ENGINE CONTROL SYSTEM

SECTION EC

CONTENTS

CONTENTS (Cont'd.)

CONTENTS (Cont'd.)

When you read wiring diagrams:

- **Read GI section, ''HOW TO READ WIRING DIAGRAMS''.**
- **Read EL section, ''POWER SUPPLY ROUTING'' for power distribution circuit.**

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

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC*5		Reference page
	CONSULT GST*2	ECM*1	
Unable to access ECM	—	—	EC-81
*COOLAN T SEN/CIRC	P0125	0908	EC-145
ABSL PRES SEN/CIRC	P0105	0803	EC-113
AIR TEMP SEN/CIRC	P0110	0401	EC-120
CAM POS SEN/CIR	P0340	0101	EC-252
CLOSED LOOP	P1148	0307	EC-331
CLOSED TP SW/CIRC	P0510	0203	EC-314
COOLANT T SEN/CIRC	P0115	0103	EC-126
CPS/CIRC (OBD) COG	P1336	0905	EC-340
CPS/CIRCUIT (OBD)	P0335	0802	EC-247
CYL 1 MISFIRE	P0301	0608	EC-238
CYL 2 MISFIRE	P0302	0607	EC-238
CYL 3 MISFIRE	P0303	0606	EC-238
CYL 4 MISFIRE	P0304	0605	EC-238
ECM	P0605	0301	EC-320
EGR SYSTEM	P0400	0302	EC-258
EGR SYSTEM	P1402	0514	EC-356
EGR TEMP SEN/CIRC	P1401	0305	EC-350
EGRC SOLENOID/V	P1400	1005	EC-345
EGRC-BPT VALVE	P0402	0306	EC-266
EVAP PURG FLOW/MON	P1447	0111	EC-386
EVAP SMALL LEAK	P1440	0213	EC-363
EVAP SMALL LEAK	P0440	0705	EC-276
EVAPO SYS PRES SEN	P0450	0704	EC-297
FRONT O2 SENSOR	P0130	0303	EC-150
FR O2 SEN HEATER	P0135	0901	EC-186
FRONT O2 SENSOR	P0133	0409	EC-171
FRONT O2 SENSOR	P0132	0410	EC-164
FRONT O2 SENSOR	P0131	0411	EC-157
FRONT O2 SENSOR	P0134	0412	EC-179
FUEL SYS DIAG-LEAN	P0171	0115	EC-224
FUEL SYS DIAG-RICH	P0172	0114	EC-229
FUEL TEMP SEN/CIRC	P0180	0402	EC-234
IACV/AAC VLV/CIRC	P0505	0205	EC-308
IGN SIGNAL-PRIMARY	P1320	0201	EC-333
KNOCK SEN/CIRCUIT	P0325	0304	EC-243
MAF SEN/CIRCUIT*3	P0100	0102	EC-104
MAP/BAR SW SOL/CIR	P1105	1302	EC-322
MULTI CYL MISFIRE	P0300	0701	EC-238
NO SELF DIAGNOSTIC FAILURE INDICATED	P0000	0505	—
NO SELF DIAGNOSTIC FAILURE INDICATED	No DTC	Flashing*4	EC-49
OVERHEAT	—	0208	EC-420
P-N POS SW/CIRCUIT	P1706	1003	EC-407
PURG VOLUME CONT/V	P1444	0214	EC-373
PURG VOLUME CONT/V	P0443	1008	EC-286
REAR O2 SENSOR	P0138	0510	EC-198
REAR O2 SENSOR	P0137	0511	EC-190
REAR O2 SENSOR	P0140	0512	EC-214
REAR O2 SENSOR	P0139	0707	EC-206
RR O2 SEN HEATER	P0141	0902	EC-220
THRTL POS SEN/CIRC*3	P0120	0403	EC-131
TOR CONV CLTCH S/V	P1775	0904	EC-412
TOR CONV CLTCH S/V	P1776	0513	EC-416
TW CATALYST SYSTEM	P0420	0702	EC-271
VC CUT/V BYPASS/V	P1491	0311	EC-402
VC/V BYPASS/V	P1490	0801	EC-397
VEH SPEED SEN/CIRC	P0500	0104	EC-303
VENT CONTROL VALVE	P1446	0215	EC-381
VENT CONTROL VALVE	P1448	0309	EC-392
VENT CONTROL VALVE	P0446	0903	EC-292

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.
*3: When the fail-safe operation occurs, the MIL illuminates.
*4: While engine is running.
*5: 1st trip DTC No. is the same as DTC No.

P NO. INDEX FOR DTC

DTC*5		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	ECM*1		
—	—	Unable to access ECM	EC-81
No DTC	Flash-ing*4	NO SELF DIAGNOSTIC FAILURE INDICATED	EC-49
P0000	0505	NO SELF DIAGNOSTIC FAILURE INDICATED	—
P0100	0102	MAF SEN/CIRCUIT*3	EC-104
P0105	0803	ABSL PRES SEN/CIRC	EC-113
P0110	0401	AIR TEMP SEN/CIRC	EC-120
P0115	0103	COOLANT T SEN/CIRC	EC-126
P0120	0403	THRTL POS SEN/CIRC*3	EC-131
P0125	0908	*COOLAN T SEN/CIRC	EC-145
P0130	0303	FRONT O2 SENSOR	EC-150
P0131	0411	FRONT O2 SENSOR	EC-157
P0132	0410	FRONT O2 SENSOR	EC-164
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P0134	0412	FRONT O2 SENSOR	EC-179
P0135	0901	FR O2 SEN HEATER	EC-186
P0137	0511	REAR O2 SENSOR	EC-190
P0138	0510	REAR O2 SENSOR	EC-198
P0139	0707	REAR O2 SENSOR	EC-206
P0140	0512	REAR O2 SENSOR	EC-214
P0141	0902	RR O2 SEN HEATER	EC-220
P0171	0115	FUEL SYS DIAG-LEAN	EC-224
P0172	0114	FUEL SYS DIAG-RICH	EC-229
P0180	0402	FUEL TEMP SEN/CIRC	EC-234
P0300	0701	MULTI CYL MISFIRE	EC-238
P0301	0608	CYL 1 MISFIRE	EC-238
P0302	0607	CYL 2 MISFIRE	EC-238
P0303	0606	CYL 3 MISFIRE	EC-238
P0304	0605	CYL 4 MISFIRE	EC-238
P0325	0304	KNOCK SEN/CIRCUIT	EC-243
P0335	0802	CPS/CIRCUIT (OBD)	EC-247
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P0400	0302	EGR SYSTEM	EC-258
P0402	0306	EGRC-BPT VALVE	EC-266
P0420	0702	TW CATALYST SYSTEM	EC-271
P0440	0705	EVAP SMALL LEAK	EC-276
P0443	1008	PURG VOLUME CONT/V	EC-286
P0446	0903	VENT CONTROL VALVE	EC-292
P0450	0704	EVAPO SYS PRES SEN	EC-297
P0500	0104	VEH SPEED SEN/CIRC	EC-303
P0505	0205	IACV/AAC VLV/CIRC	EC-308
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P0605	0301	ECM	EC-320
P1105	1302	MAP/BAR SW SOL/CIR	EC-322
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P1336	0905	CPS/CIRC (OBD) COG	EC-340
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P1401	0305	EGR TEMP SEN/CIRC	EC-350
P1402	0514	EGR SYSTEM	EC-356
P1440	0213	EVAP SMALL LEAK	EC-363
P1444	0214	PURG VOLUME CONT/V	EC-373
P1446	0215	VENT CONTROL VALVE	EC-381
P1447	0111	EVAP PURG FLOW/MON	EC-386
P1448	0309	VENT CONTROL VALVE	EC-392
P1490	0801	VC/V BYPASS/V	EC-397
P1491	0311	VC CUT/V BYPASS/V	EC-402
P1706	1003	P-N POS SW/CIRCUIT	EC-407
P1775	0904	TOR CONV CLTCH S/V	EC-412
P1776	0513	TOR CONV CLTCH S/V	EC-416
—	0208	OVERHEAT	EC-420

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
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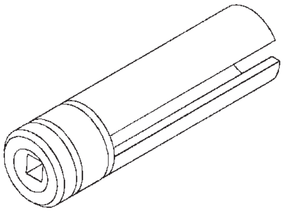
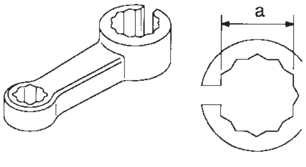
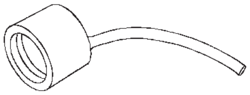
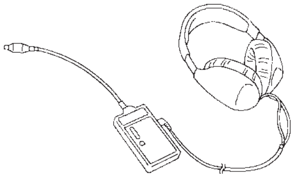
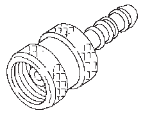
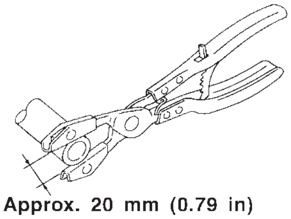
GI
MA
EM
LC
EC
FE
CL
MT
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX

Special Service Tools

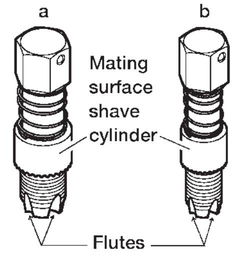
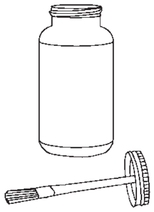
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

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

Commercial Service Tools

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

Commercial Service Tools (Cont’d)

Oxygen sensor thread cleaner (J-43897-18) (J-43897-12)	 AEM488	Reconditioning the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown in Commercial Service Tools. a: J-43897-18-18mm diameter, for Zirconia Oxygen Sensor b: J-43897-12-12mm diameter, for Titania Oxygen Sensor
Anti-seize lubricant (Permatex™ 133 AR or equivalent meeting MIL specification MIL-A-907)	 AEM489	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

Supplemental Restraint System (SRS) “AIR BAG”

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

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

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

WARNING:

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision which would result in air bag inflation, all maintenance should be performed by an authorized NISSAN dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system.**
- **Do not use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses are covered with yellow insulation either just before the harness connectors or on the complete harness, for easy identification.**
- **The vehicle is equipped with a passenger air bag deactivation switch which can be operated by the customer. When the passenger air bag is switched OFF, the passenger air bag is disabled and will not inflate in a frontal collision. When the passenger air bag is switched ON, the passenger air bag is enabled and could inflate in a frontal collision. After SRS maintenance or repair, make sure the passenger air bag deactivation switch is in the same position (ON or OFF) as when the vehicle arrived for service.**

Precautions for On Board Diagnostic (OBD) System of Engine

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

CAUTION:

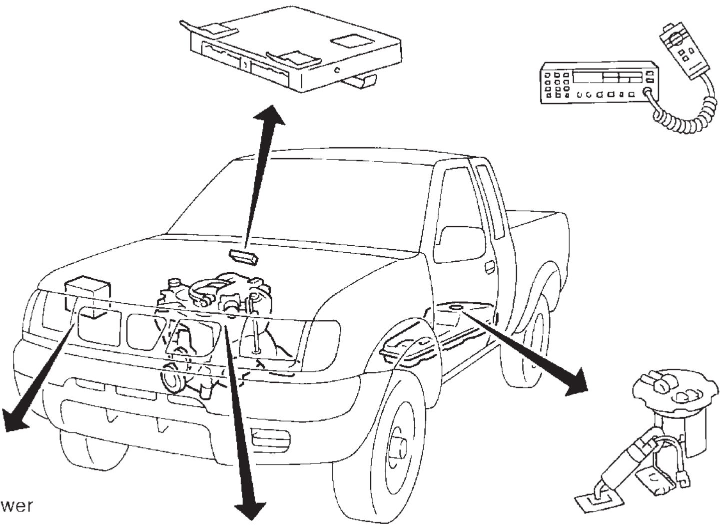
- **Be sure to turn the ignition switch “OFF’’ and disconnect the negative battery terminal before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after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

Engine Fuel & Emission Control System

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

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

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



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

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

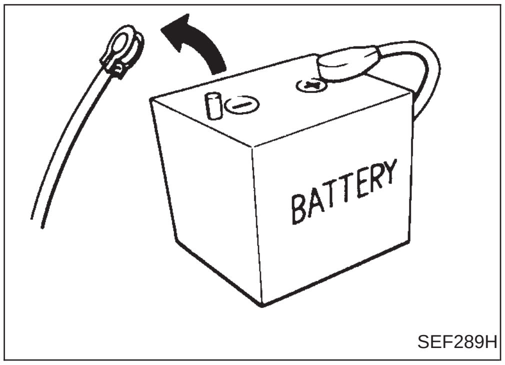
ECM PARTS HANDLING
- Handle mass air flow sensor carefully to avoid damage.
- Do not disassemble mass air flow sensor.
- Do not clean mass air flow sensor with any type of detergent.
- Do not disassemble IACV-AAC valve.
- Even a slight leak in the air intake system can cause serious problems.
- Do not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

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

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

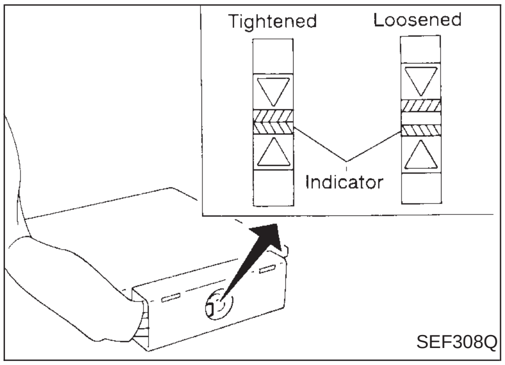
SEF236V

Precautions



SEF289H

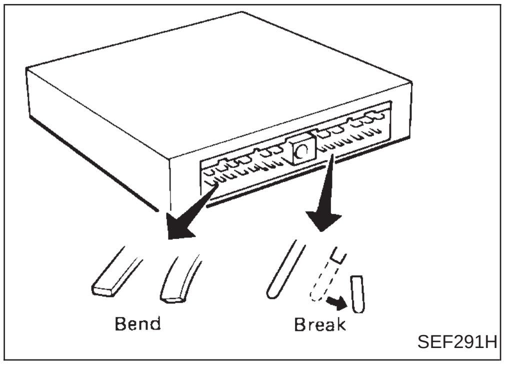
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.



SEF308Q

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

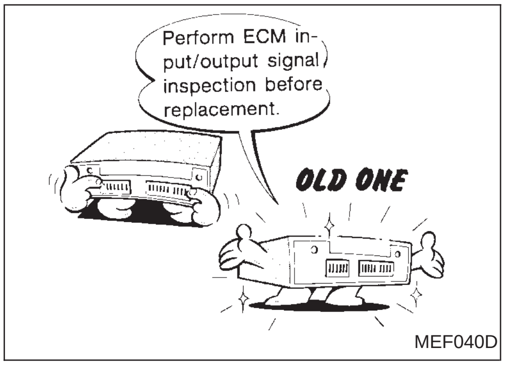
  🔧: 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



SEF291H

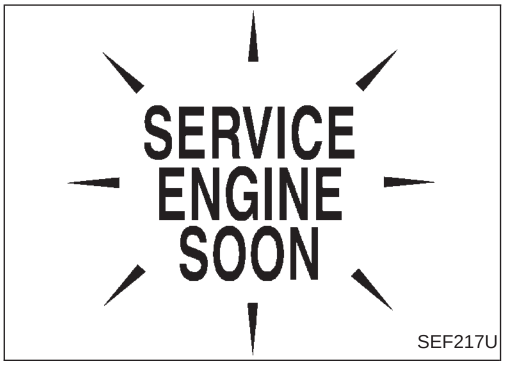
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).

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



MEF040D

- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-89.

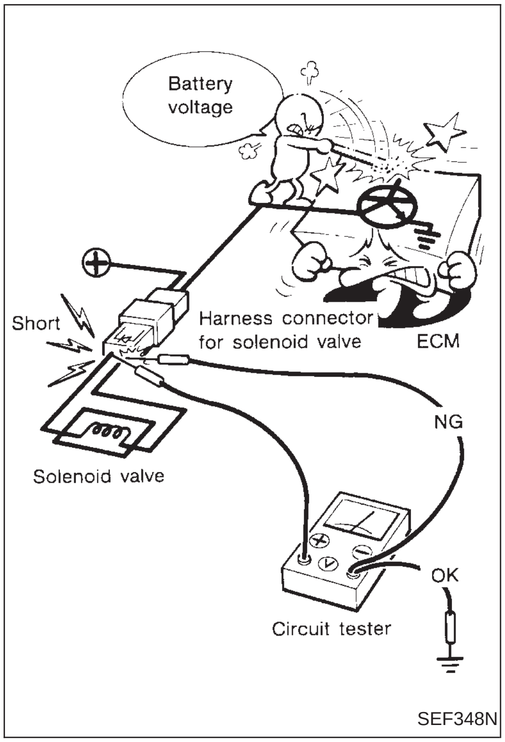


SEF217U

- After performing each TROUBLE DIAGNOSIS, perform ‘‘OVERALL FUNCTION CHECK’’ or ‘‘DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE’’.

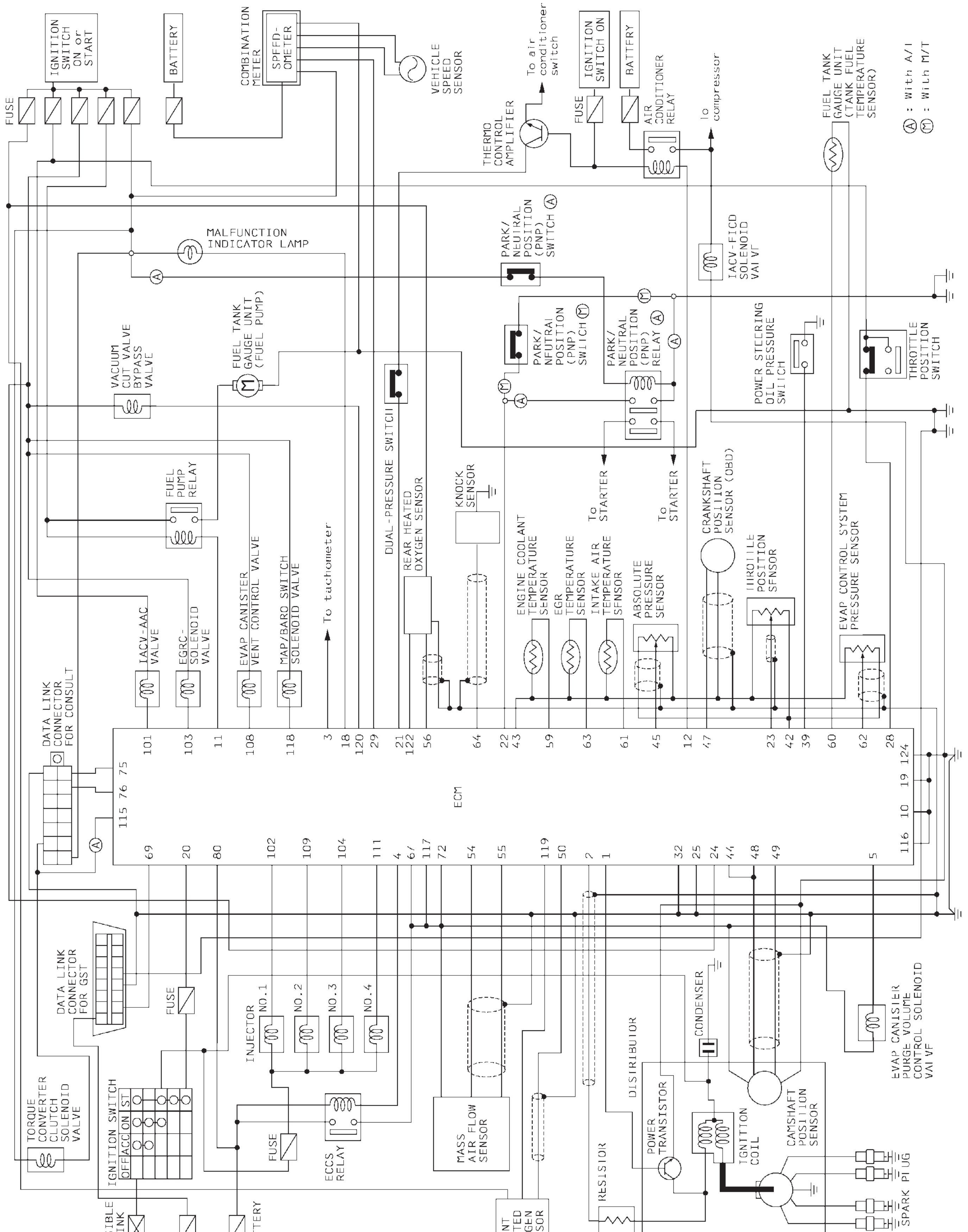
  The DTC should not be displayed in the ‘‘DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” if the repair is completed. The ‘‘OVERALL FUNCTION CHECK’’ should be a good result if the repair is completed.

Precautions (Cont'd)

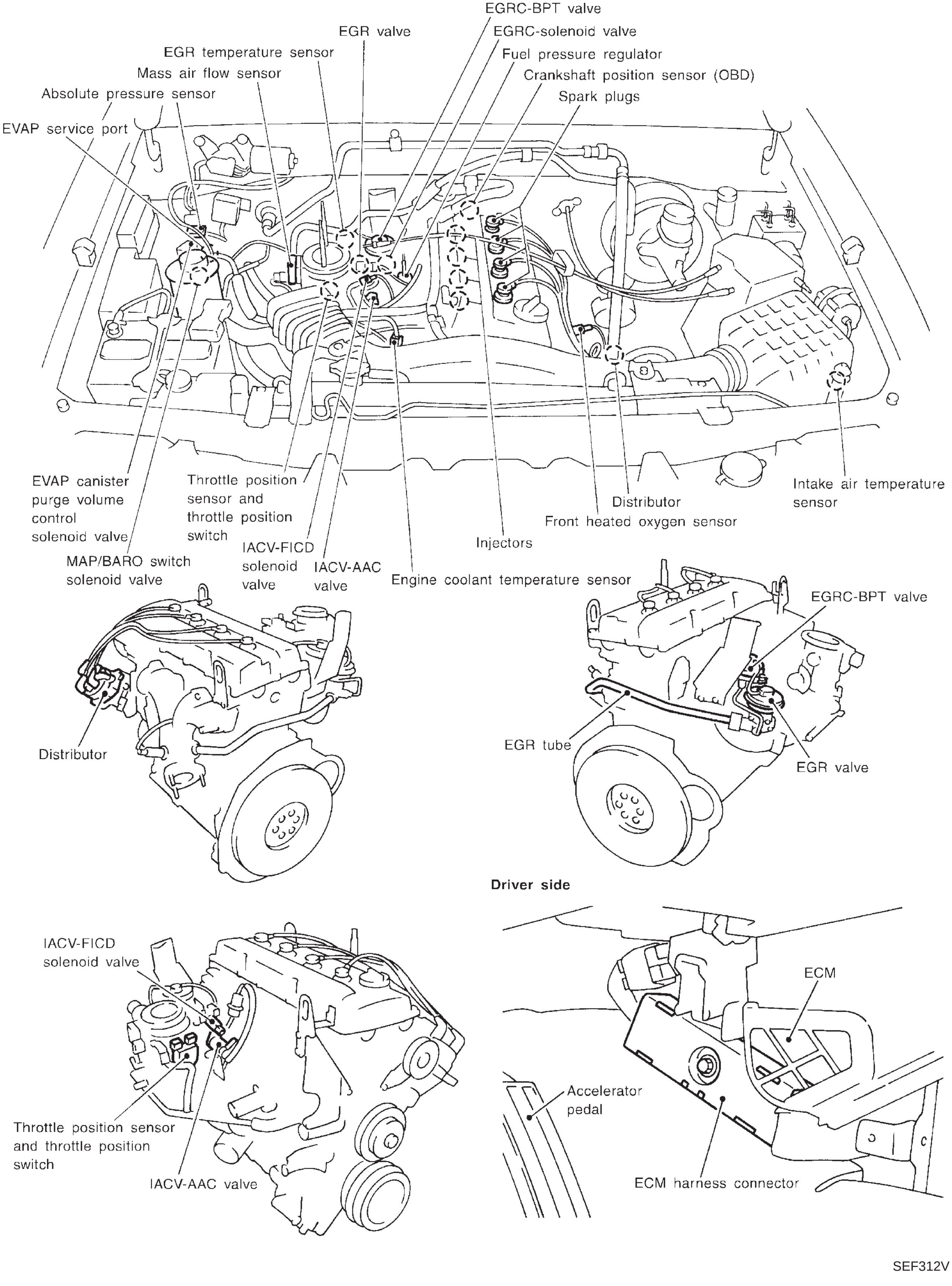


- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

Circuit Diagram

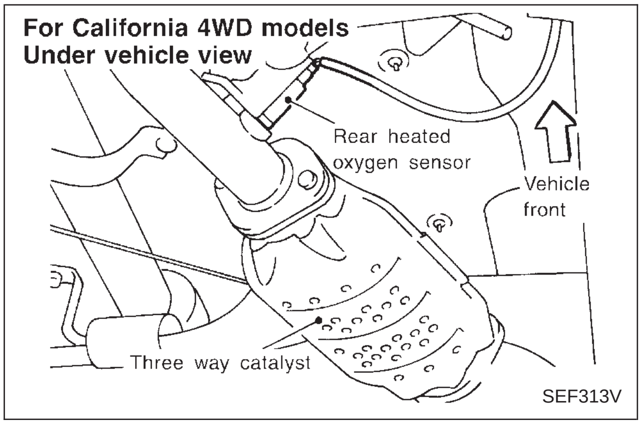


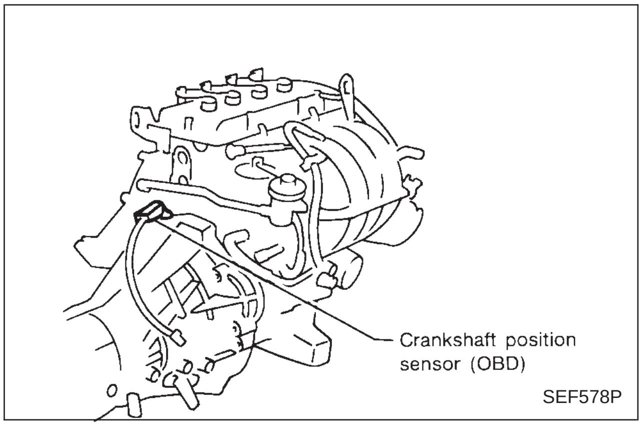
Engine Control Component Parts Location



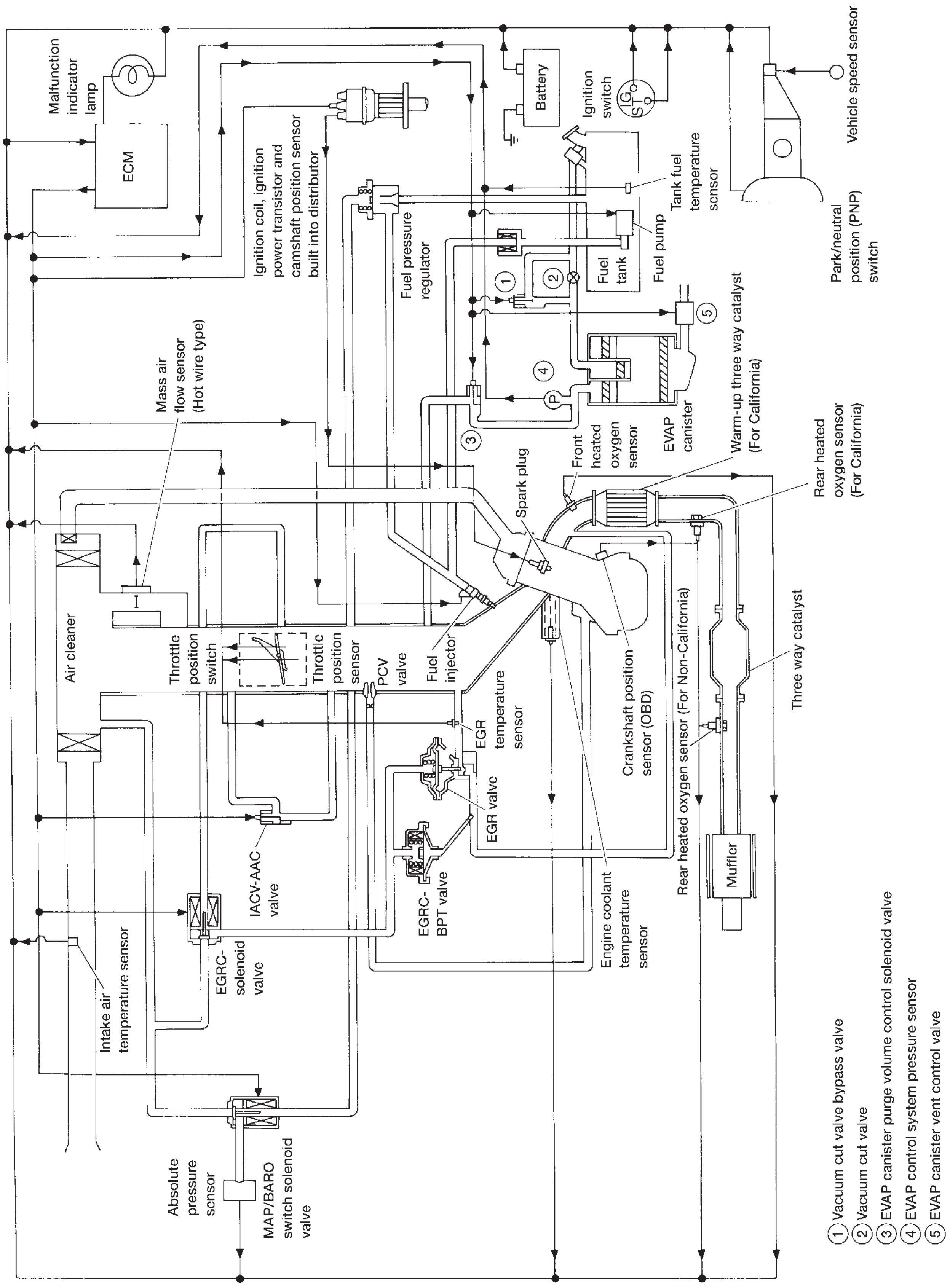
SEF312V

Engine Control Component Parts Location (Cont'd)



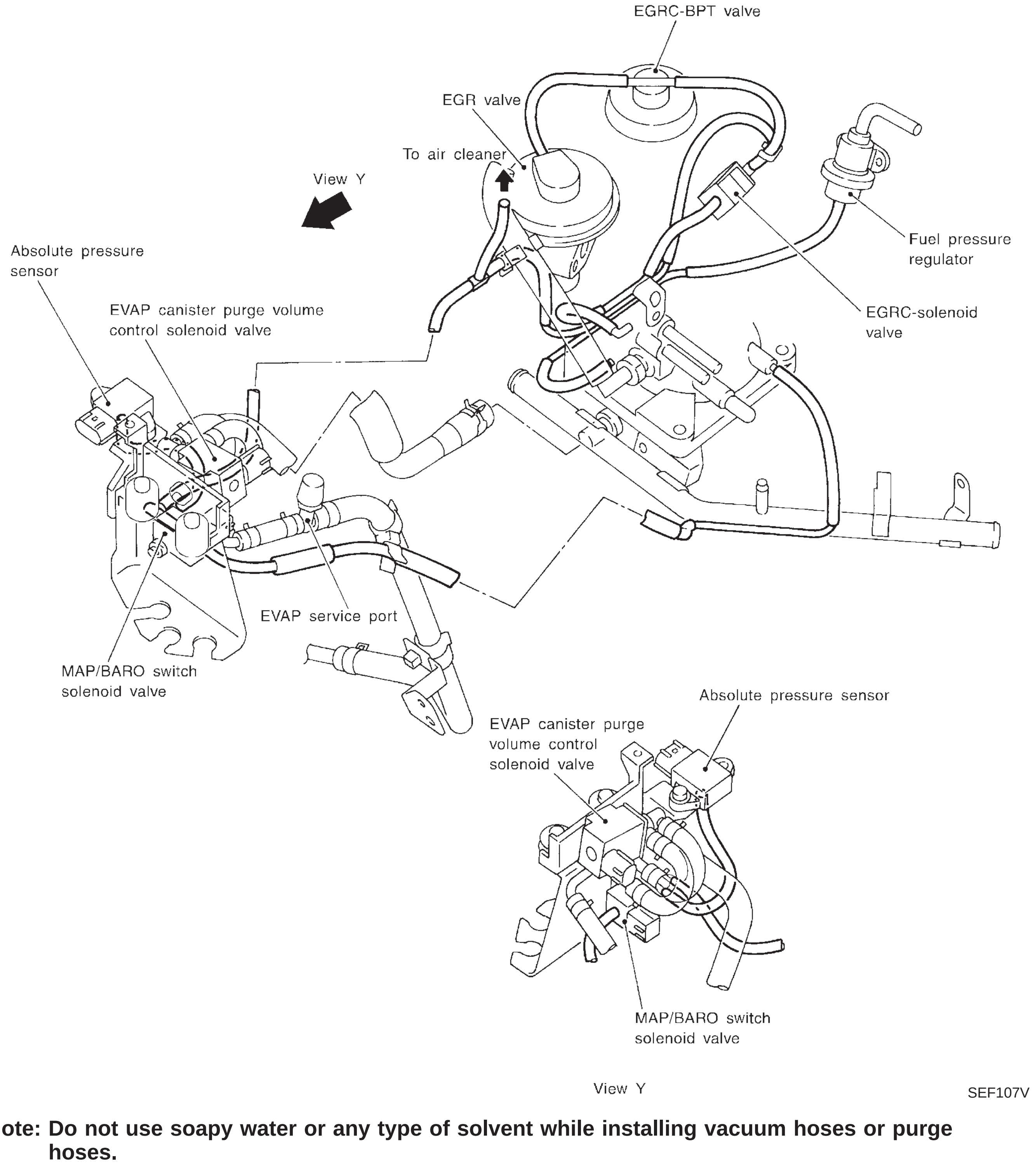


System Diagram



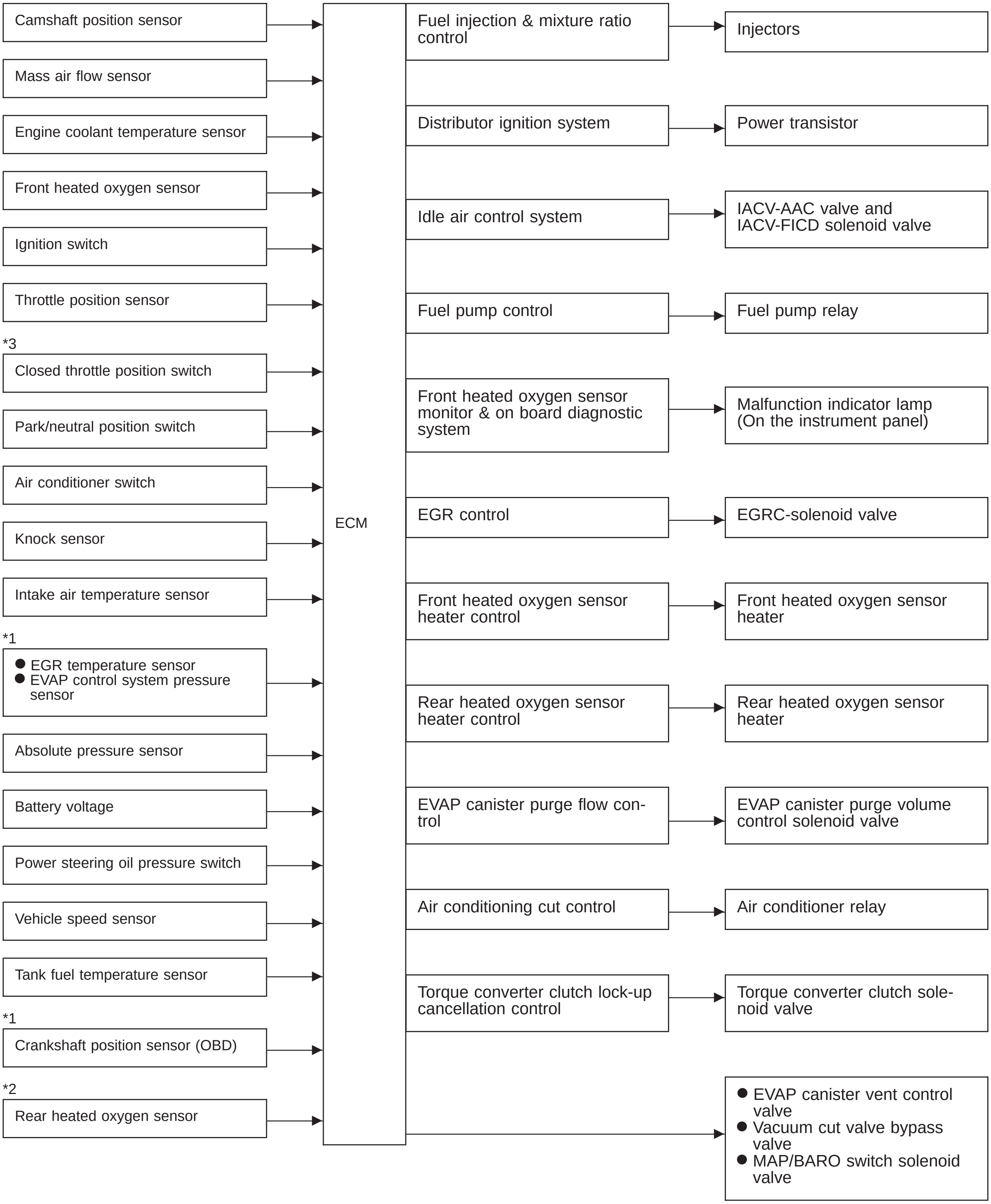
AEC868A

Vacuum Hose Drawing



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

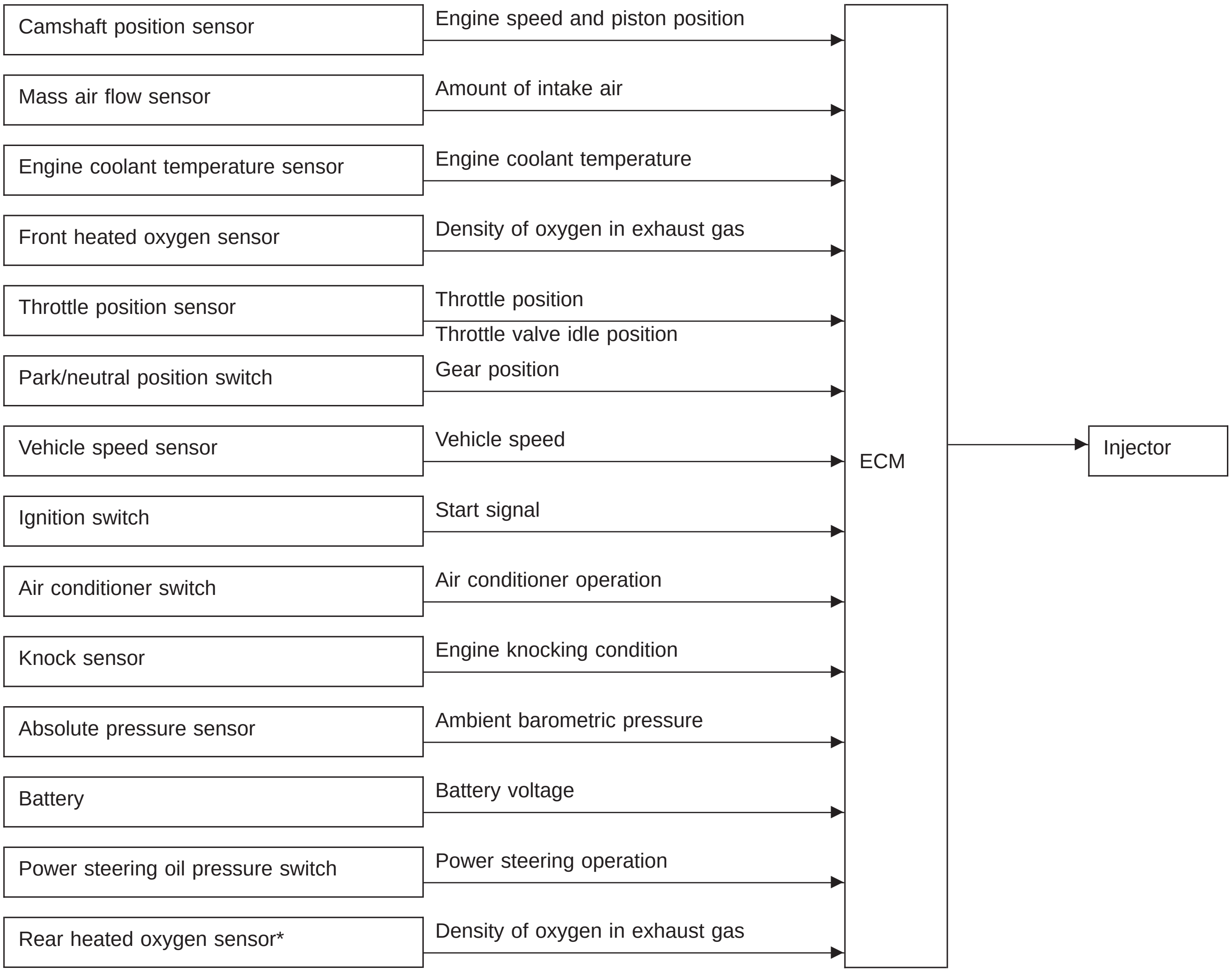
System Chart



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

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



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

BASIC MULTIPORT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

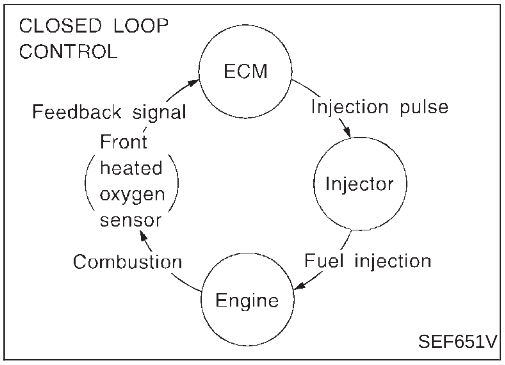
<Fuel increase>

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

<Fuel decrease>

- During deceleration
- During high engine speed operation

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



SEF651V

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the front heated oxygen sensor, refer to EC-150. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).

