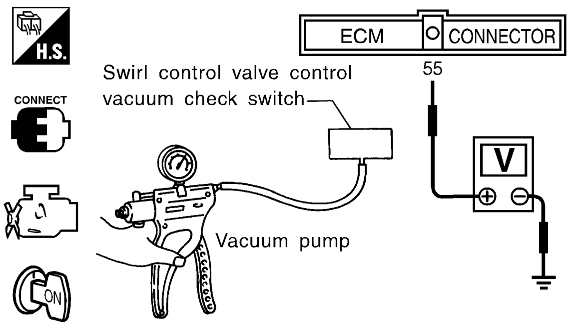
SEF005Z

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace intake manifold collector assembly.

8 CHECK SWIRL CONTROL VALVE CONTROL VACUUM CHECK SWITCH

1. Turn ignition switch “OFF”.
2. Disconnect vacuum hose connected to swirl control valve control vacuum check switch.
3. Attach vacuum pump to swirl control valve control vacuum check switch.
4. Turn ignition switch “ON”.
5. Check voltage between ECM terminal 55 and ground under the following conditions.



Applied pressure	Voltage V
More than –20.0 kPa (–150 mmHg, –5.91 inHg)	Engine ground
–20.0 to –23.0 kPa (–150 to –172 mmHg, –5.91 to –6.77 inHg)	Engine ground or Approx. 4.8
Less than –23.0 kPa (–172 mmHg, –6.77 inHg)	Approx. 4.8

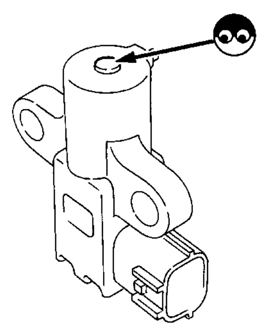
SEF709X

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace swirl control valve control vacuum check switch.

9 CHECK CRANKSHAFT POSITION SENSOR (REF)-I

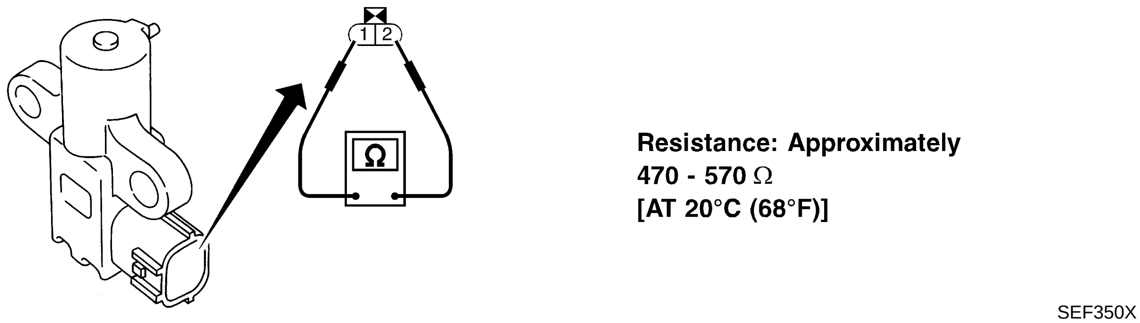
1. Turn ignition switch “OFF”.
2. Loosen the fixing bolts and remove the CKPS (REF).
3. Visually check the CKPS (REF) for chipping.



SEF585P

OK or NG

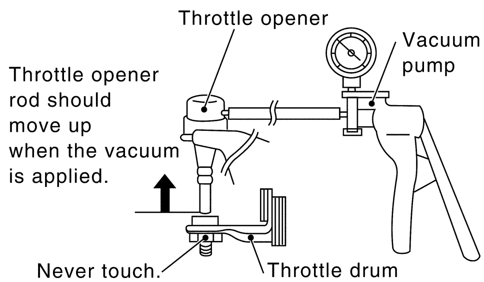
OK	▶	GO TO 10.
NG	▶	Replace crankshaft position sensor (REF).

10	CHECK CRANKSHAFT POSITION SENSOR (REF)-II	
Check resistance between CKPS (REF) terminals 1 and 2. 		
OK or NG		
OK (With CONSULT-II)	▶	GO TO 11.
OK (Without CONSULT-II)	▶	GO TO 12.
NG	▶	Replace crankshaft position sensor (REF).

11	CHECK THROTTLE POSITION SENSOR

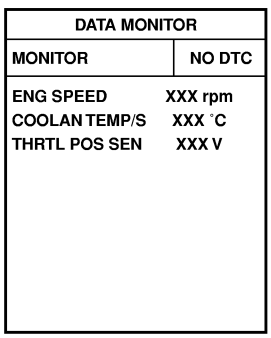
With CONSULT-II

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



SEF793W

6. Turn ignition switch ON.
7. Select "DATA MONITOR" mode with CONSULT-II.
8. Check voltage of "THRTL POS SEN" under the following conditions.
   Voltage measurement must be made with throttle position sensor installed in vehicle.



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

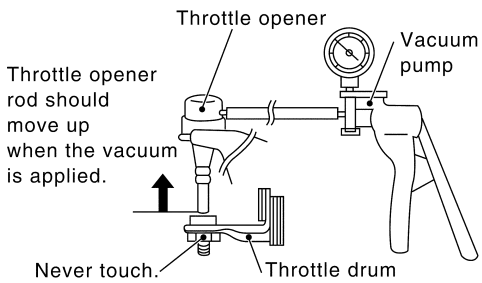
SEF062Y

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

12	CHECK THROTTLE POSITION SENSOR

Without CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Stop engine (ignition switch OFF).
3. Remove the vacuum hose connected to the throttle opener.
4. Connect suitable vacuum hose to the vacuum pump and the opener.
5. Apply vacuum [more than −40.0 kPa (−300 mmHg, −11.81 inHg)] until the throttle drum becomes free from the rod of the throttle opener.



SEF793W

6. Turn ignition switch ON.
7. Check voltage between ECM terminal 91 (Throttle position sensor signal) and ground.
Voltage measurement must be made with throttle position sensor installed in vehicle.

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

MTBL0231

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	ADJUST CLOSED THROTTLE POSITION SWITCH

Adjust closed throttle position switch. Refer to "Basic Inspection", EC-102.

Items	Specifications
Ignition timing	15° ± 5° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

MTBL0653

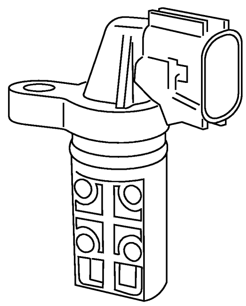
OK or NG

OK	▶	GO TO 14.
NG	▶	Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-102.

14	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**


SEF359Z

Component Description

NAEC0705

Intake valve advance unit position sensors are located in the front cylinder heads in both right/left banks.
This sensor uses a Hall IC (element).
The cam position is determined by the intake primary cam sprocket concave (in three places). The ECM provides feedback to the intake valve timing control for appropriate target valve open-close timing according to drive conditions based on detected cam position.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0706

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1) INT/V TIM (B2)	● Engine: After warming up ● Shift lever “N” ● Quickly depressed accelerator pedal ● No-load	Idle	0° CA
		2,000 rpm	Approximately 12 - 18° CA

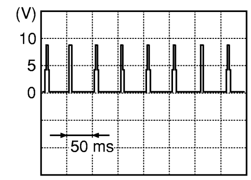
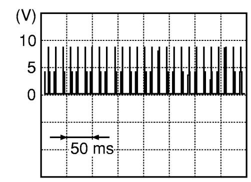
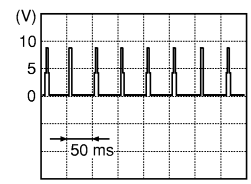
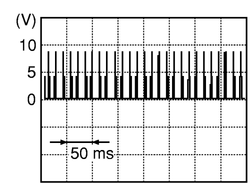
ECM Terminals and Reference Value

=NAEC0707

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 (DC Voltage)
79	Y/G	Intake valve timing control position sensors (RH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.5V  SEF351Z
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	Approximately 0.5V  SEF352Z
89	OR	Intake valve timing control position sensors (LH)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0.5V  SEF351Z
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,000 rpm.	Approximately 0.5V  SEF352Z

On Board Diagnosis Logic

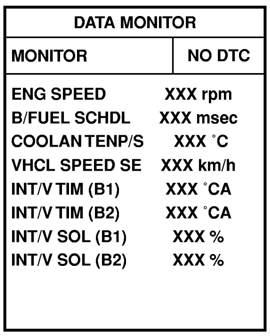
NAEC0708

Malfunction is detected when an excessively high or low voltage from the sensor is sent to ECM.

Possible Cause

NAEC0709

- Harness or connectors
  (Intake valve timing control position sensor circuit is open or shorted)
- Intake valve timing control position sensor.
- Crankshaft position sensor (REF)
- Crankshaft position sensor (POS)
- Camshaft position sensor (PHASE)



SEF353Z

DTC Confirmation Procedure

NAEC0710

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

NAEC0710S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Maintain the following conditions for at least 10 seconds.

Engine speed	More than Idle speed
Selector lever	“P” or “N” position

4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-489.

WITH GST

NAEC0710S02

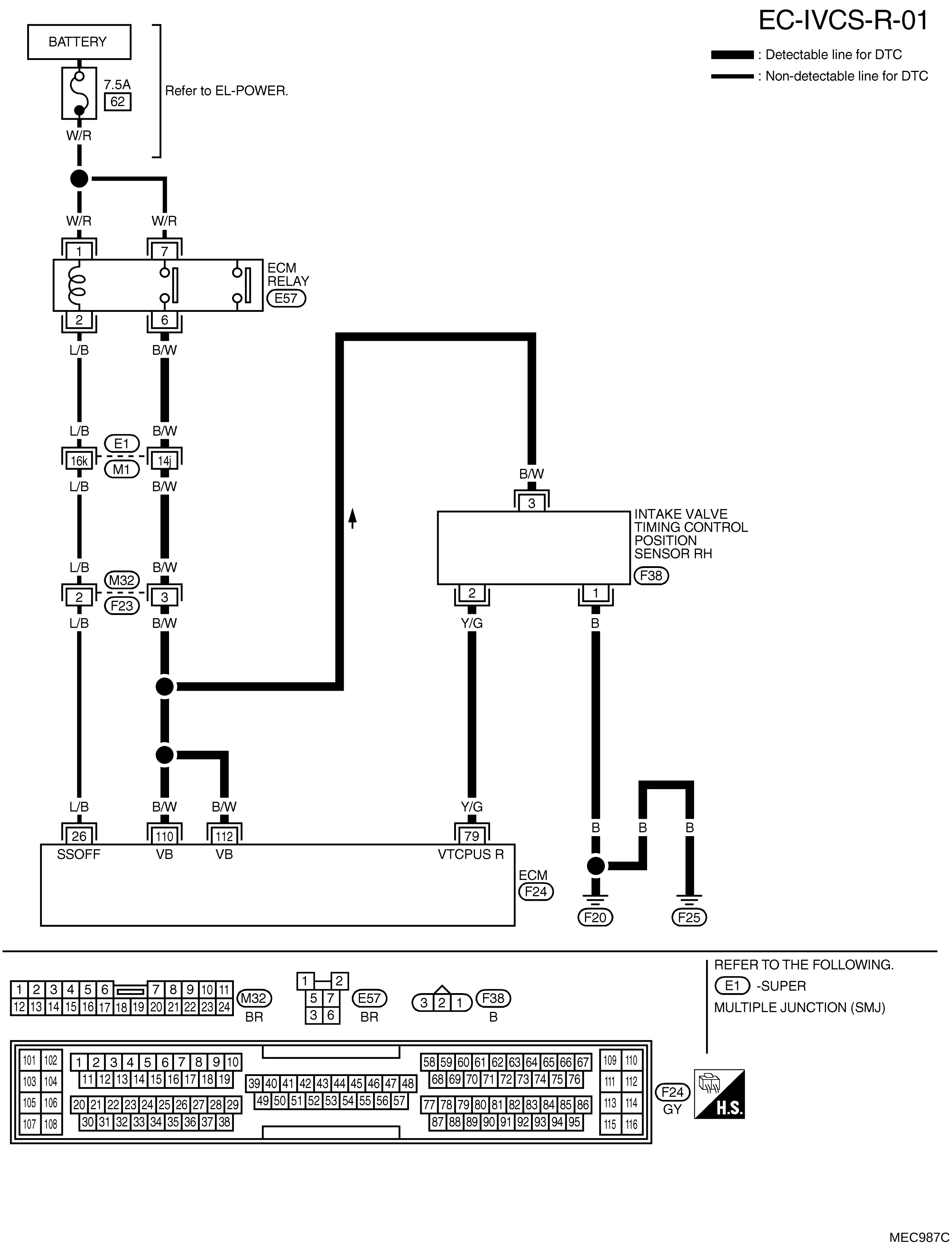
Follow the procedure “With CONSULT-II” above.

Wiring Diagram

NAEC0711

RIGHT BANK

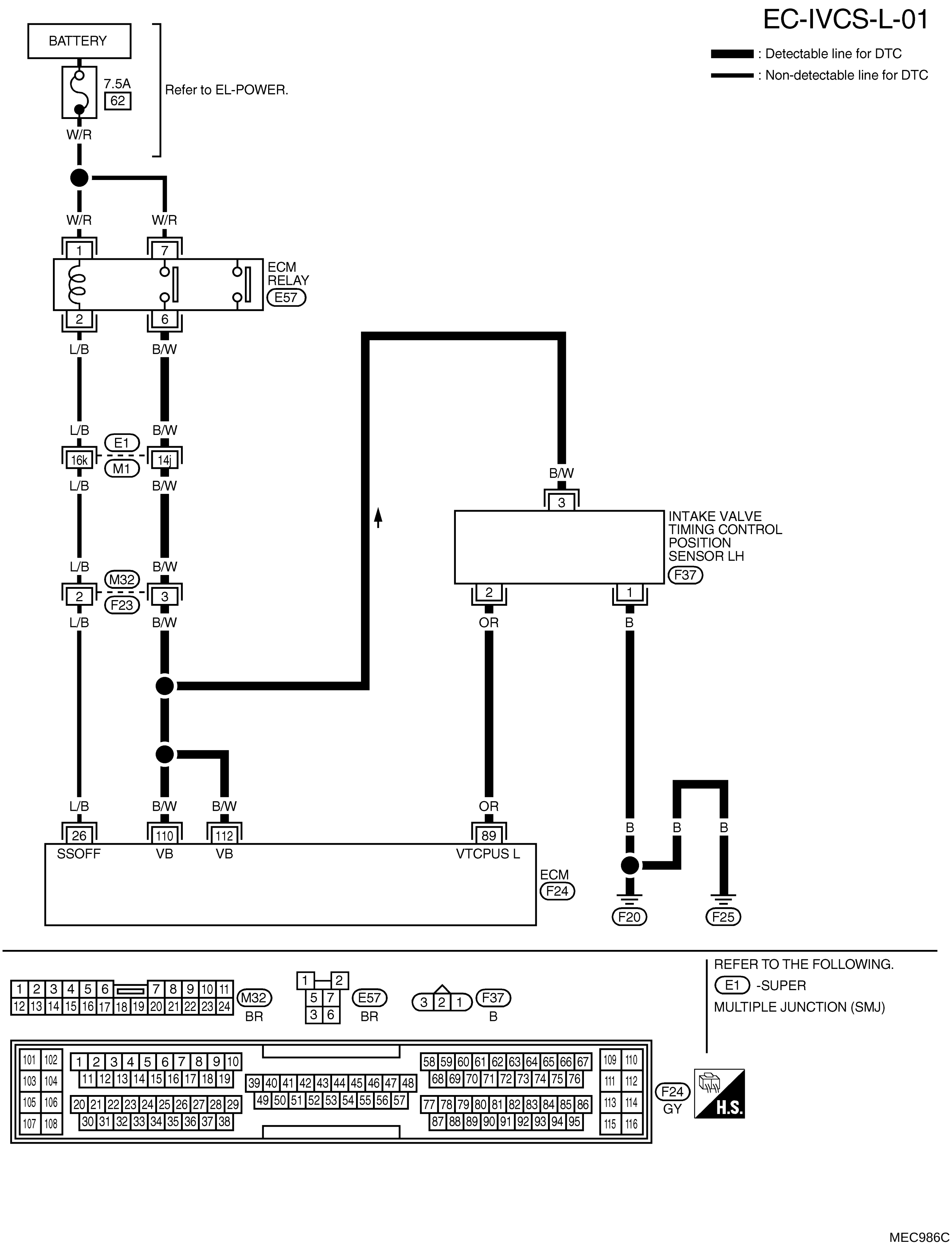
NAEC0711S01



MEC987C

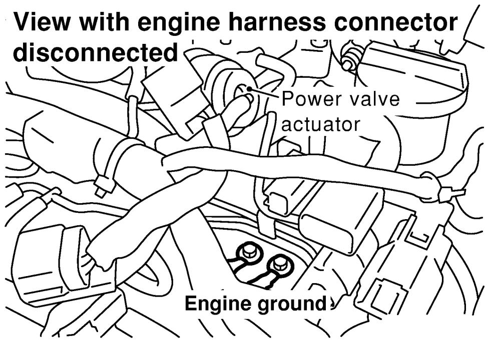
LEFT BANK

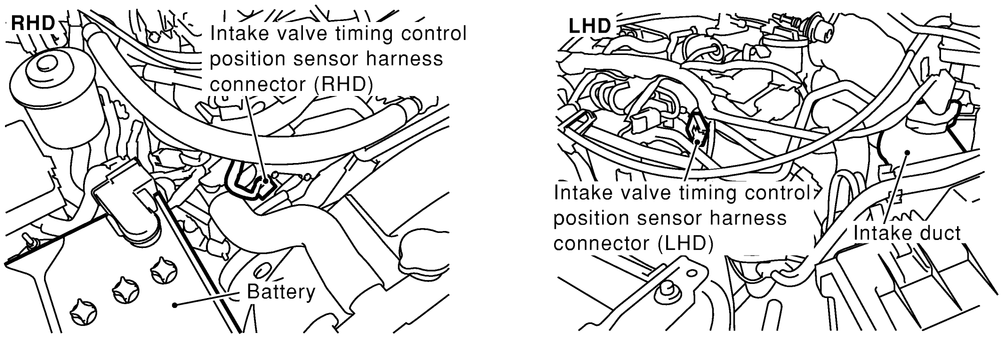
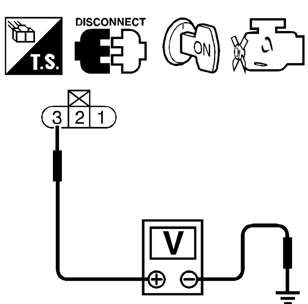
NAEC0711S02



Diagnostic Procedure

NAEC0712

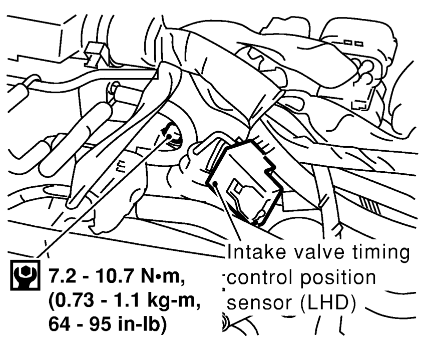
1	RETIGHTEN GROUND SCREWS
	1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.  SEF959Y
▶	GO TO 2.

2	CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT
	1. Disconnect intake valve timing control position sensor harness connector.  SEF360Z 2. Turn ignition switch "ON". 3. Check voltage between intake valve timing control position sensor harness connector terminal 3 and ground with CONSULT-II or tester.  **Voltage: Battery voltage** SEF370X 4. 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 M32, F23 ● Harness connectors E1, M1 ● Harness for open or short between ECM and intake valve timing control position sensor ● Harness for open or short between ECM relay and intake valve timing control position sensor	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

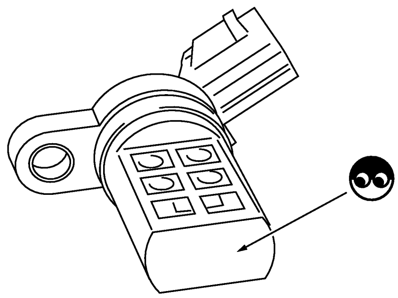
4	CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness connector continuity between intake valve timing control position sensor harness connector terminal 1 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to power. **OK or NG**	
OK ▶	GO TO 5.
NG ▶	Repair open circuit or short to power in harness or connectors.

5	CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT
1. Disconnect ECM harness connector. 2. Check harness connectors continuity between ECM terminal 79 (Right) or 89 (Left) and 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 6.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INSTALLATION
Check that intake valve timing control position sensor is installed correctly as shown below.  SEF361Z **OK or NG**	
OK ▶	GO TO 7.
NG ▶	Install intake valve timing control position sensor correclty.

7	CHECK IMPROPER INSTALLATION	
1. Loosen and retighten the fixing bolt of the intake valve timing control position sensor. 2. Reconnect harness connector disconnected. 3. Perform "DTC Confirmation Procedure", EC-486 again. **Is a 1st trip DTC P1140 (RIGHT, -B1) P1145 (LEFT, -B2) detected?**		
Yes	▶	GO TO 8.
No	▶	**INSPECTION END**

8	CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR	
1. Disconnect intake valve timing control position sensor connector. 2. Loosen the fixing bolt of the sensor. 3. Remove the sensor. 4. Visually check the sensor for chipping.		



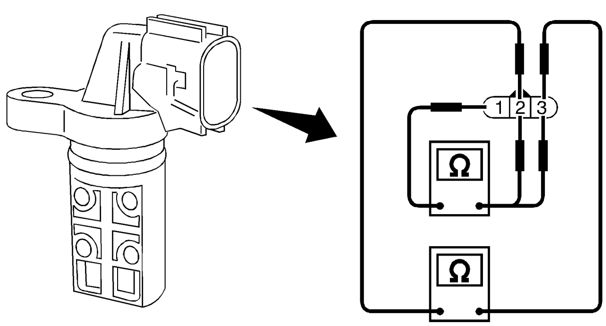
SEF362Z

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace intake valve timing control position sensor.

9	CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR-II

- Check resistance as shown below.



Resistance Ω [at 25°C (77°F)]	Terminal No. (Polarity)
Except 0 or ∞	3 (+) - 1 (–)
	2 (+) - 1 (–)
	3 (+) - 2 (–)

SEF363Z

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace intake valve timing control position sensor.

10	**CHECK CAMSHAFT**	
Check accumulation of debris to the signal pick-up portion of the camshaft. Refer to step 35 of "Timing chain removal", EM-23. **OK or NG**		
OK	▶	GO TO 11.
NG	▶	Remove debris and clean the signal pick-up cut out of camshaft.

11	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

On Board Diagnosis Logic

NAEC0282

★ **The closed loop control has the one trip detection logic.**

Malfunction is detected when the closed loop control function for right bank does not operate even when vehicle is driving in the specified condition, the closed loop control function for left bank does not operate even when vehicle is driving in the specified condition.

Possible Cause

NAEC0531

- The front heated oxygen sensor circuit is open or shorted.
- Heated oxygen sensor 1 (front)
- Heated oxygen sensor 1 heater (front)

DTC Confirmation Procedure

NAEC0283

CAUTION:

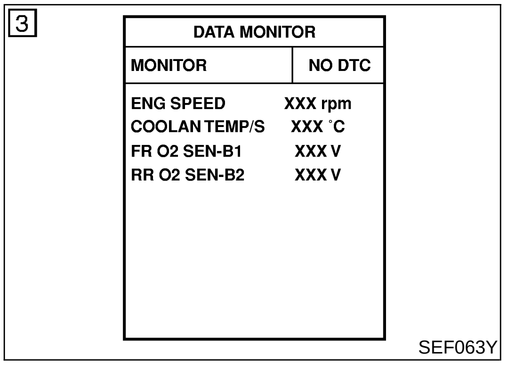
Always drive vehicle at a safe speed.

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:

- **Never raise engine speed above 3,600 rpm during the "DTC Confirmation Procedure". If the engine speed limit is exceeded, retry the procedure from step 2.**
- **Before performing the following procedure, confirm that battery voltage is more than 11V at idle.**



WITH CONSULT-II

NAEC0283S01

1) Start engine and warm it up to normal operating temperature.
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Hold engine speed at 2,000 rpm and check one of the following.

- "HO2S1 (B1)/(B2)" voltage should go above 0.70V at least once.
- "HO2S1 (B1)/(B2)" voltage should go below 0.21V at least once.
  If the check result is NG, perform "Diagnosis Procedure", EC-494.

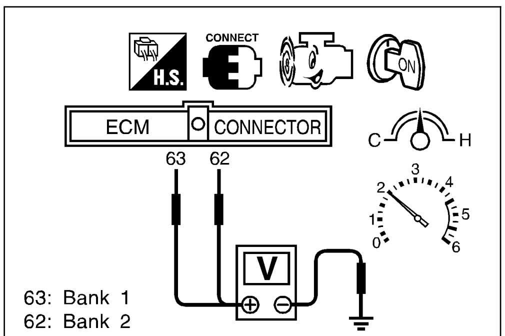
If the check result is OK, perform the following step.

4) Let engine idle at least 5 minutes.
5) Maintain the following condition at least 50 consecutive seconds.

B/FUEL SCHDL	3.6 msec or more (A/T) 3.0 msec or more (M/T)
ENG SPEED	1,500 rpm or more
Selector lever	Suitable position
VHCL SPEED SE	More than 70 km/h (43 MPH)

During this test, P0130 and/or P0150 may be displayed on CONSULT-II screen.

6) If DTC is detected, go to "Diagnostic Procedure", EC-494.



SEF308XB

Overall Function Check

NAEC0284

Use this procedure to check the overall function of the closed loop control. During this check, a DTC might not be confirmed.

WITH GST

NAEC0284S01

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal 63 [Heated oxygen sensor 1 (front) right bank signal] or 62 [Heated oxygen sensor 1 (front) left bank signal] and engine ground.
3) Check the following with engine speed held at 2,000 rpm constant under no-load.

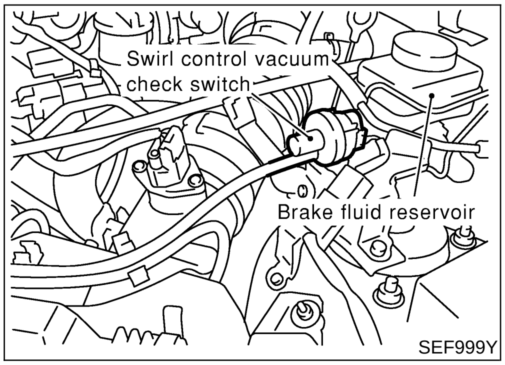
- The voltage should go above 0.70V at least once.
- The voltage should go below 0.21V at least once.

4) If NG, go to "Diagnostic Procedure", EC-494.

Diagnostic Procedure

NAEC0285

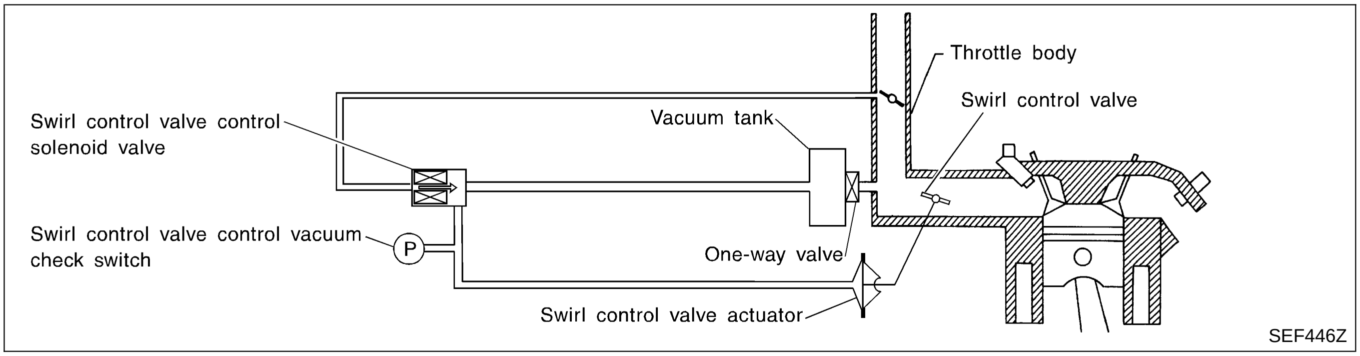
Perform trouble diagnosis for "DTC P0133, P0153", EC-220.



Component Description

NAEC0532

The swirl control valve control vacuum check switch detects vacuum signal to the swirl control valve, and sends "ON" or "OFF" signal to the ECM.
When vacuum is supplied to the valve, the swirl control valve control vacuum check switch sends "OFF" signal to the ECM.
The swirl control valve control vacuum check switch is not used to control the engine system, it is used for on board diagnosis.



CONSULT-II Reference Value in Data Monitor Mode

NAEC0533

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
SWL CON VC SW	● Engine speed: Idle ● Engine coolant temperature is between 15°C (59°F) to 50°C (122°F).	OFF
	● Engine speed: Idle ● Engine coolant temperature is above 55°C (131°F).	ON

ECM Terminals and Reference Value

NAEC0674

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)
55	W/B	Swirl control valve control vacuum check switch	**[Engine is running]** ● Idle speed ● Engine coolant temperature is between 15 to 50°C (59 to 122°F).	Approximately 5V
			[Engine is running] ● Idle speed ● Engine coolant temperature is above 55°C (131°F).	0 - 1.0V

On Board Diagnosis Logic

NAEC0535

Malfunction is detected when the swirl control valve control vacuum check switch remains “OFF” under specified engine conditions.

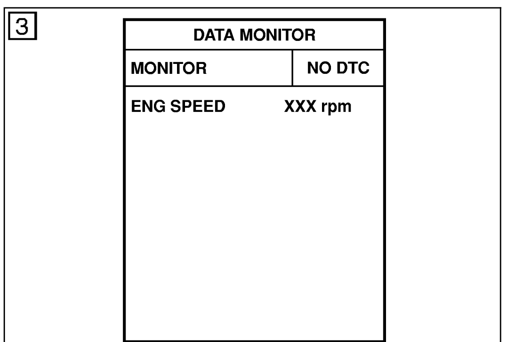
Possible Cause

NAEC0536

- Harness or connectors
  (Swirl control valve control vacuum check switch circuit is open.)
- Hoses
  (Hoses are clogged or connected incorrectly.)
- Swirl control valve control solenoid valve
- Swirl control valve control vacuum check switch

DTC Confirmation Procedure

NAEC0537



SEF058Y

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:
For best results, perform the test at a temperature above 5°C (41°F).

WITH CONSULT-II

NAEC0537S01

1) Turn ignition switch “OFF” and wait at least 10 seconds.
2) Turn ignition switch “ON”.
3) Select “DATA MONITOR” mode with CONSULT-II and wait at least 5 seconds.
   If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-498.

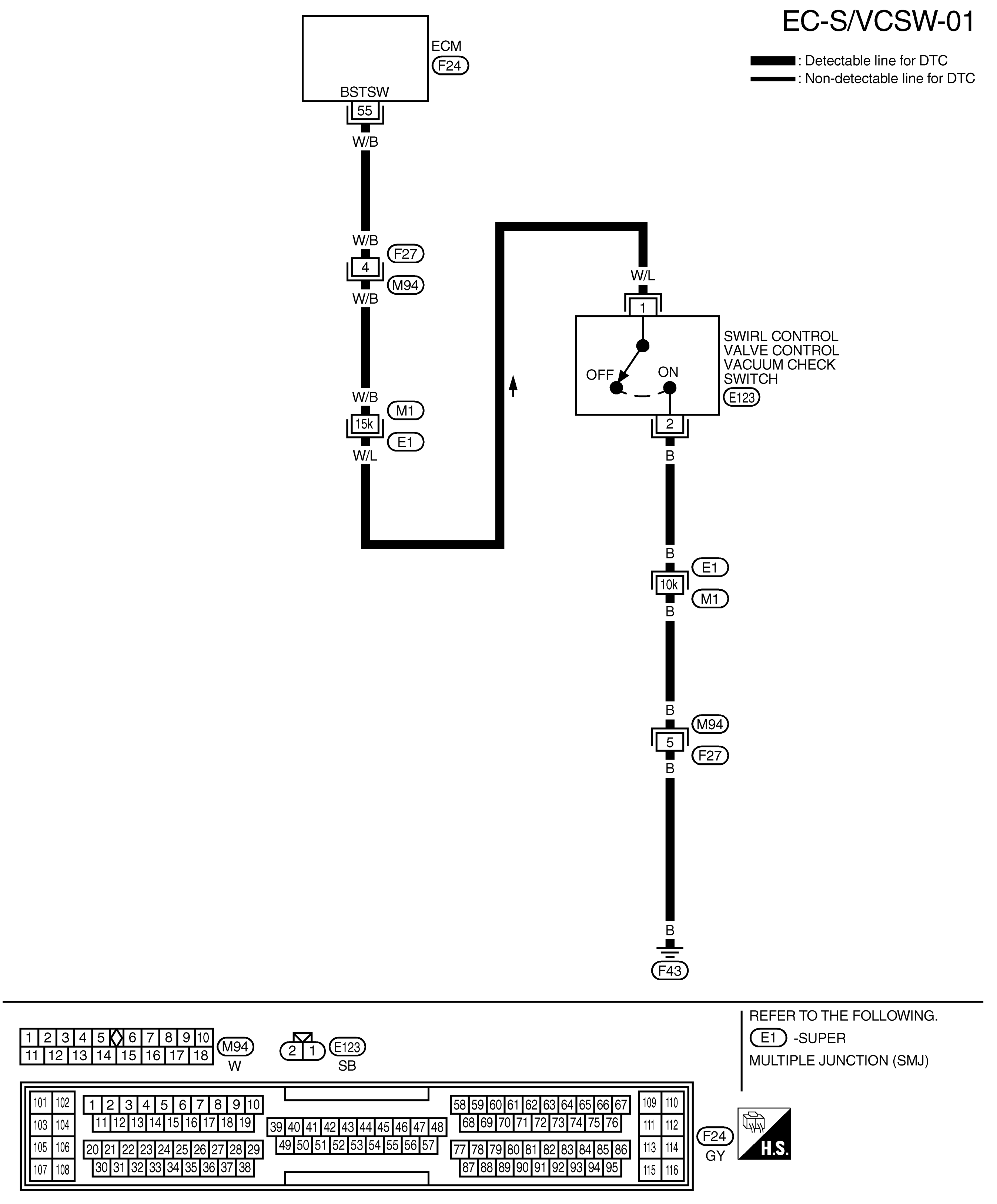
WITH GST

NAEC0537S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0538



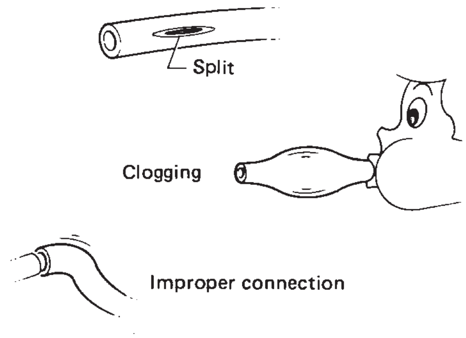
MEC981C

Diagnostic Procedure

NAEC0539

1	CHECK HOSES

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



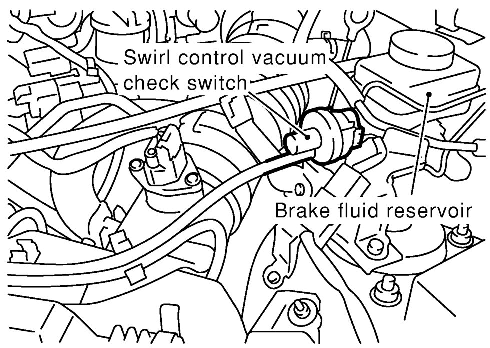
SEF109L

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair or reconnect the hose.

2	CHECK SWIRL CONTROL VALVE CONTROL VACUUM CHECK SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect swirl control valve control vacuum check switch harness connector.



SEF999Y

2. Check harness continuity between terminal 2 and ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1 and M92, F27
- Harness for open between swirl control valve control vacuum check switch and engine ground

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

4	CHECK SWIRL CONTROL VALVE CONTROL VACUUM CHECK SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

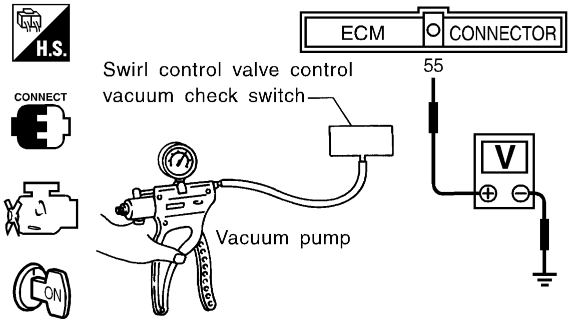
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 55 and swirl control valve control vacuum check switch terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

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

5	CHECK SWIRL CONTROL VALVE CONTROL VACUUM CHECK SWITCH

1. Turn ignition switch "OFF".
2. Disconnect vacuum hose connected to swirl control valve control vacuum check switch.
3. Attach vacuum pump to swirl control valve control vacuum check switch.
4. Turn ignition switch "ON".
5. Check voltage between ECM terminal 55 and ground under the following conditions.



Applied pressure	Voltage V
More than –20.0 kPa (–150 mmHg, –5.91 inHg)	Engine ground
–20.0 to –23.0 kPa (–150 to –172 mmHg, –5.91 to –6.77 inHg)	Engine ground or Approx. 4.8
Less than –23.0 kPa (–172 mmHg, –6.77 inHg)	Approx. 4.8

SEF709X

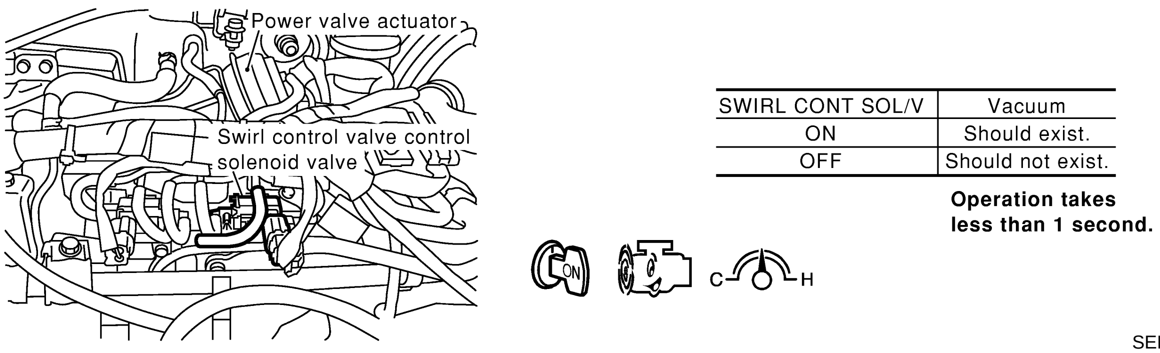
OK or NG

OK	▶	GO TO 6.
NG	▶	Replace swirl control valve control vacuum check switch.

6	CHECK SWIRL CONTROL VALVE CONTROL SOLENOID VALVE

With CONSULT-II

1. Reconnect the disconnected harness connectors.
2. Start engine and let it idle.
3. Remove vacuum hose connected to swirl control valve actuator.
4. Select "SWIRL CONT SOL/V" in "ACTIVE TEST" mode with CONSULT-II.
5. Touch "ON" and "OFF" on CONSULT-II screen.
6. Check vacuum existence and operation delay time under the following conditions.