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

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

OPEN LOOP CONTROL

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

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

MIXTURE RATIO SELF-LEARNING CONTROL

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

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

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

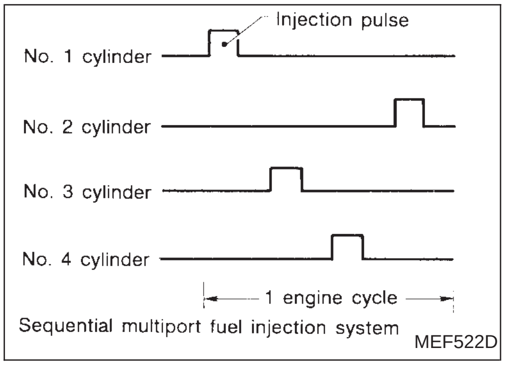
''Short term fuel trim'' is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the front heated oxygen sensor indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel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

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

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

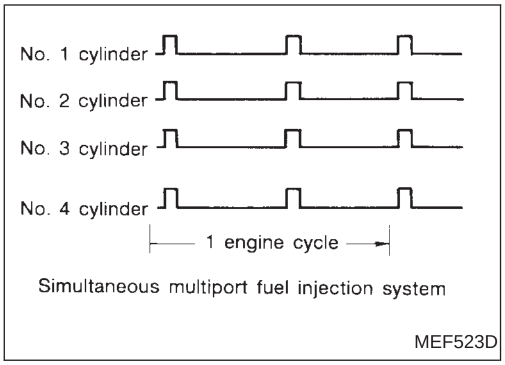
FUEL INJECTION TIMING

Two types of systems are used.



Sequential multiport fuel injection system

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



Simultaneous multiport fuel injection system

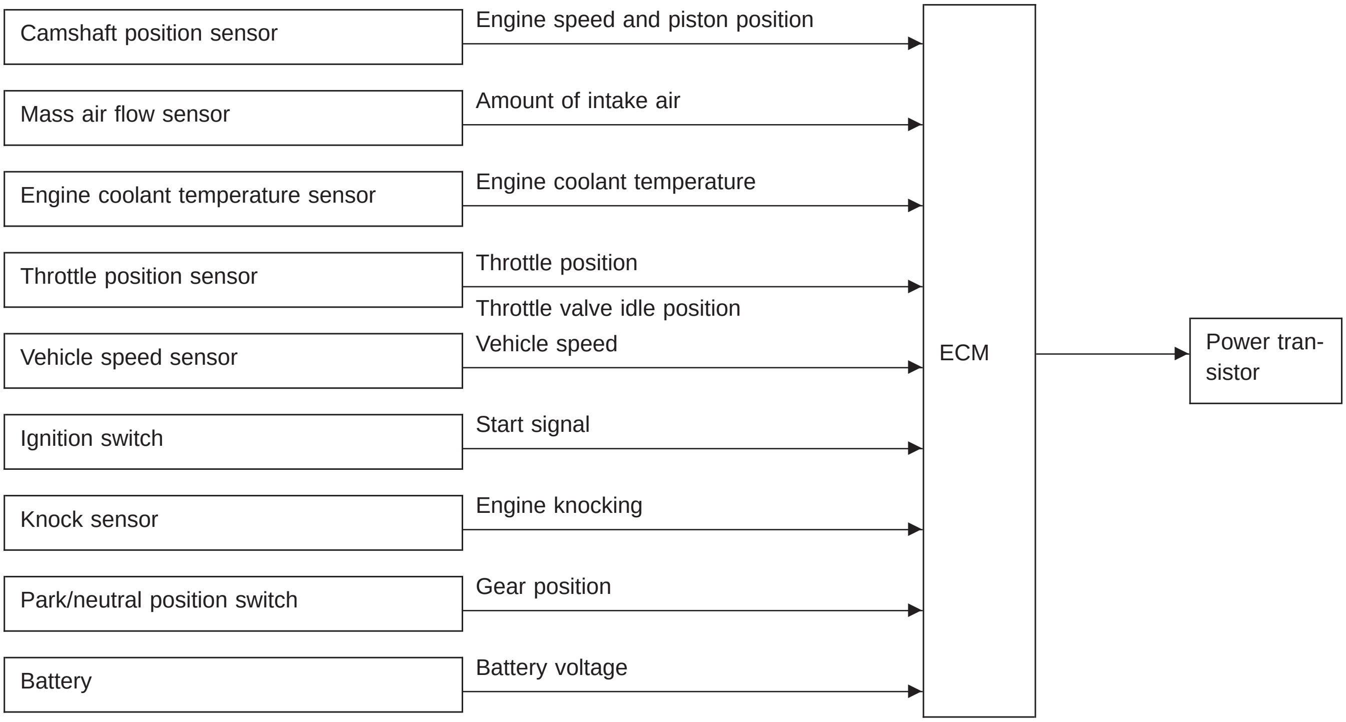
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The six injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started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

FUEL SHUT-OFF

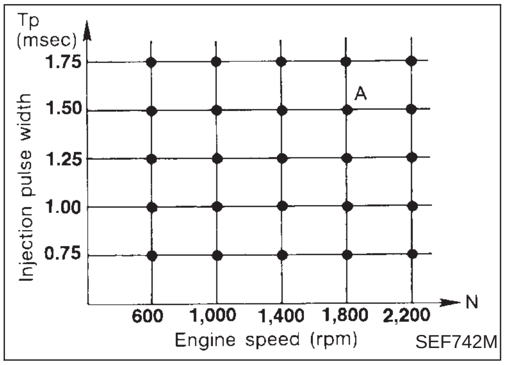
Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



Distributor Ignition (DI) System (Cont'd)



SYSTEM DESCRIPTION

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine.
The ignition timing data is stored in the ECM. This data forms the map shown.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

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

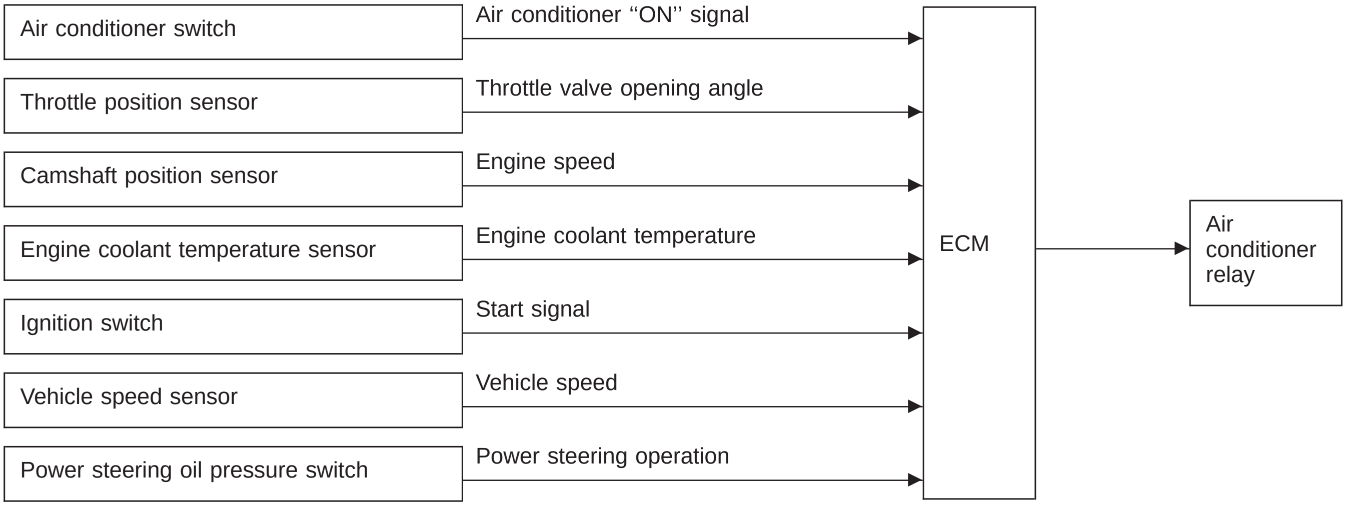
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

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

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



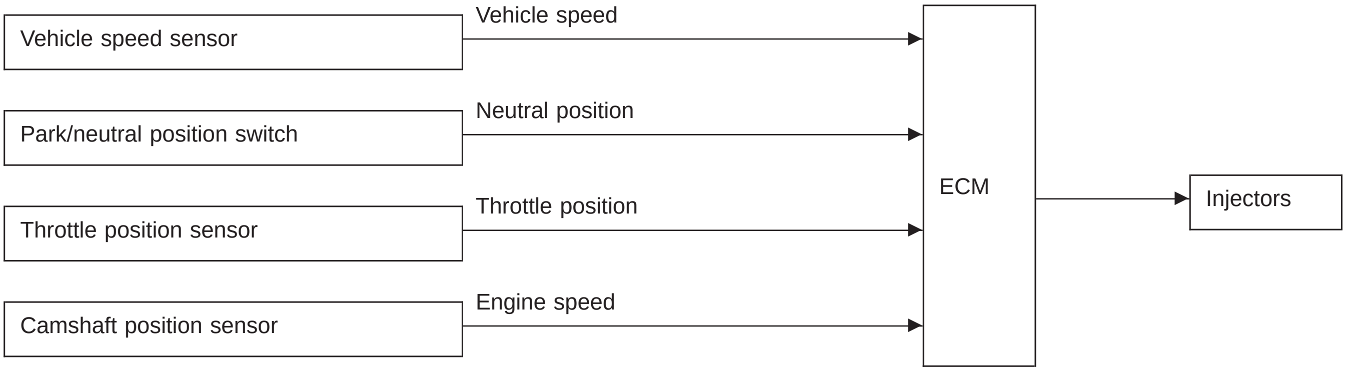
SYSTEM DESCRIPTION

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

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

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

INPUT/OUTPUT SIGNAL LINE



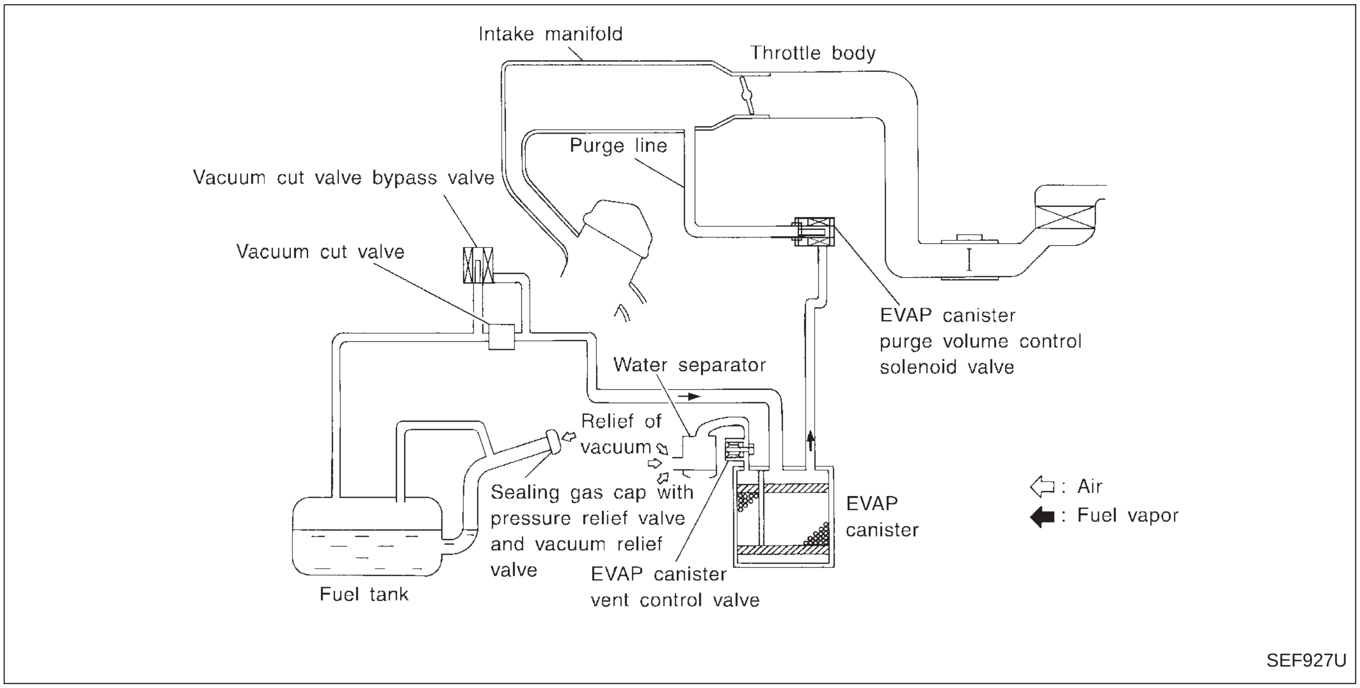
If the engine speed is above 3,000 rpm with no load, (for example, in neutral and engine speed over 3,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will operate until the engine speed reaches 1,500 rpm, then fuel cut is cancelled.

NOTE:

This function is different from deceleration control listed under ‘‘Multiport Fuel Injection (MFI) System’’, EC-18.

Description



SEF927U

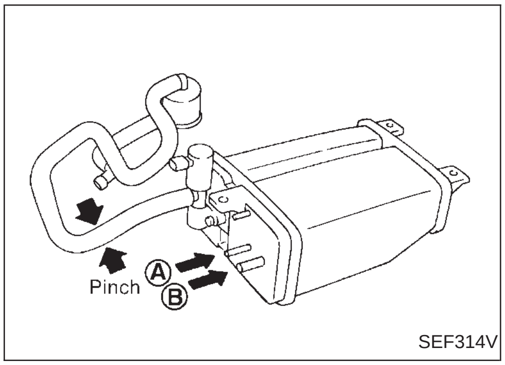
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

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.

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.



SEF314V

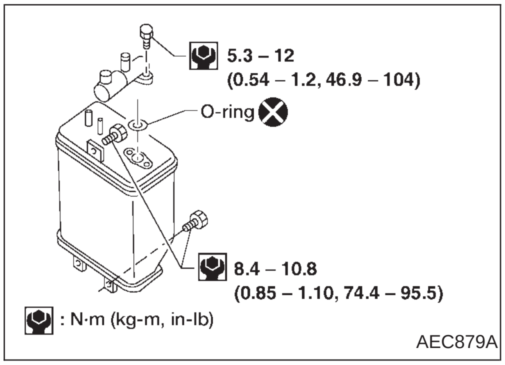
Inspection

EVAP CANISTER

Check EVAP canister as follows:

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

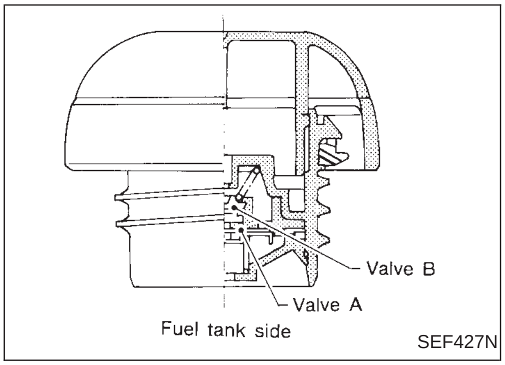
Inspection (Cont’d)

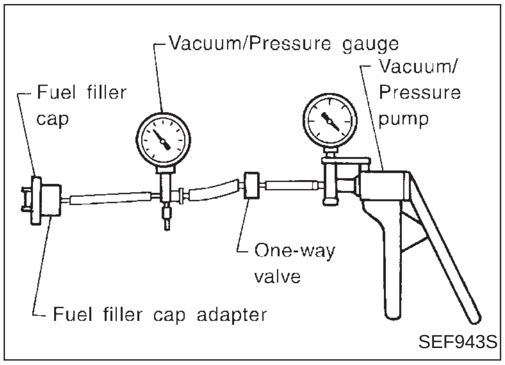


TIGHTENING TORQUE

Tighten EVAP canister as shown in the figure.

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





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

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.
   Pressure:
   16.0 - 20.0 kPa (0.163 - 0.204 kg/cm^2, 2.32 - 2.90 psi)
   Vacuum:
   −6.0 to −3.5 kPa (−0.061 to −0.036 kg/cm^2, −0.87 to −0.51 psi)
3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:

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

VACUUM CUT VALVE AND VACUUM CUT VALVE BYPASS VALVE

Refer to EC-402.

EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

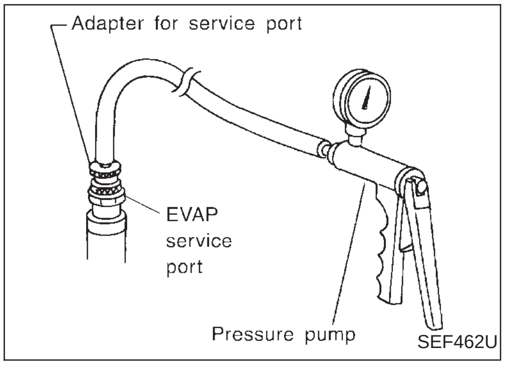
Refer to EC-373.

TANK FUEL TEMPERATURE SENSOR

Refer to EC-234.

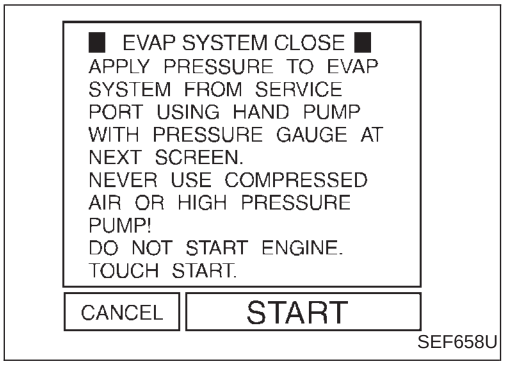
Inspection (Cont'd)

EVAP SERVICE PORT



SEF462U

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.



■ EVAP SYSTEM CLOSE ■
APPLY PRESSURE TO EVAP SYSTEM FROM SERVICE PORT USING HAND PUMP WITH PRESSURE GAUGE AT NEXT SCREEN.
NEVER USE COMPRESSED AIR OR HIGH PRESSURE PUMP!
DO NOT START ENGINE.
TOUCH START.

SEF658U

How to detect fuel vapor leakage

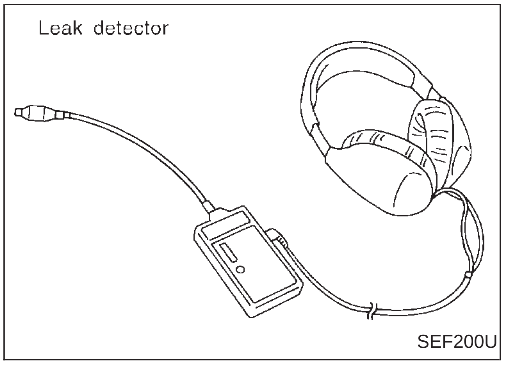
CAUTION:

- **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 adapter to the service port may cause a leak.**

1. Attach the adapter securely to the EVAP SERVICE port.
2. Also attach the pressure pump and hose.
3. Turn ignition switch "ON".
4. Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT MODE" with CONSULT.
5. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
7. Remove adapter and hose with pressure pump.
8. Locate the leak using a leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.



SEF200U

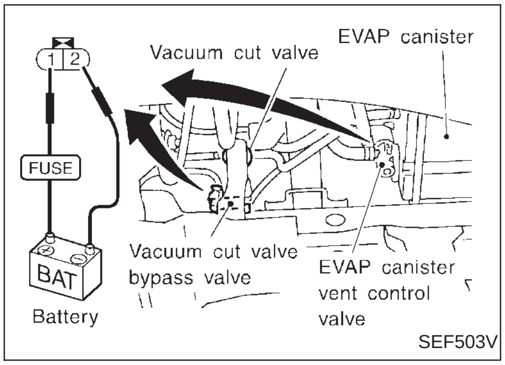
OR

CAUTION:

Never use compressed air or a high pressure pump.

NOTE:

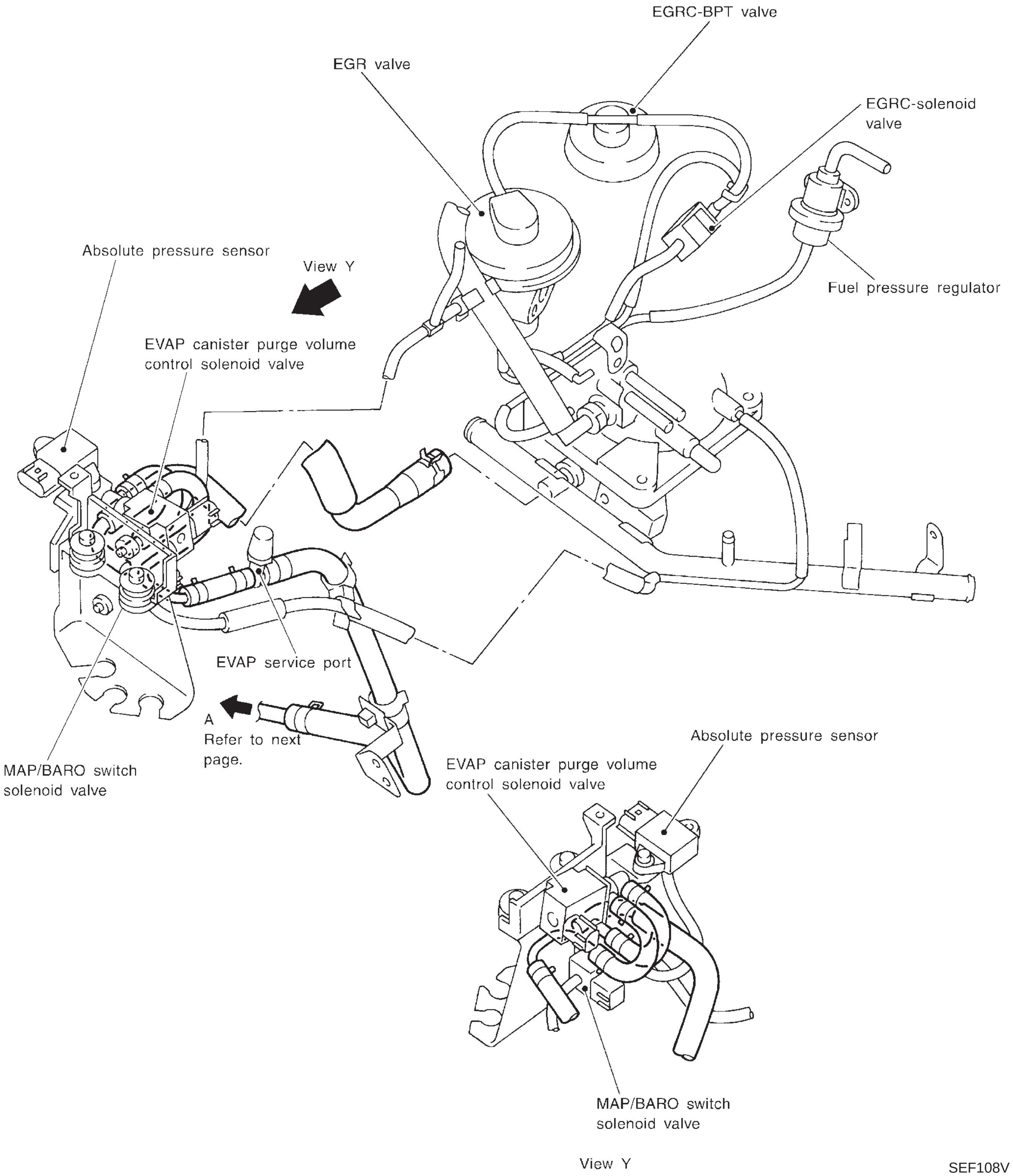
Improper installation of adapter to service port may cause a leak.



SEF503V

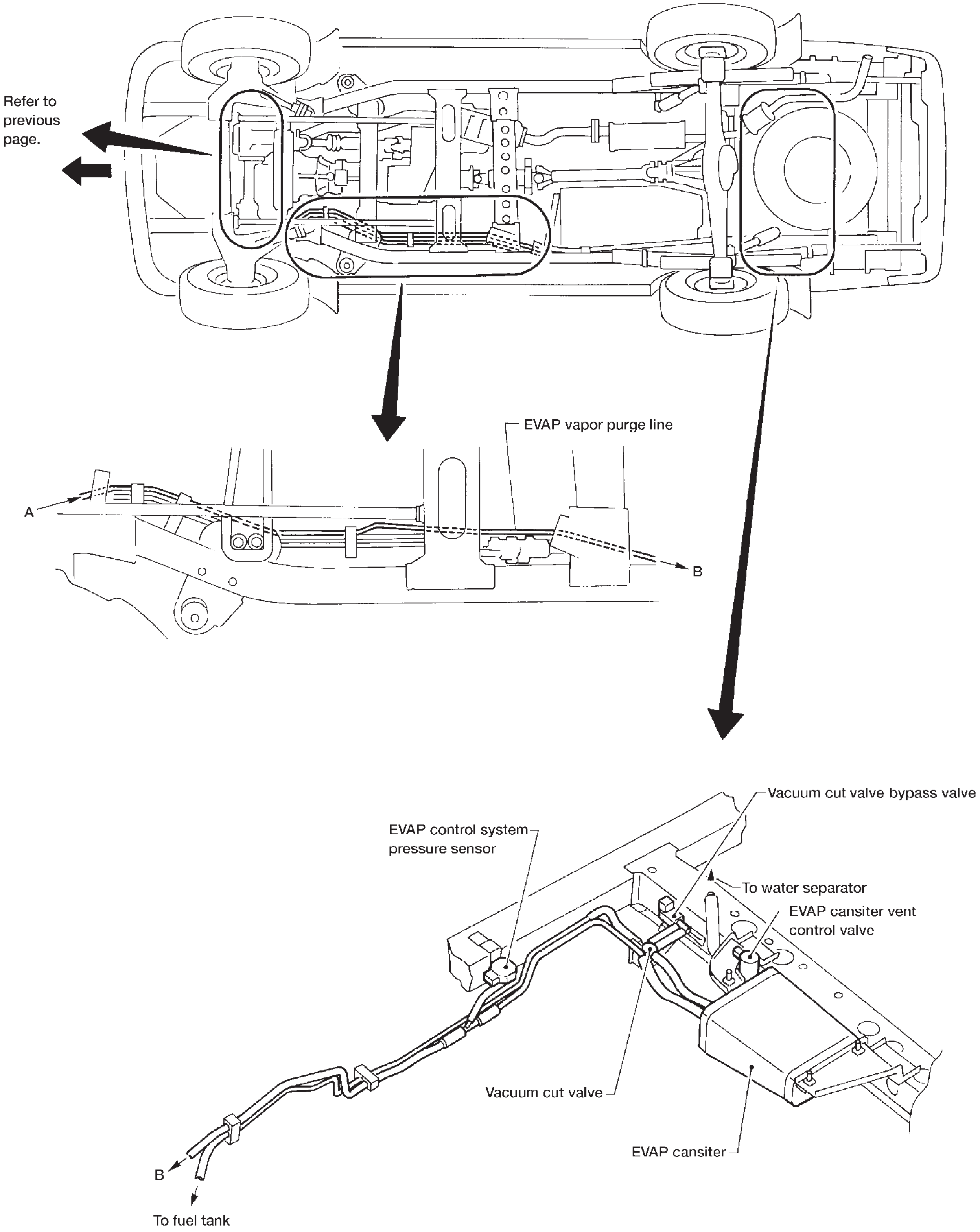
1. Attach the adapter securely to the EVAP service port and pressure pump with pressure gauge to the EVAP service port.
2. Apply battery voltage to between the terminals of both EVAP canister vent control valve and vacuum cut valve bypass valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi).
4. Remove adapter and hose with pressure pump.
5. Locate the leak using a leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

Evaporative Emission Line Drawing



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

Evaporative Emission Line Drawing (Cont'd)



AEC869A

POSITIVE CRANKCASE VENTILATION

Description

This system returns blow-by gas to the intake collector.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

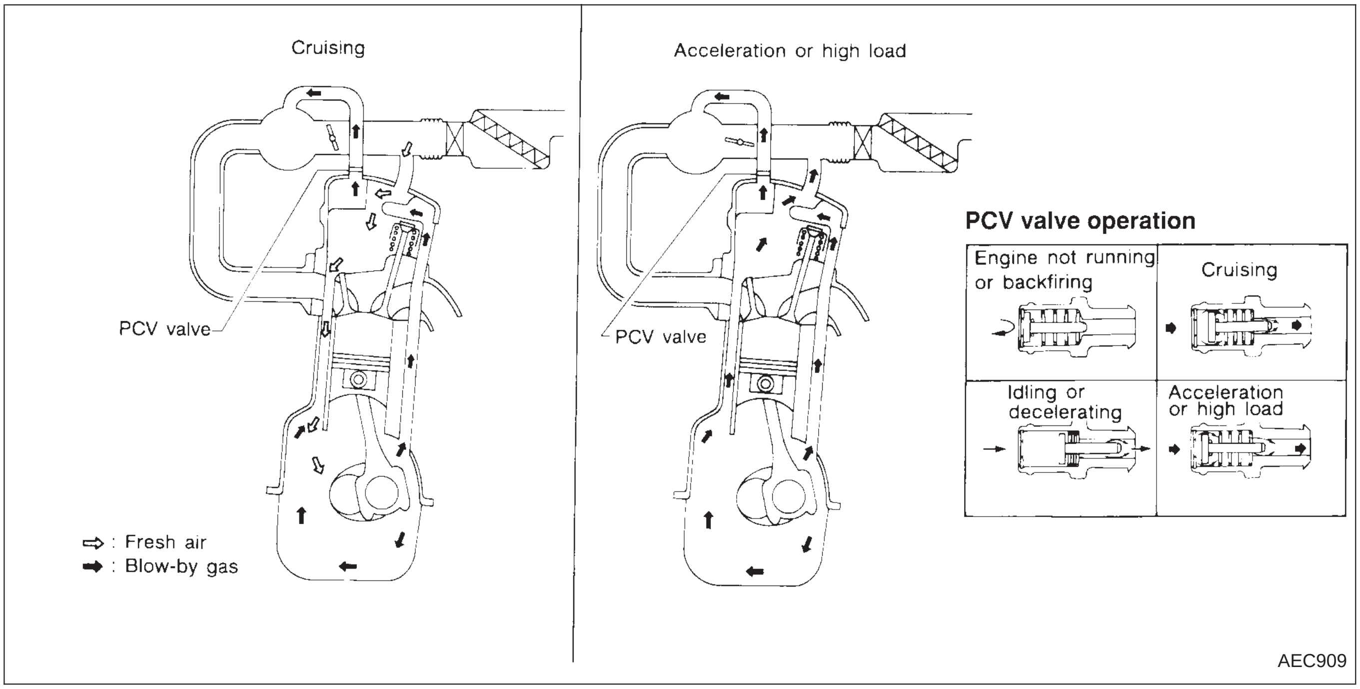
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

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

The ventilating air is then drawn from the air duct into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

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

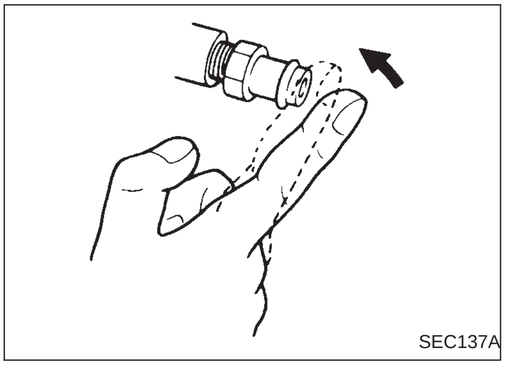
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake collector under all conditions.



AEC909

Inspection

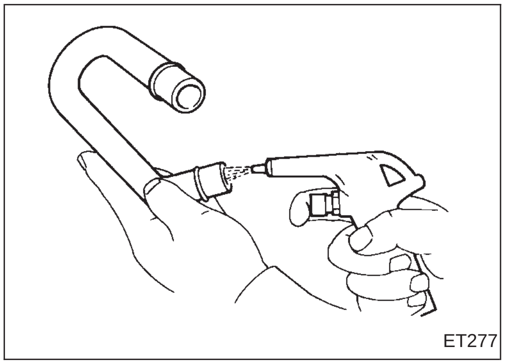
PCV (Positive Crankcase Ventilation) VALVE



SEC137A

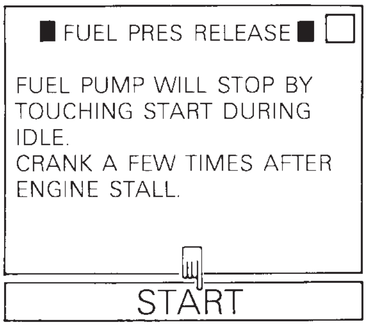
With engine running at idle, remove PCV valve from breather separator. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over the valve inlet.