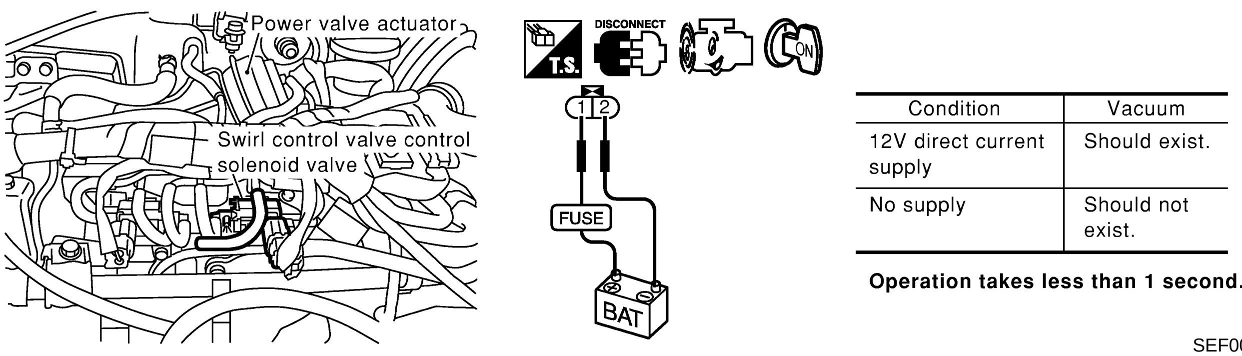
SWIRL CONT SOL/V	Vacuum
ON	Should exist.
OFF	Should not exist.

Operation takes less than 1 second.

SEF004Z

Without CONSULT-II

1. Reconnect ECM harness connector.
2. Remove vacuum hose connected to swirl control valve actuator.
3. Start engine and let it idle.
4. Apply 12V of direct current between swirl control valve control solenoid valve terminals and 2.
5. Check vacuum existence and operation delay time under the following conditions.



Condition	Vacuum
12V direct current supply	Should exist.
No supply	Should not exist.

Operation takes less than 1 second.

SEF005Z

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace intake manifold collector assembly.

7	CHECK INTERMITTENT INCIDENT
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

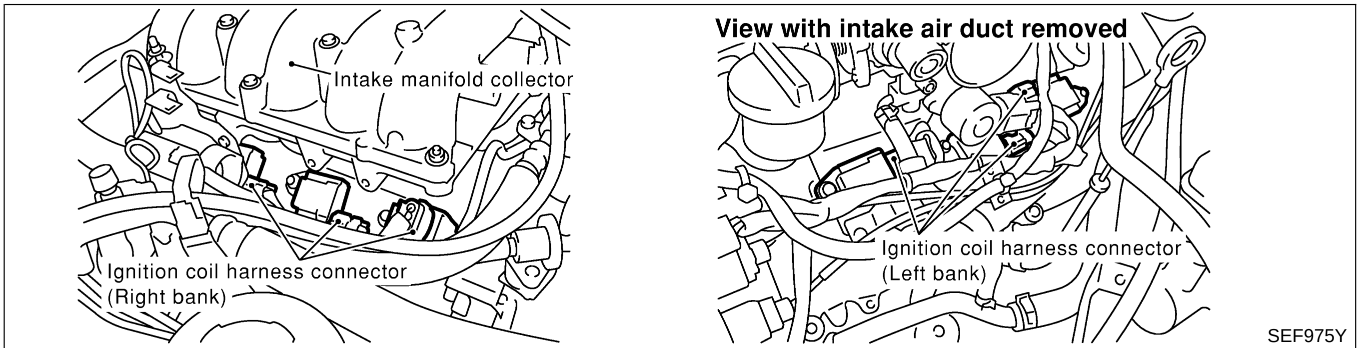
Component Description

NAEC0286

IGNITION COIL & POWER TRANSISTOR

NAEC0286S01

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.



SEF975Y

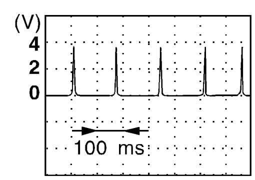
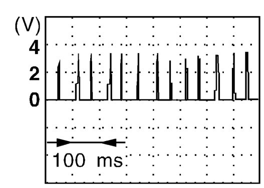
ECM Terminals and Reference Value

NAEC0675

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 22 23 30 31 32	Y/R G/R L/R GY PU/W GY/R	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4 Ignition signal No. 5 Ignition signal No. 6	**[Engine is running]** ● **Warm-up condition** ● Idle speed	0 - 0.2V★  SEF399T
			[Engine is running] ● **Warm-up condition** ● Engine speed is 2,500 rpm.	0.1 - 0.3V★  SEF645T

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

On Board Diagnosis Logic

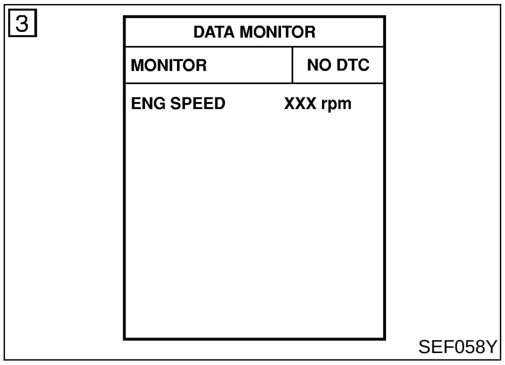
NAEC0288

Malfunction is detected when the ignition signal in the primary circuit is not sent to ECM during engine cranking or running.

Possible Cause

NAEC0572

- Harness or connectors (The ignition primary circuit is open or shorted.)
- Power transistor unit built into ignition coil
- Condenser
- Crankshaft position sensor (REF)
- Crankshaft position sensor (REF) circuit



SEF058Y

DTC Confirmation Procedure

NAEC0289

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.
- **If DTC P1320 is displayed with DTC P0335, P0340, P1335 or P1336, perform trouble diagnosis for DTC P0335, P0340, P1335 or P1336 first. Refer to EC-336, EC-344, EC-512 or EC-519.**

WITH CONSULT-II

NAEC0289S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine. (If engine does not run, turn ignition switch to “START” for at least 5 seconds.)
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-506.

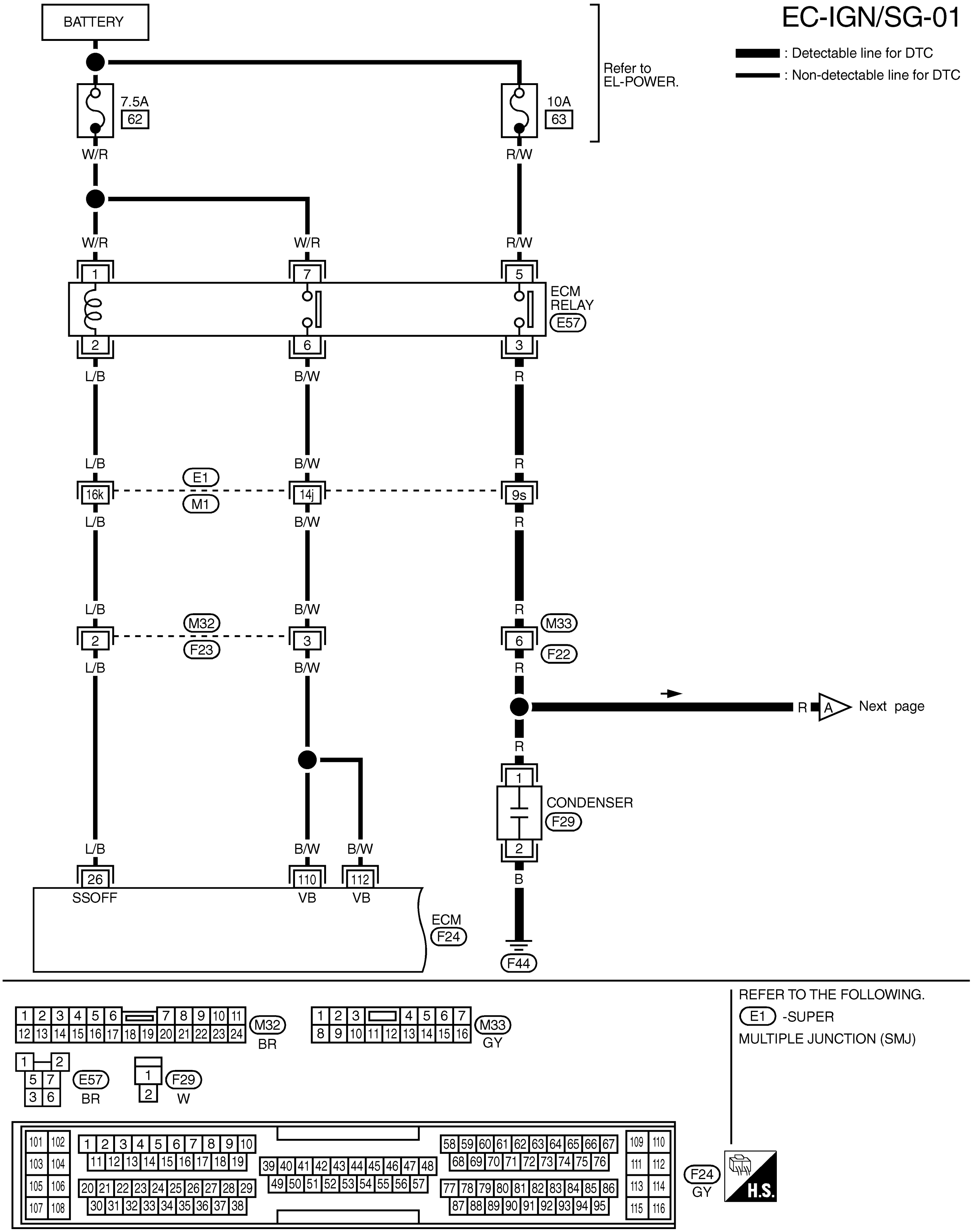
WITH GST

NAEC0289S02

Follow the procedure “WITH CONSULT-II” above.

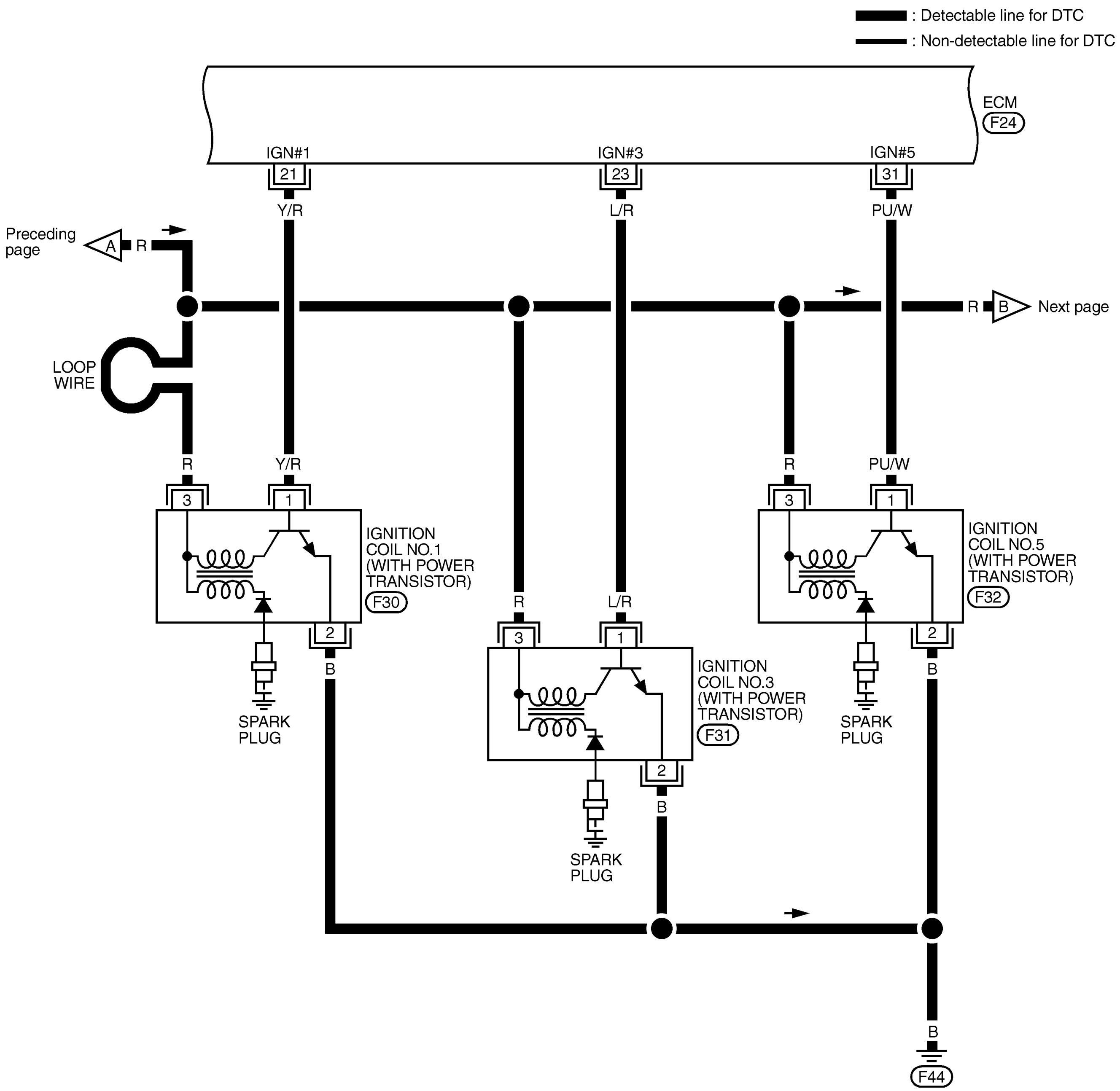
Wiring Diagram

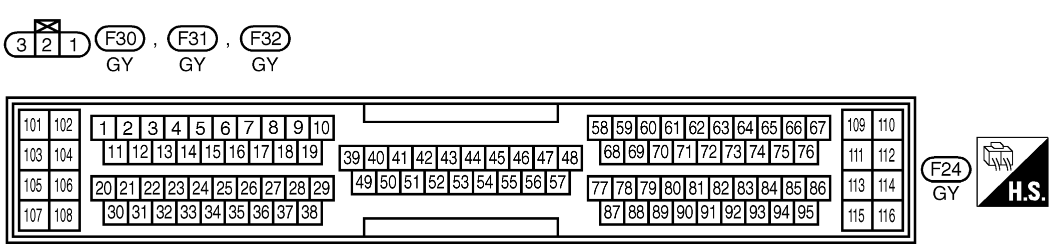
NAEC0290



MEC969C

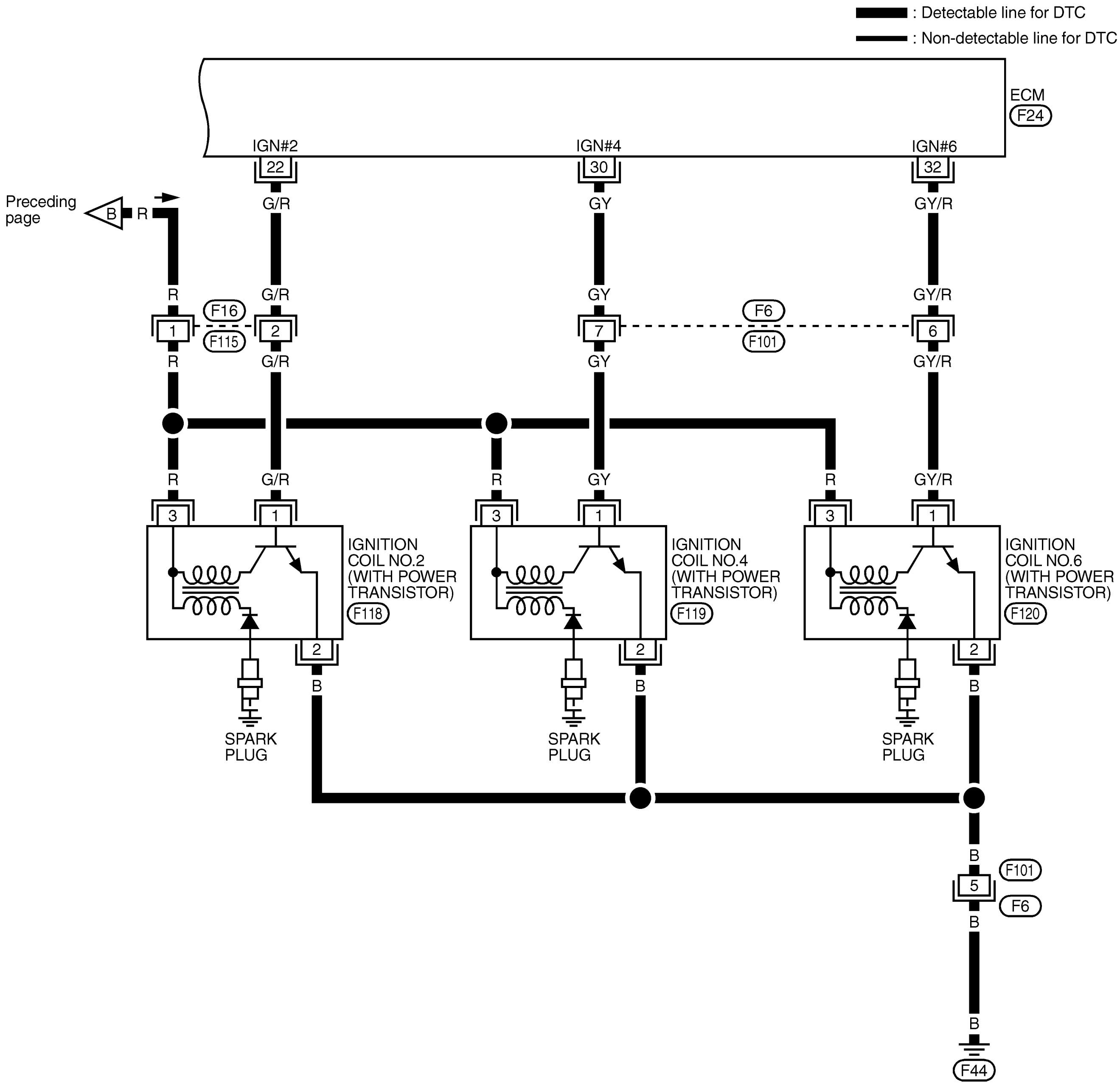
EC-IGN/SG-02

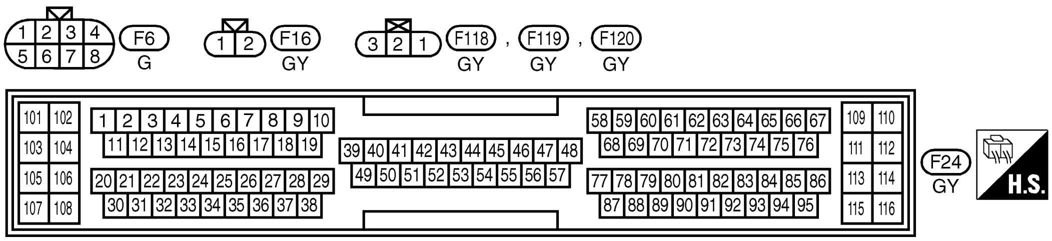




MEC970C

EC-IGN/SG-03





MEC971C

Diagnostic Procedure

NAEC0291

1	CHECK ENGINE START

Turn ignition switch “OFF”, and restart engine.
Is engine running?

Yes or No

Yes (With CONSULT-II) ▶	GO TO 2.
Yes (Without CONSULT-II) ▶	GO TO 12.
No ▶	GO TO 3.

2	SEARCH FOR MALFUNCTIONING CIRCUIT

With CONSULT-II

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.
2. Search for circuit which does not produce a momentary engine speed drop.

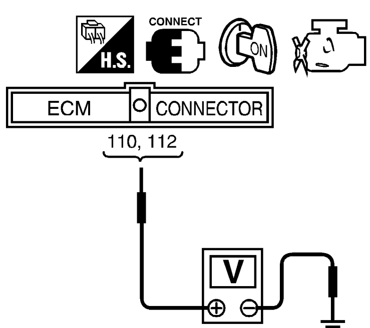
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

▶	GO TO 12.

3	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check voltage between ECM terminals 110, 112 and ground with CONSULT-II or tester.



Voltage: Battery voltage

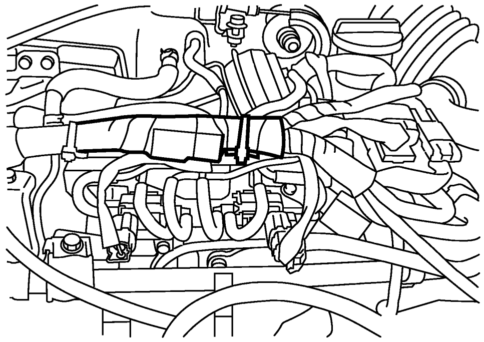
SEF366X

OK or NG

OK ▶	GO TO 4.
NG ▶	Go to TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-144.

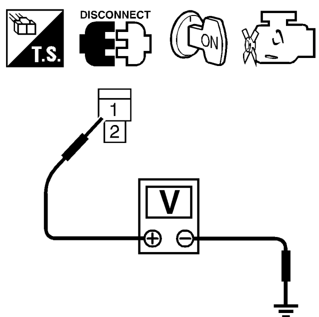
4	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.



SEF008Z

3. Turn ignition switch ON.
4. Check voltage between condenser terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

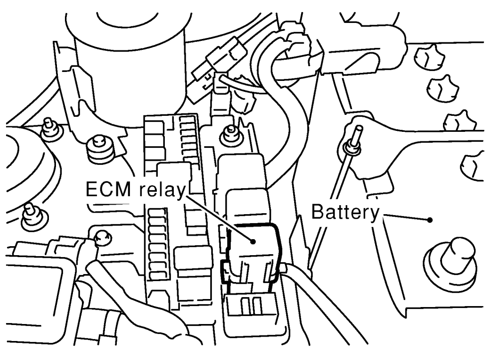
SEF367X

OK or NG

OK	▶	GO TO 10.
NG	▶	GO TO 5.

5	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect ECM relay.



SEF009Z

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 7.
NG	▶	GO TO 6.

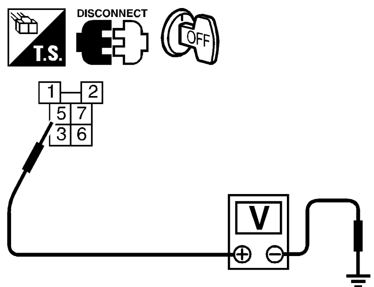
6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E1, M1 and M33, F22
- 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.

7	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

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



Voltage: Battery voltage

SEF010Z

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

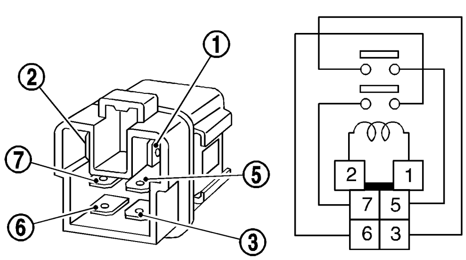
8	DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse
- Harness for open and short between ECM relay and fuse

▶	Repair or replace harness or connectors.

9	CHECK ECM RELAY

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



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

SEF296X

OK or NG

OK	▶	GO TO 17.
NG	▶	Replace ECM relay.

10	CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

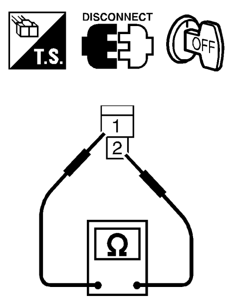
1. Turn ignition switch OFF.
2. Check harness continuity between condenser terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 11.
NG	▶	Repair open circuit or short to power in harness or connectors.

11	CHECK CONDENSER

Check resistance between condenser terminals 1 and 2.



Resistance: Above 1MΩ at 25°C (77°F)

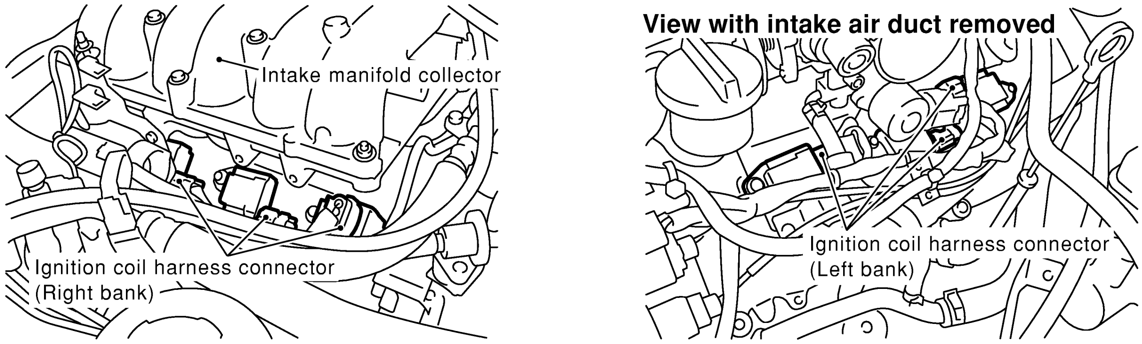
SEF369X

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace condenser.

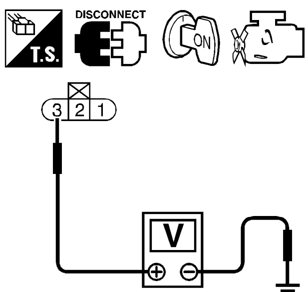
12	CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect ignition coil harness connector.



SEF975Y

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



Voltage: Battery voltage

SEF370X

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	DETECT MALFUNCTIONING PART

Check the harness for open or short between ignition coil and harness connector F22.

	▶	Repair or replace harness or connectors.

14	CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 15.
NG	▶	Repair open circuit or short to power in harness or connectors.

15	CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

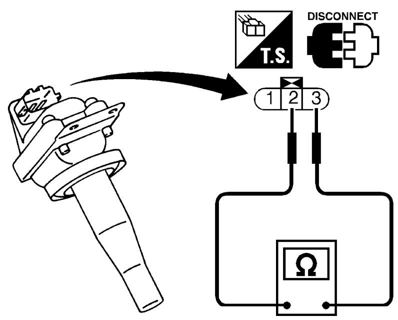
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 21, 22, 23, 30, 31, 32 and ignition coil terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 16.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

16	CHECK IGNITION COIL WITH POWER TRANSISTOR

Check resistance between ignition coil terminals 2 and 3.



Terminals	Resistance	Result
2 and 3	Not 0Ω	OK
	0Ω	NG

SEF371X

OK or NG

OK ▶	GO TO 17.
NG ▶	Replace ignition coil with power transistor.

17	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**

GI
MA
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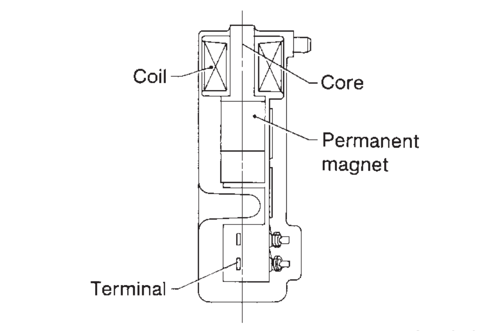


SEF253P

Component Description

NAEC0573

The crankshaft position sensor (REF) is located on the oil pan (upper) facing the crankshaft pulley. It detects the TDC (Top Dead Center) signal (120° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the crankshaft pulley will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the TDC signal (120° signal).

CONSULT-II Reference Value in Data Monitor Mode

NAEC0574

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS) ENG SPEED	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.

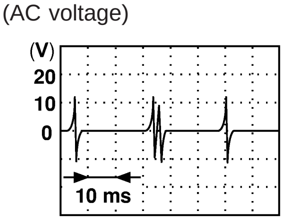
ECM Terminals and Reference Value

NAEC0676

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

CAUTION:

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

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65 75	LG LG	Crankshaft position sensor (REF)	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 2.3V★ (AC voltage)  SEF581X

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

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

On Board Diagnosis Logic

NAEC0576

Malfunction is detected when
(Malfunction A) 120° signal is not entered to ECM for the first few seconds during engine cranking,
(Malfunction B) 120° signal is not entered to ECM during engine running,
(Malfunction C) 120° signal cycle excessively changes during engine running.

FAIL-SAFE MODE

NAEC0576S01

When the ECM enters the fail-safe mode, the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode
Crankshaft position sensor (REF) circuit	Compression TDC signal (120° signal) is controlled by camshaft position sensor (PHASE) signal and crankshaft position sensor (POS) signal. Ignition timing will be delayed 0° to 2°.

Possible Cause

NAEC0577

- Harness or connectors
  (The crankshaft position sensor (REF) circuit is open or shorted.)
- Crankshaft position sensor (REF)
- Starter motor (Refer to SC section.)
- Starting system circuit (Refer to SC section.)
- Dead (Weak) battery

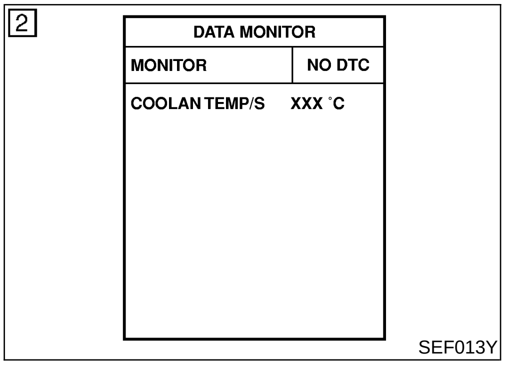
DTC Confirmation Procedure

NAEC0578

NOTE:

- **Perform “PROCEDURE FOR MALFUNCTION A” first. If 1st trip DTC cannot be confirmed, perform “PROCEDURE FOR MALFUNCTION B AND C”.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5V at idle.



SEF013Y

PROCEDURE FOR MALFUNCTION A

NAEC0578S01

With CONSULT-II

NAEC0578S0101

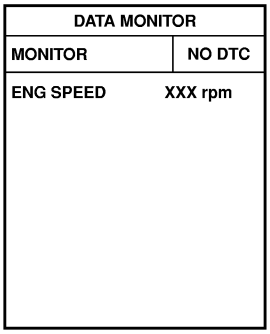
1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Crank engine for at least 2 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-516.

With GST

NAEC0578S0102

Follow the procedure “With CONSULT-II” above.

3



SEF058Y

PROCEDURE FOR MALFUNCTION B AND C

NAEC0578S02

With CONSULT-II

NAEC0578S0201

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 1st trip DTC is detected, go to "Diagnostic Procedure", EC-516.

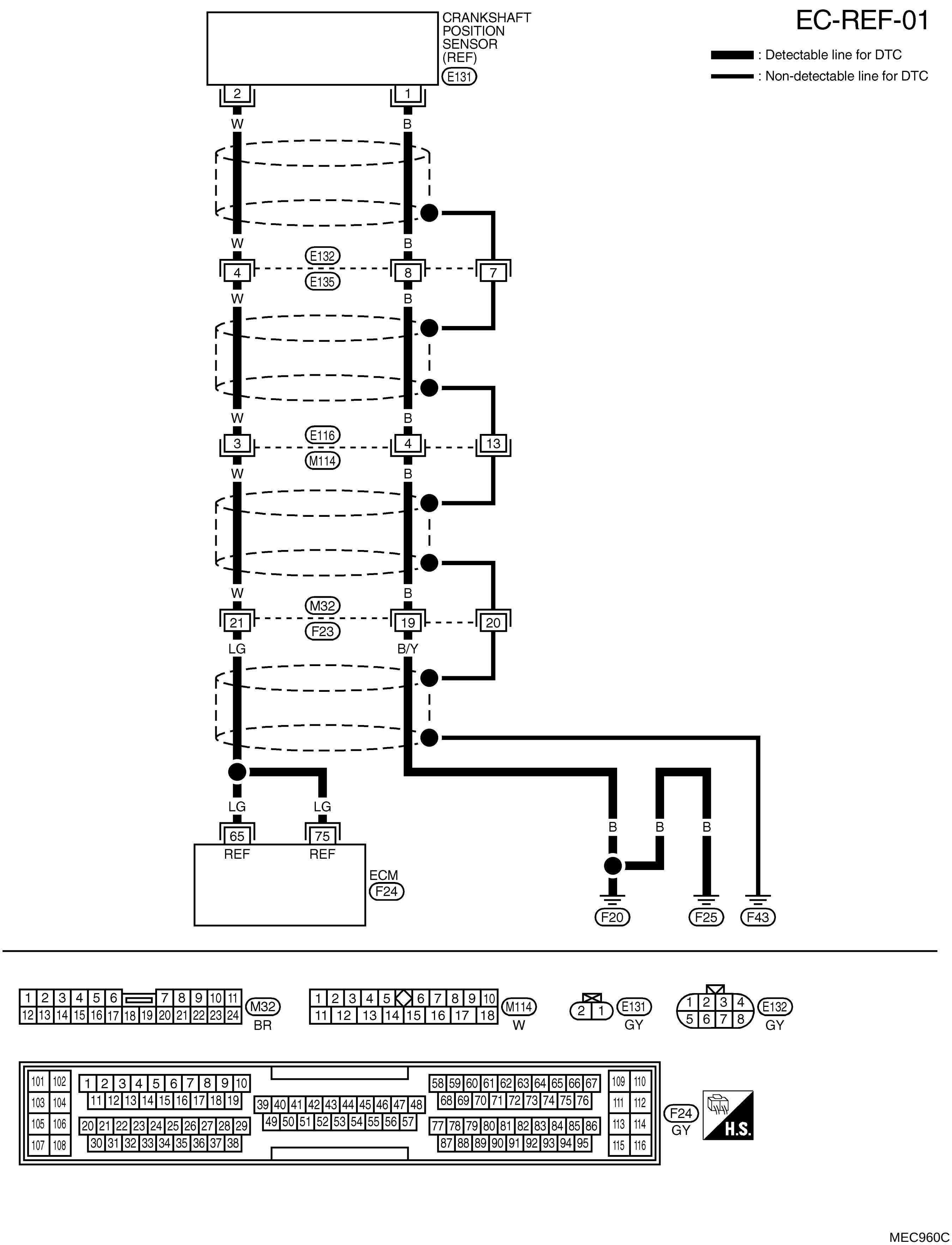
With GST

NAEC0578S0202

Follow the procedure "With CONSULT-II" above.

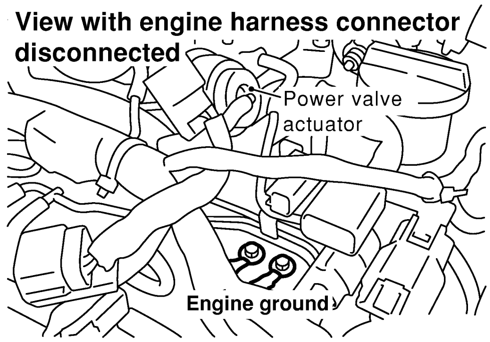
Wiring Diagram

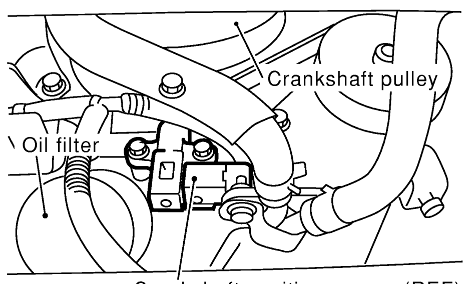
NAEC0579



Diagnostic Procedure

NAEC0580

1	RETIGHTEN GROUND SCREWS
1. Turn ignition switch "OFF". 2. Loosen and retighten engine ground screws.  SEF959Y	
▶	GO TO 2.

2	CHECK CKPS (REF) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect CKPS (REF) harness connector.  SEF011Z 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminals 65, 75 and CKPS (REF) 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 ▶	GO TO 4.
NG ▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E132, E135 ● Harness connectors E116, M114 and M32, F23 ● Harness for open or short between crankshaft position sensor (REF) and ECM	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK CKPS (REF) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Check harness continuity between CKPS (REF) terminal 1 and engine ground.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

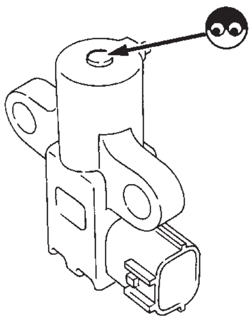
5	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E132, E135
- Harness connectors E116, M114 and M32, F23
- Harness for open between crankshaft position sensor (REF) and engine ground

	▶	Repair open circuit or short to power in harness or connector.

6	CHECK CKPS (REF)-I

1. Loosen the fixing bolts and remove the CKPS (REF).
2. Visually check the CKPS (REF) for chipping.



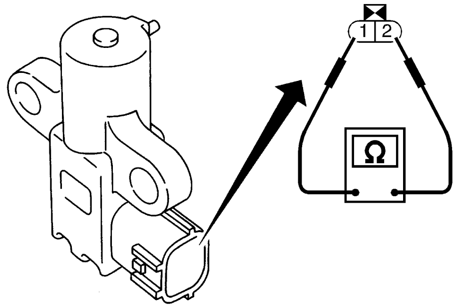
SEF585P

OK or NG

OK	▶	GO TO 7.
NG	▶	Replace crankshaft position sensor (REF).

7	CHECK CKPS (REF)-II

Check resistance between CKPS (REF) terminals 1 and 2.



Resistance: Approximately
470 - 570 Ω
[AT 20°C (68°F)]

SEF350X

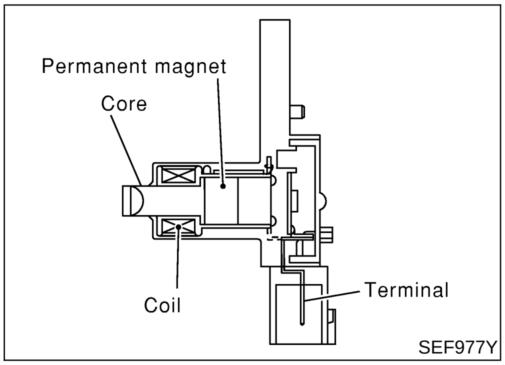
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace crankshaft position sensor (REF).

8	**CHECK CKPS (REF) SHIELD CIRCUIT FOR OPEN AND SHORT**
1. Turn ignition switch "OFF". 2. Disconnect harness connectors E132, E135. 3. Check harness continuity between harness connector E135 terminal 7 and engine ground. **Continuity should exist.** 4. 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 E132, E135 ● Harness connectors E116, M114 and M32, F23 ● Harness for open between harness connector F23 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

10	**CHECK INTERMITTENT INCIDENT**
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



Component Description

NAEC0292

The crankshaft position sensor (POS) is located on the oil pan facing the gear teeth (cogs) of the signal plate (flywheel). It detects the crankshaft position signal (1° signal).
The sensor consists of a permanent magnet, core and coil.
When engine is running, the gap between the sensor and the gear teeth (cogs) will periodically change. Permeability near the sensor also changes.
Due to the permeability change, the magnetic flux near the core is changed. Therefore, the voltage signal generated in the coil is changed.
The ECM receives the voltage signal and detects the crankshaft position signal (1° signal).

CONSULT-II Reference Value in Data Monitor Mode

NAEC0581

Specification data are reference values.

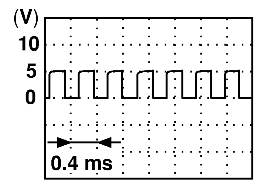
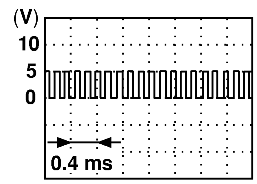
MONITOR ITEM	CONDITION	SPECIFICATION
CKPS·RPM (POS)	• Tachometer: Connect • Run engine and compare tachometer indication with the CONSULT-II value.	Almost the same speed as the CONSULT-II value.
ENG SPEED		

ECM Terminals and Reference Value

=NAEC0677

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)
85	Y	Crankshaft position sensor (POS)	**[Engine is running]** ● Idle speed	Approximately 2.4V  SEF057V
			[Engine is running] ● Engine speed is 2,000 rpm.	Approximately 2.3V  SEF058V

On Board Diagnosis Logic

NAEC0294

Malfunction is detected when chipping of the signal plate (flywheel or drive plate) gear tooth (cog) is detected by the ECM.