VENTILATION HOSE



ET277

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

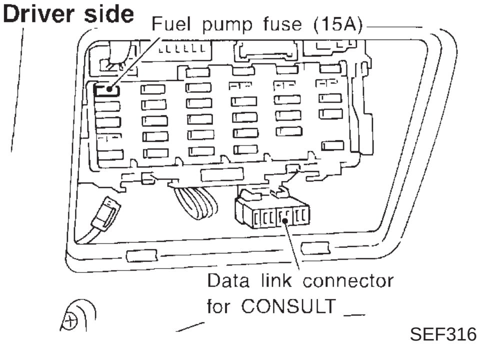


■ FUEL PRES RELEASE ■ ☐

FUEL PUMP WILL STOP BY TOUCHING START DURING IDLE.
CRANK A FEW TIMES AFTER ENGINE STALL.

START

SEF823K



SEF316V

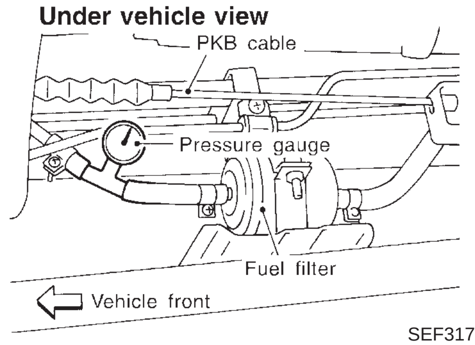
Fuel Pressure Release

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

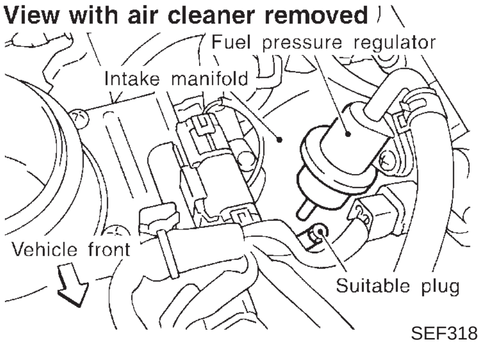
1. Start engine.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT.
3. After engine stalls, crank it two or three times to make sure that fuel pressure is released.
4. Turn ignition switch “OFF”.

OR

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



SEF317V



SEF318V

Fuel Pressure Check

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

1. Release fuel pressure to zero.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.

   At idling:

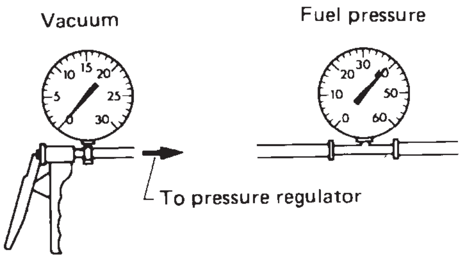
   With vacuum hose connected

   Approximately 235 kPa (2.4 kg/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”.

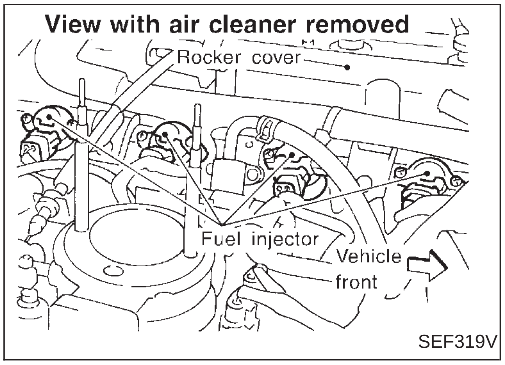


SEF718B

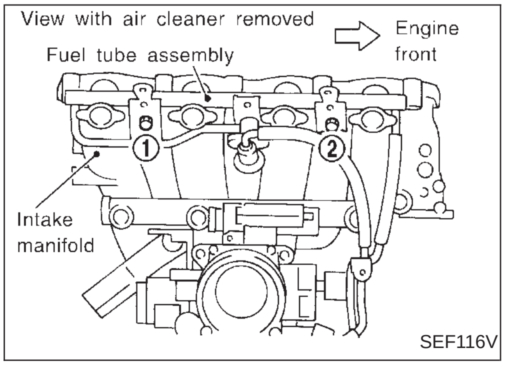
Fuel Pressure Regulator Check

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

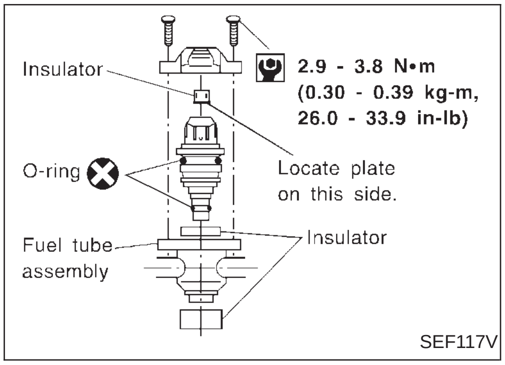
Fuel pressure should decrease as vacuum increases. If results are unsatisfactory, replace fuel pressure regulator.



SEF319V



SEF116V



SEF117V

Injector Removal and Installation

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

Always replace O-rings with new ones.
Lubricate O-rings with a smear of engine oil.

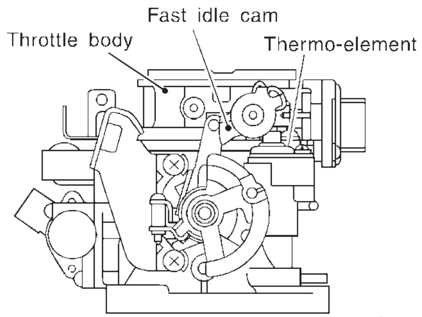
5. Install injectors with fuel tube assembly to intake manifold.

Tighten in numerical order shown in the figure.

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

CAUTION:

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

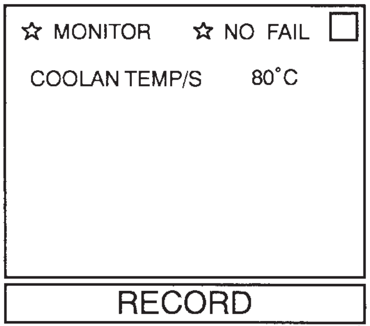


SEF500V

Fast Idle Cam (FIC)

COMPONENT DESCRIPTION

The FIC is installed on the throttle body to maintain adequate engine speed while the engine is cold. It is operated by a volumetric change in wax located inside the thermo-element. The thermo-element is operated by engine coolant temperature.



☆ MONITOR ☆ NO FAIL ☐

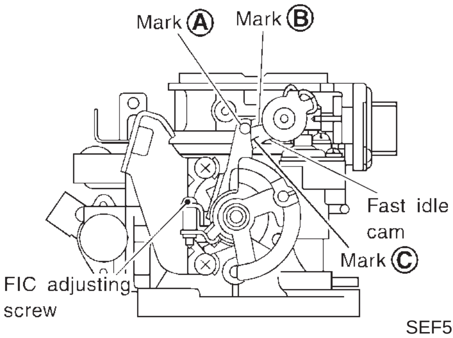
COOLAN TEMP/S 80°C

RECORD

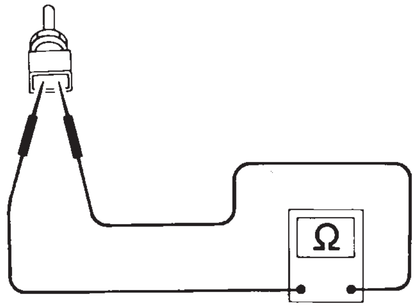
SEF522P

COMPONENT INSPECTION AND ADJUSTMENT

1. Turn ignition switch “ON”.
2. See “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT.
3. Start engine and warm it up.
   When engine temperature is 80±5°C (176±9°F), make sure that the center of mark Ⓐ is aligned with mark Ⓑ as shown in the figure.



SEF501V



SEF536H

OR

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

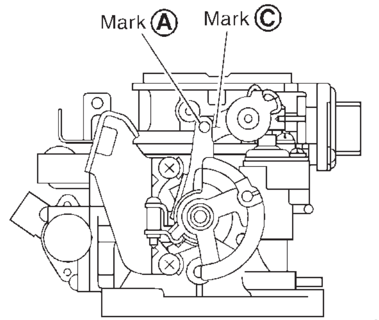
- If NG, adjust by turning adjusting screw.
  Adjusting screw tightening torque:
  0.98 - 1.96 N·m (10 - 20 kg-cm, 8.7 - 17.4 in-lb)

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

OR

5. When the resistance of engine coolant temperature sensor is 1.65 to 2.40 kΩ, make sure that the center of mark Ⓐ is aligned with mark Ⓒ as shown in the figure.

- If NG, replace thermo-element and perform the above inspection and adjustment again.



SEF502V

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

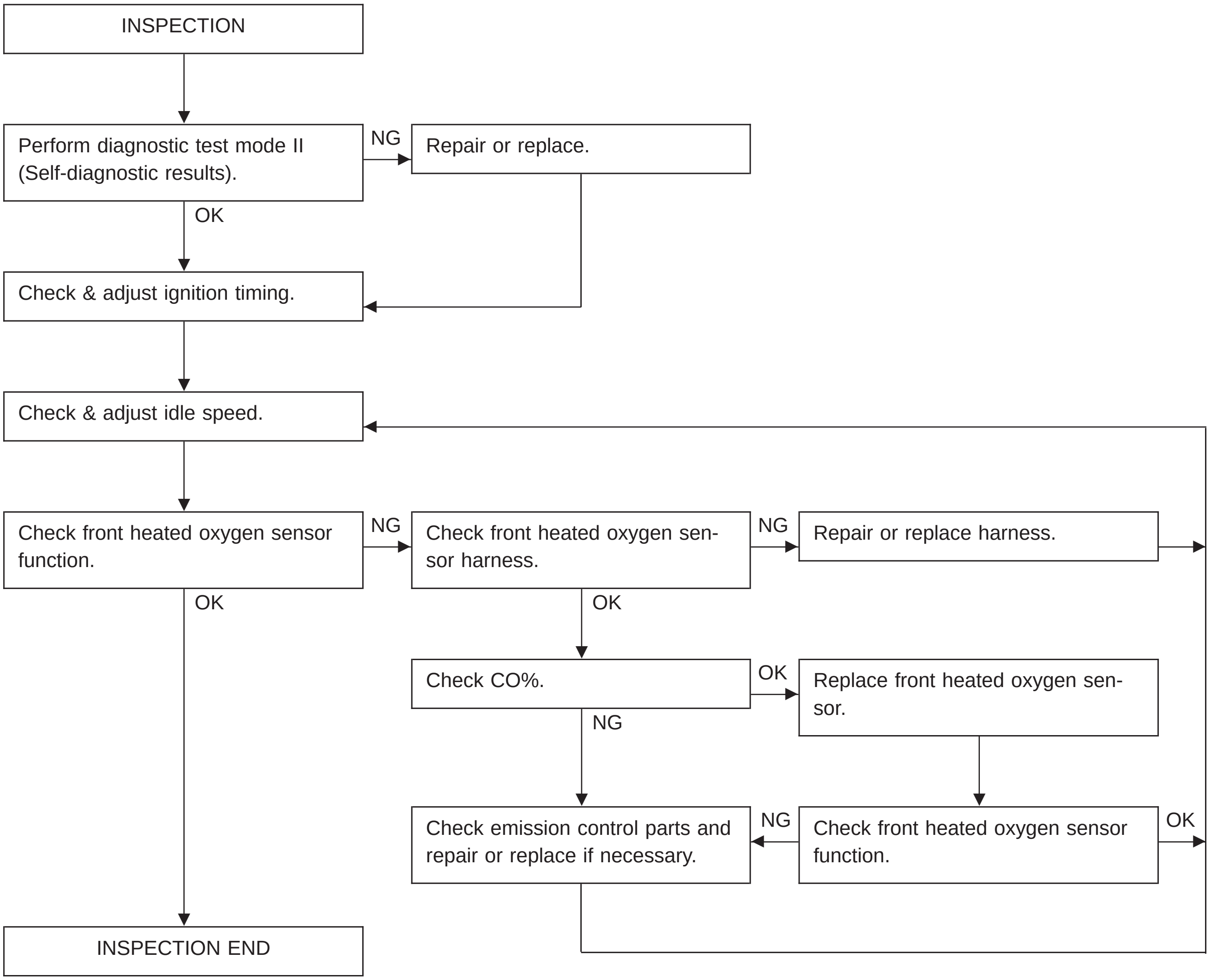
PREPARATION

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

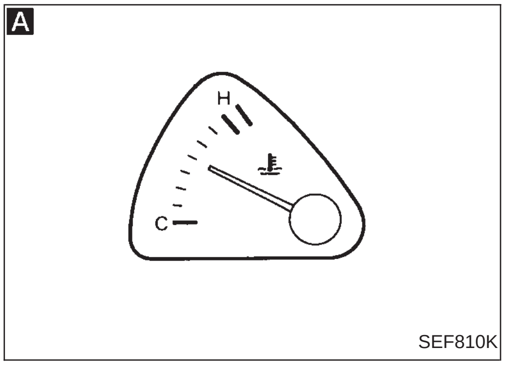
(1) Battery
(2) Ignition system
(3) Engine oil and coolant levels
(4) Fuses
(5) ECM harness connector
(6) Vacuum hoses
(7) Air intake system
(Oil filler cap, oil level gauge, etc.)
(8) Fuel pressure
(9) Engine compression
(10) EGR valve operation
(11) Throttle valve
(12) EVAP system

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

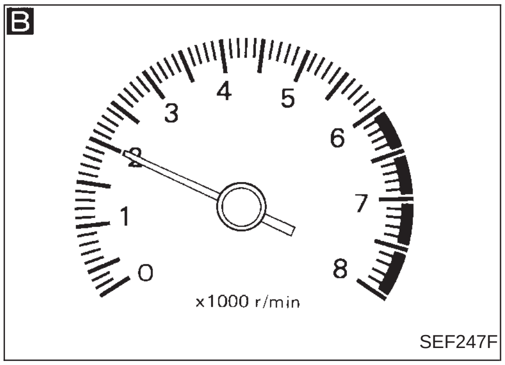
Overall inspection sequence



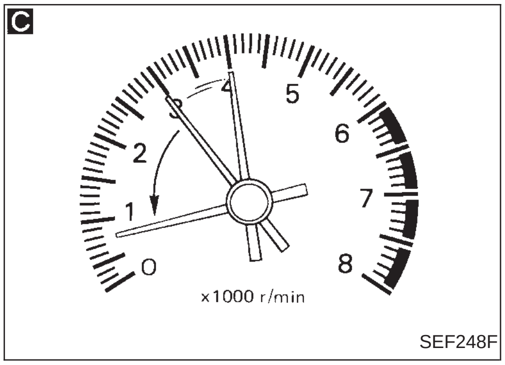
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)



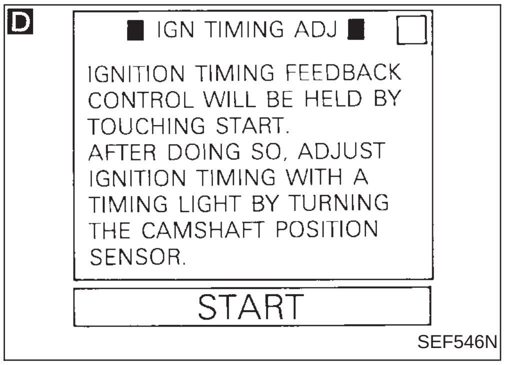
SEF810K



SEF247F



SEF248F

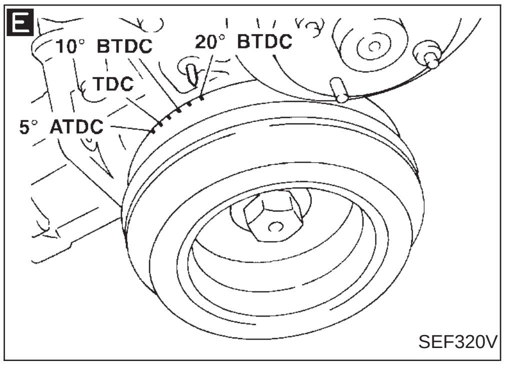


■ IGN TIMING ADJ ■

IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START.
AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.

START

SEF546N



SEF320V

START

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

A

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

B

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

Perform ECM Self-diagnosis.

OK

NG

Repair or replace components as necessary.

C

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

D

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

OR

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

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

E

Check ignition timing with a timing light.

20°±2° BTDC (A/T in "N" position)

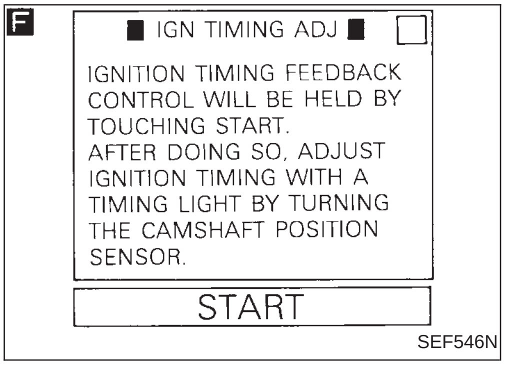
OK

Ⓐ (Go to next page.)

NG

Ⓑ (Go to next page.)

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

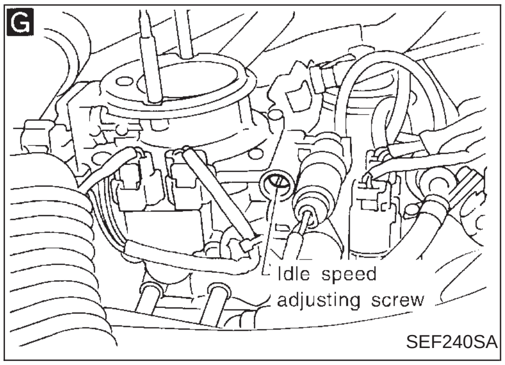


■ IGN TIMING ADJ ■ ☐

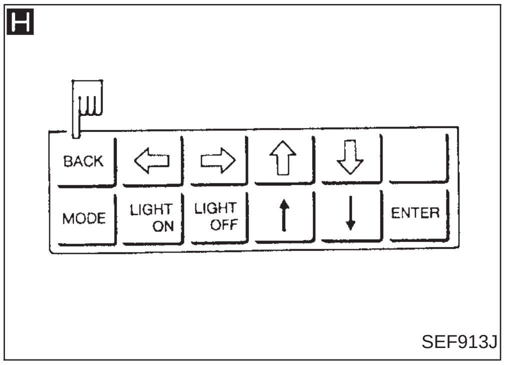
IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START.
AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.

START

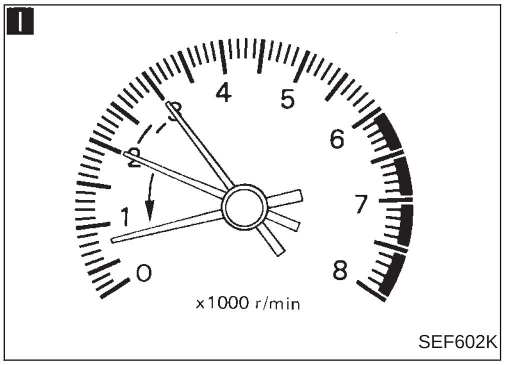
SEF546N



SEF240SA



SEF913J



SEF602K

Ⓐ Ⓑ

Adjust ignition timing to the specified value by turning distributor after loosening bolts which secure distributor.

20°±2° BTDC (in "N" position)

Ⓕ

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

OR

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

F

Check base idle speed.

Read idle speed in "IGN TIMING ADJ" mode with CONSULT.

OR

Check idle speed.

750±50 rpm (in "N" position)

OK NG

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

G

Adjust idle speed by turning idle speed adjusting screw.

750±50 rpm (in "N" position)

H

Touch "Back".

OR

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

I

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

Ⓒ

(Go to next page.)

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

Ⓒ

J

Check target idle speed.

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

OR

Check idle speed.

800±50 rpm (in "N" position)

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

NG ↓

Check IACV-AAC valve and replace if necessary.

↓

Check IACV-AAC valve harness and repair if necessary.

↓

Check ECM function* by substituting another known good ECM.

↓

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

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

↓

K

Check front heated oxygen sensor signal.

1. See "FR O2 MNTR" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

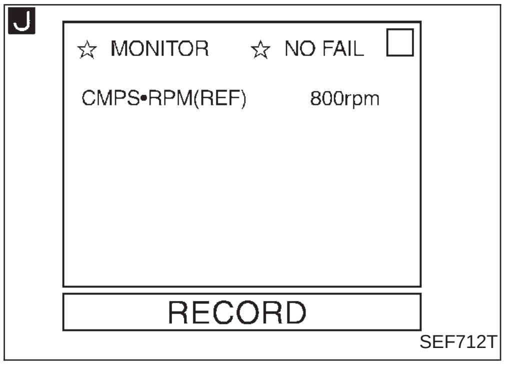
OR

1. Set the diagnostic test mode II (front heated oxygen sensor monitor).
2. Make sure that malfunction indicator lamp goes on more than 5 times during 10 seconds at 2,000 rpm.

NG → Ⓓ (Go to next page.)

OK ↓

INSPECTION END

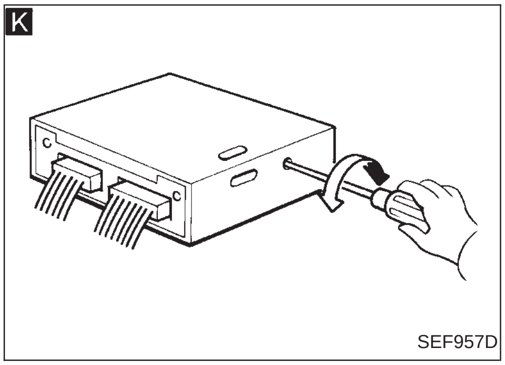

J

☆ MONITOR ☆ NO FAIL ☐

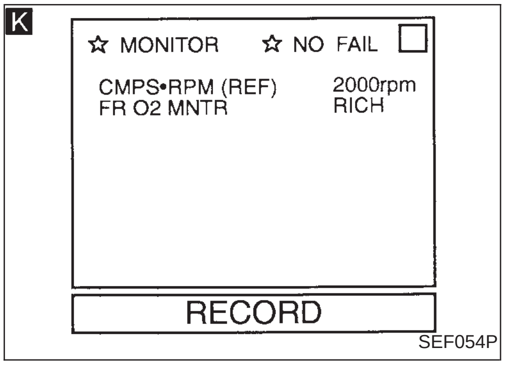
CMPS•RPM(REF) 800rpm

RECORD

SEF712T



SEF957D

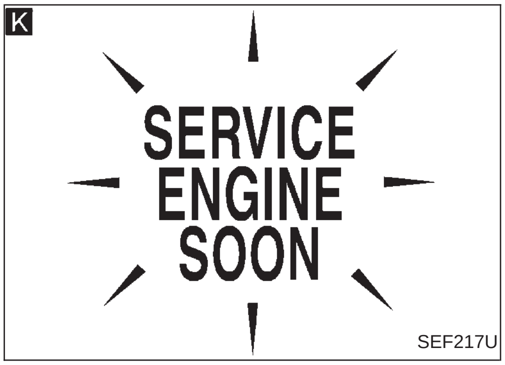

K

☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM (REF) 2000rpm
FR O2 MNTR RICH

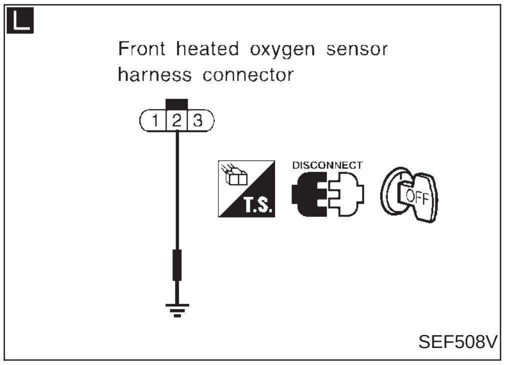
RECORD

SEF054P

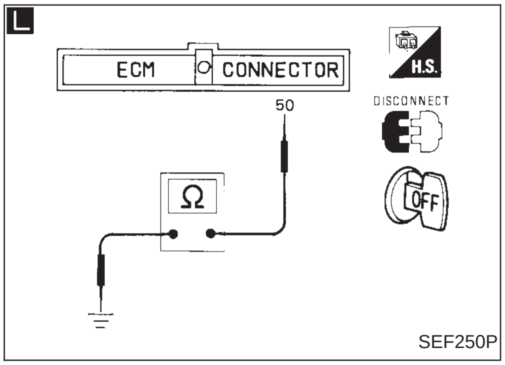


SEF217U

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



SEF508V



SEF250P

Ⓓ

Check front heated oxygen sensor harness:

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

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

OK

NG

Repair harness.

Ⓕ
(Go to EC-34.)

Connect ECM harness connector to ECM.

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

OR

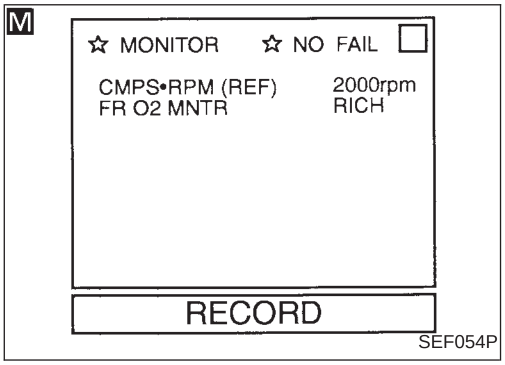
1. Disconnect engine coolant temperature sensor harness connector.
2. Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.

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

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

Ⓔ
(Go to next page.)

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



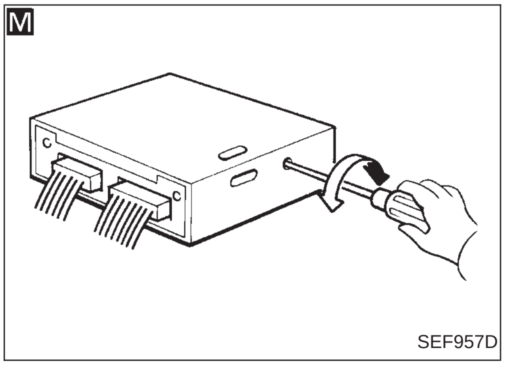
☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM (REF) 2000rpm

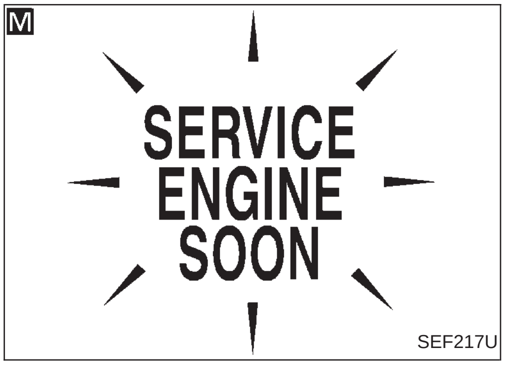
FR O2 MNTR RICH

RECORD

SEF054P



SEF957D



SEF217U

Ⓔ

Check "CO"%.

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

After checking "CO"%

Touch "BACK".

OR

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

NG → Connect front heated oxygen sensor harness connector to front oxygen sensor.

OK ↓

Replace front heated oxygen sensor.

1. See "FR O2 MNTR" in "DATA MONITOR" mode.
2. Maintaining engine at 2,000 rpm under no-load (engine is warmed up to normal operating temperature.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

1. Set the diagnostic test mode II (front heated oxygen sensor monitor).
2. Make sure that malfunction indicator lamp goes on more than 5 times during 10 seconds at 2,000 rpm.

NG → Connect front heated oxygen sensor harness connector to front oxygen sensor.

OK → Ⓕ (Go to EC-34.)

Connect front heated oxygen sensor harness connector to front oxygen sensor.

↓

Check fuel pressure regulator.

↓

Check mass air flow sensor.

↓

Check injector and clean or replace if necessary.

↓

Check engine coolant temperature sensor.

↓

Check ECM function* by substituting another known good ECM.

↓

Ⓕ (Go to EC-34.)

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

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

ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

Introduction

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

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

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

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

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

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode (Refer to EC-81.).

Two Trip Detection Logic

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not light up at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL lights up. The MIL lights up at the same time when the DTC is stored. <2nd trip> The ‘‘trip’’ in the ‘‘Two Trip Detection Logic’’ means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to light up or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up	Blinking	Lighting up				
Coolant over temperature enrichment protection — DTC: P0217	—	X	—	—	—	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) is being detected	X	—	—	—	X	—	X	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) is being detected	—	—	X	—	—	X	—	—
Closed loop control — DTC: P1148 (0307)	—	X	—	—	X	—	X	—
Fail-safe items (Refer to EC-81.)	—	X	—	—	X*1	—	X*1	—
Except above	—	—	—	X	—	X	X	—

*1: Except ‘‘ECM’’.

Emission-related Diagnostic Information

DTC AND 1ST TRIP DTC

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

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in ‘‘HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION’’. Refer to EC-48.

For malfunctions in which 1st trip DTCs are displayed, refer to EC-46. These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.

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

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in ‘‘Work Flow’’ procedure Step II, refer to page EC-72. Then perform ‘‘Diagnostic trouble code confirmation procedure’’ or ‘‘Overall function check’’ to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

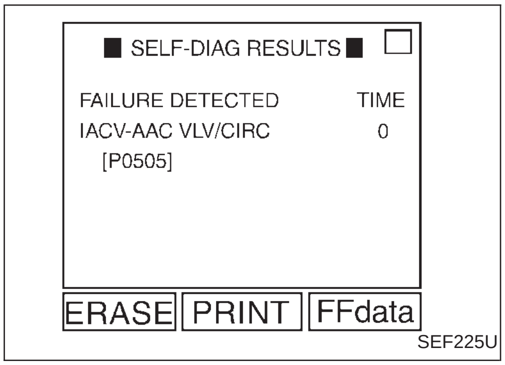
How to read DTC and 1st trip DTC

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

NO TOOLS 1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc.
These DTCs are controlled by NISSAN.

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

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


■ SELF-DIAG RESULTS ■

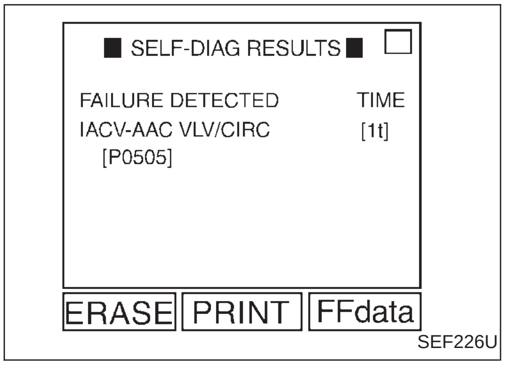
FAILURE DETECTED	TIME
IACV-AAC VLV/CIRC [P0505]	0

SEF225U

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

Emission-related Diagnostic Information (Cont'd)

If a 1st trip DTC is stored in the ECM, the time data will be ‘‘[1t]’’.



■ SELF-DIAG RESULTS ■ ☐

FAILURE DETECTED TIME

IACV-AAC VLV/CIRC [1t]

[P0505]

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

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

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For details, see EC-60.

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

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

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

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in ‘‘HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION’’. Refer to EC-48.

SYSTEM READINESS TEST (SRT) CODE

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

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

SRT codes are set after self-diagnosis has been performed one or more times. This occurs regardless of whether the diagnosis is in ‘‘OK’’ or ‘‘NG’’, and whether or not the diagnosis is performed in consecutive trips. The following table lists the 5 SRT items (18 test items) for the ECM used in D22 models.

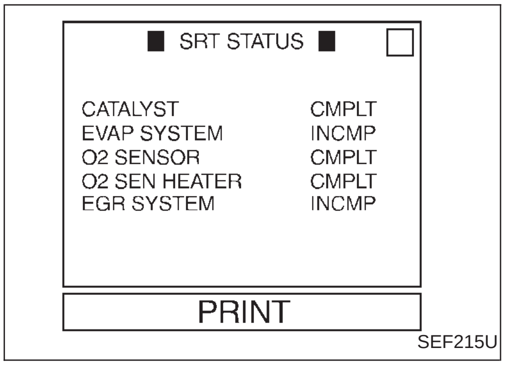
Emission-related Diagnostic Information (Cont'd)

SRT items	Self-diagnostic test items
Catalyst monitoring	● Three way catalyst function P0420 (0702)
EVAP system monitoring	● EVAP control system (Small leak — Negative pressure) P0440 (0705) ● EVAP control system (Small leak — Positive pressure) P1440 (0213) ● EVAP control system purge flow monitoring P1447 (0111)
Oxygen sensor monitoring	● Front heated oxygen sensor (Response monitoring) P0133 (0409) ● Front heated oxygen sensor (Rich shift monitoring) P0132 (0410) ● Front heated oxygen sensor (Lean shift monitoring) P0131 (0411) ● Front heated oxygen sensor (Circuit) P0130 (0303) ● Front heated oxygen sensor (High voltage) P0134 (0412) ● Rear heated oxygen sensor (Response monitoring) P0139 (0707) ● Rear heated oxygen sensor (Max. voltage monitoring) P0138 (0510) ● Rear heated oxygen sensor (Min. voltage monitoring) P0137 (0511) ● Rear heated oxygen sensor (High voltage) P0140 (0512)
Oxygen sensor heater monitoring	● Front heated oxygen sensor heater P0135 (0901) ● Rear heated oxygen sensor heater P0141 (0902)
EGR system monitoring	● EGR function (Close) P0400 (0302) ● EGR function (Open) P1402 (0514) ● EGRC-BPT valve function P0402 (0306)

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-48). In addition, after ECCS components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

How to display SRT code

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



■ SRT STATUS ■ ☐

CATALYST	CMPLT
EVAP SYSTEM	INCMP
O2 SENSOR	CMPLT
O2 SEN HEATER	CMPLT
EGR SYSTEM	INCMP

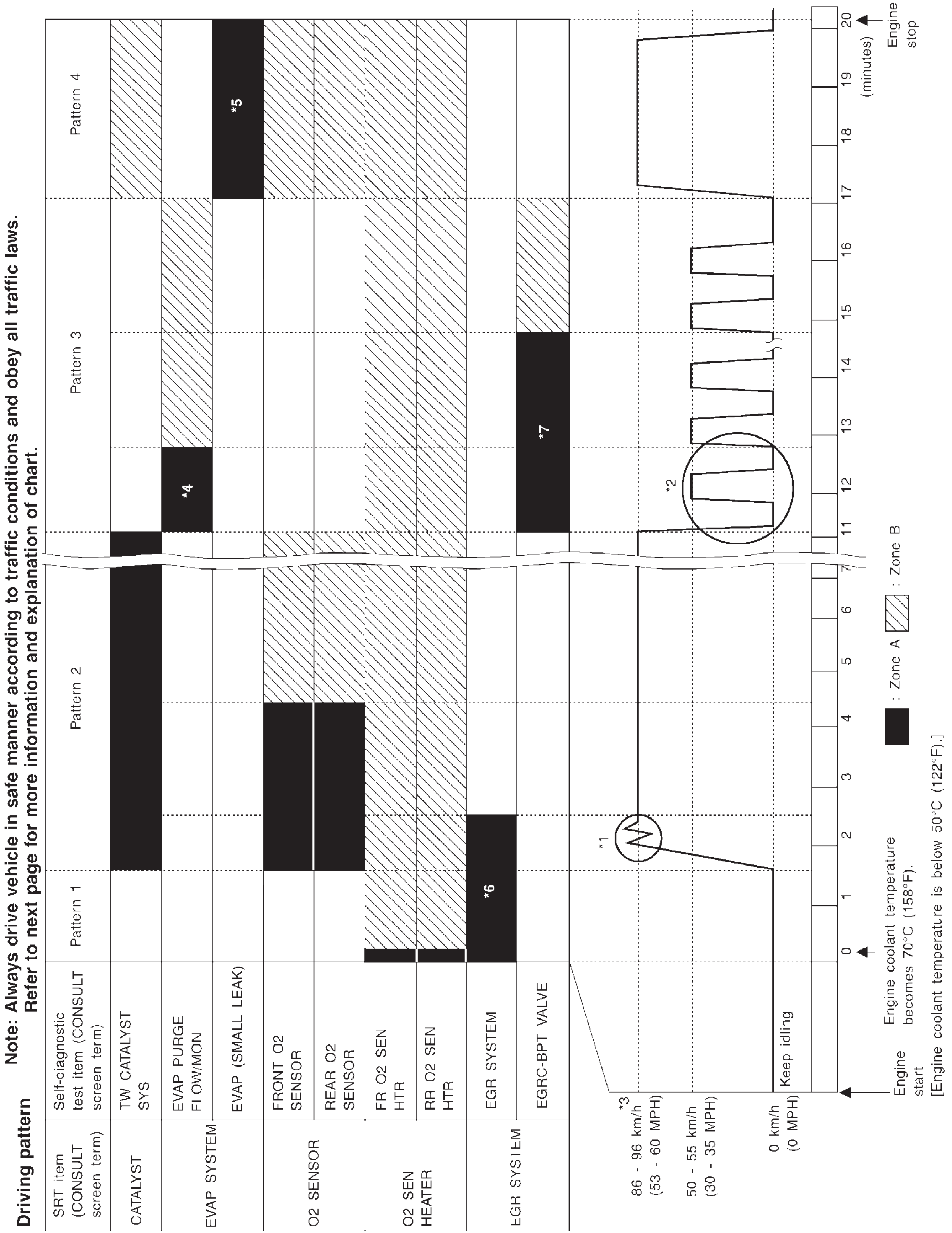
SEF215U

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

How to set SRT code

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

Driving pattern



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

SEF933V

Emission-related Diagnostic Information (Cont'd)

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time required, for the diagnosis under normal conditions*, is the shortest. Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

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

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

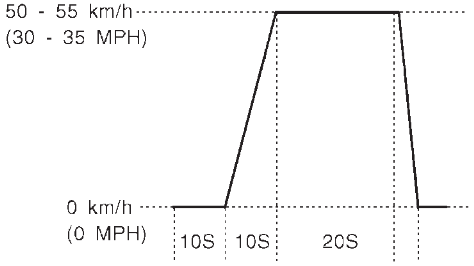
Pattern 2:
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:
- The driving pattern outlined in *2 must be repeated at least 3 times.
  On M/T models, shift gears following ''suggested upshift speeds'' schedule on next page.

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

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

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



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

*4: The driving pattern may be omitted when ''PURG FLOW P1447'' is performed using the ''DTC WORK SUPPORT'' mode with CONSULT.

*5: The driving pattern may be omitted when ''EVAP SML LEAK P0440'' is performed using the ''DTC WORK SUPPORT'' mode with CONSULT.

*6: The driving pattern may be omitted when all of the following are performed using the ''DTC WORK SUPPORT'' mode with CONSULT.
- ''EGR SYSTEM P0400''
- ''EGR SYSTEM P1402''

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

Suggested transmission gear position for A/T models

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

Suggested upshift speeds for M/T models

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

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

Suggested maximum speed in each gear

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

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

2-wheel drive models

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

4-wheel drive models
2H/4H position

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

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

The following is the information specified in Mode 6 of SAE J1979.
The test value is a parameter used to determine whether a system/circuit diagnostic test is ‘‘OK’’ or ‘‘NG’’ while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
Items for which these data (test value and test limit) are displayed are the same as SRT code items (9 test items).
These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

X: Applicable
—: Not applicable

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

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC *4	Reference page
	CONSULT GST*2	ECM*1				
NO SELF DIAGNOSTIC FAILURE INDICATED	**P0000**	**0505**	—	—	—	—
MAF SEN/CIRCUIT	P0100	0102	—	—	X	EC-104
ABSL PRES SEN/CIRC	P0105	0803	—	—	X	EC-113
AIR TEMP SEN/CIRC	P0110	0401	—	—	X	EC-120
COOLANT T SEN/CIRC	P0115	0103	—	—	X	EC-126
THRTL POS SEN/CIRC	P0120	0403	—	—	X	EC-131
*COOLAN T SEN/CIRC	P0125	0908	—	—	X	EC-145
FRONT O2 SENSOR	P0130	0303	X	X	X*3	EC-150
FRONT O2 SENSOR	P0131	0411	X	X	X*3	EC-157
FRONT O2 SENSOR	P0132	0410	X	X	X*3	EC-164
FRONT O2 SENSOR	P0133	0409	X	X	X*3	EC-171
FRONT O2 SENSOR	P0134	0412	X	X	X*3	EC-179
FR O2 SEN HEATER	P0135	0901	X	X	X*3	EC-186
REAR O2 SENSOR	P0137	0511	X	X	X*3	EC-190
REAR O2 SENSOR	P0138	0510	X	X	X*3	EC-198
REAR O2 SENSOR	P0139	0707	X	X	X*3	EC-206
REAR O2 SENSOR	P0140	0512	X	X	X*3	EC-214
RR O2 SEN HEATER	P0141	0902	X	X	X*3	EC-220
FUEL SYS DIAG-LEAN	P0171	0115	—	—	X	EC-224
FUEL SYS DIAG-RICH	P0172	0114	—	—	X	EC-229
FUEL TEMP SEN/CIRC	P0180	0402	—	—	X	EC-234
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-238
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-238
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-238
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-238
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-238
KNOCK SEN/CIRCUIT	P0325	0304	—	—	X	EC-243
CPS/CIRCUIT (OBD)	P0335	0802	—	—	X	EC-247
CAM POS SEN/CIR	P0340	0101	—	—	X	EC-252
EGR SYSTEM	P0400	0302	X	X	X*3	EC-258
EGRC-BPT VALVE	P0402	0306	X	X	X*3	EC-266
TW CATALYST SYSTEM	P0420	0702	X	X	X*3	EC-271
EVAP SMALL LEAK	P0440	0705	X	X	X*3	EC-276
PURG VOLUME CONT/V	P0443	1008	—	—	X	EC-286
VENT CONTROL VALVE	P0446	0903	—	—	X	EC-292
EVAPO SYS PRES SEN	P0450	0704	—	—	X	EC-297

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.
*3: These are not displayed with GST.
*4: 1st trip DTC No. is the same as DTC No.

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

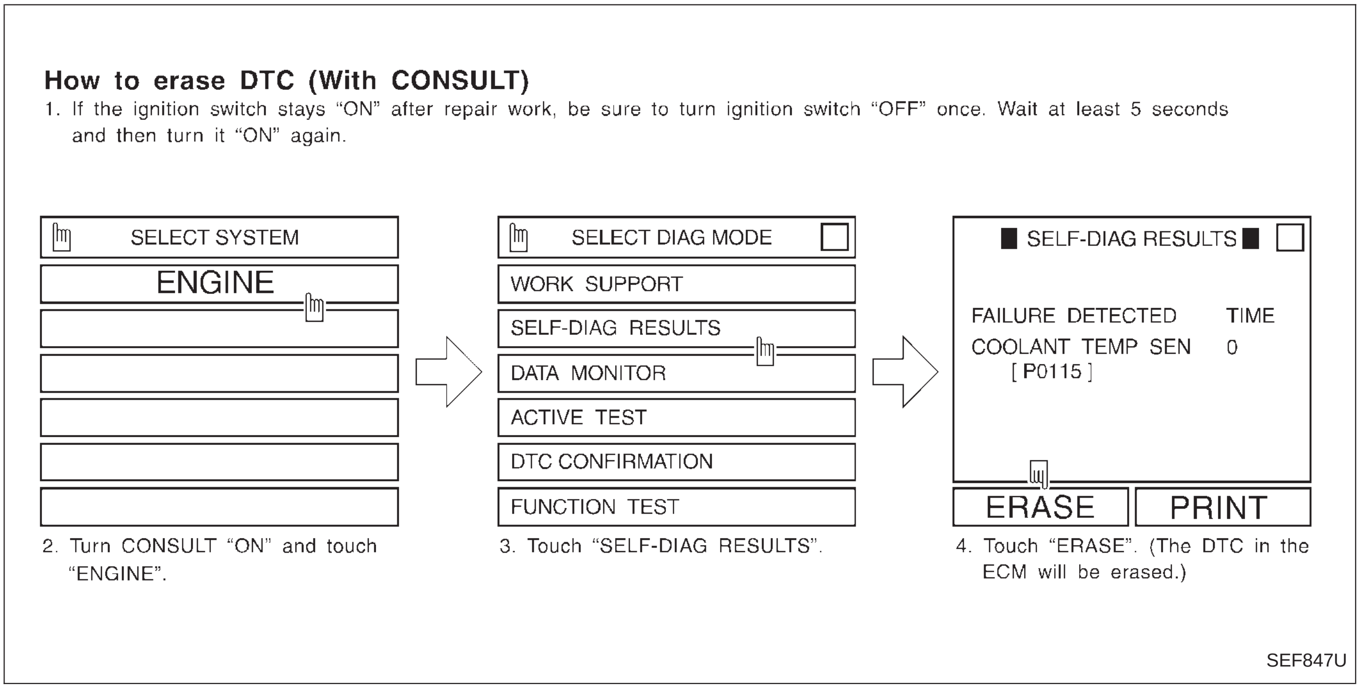
Items (CONSULT screen terms)	DTC*4		SRT code	Test value/ Test limit (GST only)	1st trip DTC *4	Reference page
	CONSULT GST*2	ECM*1				
VEH SPEED SEN/CIRC	P0500	0104	—	—	X	EC-303
IACV/AAC VLV/CIRC	P0505	0205	—	—	X	EC-308
CLOSED TP SW/CIRC	P0510	0203	—	—	X	EC-314
ECM	P0605	0301	—	—	X	EC-320
MAP/BAR SW SOL/CIR	P1105	1302	—	—	X	EC-322
CLOSED LOOP	P1148	0307	—	—	X	EC-331
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-333
CPS/CIRC (OBD) COG	P1336	0905	—	—	X	EC-340
EGRC SOLENOID/V	P1400	1005	—	—	X	EC-345
EGR TEMP SEN/CIRC	P1401	0305	—	—	X	EC-350
EGR SYSTEM	P1402	0514	X	X	X*3	EC-356
EVAP SMALL LEAK	P1440	0213	X	X	X*3	EC-363
PURG VOLUME CONT/V	P1444	0214	—	—	X	EC-373
VENT CONTROL VALVE	P1446	0215	—	—	X	EC-381
EVAP PURG FLOW/MON	P1447	0111	X	X	X*3	EC-386
VENT CONTROL VALVE	P1448	0309	—	—	X	EC-392
VC/V BYPASS/V	P1490	0801	—	—	X	EC-397
VC CUT/V BYPASS/V	P1491	0311	—	—	X	EC-402
P-N POS SW/CIRCUIT	P1706	1003	—	—	X	EC-407
TOR CONV CLTCH S/V	P1775	0904	—	—	X	EC-412
TOR CONV CLTCH S/V	P1776	0513	—	—	X	EC-416

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.
*3: These are not displayed with GST.
*4: 1st trip DTC No. is the same as DTC No.

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to erase DTC (With CONSULT)

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



How to erase DTC (With CONSULT)

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

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

3. Touch "SELF-DIAG RESULTS".

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

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

How to erase DTC (With GST)

1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch ''OFF'' once. Wait at least 5 seconds and then turn it ''ON'' (engine stopped) again.
2. Select Mode 4 with GST (Generic Scan Tool).

The emission-related diagnostic information in the ECM can be erased by selecting Mode 4 with GST (Generic Scan Tool).

How to erase DTC (No Tools)

1. If the ignition switch stays ''ON'' after repair work, be sure to turn ignition switch ''OFF'' once. Wait at least 5 seconds and then turn it ''ON'' again.
2. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-50.)

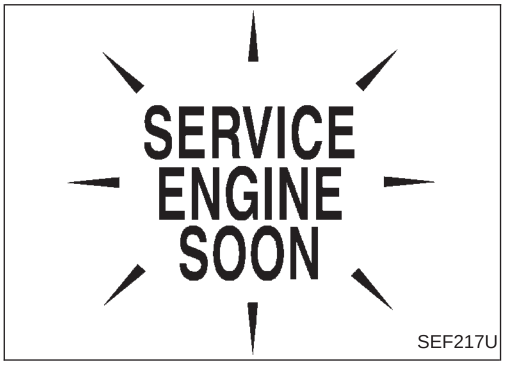
The emission-related diagnostic information in the ECM can be erased by changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by turning the mode selector on the ECM. (Refer to EC-50.)

Note:

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

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

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



Malfunction Indicator Lamp (MIL)

The malfunction indicator lamp is located on the instrument panel.

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
- If the malfunction indicator lamp does not light up, refer to EL section (‘‘WARNING LAMPS’’) or see EC-441.
2. When the engine is started, the malfunction indicator lamp should go off.
   If the lamp remains on, the on board diagnostic system has detected an engine system malfunction.

ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following four functions.

Diagnostic Test Mode I

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

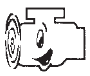
Diagnostic Test Mode II

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

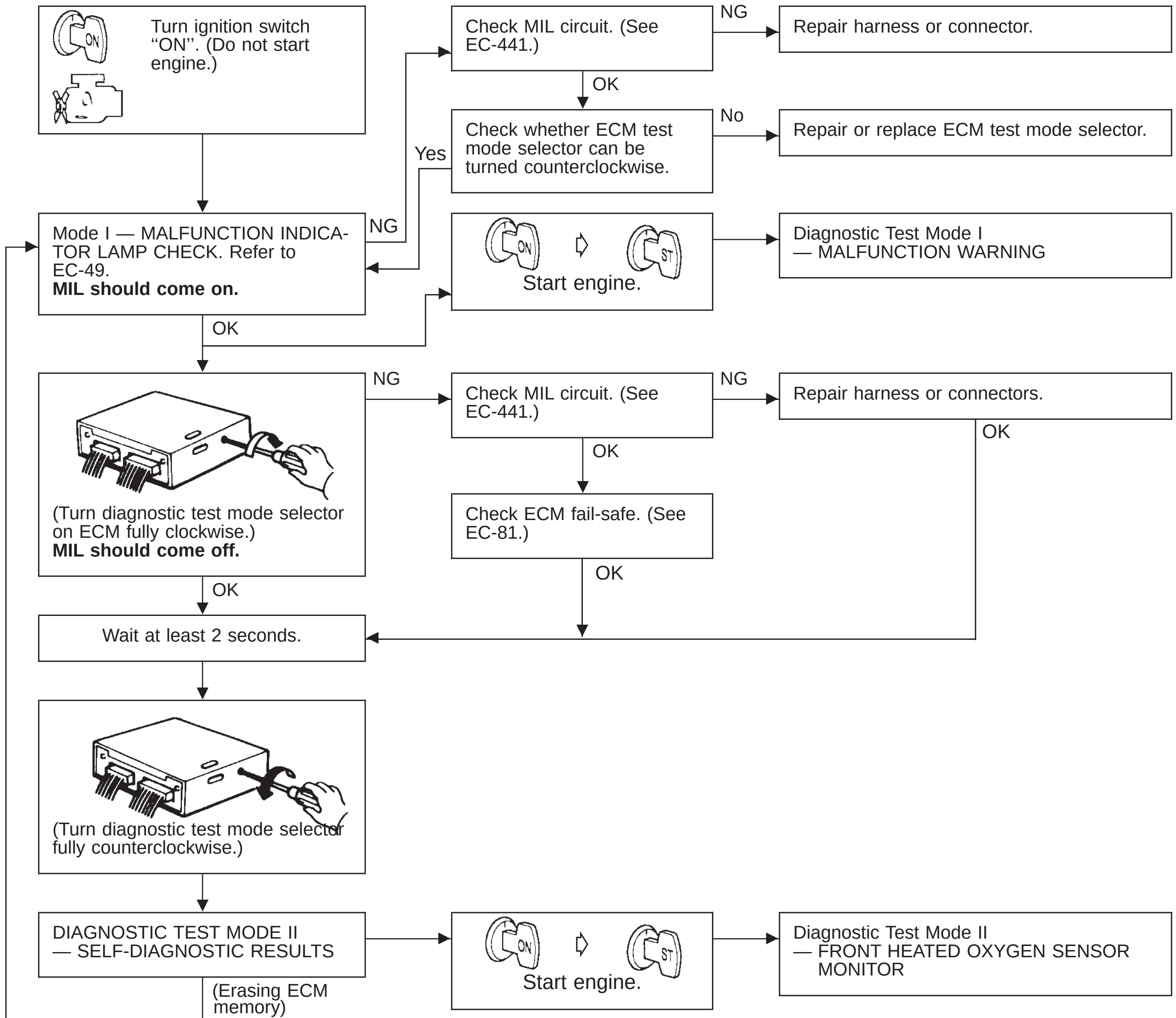
MIL flashing without DTC

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

How to switch the diagnostic test (function) modes, and details of the above functions are described later. (Refer to EC-50.)

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

HOW TO SWITCH DIAGNOSTIC TEST MODES



Turn ignition switch "ON". (Do not start engine.)

Check MIL circuit. (See EC-441.)

Repair harness or connector.

Check whether ECM test mode selector can be turned counterclockwise.

Repair or replace ECM test mode selector.

Mode I — MALFUNCTION INDICATOR LAMP CHECK. Refer to EC-49.
MIL should come on.

Start engine.

Diagnostic Test Mode I
— MALFUNCTION WARNING

(Turn diagnostic test mode selector on ECM fully clockwise.)
MIL should come off.

Check MIL circuit. (See EC-441.)

Repair harness or connectors.

Check ECM fail-safe. (See EC-81.)

Wait at least 2 seconds.

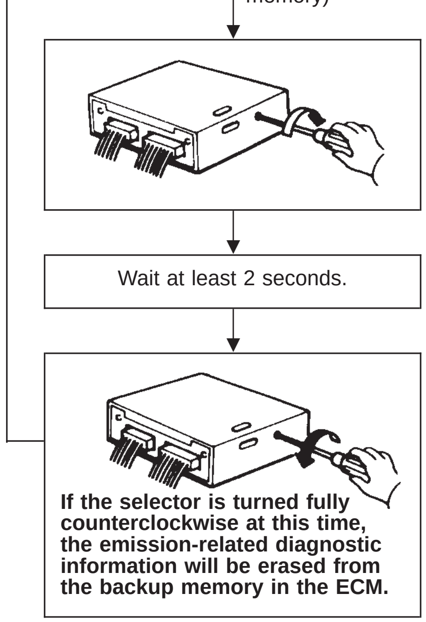
(Turn diagnostic test mode selector fully counterclockwise.)

DIAGNOSTIC TEST MODE II
— SELF-DIAGNOSTIC RESULTS

Start engine.

Diagnostic Test Mode II
— FRONT HEATED OXYGEN SENSOR MONITOR

(Erasing ECM memory)



Wait at least 2 seconds.

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

The following emission-related diagnostic information is cleared when the ECM memory is erased.
1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

- **Switching the modes is not possible when the engine is running.**
- **When ignition switch is turned off during diagnosis, power to ECM will drop after approx. 5 seconds.**
  The diagnosis will automatically return to Diagnostic Test Mode I.
- **Turn back diagnostic test mode selector to the fully counterclockwise position whenever vehicle is in use.**

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MALFUNCTION INDICATOR LAMP on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to EL section (“WARNING LAMPS’’) or see EC-441.

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

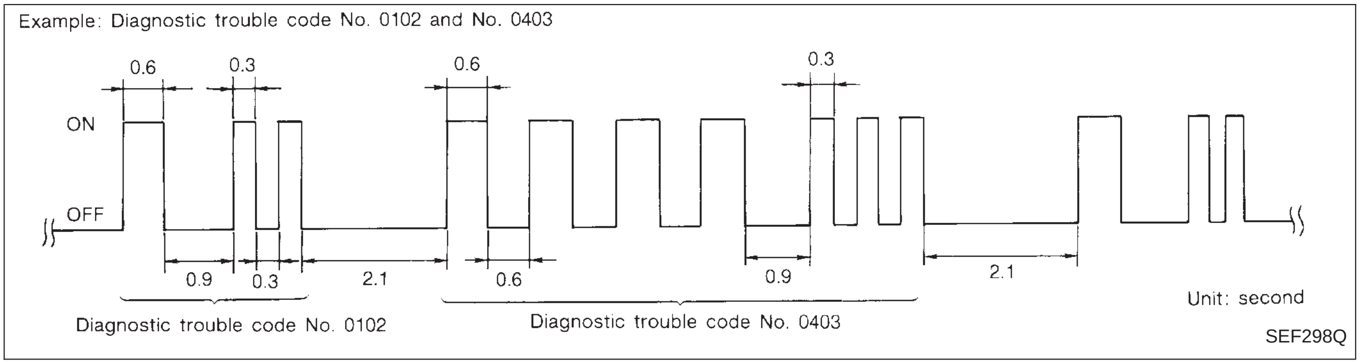
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

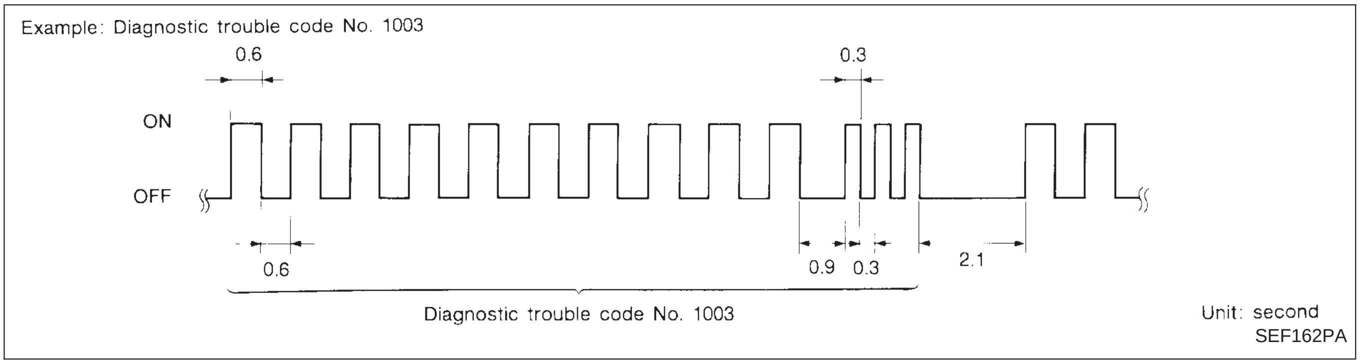
- These Diagnostic Trouble Code Numbers are clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS).

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

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

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





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

In this way, all the detected malfunctions are classified by their diagnostic trouble code numbers. The DTC ‘‘0505’’ refers to no malfunction. (See DIAGNOSTIC TROUBLE CODE (DTC) INDEX, EC-4.)

Malfunction Indicator Lamp (MIL) (Cont'd)

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

The diagnostic trouble code can be erased from the backup memory in the ECM when the diagnostic test mode is changed from Diagnostic Test Mode II to Diagnostic Test Mode I. (Refer to ''HOW TO SWITCH DIAGNOSTIC TEST MODES''.)

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

DIAGNOSTIC TEST MODE II — FRONT HEATED OXYGEN SENSOR MONITOR

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

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

*: Maintains conditions just before switching to open loop.

To check the front heated oxygen sensor function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MALFUNCTION INDICATOR LAMP comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no-load.

OBD System Operation Chart

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

- When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data are stored in the ECM memory.
- When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data are stored in the ECM memory, and the MIL will come on. For details, refer to ''Two Trip Detection Logic'' on EC-38.
- The MIL will go off after the vehicle is driven 3 times with no malfunction. The drive is counted only when the recorded driving pattern is met (as stored in the ECM). If another malfunction occurs while counting, the counter will reset.
- The DTC and the freeze frame data will be stored until the vehicle is driven 40 times (driving pattern A) without the same malfunction recurring (except for Misfire and Fuel Injection System). For Misfire and Fuel Injection System, the DTC and freeze frame data will be stored until the vehicle is driven 80 times (driving pattern C) without the same malfunction recurring. The ''TIME'' in ''SELF-DIAGNOSTIC RESULTS'' mode of CONSULT will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in ''OK'' for the 2nd trip.

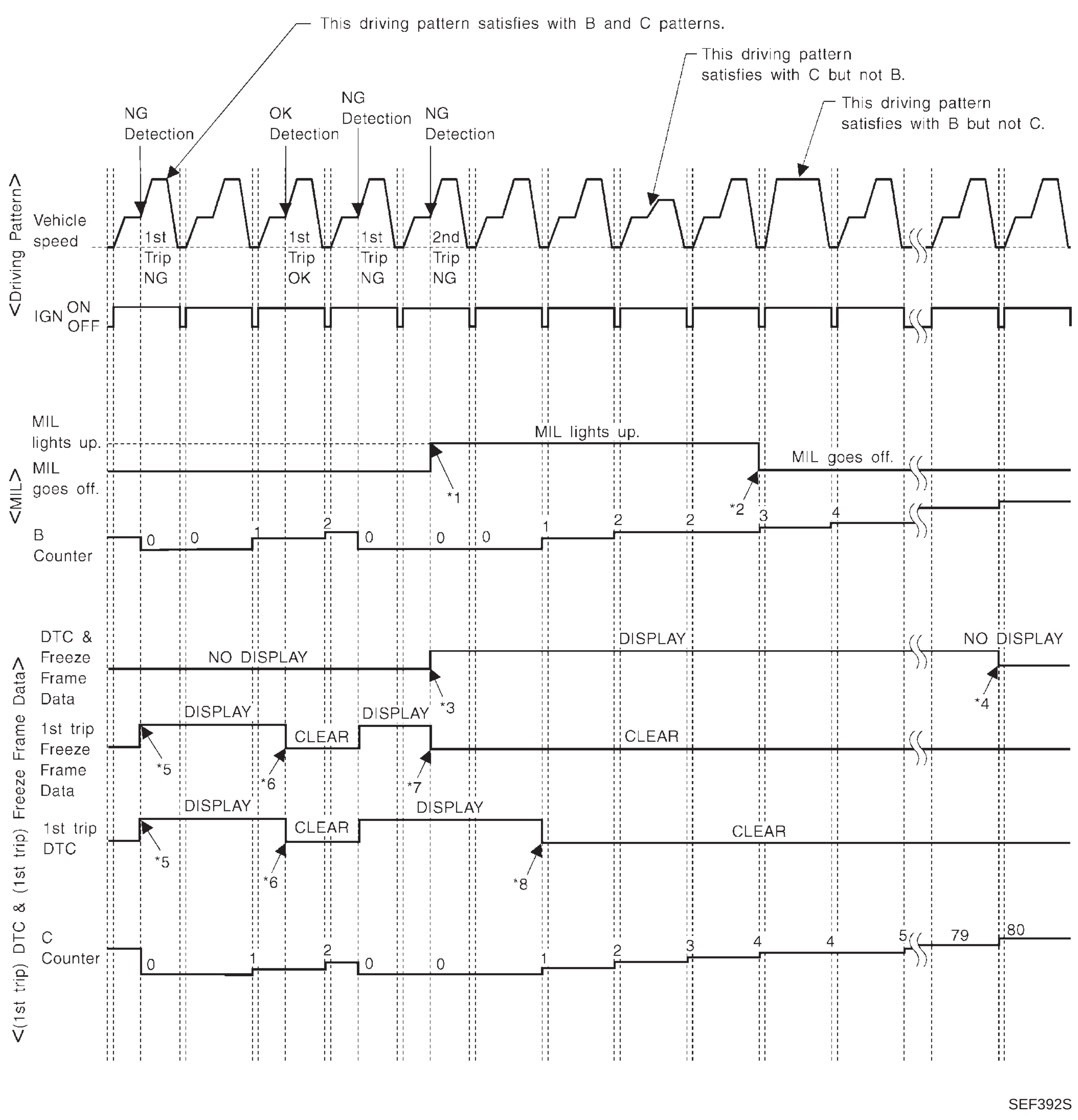
SUMMARY CHART

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

For details about patterns ''B'' and ''C'' under ''Fuel Injection System'' and ''Misfire'', see EC-54.
For details about patterns ''A'' and ''B'' under ''Other'', see EC-56.
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

OBD System Operation Chart (Cont’d)

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



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

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

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

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

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

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

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

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

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

<Driving pattern B>

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

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

<Driving pattern C>

Driving pattern C means the vehicle operation as follows:

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

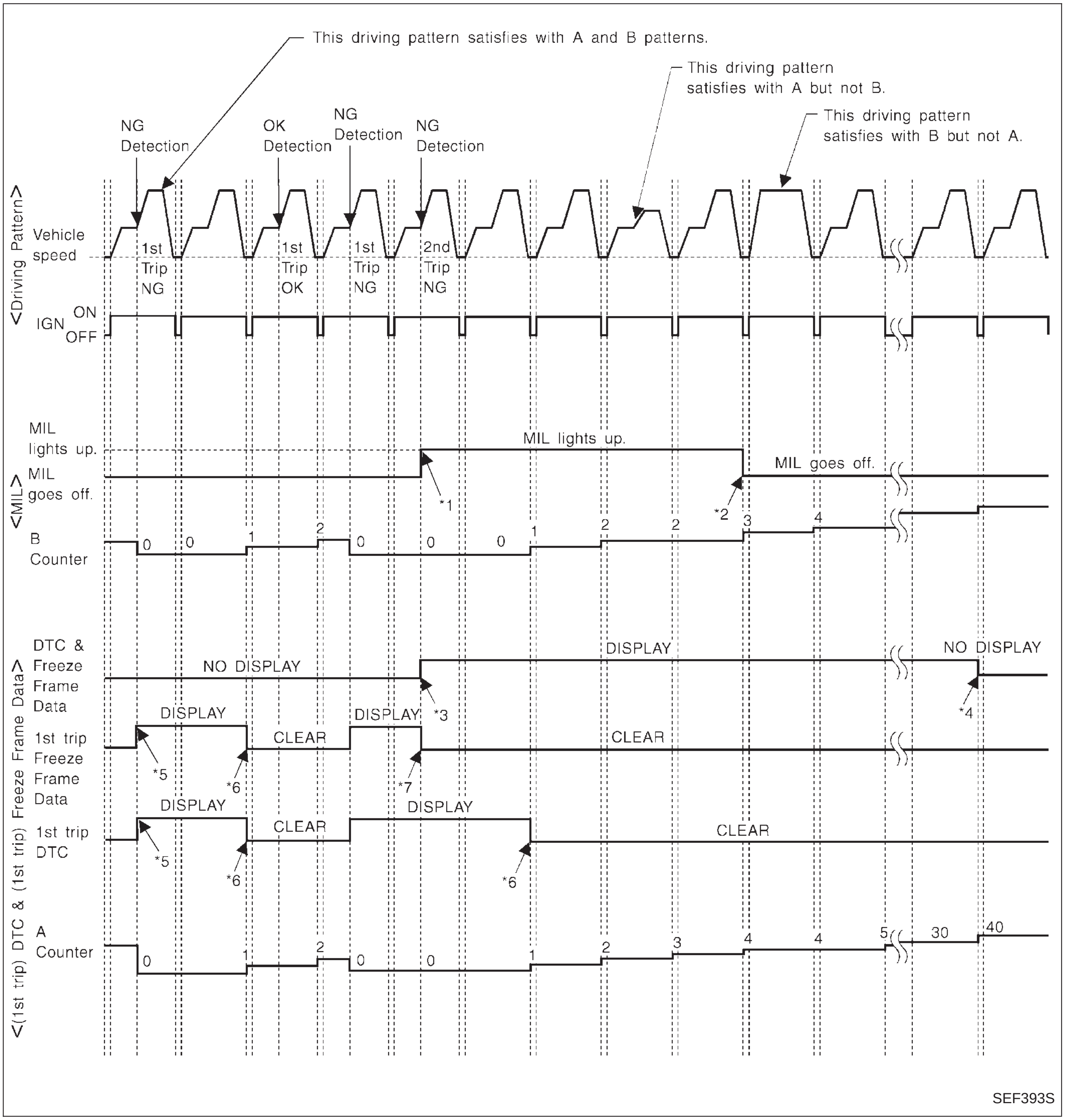
- When the freeze frame data shows lower than 70°C (158°F), ‘‘T’’ should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), ‘‘T’’ should be higher than or equal to 70°C (158°F).

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

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

OBD System Operation Chart (Cont'd)

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



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.

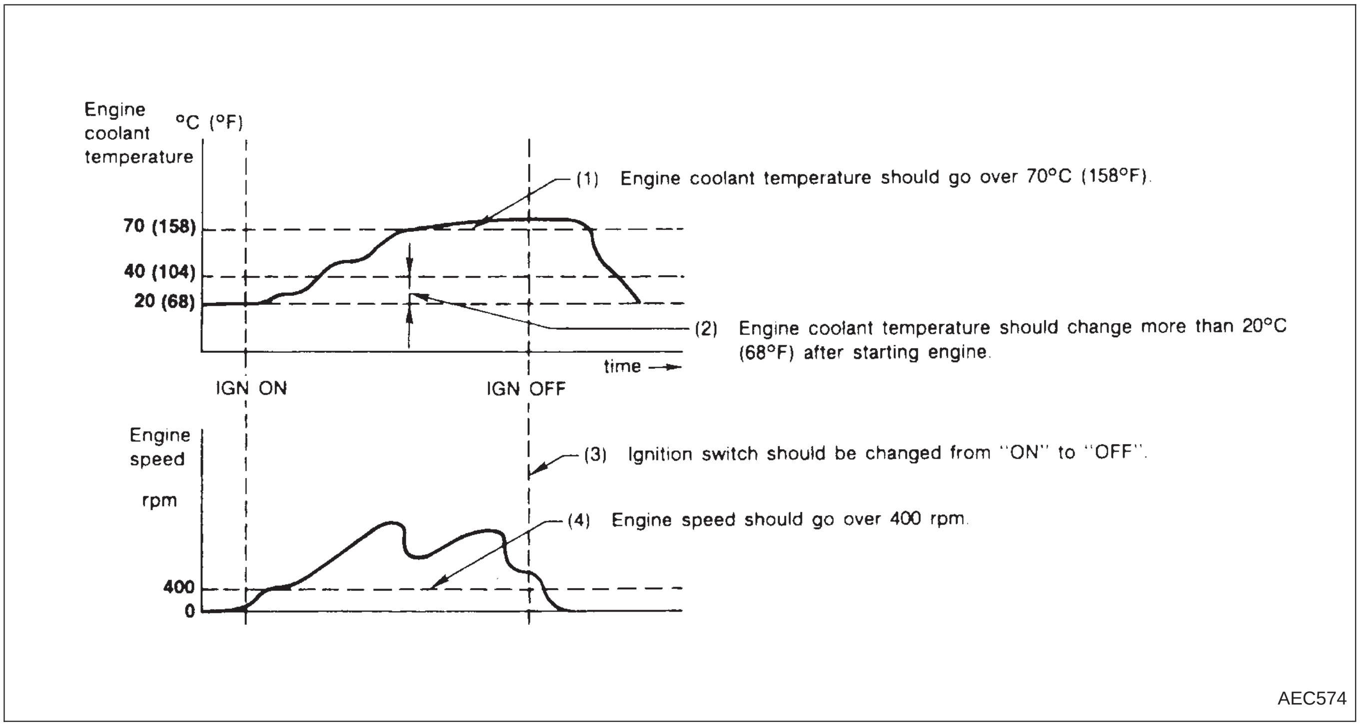
*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

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

OBD System Operation Chart (Cont’d)

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

<Driving pattern A>



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

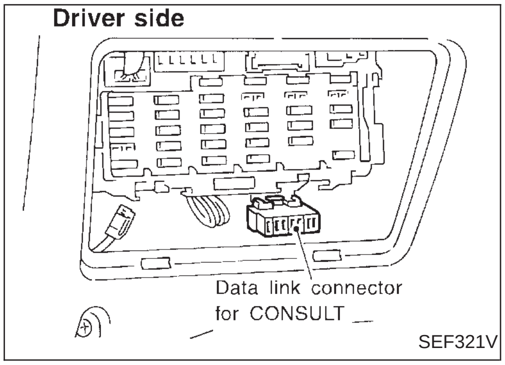
<Driving pattern B>

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

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

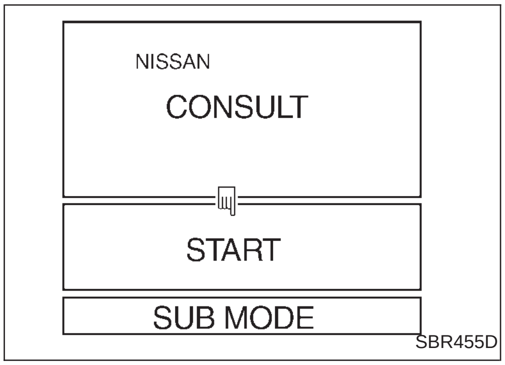
CONSULT

CONSULT INSPECTION PROCEDURE



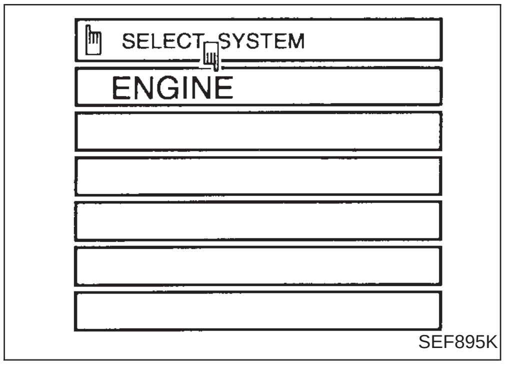
SEF321V

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



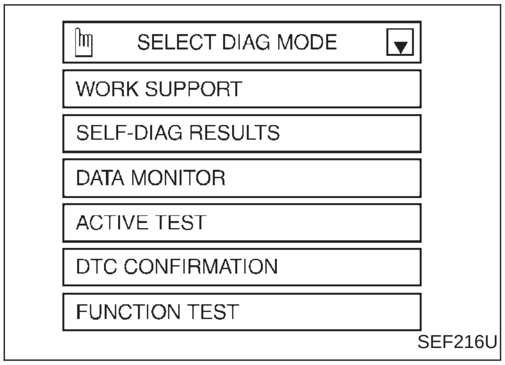
SBR455D

3. Turn ignition switch ‘‘ON’’.
4. Touch ‘‘START’’.



SEF895K

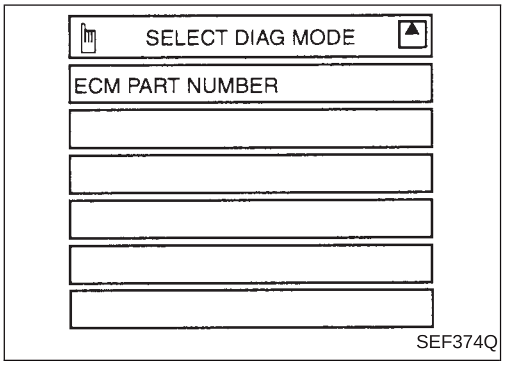
5. Touch ‘‘ENGINE’’.



SEF216U

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

For further information, see the CONSULT Operation Manual. This sample shows the display when using the UE990 program card. Screen differs in accordance with the program card used.



SEF374Q

CONSULT (Cont'd)

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

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

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-40.