Possible Cause

NAEC0582

- Harness or connectors
- Crankshaft position sensor (POS)
- Signal plate (Drive plate/Flywheel)

GI
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RS
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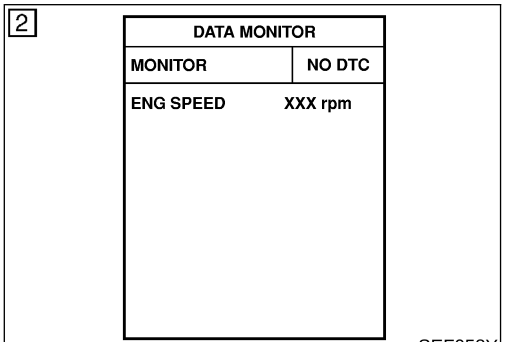
EL
IDX

DTC Confirmation Procedure

NAEC0295

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.



SEF058Y

WITH CONSULT-II

NAEC0295S01

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT-II.
2) Start engine and run it for at least 70 seconds at idle speed.
3) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-523.

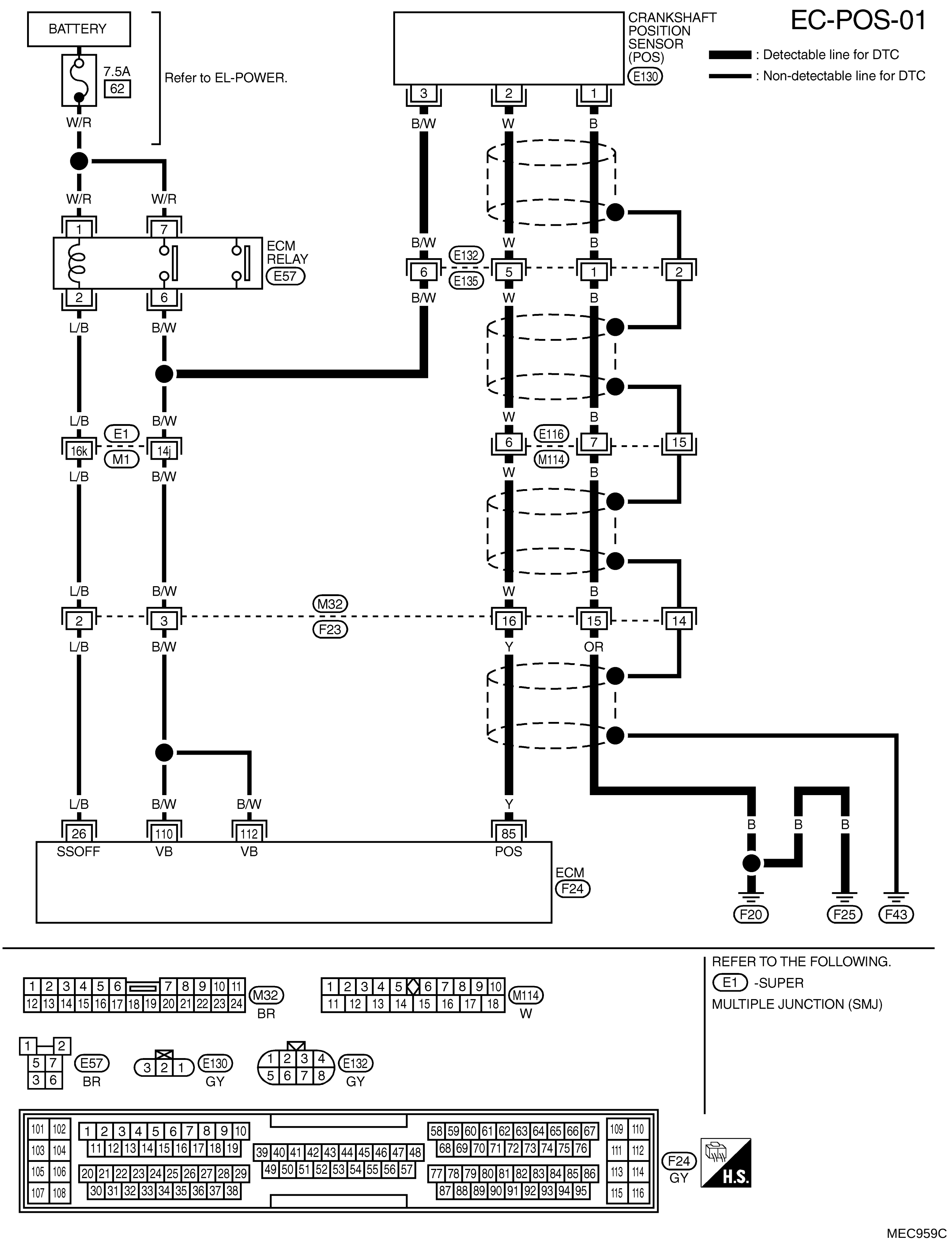
WITH GST

NAEC0295S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0296

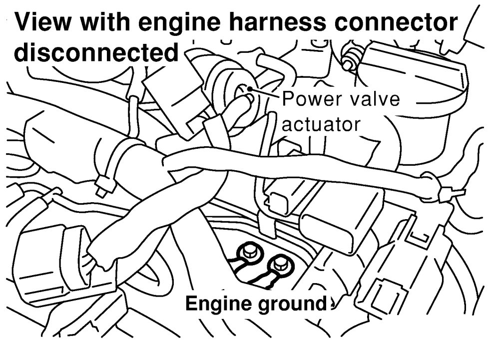


Diagnostic Procedure

NAEC0297

1	RETIGHTEN GROUND SCERWS

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

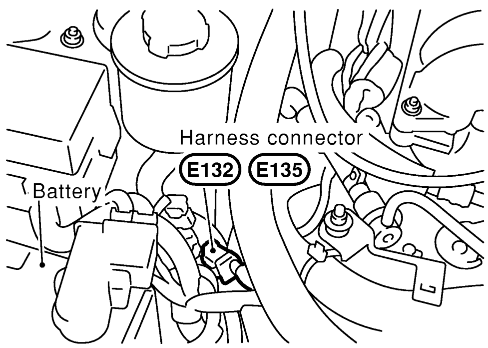


SEF959Y

▶	GO TO 2.

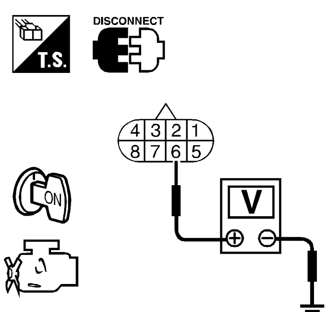
2	CHECK CKPS (POS) POWER SUPPLY CIRCUIT

1. Disconnect harness connectors E132, E135.



SEF978Y

2. Check voltage between harness connector E135 terminal 6 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF979Y

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 E132, E135 ● Harness for open or short between ECM and crankshaft position sensor (POS) ● Harness for open or short between ECM relay and crankshaft position sensor (POS)	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

4	CHECK CKPS (POS) GROUND CIRCUIT FOR OPEN AND SHORT
1. Check harness continuity between harness connector E135 terminal 1 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 2. Also check harness for short to power. **OK or NG**	
OK ▶	GO TO 6.
NG ▶	GO TO 5.

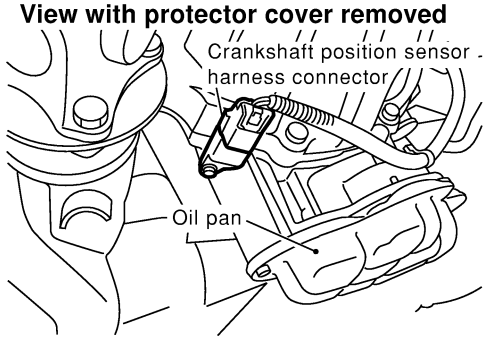
5	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E132, E135 ● Harness connectors E116, M114 ● Harness connectors M32, F23 ● Harness for open between ECM and crankshaft position sensor (POS)	
▶	Repair open circuit or short to power in harness or connectors.

6	CHECK CKPS (POS) INPUT SIGNAL CIRCUIT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 85 and harness connector F23 terminal 16. 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 ▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E132, E135 ● Harness connectors E116, M114 ● Harness connectors M32, F23 ● Harness for open or short between ECM and crankshaft position sensor (POS)	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK CKPS (POS) SUB-HARNESS CIRCUIT FOR OPEN AND SHORT

1. Disconnect CKPS (POS) harness connector.



SEF980Y

2. Check harness continuity between CKPS (POS) terminals and harness connector E132 terminals as follows.

CKPS (POS) terminal	Harness conector E132 terminal
1	1
2	5
3	6

MTBL0531

Continuity should exist.

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

OK or NG

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

9	CHECK IMPROPER INSTALLATION

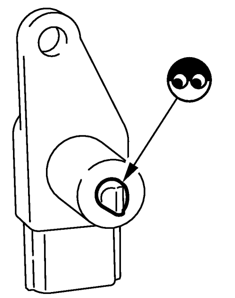
1. Loosen and retighten the fixing bolt of the crankshaft position sensor (POS).
2. Reconnect harness connectors disconnected.
3. Perform “DTC Confirmation Procedure”, EC-521 again.

Is a 1st trip DTC P1336 detected?

Yes	▶	GO TO 10.
No	▶	**INSPECTION END**

10	CHECK CRANKSHAFT POSITION SENSOR (POS)

1. Disconnect crankshaft position sensor (POS) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



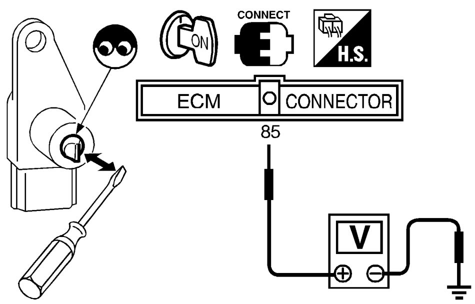
SEF981Y

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace crankshaft position sensor (POS).

11	CHECK CRANKSHAFT POSITION SENSOR (POS)-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminal 85 and ground by briefly touching the sensor core with a flat-bladed screwdriver.



ECM terminal	Condition	Voltage
85	Contacted	Approximately 5V
	Pulled away	Approximately 0V

There should be a steady 5V as the flat-bladed screwdriver is drawn away slowly.

SEF343Z

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace crankshaft position sensor (POS).

12	CHECK CKPS (POS) SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect harness connectors E132, E135.
2. Check harness continuity between harness connector E135 terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to power.

OK or NG

OK	▶	GO TO 14.
NG	▶	GO TO 13.

13	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E132, E135 ● Harness connectors E116, M114 ● Harness connectors M32, F23 ● Harness for open between harness connector E135 and engine ground	
▶	Repair open circuit or short to power in harness or connectors.

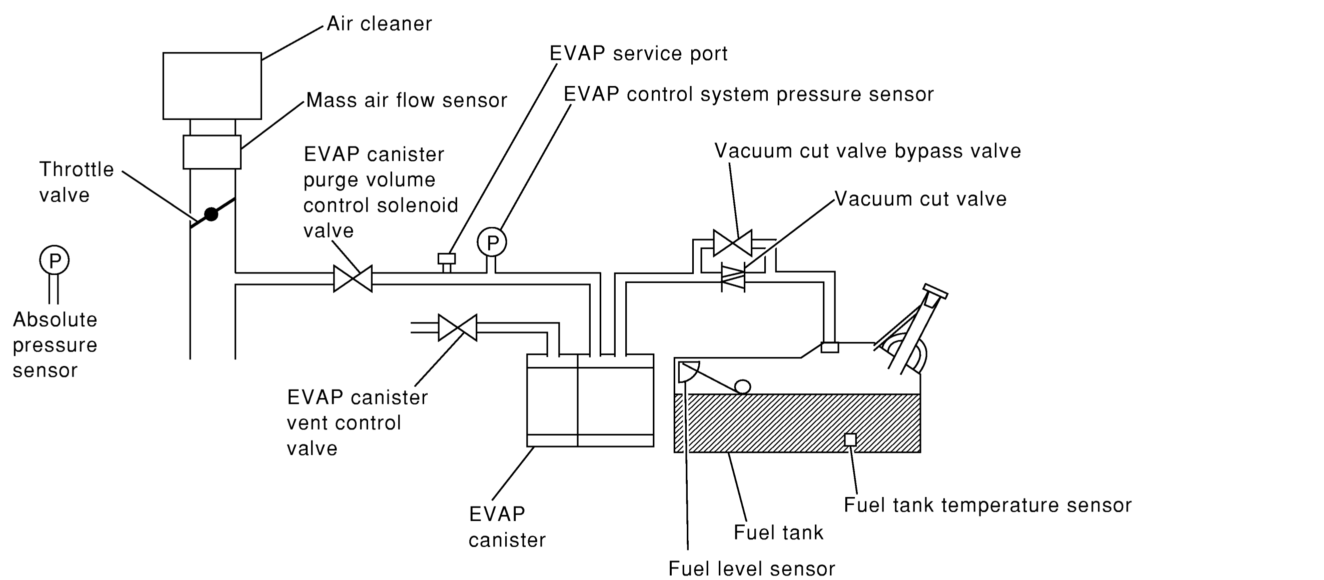
14	CHECK GEAR TOOTH
Visually check for chipping signal plate (flywheel or drive plate) gear tooth (cog). **OK or NG**	
OK ▶	GO TO 15.
NG ▶	Replace the signal plate (flywheel or drive plate).

15	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

On Board Diagnosis Logic

NAEC0316

This diagnosis detects very small leaks in the EVAP line between the fuel tank and the EVAP canister purge volume control solenoid valve using intake manifold vacuum in the same way as conventional EVAP small leak diagnosis.
If the ECM judges a leak equivalent to a very small leak, the very small leak DTC P1441 will be detected. If the ECM judges a leak equivalent to a small leak, the EVAP small leak DTC P0440 will be detected. Correspondingly, if the ECM judges there is no leak, the diagnosis result is OK.



SEF373Z

Malfunction is detected when EVAP control system has a very small leak, EVAP control system does not operate properly.

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

Possible Cause

NAEC0587

- Incorrect fuel tank vacuum relief valve
- Incorrect fuel filler cap used
- Fuel filler cap remains open or fails to close.
- Foreign matter caught in fuel filler cap.
- Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve.
- Foreign matter caught in EVAP canister vent control valve.
- EVAP canister or fuel tank leaks
- EVAP purge line (pipe and rubber tube) leaks

- EVAP purge line rubber tube bent.
- Blocked or bent rubber tube to EVAP control system pressure sensor
- Loose or disconnected rubber tube
- EVAP canister vent control valve and the circuit
- EVAP canister purge volume control solenoid valve
- Absolute pressure sensor
- Fuel tank temperature sensor
- O-ring of EVAP canister vent control valve is missing or damaged.
- Water separator
- EVAP canister is saturated with water.
- Fuel level sensor and the circuit
- EVAP control system pressure sensor

DTC Confirmation Procedure

NAEC0317

CAUTION:
Never remove fuel filler cap during the DTC confirmation procedure.

NOTE:
- **If DTC P1441 is displayed with P0440, perform TROUBLE DIAGNOSIS FOR DTC P1441 first.**
- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**
- **After repair, make sure that the hoses and clips are installed properly.**

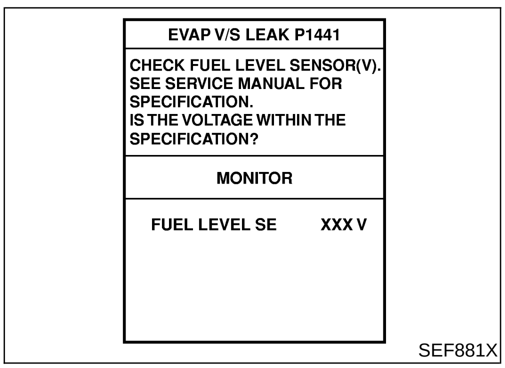
TESTING CONDITION:
- **Open engine hood before conducting following procedure.**
- **If any of following condition is met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**

a) **Fuel filler cap is removed.**
b) **Refilled or drained the fuel.**
c) **EVAP component parts is/are removed.**

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

With CONSULT-II

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT-II.
2) Make sure the following conditions are met.
FUEL LEVEL SE: 1.08 - 0.2V
COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
INT A/TEMP SE: More than 0°C (32°F)
If NG, turn ignition switch "OFF" and leave the vehicle in a cool



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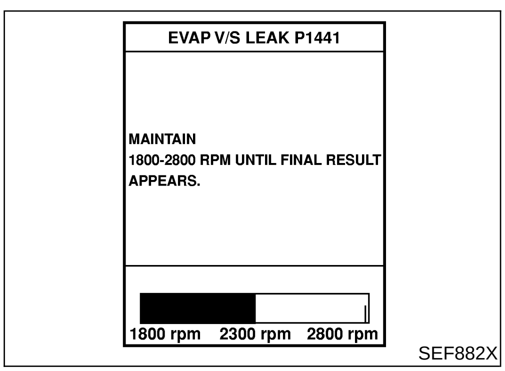

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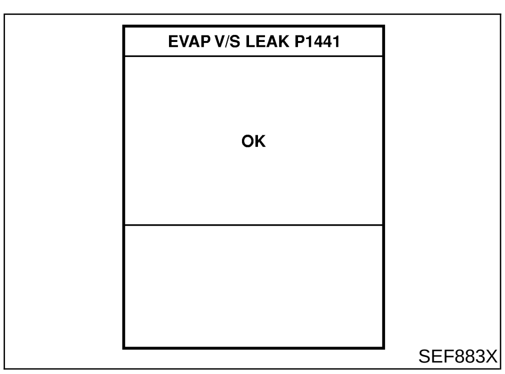


SEF883X

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

place (soak the vehicle) or refilling/draining fuel until the output voltage condition of the "FUEL LEVEL SE" meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1).

3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Turn ignition switch "ON".
5) Select "EVAP VERY/SML LEAK P1441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
   Follow the instruction displayed.
6) Make sure that "OK" is displayed.
   If "NG" is displayed, refer to "Diagnostic Procedure", EC-531.

NOTE:

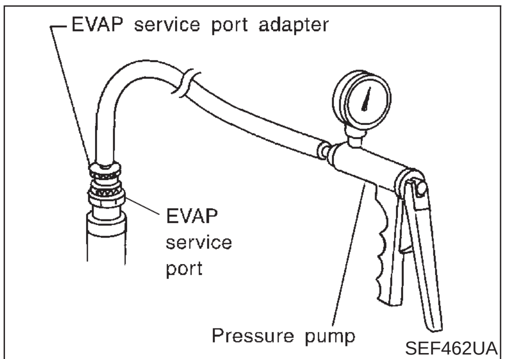
- **If the engine speed cannot be maintained within the range displayed on CONSULT-II screen, go to "Basic inspection", EC-102.**
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

OVERALL FUNCTION CHECK

NAEC0317S05

With GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.



SEF462UA

CAUTION:

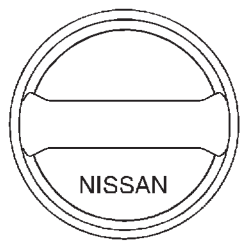
- **Never use compressed air, doing so may damage the EVAP system.**
- **Do not start engine.**
- **Do not exceeded 4.12 kPa (0.042 kg/cm^2, 0.6 psi).**

1) Attach the EVAP service port adapter securely to the EVAP service port.
2) Set the pressure pump and a hose.
3) Also set a vacuum gauge via 3-way connector and a hose.
4) Turn ignition switch "ON".
5) Connect GST and select mode 8.
6) Using mode 8 control the EVAP canister vent control valve (close) and vacuum cut valve bypass valve (open).
7) Apply pressure and make sure the following conditions are satisfied.
   Pressure to be applied: 2.7 kPa (20 mmHg, 0.79 inHg)
   Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (3 mmHg, 0.12 inHg)
   If NG, go to diagnostic procedure, EC-531.

NOTE:
For more information, refer to GST instruction manual.

Diagnostic Procedure

NAEC0643

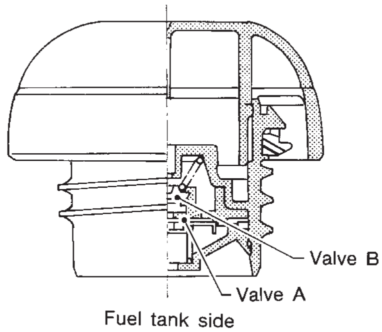
1	CHECK FUEL FILLER CAP DESIGN	
1. Turn ignition switch "OFF". 2. Check for genuine NISSAN fuel filler cap design.  SEF915U **OK or NG**		
OK	▶	GO TO 2.
NG	▶	Replace with genuine NISSAN fuel filler cap.

2	CHECK FUEL FILLER CAP INSTALLATION	
Check that the cap is tightened properly by rotating the cap clockwise. **OK or NG**		
OK	▶	GO TO 3.
NG	▶	● Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. ● Retighten until ratcheting sound is heard.

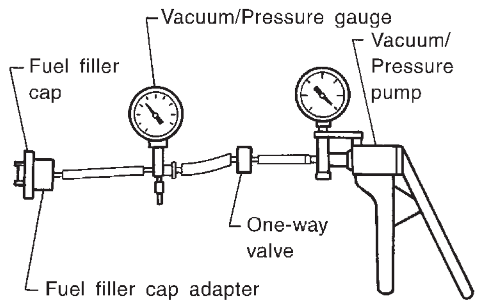
3	CHECK FUEL FILLER CAP FUNCTION	
Check for air releasing sound while opening the fuel filler cap. **OK or NG**		
OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	CHECK FUEL TANK VACUUM RELIEF VALVE

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



SEF427N



SEF943S

Pressure:
15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
Vacuum:
−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)

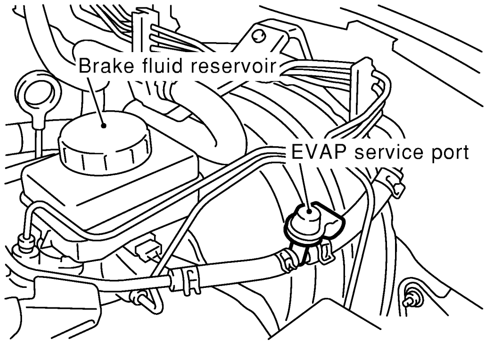
CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.

OK or NG

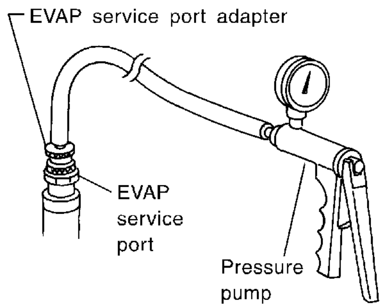
OK	▶	GO TO 5.
NG	▶	Replace fuel filler cap with a genuine one.

5	INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port securely.



SEF983Y



SEF916U

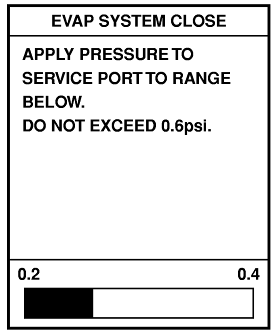
NOTE:
Improper installation of the EVAP service port adapter to the EVAP service port may cause leaking.

Models with CONSULT-II ▶	GO TO 6.
Models without CONSULT-II ▶	GO TO 7.

6	CHECK FOR EVAP LEAK

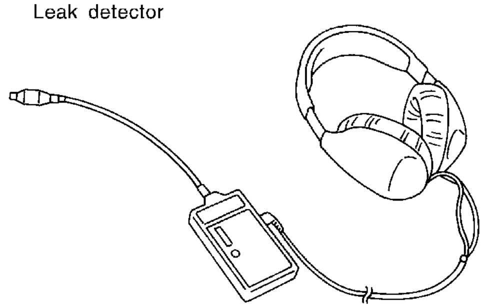
With CONSULT-II

1. Turn ignition switch "ON".
2. Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-II.
3. Touch "START" and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**



PEF917U

4. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details.
   Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.



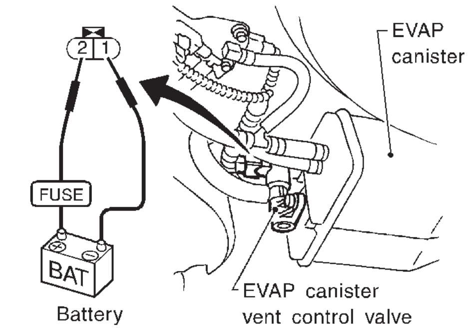
SEF200U

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or replace.

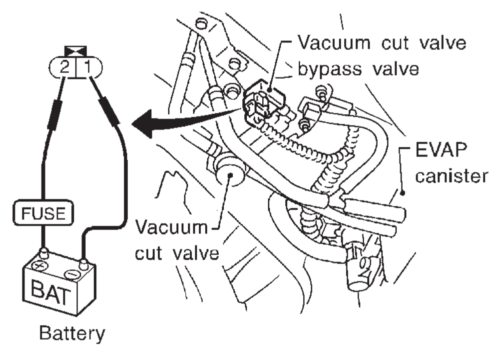
7	CHECK FOR EVAP LEAK

Without CONSULT-II
1. Turn ignition switch "OFF".
2. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)



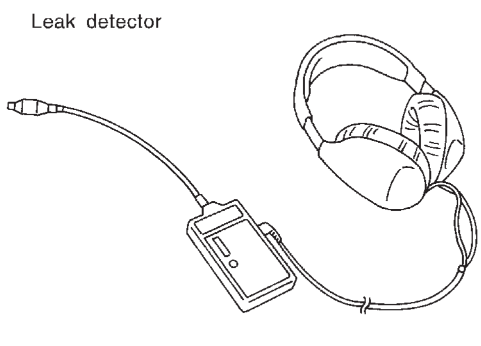
SEF598U

3. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12V until the end of test.)



SEF599U

4. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg), then remove pump and EVAP service port adapter.
   NOTE:
   - **Never use compressed air or a high pressure pump.**
   - **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**
5. Using EVAP leak detector, locate the EVAP leak. For the leak detector, refer to the instruction manual for more details. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.



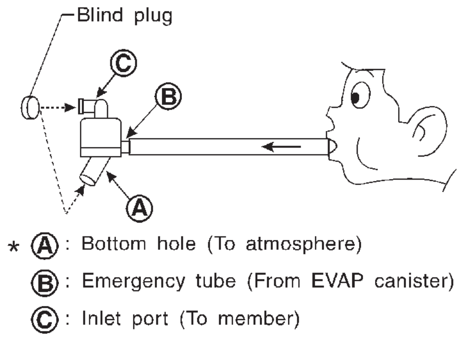
SEF200U

OK or NG

OK	▶	GO TO 8.
NG	▶	Repair or replace.

8	CHECK WATER SEPARATOR

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that **A** and **C** are not clogged by blowing air into **B** with **A**, and then **C** plugged.



SEF829T

5. In case of NG in items 2 - 4, replace the parts.

NOTE:

- Do not disassemble water separator.

OK or NG

OK	▶	GO TO 9.
NG	▶	Replace water separator.

9	CHECK EVAP CANISTER VENT CONTROL VALVE, O-RING AND CIRCUIT

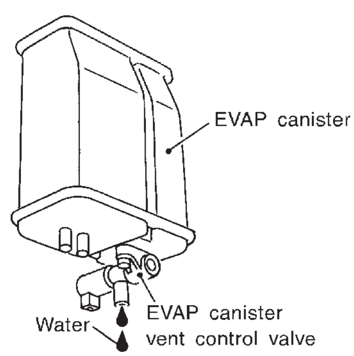
Refer to "DTC Confirmation Procedure", EC-377.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

10	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Does water drain from the EVAP canister?



SEF596U

Yes or No

Yes	▶	GO TO 11.
No (With CONSULT-II)	▶	GO TO 13.
No (Without CONSULT-II)	▶	GO TO 14.

11	CHECK EVAP CANISTER	
Weigh the EVAP canister with the EVAP canister vent control valve attached. **The weight should be less than 1.8 kg (4.0 lb).** **OK or NG**		
OK (With CONSULT-II)	▶	GO TO 13.
OK (Without CONSULT-II)	▶	GO TO 14.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART	
Check the following. ● EVAP canister for damage ● EVAP hose between EVAP canister and water separator for clogging or poor connection		
	▶	Repair hose or replace EVAP canister.

13 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-II

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT-II screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

Vacuum should exist.

SEF984Y

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

14 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-II

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   Vacuum should exist.

OK or NG

OK	▶	GO TO 17.
NG	▶	GO TO 15.

15	CHECK VACUUM HOSE
Check vacuum hoses for clogging or disconnection. Refer to "Vacuum Hose Drawing", EC-26. **OK or NG**	
OK (With CONSULT-II) ▶	GO TO 16.
OK (Without CONSULT-II) ▶	GO TO 17.
NG ▶	Repair or reconnect the hose.

16	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

SEF985Y

OK or NG

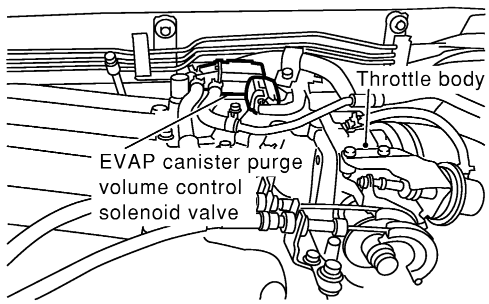
OK ▶	GO TO 18.
NG ▶	GO TO 17.

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

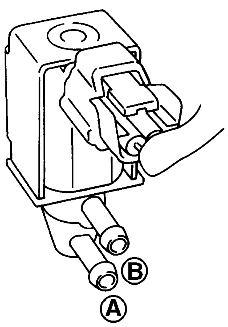
17 CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y

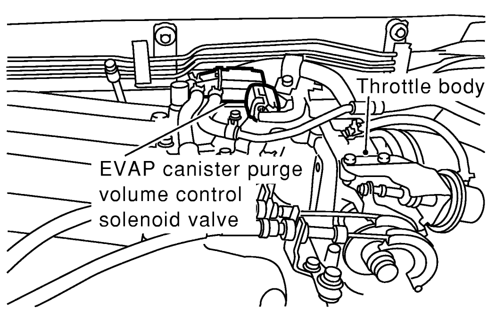


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

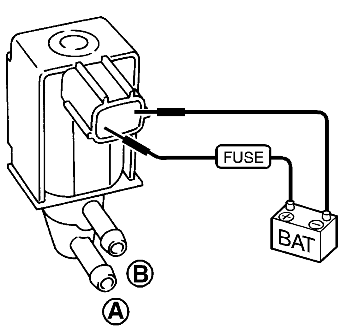
SEF334X

Without CONSULT-II

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



SEF986Y



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

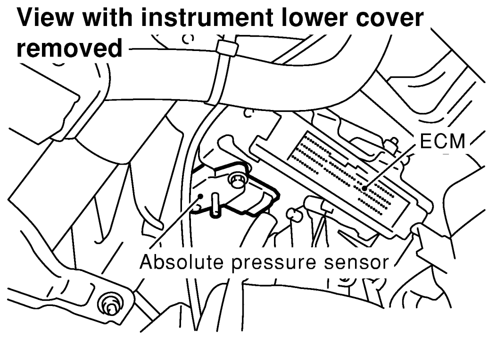
SEF335X

OK or NG

OK	▶	GO TO 18.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

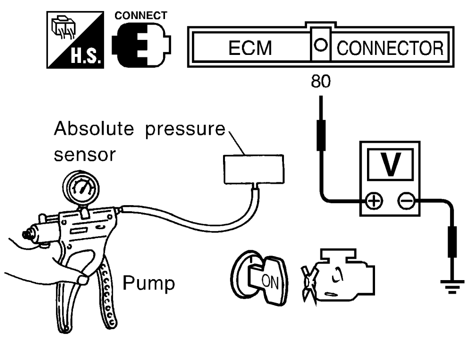
18	CHECK ABSOLUTE PRESSURE SENSOR

1. Remove absolute pressure sensor with its harness connector connected.



SEF961Y

2. Remove hose from absolute pressure sensor.
3. Install a vacuum pump to absolute pressure sensor.
4. Turn ignition switch "ON" and check output voltage between ECM terminal 80 and engine ground under the following conditions.



Applied vacuum kPa (mmHg, inHg)	Voltage V
Not applied	1.8 - 4.8
–26.7 (–200, –7.87)	1.0 to 1.4 lower than above value

SEF300XA

CAUTION:

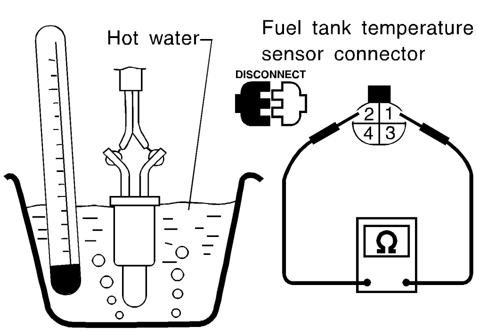
- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below −93.3 kPa (–700 mmHg, –27.56 inHg) or over 101.3 kPa (760 mmHg, 29.92 inHg) of pressure.**

OK or NG

OK	▶	GO TO 19.
NG	▶	Replace absolute pressure sensor.

19	CHECK FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 2 by heating with hot water or heat gun as shown in the figure.



Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

SEF974Y

OK or NG

OK	▶	GO TO 20.
NG	▶	Replace fuel level sensor unit.

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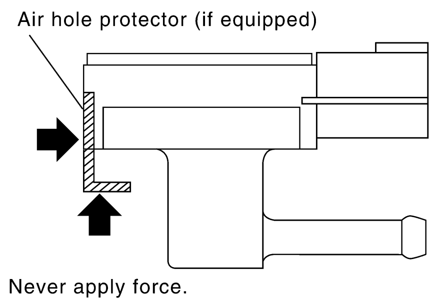
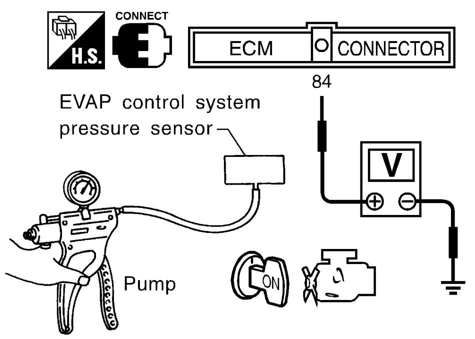
20	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure sensor which has been dropped from a height of more than 0.5m (19.7in) onto a hard surface such as a concrete floor; use a new one.**

OK or NG

OK	▶	GO TO 21.
NG	▶	Replace EVAP control system pressure sensor.

21	CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to "Evaporative Emission System", EC-32.

OK or NG

OK	▶	GO TO 22.
NG	▶	Repair or reconnect the hose.

22	CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

	▶	GO TO 23.

23	**CHECK FUEL LEVEL SENSOR**	
Refer to EL-128, "Fuel Level Sensor Unit Check".		
OK or NG		
OK	▶	GO TO 24.
NG	▶	Replace fuel level sensor unit.

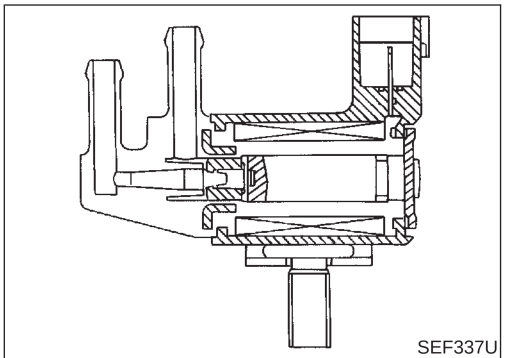
24	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

Description
NAEC0319

SYSTEM DESCRIPTION
NAEC0319S01

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Ignition switch	Start signal		
Throttle position sensor	Throttle position		
Throttle position switch	Closed throttle position		
Heated oxygen sensor 1 (front)	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
Vehicle speed sensor	Vehicle speed		

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.


SEF337U

COMPONENT DESCRIPTION
NAEC0319S02

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
NAEC0320

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	• Engine: After warming up • Air conditioner switch “OFF” • Shift lever: “N” • No-load	Idle (Vehicle stopped)	0%
		2,000 rpm	—

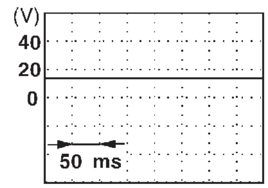
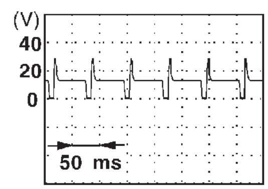
ECM Terminals and Reference Value

NAEC0678

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)
1	L/Y	EVAP canister purge volume control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF994U
			[Engine is running] ● Engine speed is about 2,000 rpm (More than 100 seconds after starting engine).	BATTERY VOLTAGE (11 - 14V)  SEF995U

On Board Diagnosis Logic

NAEC0322

Malfunction is detected when the canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.

Possible Cause

NAEC0588

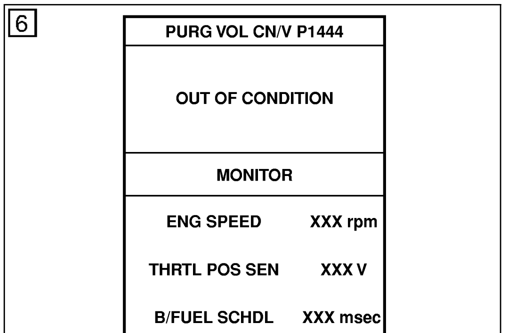
- EVAP control system pressure sensor
- EVAP canister purge volume control solenoid valve (The valve is stuck open.)
- EVAP canister vent control valve
- EVAP canister
- Hoses
  (Hoses are connected incorrectly or clogged.)

DTC Confirmation Procedure

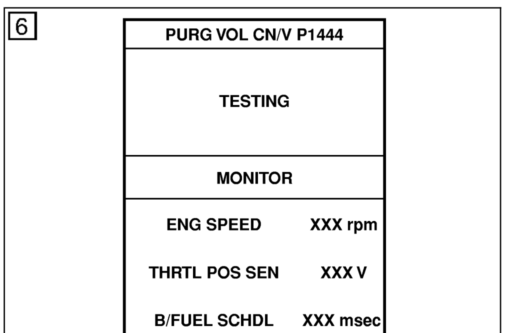
NAEC0323

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.

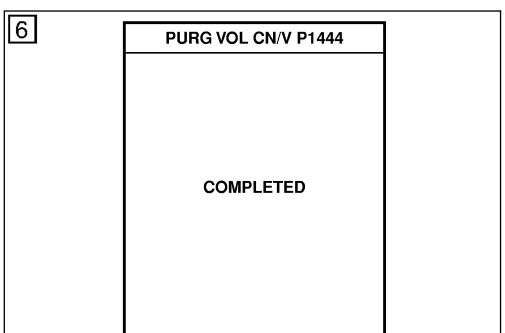
TESTING CONDITION:
Always perform test at a temperature of 0°C (32°F) or more.



SEF205Y



SEF206Y



SEF237Y

WITH CONSULT-II

NAEC0323S01

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 “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
5) Touch “START”.
6) Start engine and let it idle until “TESTING” on CONSULT-II changes to “COMPLETED”. (It will take for approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.
7) Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to “Diagnostic Procedure”, EC-547.