CONSULT (Cont'd)

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*1
Data monitor	Input/Output data in the ECM can be read.
Active test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
DTC confirmation	The status of system monitoring tests and the self-diagnosis status/result can be confirmed.
Function test	Conducted by CONSULT instead of a technician to determine whether each system is ''OK'' or ''NG''.
ECM part numbers	ECM part numbers can be read.

*1 The following emission-related diagnostic information is cleared when the ECM memory is erased.
1. Diagnostic trouble codes
2. 1st trip diagnostic trouble codes
3. Freeze frame data
4. 1st trip freeze frame data
5. System readiness test (SRT) codes
6. Test values
7. Others

WORK SUPPORT MODE

WORK ITEM	CONDITION	USAGE
THRTL POS SEN ADJ	CHECK THE THROTTLE POSITION SENSOR SIGNAL. ADJUST IT TO THE SPECIFIED VALUE BY ROTATING THE SENSOR BODY UNDER THE FOLLOWING CONDITIONS. ● IGN SW ''ON'' ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position
IGNITION TIMING ADJ	● IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING ''START''. AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CRANKSHAFT POSITION SENSOR.	When adjusting initial ignition timing
IACV-AAC/V ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. ● ENGINE WARMED UP ● NO-LOAD	When adjusting idle speed
FUEL PRESSURE RELEASE	● FUEL PUMP WILL STOP BY TOUCHING ''START'' DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
EVAP SYSTEM CLOSE	OPEN THE VACUUM CUT VALVE BYPASS VALVE AND CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. ● BATTERY VOLTAGE IS SUFFICIENT. ● IGN SW ''ON'' ● ENGINE NOT RUNNING ● AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). ● NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM ● TANK FUEL TEMP. IS MORE THAN 0°C (32°F). ● WITHIN 10 MINUTES AFTER STARTING ''EVAP SYSTEM CLOSE'' WHEN TRYING TO EXECUTE ''EVAP SYSTEM CLOSE'' UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE: WHEN STARTING ENGINE, CONSULT MAY DISPLAY ''BATTERY VOLTAGE IS LOW. CHARGE BATTERY'', EVEN IN USING CHARGED BATTERY.**	When detecting EVAP vapor leak point of EVAP system

SELF-DIAGNOSTIC MODE

DTC and 1st trip DTC

Regarding items of ''DTC and 1st trip DTC'', refer to ''DIAGNOSTIC TROUBLE CODE INDEX'' (See EC-4.).

Freeze frame data and 1st trip freeze frame data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	● Engine control component part/control system has a trouble code, it is displayed as ''PXXXX''. [Refer to ''Alphabetical & P No. Index for DTC'' (EC-4).]
FUEL SYS	● ''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
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 [%]	● ''Short-term fuel trim'' at the moment a malfunction is detected is displayed. ● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
L-FUEL TRIM [%]	● ''Long-term fuel trim'' at the moment a malfunction is detected is displayed. ● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
ENGINE SPEED [rpm]	● The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	● The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL PRESS [kPa] or [kg/cm^2] or [psi]	● The absolute pressure at the moment a malfunction is detected is displayed.

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

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (REF) [rpm]	○	○	● Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor.	
MAS AIR/FL SE [V]	○	○	● The signal voltage of the mass air flow sensor is displayed.	● When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	○	○	● The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	● When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
FR O2 SENSOR [V]	○	○	● The signal voltage of the front heated oxygen sensor is displayed.	
RR O2 SENSOR [V]	○	○	● The signal voltage of the rear heated oxygen sensor is displayed.	
FR O2 MNTR [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.
RR O2 MNTR [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.
VHCL SPEED SE [km/h] or [mph]	○	○	● The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	● The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	● The throttle position sensor signal voltage is displayed.	
TANK F/TMP SE [°C] or [°F]	○		● The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed.	
EGR TEMP SEN [V]	○		● The signal voltage of the EGR temperature sensor is displayed.	
INT/A TEMP SE [°C] or [°F]	○		● The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	
START SIGNAL [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the starter signal.	● After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/P SW [ON/OFF]	○	○	● Indicates mechanical contact [ON/OFF] condition of the throttle position switch.	
CLSD THL POS [ON/OFF]	○	○	● Indicates idle position [ON/OFF] computed by ECM according to the throttle position sensor signal.	
AIR COND SIG [ON/OFF]			● Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	○	○	● Indicates [ON/OFF] condition from the park/neutral position switch signal.	

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

CONSULT (Cont’d)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
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.	
IGNITION SW [ON/OFF]	○		● Indicates [ON/OFF] condition from ignition switch.	
INJ PULSE [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.
B/FUEL SCHDL [msec]		○	● ‘‘Base fuel schedule’’ indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
IGN TIMING [BTDC]		○	● Indicates the ignition timing computed by ECM according to the input signals.	● When the engine is stopped, a certain value is indicated.
IACV-AAC/V [%]		○	● Indicates the IACV-AAC valve control value computed by ECM according to the input signals.	
PURG VOL C/V [%]		○	● Indicates the EVAP canister purge volume control solenoid valve computed by the ECM according to the input signals. ● The opening becomes larger as the value increases.	
A/F ALPHA [%]			● 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.
EVAP SYS PRES [V]		○	● The signal voltage of EVAP control system pressure sensor is displayed.	
AIR COND RLY [ON/OFF]			● The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
FUEL PUMP RLY [ON/OFF]			● Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
EGRC SOL/V [ON/OFF] (Cut/flow)			● The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated. ● ON ... EGR operation is cut-off OFF ... EGR is operational	
TCC SOL/V			● The control condition of the torque converter clutch solenoid valve (determined by ECM according to the input signal) is indicated. ON ... Lock-up is cancelled OFF ... Lock-up is operational	
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	
FR O2 HEATER [ON/OFF]			● Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals.	
RR O2 HEATER [ON/OFF]			● Indicates [ON/OFF] condition of rear heated oxygen sensor heater determined by ECM according to the input signals.	
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	

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CAL/LD VALUE [%]			● ''Calculated load value'' indicates the value of the current airflow divided by peak airflow.	
ABSOL TH·P/S [%]			● ''Absolute throttle position sensor'' indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.	
MASS AIRFLOW [g·m/s]			● Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor.	
MAP/BARO SW/V [MAP/BARO]			● The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated. MAP ... Intake manifold absolute pressure BARO ... Barometric pressure	
ABSOL PRES/SE [V]			● The signal voltage of the absolute pressure sensor is displayed.	
VOLTAGE [V]			● Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			● Pulse width, frequency or duty cycle measured by the pulse probe.	● Only ''#'' is displayed if item is unable to be measured. ● Figures with ''#''s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

CONSULT (Cont’d)

ACTIVE TEST MODE

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

CONSULT (Cont'd)

DTC CONFIRMATION MODE

SRT STATUS mode

For details, refer to ''SYSTEM READINESS TEST (SRT) CODE'', EC-40.

DTC WORK SUPPORT mode

TEST MODE	TEST ITEM	CONDITION	REFERENCE PAGE
EVAPORATIVE SYSTEM	PURGE FLOW P1447	Refer to corresponding trouble diagnosis for DTC.	EC-386
	VC CUT/V BP/V P1491		EC-402
	PURG VOL CN/V P1444		EC-373
	EVAP SML LEAK P0440		EC-276
	EVAP SML LEAK P1440		EC-363
FR O2 SENSOR	FR O2 SENSOR P0130		EC-150
	FR O2 SENSOR P0131		EC-157
	FR O2 SENSOR P0132		EC-164
	FR O2 SENSOR P0133		EC-171
RR O2 SENSOR	RR O2 SENSOR P0137		EC-190
	RR O2 SENSOR P0138		EC-198
	RR O2 SENSOR P0139		EC-206
EGR SYSTEM	EGR SYSTEM P0400		EC-258
	EGRC-BPT/VLV P0402		EC-266
	EGR SYSTEM P1402		EC-356
A/T (TCC S/V)	TCC S/V FNCTN P1776		EC-416

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	● Ignition switch: ON (Engine stopped) ● Displays the results of on board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI	● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully. (''IDLE POSITION'' is the test item name for the vehicles in which idle is selected by throttle position sensor.)	Throttle valve: opened	OFF	● Harness and connector ● Throttle position sensor (Closed throttle position) ● Throttle position sensor (Closed throttle position) adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.
PARK/NEUT POSI SW CKT	● Ignition switch: ON (Engine stopped) ● Park/neutral position (PNP) switch circuit is tested when shift lever is manipulated.	Out of N/P positions	OFF	● Harness and connector ● Park/neutral position (PNP) switch ● Linkage or park/neutral position (PNP) switch adjustment
		In N/P positions	ON	
FUEL PUMP CIRCUIT	● Ignition switch: ON (Engine stopped) ● Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		● Harness and connector ● Fuel pump ● Fuel pump relay ● Fuel filter clogging ● Fuel level
EGRC SOL/V CIRCUIT	● Ignition switch: ON (Engine stopped) ● EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		● Harness and connector ● EGRC-solenoid valve

CONSULT (Cont’d)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	● Ignition switch: ON → START ● Start signal circuit is tested when engine is started by operating the starter. Battery voltage and engine coolant temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed.	Start signal: OFF → ON		● Harness and connector ● Ignition switch
PW/ST SIGNAL CIRCUIT	● Ignition switch: ON (Engine running) ● Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position	ON	● Harness and connector ● Power steering oil pressure switch ● Power steering oil pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	● Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 MPH).		● Harness and connector ● Vehicle speed sensor ● Speedometer
IGN TIMING ADJ	● After warming up, idle the engine. ● Ignition timing is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		● Adjust ignition timing (by moving camshaft position sensor or distributor) ● Camshaft position sensor drive mechanism
MIXTURE RATIO TEST	● Air-fuel ratio feedback circuit (injection system, ignition system, vacuum system, etc.) is tested by examining the front heated oxygen sensor output at 2,000 rpm under non-loaded state.	Front heated oxygen sensor COUNT: More than 5 times during 10 seconds		● INJECTION SYS (Injector, fuel pressure regulator, harness or connector) ● IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector) ● VACUUM SYS (Intake air leaks) ● Front heated oxygen sensor circuit ● Front heated oxygen sensor operation ● Fuel pressure high or low ● Mass air flow sensor
POWER BALANCE	● After warming up, idle the engine. ● Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.		● Injector circuit (Injector, harness or connector) ● Ignition circuit (Spark plug, ignition coil with power transistor harness or connector) ● Compression ● Valve timing
IACV-AAC/V SYSTEM	● After warming up, idle the engine. ● IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%.	Difference in engine speed is greater than 150 rpm between when valve opening is at 80% and 20%.		● Harness and connector ● IACV-AAC valve ● Air passage restriction between air inlet and IACV-AAC valve ● IAS (Idle adjusting screw) adjustment

CONSULT (Cont'd)

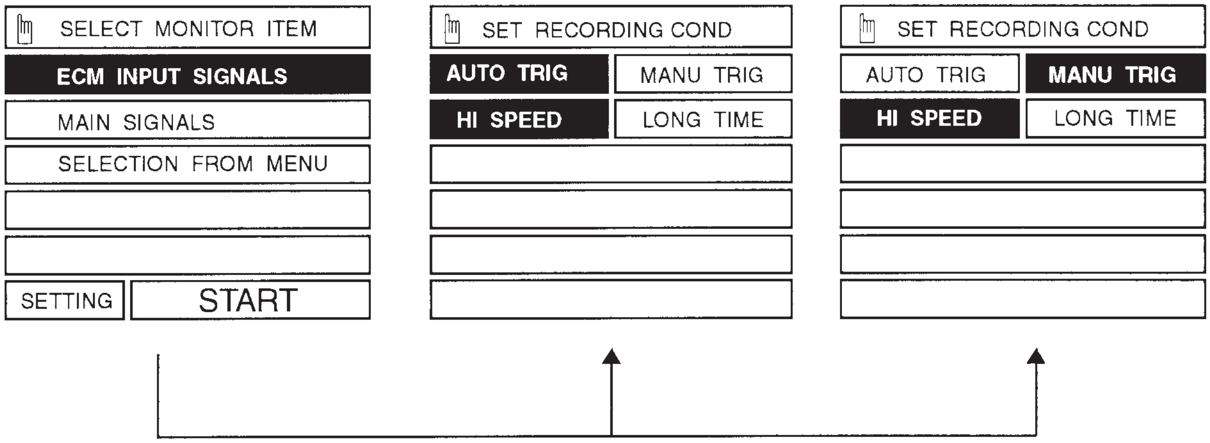
REAL TIME DIAGNOSIS IN DATA MONITOR MODE (Recording vehicle data)

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

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

Use these triggers as follows:

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



"SETTING"

"AUTO TRIG"
A malfunction can be displayed on "DATA MONITOR" screen automatically if detected.

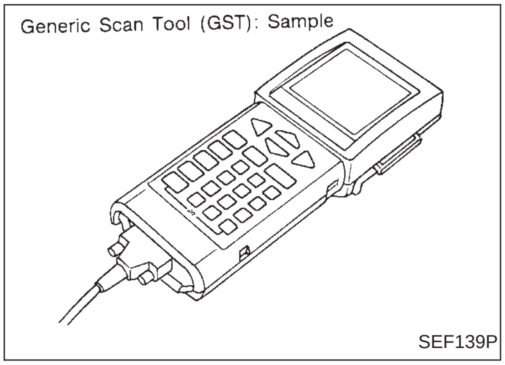
"MANU TRIG"
A malfunction can not be displayed on "DATA MONITOR" screen automatically even if detected.

SEF529Q

Generic Scan Tool (GST)

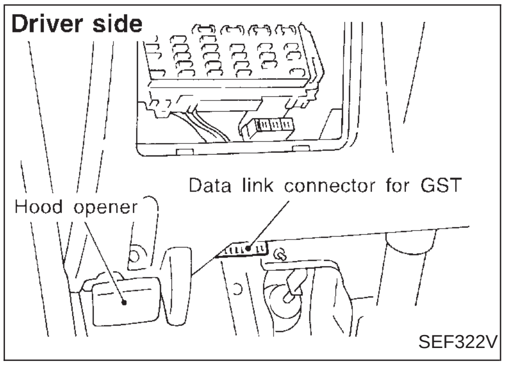
DESCRIPTION

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



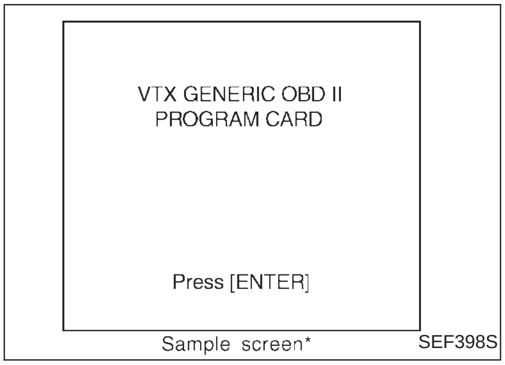
GST INSPECTION PROCEDURE

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



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

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



VTX GENERIC OBD II
PROGRAM CARD

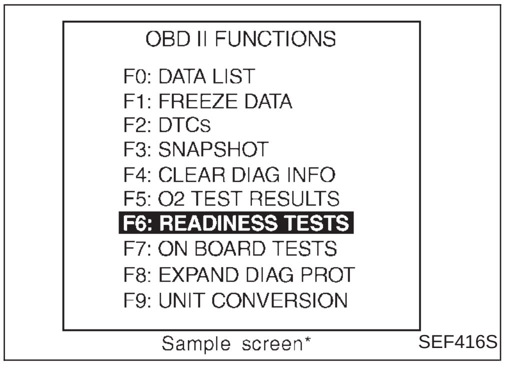
Press [ENTER]

Sample screen*

SEF398S

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

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



OBD II FUNCTIONS

F0: DATA LIST
F1: FREEZE DATA
F2: DTCs
F3: SNAPSHOT
F4: CLEAR DIAG INFO
F5: O2 TEST RESULTS
F6: READINESS TESTS
F7: ON BOARD TESTS
F8: EXPAND DIAG PROT
F9: UNIT CONVERSION

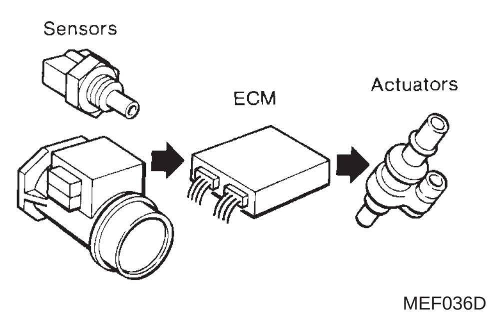
Sample screen*

SEF416S

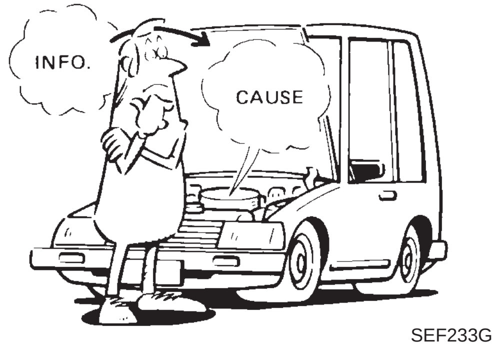
FUNCTION

Diagnostic test mode		Function
MODE 1	READINESS TESTS	This mode gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
MODE 2	(FREEZE DATA)	This mode gains access to emission-related data value which were stored by ECM during the freeze frame. [For details, refer to ''Freeze Frame Data'' (EC-60).]
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, 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

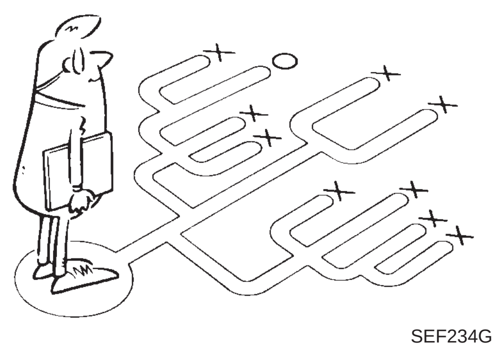
Introduction



MEF036D



SEF233G



SEF234G

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

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

A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the ‘‘Work Flow’’ on EC-72.

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

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

Diagnostic Worksheet

KEY POINTS

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

SEF907L

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

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

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

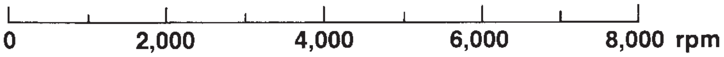
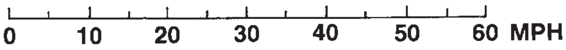
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

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

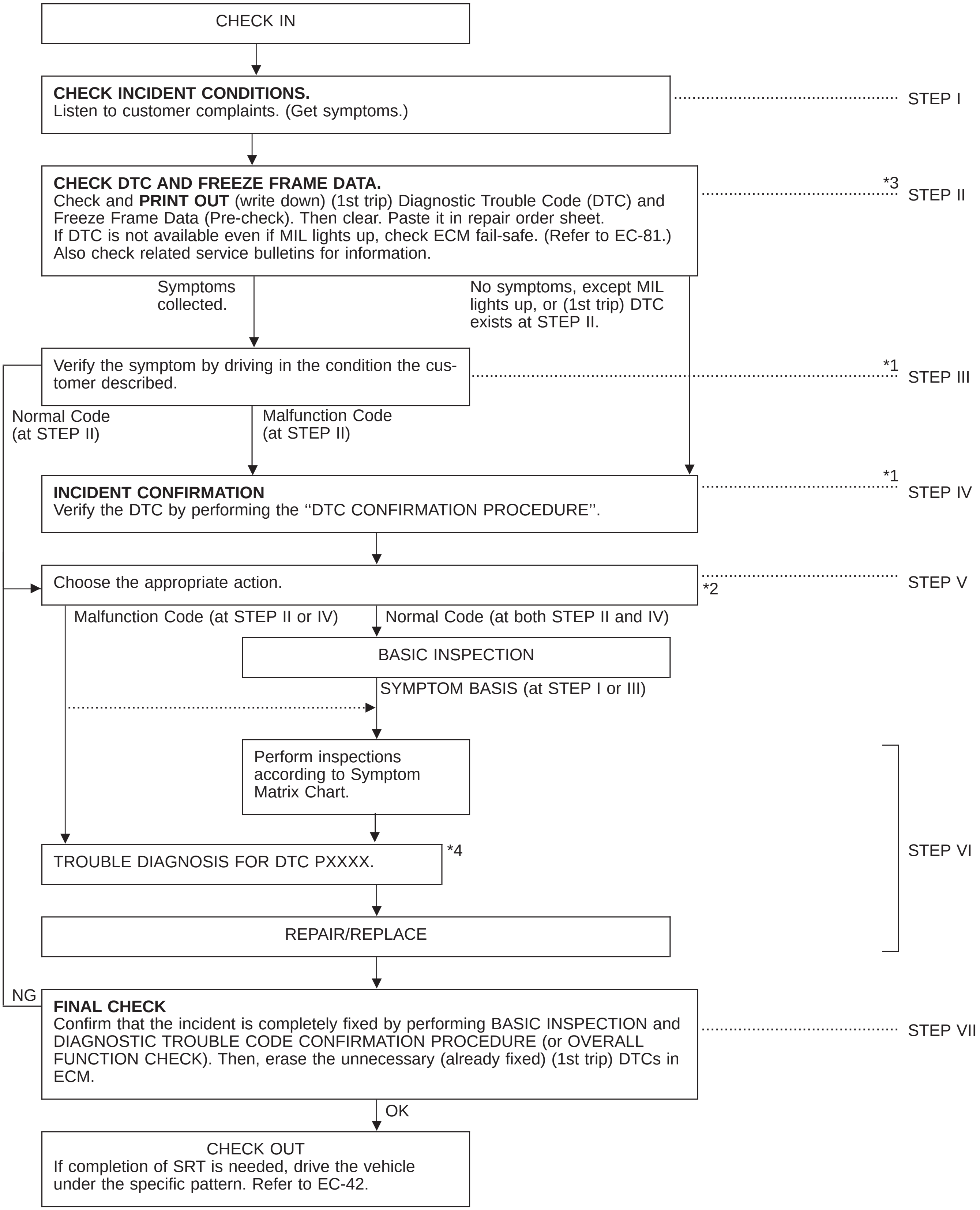
Diagnostic Worksheet (Cont'd)

WORKSHEET SAMPLE

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

Fuel and fuel filler cap		☐ 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 
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 
Malfunction indicator lamp		☐ Turned on ☐ Not turned on

Work Flow



CHECK IN

CHECK INCIDENT CONDITIONS.
Listen to customer complaints. (Get symptoms.)

CHECK DTC AND FREEZE FRAME DATA.
Check and **PRINT OUT** (write down) (1st trip) Diagnostic Trouble Code (DTC) and Freeze Frame Data (Pre-check). Then clear. Paste it in repair order sheet.
If DTC is not available even if MIL lights up, check ECM fail-safe. (Refer to EC-81.)
Also check related service bulletins for information.

Verify the symptom by driving in the condition the customer described.

INCIDENT CONFIRMATION
Verify the DTC by performing the ‘‘DTC CONFIRMATION PROCEDURE’’.

Choose the appropriate action.

BASIC INSPECTION

Perform inspections according to Symptom Matrix Chart.

TROUBLE DIAGNOSIS FOR DTC PXXXX.

REPAIR/REPLACE

FINAL CHECK
Confirm that the incident is completely fixed by performing BASIC INSPECTION and DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (or OVERALL FUNCTION CHECK). Then, erase the unnecessary (already fixed) (1st trip) DTCs in ECM.

CHECK OUT
If completion of SRT is needed, drive the vehicle under the specific pattern. Refer to EC-42.

***1: If the incident cannot be duplicated, refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit. Refer to “TROUBLE DIAGNOSIS FOR POWER SUPPLY’’, EC-99.**

***3: If time data of “SELF-DIAG RESULTS’’ is other than “0’’ or “1t’’ refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.**

***4: If the malfunctioning part cannot be found, refer to “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.**

Description for Work Flow

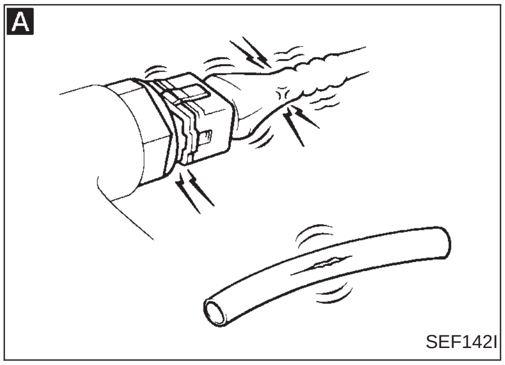
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the ‘‘DIAGNOSTIC WORK SHEET’’, EC-71.
STEP II	Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-48.) The (1st trip) DTC and the (1st trip) freeze frame data can be used when duplicating the incident at STEP III & IV. 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-82.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The ‘‘DIAGNOSTIC WORK SHEET’’ and the freeze frame data are useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.) If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) Diagnostic Trouble Code by driving in (or performing) the ‘‘DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE’’. Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT or Generic Scan Tool. During the (1st trip) DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.) In case the ‘‘DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE’’ is not available, perform the ‘‘OVERALL FUNCTION CHECK’’ instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified ‘‘check’’ is an effective alternative. 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-74.) Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-82.)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) ‘‘Harness Layouts’’. Gently shake the related connectors, components or wiring harness with CONSULT set in ‘‘DATA MONITOR (AUTO TRIG)’’ mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT. Refer to EC-85. The ‘‘DIAGNOSTIC PROCEDURE’’ in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section (‘‘HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT’’, ‘‘Circuit Inspection’’). Repair or replace the malfunction parts.
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 ‘‘DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE’’ and confirm the normal code [Diagnostic trouble code No. P0000 or 0505] is detected. If the incident is still detected in the final check, perform STEP VI by using a different method from the previous one. Before returning the vehicle to the customer, be sure to erase the unnecessary (already fixed) (1st trip) DTC in ECM. (Refer to EC-48.)

Basic Inspection

Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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



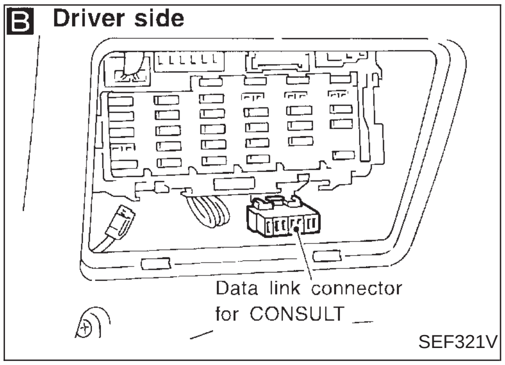
SEF142I

A

BEFORE STARTING

1. Check service records for repairs of related problems, or the current need for scheduled maintenance.
2. Open engine hood and check the following:

- Harness connectors for proper connections
- Vacuum hoses for splits, kinks, and proper connections
- Wiring for proper connections, pinches, or cuts

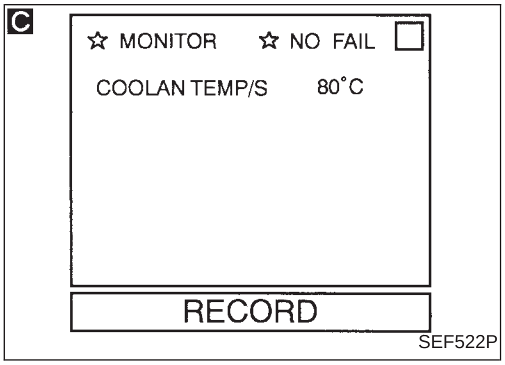


SEF321V

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. (Refer to page EC-57.)

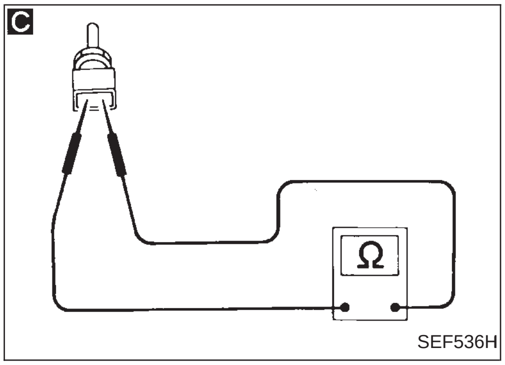


☆ MONITOR ☆ NO FAIL ☐

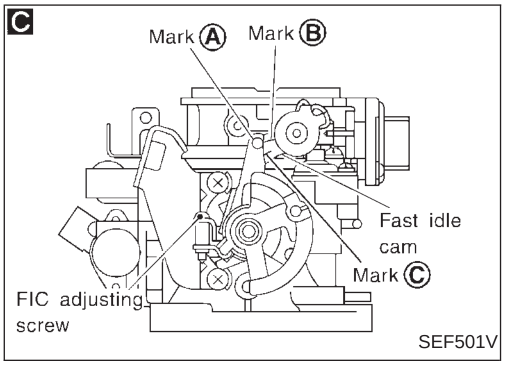
COOLAN TEMP/S 80°C

RECORD

SEF522P



SEF536H



SEF501V

C

CHECK FI CAM FUNCTION

1. Warm up engine to 75°C (167°F).
2. Stop engine and wait at least 5 seconds then turn ignition switch "ON".
3. Select "COOLAN TEMP/S" in "DATA MONITOR MODE" with CONSULT.
4. Check the FI cam when the engine coolant temperature is 75 to 85°C (167 to 185°F). Make sure that the center of mark Ⓐ is aligned with mark Ⓑ as shown in the figure.

OR

2. Stop engine and wait at least 5 seconds then turn ignition switch "ON".
3. Select "MODE 1" WITH GST.
4. Check the FI cam when the engine coolant temperature is 75 to 85°C (167 to 185°F). Make sure that the center of Ⓐ is aligned with mark Ⓑ as shown in the figure.

OR

1. Disconnect engine coolant temperature sensor harness connector and check resistance as shown in the figure.
2. Warm up engine until the resistance of coolant temperature sensor is 0.26 to 0.39 kΩ.
3. Turn ignition switch "OFF".
4. With the resistance of the engine coolant temperature sensor between 0.26 to 0.39 kΩ, make sure that the center of mark Ⓐ is aligned with mark Ⓑ as shown in the figure.

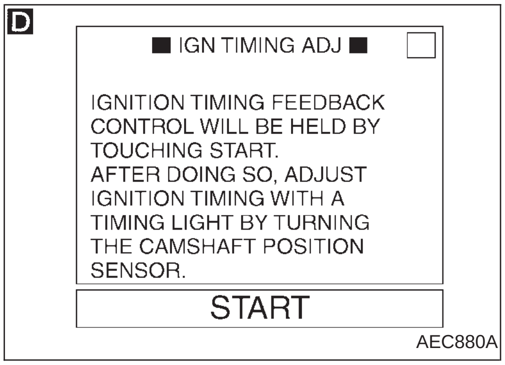
NG → Check FI cam, refer to "Fast Idle Cam (FIC) Inspection and Adjustment" in "BASIC SERVICE PROCEDURE".

OK ↓

Ⓐ

(Go to next page.)

Basic Inspection (Cont'd)

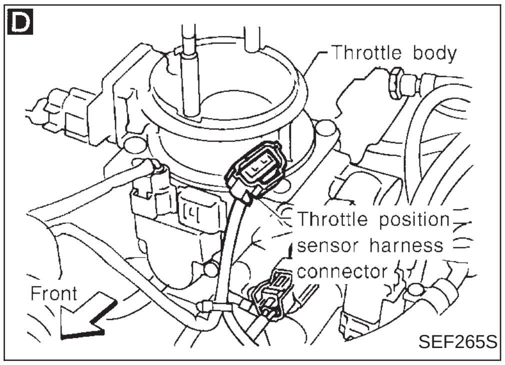


■ IGN TIMING ADJ ■ ☐

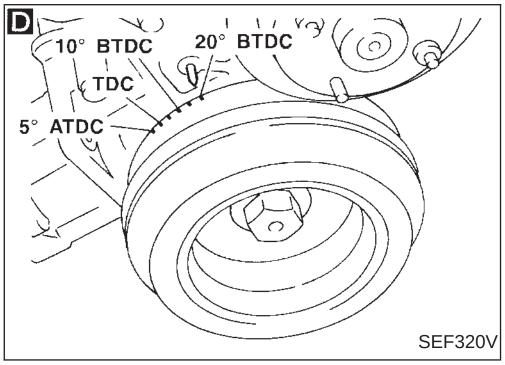
IGNITION TIMING FEEDBACK CONTROL WILL BE HELD BY TOUCHING START.
AFTER DOING SO, ADJUST IGNITION TIMING WITH A TIMING LIGHT BY TURNING THE CAMSHAFT POSITION SENSOR.

START

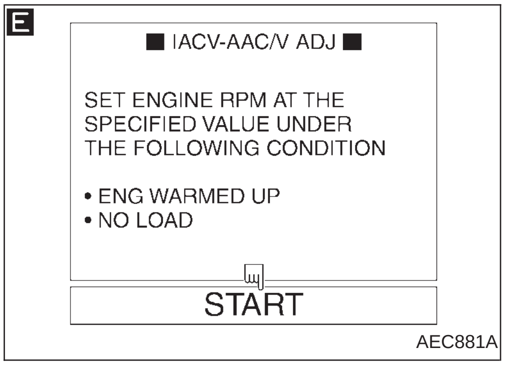
AEC880A



SEF265S



SEF320V



■ IACV-AAC/V ADJ ■

SET ENGINE RPM AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITION

- ENG WARMED UP
- NO LOAD

START

AEC881A

Ⓐ

D

CHECK IGNITION TIMING.

1. Warm up engine to normal operating temperature.
2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".
4. Check ignition timing at idle using timing light.
   Ignition timing:
   20°±2° BTDC

OR

1. Warm up engine to normal operating temperature.
2. Stop engine and disconnect throttle position sensor harness connector.
3. Start engine.
4. Check ignition timing at idle using timing light.
   Ignition timing:
   20°±2° BTDC

NG → Check camshaft position sensor (PHASE), crankshaft position sensor (REF), and crankshaft position sensor (POS).

OK

E

CHECK BASE IDLE SPEED.

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

OR

Does engine run at
M/T: 750±50 rpm
A/T: 750±50 rpm
(in "P" or "N" position)?

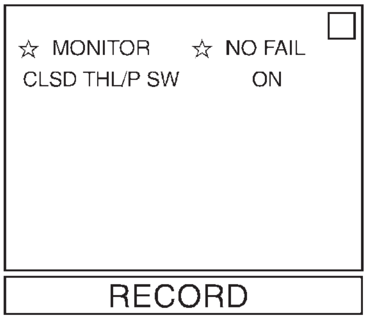
NG → Adjust base idle speed by turning idle speed adjusting screw.
Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment", in "BASIC SERVICE PROCEDURE".

OK

Ⓑ
(Go to next page.)

Basic Inspection (Cont’d)

F

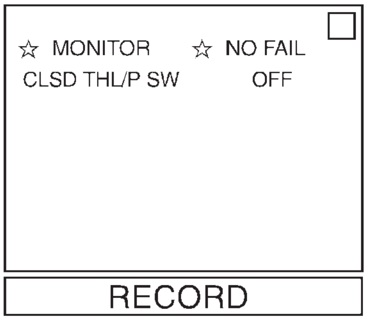


☆ MONITOR ☆ NO FAIL ☐

CLSD THL/P SW ON

RECORD

SEF577W



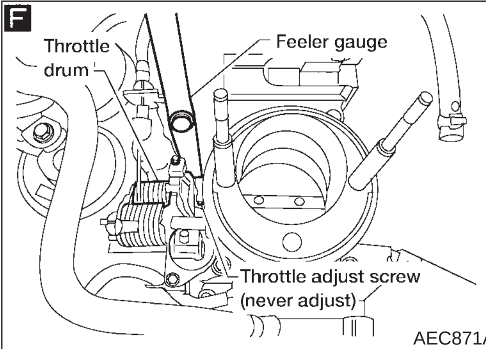
☆ MONITOR ☆ NO FAIL ☐

CLSD THL/P SW OFF

RECORD

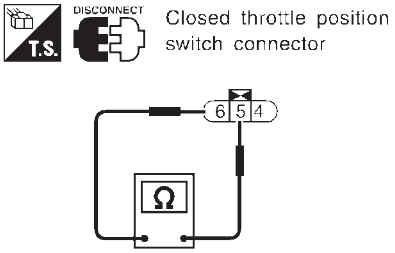
SEF122W

F



AEC871A

F



SEF862V

Ⓑ

F

CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION. (Check throttle position sensor idle position.)

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

1. Warm up engine to normal operating temperature.
2. Check FI cam, refer to procedure **C** .
3. Stop engine.
4. Turn ignition switch “ON”.
5. Select “DATA MONITOR” mode with CONSULT.
6. Select “CLSD THL/P SW” from the menu.
7. Read “CLSD THL/P SW” signal under the following conditions.

- Insert a 0.1 mm (0.004 in) and 0.3 mm (0.012 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure and check the signal.

“CLSD THL/P SW” signal should remain “ON” while inserting 0.1 mm (0.004 in) feeler gauge.

“CLSD THL/P SW” signal should remain “OFF” while inserting 0.3 mm (0.012 in) feeler gauge.

OR

4. Disconnect closed throttle position switch harness connector.
5. Connect the tester probes to closed throttle position switch terminals ⑤ and ⑥.
6. Check harness continuity under the following conditions.

- Insert a 0.1 mm (0.004 in) and 0.3 mm (0.012 in) feeler gauge alternately between the throttle adjust screw (TAS) and throttle drum as shown in the figure and check continuity.

“Continuity should exist” while inserting 0.1 mm (0.004 in) feeler gauge.

“Continuity should not exist” while inserting 0.3 mm (0.012 in) feeler gauge.

NG

G

ADJUSTMENT

Refer to “THROTTLE POSITION SENSOR IDLE POSITION ADJUSTMENT”.

Go to EC-78.

OK

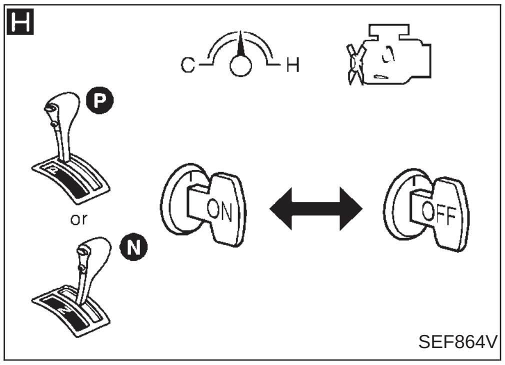
OK

Ⓒ

(Go to next page.)

Basic Inspection (Cont'd)

H



SEF864V

Ⓒ

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

H

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. Start engine.
2. Warm up engine to normal operating temperature.
3. Select "CLSD THL POS" in "DATA MONITOR" mode (Manual trigger) with CONSULT.
4. Stop engine. (Turn ignition switch "OFF".)
5. Turn ignition switch "ON" and wait at least 5 seconds.
6. Turn ignition switch "OFF" and wait at least 5 seconds.
7. Repeat steps 5 and 6 until "CLSD THL POS" in "DATA MONITOR" mode with CONSULT changes to "ON".

OR

7. Repeat steps 5 and 6, 20 times.

CHECK TARGET IDLE SPEED.

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

M/T: 800±50 rpm
A/T: 800±50 rpm
(in "P" or "N" position)

OR

Check target idle speed.

M/T: 800±50 rpm
A/T: 800±50 rpm
(in "P" or "N" position)

NG → Adjust idle speed. Refer to "Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment" in "BASIC SERVICE PROCEDURE".

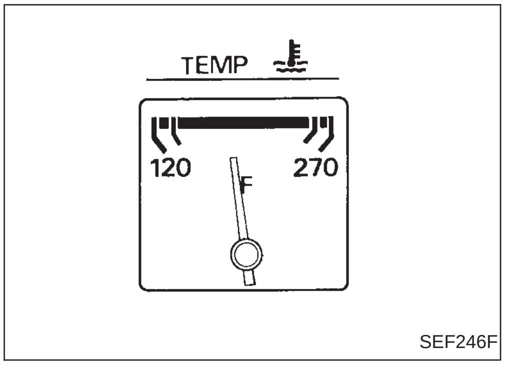
OK

ERASE DTC MEMORY.

After this inspection, unnecessary diagnostic trouble code No. might be stored or displayed. Erase the stored memory in ECM and TCM. Refer to "How to erase DTC" in "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" and A/T section ("Self-diagnosis", "TROUBLE DIAGNOSES").

INSPECTION END

Basic Inspection (Cont'd)



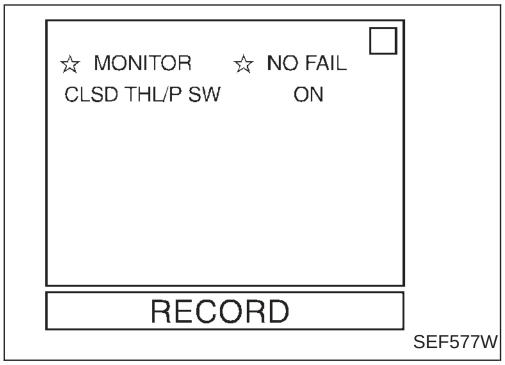
SEF246F

G THROTTLE POSITION SENSOR IDLE POSITION ADJUSTMENT

Note:

- **Never adjust throttle adjust screw (TAS).**
- **Do not touch throttle drum when checking "CLSD THL/P SW" signal or "continuity", doing so may cause an incorrect adjustment.**

1. Warm engine up to normal operating temperature.
2. Check FI cam. Refer to procedure C .
3. Stop engine.
4. Loosen throttle position sensor fixing bolts.

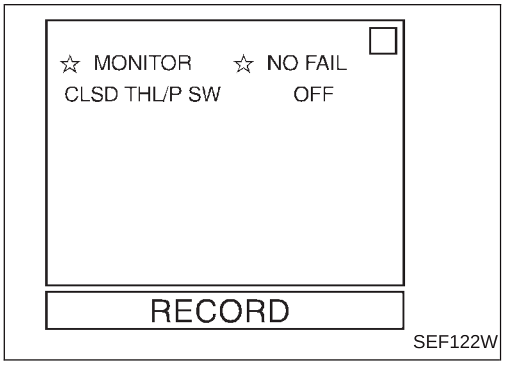


☆ MONITOR ☆ NO FAIL ☐

CLSD THL/P SW ON

RECORD

SEF577W



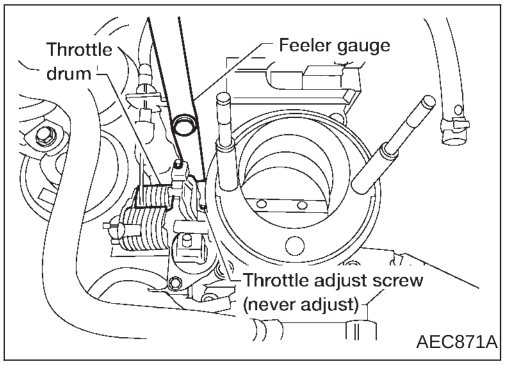
☆ MONITOR ☆ NO FAIL ☐

CLSD THL/P SW OFF

RECORD

SEF122W

5. Turn ignition switch "ON".
6. Select "DATA MONITOR" mode with CONSULT.
7. Select "CLSD THL/P SW" from the menu.
8. Read "CLSD THL/P SW" signal under the following conditions.
   - Insert a 0.1 mm (0.004 in) feeler gauge between throttle adjust screw and throttle drum as shown in the figure and check the following.
   - **Open throttle valve and then close.**
   - **"CLSD THL/P SW" signal should remain "OFF" when the throttle valve is closed. (If signal is "ON", turn throttle position sensor body counterclockwise until the signal switches to "OFF".)**
9. 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 tighten sensor body fixing bolts.**
10. Make sure the signal is "ON" when the throttle valve is closed and "OFF" when it is opened. Repeat it 2 or 3 times.
11. Remove 0.1 mm (0.004 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge and check the following.
    Make sure the signal remains "OFF" when the throttle valve is closed. Repeat it 2 or 3 times.
12. Tighten throttle position sensor.
    Check that the "CLSD THL/P SW" signal remains "OFF" while closing throttle valve. If NG, repeat from step 4.
    After this adjustment, go to procedure H RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.



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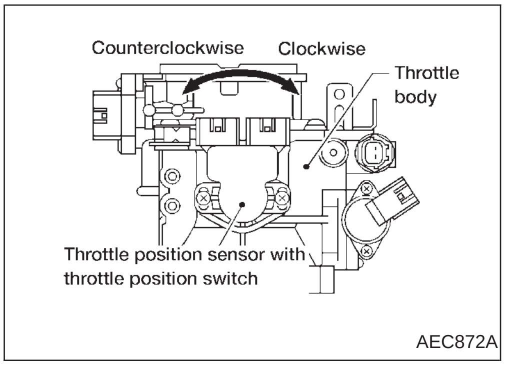
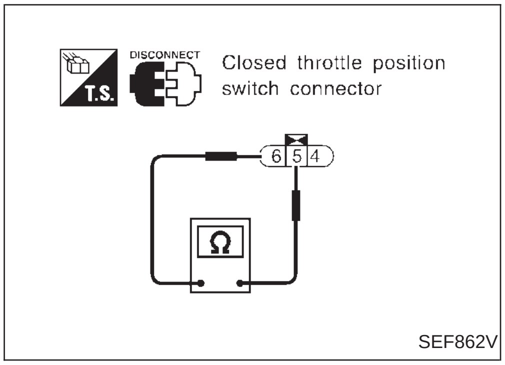
OR



AEC872A

5. Disconnect closed throttle position sensor harness connector.
6. Connector tester probes to closed throttle position switch terminals ⑤ and ⑥ and check continuity under the following conditions.
   - Insert a 0.1 mm (0.004 in) feeler gauge between the throttle adjust screw and throttle drum as shown in the figure and check the following.
   - **Open throttle valve then close.**
   - **Continuity should not exist while closing the throttle valve. If continuity exists, turn throttle position sensor body counterclockwise until continuity does not exist.**
7. Temporarily tighten sensor body fixing bolts as follows.
   - **Gradually move the sensor body clockwise and stop it when continuity comes to exist, then tighten sensor body fixing bolts.**

Basic Inspection (Cont’d)



8. Make sure continuity exists when the throttle valve is closed and continuity does not exist when it is opened. Repeat it 2 or 3 times.
9. Remove 0.1 mm (0.004 in) feeler gauge then insert 0.3 mm (0.012 in) feeler gauge and check the following. Make sure continuity does not exist when the throttle valve is closed. Repeat it 2 or 3 times.
10. Tighten throttle position sensor.
    Check that continuity does not exist while closing the throttle valve. If NG, repeat from step 5.
    After this adjustment, go to procedure H RESET THROTTLE POSITION SENSOR IDLE POSITION MEMORY.

Diagnostic Trouble Code (DTC) Inspection Priority Chart

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

Priority	Detected items (DTC)
1	● P0100 Mass air flow sensor (0102) ● P0110 Intake air temperature sensor (0401) ● P0115, P0125 Engine coolant temperature sensor (0103), (0908) ● P0120 Throttle position sensor (0403) ● P0180 Tank fuel temperature sensor (0402) ● P0325 Knock sensor (0304) ● P0340 Camshaft position sensor (0101) ● P0500 Vehicle speed sensor (0104) ● P0605 ECM (0301) ● P1320 Ignition signal (0201) ● P1400 EGRC-solenoid valve (1005) ● P1706 Park/neutral position (PNP) switch (1003)
2	● P0105 Absolute pressure sensor (0803) ● P0130-P0134 Front heated oxygen sensor (0303-0412) ● P0135 Front heated oxygen sensor heater (0901) ● P0137-P0140 Rear heated oxygen sensor (0510-0707) ● P0141 Rear heated oxygen sensor heater (0902) ● P0335, P1336 Crankshaft position sensor (OBD) (0802), (0905) ● P0443, P1444 EVAP canister purge volume control solenoid valve (1008), (0214) ● P0446, P1446, P1448 EVAP canister vent control valve (0903), (0215), (0309) ● P0450 EVAP control system pressure sensor (0704) ● P0510 Closed throttle position switch (0203) ● P1105 MAP/BARO switch solenoid valve (1302) ● P1401 EGR temperature sensor (0305) ● P1447 EVAP control system purge flow monitoring (0111) ● P1490, P1491 Vacuum cut valve bypass valve (0801), (0311) ● P1775, P1776 Torque converter clutch solenoid valve (0904), (0513)
3	● P0171, P0172 Fuel injection system function (0115), (0114) ● P0304 - P0300 Misfire (0605 - 0701) ● P0400, P1402 EGR function (0302), (0514) ● P0402 EGRC-BPT valve function (0306) ● P0420 Three way catalyst function (0702) ● P0440, P1440 EVAP control system (SMALL LEAK) (0705), (0213) ● P0505 IACV-AAC valve (0205) ● P1148 Closed loop control (0307)

Fail-Safe Chart

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

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

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

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-429
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-29
	Injector circuit	1	1	2	3	2		2	2			2			EC-423
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-23
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-28
	Incorrect idle speed adjustment	3	3				1	1	1	1		1			EC-74
	IACV-AAC valve circuit	1	1	2	3	3	2	2	2	2		2		2	EC-308
	IACV-FICD solenoid valve circuit	2	2	3	3	3	3	3	3	3		3			EC-437
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-74
	Ignition circuit	1	1	2	2	2		2	2			2			EC-333
EGR	EGRC-solenoid valve circuit		2	2	3	3						3			EC-345
	EGR system	2	1	2	3	3	3	2	2	3		3			EC-258, 266, 356
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3		2	EC-99
Air conditioner circuit		2	2	3	3	3	3	3	3	3		3		2	HA section

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

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — Engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine control	Camshaft position sensor circuit	2	2	3	3	3		3	3			3			EC-252
	Mass air flow sensor circuit	1	1	2	2	2		2	2			2			EC-104
	Front heated oxygen sensor circuit		1	2	3	2		2	2			2			EC-150, 157
	Engine coolant temperature sensor circuit	1	1	2	3	2	3	2	2	3		2			EC-126, 145
	Throttle position sensor circuit		1	2		2	2	2	2	2		2			EC-131
	Incorrect throttle position sensor adjustment		3	1		1	1	1	1	1		1			EC-74
	Vehicle speed sensor circuit		2	3		3						3			EC-303
	Knock sensor circuit			2								3			EC-243
	ECM	2	2	3	3	3	3	3	3	3	3	3			EC-320, 81
	Start signal circuit	2													EC-426
	Park/neutral position (PNP) switch circuit			3		3		3	3			3			EC-407
	Power steering oil pressure switch circuit		2					3	3						EC-434

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

(continued on next page)

Symptom Matrix Chart (Cont'd)

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

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

CONSULT Reference Value in Data Monitor Mode

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.

  * Specification data may not be directly related to their components signals/values/operations.

  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS·RPM (REF)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	0.9 - 1.8V
		2,500 rpm	1.9 - 2.3V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
FR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 MNTR			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
RR O2 SENSOR	● Engine: After warming up	Revving engine from idle to 3,000 rpm quickly	0 - 0.3V ↔ Approx. 0.6 - 1.0V
RR O2 MNTR			LEAN ↔ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: fully closed	0.2 - 0.8V
		Throttle valve: fully opened	3.5 - 4.5V
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
CLSD THL POS	● Engine: After warming up ● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: "OFF"	OFF
		Air conditioner switch: "ON" (Compressor operates.)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever: "P" or "N"	ON
		Except above	OFF
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is fully turned	ON

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

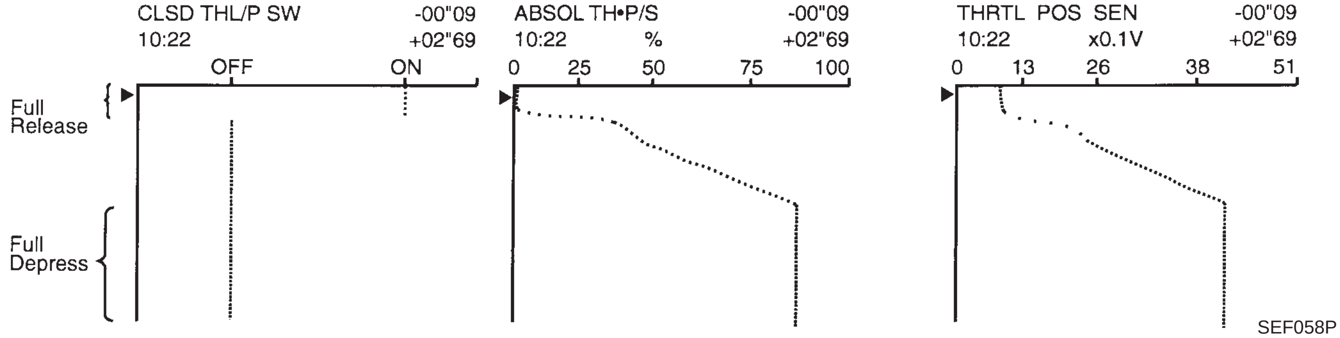
MONITOR ITEM	CONDITION		SPECIFICATION
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
INJ PULSE	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	2.5 - 3.3 msec
		2,000 rpm	2.4 - 3.2 msec
B/FUEL SCHDL	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	0.8 - 1.2 msec
		2,000 rpm	0.8 - 1.2 msec
IGN TIMING	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	Approx. 20° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	Approx. 30%
		2,000 rpm	—
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch “OFF” ● No-load	Idle	0%
		2,000 rpm (More than 200 seconds after starting engine)	—
A/F ALPHA	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	50 - 159%
EVAP SYS PRES	● Ignition switch: ON		Approx. 3.4V
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking		ON
	Except as shown above		OFF
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	ON (Cut)
		Engine speed: Revving engine from idle to 3,000 rpm quickly	OFF (Flow)
TCC SOL/V	● Engine: After warming up	Idle	ON
		2,000 rpm	OFF
VENT CONT/V	● Ignition switch: ON		OFF
FR O2 HEATER	● Engine speed: Below 3,000 rpm (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only)		ON
	● Engine speed: Above 3,000 rpm (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models)		OFF
RR O2 HEATER	● Engine speed: Idle after driving 2 minutes at 70 km/h (43 MPH) or more		ON
	● Ignition switch: ON (Engine stopped)		OFF
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	9.5 - 34.0%
		2,500 rpm	13.9 - 24.9%
ABSOL TH·P/S	● Engine: After warming up, engine stopped ● Ignition switch: ON	Throttle valve: fully closed	0.0%
		Throttle valve: fully opened	Approx. 80%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: “OFF” ● Shift lever: “N” ● No-load	Idle	0.9 - 5.8 g·m/s
		2,500 rpm	7.5 - 13.2 g·m/s
MAP/BARO SW/V	● Engine: For 5 seconds after starting engine		BARO
	● Ignition switch: More than 5 seconds after turning ignition switch “ON” ● Engine: More than 5 seconds after starting engine		MAP
ABSOL PRES/SE	● Ignition switch: ON ● Engine: For 5 seconds after starting engine		Approx. 4.4V
	● Engine: More than 5 seconds after starting engine (After warming up)		Approx. 1.2V

Major Sensor Reference Graph in Data Monitor Mode

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

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

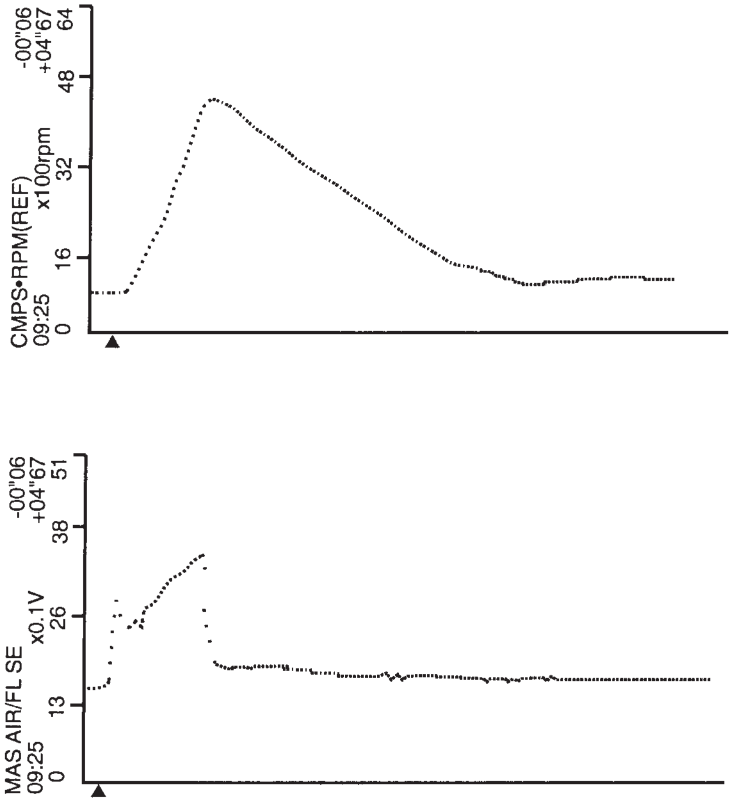
Below is the data for “THRTL POS SEN”, “ABSOL TH·P/S” and “CLSD THL/P SW” when depressing the accelerator pedal with the ignition switch “ON”.
The signal of “THRTL POS SEN” and “ABSOL TH·P/S” should rise gradually without any intermittent drop or rise after “CLSD THL/P SW” is changed from “ON” to “OFF”.



SEF058P

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

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

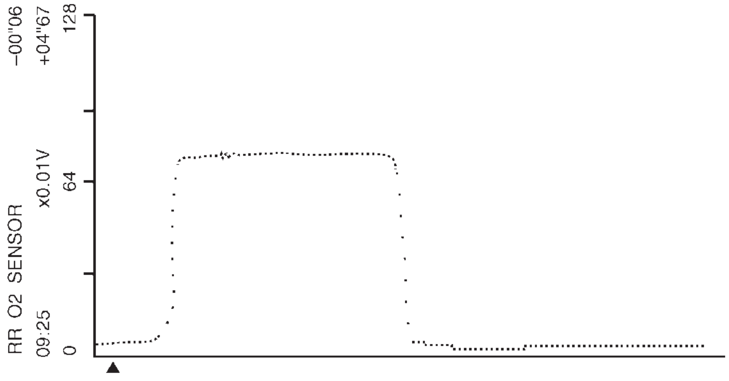


- “CMPS•RPM(REF)” should increase gradually while depressing the accelerator pedal and should decrease gradually after releasing the pedal without any intermittent drop or rise.
- “MAS AIR/FL SE” should increase when depressing the accelerator pedal and should decrease at the moment "THRTL POS SEN" is closed (accelerator pedal is released).

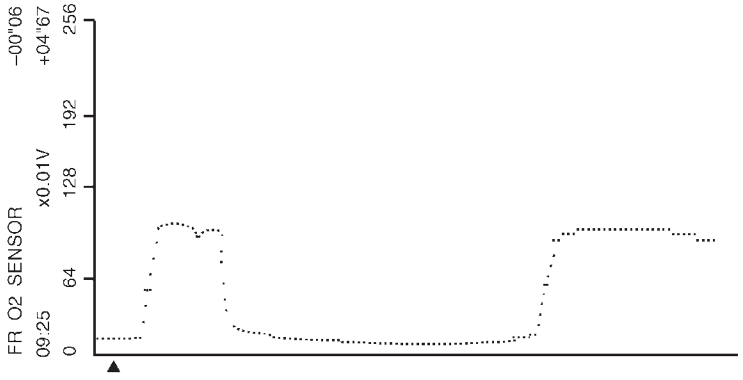
SEF059P

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

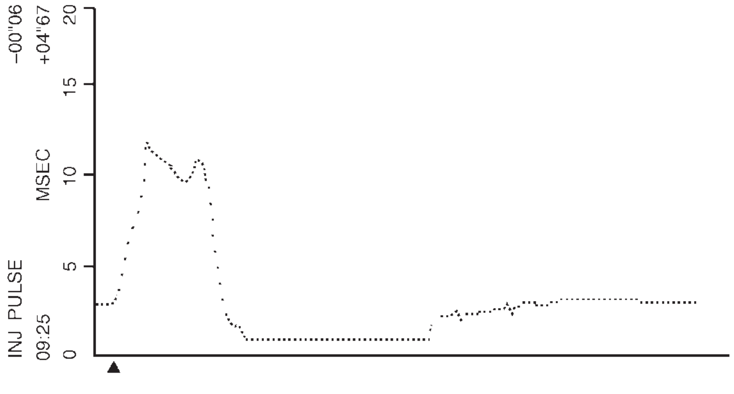
- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



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



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

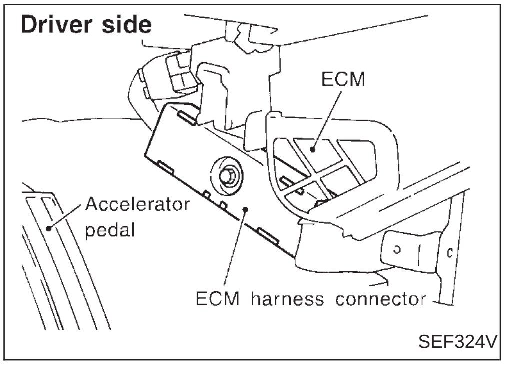


- "INJ PULSE" should increase when depressing the accelerator pedal and should decrease when the pedal is released.

SEF417R

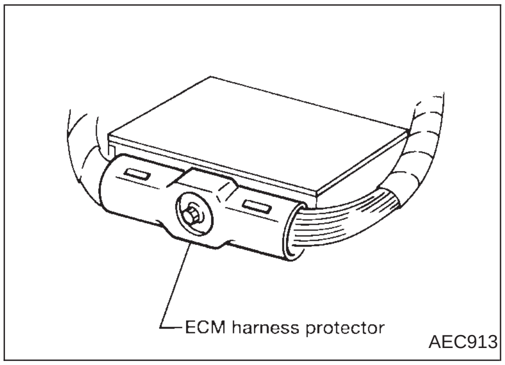
ECM Terminals and Reference Value

PREPARATION



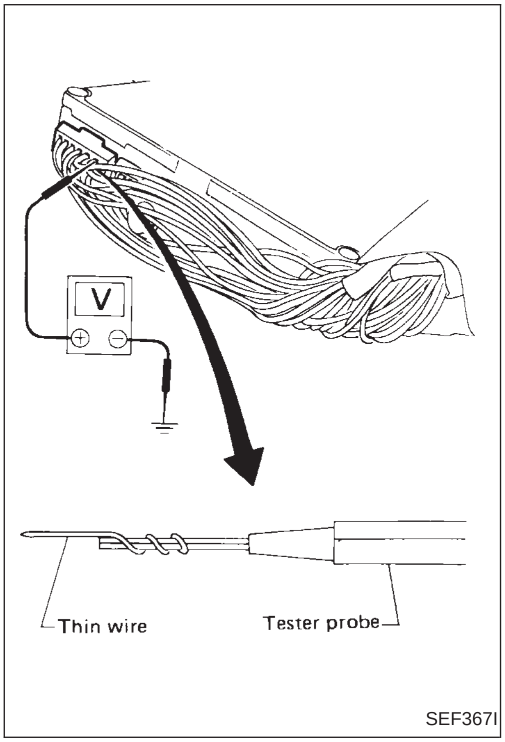
SEF324V

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



AEC913

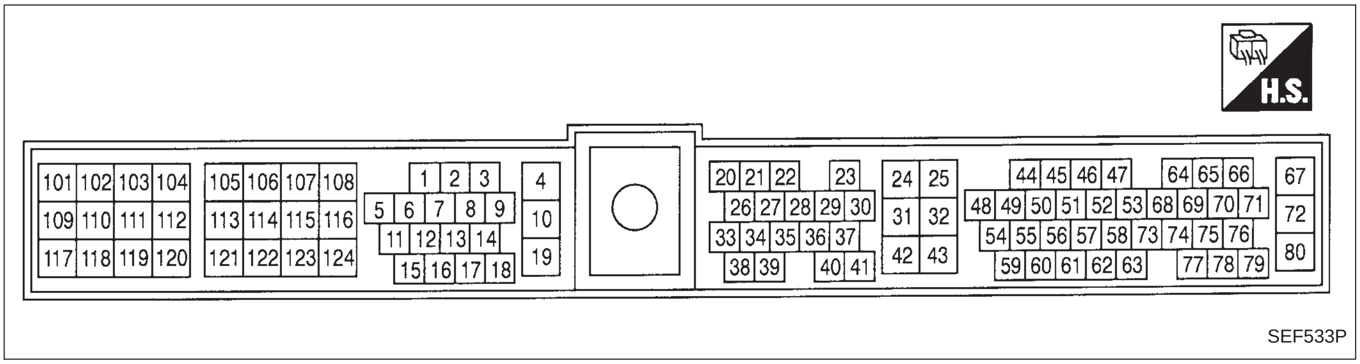
2. Remove ECM harness protector.



SEF367I

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

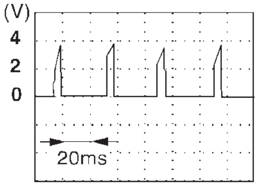
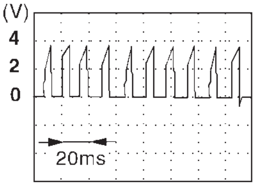
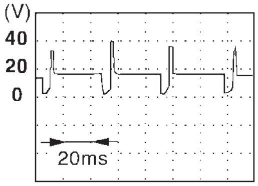
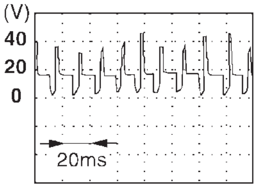
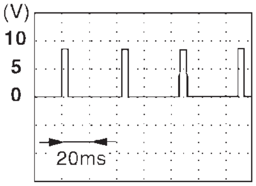
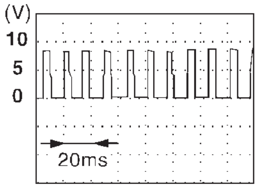


SEF533P

ECM Terminals and Reference Value (Cont'd)

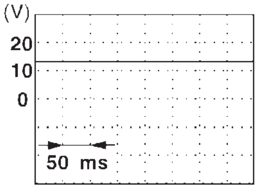
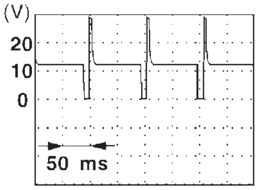
ECM INSPECTION TABLE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	PU/W	Ignition signal	Engine is running. (Warm-up condition) └ Idle speed	0 - 0.5V  SEF186T
			Engine is running. └ Engine speed is 2,000 rpm.	0.2 - 1.0V  SEF187T
2	B	Ignition check	Engine is running. (Warm-up condition) └ Idle speed	12 - 14V  SEF188T
			Engine is running. └ Engine speed is 2,000 rpm.	12 - 13V  SEF189T
3	P/L	Tachometer	Engine is running. (Warm-up condition) └ Idle speed	0 - 1V  SEF190T
			Engine is running. └ Engine speed is 2,000 rpm.	0.5 - 2V  SEF191T

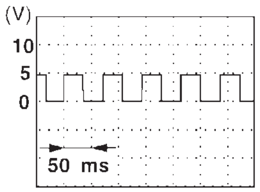
ECM Terminals and Reference Value (Cont’d)

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

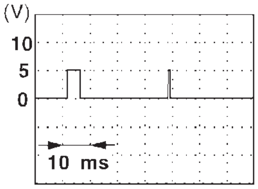
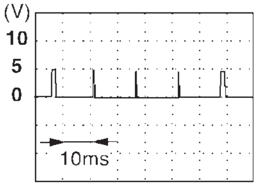
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	LG/R	ECCS relay (Self-shutoff)	Engine is running. Ignition switch “OFF” For a few seconds after turning ignition switch “OFF”	0 - 1V
			Ignition switch “OFF” More than a few seconds after turning ignition switch “OFF”	BATTERY VOLTAGE (11 - 14V)
5	R/Y	EVAP canister purge volume control solenoid valve	Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF109V
			Engine is running. Engine speed is 2,000 rpm. (More than 200 seconds after starting engine)	12 - 13V  SEF110V
10	B/R	ECM ground	Engine is running. Idle speed	Engine ground
11	W/R	Fuel pump relay	Ignition switch “ON” For 5 seconds after turning ignition switch “ON” Engine is running.	0 - 1V
			Ignition switch “ON” More than 5 seconds after turning ignition switch “ON”	BATTERY VOLTAGE (11 - 14V)
12	P	Air conditioner relay	Engine is running. Both A/C switch and blower switch are “ON”*	Approximately 0V
			Engine is running. A/C switch is “OFF”.	BATTERY VOLTAGE (11 - 14V)
18	R/W	Malfunction indicator lamp	Ignition switch “ON”	0 - 1V
			Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)
19	B/R	ECM ground	Engine is running. Idle speed	Engine ground

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

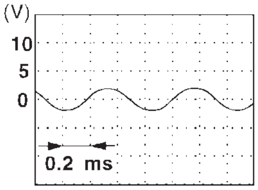
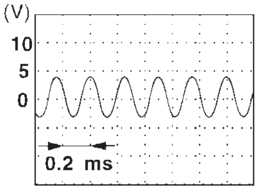
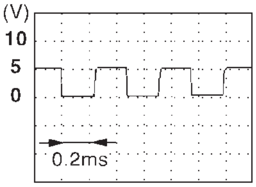
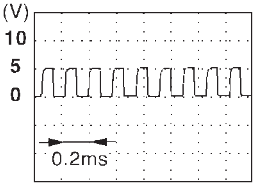
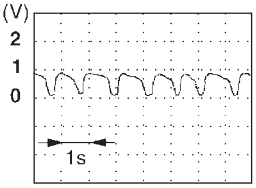
ECM Terminals and Reference Value (Cont’d)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	L/OR	Start signal	Ignition switch “ON”	Approximately 0V
			Ignition switch “START”	BATTERY VOLTAGE (11 - 14V)
21	G/R	Air conditioner dual-pressure switch	Engine is running. └ Both air conditioner switch and blower switch are “ON” (Compressor operates)	Approximately 0V
			Engine is running. └ Air conditioner switch is “OFF”.	BATTERY VOLTAGE (11 - 14V)
22	L/B	Park/neutral position (PNP) switch	Ignition switch “ON” └ Gear position is “N” or “P”.	Approximately 0V
			Ignition switch “ON” └ Except the above gear position	Approximately 5V
23	L	Throttle position sensor	Ignition switch “ON” (Warm-up condition) └ Accelerator pedal fully released	0.2 - 0.8V
			Ignition switch “ON” └ Accelerator pedal fully depressed	3.5 - 4.5V
24	W/G	Ignition switch	Ignition switch “OFF”	0V
			Ignition switch “ON”	BATTERY VOLTAGE (11 - 14V)
25	B/Y	ECM ground	Engine is running. └ Idle speed	Engine ground
28	BR/W	Throttle position switch (Closed position)	Ignition switch “ON” (Warm-up condition) └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch “ON” └ Accelerator pedal depressed	Approximately 0V
29	G/B	Vehicle speed sensor	Engine is running. ├ Lift up the vehicle. ├ In 2nd gear position └ 40 km/h (25 MPH)	1 - 4V  SEF111V
32	B/Y	ECM ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
39	GY/R	Power steering oil pressure switch	Engine is running. └ Steering wheel is fully turned.	Approximately 0V
			Engine is running. └ Steering wheel is not turned.	Approximately 5V

ECM Terminals and Reference Value (Cont'd)

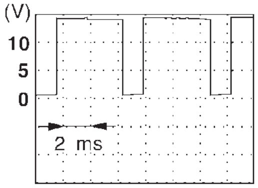
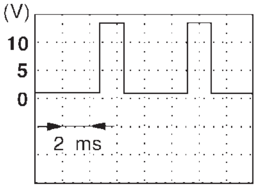
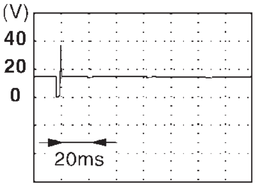
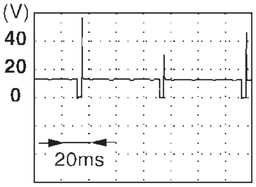
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	BR	Sensors' power supply	Ignition switch "ON"	Approximately 5V
43	B/W	Sensors' ground	Engine is running. Idle speed	Approximately 0V
44	PU	Camshaft position sensor (Reference signal)	Engine is running. (Warm-up condition) Idle speed	0.2 - 0.5V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

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	L	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) Idle speed	Approximately 0V  SEF112V
			Engine is running. Engine speed is 2,000 rpm.	Approximately 0V  SEF113V
49	LG	Camshaft position sensor (Position signal)	Engine is running. (Warm-up condition) Idle speed	Approximately 2.6V  SEF195T
			Engine is running. Engine speed is 2,000 rpm.	Approximately 2.5 - 2.6V  SEF196T
50	B	Front heated oxygen sensor	Engine is running. After warming up to normal operating temperature and engine speed is 2,000 rpm.	0 - Approximately 1.0V  SEF201T
54	R	Mass air flow sensor	Engine is running. (Warm-up condition) Idle speed	0.9 - 1.8V
			Engine is running. (Warm-up condition) Engine speed is 2,500 rpm.	1.8 - 2.3V
55	G	Mass air flow sensor ground	Engine is running. (Warm-up condition) Idle speed	Approximately 0V

ECM Terminals and Reference Value (Cont'd)

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

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

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
116	B/R	ECM ground	Engine is running. Idle speed	Engine ground
117	B/P	Current return	Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)
118	LG/B	MAP/BARO switch solenoid valve	Ignition switch "ON" For 5 seconds after turning ignition switch "ON" Engine is running. Idle speed For 5 seconds after starting engine	0 - 1V
			Ignition switch "ON" More than 5 seconds after turning ignition switch "ON" Engine is running. Idle speed More than 5 seconds after starting engine	BATTERY VOLTAGE (11 - 14V)
119	BR/Y	Front heated oxygen sensor heater	Engine is running. Engine speed is below 3,000 rpm. (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only)	Approximately 0.4V
			Engine is running. Engine speed is above 3,000 rpm. (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models)	BATTERY VOLTAGE (11 - 14V)
120	P/B	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
122	R/B	Rear heated oxygen sensor heater	Engine is running. Idle speed after driving 2 minutes at 70 km/h (43 MPH) or more	Approximately 0.4V
			Ignition switch "ON" Engine is not running.	BATTERY VOLTAGE (11 - 14V)
124	B/R	ECM ground	Engine is running. Idle speed	Engine ground

Description

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

Common I/I Report Situations

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

Diagnostic Procedure

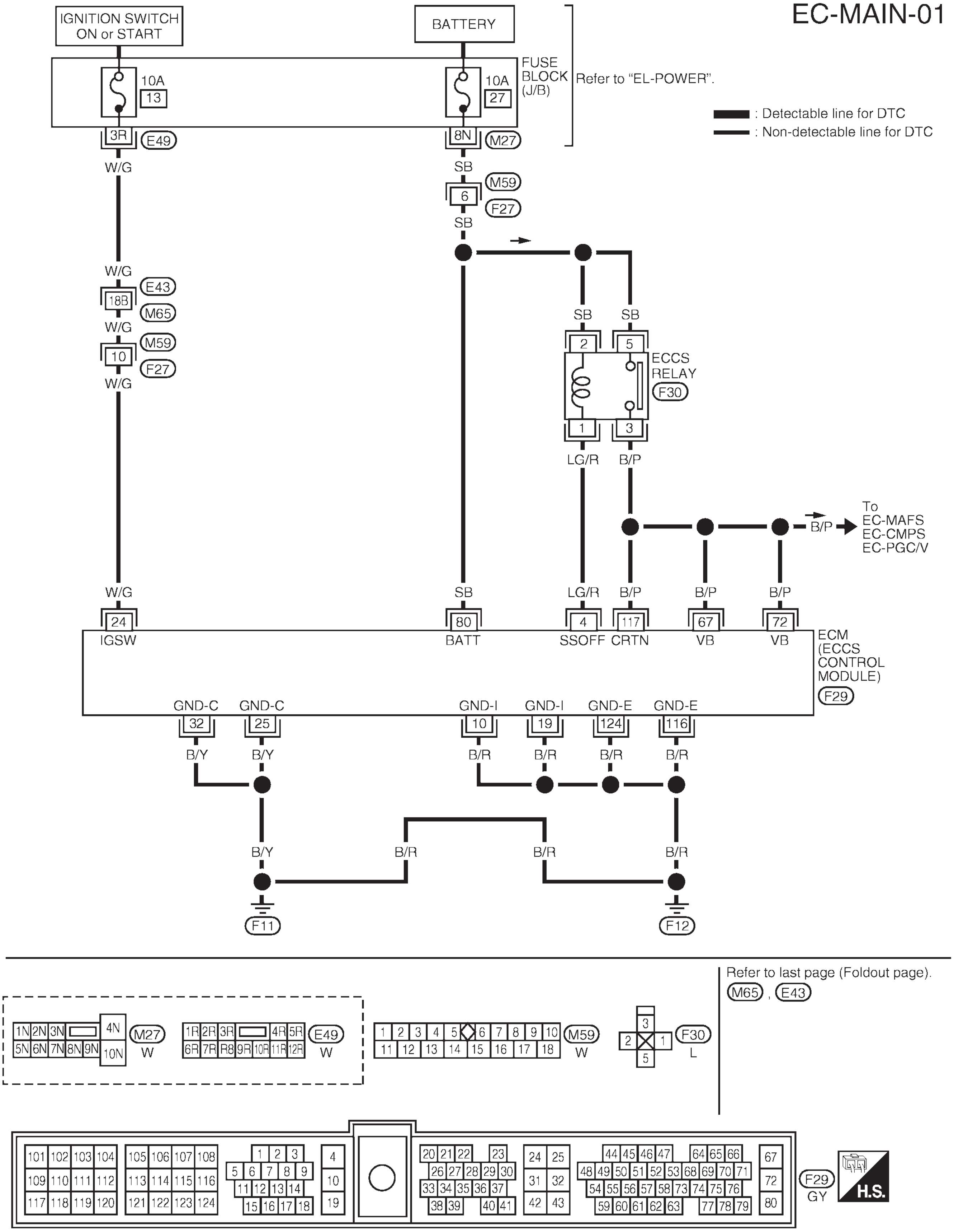
Erase (1st trip) DTCs. Refer to ‘‘HOW TO ERASE EMISSION-RELATED INFORMATION’’ (EC-48).