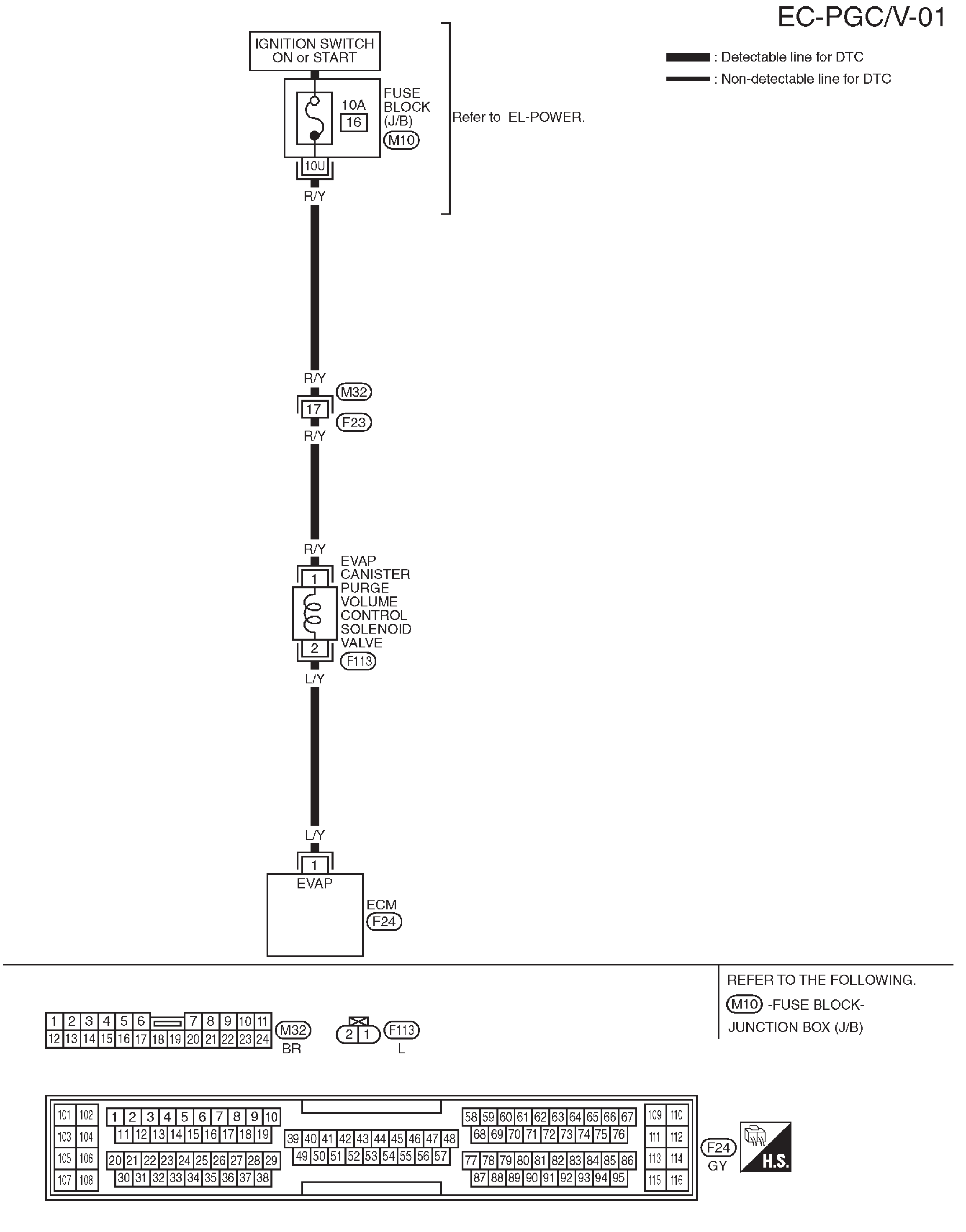
WITH GST

NAEC0323S02

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 let it idle for at least 20 seconds.
4) Select “MODE 7” with GST.
5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-547.

Wiring Diagram

NAEC0324

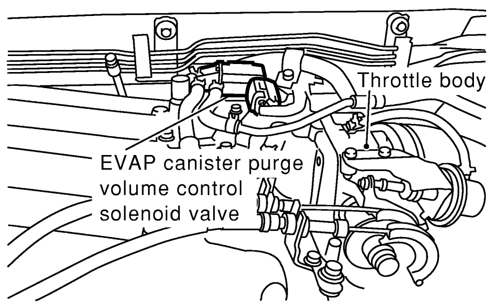


Diagnostic Procedure

NAEC0325

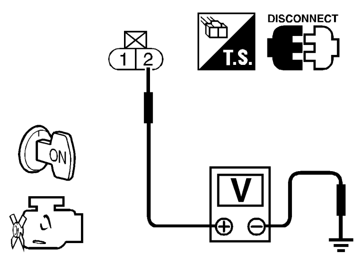
1	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch “OFF”.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.



SEF986Y

3. Turn ignition switch “ON”.
4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and engine ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF333X

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- Fuse block (J/B) connector M10
- 10A fuse
- Harness for open or short between EVAP canister purge volume control solenoid valve and fuse

	▶	Repair harness or connectors.

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

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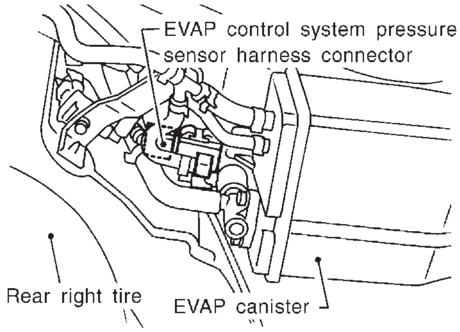
4	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.



SEF495R

OK or NG

OK	▶	GO TO 5.
NG	▶	Repair it.

5	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

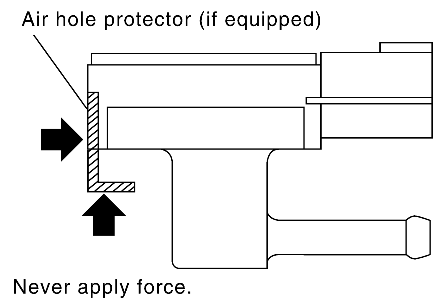
1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace EVAP control system pressure sensor.

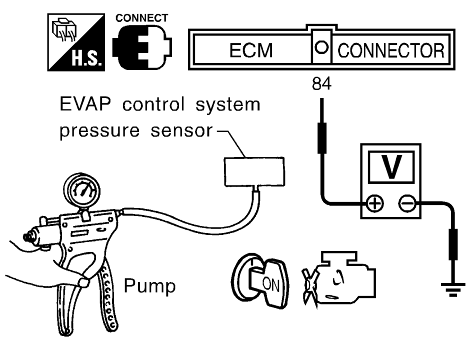
6	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure sensor which has been dropped from a height of more than 0.5m (19.7in) onto a hard surface such as a concrete floor; use a new one.**

OK or NG

OK (With CONSULT-II)	▶	GO TO 7.
OK (Without CONSULT-II)	▶	GO TO 8.
NG	▶	Replace EVAP control system pressure sensor.

7	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Turn ignition switch "OFF".
2. Reconnect harness connectors disconnected.
3. Start engine.
4. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

SEF985Y

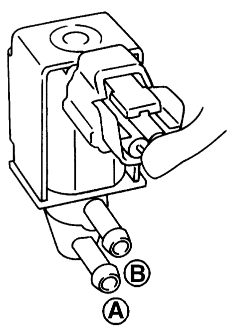
OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	CHECK 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.

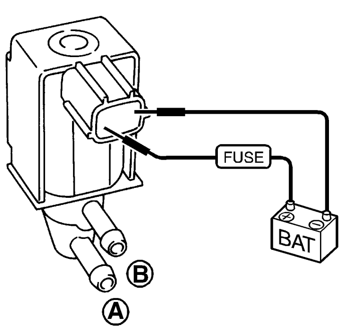


Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

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

SEF335X

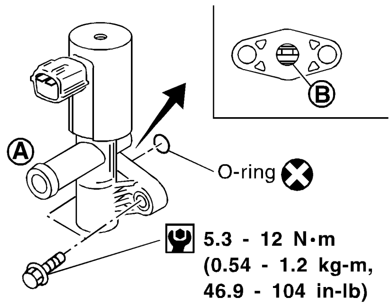
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

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

9	CHECK RUBBER TUBE FOR CLOGGING	
1. Disconnect rubber tube connected to EVAP canister vent control valve. 2. Check the rubber tube for clogging. **OK or NG**		
OK	▶	GO TO 10.
NG	▶	Clean the rubber tube using an air blower.

10	CHECK EVAP CANISTER VENT CONTROL VALVE-I	
1. Remove EVAP canister vent control valve from EVAP canister. 2. Check portion **B** of EVAP canister vent control valve for being rusted.		



SEF337X

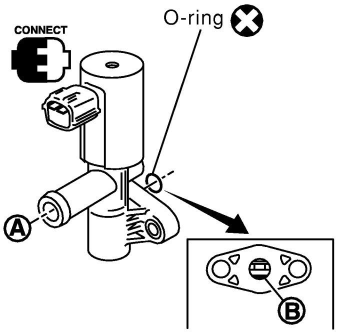
OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EVAP canister vent control valve.

11	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch "ON".
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

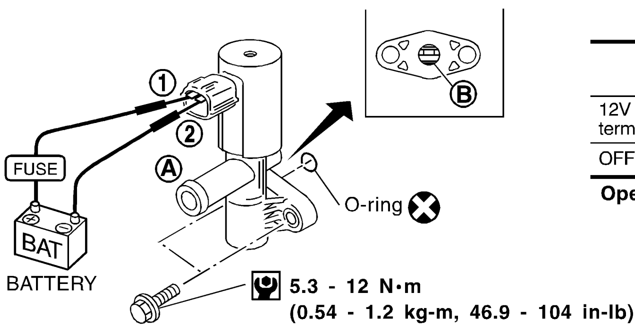
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 13.
NG	▶	GO TO 12.

12	CHECK EVAP CANISTER VENT CONTROL VALVE-III

1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform procedure 9 again.

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace EVAP canister vent control valve.

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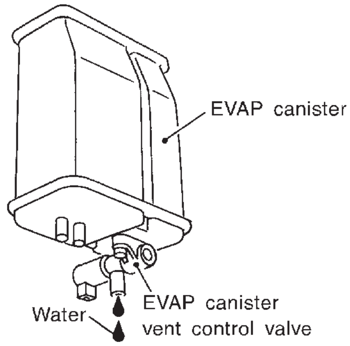
13	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



SEF596U

Yes or No

Yes	▶	GO TO 14.
No	▶	GO TO 17.

14	CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK	▶	GO TO 16.
NG	▶	GO TO 15.

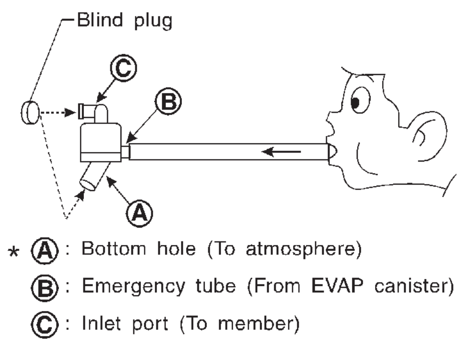
15	DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and water separater for clogging or poor connection

	▶	Repair hose or replace EVAP canister.

16	CHECK WATER SEPARATOR

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that **A** and **C** are not clogged by blowing air into **B** with **A**, and then **C** plugged.



SEF829T

5. In case of NG in items 2 - 4, replace the parts.

NOTE:
- Do not disassemble water separator.

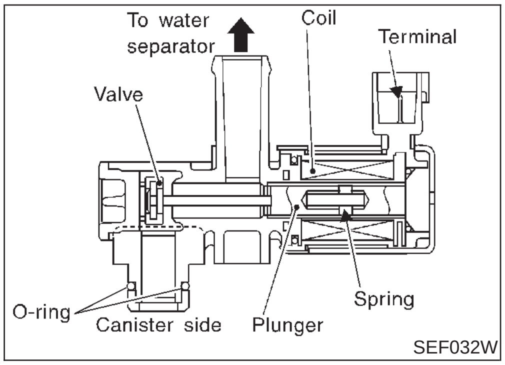
OK or NG

OK	▶	GO TO 17.
NG	▶	Clean or replace water separator.

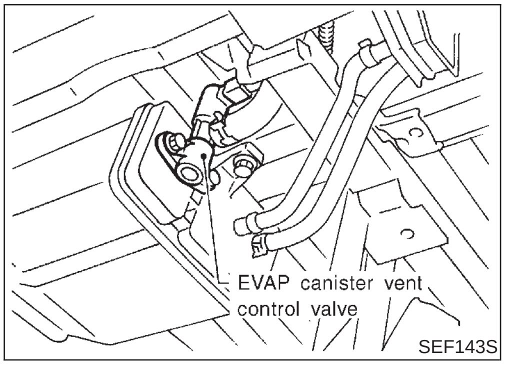
17	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**



SEF032W



SEF143S

Component Description

NAEC0326

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows “EVAP Control System (Small Leak)” diagnosis.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0327

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

ECM Terminals and Reference Value

NAEC0679

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)
40	G/Y	EVAP canister vent control valve	**[Ignition switch “ON”]**	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

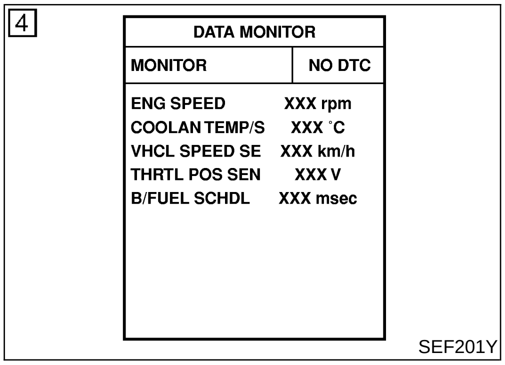
NAEC0329

Malfunction is detected when EVAP canister vent control valve remains closed under specified driving conditions.

Possible Cause

NAEC0589

- EVAP canister vent control valve
- EVAP control system pressure sensor and the circuit
- Blocked rubber tube to EVAP canister vent control valve
- Water separator
- EVAP canister is saturated with water.



SEF201Y

DTC Confirmation Procedure

NAEC0330

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

NAEC0330S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine.
4) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.

NOTE:
If a malfunction exists, NG result may be displayed quicker.

5) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-558.

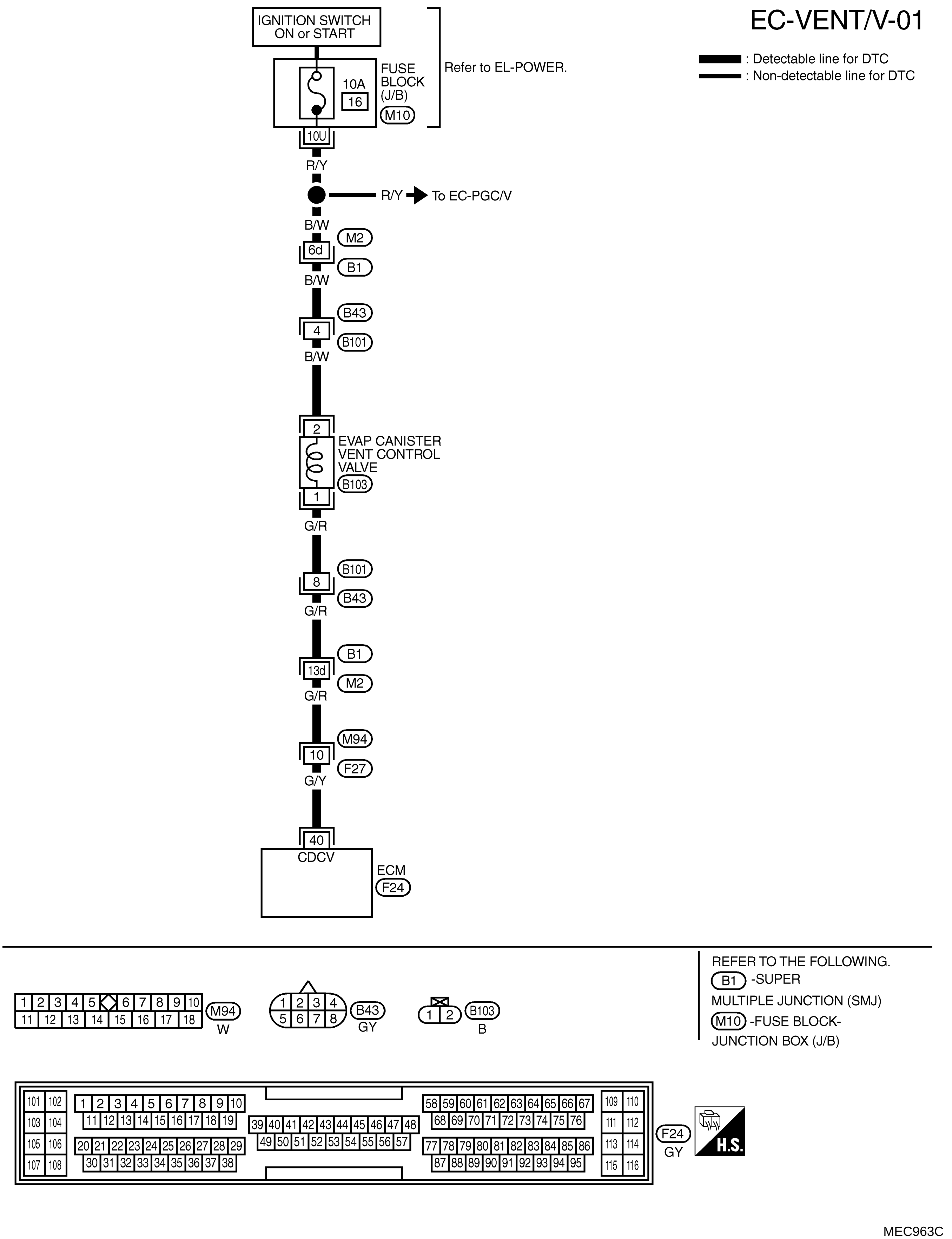
WITH GST

NAEC0330S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0331



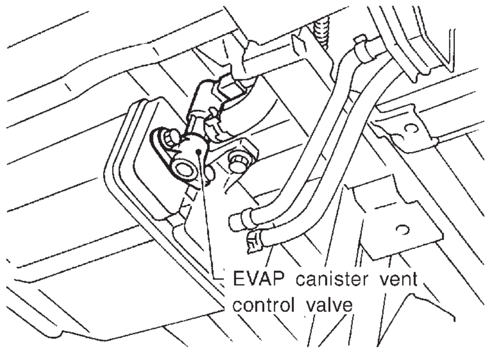
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX

Diagnostic Procedure

NAEC0332

1	CHECK RUBBER TUBE

1. Turn ignition switch “OFF”.
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.



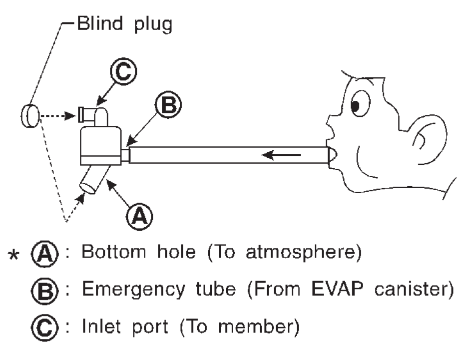
SEF143S

OK or NG

OK	▶	GO TO 2.
NG	▶	Clean rubber tube using an air blower.

2	CHECK WATER SEPARATOR

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that **A** and **C** are not clogged by blowing air into **B** with **A**, and then **C** plugged.



SEF829T

5. In case of NG in items 2 - 4, replace the parts.

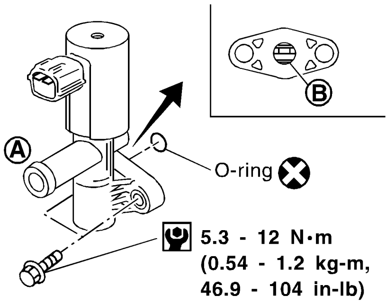
NOTE:
- Do not disassemble water separator.

OK or NG

OK	▶	GO TO 3.
NG	▶	Clean or replace water separator.

3	CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



SEF337X

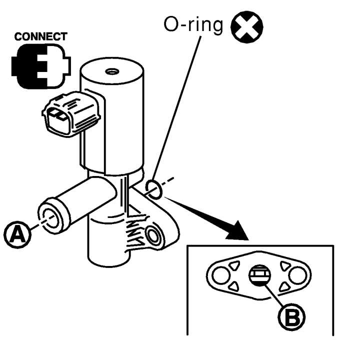
OK or NG

OK	▶	GO TO 4.
NG	▶	Replace EVAP canister vent control valve.

4	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II

1. Turn ignition switch ON.
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
3. Check air passage continuity and operation delay time.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

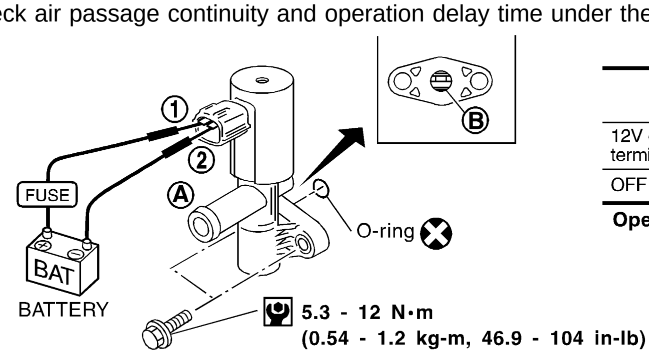
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 6.
NG	▶	GO TO 5.

5	CHECK EVAP CANISTER VENT CONTROL VALVE-III

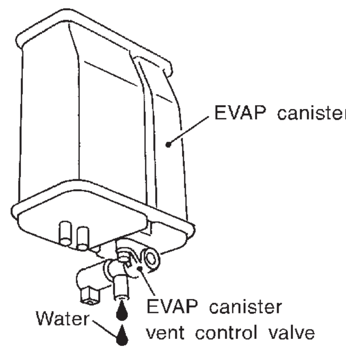
1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform the procedure 4 again.

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace EVAP canister vent control valve.

6	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



SEF596U

Yes or No

Yes	▶	GO TO 7.
No	▶	GO TO 9.

7	CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

8	DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and water separator for clogging or poor connection

	▶	Repair hose or replace EVAP canister.

9	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

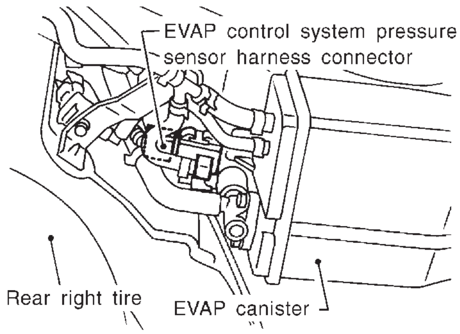
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK	▶	GO TO 10.
NG	▶	Repair it.

10	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



SEF495R

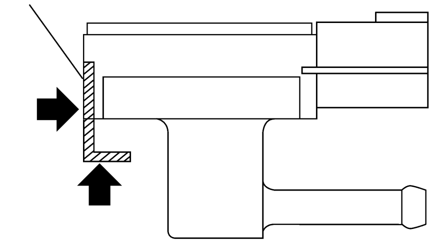
2. Check connectors for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EVAP control system pressure sensor.

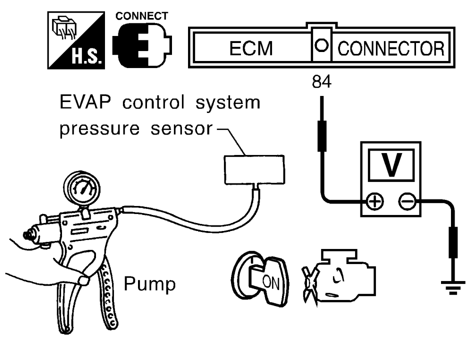
11	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure 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.**

OK or NG

OK ▶	GO TO 12.
NG ▶	Replace EVAP control system pressure sensor.

12	CHECK INTERMITTENT INCIDENT

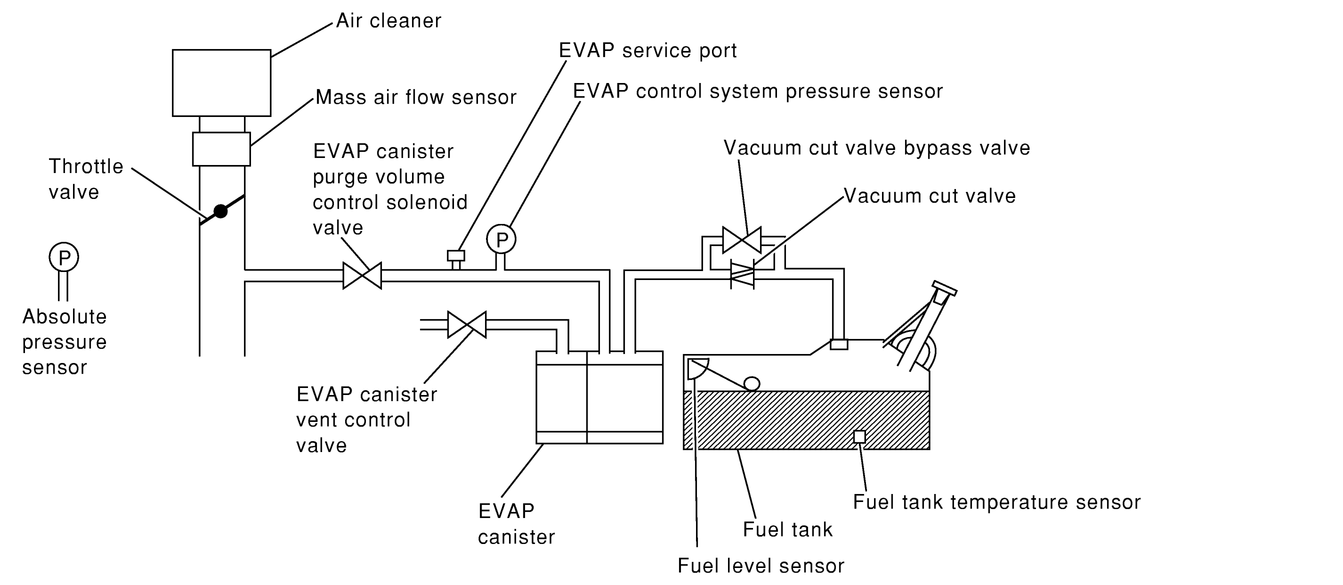
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**

System Description

NAEC0333

NOTE:
If DTC P1447 is displayed with P0510, perform trouble diagnosis for DTC P0510 first. (See EC-433.)



SEF373Z

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

On Board Diagnosis Logic

NAEC0334

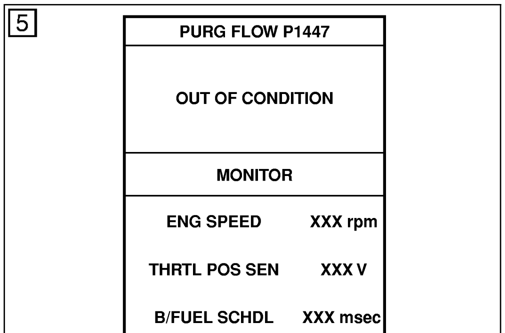
Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.
Malfunction is detected when EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.

Possible Cause

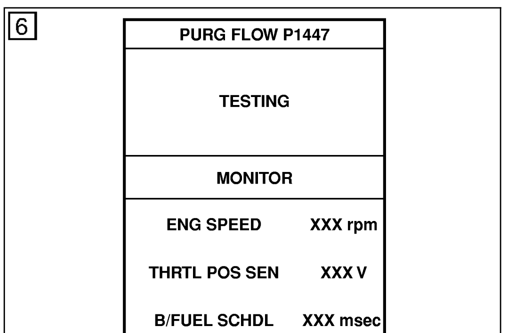
NAEC0590

- EVAP canister purge volume control solenoid valve stuck closed
- EVAP control system pressure sensor and the circuit
- Loose, disconnected or improper connection of rubber tube
- Blocked rubber tube
- Cracked EVAP canister
- EVAP canister purge volume control solenoid valve circuit
- Closed throttle position switch
- Blocked purge port

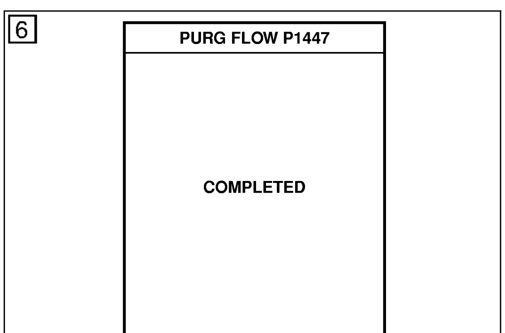
- EVAP canister vent control valve



SEF207Y



SEF208Y



SEF238Y

DTC Confirmation Procedure

NAEC0335

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 test at a temperature of 5°C (41°F) or more.

WITH CONSULT-II

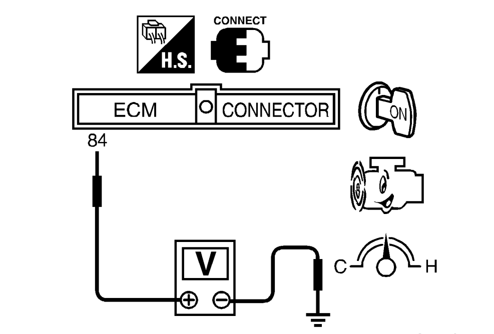
NAEC0335S01

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 let it idle for at least 70 seconds.
4) Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CONSULT-II.
5) Touch "START".
   If "COMPLETED" is displayed, go to step 7.
6) When the following conditions are met, "TESTING" will be displayed on the CONSULT-II screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 35 seconds.)

Selector lever	Suitable position
Vehicle speed	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,000 rpm
B/FUEL SCHDL	1.0 - 10 msec
Engine coolant temperature	More than 70°C (158°F)

   If "TESTING" is not changed for a long time, retry from step 2.

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-566.



SEF355X

Overall Function Check

NAEC0336

Use this procedure to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

WITH GST

NAEC0336S01

1) Lift up drive wheels.
2) Start engine (TCS switch "OFF") and warm it up to normal operating temperature.
3) Turn ignition switch "OFF", wait at least 10 seconds.
4) Start engine and wait at least 70 seconds.
5) Set voltmeter probes to ECM terminals 84 (EVAP control system pressure sensor signal) and ground.
6) Check EVAP control system pressure sensor value at idle speed and note it.
7) Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch	ON
Steering wheel	Fully turned
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than "P", "N" or "R"

8) Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
9) If NG, go to "Diagnostic Procedure", EC-566.

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Diagnostic Procedure

=NAEC0337

1	CHECK EVAP CANISTER	

1. Turn ignition switch “OFF”.
2. Check EVAP canister for cracks.

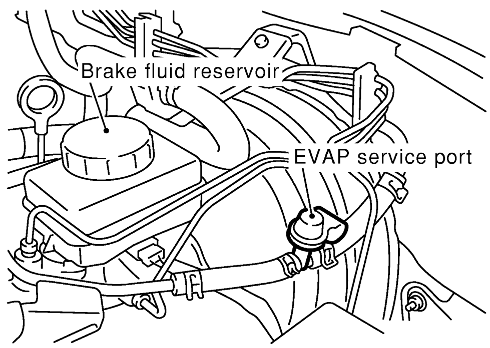
OK or NG

OK (With CONSULT-II)	▶	GO TO 2.
OK (Without CONSULT-II)	▶	GO TO 3.
NG	▶	Replace EVAP canister.

2	CHECK PURGE FLOW

With CONSULT-II

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.



SEF983Y

2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-II.
4. Rev engine up to 2,000 rpm.
5. Touch “Qd” and “Qu” on CONSULT-II screen to adjust “PURG VOL CONT/V” opening and check vacuum existence.

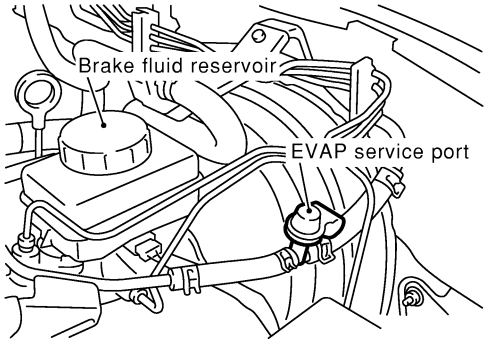
ACTIVE TEST	
PURG VOL CONT/V	XXX %
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

PURG VOL CONT/V	VACUUM
100.0%	Should exist
0.0%	Should not exist

SEF012Z

OK or NG

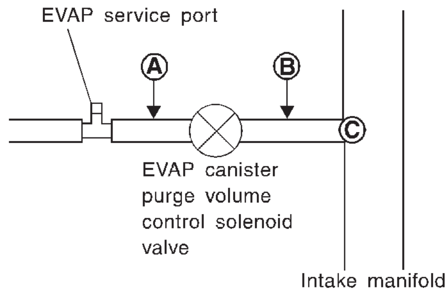
OK	▶	GO TO 7.
NG	▶	GO TO 4.

3	CHECK PURGE FLOW		
Without CONSULT-II 1. Start engine and warm it up to normal operating temperature. 2. Stop engine. 3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.  SEF983Y 4. Start engine and let it idle for at least 80 seconds. 5. Check vacuum gauge indication when revving engine up to 2,000 rpm. **Vacuum should exist.** 6. Release the accelerator pedal fully and let idle. **Vacuum should not exist.**			
OK or NG			
OK	▶	GO TO 7.	
NG	▶	GO TO 4.	

4	CHECK EVAP PURGE LINE	
1. Turn ignition switch "OFF". 2. Check EVAP purge line for improper connection or disconnection. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36.		
OK or NG		
OK (With CONSULT-II)	▶	GO TO 5.
OK (Without CONSULT-II)	▶	GO TO 6.
NG	▶	Repair it.

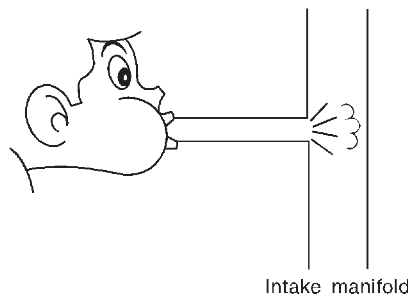
5	CHECK EVAP PURGE HOSE AND PURGE PORT

1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.



SEF367U

2. Blow air into each hose and EVAP purge port **C**.
3. Check that air flows freely.



SEF368U

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair or clean hoses and/or purge port.

6	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-II

1. Start engine.
2. 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	0.0%
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	RICH
HO2S1 MNTR (B2)	RICH
THRTL POS SEN	XXX V

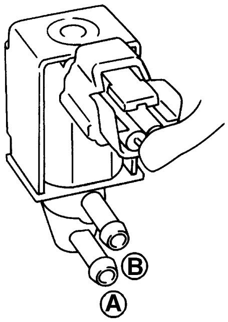
SEF985Y

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

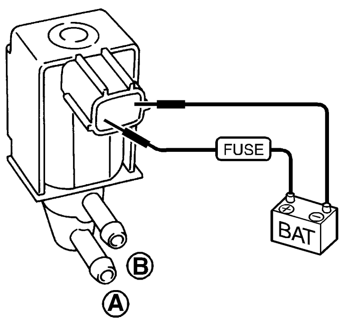
With CONSULT-II
Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition PURG VOL CONT/V value	Air passage continuity between A and B
100.0%	Yes
0.0%	No

SEF334X

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

SEF335X

OK or NG

OK	▶	GO TO 8.
NG	▶	Replace EVAP canister purge volume control solenoid valve.

8	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

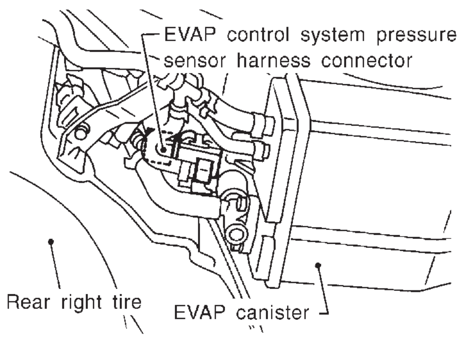
1. Turn ignition switch “OFF”.
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK	▶	GO TO 9.
NG	▶	Repair it.

9	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



SEF495R

2. Check connectors for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace EVAP control system pressure sensor.

10	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to "DTC Confirmation Procedure" for DTC P0450, EC-384.

OK or NG

OK	▶	GO TO 11.
NG	▶	Replace EVAP control system pressure sensor.

11	CHECK RUBBER TUBE FOR CLOGGING

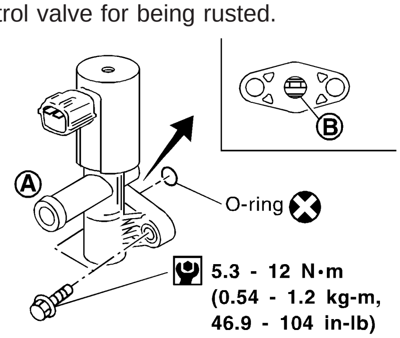
1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK	▶	GO TO 12.
NG	▶	Clean the rubber tube using an air blower.

12	CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



SEF337X

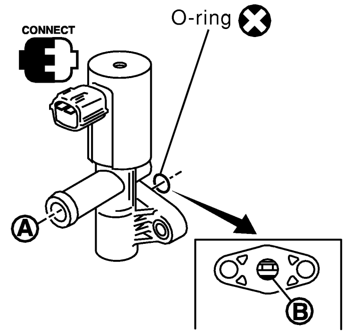
OK or NG

OK	▶	GO TO 13.
NG	▶	Replace EVAP canister vent control valve.

13	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II

1. Reconnect harness connectors disconnected.
2. Turn ignition switch "ON".
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

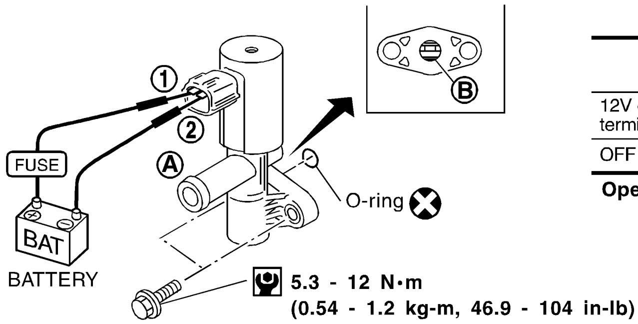
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 15.
NG	▶	GO TO 14.

14	CHECK EVAP CANISTER VENT CONTROL VALVE-III

1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform Test No. 13 again.

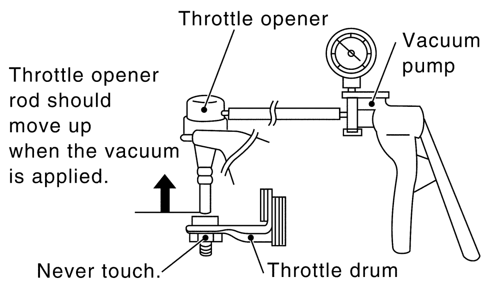
OK or NG

OK (With CONSULT-II)	▶	GO TO 16.
OK (Without CONSULT-II)	▶	GO TO 16.
NG	▶	Replace EVAP canister vent control valve.