Check ground terminals. Refer to ‘‘Circuit Inspection’’, ‘‘GROUND INSPECTION’’ (GI section).

Perform ‘‘Incident Simulation Tests’’ (GI section).

Check connector terminals. Refer to ‘‘How to Check Enlarged Contact Spring of Terminal’’ (GI section).

Main Power Supply and Ground Circuit



AEC518A

ECM TERMINALS AND REFERENCE VALUE

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

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

Main Power Supply and Ground Circuit (Cont'd)

DIAGNOSTIC PROCEDURE

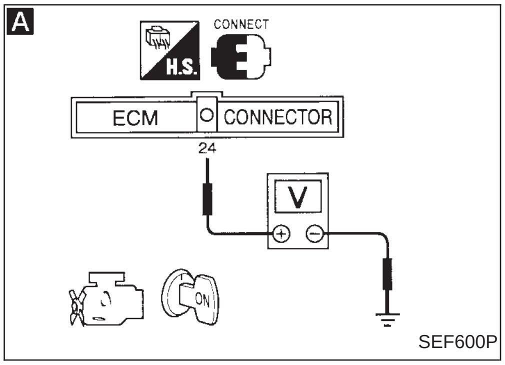
INSPECTION START

↓

Start engine.
Is engine running?

Yes → Go to **E** "**CHECK POWER SUPPLY-III**" on next page.

No ↓



SEF600P

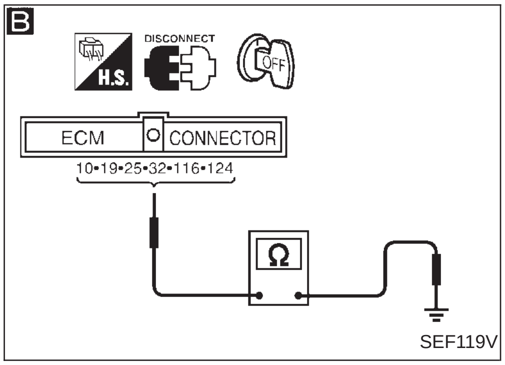
A

CHECK POWER SUPPLY-I.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal ㉔ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors M65, E43
- Harness connectors M59, F27
- 10A fuse
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

OK ↓



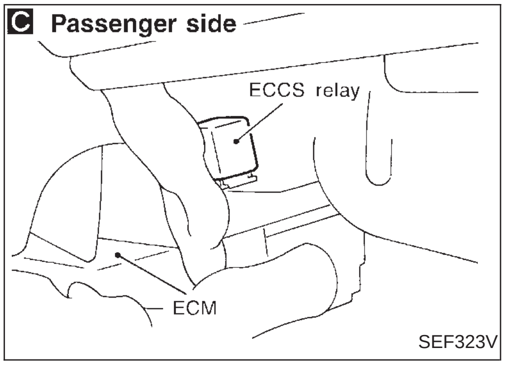
SEF119V

B

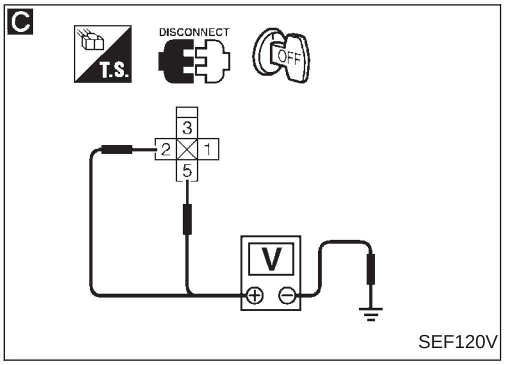
CHECK GROUND CIRCUIT-I.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals ⑩, ⑲, ㉕, ㉜, (116), (124) and engine ground.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓



SEF323V



SEF120V

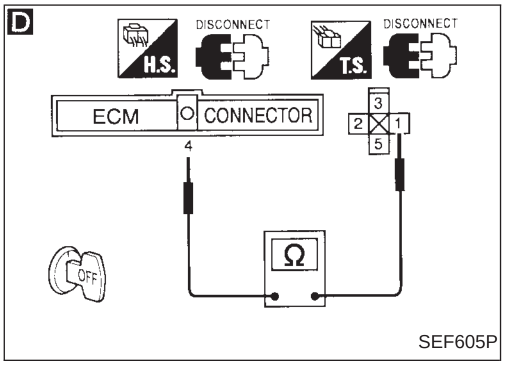
C

CHECK POWER SUPPLY-II.
1. Disconnect ECCS relay.
2. Turn ignition switch "OFF".
3. Check voltage between terminals ②, ⑤ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness connectors M59, F27
- Harness for open or short between ECCS relay and battery

If NG, repair harness or connectors.

OK ↓



SEF605P

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between ECM terminal ④ and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

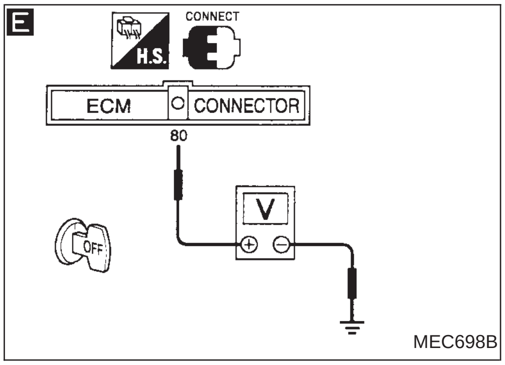
OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

Main Power Supply and Ground Circuit (Cont'd)



MEC698B

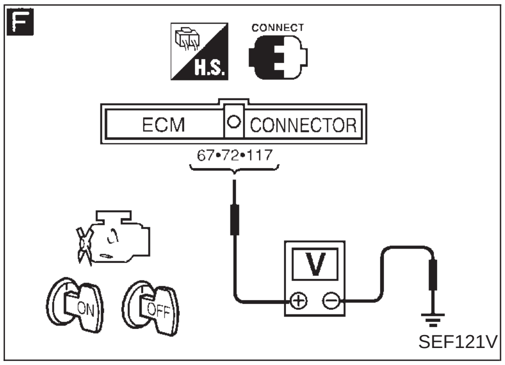
E

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

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

If NG, repair harness or connectors.

OK ↓



SEF121V

F

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

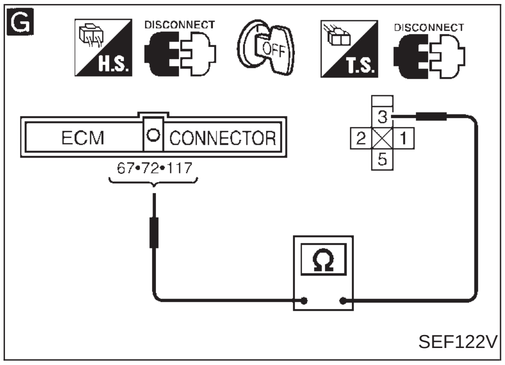
OK → Go to K "CHECK GROUND CIRCUIT-II" on next page.

NG ↓

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

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

Case-1 ↓



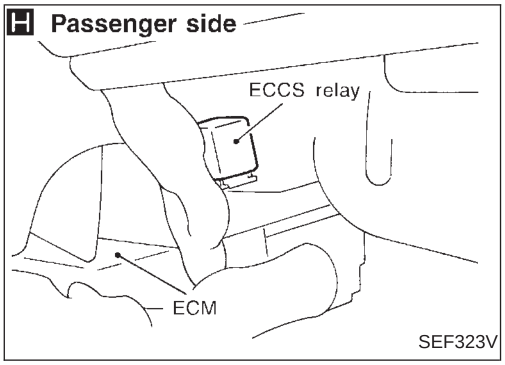
SEF122V

G

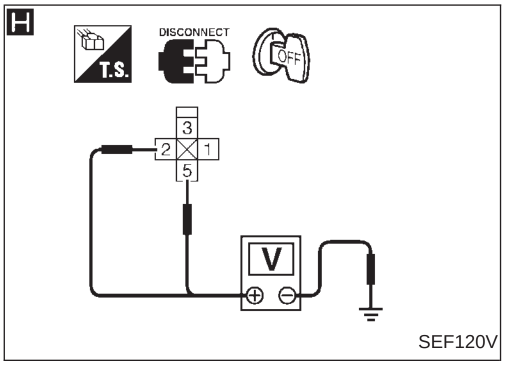
CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM terminals (67), (72), (117) and relay terminal ③.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓



SEF323V



SEF120V

H

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

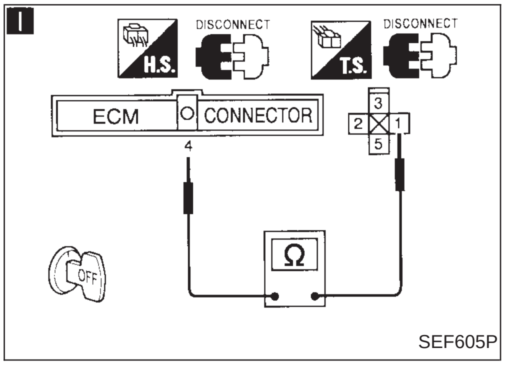
NG → Check the following.
- Harness connectors (F27), (M59)
- 10A fuse
- Harness for open or short between ECCS relay and battery

If NG, repair harness or connectors.

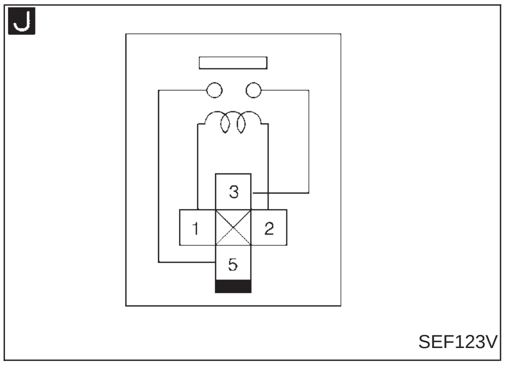
OK ↓

Ⓑ
(Go to next page.)

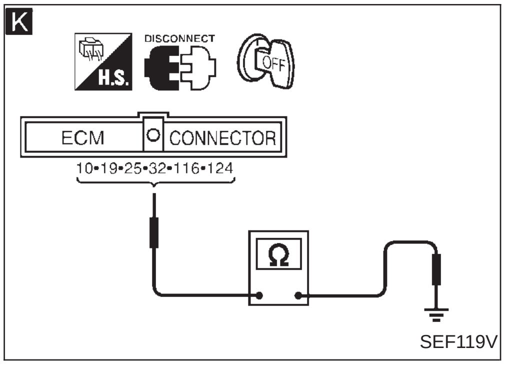
Main Power Supply and Ground Circuit (Cont'd)



SEF605P



SEF123V



SEF119V

Ⓑ

I

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

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

OK

J

CHECK ECCS RELAY.

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

NG → Replace ECCS relay.

OK

K

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

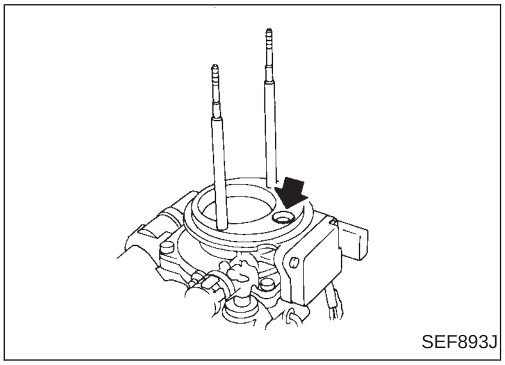
NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

INSPECTION END



Mass Air Flow Sensor (MAFS)

COMPONENT DESCRIPTION

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

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	0.9 - 1.8V
		2,500 rpm	1.9 - 2.3V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	9.5 - 34.0%
		2,500 rpm	13.9 - 24.9%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	0.9 - 5.8 g·m/s
		2,500 rpm	7.5 - 13.2 g·m/s

ECM TERMINALS AND REFERENCE VALUE

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

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

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0100 0102	A) An excessively high voltage from the sensor is sent to ECM when engine is not running. C) A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor
	B) An excessively low voltage from the sensor is sent to ECM* when engine is running. D) A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The sensor circuit is open or shorted.) ● Intake air leaks ● Mass air flow sensor

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

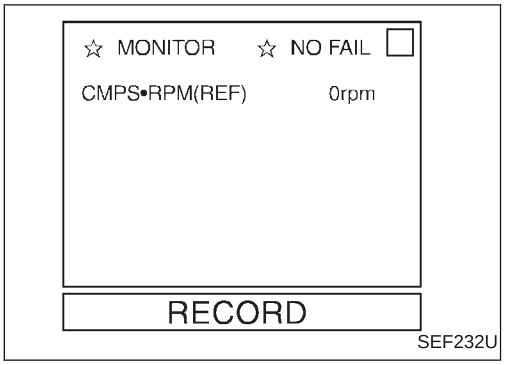
Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

CAUTION:
Always drive vehicle at a safe speed.

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



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

RECORD

SEF232U

Procedure for malfunction A

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 6 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-109.

OR

GST

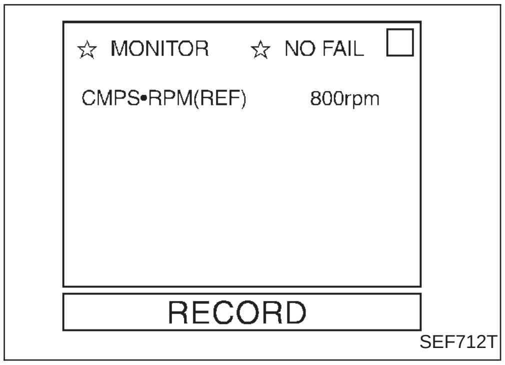
1) Turn ignition switch "ON", and wait at least 6 seconds.
2) Select "MODE 7" with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-109.

OR

NO TOOLS

1) Turn ignition switch "ON", and wait at least 6 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-109.

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



CMPS•RPM(REF) 800rpm

SEF712T

Procedure for malfunction B

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT.
3) Start engine and wait 5 seconds at most.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

OR

GST

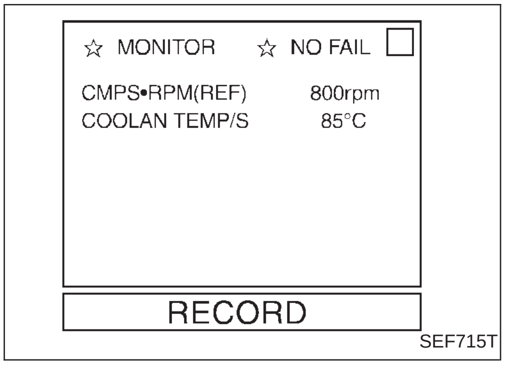
1) Turn ignition switch ''ON''.
2) Start engine and wait 5 seconds at most.
3) Select ''MODE 7'' with GST.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

OR

NO TOOLS

1) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
2) Start engine and wait 5 seconds at most.
3) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
4) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
5) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

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



CMPS•RPM(REF) 800rpm
COOLAN TEMP/S 85°C

SEF715T

Procedure for malfunction C

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

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT.
3) Start engine and warm it up to normal operating temperature.
4) Run engine for at least 10 seconds at idle speed.
5) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

OR

GST

1) Start engine and warm it up to normal operating temperature.
2) Run engine for at least 10 seconds at idle speed.
3) Select ''MODE 7'' with GST.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

OR

NO TOOLS

1) Start engine and warm it up to normal operating temperature.
2) Run engine for at least 10 seconds at idle speed.
3) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
4) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
5) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

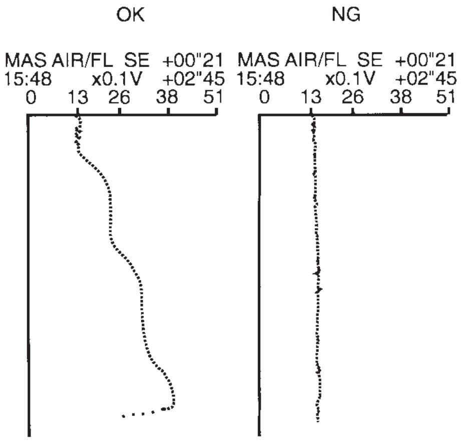
Mass Air Flow Sensor (MAFS) (Cont'd)

Procedure for malfunction D

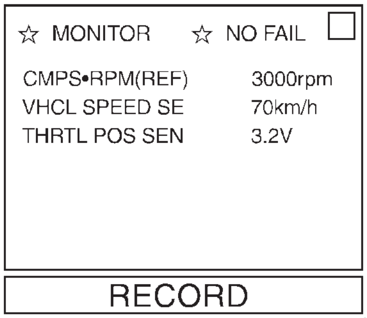
1) Turn ignition switch ''ON''.
2) Start engine and warm it up to normal operating temperature.

If engine cannot be started, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

3) Select ''DATA MONITOR'' mode with CONSULT.
4) Check the voltage of MAS AIR/FL SE with ''DATA MONITOR''.
5) Increase 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-109.
   If OK, go to following step.
7) Maintain the following conditions for at least 10 consecutive seconds.
   CMPS·RPM (REF): More than 2,000 rpm
   THRTL POS SEN: More than 3V
   Selector lever: Suitable position
   Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.
8) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-109.



SEF998N

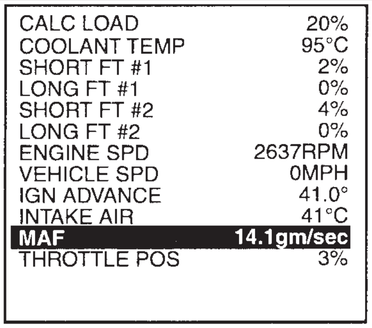


```
☆ MONITOR    ☆ NO FAIL ☐

CMPS•RPM(REF)      3000rpm
VHCL SPEED SE      70km/h
THRTL POS SEN      3.2V

RECORD
```

SEF231U



```
CALC LOAD              20%
COOLANT TEMP          95°C
SHORT FT #1             2%
LONG FT #1              0%
SHORT FT #2             4%
LONG FT #2              0%
ENGINE SPD         2637RPM
VEHICLE SPD           0MPH
IGN ADVANCE          41.0°
INTAKE AIR            41°C
MAF            14.1gm/sec
THROTTLE POS            3%
```

SEF534P

OR

OVERALL FUNCTION CHECK

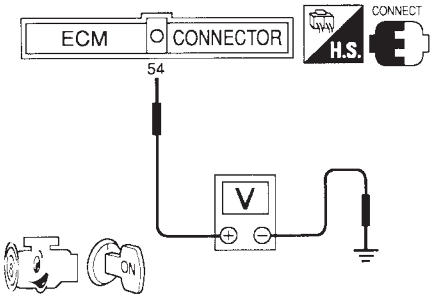
Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Procedure for malfunction D

1) Turn ignition switch ''ON''.
2) Start engine and warm it up to normal operating temperature.
3) Select ''MODE 1'' with GST.
4) Check the mass air flow with ''MODE 1''.
5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.
6) If NG, go to ''DIAGNOSTIC PROCEDURE'', EC-109.

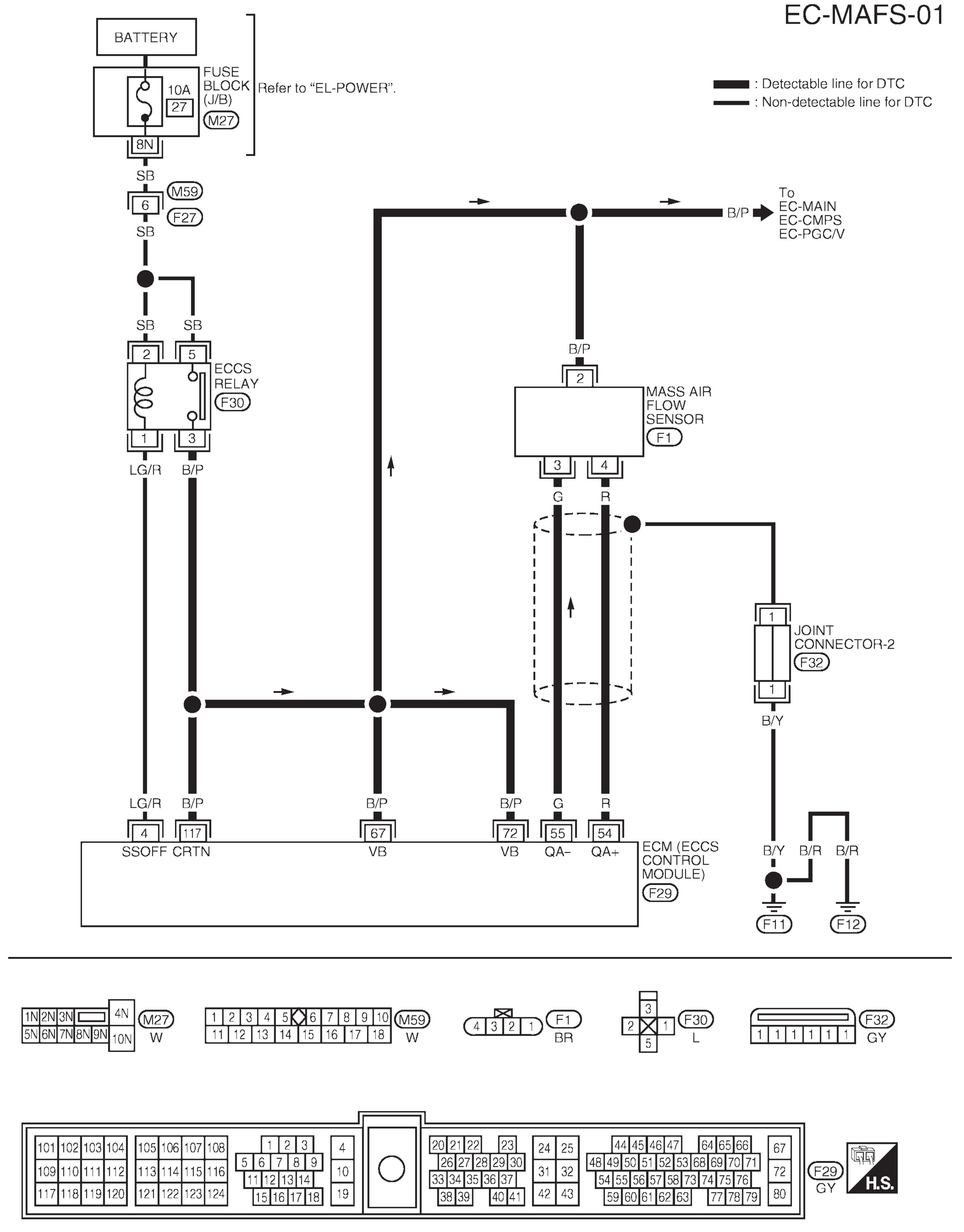
OR

1) Turn ignition switch ''ON''.
2) Start engine and warm it up to normal operating temperature.
3) Check the voltage between ECM terminal (54) and ground.
4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.
5) If NG, go to ''DIAGNOSTIC PROCEDURE'', EC-109.



SEF535P

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



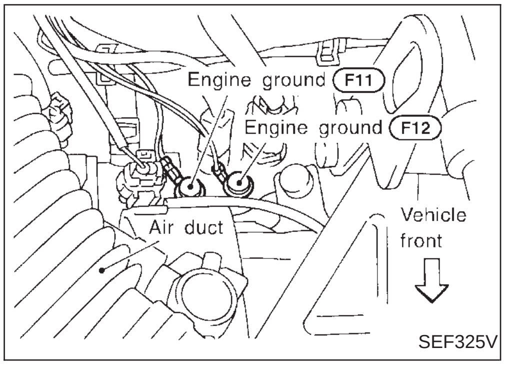
AEC519A

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

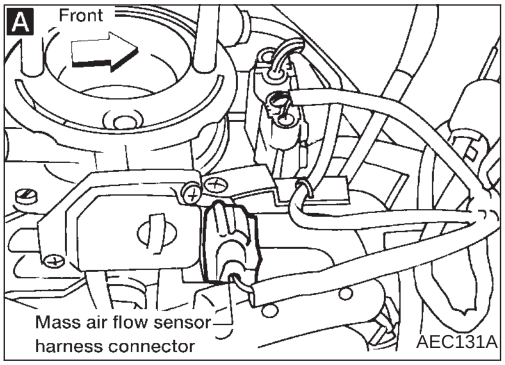
DIAGNOSTIC PROCEDURE

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

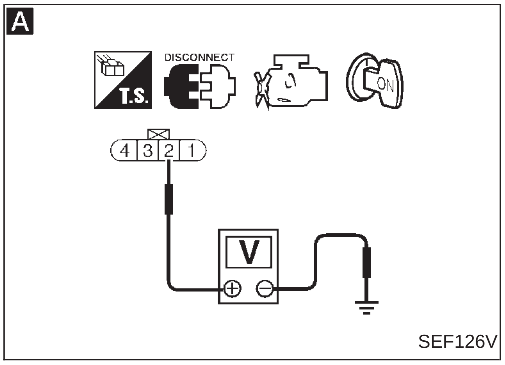
Procedure A



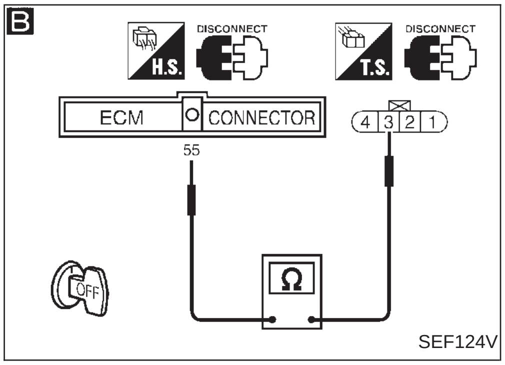
SEF325V



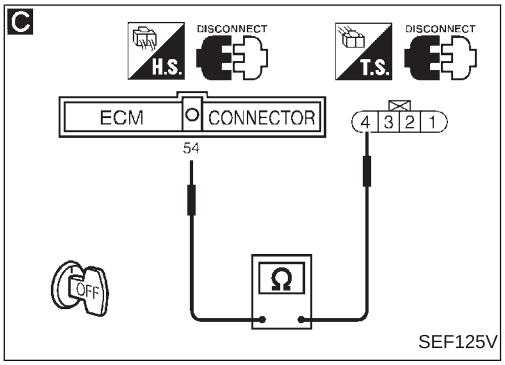
AEC131A



SEF126V



SEF124V



SEF125V

INSPECTION START

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

A

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

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

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ③ and ECM terminal ㊺.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ④ and ECM terminal ㊹.
Continuity should exist.
If OK, check harness for short.

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

OK

CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-112.

NG → Replace mass air flow sensor.

OK

Ⓐ
(Go to next page.)

Mass Air Flow Sensor (MAFS) (Cont’d)

Ⓐ

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

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

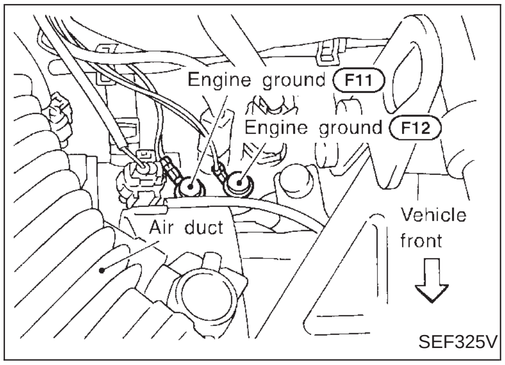
NG → Repair open circuit, short to ground or short to power in harness or connectors.

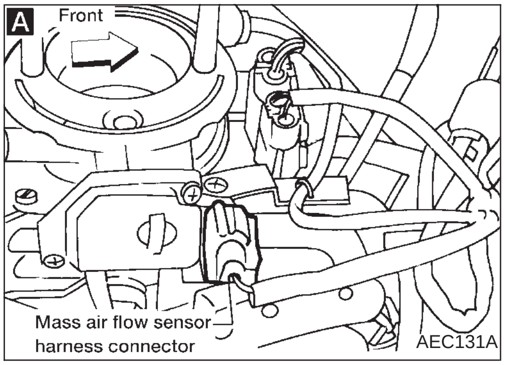
OK

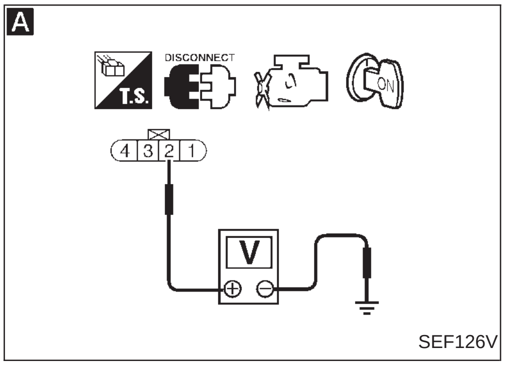
Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-98.

INSPECTION END

Procedure B







INSPECTION START

CHECK INTAKE SYSTEM.
Check the following for connection.
- Air duct
- Air cleaner
- Vacuum hoses
- Intake air passage between air duct to collector

If disconnected, reconnect the parts.

NG → Reconnect the parts.

OK

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

A

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

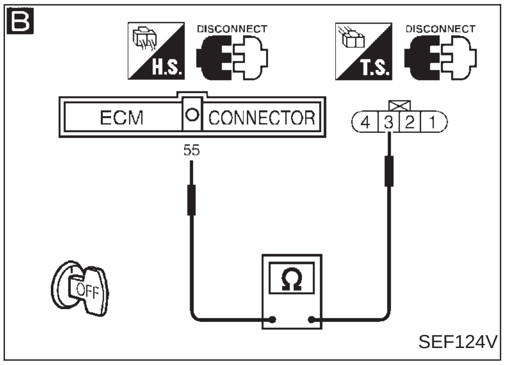
NG → Check the following.
- Harness for open or short between ECCS relay and mass air flow sensor
- Harness for open or short between mass air flow sensor and ECM

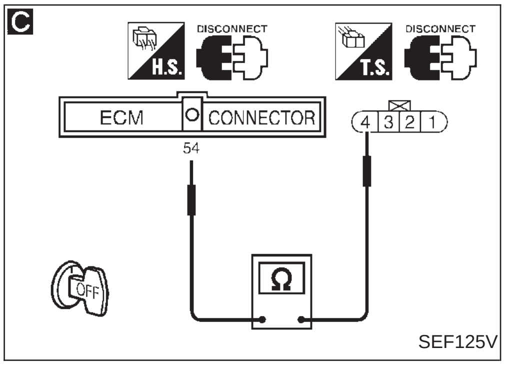
If NG, repair harness or connectors.

OK

Ⓐ
(Go to next page.)

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





Ⓐ

B

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

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

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ④ and ECM terminal (54).
Continuity should exist.
If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK COMPONENT
(Mass air flow sensor).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace mass air flow sensor.

OK ↓

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

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

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

OK ↓

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

INSPECTION END

GI
MA
EM
LC
EC
FE
CL
MT
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PD
FA
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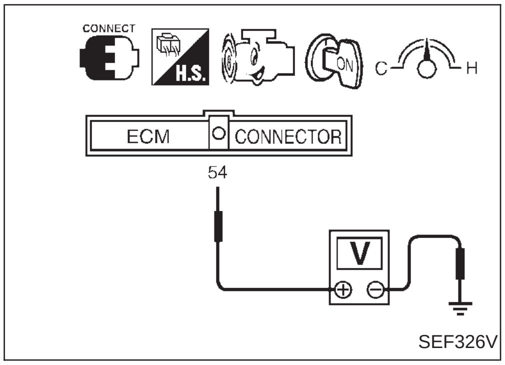
RS
BT
HA
EL
IDX

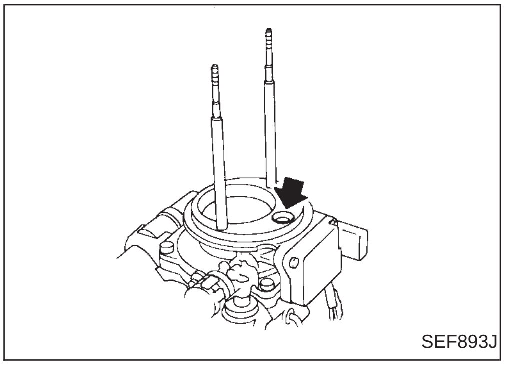
Mass Air Flow Sensor (MAFS) (Cont’d)

COMPONENT INSPECTION

Mass air flow sensor



SEF326V



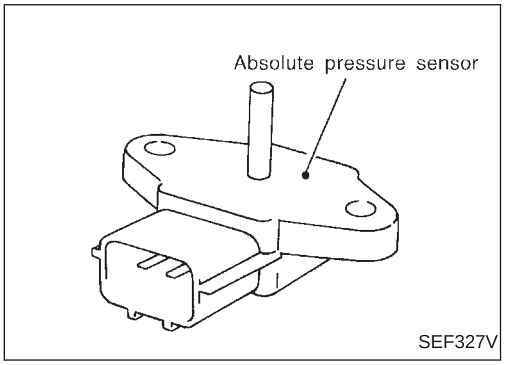
SEF893J

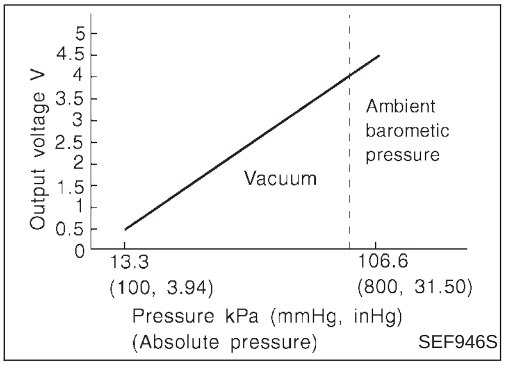
1. Turn ignition switch ‘‘ON’’.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between terminal (54) and ground.

Conditions	Voltage V
Ignition switch ‘‘ON’’ (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.8
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.9 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 3

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

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





Absolute Pressure Sensor

COMPONENT DESCRIPTION

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

ON BOARD DIAGNOSIS LOGIC

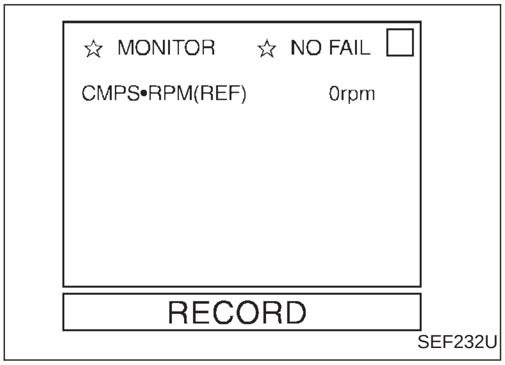
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0105 0803	A) An excessively low or high voltage from the sensor is sent to ECM.	● Harness or connectors (Absolute pressure sensor circuit is open or shorted.) ● Absolute pressure sensor
	B) A high voltage from the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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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

Absolute Pressure Sensor (Cont’d)



CMPS•RPM(REF) 0rpm

SEF232U

Procedure for malfunction A

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT.
3) Wait at least 6 seconds.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-117.