15	CHECK THROTTLE POSITION SWITCH

With CONSULT-II

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



SEF793W

7. Turn ignition switch "ON".
8. Select "DATA MONITOR" mode with CONSULT-II.
9. Check indication of "CLSD THL/P SW" under the following conditions.
   Measurement must be made with throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

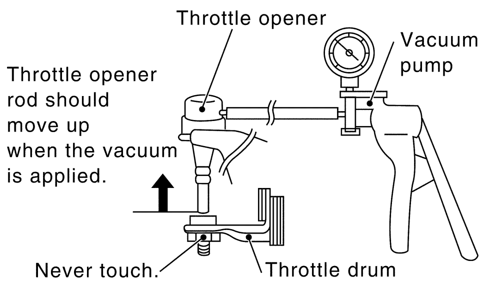
MTBL0355

OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 17.

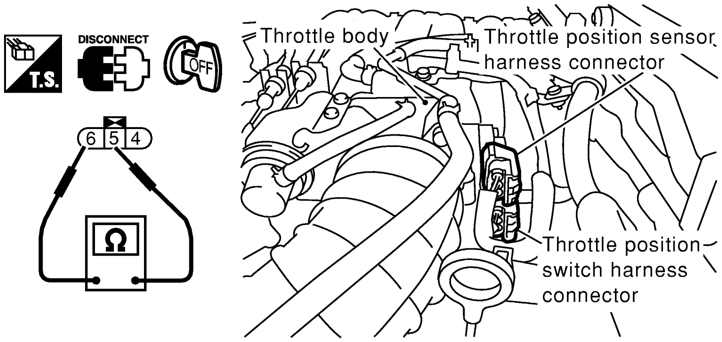
16 CHECK THROTTLE POSITION SWITCH

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



SEF793W

7. Disconnect closed throttle position switch harness connector.
8. Check continuity between closed throttle position switch terminals 6 and 5 under the following conditions. Resistance measurement must be made with throttle position switch installed in vehicle.



Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

SEF998Y

OK or NG

OK	▶	GO TO 18.
NG	▶	GO TO 17.

17 ADJUST THROTTLE POSITION SWITCH

Check the following items. Refer to "Basic Inspection", EC-102.

Items	Specifications
Ignition timing	15° ± 2° BTDC
Closed throttle position switch idle position adjustment	Feeler gauge thickness and switch condition 0.05 mm (0.0020 in): ON 0.15 mm (0.0059 in): OFF
Target idle speed	M/T: 750 ± 50 rpm A/T: 750 ± 50 rpm (in "P" or "N" position)

MTBL0537

Is it possible to adjust closed throttle position switch?

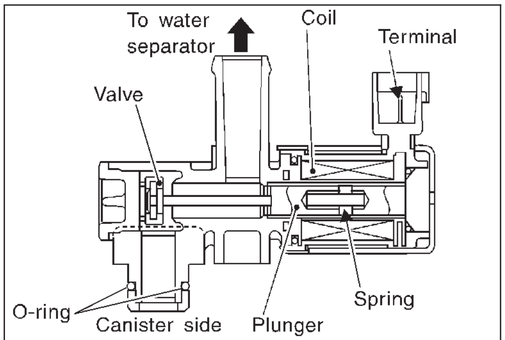
Yes or No

Yes	▶	GO TO 18.
No	▶	Replace throttle position switch.

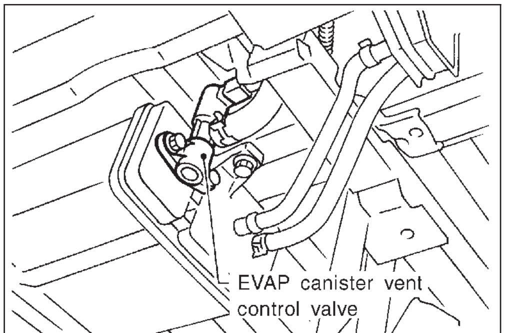
18	**CHECK EVAP PURGE LINE**	
Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to "EVAPORATIVE EMISSION LINE DRAWING", EC-36. **OK or NG**		
OK	▶	GO TO 19.
NG	▶	Replace it.

19	**CLEAN EVAP PURGE LINE**	
Clean EVAP purge line (pipe and rubber tube) using air blower.		
	▶	GO TO 20.

20	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**



SEF032W



SEF143S

Component Description

NAEC0338

NOTE:
If DTC P1448 is displayed with P0440, perform trouble diagnosis for DTC P1448 first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0339

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	• Ignition switch: ON	OFF

ECM Terminals and Reference Value

NAEC0680

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)
40	Y	EVAP canister vent control valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NAEC0341

Malfunction is detected when EVAP canister vent control valve remains opened under specified driving conditions.

Possible Cause

NAEC0591

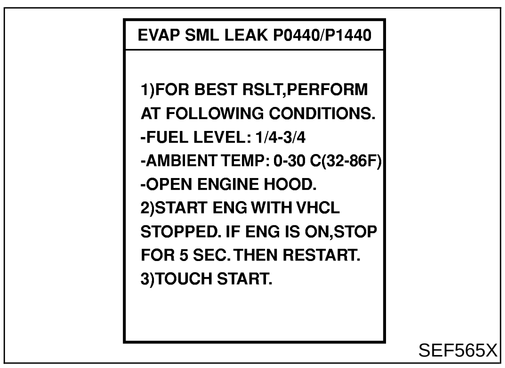
- EVAP canister vent control valve
- EVAP control system pressure sensor and circuit
- Blocked rubber tube to EVAP canister vent control valve
- Water separator
- EVAP canister is saturated with water.
- Vacuum cut valve

DTC Confirmation Procedure

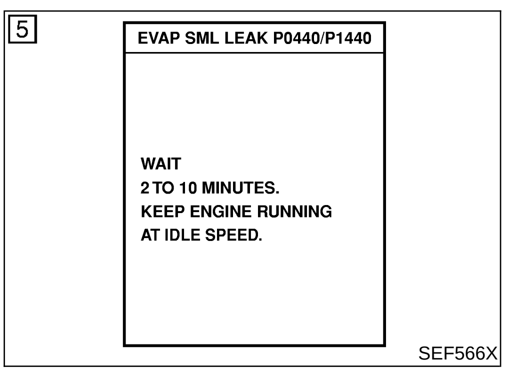
NAEC0342

NOTE:

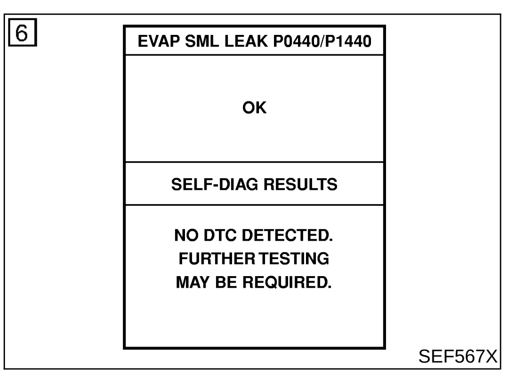
- **If DTC P1448 is displayed with P0440 or P1440, perform trouble diagnosis for DTC P1448 first.**
- If “DTC Confirmation Procedure” has been previously conducted, always turn ignition switch “OFF” and wait at least 10 seconds before conducting the next test.



SEF565X



SEF566X



SEF567X

WITH CONSULT-II

NAEC0342S01

TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 to 3/4 full and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedure.**

1) Turn ignition switch “ON”.
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) Make sure that the following conditions are met.

COOLAN TEMP/S	0 - 70°C (32 - 158°F)
INT/A TEMP SE	0 - 30°C (32 - 86°F)

5) Select “EVAP SML LEAK P0440/P1440” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-II.
   Follow the instruction displayed.

NOTE:

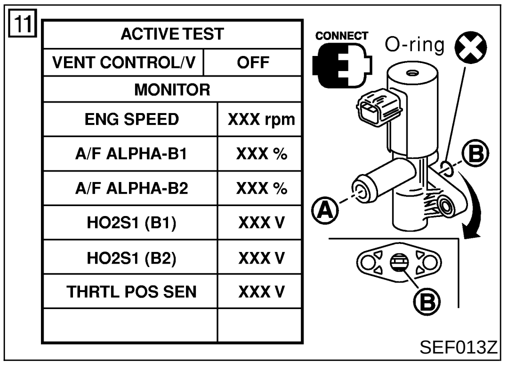
If the engine speed cannot be maintained within the range displayed on the CONSULT-II screen, go to “Basic Inspection”, EC-102.

6) Make sure that “OK” is displayed.
   If “NG” is displayed, go to the following step.

NOTE:

Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

7) Stop engine and wait at least 10 seconds, then turn “ON”.
8) Disconnect hose from water separator.
9) Select “VENT CONTROL/V” of “ACTIVE TEST” mode with CONSULT-II.
10) Touch “ON” and “OFF” alternately.



SEF013Z

11) Make sure the following.

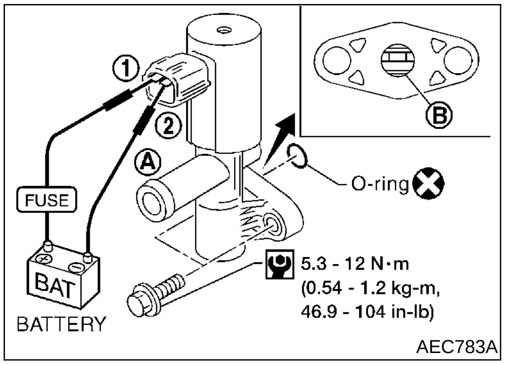
Condition VENT CONTROL/V	Air passage continuity between **A** and **B**
ON	No
OFF	Yes

If the result is NG, go to "Diagnostic Procedure", EC-579.
If the result is OK, go to "Diagnostic Procedure" for DTC P0440, EC-357.

Overall Function Check

NAEC0343

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.



AEC783A

WITH GST

NAEC0343S01

1) Disconnect hose from water separator.
2) Disconnect EVAP canister vent control valve harness connector.
3) Verify the following.

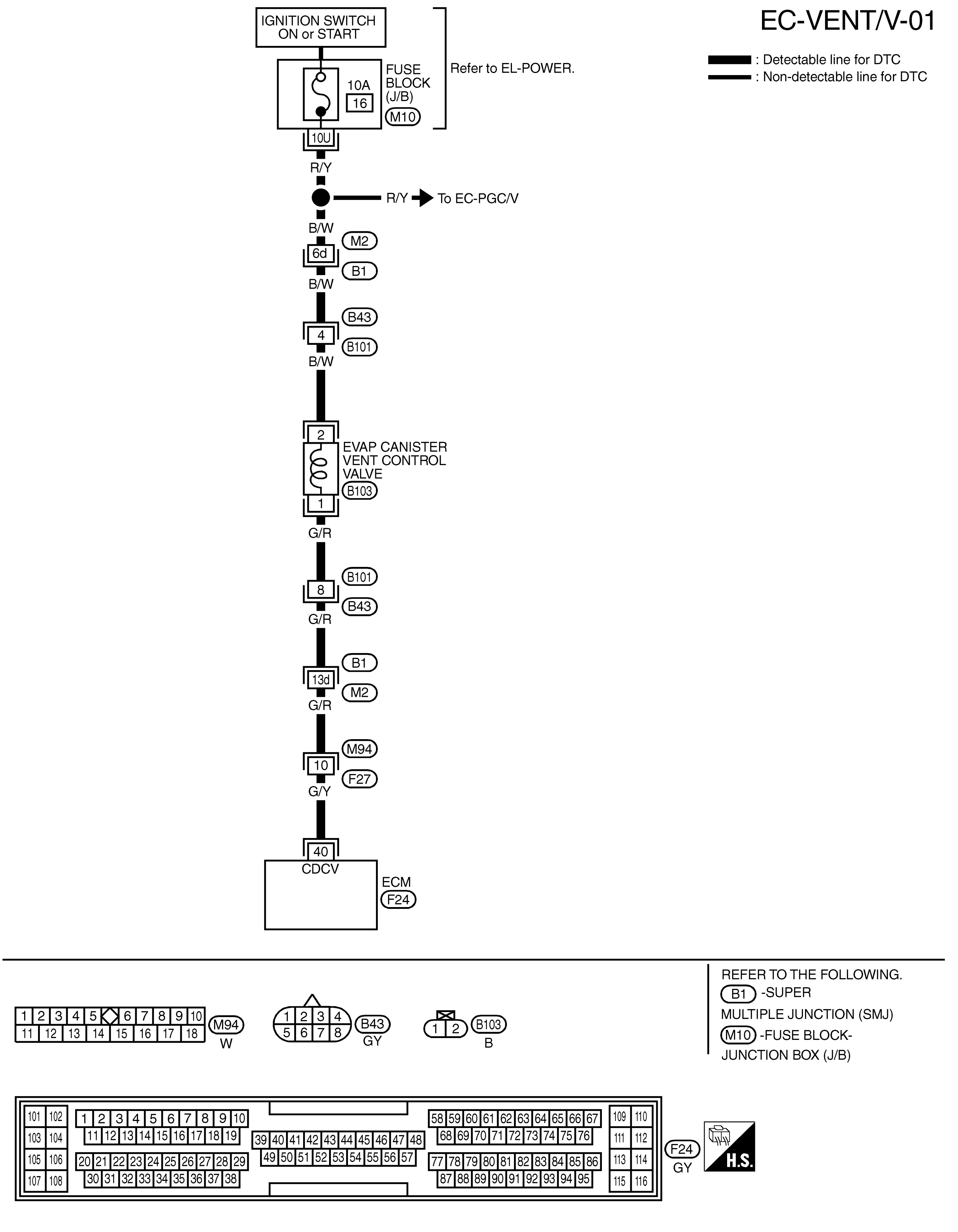
Condition	Air passage continuity
12V direct current supply between terminals 1 and 2	No
No supply	Yes

If the result is NG, go to "Diagnostic Procedure", EC-579.
If the result is OK, go to "Diagnostic Procedure" for DTC P0440, EC-357.

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

Wiring Diagram

NAEC0344



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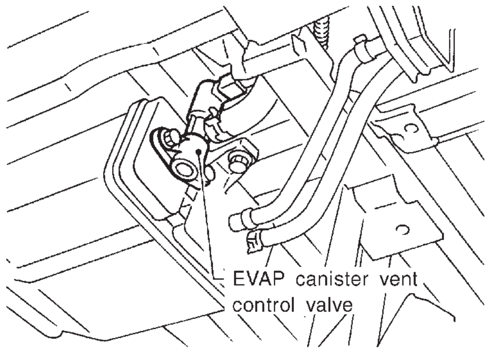
Diagnostic Procedure

NAEC0345

1	CHECK RUBBER TUBE

1. Turn ignition switch “OFF”.
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.



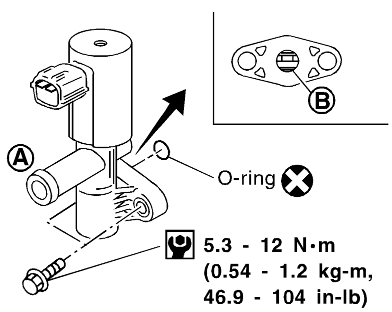
SEF143S

OK or NG

OK	▶	GO TO 2.
NG	▶	Clean rubber tube using an air blower.

2	CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



SEF337X

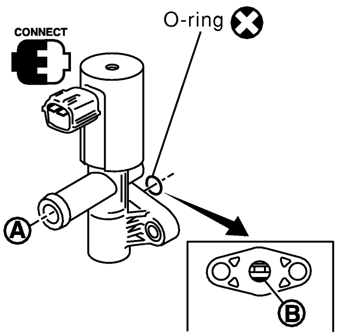
OK or NG

OK	▶	GO TO 3.
NG	▶	Replace EVAP canister vent control valve.

3	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II

1. Turn ignition switch ON.
2. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
3. Check air passage continuity and operation delay time.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

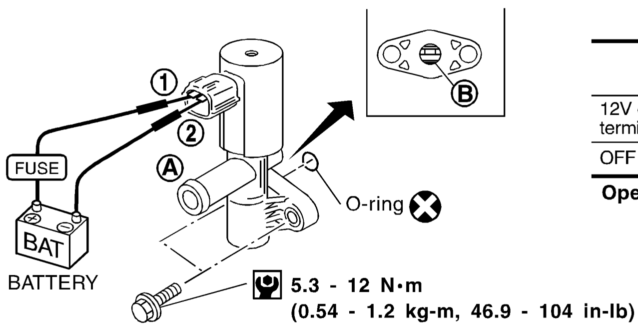
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	CHECK EVAP CANISTER VENT CONTROL VALVE-III

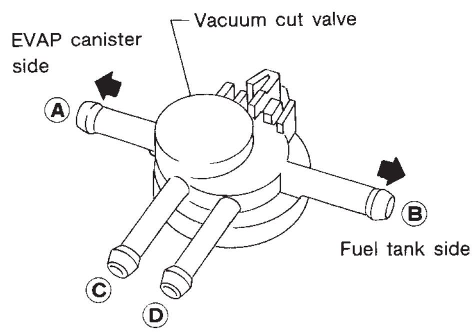
1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower.
2. Perform Test No. 3 again.

OK or NG

OK	▶	GO TO 5.
NG	▶	Replace EVAP canister vent control valve.

5	CHECK VACUUM CUT VALVE

1. Turn ignition switch OFF.
2. Remove vacuum cut valve.
3. Check vacuum cut valve as follows:



SEF379Q

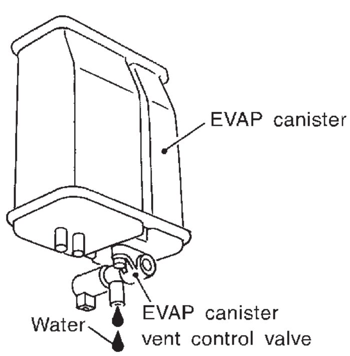
a. Plug port **C** and **D** with fingers.
b. Apply vacuum to port **A** and check that there is no suction from port **B**.
c. Apply vacuum to port **B** and check that there is suction from port **A**.
d. Blow air in port **B** and check that there is a resistance to flow out of port **A**.
e. Open port **C** and **D**.
f. Blow air in port **A** check that air flows freely out of port **C**.
g. Blow air in port **B** check that air flows freely out of port **D**.

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace vacuum cut valve.

6	CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.



SEF596U

Yes or No

Yes	▶	GO TO 7.
No	▶	GO TO 9.

7	CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve attached.
The weight should be less than 1.8 kg (4.0 lb).

OK or NG

OK	▶	GO TO 9.
NG	▶	GO TO 8.

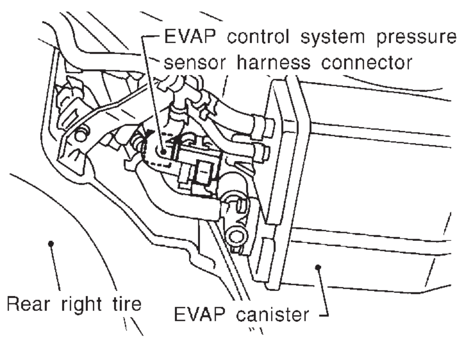
GI MA EM LC EC FE CL MT AT TF PD AX SU BR ST RS BT HA SC EL IDX

8	DETECT MALFUNCTIONING PART
Check the following. ● EVAP canister for damage ● EVAP hose between EVAP canister and water separator for clogging or poor connection	
▶	Repair hose or replace EVAP canister.

9	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE
Check disconnection or improper connection of hose connected to EVAP control system pressure sensor. **OK or NG**	
OK ▶	GO TO 10.
NG ▶	Repair it.

10 CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



SEF495R

2. Check connectors for water.
   Water should not exist.

OK or NG

OK ▶	GO TO 11.
NG ▶	Replace EVAP control system pressure sensor.

GI
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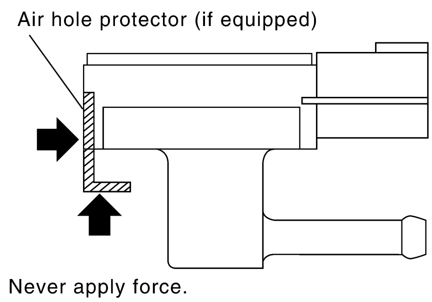
EL
IDX

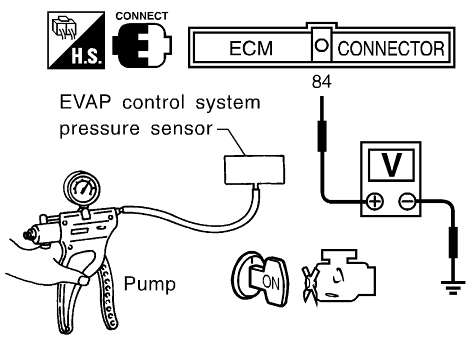
11	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

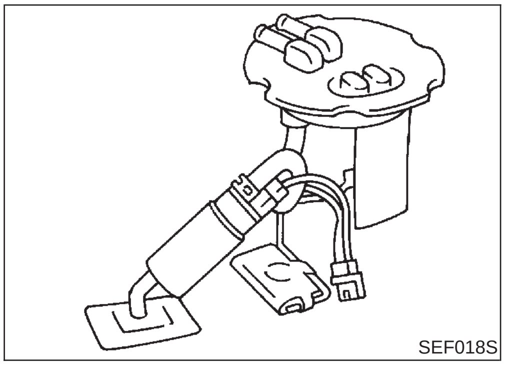
SEF342X

CAUTION:
- **Discard and EVAP control system pressure 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.**

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace EVAP control system pressure sensor.

12	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**


SEF018S

Component Description

NAEC0632

The fuel level sensor is mounted in the fuel level sensor unit. The sensor detects a fuel level in the fuel tank and transmits a signal to the ECM.
It consists of two parts, one is mechanical float and the other side is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

On Board Diagnostic Logic

NAEC0633

ECM receives two signals from the fuel level sensor.
One is fuel level sensor power supply circuit, and the other is fuel level sensor ground circuit.
This diagnosis indicates the latter to detect open circuit malfunction. Malfunction is detected when a high voltage from the sensor is sent to ECM.

Possible Cause

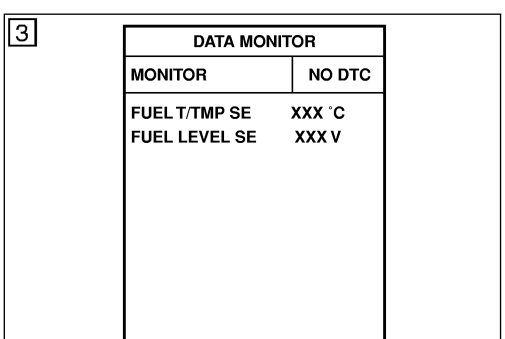
NAEC0634

- Fuel level sensor circuit
  (The fuel level sensor circuit is open or shorted.)

DTC Confirmation Procedure

NAEC0635

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.



SEF195Y

WITH CONSULT-II

NAEC0635S01

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 “Diagnostic Procedure”, EC-586.

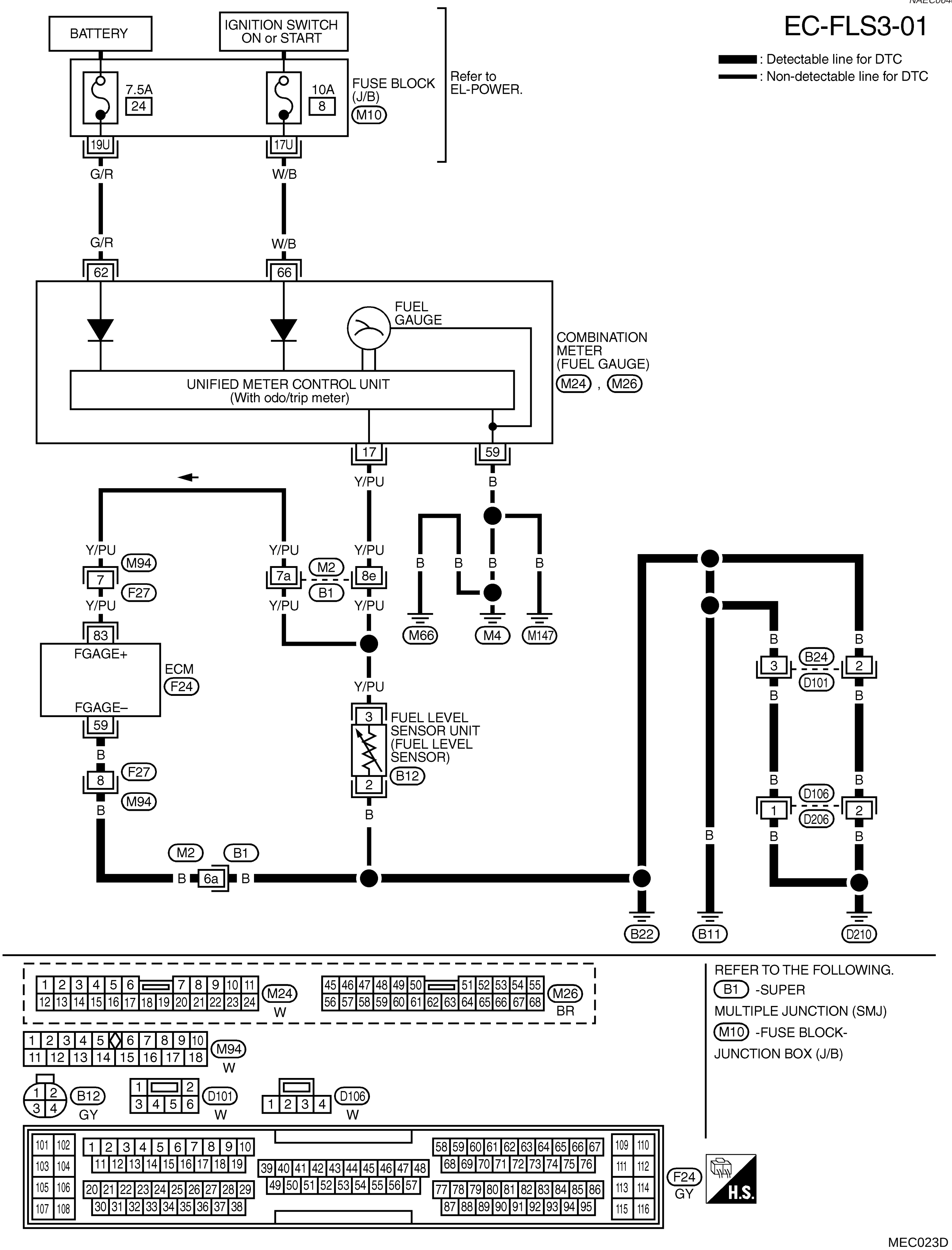
WITH GST

NAEC0635S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0640



GI
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Diagnostic Procedure

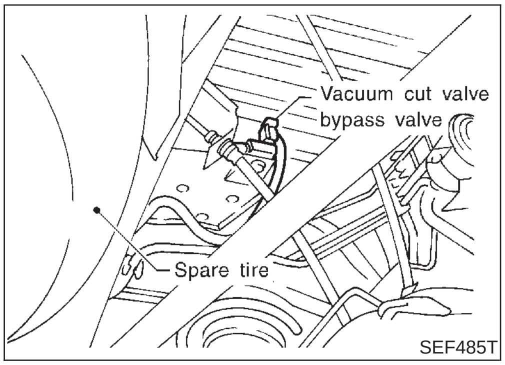
=NAEC0641

1	CHECK FUEL LEVEL SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch “OFF”. 2. Disconnect ECM harness connector. 3. Check harness continuity between ECM terminal 59 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 3.
NG ▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
1. Check the following. ● Harness connectors F27, M94 ● Harness connectors M2, B1 ● Harness for open between ECM and body ground	
▶	Replace open circuit or short to power in harness or connectors.

3	CHECK FUEL LEVEL SENSOR
Refer to EL-128, “Fuel Level Sensor Unit Check”. **OK or NG**	
OK ▶	GO TO 4.
NG ▶	Replace fuel level sensor unit.

4	CHECK INTERMITTENT INCIDENT
Refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-142 **OK or NG**	
▶	**INSPECTION END**



SEF485T

Description

=NAEC0346

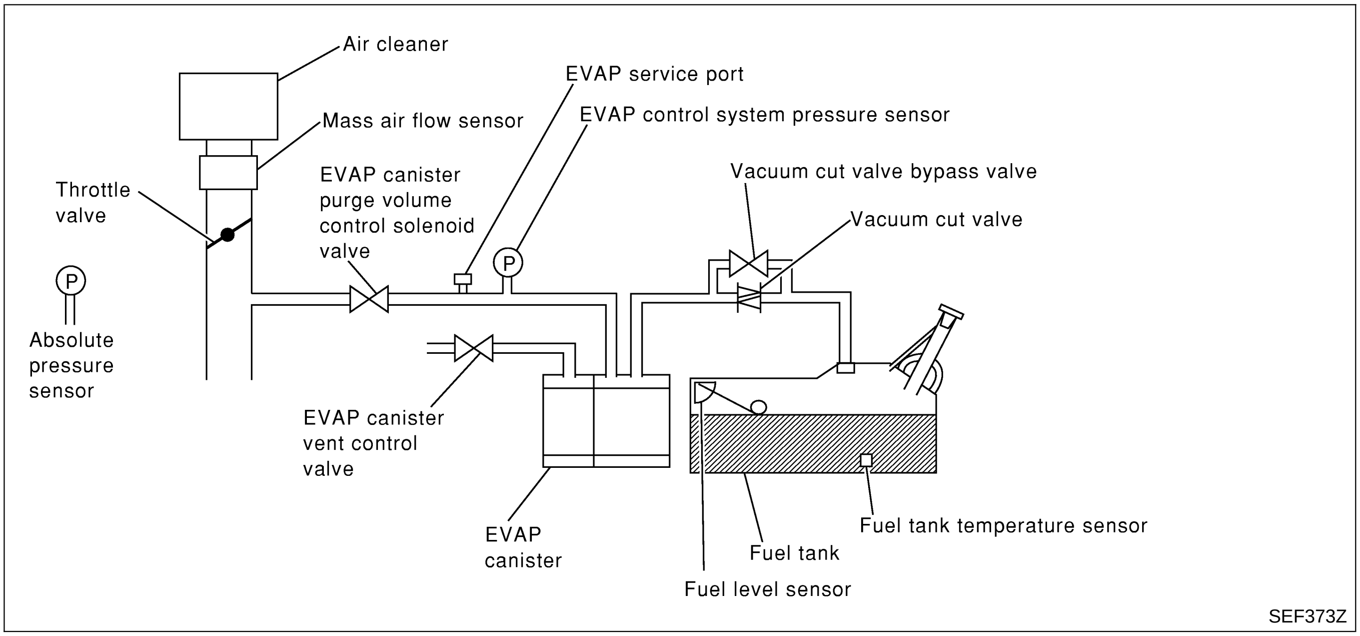
COMPONENT DESCRIPTION

NAEC0346S01

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM

NAEC0346S02



SEF373Z

CONSULT-II Reference Value in Data Monitor Mode

NAEC0347

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM Terminals and Reference Value

NAEC0681

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)
39	G/W	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

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

On Board Diagnosis Logic

NAEC0349

Malfunction is detected when an improper voltage signal is sent to ECM through vacuum cut valve bypass valve.

Possible Cause

NAEC0592

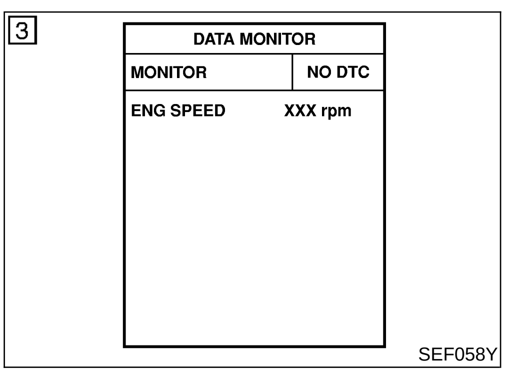
- Harness or connectors
  (The vacuum cut valve bypass valve circuit is open or shorted.)
- Vacuum cut valve bypass valve

DTC Confirmation Procedure

NAEC0350

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 speed.



SEF058Y

WITH CONSULT-II

NAEC0350S01

1) Turn ignition switch “ON”.
2) Select “DATA MONITOR” mode with CONSULT-II.
3) Start engine and wait at least 5 seconds.
4) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-590.

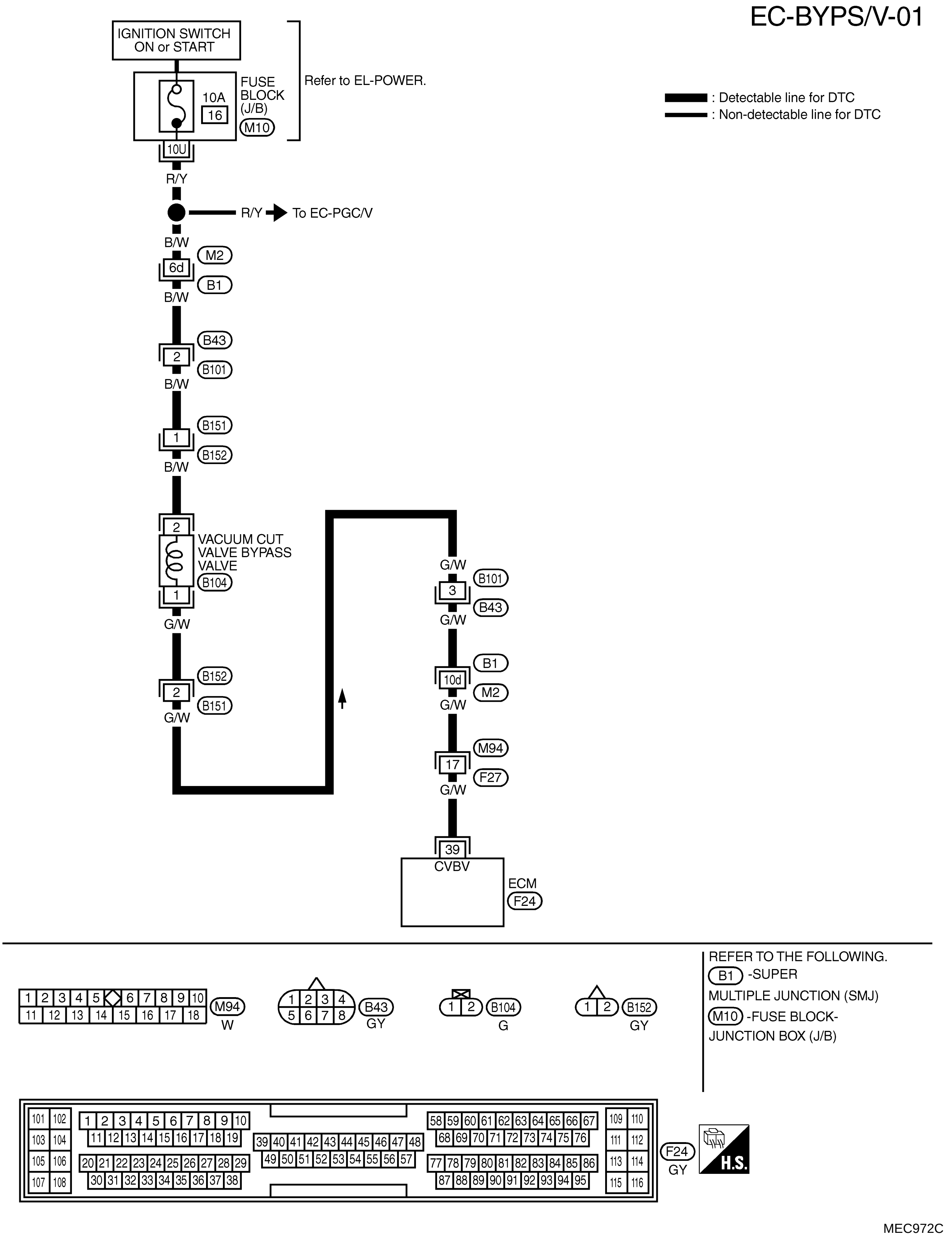
WITH GST

NAEC0350S02

Follow the procedure “WITH CONSULT-II” above.

Wiring Diagram

NAEC0351



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

Diagnostic Procedure

NAEC0352

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK VACUUM CUT VALVE BYPASS VALVE CIRCUIT

With CONSULT-II

1. Turn ignition switch “OFF” and then “ON”.
2. Select “VC/V BYPASS/V” in “ACTIVE TEST” mode with CONSULT-II.
3. Touch “ON/OFF” on CONSULT-II screen.

ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

SEF014Z

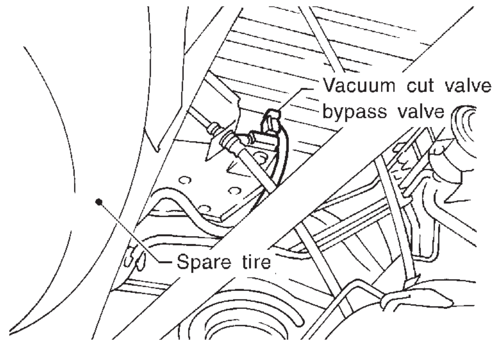
4. Make sure that clicking sound is heard from the vacuum cut valve bypass valve.

OK or NG

OK ▶	GO TO 7.
NG ▶	GO TO 3.

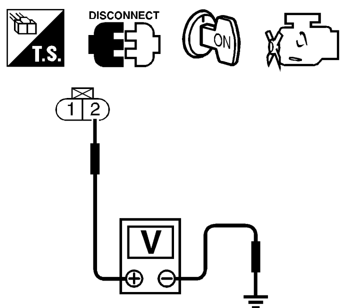
3	CHECK VACUUM CUT VALVE BYPASS VALUE POWER SUPPLY CIRCUIT

1. Turn ignition switch "OFF".
2. Disconnect vacuum cut valve bypass valve harness connector.



SEF485T

3. Turn ignition switch "ON".
4. Check voltage between vacuum cut valve bypass valve terminal 2 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF015Z

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M2, B1
- Fuse block (J/B) connector M10
- Harness connectors B43, B101 and B151, B152
- 10A fuse
- Harness for open or short between vacuum cut valve bypass valve and fuse

▶	Repair harness or connectors.

5	CHECK VACUUM CUT VALVE BYPASS 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 39 and vacuum cut valve bypass valve 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 7.
NG	▶	GO TO 6.

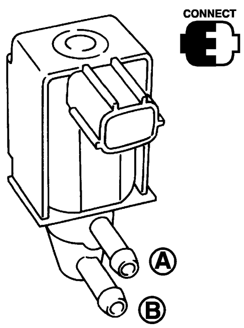
6	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B152, B151 and B101, B43
- Harness connectors B1, M2 and M94, F27
- Harness for open or short between vacuum cut valve bypass valve and ECM

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

7	CHECK VACUUM CUT VALVE BYPASS VALVE

With CONSULT-II
1. Reconnect harness disconnected connectors.
2. Turn ignition switch ON.
3. Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time under the following conditions.



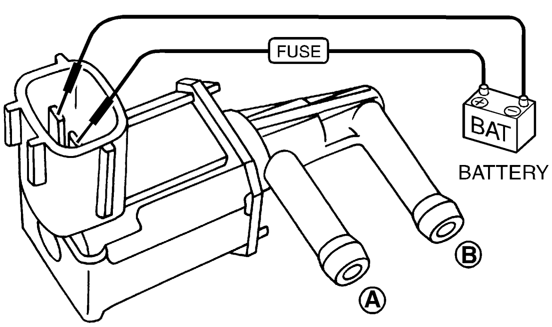
ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

Condition VC/V BYPASS/V	Air passage continuity between A and B
ON	Yes
OFF	No

Operation takes less than 1 second.

SEF016Z

Without CONSULT-II
Check air passage continuity and operation delay time 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

Operation takes less than 1 second.

SEF358X

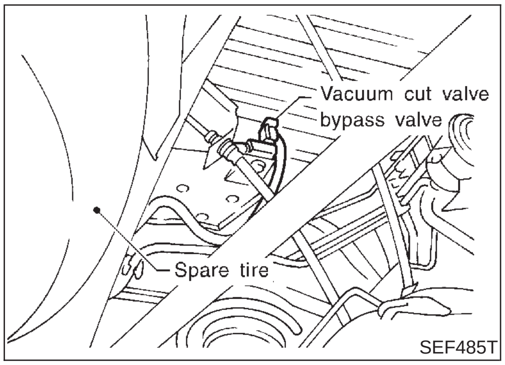
OK or NG

OK	▶	GO TO 8.
NG	▶	Replace vacuum cut valve bypass valve.

8	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

▶	**INSPECTION END**



Description

NAEC0353

COMPONENT DESCRIPTION

NAEC0353S01

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.

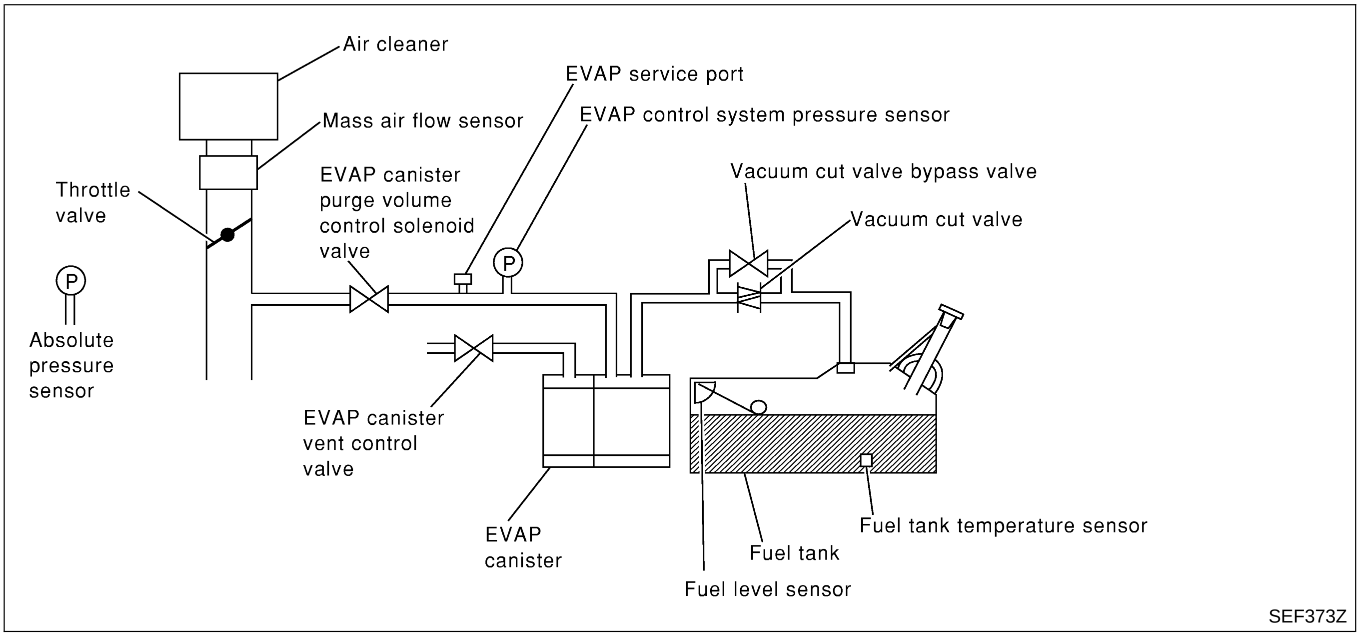
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.

The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.

The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM

NAEC0353S02



CONSULT-II Reference Value in Data Monitor Mode

NAEC0354

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM Terminals and Reference Value

NAEC0682

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)
39	G/W	Vacuum cut valve bypass valve	**[Ignition switch "ON"]**	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

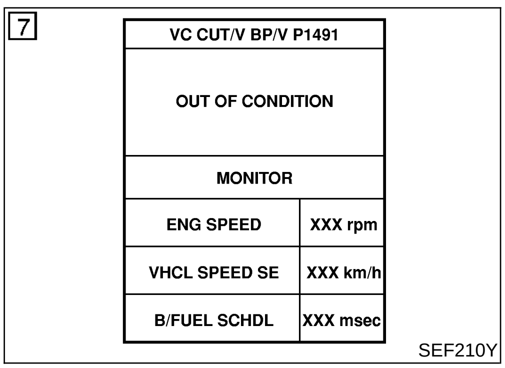
NAEC0356

Malfunction is detected when vacuum cut valve bypass valve does not operate properly.

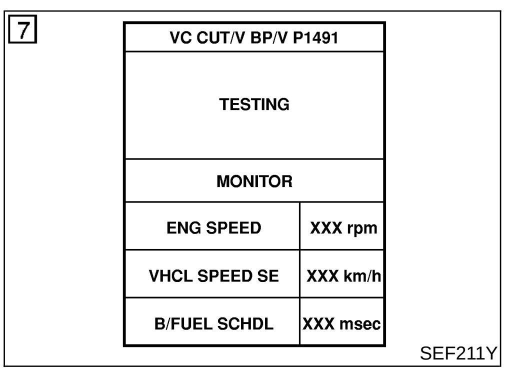
Possible Cause

NAEC0593

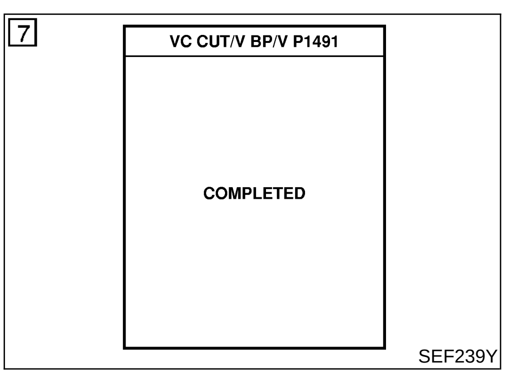
- Vacuum cut valve bypass valve
- Vacuum cut valve
- Bypass hoses for clogging
- EVAP control system pressure sensor and circuit
- EVAP canister vent control valve
- Hose between fuel tank and vacuum cut valve clogged
- Hose between vacuum cut valve and EVAP canister clogged
- EVAP canister
- EVAP purge port of fuel tank for clogging



SEF210Y



SEF211Y



SEF239Y

DTC Confirmation Procedure

NAEC0357

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:

For best results, perform test at a temperature of 5 to 30°C (41 to 86°F).

WITH CONSULT-II

NAEC0357S01

1) Turn ignition switch "ON".
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch "OFF" and wait at least 10 seconds.
4) Start engine and let it idle for at least 70 seconds.
5) Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-II.
6) Touch "START".
7) 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 at least 30 seconds.)

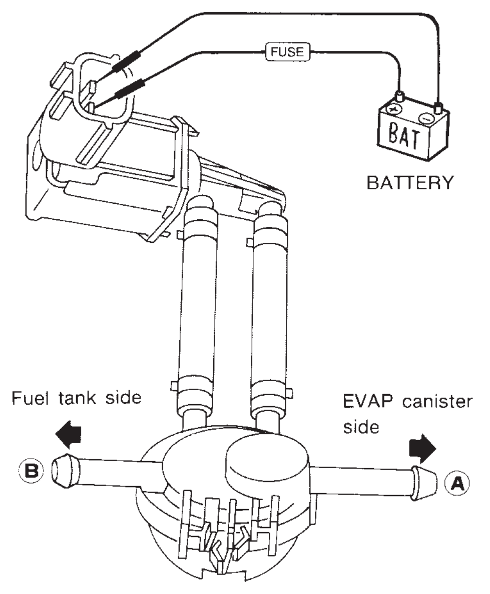
ENG SPEED	Idle speed or more
Selector lever	Suitable position
Vehicle speed	37 km/h (23 MPH) or more
B/FUEL SCHDL	1.3 - 10 msec

If "TESTING" is not displayed after 5 minutes, retry from step 3.

8) Make sure that "OK" is displayed after touching "SELF-DIAG

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

RESULTS". If "NG" is displayed, refer to "Diagnostic Procedure", EC-597.



SEF530Q

Overall Function Check

NAEC0358

Use this procedure to check the overall function of vacuum cut valve bypass valve. During this check, the 1st trip DTC might not be confirmed.

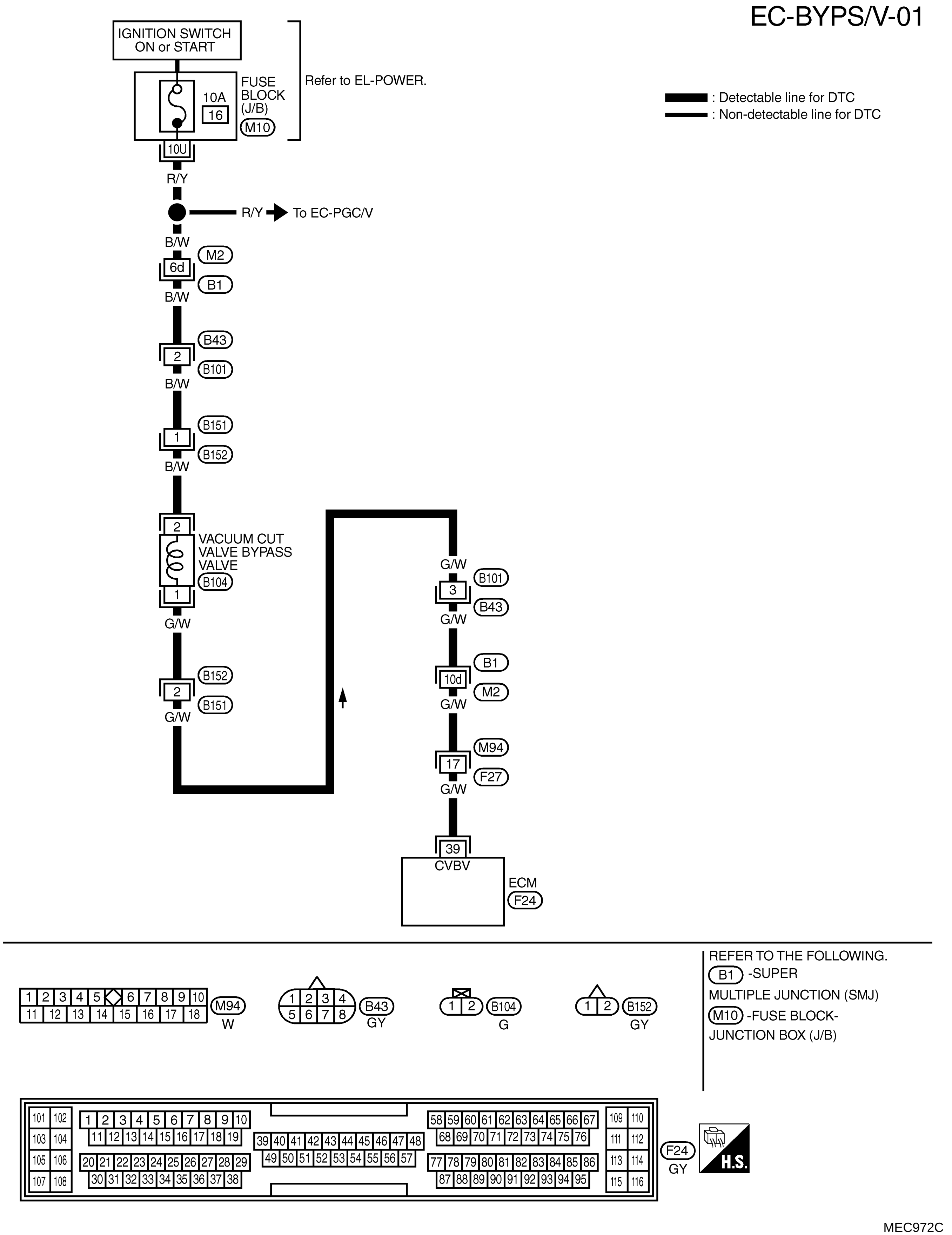
WITH GST

NAEC0358S01

1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
2) Apply vacuum to port **A** and check that there is no suction from port **B**.
3) Apply vacuum to port **B** and check that there is suction from port **A**.
4) Blow air in port **B** and check that there is a resistance to flow out of port **A**.
5) Supply battery voltage to the terminal.
6) Blow air in port **A** and check that air flows freely out of port **B**.
7) Blow air in port **B** and check that air flows freely out of port **A**.
8) If NG, go to "Diagnostic Procedure", EC-597.

Wiring Diagram

NAEC0359



Diagnostic Procedure

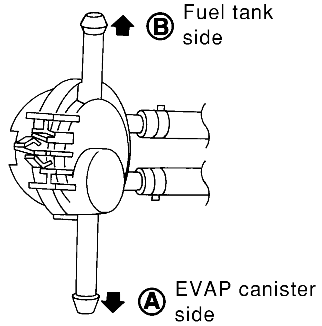
NAEC0360

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION

With CONSULT-II

1. Turn ignition switch “OFF”.
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port A and check that there is no suction from port B.
4. Apply vacuum to port B and check that there is suction from port A.
5. Blow air in port B and check that there is a resistance to flow out of port A.
6. Turn ignition switch “ON”.
7. Select “VC/V BYPASS/V” in “ACTIVE TEST” mode with CONSULT-II and touch “ON”.
8. Blow air in port A and check that air flows freely out of port B.
9. Blow air in port B and check that air flows freely out of port A.



ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

SEF017Z

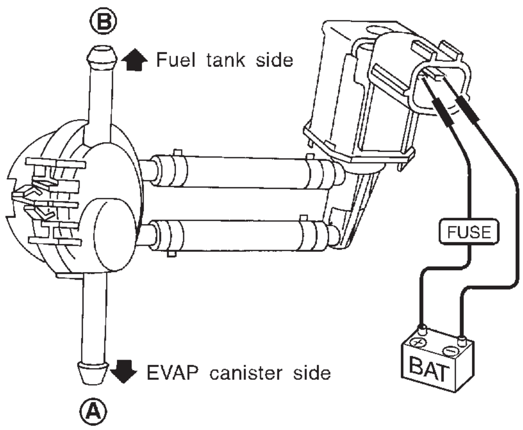
OK or NG

OK ▶	GO TO 4.
NG ▶	GO TO 5.

3	CHECK VACUUM CUT VALVE BYPASS VALVE OPERATION	

Without CONSULT-II

1. Turn ignition switch "OFF".
2. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
3. Apply vacuum to port A and check that there is no suction from port B.
4. Apply vacuum to port B and check that there is suction from port A.
5. Blow air in port B and check that there is a resistance to flow out of port A.
6. Disconnect vacuum cut valve bypass valve harness connector.
7. Supply battery voltage to the terminal.
8. Blow air in port A and check that air flows freely out of port B.
9. Blow air in port B and check that air flows freely out of port A.



SEF914U

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 7.

4	CHECK EVAP PURGE LINE	

Check EVAP purge line between EVAP canister and fuel tank for clogging or disconnection.

OK or NG

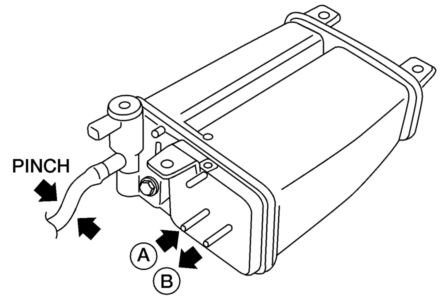
OK	▶	GO TO 5.
NG	▶	Repair it.

5	CHECK EVAP PURGE PORT	

Check EVAP purge port of fuel tank for clogging.

OK or NG

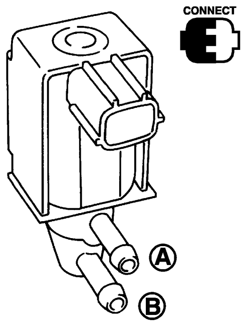
OK	▶	GO TO 6.
NG	▶	Clean EVAP purge port.

6	CHECK EVAP CANISTER	
1. Pinch the fresh air hose. 2. Blow air into port **A** and check that it flows freely out of port **B**.  AEC630A **OK or NG**		
OK	▶	GO TO 12.
NG	▶	Replace EVAP canister.

7	CHECK BYPASS HOSE	
Check bypass hoses for clogging. **OK or NG**		
OK	▶	GO TO 8.
NG	▶	Repair or replace hoses.

8	CHECK VACUUM CUT VALVE BYPASS VALVE

With CONSULT-II
1. Perform "VC/V BYPASS/V" in "ACTIVE TEST" mode.
2. Check air passage continuity and operation delay time under the following conditions.



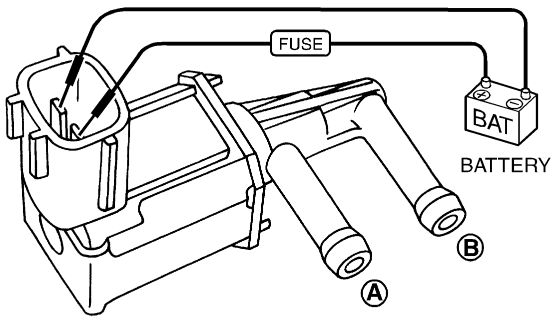
ACTIVE TEST	
VC/V BYPASS/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 MNTR (B1)	LEAN
HO2S1 MNTR (B2)	LEAN
THRTL POS SEN	XXX V

Condition VC/V BYPASS/V	Air passage continuity between A and B
ON	Yes
OFF	No

Operation takes less than 1 second.

SEF016Z

Without CONSULT-II
Check air passage continuity and operation delay time 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

Operation takes less than 1 second.

SEF358X

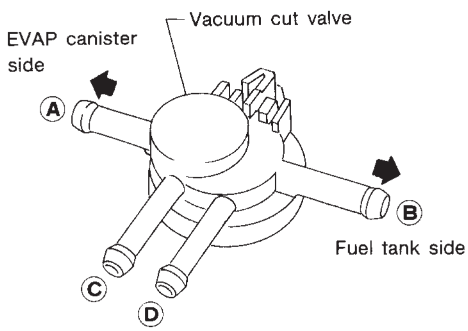
OK or NG

OK	▶	GO TO 9.
NG	▶	Replace vacuum cut valve bypass valve.

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

9	CHECK VACUUM CUT VALVE	

Check vacuum cut valve as follows:



SEF379Q

a. Plug port **C** and **D** with fingers.
b. Apply vacuum to port **A** and check that there is no suction from port **B**.
c. Apply vacuum to port **B** and check that there is suction from port **A**.
d. Blow air in port **B** and check that there is a resistance to flow out of port **A**.
e. Open port **C** and **D**.
f. Blow air in port **A** check that air flows freely out of port **C**.
g. Blow air in port **B** check that air flows freely out of port **D**.

OK or NG

OK	▶	GO TO 10.
NG	▶	Replace vacuum cut valve.

10	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR HOSE

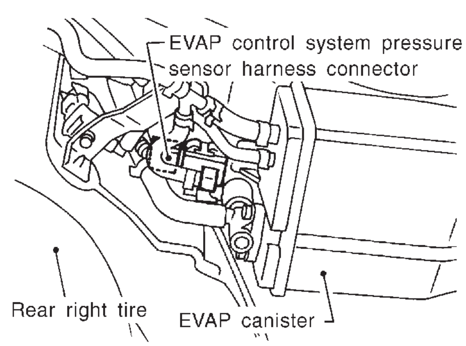
1. Turn ignition switch "OFF".
2. Check disconnection or improper connection of hose connected to EVAP control system pressure sensor.

OK or NG

OK	▶	GO TO 11.
NG	▶	Repair or replace.

11	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.



SEF495R

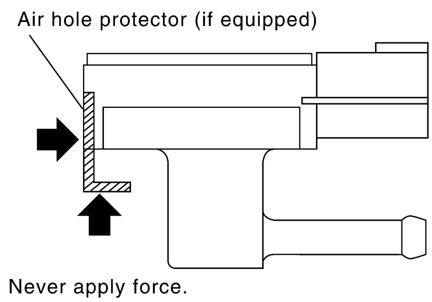
2. Check connectors for water.
   Water should not exist.

OK or NG

OK	▶	GO TO 12.
NG	▶	Replace EVAP control system pressure sensor.

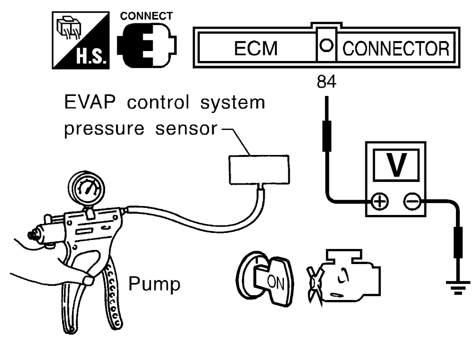
12	CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector connected.
   CAUTION:
   - **Never apply force to the air hole protector of the sensor if equipped.**



SEF799W

2. Remove hose from EVAP control system pressure sensor.
3. Turn ignition switch "ON".
4. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
   CAUTION:
   - **Always calibrate the vacuum pump gauge when using it.**
   - **Do not apply below −20 kPa (−150 mmHg, −5.91 inHg) or over 20 kPa (150 mmHg, 5.91 inHg) of pressure.**
5. Check input voltage between ECM terminal 84 and ground.



Pressure (Relative to atmospheric pressure)	Voltage V
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
–9.3 kPa (–70 mmHg, –2.76 inHg)	0.4 - 0.6

SEF342X

CAUTION:
- **Discard and EVAP control system pressure 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.**

OK or NG

OK	▶	GO TO 13.
NG	▶	Replace EVAP control system pressure sensor.

13	CHECK RUBBER TUBE FOR CLOGGING

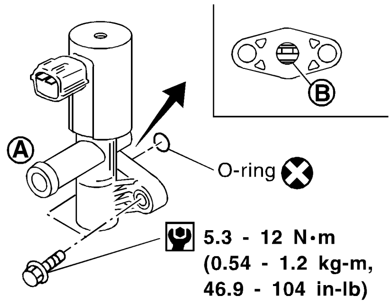
1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK	▶	GO TO 14.
NG	▶	Clean the rubber tube using an air blower.

14	CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion **B** of EVAP canister vent control valve for being rusted.



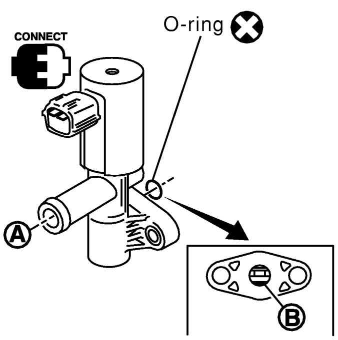
SEF337X

OK or NG

OK	▶	GO TO 15.
NG	▶	Replace EVAP canister vent control valve.

15	CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-II
1. Reconnect harness disconnected connectors.
2. Turn ignition switch ON.
3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
4. Check air passage continuity and operation delay time.



ACTIVE TEST	
VENT CONTROL/V	OFF
MONITOR	
ENG SPEED	XXX rpm
A/F ALPHA-B1	XXX %
A/F ALPHA-B2	XXX %
HO2S1 (B1)	XXX V
HO2S1 (B2)	XXX V
THRTL POS SEN	XXX V

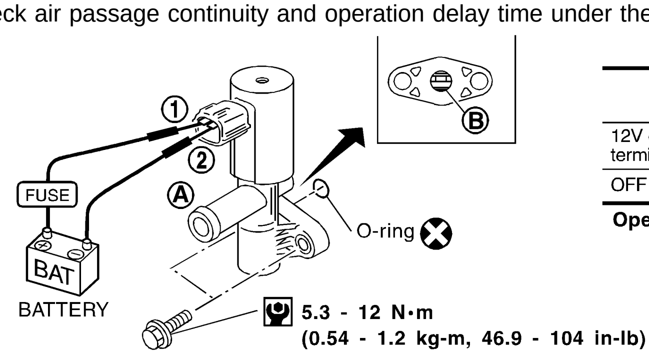
Condition VENT CONTROL/V	Air passage continuity between A and B
ON	No
OFF	Yes

Operation takes less than 1 second.

SEF991Y

Without CONSULT-II

Check air passage continuity and operation delay time under the following conditions.



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

Operation takes less than 1 second.

SEF339X

Make sure new O-ring is installed properly.

OK or NG

OK	▶	GO TO 17.
NG	▶	GO TO 16.

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

16	CHECK EVAP CANISTER VENT CONTROL VALVE-III	
1. Clean the air passage (Portion **A** to **B**) of EVAP canister vent control valve using an air blower. 2. Perform the Test No. 15 again. **OK or NG**		
OK	▶	GO TO 17.
NG	▶	Replace EVAP canister vent control valve.

17	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

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Component Description

NAEC0361

The malfunction information related to A/T (Automatic Transmission) is transferred through the line (circuit) from TCM (Transmission control module) to ECM. Therefore, be sure to erase the malfunction information such as DTC not only in TCM (Transmission control module) but also ECM after the A/T related repair.

On Board Diagnosis Logic

NAEC0363

Malfunction is detected when an incorrect signal from TCM (Transmission control module) is sent to ECM.

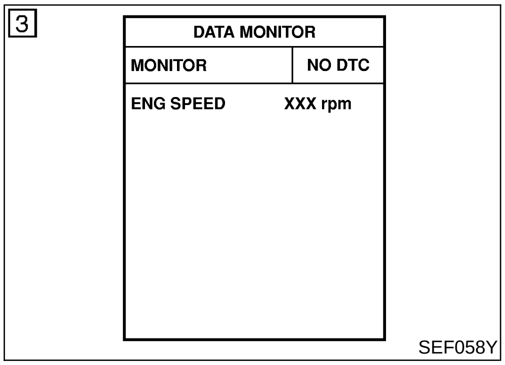
Possible Cause

NAEC0594

- Harness or connectors
  [The communication line circuit between ECM and TCM (Transmission control module) is open or shorted.]
- Dead (Weak) battery
- TCM (Transmission control module)

DTC Confirmation Procedure

NAEC0364



SEF058Y

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 at idle.

WITH CONSULT-II

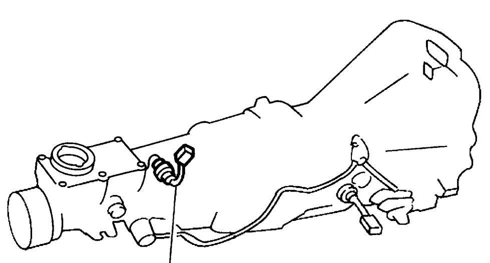
NAEC0364S01

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT-II.
3) Start engine and wait at least 40 seconds.
4) If 1st trip DTC is detected, go to "DTC P0600 A/T COMMUNICATION LINE Diagnostic Procedure", EC-445.

WITH GST

NAEC0364S02

Follow the procedure "WITH CONSULT-II" above.



Component Description

NAEC0367

When the gear position is “P” (A/T models only) or “N”, park/neutral position (PNP) switch is “ON”.
ECM detects the position because the continuity of the line (the “ON” signal) exists.
For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0368

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: “P” or “N”	ON
		Except above	OFF

ECM Terminals and Reference Value

NAEC0683

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

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

TERMI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
44	L (A/T)	PNP switch	**[Ignition switch “ON”]** ● Gear position is “P” or “N” (A/T models).	Approximately 0V
			[Ignition switch “ON”] ● Except the above gear position	BATTERY VOLTAGE (11 - 14V)

On Board Diagnosis Logic

NAEC0370

Malfunction is detected when the signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.

Possible Cause

NAEC0595

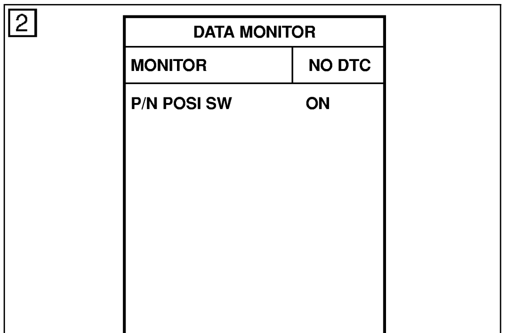
- Harness or connectors
  [The park/neutral position (PNP) switch circuit is open or shorted.]
- Park/neutral position (PNP) switch

DTC Confirmation Procedure

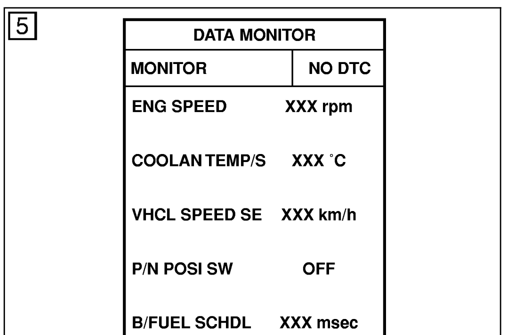
NAEC0371

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.



SEF212Y



SEF213Y

WITH CONSULT-II

NAEC0371S01

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.

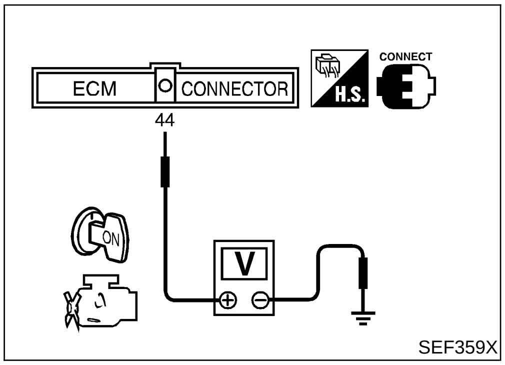
Position (Selector lever)	Known-good signal
“N” and “P” position	ON
Except the above position	OFF

If NG, go to “Diagnostic Procedure”, EC-610.
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	1,500 - 2,500 rpm (A/T) 1,800 - 2,800 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.6 - 12 msec
VHCL SPEED SE	70 - 100 km/h (43 - 62 MPH)
Selector lever	Suitable position

6) If 1st trip DTC is detected, go to “Diagnostic Procedure”, EC-610.



Overall Function Check

=NAEC0372

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

NAEC0372S01

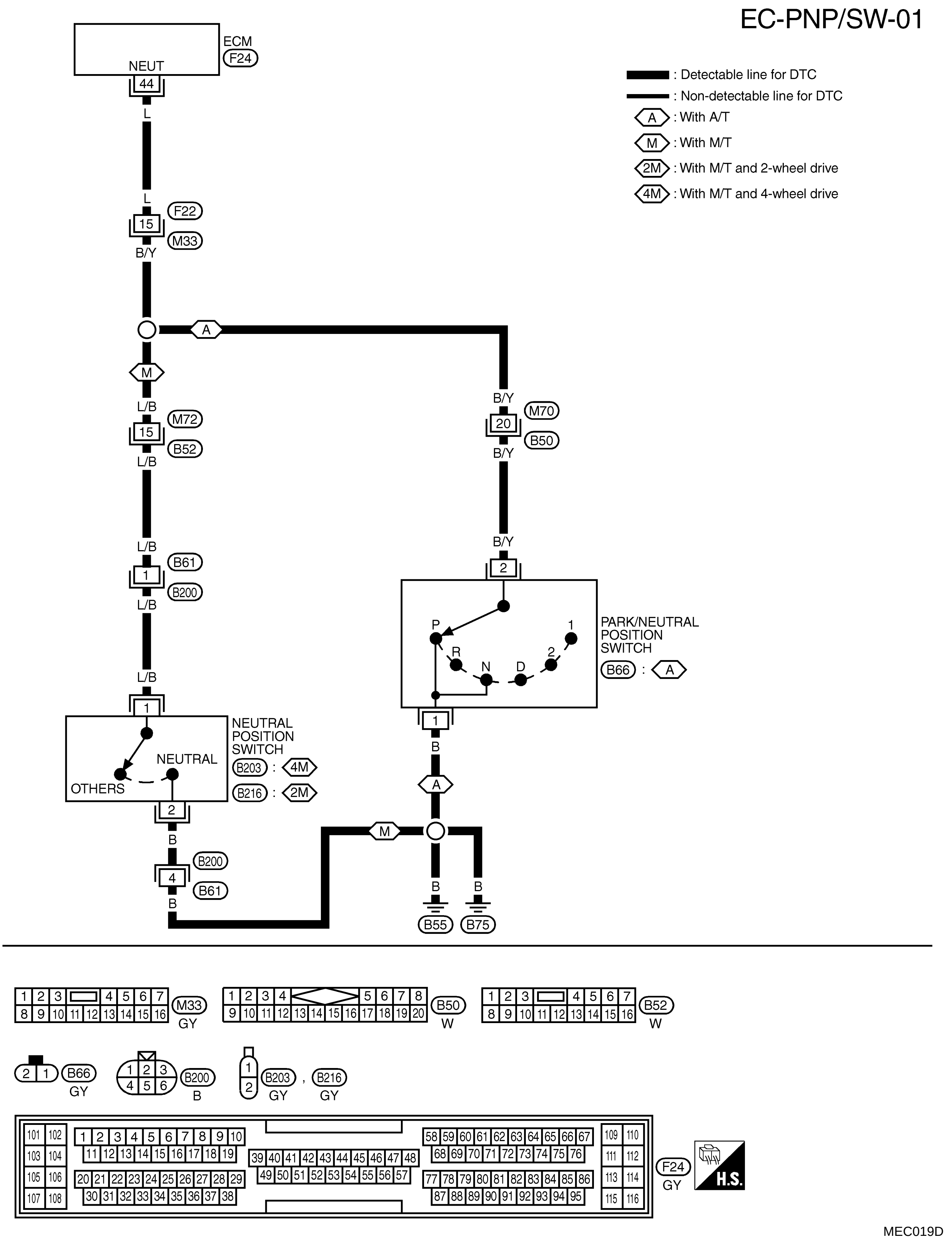
1) Turn ignition switch “ON”.
2) Check voltage between ECM terminal 44 and body ground under the following conditions.

Condition (Gear position)	Voltage V (Known-good data)
“P” and “N” position	Approx. 0
Except the above position	Battery voltage

3) If NG, go to “Diagnostic Procedure”, EC-610.

Wiring Diagram

NAEC0373



Diagnostic Procedure

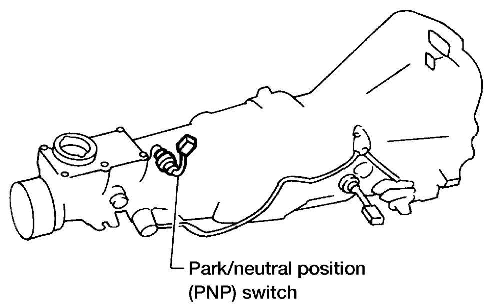
NAEC0374

FOR M/T MODELS

NAEC0374S03

1	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



3. Check harness continuity between PNP switch terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 2.
NG	▶	Repair open circuit or short to power in harness or connectors.

2	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 44 and PNP switch 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.

3	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH

Refer to MT-6, MT-7, "Position Switch Check".

OK or NG

OK	▶	GO TO 4.
NG	▶	Replace park/neutral position (PNP) switch.

4	CHECK INTERMITTENT INCIDENT

Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

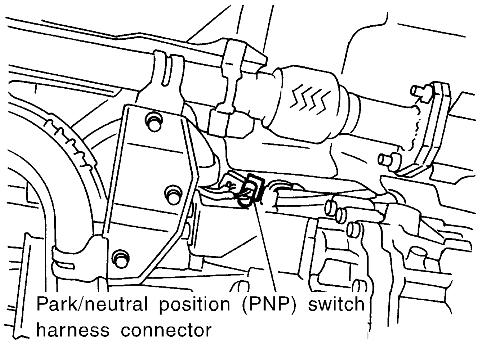
	▶	**INSPECTION END**

FOR A/T MODELS

=NAEC0374S02

1	CHECK PNP SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.



SEF011SA

3. Check harness continuity between PNP switch terminal 1 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

OK	▶	GO TO 3.
NG	▶	GO TO 2.

2	DETECT MALFUNCTIONING PART
Check harness for open between park/neutral position (PNP) switch and engine ground.	
▶	Repair open circuit or short to power in harness or connectors.

3	CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 44 and PNP switch 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 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F22, M33 and M70, B50
- Harness for open or short between ECM and park/neutral position (PNP) switch

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

5	CHECK PARK/NEUTRAL POSITION (PNP) SWITCH
Refer to AT-102, "Diagnostic Procedure".	

OK or NG

OK	▶	GO TO 6.
NG	▶	Replace park/neutral position (PNP) switch.

6	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

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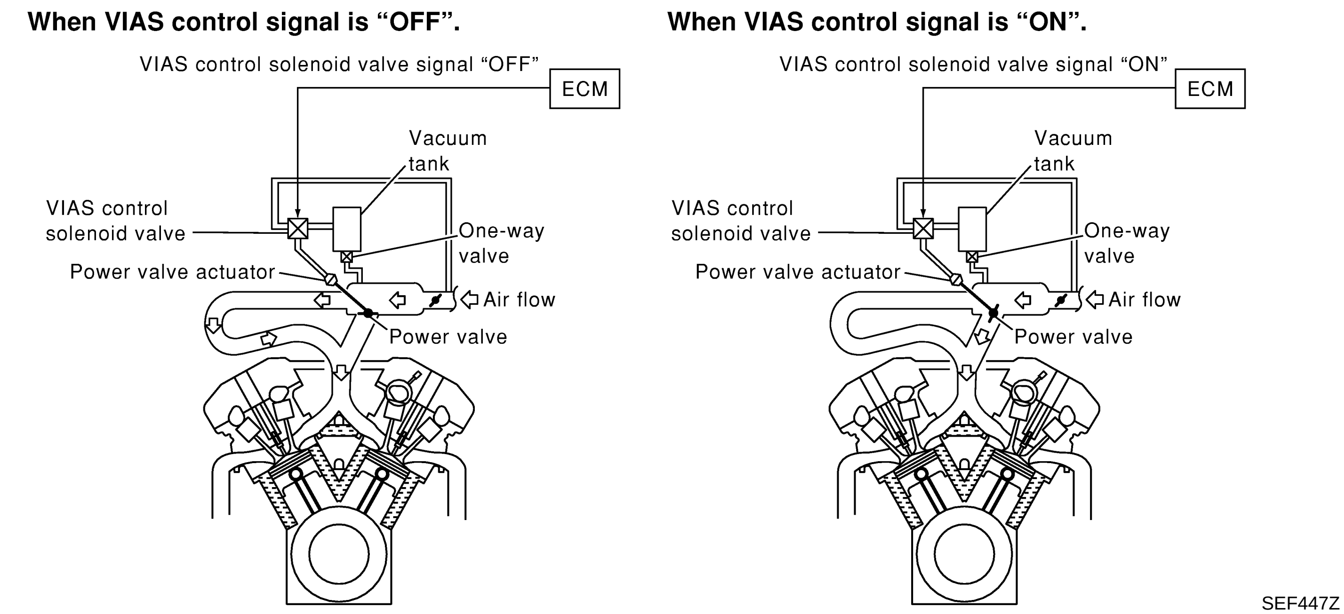
Description

NAEC0596

SYSTEM DESCRIPTION

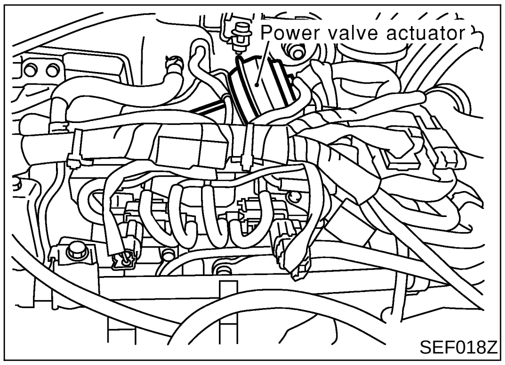
NAEC0596S01

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		
Closed throttle position	Throttle valve idle position		
Ignition switch	Start signal		
Crankshaft position sensor (POS)	Engine speed (POS signal)		
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Engine coolant temperature sensor	Engine coolant temperature		



SEF447Z

When the engine is running at low or medium speed, the 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 sends the signal to the VIAS control solenoid valve. 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 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.



SEF018Z

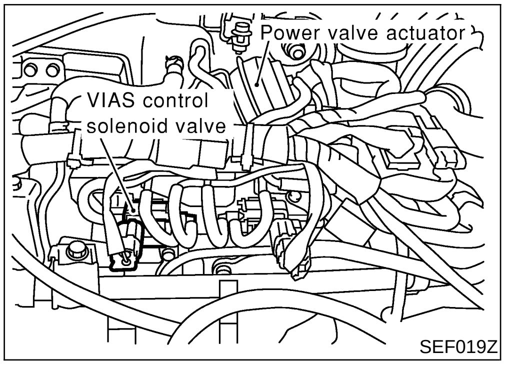
COMPONENT DESCRIPTION

NAEC0596S02

Power Valve

NAEC0596S0201

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.



SEF019Z

VIAS Control Solenoid Valve

NAEC0596S0202

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 cut. 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

NAEC0684

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

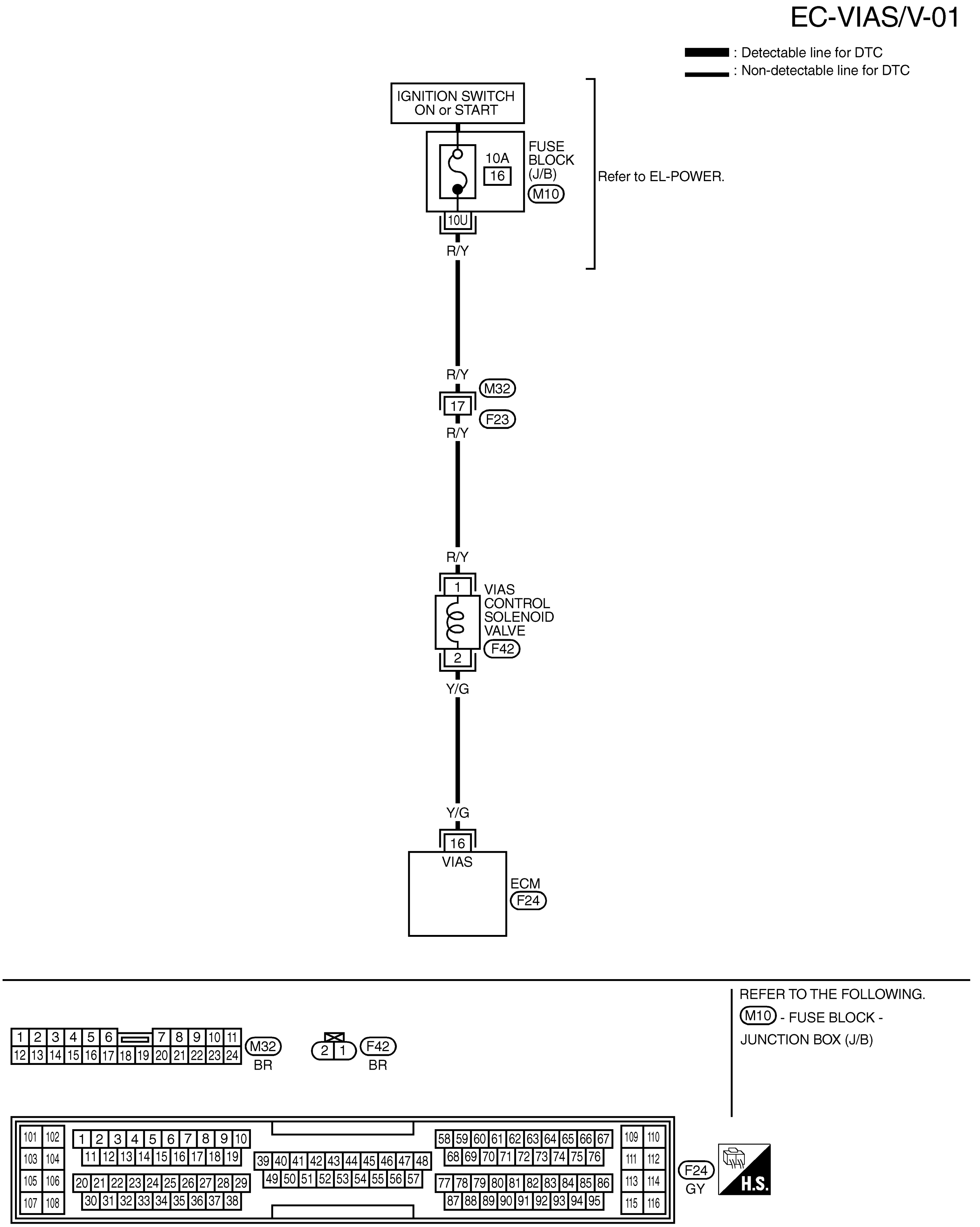
CAUTION:

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)
16	Y/G	VIAS control solenoid valve	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Engine speed is above 5,000 rpm.	0 - 1.0V

Wiring Diagram

NAEC0597



MEC990C

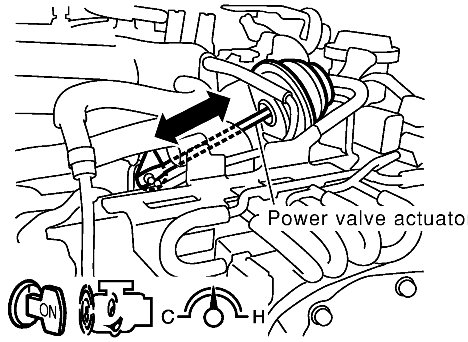
Diagnostic Procedure

NAEC0598

1	CHECK OVERALL FUNCTION

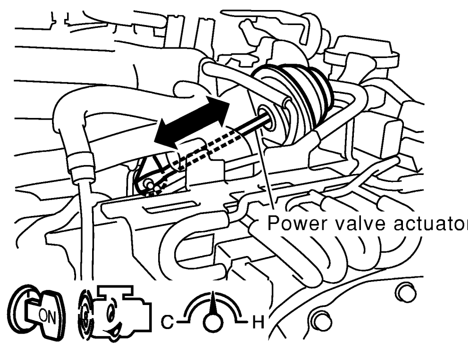
With CONSULT-II
1. Start engine and warm it up to normal operating temperature.
2. Perform “VIAS SOL VALVE” in “ACTIVE TEST” mode with CONSULT-II.
3. Turn VIAS control solenoid valve “ON” and “OFF”, and make sure that power valve actuator rod moves.

ACTIVE TEST	
VIAS SOL VALVE	OFF
MONITOR	
ENG SPEED	XXX rpm
IACV-AAC/V	XXX step



SEC304C

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.



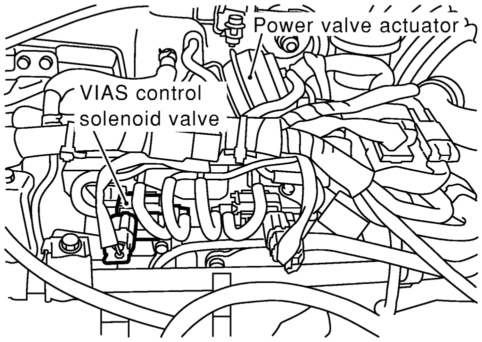
SEF021Z

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

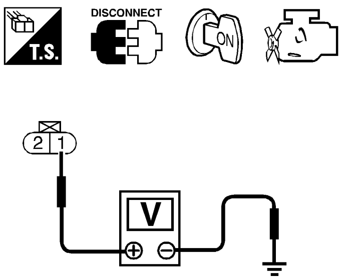
2	CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Stop engine.
2. Disconnect VIAS control solenoid valve harness connector.



SEF019Z

3. Turn ignition switch "ON".
4. Check voltage between terminal 1 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF603X

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M32, F23
- 10A fuse
- Harness continuity between fuse and VIAS control solenoid valve

	▶	Repair harness or connectors.

4	CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

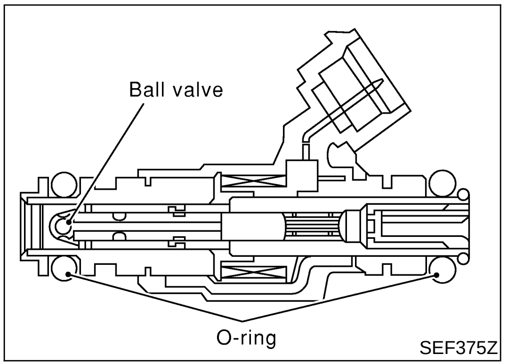
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 16 and terminal 2. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to ground and short to power.

OK or NG

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

5	**RETEST OVERALL FUNCTION**	
1. Reconnect harness connectors disconnected. 2. Perform Test No. 1 again. **OK or NG**		
OK	▶	**INSPECTION END**
NG	▶	GO TO 6.

6	**CHECK INTERMITTENT INCIDENT**	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142. **OK or NG**		
OK	▶	Replace VIAS control solenoid valve as intake manifold collector assembly.
NG	▶	Repair or replace harness or connectors.



Component Description

NAEC0383

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

NAEC0384

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INJ PULSE-B2 INJ PULSE-B1	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	2.4 - 3.2 msec
		2,000 rpm	1.9 - 2.8 msec
B/FUEL SCHDL	ditto	Idle	2.0 - 3.2 msec
		2,000 rpm	1.4 - 2.6 msec

ECM Terminals and Reference Value

NAEC0685

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

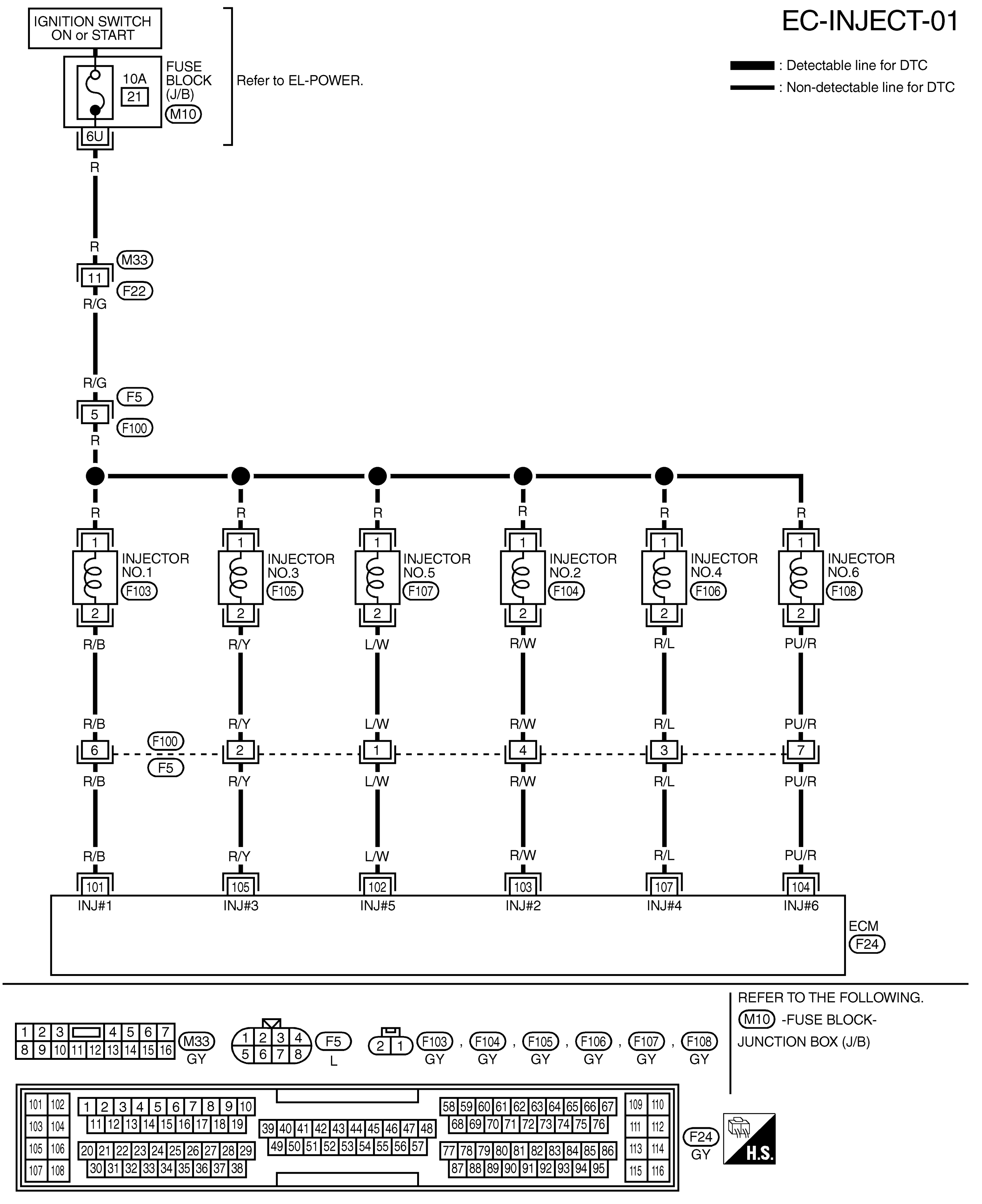
CAUTION:

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)
101 102 103 104 105 107	R/B L/W R/W PU/R R/Y R/L	Injector No. 1 Injector No. 5 Injector No. 2 Injector No. 6 Injector No. 3 Injector No. 4	**[Engine is running]** ● Idle speed	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

NAEC0386



MEC974C

Diagnostic Procedure

NAEC0387

1	INSPECTION START
Turn ignition switch to “START”. **Is any cylinder ignited?** **Yes or No**	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-II.

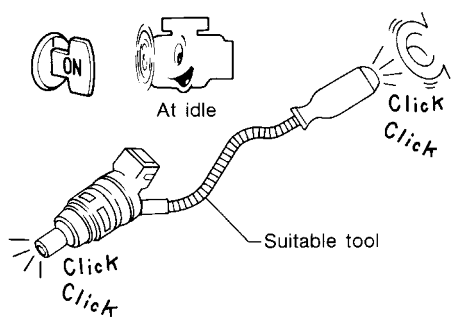
ACTIVE TEST	
POWER BALANCE	
MONITOR	
ENG SPEED	XXX rpm
MAS A/F SE-B1	XXX V
IACV-AAC/V	XXX step

SEF190Y

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

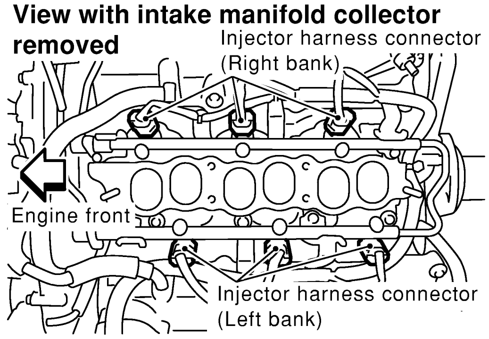
Clicking noise should be heard.

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 3.

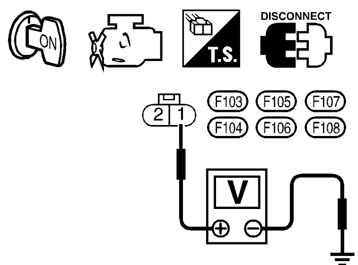
3	CHECK INJECTOR POWER SUPPLY CIRCUIT	

1. Turn ignition switch "OFF".



SEF023Z

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



Voltage: Battery voltage

SEF364Z

OK or NG

OK	▶	GO TO 5.
NG	▶	GO TO 4.

4	DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M33, F22
- Harness connectors F5, F100
- Fuse block (J/B) connector M10
- 10A fuse
- Harness for open or short between injector and fuse

	▶	Repair 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 2 and ECM terminals 103, 104, 107, 101, 105, 102. 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.

6	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors F100, F5 ● Harness for open or short between harness connector F5 and ECM ● Harness for open or short between harness connector F100 and injector	
▶	Repair open circuit or short to ground or short to power in harness or connectors.

7	CHECK SUB-HARNESS CIRCUIT FOR OPEN AND SHORT
1. Remove intake manifold collector. 2. Disconnect injector harness connectors. 3. Check harness continuity between the following terminals. Refer to Wiring Diagram.	

Harness connector F100	Injector F103, F105, F107, F104, F106, F108
5	1
6, 2, 1, 4, 3, 7	2

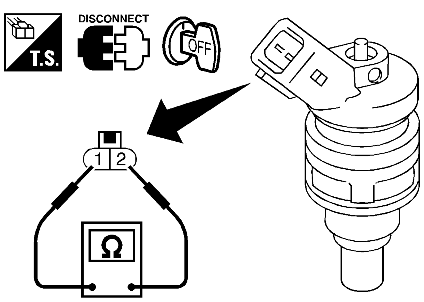
MTBL0483

Continuity should exist.

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 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)]

SEF964XB

OK or NG

OK ▶	GO TO 9.
NG ▶	Replace injector.

9	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

CONSULT-II Reference Value in Data Monitor Mode

NAEC0388

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

ECM Terminals and Reference Value

NAEC0688

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

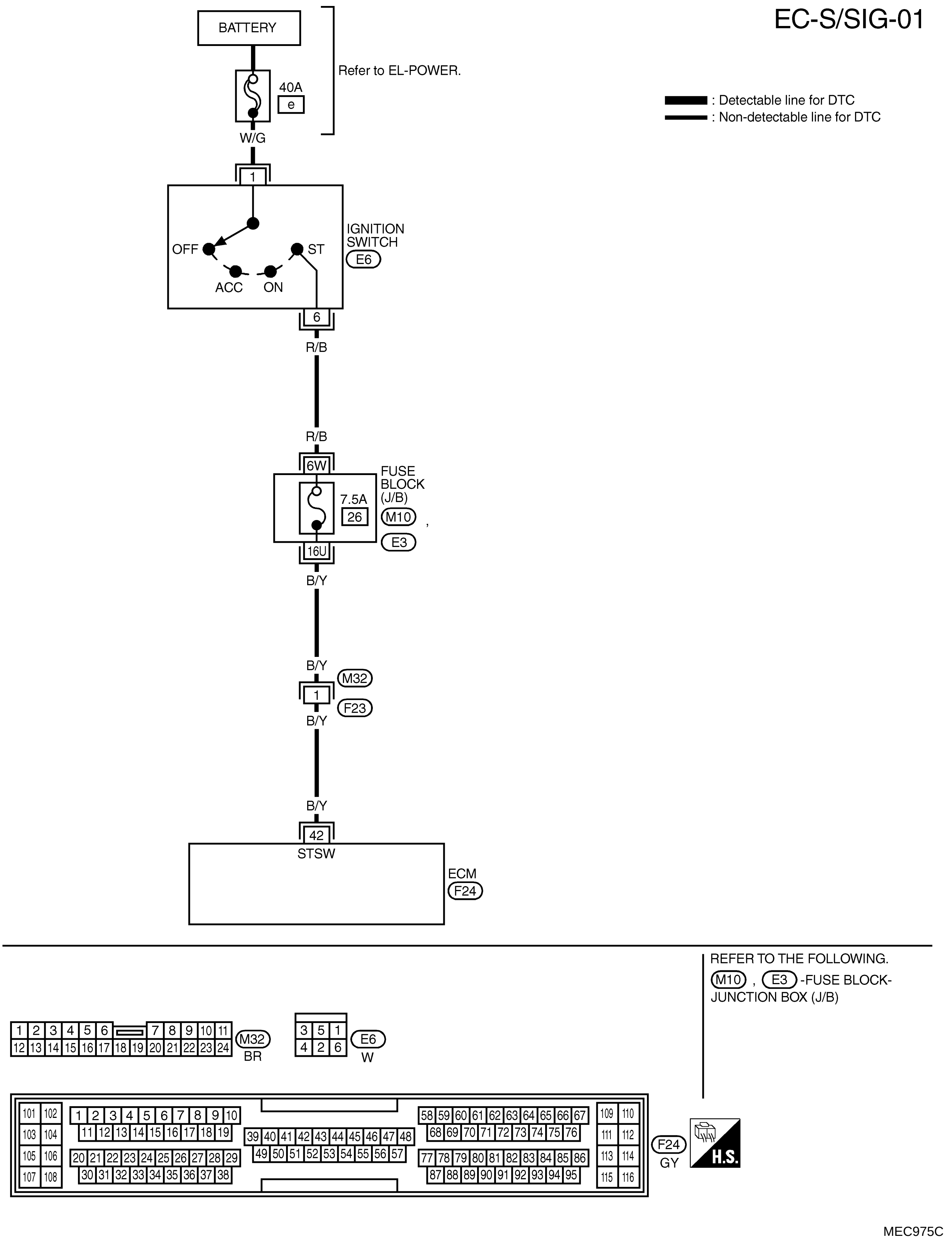
CAUTION:

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)
42	B/Y	Start signal	**[Ignition switch "ON"]**	Approximately 0V
			[Ignition switch "START"]	9 - 12V

Wiring Diagram

=NAEC0390



Diagnostic Procedure

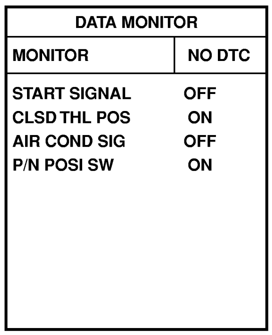
NAEC0391

1	INSPECTION START
Do you have CONSULT-II?	
Yes or No	
Yes ▶	GO TO 2.
No ▶	GO TO 3.

2	CHECK OVERALL FUNCTION

With CONSULT-II

1. Turn ignition switch “ON”.
2. Check “START SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.



Condition	“START SIGNAL”
Ignition switch “ON”	OFF
Ignition switch “START”	ON

SEF072Y

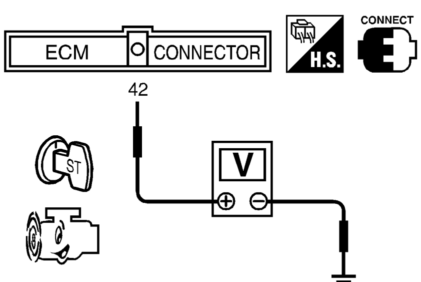
OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II

Check voltage between ECM terminal 42 and ground under the following conditions.



Condition	Voltage
Ignition switch “START”	Battery voltage
Other positions	Approximately 0V

SEF362X

OK or NG

OK ▶	**INSPECTION END**
NG ▶	GO TO 4.

4	CHECK STARTING SYSTEM

Turn ignition switch “OFF”, then turn it to “START”.
Does starter motor operate?

Yes or No

Yes ▶	GO TO 5.
No ▶	Refer to SC-10, “STARTING SYSTEM”.

5	CHECK FUSE	
1. Turn ignition switch "OFF". 2. Disconnect 7.5A fuse. 3. Check if 7.5A fuse is OK. **OK or NG**		
OK	▶	GO TO 6.
NG	▶	Replace 7.5A fuse.

6	CHECK START SIGNAL INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT	
1. Disconnect ECM harness connector. 2. Disconnect ignition switch harness connector. 3. Check harness continuity between ECM terminal 42 and fuse block, ignition switch and fuse block. 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 M32, F23 ● Fuse block (J/B) connectors M10, E3 ● Harness for open or short between ignition switch and fuse ● Harness for open or short between ECM and fuse		
	▶	Repair open circuit or short to ground or short to power in harness or connectors.

8	CHECK INTERMITTENT INCIDENT	
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.		
	▶	**INSPECTION END**

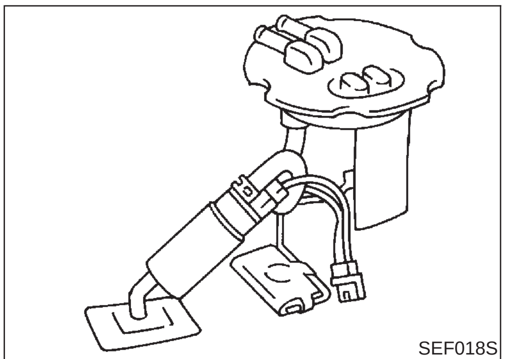
System Description

NAEC0392

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed (POS signal)	Fuel pump control	Fuel pump relay
Crankshaft position sensor (REF)	Engine speed (REF signal)		
Ignition switch	Start signal		

The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 120° signal from the crankshaft position sensor (REF), 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 1 second.
Engine running and cranking	Operates.
When engine is stopped	Stops in 1.5 seconds.
Except as shown above	Stops.



SEF018S

Component Description

NAEC0393

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

NAEC0394

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	• Ignition switch is turned to ON. (Operates for 1 second.) • Engine running and cranking	ON
	Except as shown above	OFF

ECM Terminals and Reference Value

=NAEC0686

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

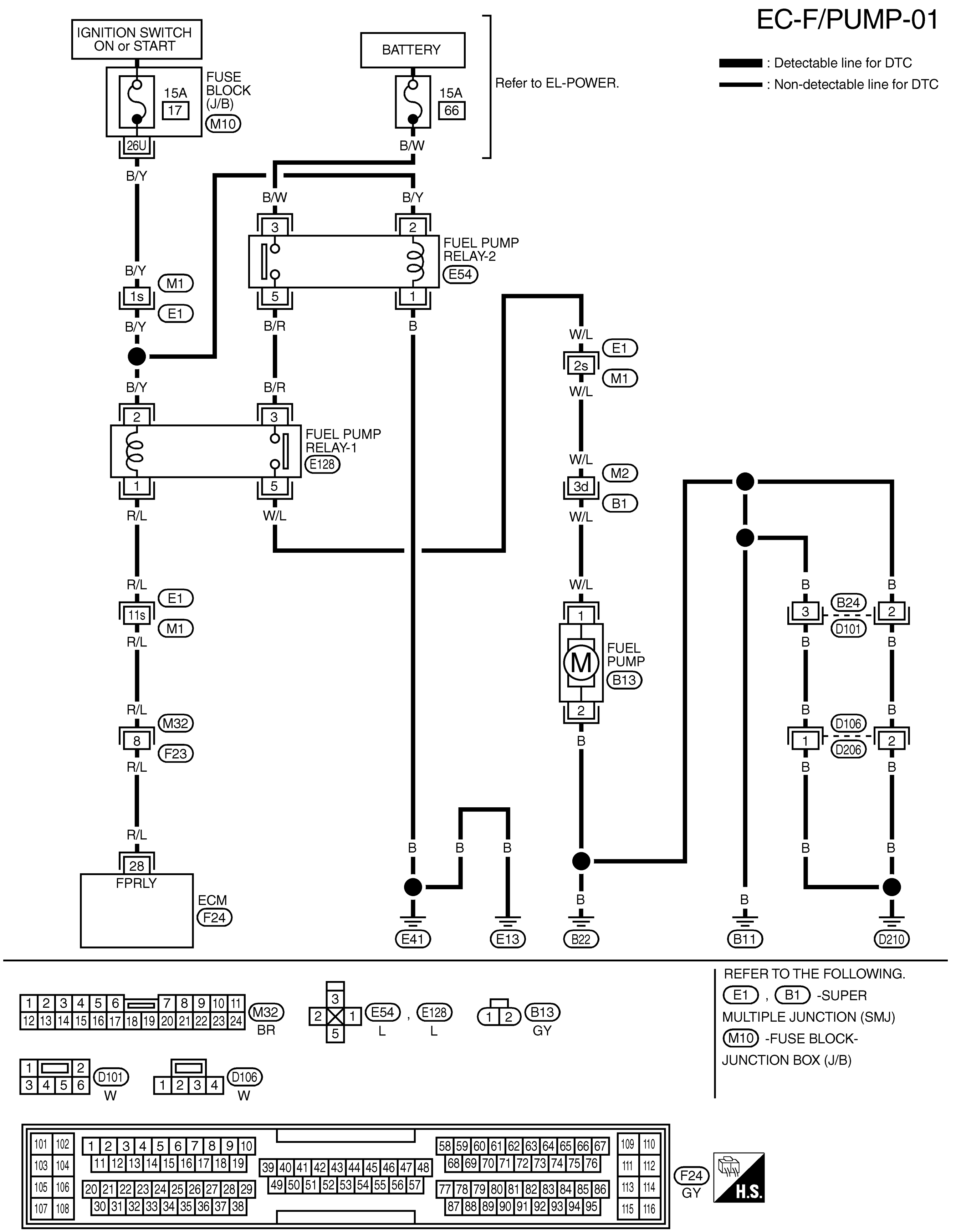
CAUTION:

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)
28	R/L	Fuel pump relay	**[Ignition switch "ON"]** ● For 1 second after turning ignition switch "ON" **[Engine is running]**	0 - 1.5V
			[Ignition switch "ON"] ● 1 second passed after turning ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)

Wiring Diagram

NAEC0396



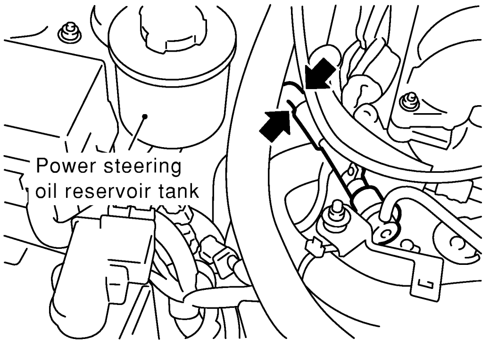
MEC976C

Diagnostic Procedure

NAEC0397

1	CHECK OVERALL FUNCTION

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with two fingers.



SEF025Z

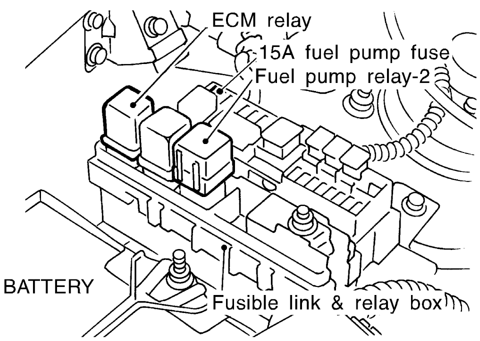
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned "ON".

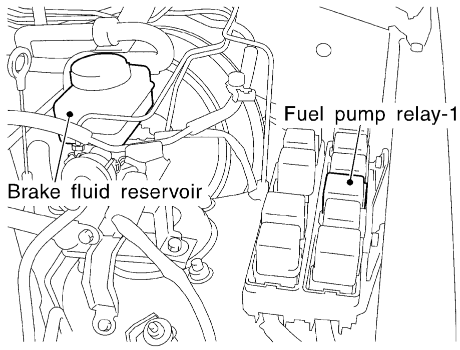
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

2	CHECK FUEL PUMP RELAY-1 and -2 POWER SUPPLY CIRCUIT-I

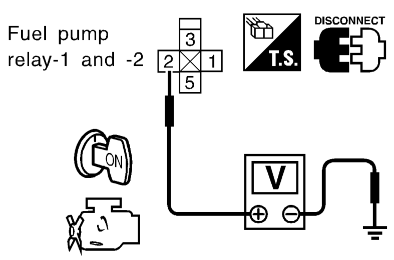
1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay-1 and -2.





SEF346Z

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



Voltage: Battery voltage

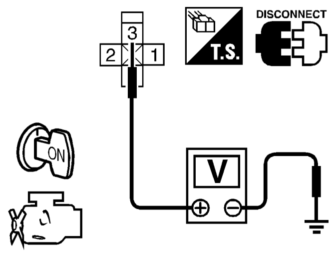
SEF347Z

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Fuse block (J/B) connector M10 ● 15A fuse in fuse block (J/B) ● Harness connectors M1, E1 ● Harness for open or short between fuse and fuel pump relay-1 and fuel pump relay-2	
▶	Repair harness or connectors.

4	CHECK FUEL PUMP RELAY-1 POWER SUPPLY CIRCUIT-II
Check voltage between terminal 3 and ground with CONSULT-II or tester.	



Voltage: Battery voltage

SEF348Z

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 5.

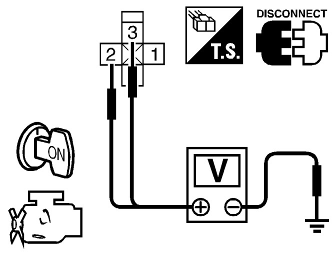
5	CHECK FUEL PUMP RELAY-2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect fuel pump relay-2. 2. Check harness continuity between fuel pump relay-2 terminal 5 and fuel pump relay-1 terminal 3. Refer to Wiring Diagram. **Continuity should exist.** 3. Also check harness for short to ground and short to power.	

OK or NG

OK	▶	GO TO 6.
NG	▶	Repair open circuit or short to ground or short to power in harness or connectors.

6	CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT-III

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay-2.
3. Turn ignition switch "ON".
4. Check voltage between terminals 2, 3 and ground with CONSULT-II or tester.



Voltage: Battery voltage

SEF026Z

OK or NG

OK	▶	GO TO 8.
NG	▶	GO TO 7.

7	DETECT MALFUNCTIONING PART

Check the following.
- 15A fuse in fusible link and relay box
- Harness for open or short between fuse and fuel pump relay-2

	▶	Repair harness or connectors.

8	CHECK FUEL PUMP RELAY-2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between fuel pump relay-2 terminal 1 and ground.
   Continuity should exist.
2. Also check harness for short to power.

OK or NG

	▶	Repair open circuit or short to power in harness or connector.

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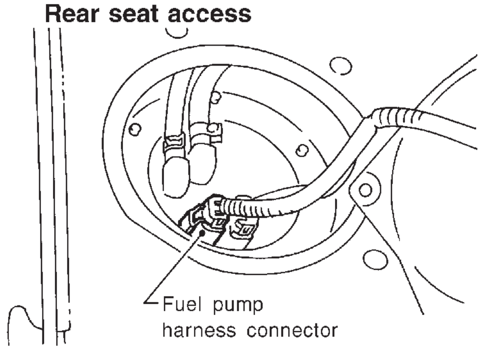
9	CHECK FUEL PUMP POWER SUPPLY AND GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch "OFF".
2. Disconnect fuel level sensor unit and fuel pump harness connector.



SEF021S

3. Check harness continuity between fuel pump terminal 2 and body ground, fuel pump terminal 1 and fuel pump relay terminal 5. 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 11.
NG	▶	GO TO 10.

10	DETECT MALFUNCTIONING PART

Check harness for open or short between fuel pump relay and fuel pump.

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

11	CHECK FUEL PUMP RELAY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 28 and fuel pump relay-1 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 13.
NG	▶	GO TO 12.

12	DETECT MALFUNCTIONING PART

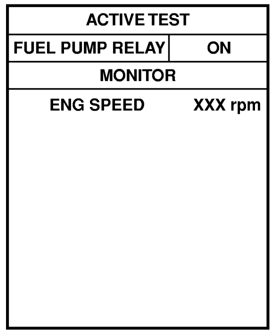
Check the following.
- Harness connectors E1, M1
- Harness connectors M32, F23
- Harness for open or short between ECM and fuel pump relay-1

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

13	CHECK FUEL PUMP RELAY-1 AND -2

With CONSULT-II

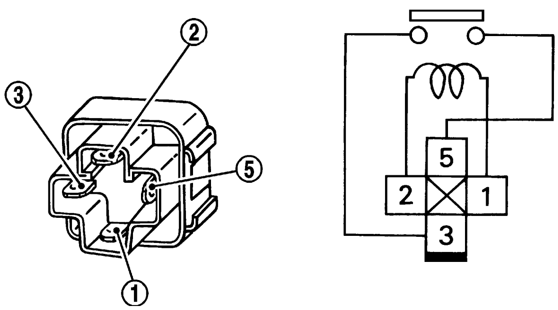
1. Reconnect fuel pump relay-1 and -2, fuel level sensor unit and fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay-1, -2 "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT-II and check operating sound.



SEF073Y

Without CONSULT-II

Check continuity between terminals 3 and 5 under the following conditions.



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

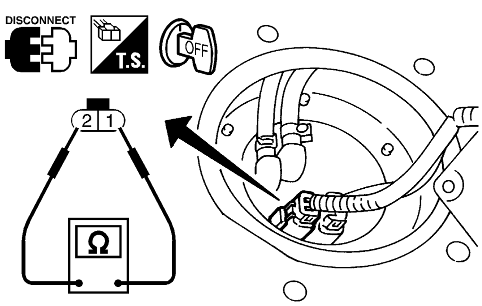
SEF608X

OK or NG

OK	▶	GO TO 14.
NG	▶	Replace fuel pump relay.

14	CHECK FUEL PUMP

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check resistance between fuel level sensor unit and fuel pump terminals 1 and 2.



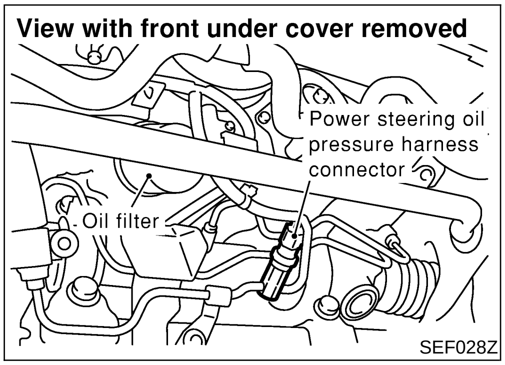
Resistance: 0.2 - 5.0 Ω [at 25°C (77°F)]

SEF027Z

OK or NG

OK	▶	GO TO 15.
NG	▶	Replace fuel pump.

15	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**



Component Description

NAEC0398

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

CONSULT-II Reference Value in Data Monitor Mode

NAEC0399

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is fully turned.	ON

ECM Terminals and Reference Value

NAEC0687

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

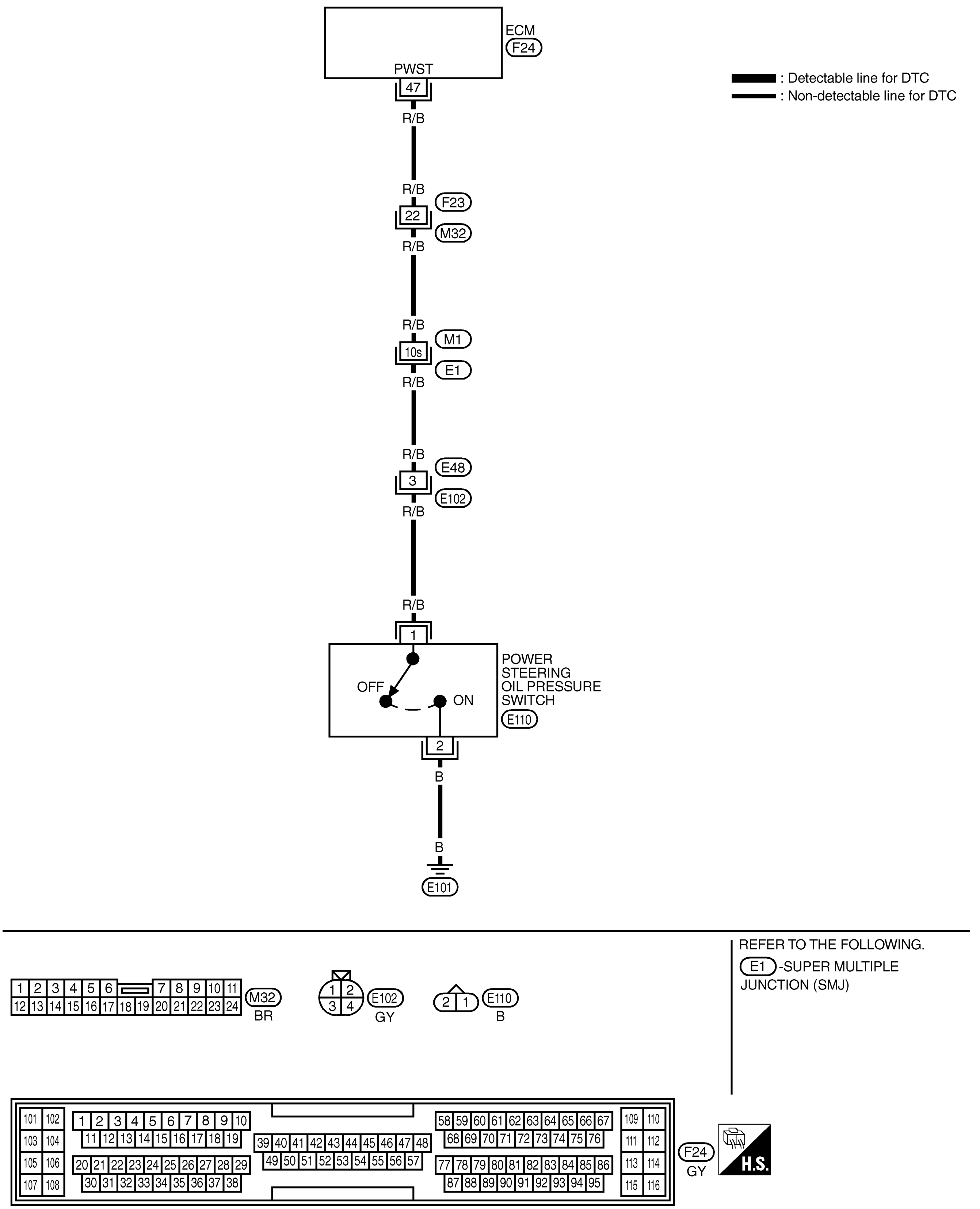
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	R/B	Power steering oil pressure switch	**[Engine is running]** • Steering wheel is being turned.	0 - 1.0V
			[Engine is running] • Steering wheel is not being turned.	Approximately 5V

Wiring Diagram

NAEC0401

EC-PST/SW-01



MEC977C

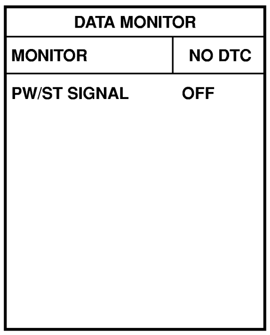
Diagnostic Procedure

NAEC0402

1	INSPECTION START	
Do you have CONSULT-II?		
Yes or No		
Yes	▶	GO TO 2.
No	▶	GO TO 3.

2	CHECK OVERALL FUNCTION

With CONSULT-II
1. Start engine.
2. Check “PW/ST SIGNAL” in “DATA MONITOR” mode with CONSULT-II under the following conditions.



Steering is in neutral position	OFF
Steering is turned	ON

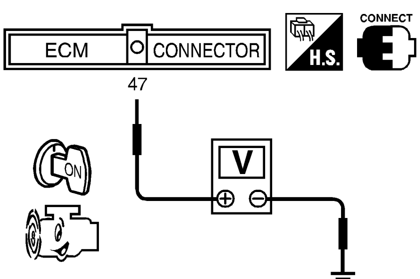
SEF228Y

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

3	CHECK OVERALL FUNCTION

Without CONSULT-II
1. Start engine.
2. Check voltage between ECM terminal 47 and ground under the following conditions.



Conditions	Voltage
Steering is neutral position.	Approximately 5V
Steering is turned to full position.	Approximately 0V

SEF363X

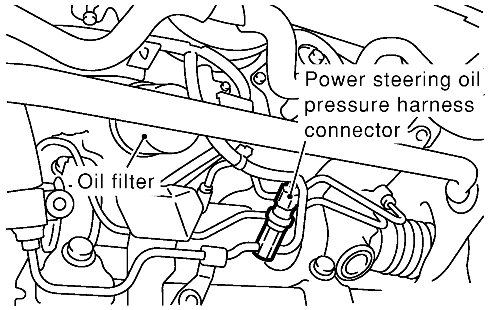
OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 4.

4 CHECK POWER STEERING OIL PRESSURE SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch “OFF”.
2. Disconnect power steering oil pressure switch harness connector.

View with front under cover removed



SEF028Z

3. Check harness continuity between power steering oil pressure switch terminal 2 and engine ground. Refer to Wiring Diagram.
   Continuity should exist.
4. Also check harness for short to power.

OK or NG

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

5 CHECK POWER STEERING OIL PRESSURE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

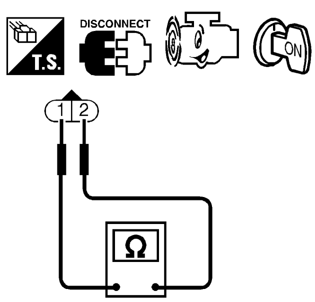
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 47 and power steering oil pressure switch terminal 1. Refer to Wiring Diagram.
   Continuity should exist.
3. Also check harness for short to ground and short to power.

OK or NG

OK ▶	GO TO 6.
NG ▶	Repair open circuit or short to ground or short to power in harness or connectors.

6 CHECK POWER STEERING OIL PRESSURE SWITCH

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between power steering oil pressure switch terminals 1 and 2 under the following conditions.



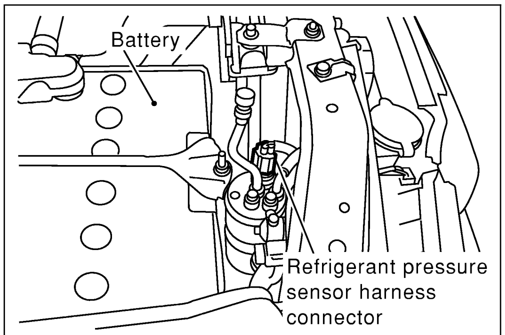
Conditions	Continuity
Steering wheel is being fully turned.	Yes
Steering wheel is not being turned.	No

SEF364X

OK or NG

OK ▶	GO TO 7.
NG ▶	Replace power steering oil pressure switch.

7	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	INSPECTION END

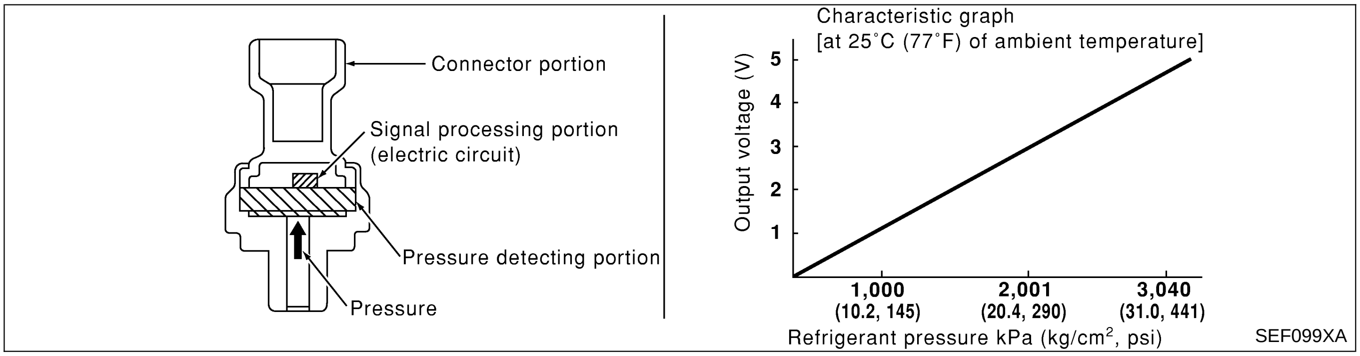


SEF029Z

Description

NAEC0636

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.



SEF099XA

ECM Terminals and Reference Value

NAEC0689

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

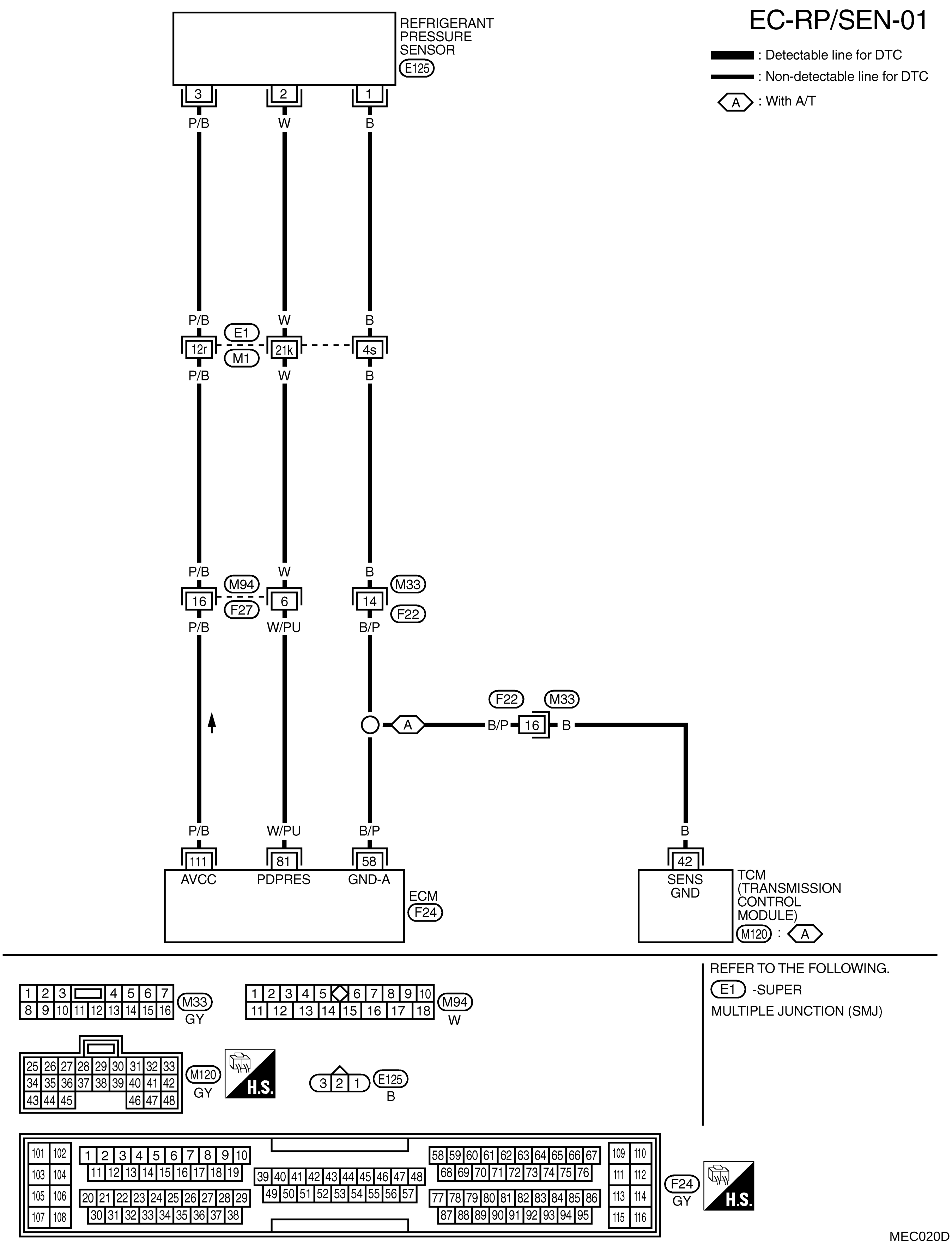
CAUTION:

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)
58	B/P	Sensors' ground	**[Engine is running]** ● **Warm-up condition** ● Idle speed	Approximately 0V
81	W/PU	Refrigerant pressure sensor	**[Engine is running]** ● **Warm-up condition** ● Both A/C switch and blower switch are "ON". (Compressor operates.)	1.0 - 3.88V
111	P/B	Sensors' power supply	**[Ignition switch "ON"]**	Approximately 5V

Wiring Diagram

NAEC0637

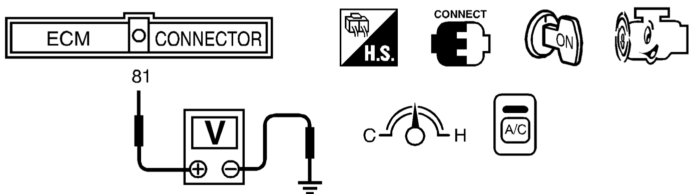


Diagnostic Procedure

NAEC0638

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 81 and ground with CONSULT-II or tester.



Voltage: 1 - 4V

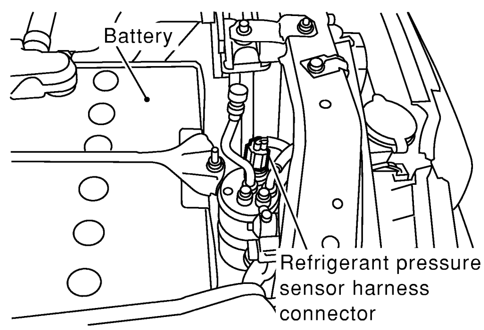
SEF617XA

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 2.

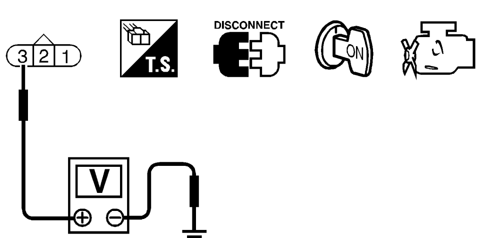
2	CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn A/C switch and blower switch "OFF".
2. Stop engine.
3. Disconnect refrigerant pressure sensor harness connector.



SEF029Z

4. Turn ignition switch "ON".
5. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT-II or tester.



Voltage: Approximately 5V

SEF030Z

OK or NG

OK	▶	GO TO 4.
NG	▶	GO TO 3.

3	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E1, M1 ● Harness for open or short between ECM and refrigerant pressure sensor	
▶	Repair harness or connectors.

4	CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT
1. Turn ignition switch "OFF". 2. Check harness continuity between refrigerant pressure sensor terminal 1 and engine ground. Refer to Wiring Diagram. **Continuity should exist.** 3. 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. ● Harness connectors E1, M1 and M33, F22 ● Harness connectors F23, M32 ● Harness for open between ECM and refrigerant pressure sensor ● Harness for open between TCM (Transmission control module) and refrigerant pressure sensor	
▶	Repair open circuit or short to power in harness or connectors.

6	CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT
1. Disconnect ECM harness connector. 2. Check harness continuity between ECM terminal 81 and refrigerant pressure sensor 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 8.
NG ▶	GO TO 7.

7	DETECT MALFUNCTIONING PART
Check the following. ● Harness connectors E1, M1 and M94, F27 ● 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 REFRIGERANT PRESSURE SENSOR
Refer to HA-15, "Refrigerant pressure sensor". **OK or NG**	
OK ▶	GO TO 9.
NG ▶	Replace refrigerant pressure sensor.

9	CHECK INTERMITTENT INCIDENT
Refer to "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.	
▶	**INSPECTION END**

ECM Terminals and Reference Value

NAEC0690

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

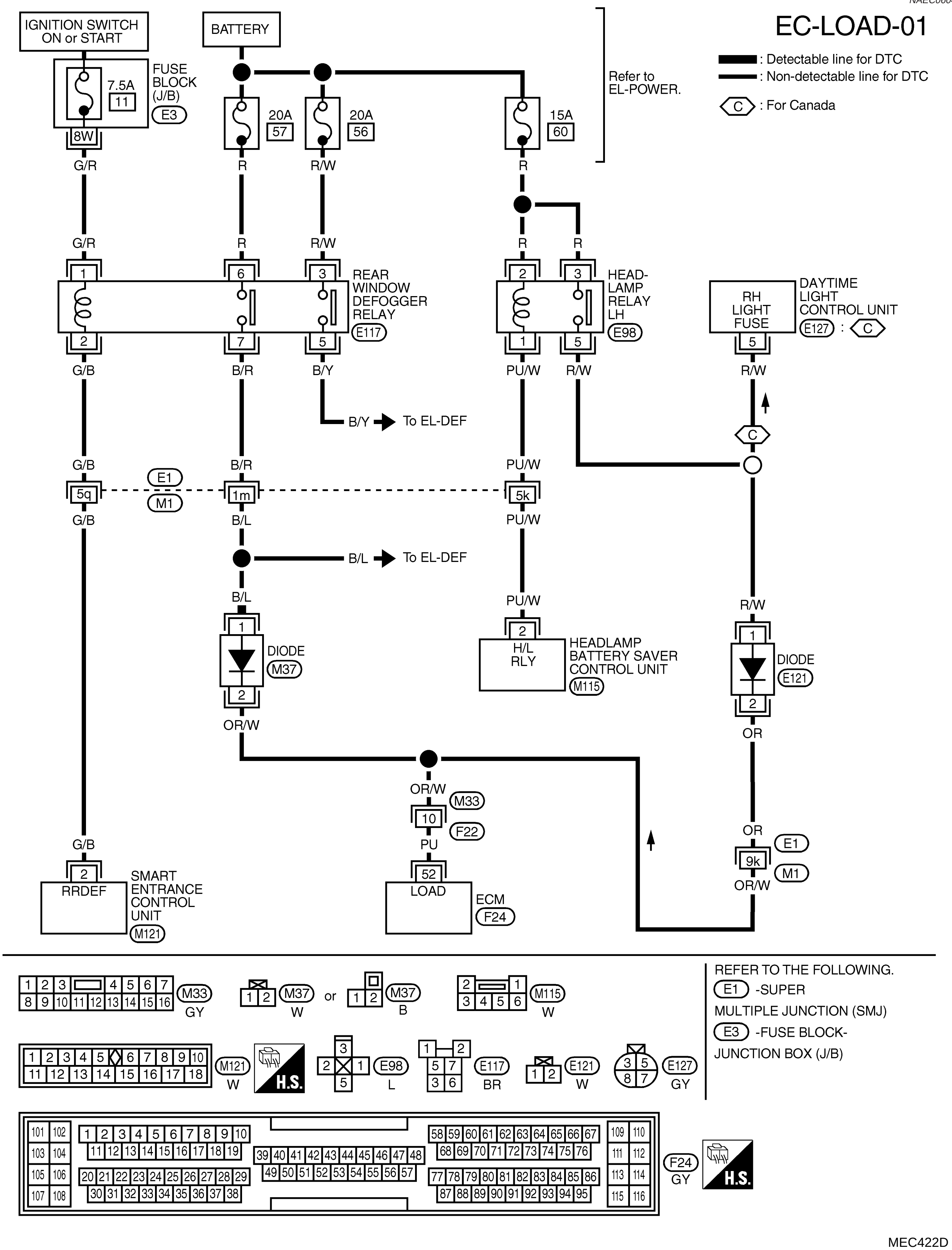
CAUTION:

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.

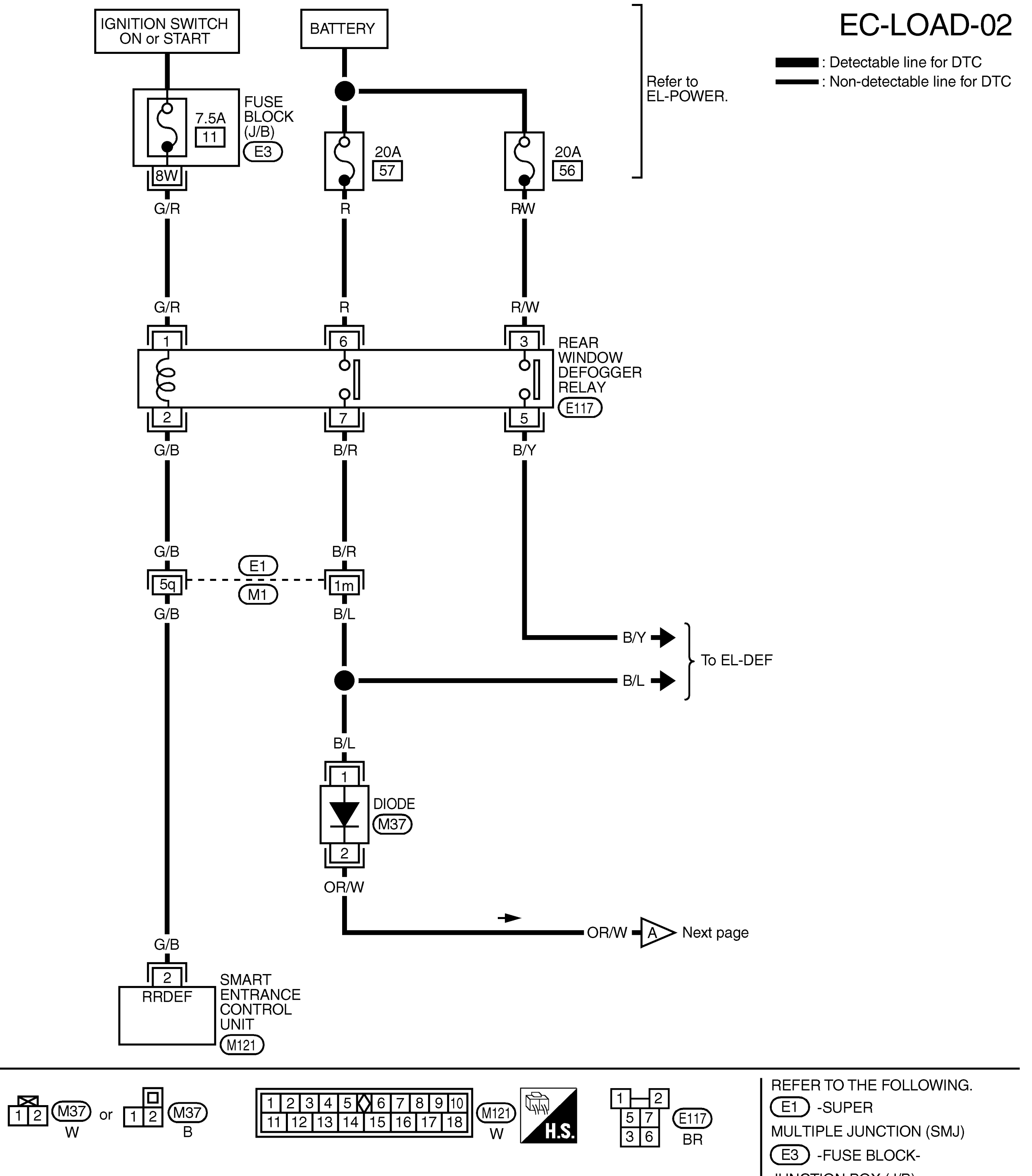
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
52	PU	Electrical load signal	**[Engine is running]** ● Rear window defogger: ON ● Hi-beam headlamp: ON	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] ● Electrical load: OFF	0V

Wiring Diagram

NAEC0604

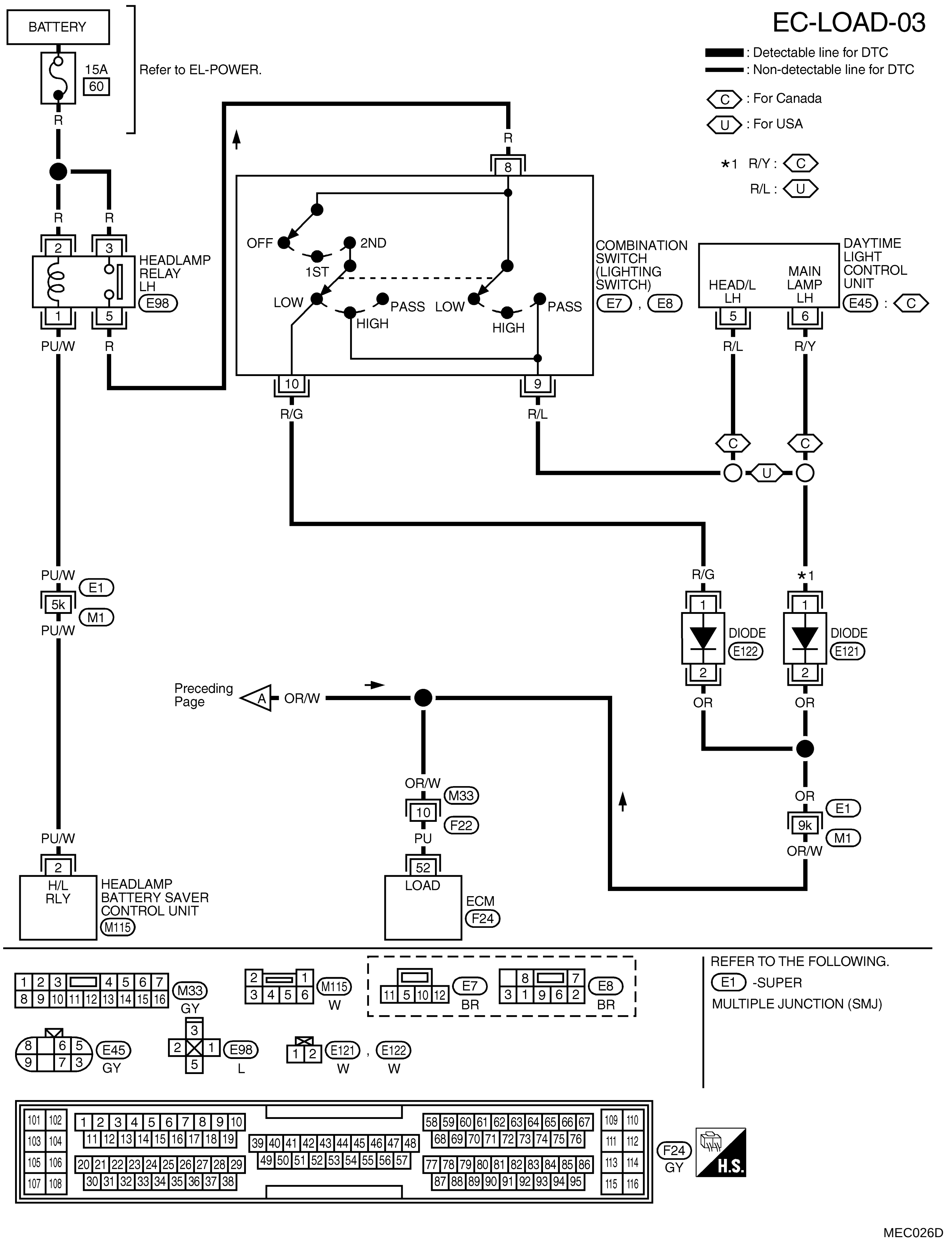


Wiring Diagram (Cont'd)



REFER TO THE FOLLOWING.
E1 -SUPER MULTIPLE JUNCTION (SMJ)
E3 -FUSE BLOCK-JUNCTION BOX (J/B)

MEC423D

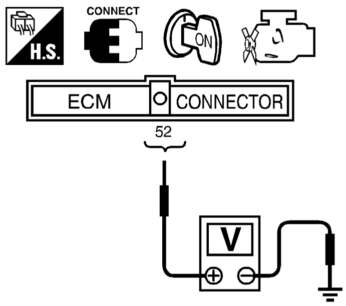

EC-LOAD-03
: Detectable line for DTC
: Non-detectable line for DTC
C : For Canada
U : For USA
*1 R/Y : C
R/L : U
BATTERY
15A
60
Refer to EL-POWER.
HEADLAMP RELAY LH
E98
COMBINATION SWITCH (LIGHTING SWITCH)
E7 , E8
OFF
2ND
1ST
LOW
PASS
HIGH
DAYTIME LIGHT CONTROL UNIT
E45 : C
HEAD/L LH
MAIN LAMP LH
R/G
R/L
R/Y
PU/W
E1
M1
DIODE
E122
E121
Preceding Page
A
OR/W
OR
M33
F22
PU
LOAD
ECM
F24
H/L RLY
HEADLAMP BATTERY SAVER CONTROL UNIT
M115
GY
W
BR
L
REFER TO THE FOLLOWING.
E1 -SUPER MULTIPLE JUNCTION (SMJ)
H.S.
MEC026D

Diagnostic Procedure

NAEC0605

1 CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

1. Turn ignition switch “ON”.
2. Check voltage between ECM terminal 52 and ground under the following conditions.



Condition	Voltage
Rear window defogger switch “ON”	BATTERY VOLTAGE
Rear window defogger switch “OFF”	0V

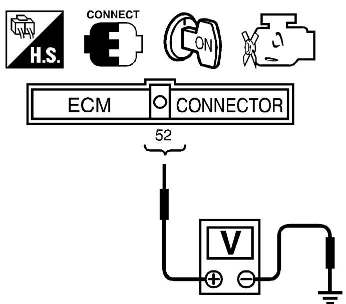
SEF610X

OK or NG

OK	▶	GO TO 2.
NG	▶	GO TO 3.

2 CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Check voltage between ECM terminal 52 and ground under the following conditions.



Condition	Voltage
Lighting switch “ON” at 1st position	BATTERY VOLTAGE
Lighting switch “OFF”	0V

SEF611X

OK or NG

OK	▶	**INSPECTION END**
NG	▶	GO TO 7.

3 CHECK REAR WINDOW DEFOGGER FUNCTION

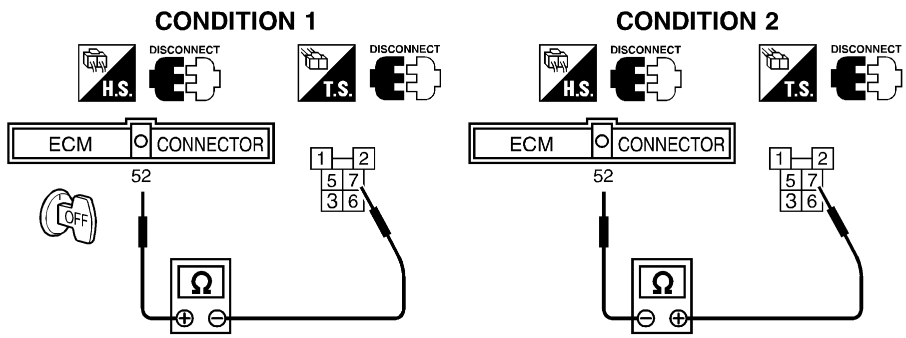
1. Start engine.
2. Turn “ON” the rear window defogger switch.
3. Check the rear windshield. Is the rear windshield heated up?

Yes or No

Yes	▶	GO TO 4.
No	▶	Refer to EL-170, “Rear Window Defogger”.

4	CHECK REAR WINDOW DEFOGGER INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect rear window defogger relay.
4. Check harness continuity between ECM terminal 52 and rear window defogger relay terminal 7.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF031Z

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 E1, M1
- Harness connectors M33, F22
- Diode M37
- Harness for open and short between ECM and rear window defigger relay

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

6	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

7	CHECK HEADLAMP FUNCTION

1. Start engine.
2. Turn the lighting switch "ON" at 1st position with high beam.
3. Check that headlamps are illuminated.

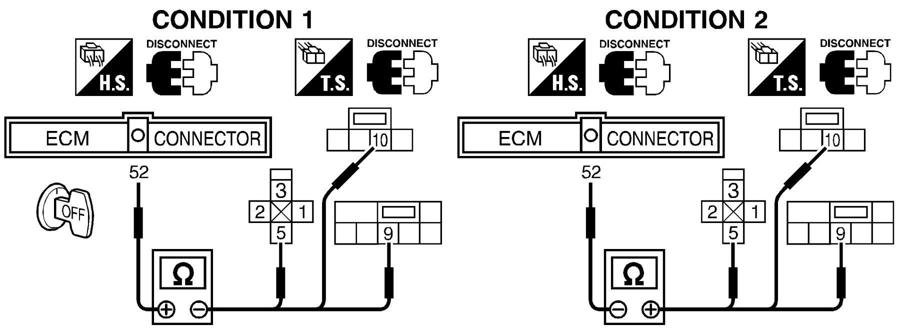
OK or NG

OK	▶	GO TO 8.
NG	▶	Refer to EL-32, "HEADLAMP (FOR USA)" or "EL-53, "HEADLAMP (FOR CANADA) — DAYTIME LIGHT SYSTEM".

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

8	CHECK HEADLAMP INPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

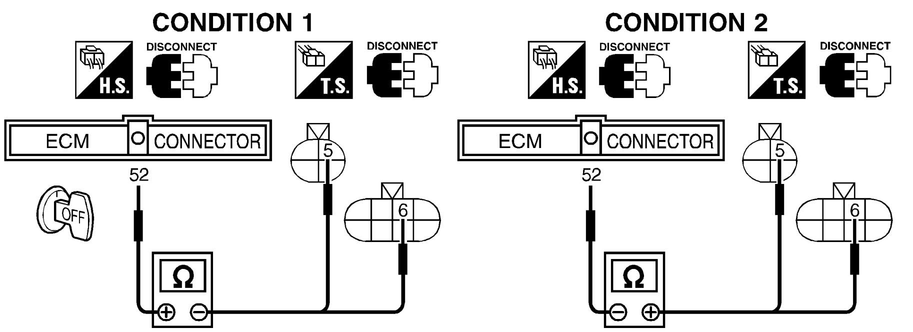
1. Stop engine.
2. Disconnect ECM harness connector.
3. Disconnect headlamp LH relay. (Models for USA), daytime light control unit harness connector (Models for Canada).
4. Check harness continuity between ECM terminal 52 and headlamp LH relay terminal 5 or combination switch 9, 10 (without autolight system) under the following conditions.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF038Z

5. Check harness continuity between ECM terminal 52 and daytime light control unit terminal 5 (with autolight system for Canada) or 6 (without autolight system for Canada) under the following conditions.



CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.

SEF039Z

6. 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.
- Harness connectors E1, M1
- Harness connectors M33, F22
- Diode E121, E122
- Harness for open and short between ECM and headlamp LH relay or daytime light control unit

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

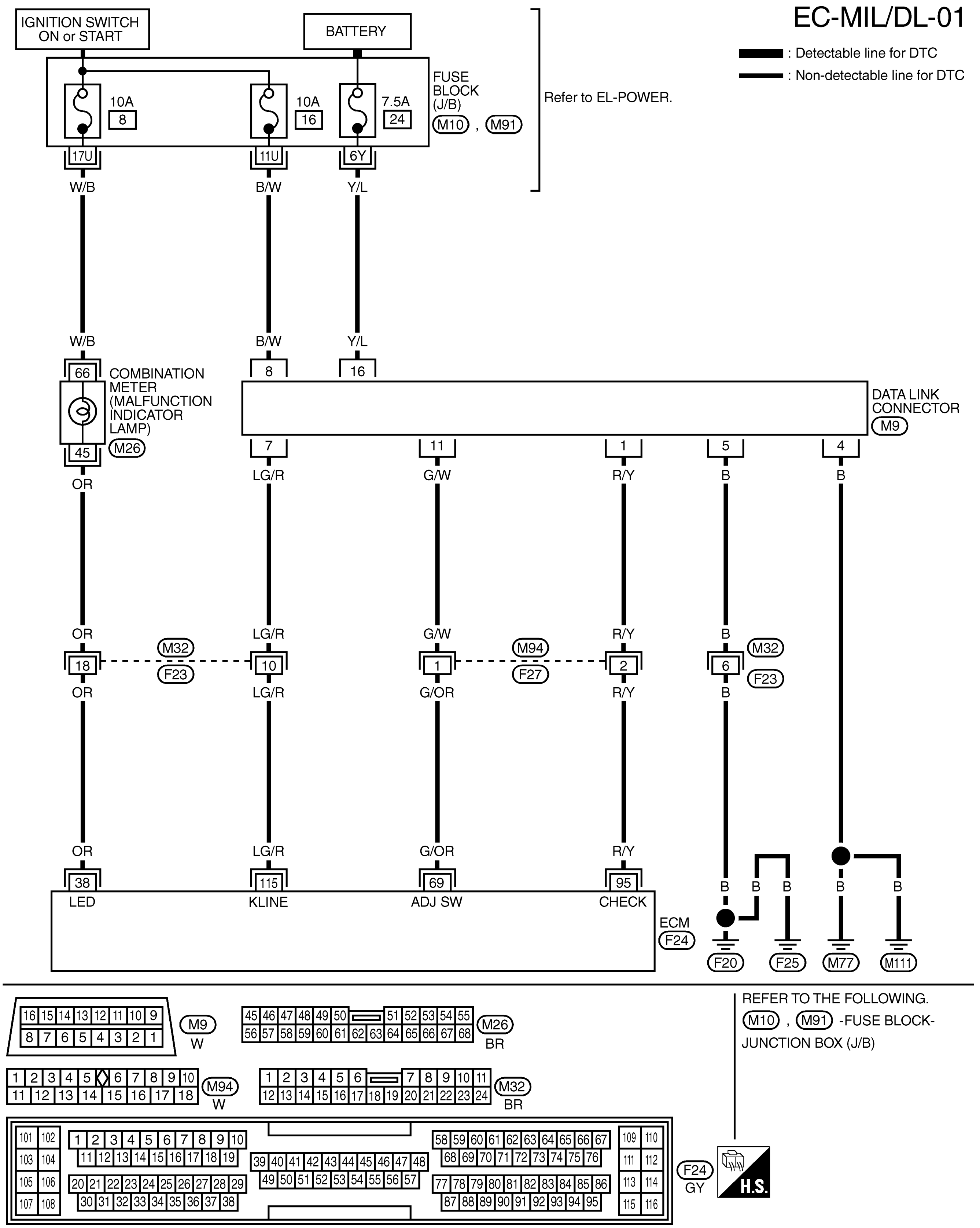
10	CHECK INTERMITTENT INCIDENT

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-142.

	▶	**INSPECTION END**

Wiring Diagram

NAEC0407



MEC978C

Fuel Pressure Regulator

NAEC0408

Fuel pressure at idling kPa (kg/cm², psi)	
Vacuum hose is connected.	Approximately 235 (2.4, 34)
Vacuum hose is disconnected.	Approximately 294 (3.0, 43)

Idle Speed and Ignition Timing

NAEC0409

Target idle speed*1	No-load*2 (in “P” or N” position)	M/T: 750±50 rpm A/T: 750±50 rpm
Air conditioner: ON	In “P” or N” position	825 rpm or more
Ignition timing*1	In “P” or N” position	15°±5° BTDC
Throttle position sensor idle position		0.15 - 0.85V

*1: Throttle position sensor harness connector connected
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Mass Air Flow Sensor

NAEC0411

Supply voltage	Battery voltage (11 - 14)V
Output voltage at idle	1.2 - 1.8*V
Mass air flow (Using CONSULT-II or GST)	2.0 - 6.0 g·m/sec at idle* 7.0 - 20.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

Engine Coolant Temperature Sensor

NAEC0412

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

Heated Oxygen Sensor 1 Heater (front)

NAEC0414

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Fuel Pump

NAEC0415

Resistance [at 25°C (77°F)]	0.2 - 5.0Ω

IACV-AAC Valve

NAEC0416

Resistance [at 20°C (68°F)]	Approximately 20 - 24Ω

Injector

NAEC0417

Resistance [at 20°C (68°F)]	13.5 - 17.5Ω

Resistor

NAEC0418

Resistance [at 25°C (77°F)]	Approximately 2.2 kΩ

Throttle Position Sensor

NAEC0419

Throttle valve conditions	Voltage (at normal operating temperature, engine off, ignition switch ON, throttle opener disengaged)
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

Calculated Load Value

NAEC0420

	Calculated load value % (Using CONSULT-II or GST)
At idle	14.0 - 33.0
At 2,500 rpm	12.0 - 25.0

Intake Air Temperature Sensor

NAEC0421

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

Heated Oxygen Sensor 2 Heater (rear)

NAEC0422

Resistance [at 25°C (77°F)]	2.3 - 4.3Ω

Crankshaft Position Sensor (REF)

NAEC0423

Resistance [at 20°C (68°F)]	470 - 570Ω

Fuel Tank Temperature Sensor

NAEC0424

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

Camshaft Position Sensor (PHASE)

NAEC0639

Resistance [at 20°C (68°F)]	HITACHI make	1,440 - 1,760Ω
	MITSUBISHI make	2,090 - 2,550Ω

NOTES