OR

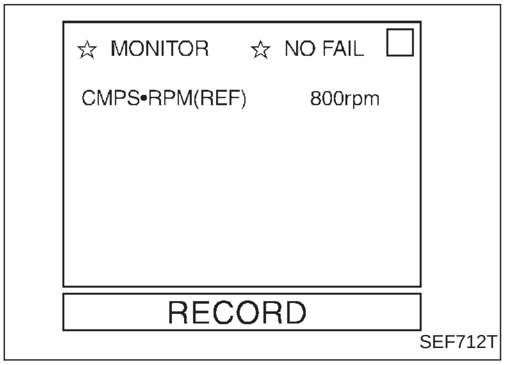
GST

1) Turn ignition switch ‘‘ON’’ and wait at least 6 seconds.
2) Select ‘‘MODE 7’’ with GST.
3) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-117.

OR

NO TOOLS

1) Turn ignition switch ‘‘ON’’ and wait at least 6 seconds.
2) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
3) Perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-117.



CMPS•RPM(REF) 800rpm

SEF712T

Procedure for malfunction B

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
3) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT.
4) Start engine and let it idle.
5) Wait at least 10 seconds.
6) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-117.

OR

GST

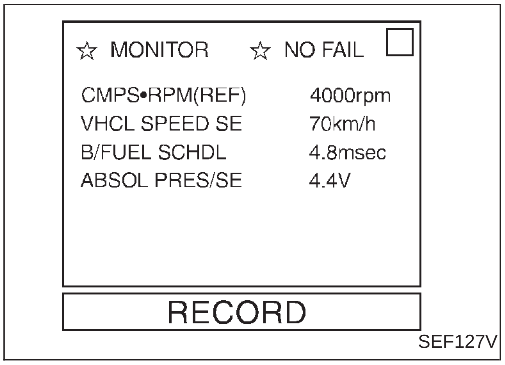
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
3) Start engine.
4) Let engine idle and wait at least 10 seconds.
5) Select ‘‘MODE 7’’ with GST.
6) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-117.

OR

NO TOOLS

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
3) Start engine.
4) Let engine idle and wait at least 10 seconds.
5) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
6) Perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
7) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-117.

Absolute Pressure Sensor (Cont'd)



```
☆ MONITOR      ☆ NO FAIL  ☐

CMPS•RPM(REF)        4000rpm
VHCL SPEED SE        70km/h
B/FUEL SCHDL         4.8msec
ABSOL PRES/SE        4.4V

            RECORD
```

SEF127V

Procedure for malfunction C

CAUTION:

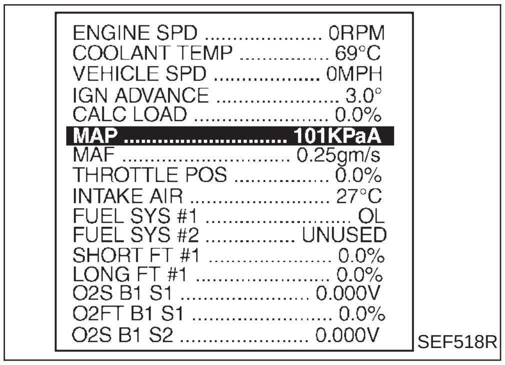
Always drive vehicle at a safe speed.

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
   The voltage of "ABSOL PRES/SE" should be more than 1.74 [V].
   If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-117.
   If the check result is OK, go to following step.
3) Start engine and warm it up to normal operating temperature.
4) Turn ignition switch "OFF" and wait at least 5 seconds.
5) Start engine and let it idle for at least 10 seconds.
6) Select "DATA MONITOR" mode with CONSULT.
7) Drive the vehicle at least 3 consecutive seconds under the following conditions,
   B/FUEL SCHDL: More than 4 msec
   CMPS·RPM (REF): 3,000 - 4,800 rpm
   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-117.

OR

OVERALL FUNCTION CHECK

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



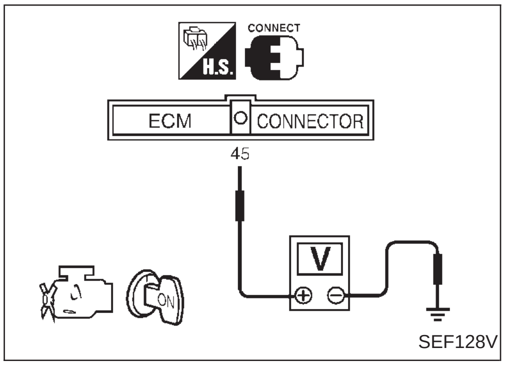
```
ENGINE SPD ..................... 0RPM
COOLANT TEMP ................ 69°C
VEHICLE SPD ................... 0MPH
IGN ADVANCE ...................... 3.0°
CALC LOAD ........................ 0.0%
MAP ............................ 101KPaA
MAF ............................. 0.25gm/s
THROTTLE POS ................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

SEF518R

Procedure for malfunction C

1) Turn ignition switch "ON".
2) Select "MAP" in "MODE 1" with GST.
3) Make sure that the pressure of "MAP" is more than 46 kPa (0.47 kg/cm^2, 6.7 psi).
4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-117.

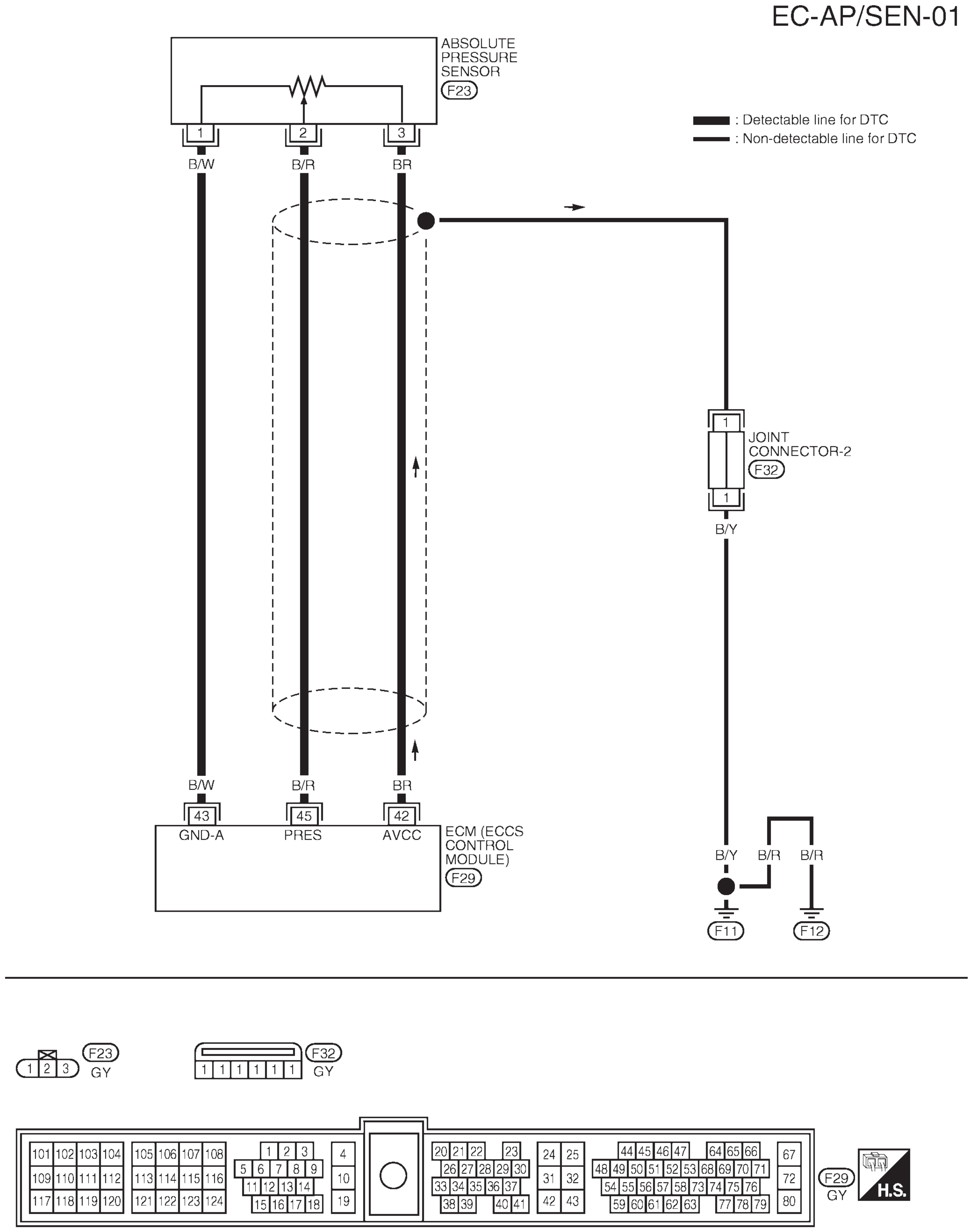
OR



SEF128V

1) Turn ignition switch "ON".
2) Make sure that the voltage between ECM terminal ㊺ and ground is more than 1.74 [V].
3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-117.

Absolute Pressure Sensor (Cont'd)



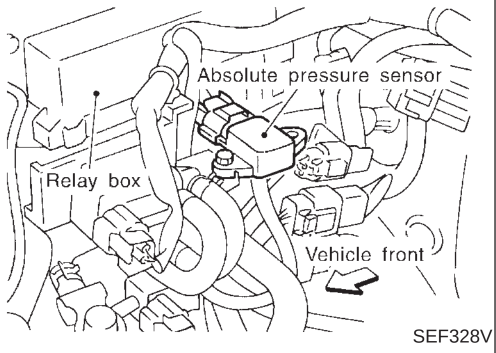
AEC520A

Absolute Pressure Sensor (Cont'd)

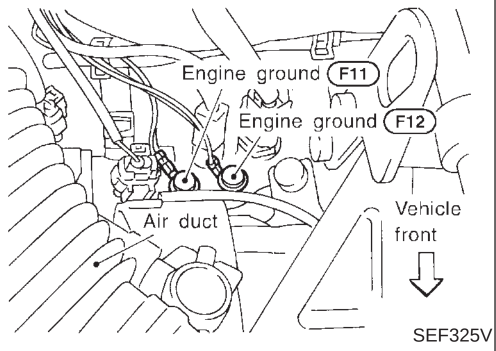
DIAGNOSTIC PROCEDURE

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

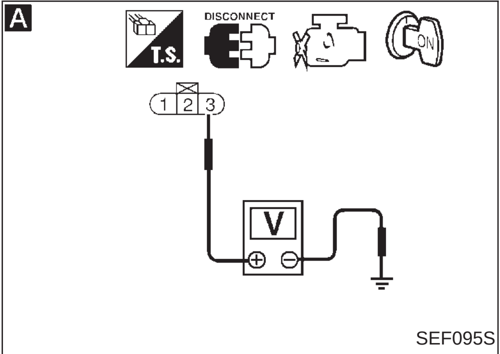
Procedure A



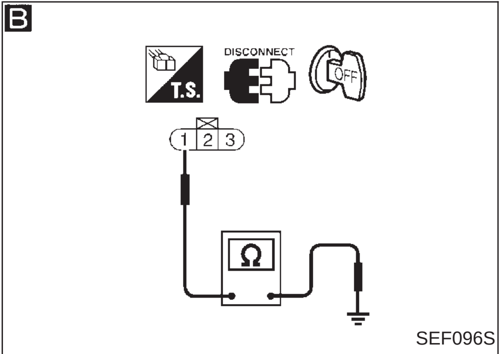
SEF328V



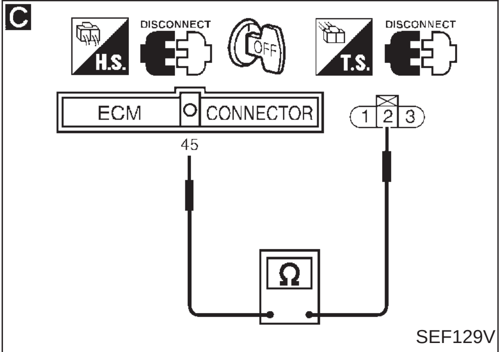
SEF325V



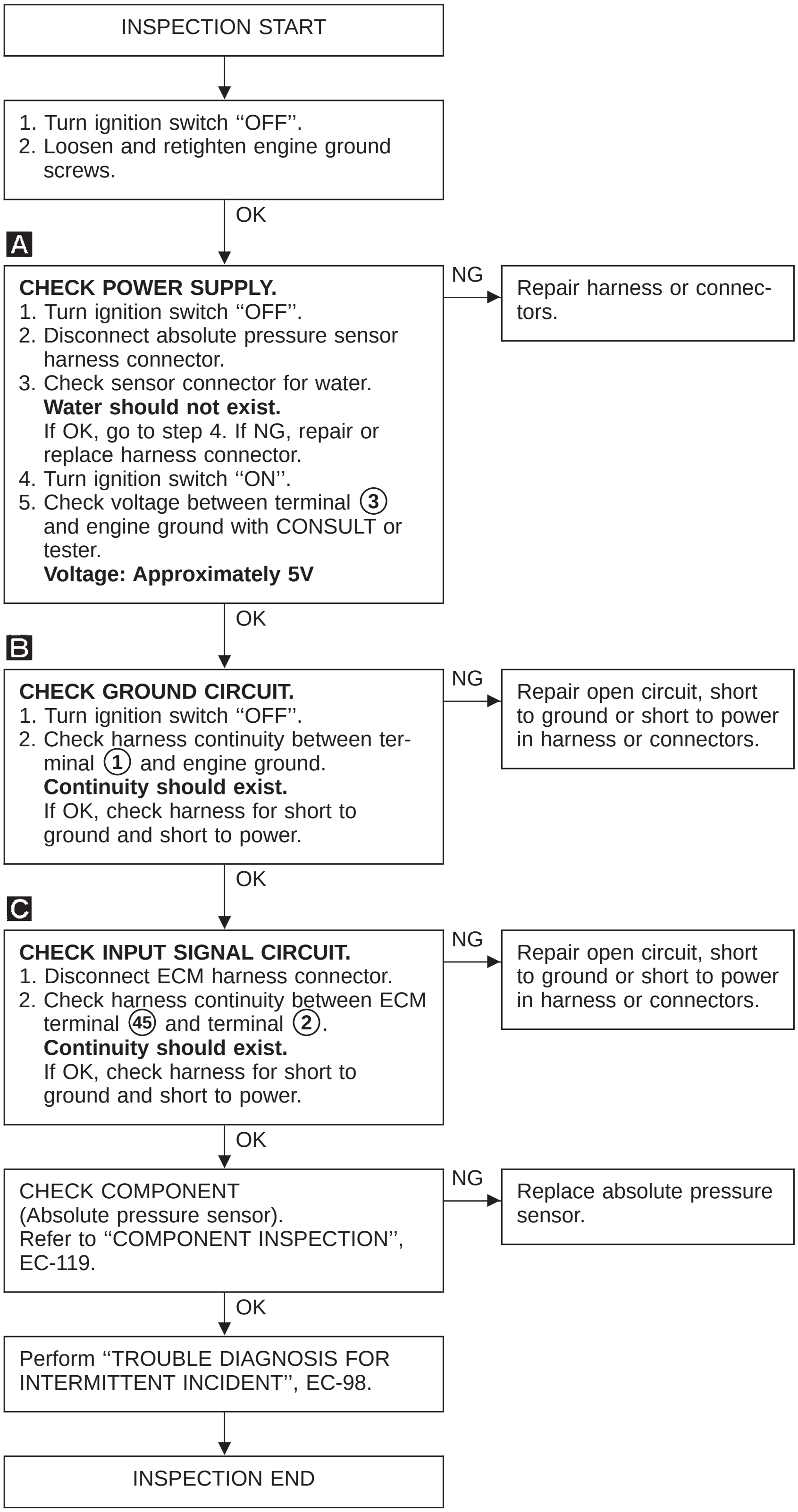
SEF095S



SEF096S



SEF129V



INSPECTION START

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

OK

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF''.
2. Disconnect absolute pressure sensor harness connector.
3. Check sensor connector for water.
   Water should not exist.
   If OK, go to step 4. If NG, repair or replace harness connector.
4. Turn ignition switch "ON''.
5. Check voltage between terminal ③ and engine ground with CONSULT or tester.
   Voltage: Approximately 5V

NG → Repair harness or connectors.

OK

B

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

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

OK

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊺ and terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

CHECK COMPONENT
(Absolute pressure sensor).
Refer to "COMPONENT INSPECTION'', EC-119.

NG → Replace absolute pressure sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

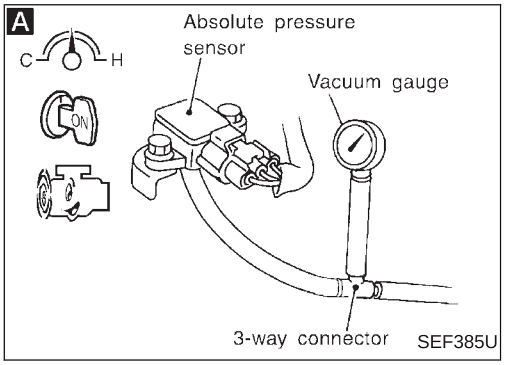
INSPECTION END

Absolute Pressure Sensor (Cont’d)

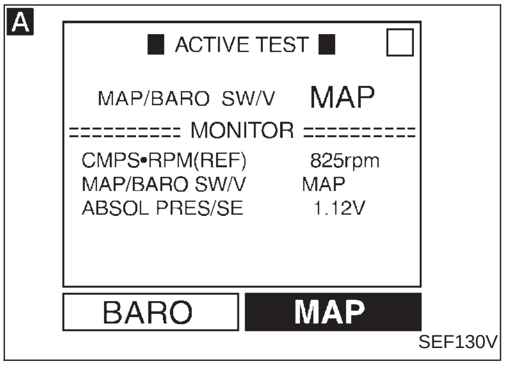
Procedure B

INSPECTION START

A



SEF385U



A

■ ACTIVE TEST ■ ☐

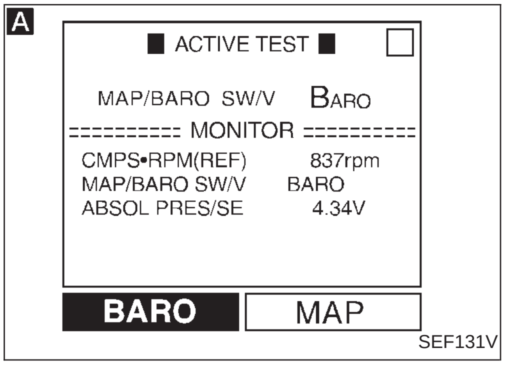
MAP/BARO SW/V MAP

========== MONITOR ==========

CMPS•RPM(REF) 825rpm
MAP/BARO SW/V MAP
ABSOL PRES/SE 1.12V

BARO | MAP

SEF130V



A

■ ACTIVE TEST ■ ☐

MAP/BARO SW/V BARO

========== MONITOR ==========

CMPS•RPM(REF) 837rpm
MAP/BARO SW/V BARO
ABSOL PRES/SE 4.34V

BARO | MAP

SEF131V

CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR.

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

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

OR

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

NG

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

OK

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

OK

CHECK COMPONENT
(MAP/BARO switch solenoid valve).
Refer to “COMPONENT INSPECTION” of “TROUBLE DIAGNOSIS FOR DTC P1105”, EC-330.

NG

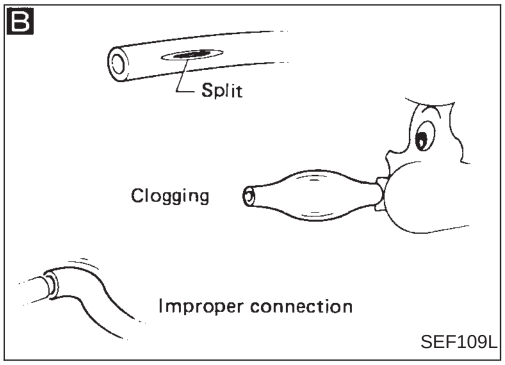
Replace MAP/BARO switch solenoid valve.

OK

CHECK INTAKE SYSTEM.
Check intake system for air leaks.

OK

B



SEF109L

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

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

NG

Repair or reconnect hose.

OK

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

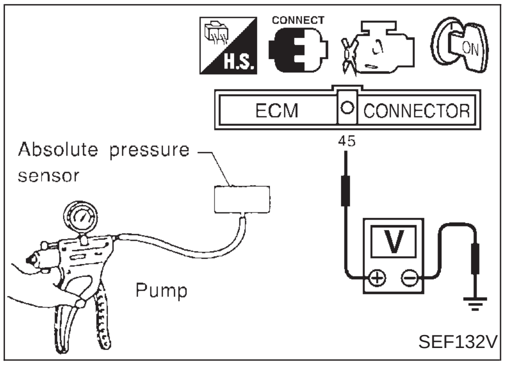
NG

Replace absolute pressure sensor.

OK

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT”, EC-98.

INSPECTION END



Absolute Pressure Sensor (Cont'd)

COMPONENT INSPECTION

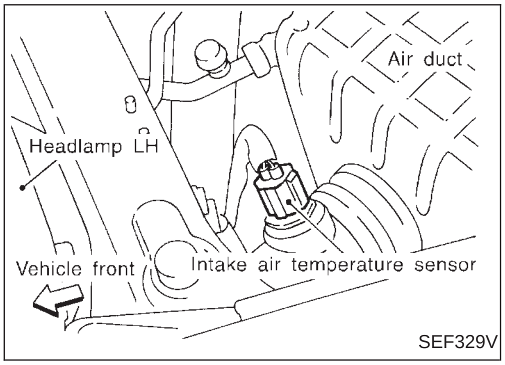
Absolute pressure sensor

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

CAUTION:

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

5. If NG, replace absolute pressure sensor.

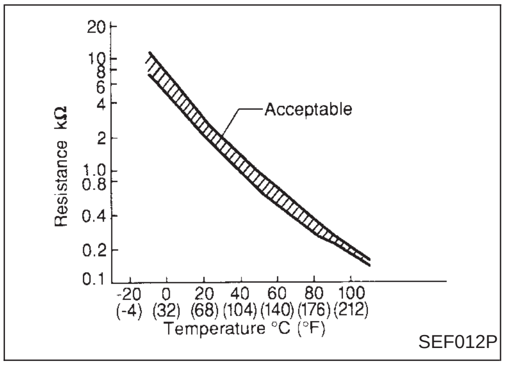


Intake Air Temperature Sensor

COMPONENT DESCRIPTION

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

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



<Reference data>

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

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

ON BOARD DIAGNOSIS LOGIC

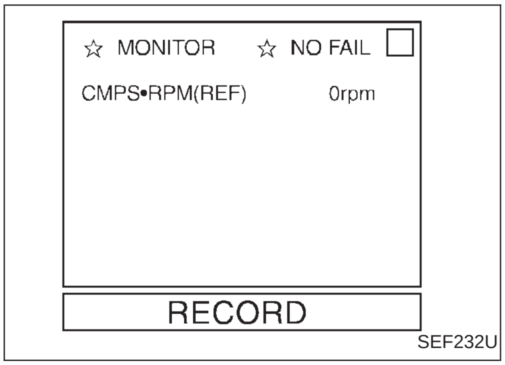
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0110 0401	A) An excessively low or high voltage from the sensor is sent to ECM. .... B) Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

NOTE:

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



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

RECORD

SEF232U

Procedure for malfunction A

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-124.

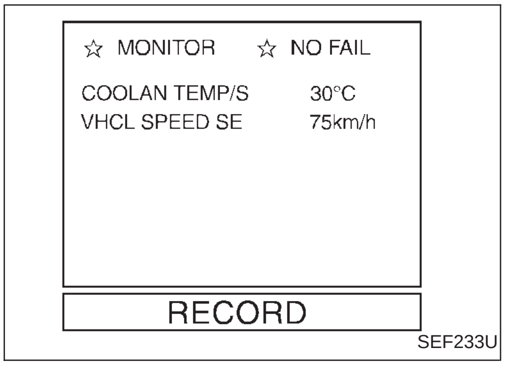
OR

1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select MODE 7 with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-124.

Intake Air Temperature Sensor (Cont'd)

OR

1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-124.



```
☆ MONITOR     ☆ NO FAIL

COOLAN TEMP/S     30°C
VHCL SPEED SE     75km/h

        RECORD
```

SEF233U

Procedure for malfunction B

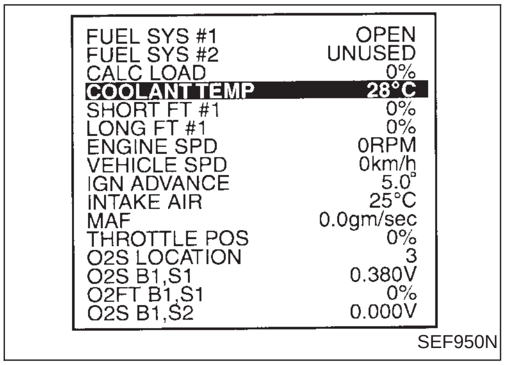
CAUTION:

Always drive vehicle at a safe speed.

TESTING CONDITION:

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

1) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Select "DATA MONITOR" mode with CONSULT.
   (c) Check the engine coolant temperature.
   (d) If the engine coolant temperature is above 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
2) Turn ignition switch "ON".
3) Select "DATA MONITOR" mode with CONSULT.
4) Start engine.
5) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-124.



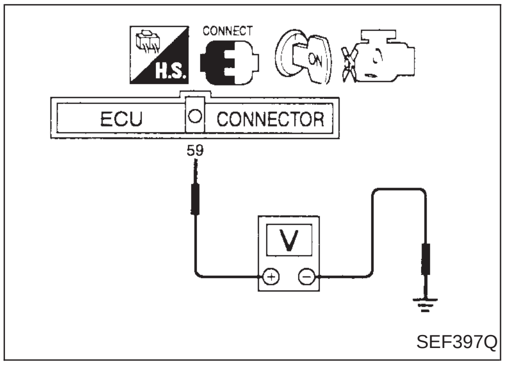
```
FUEL SYS #1             OPEN
FUEL SYS #2           UNUSED
CALC LOAD                 0%
COOLANT TEMP            28°C
SHORT FT #1               0%
LONG FT #1                0%
ENGINE SPD              0RPM
VEHICLE SPD           0km/h
IGN ADVANCE              5.0°
INTAKE AIR              25°C
MAF   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

SEF950N

OR

1) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Select MODE 1 with GST.
   (c) Check the engine coolant temperature.
   (d) If the engine coolant temperature is above 90°C (194°F), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before engine coolant temperature is above 90°C (194°F).
2) Start engine.
3) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
4) Select MODE 7 with GST.
5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-124.

Intake Air Temperature Sensor (Cont'd)



SEF397Q

OR

NO TOOLS

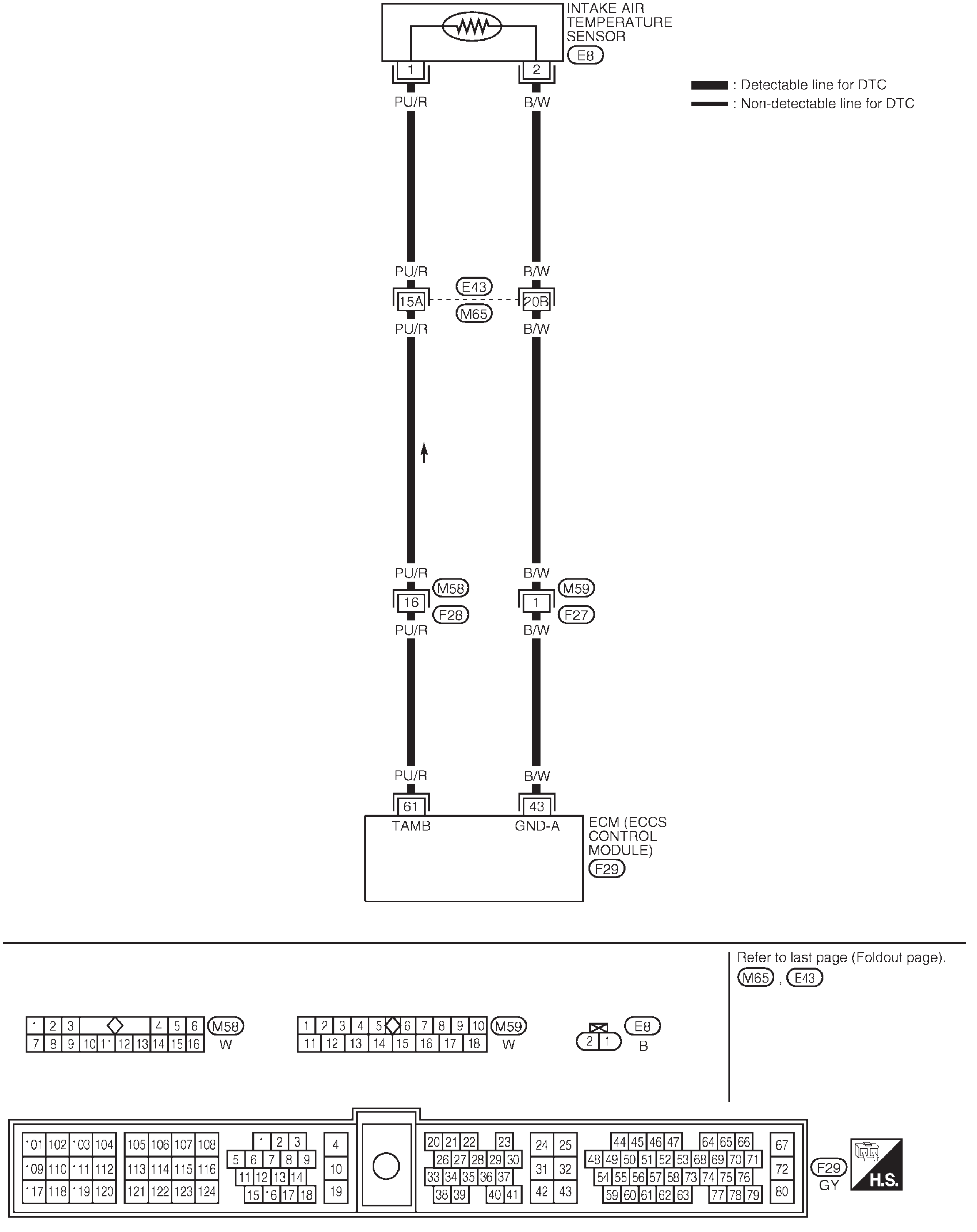
1) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch ''ON''.
   (b) Check voltage between ECM terminal ㊾ and ground.
   Voltage: More than 1.0 (V)
   (c) If the voltage is below 1.0 (V), turn ignition switch ''OFF'' and cool down engine.

- Perform the following steps before the voltage is below 1.0V.

2) Start engine.
3) Hold vehicle speed more than 70 km/h (43 MPH) for 100 consecutive seconds.
4) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
5) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
6) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-124.

Intake Air Temperature Sensor (Cont'd)

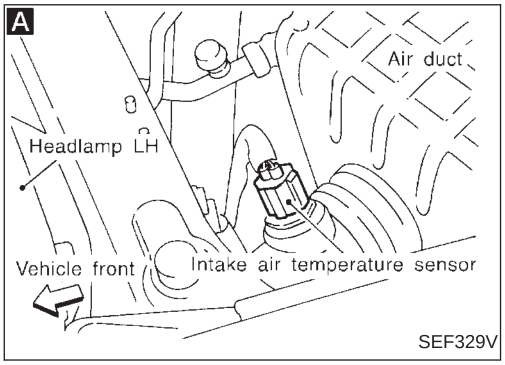
EC-IATS-01

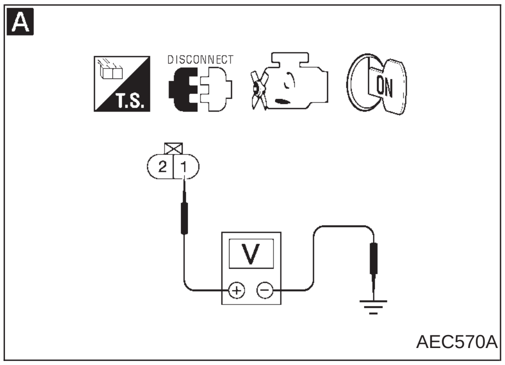


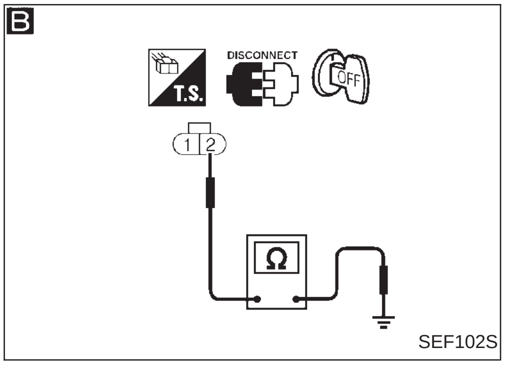
AEC521A

Intake Air Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK POWER SUPPLY.

1. Turn ignition switch ''OFF''.
2. Disconnect intake air temperature sensor harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ① and ground.
   Voltage:
   Approximately 5V

NG → Repair harness or connectors.

↓ OK

B

CHECK GROUND CIRCUIT.

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

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

↓ OK

CHECK COMPONENT
(Intake air temperature sensor).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace intake air temperature sensor.

↓ OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

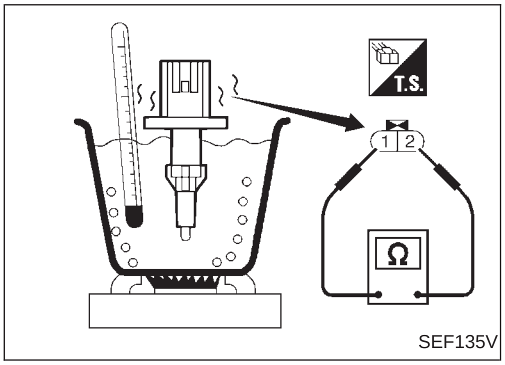
INSPECTION END

Intake Air Temperature Sensor (Cont'd)

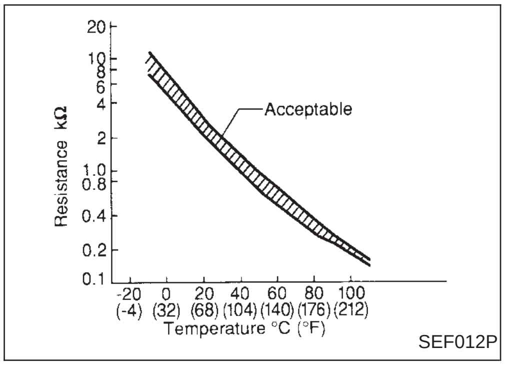
COMPONENT INSPECTION

Intake air temperature sensor

Check resistance as shown in the figure.



SEF135V

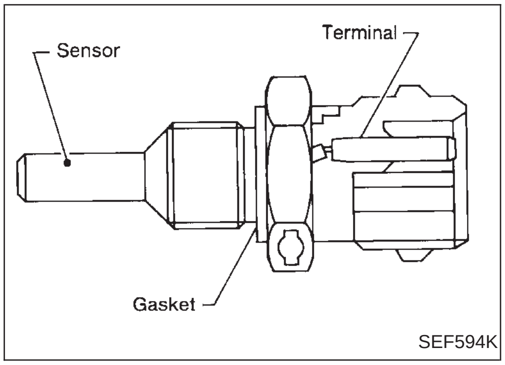


SEF012P

<Reference data>

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

If NG, replace intake air temperature sensor.

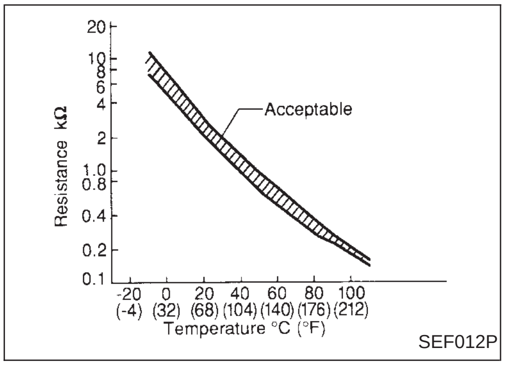


SEF594K

Engine Coolant Temperature Sensor (ECTS) (Circuit)

COMPONENT DESCRIPTION

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



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 (59) (Engine coolant temperature sensor) and ECM terminal (32) (ECM ground).

ON BOARD DIAGNOSIS LOGIC

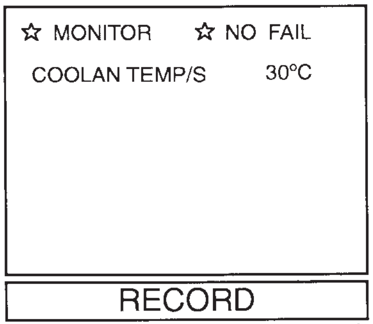
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0103	● An excessively high or low voltage from the sensor is sent to ECM.*	● Harness or connectors (The sensor circuit is open or shorted.) ● Engine coolant temperature sensor

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

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

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

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



☆ MONITOR ☆ NO FAIL

COOLAN TEMP/S 30°C

RECORD

SEF002P

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

OR

GST

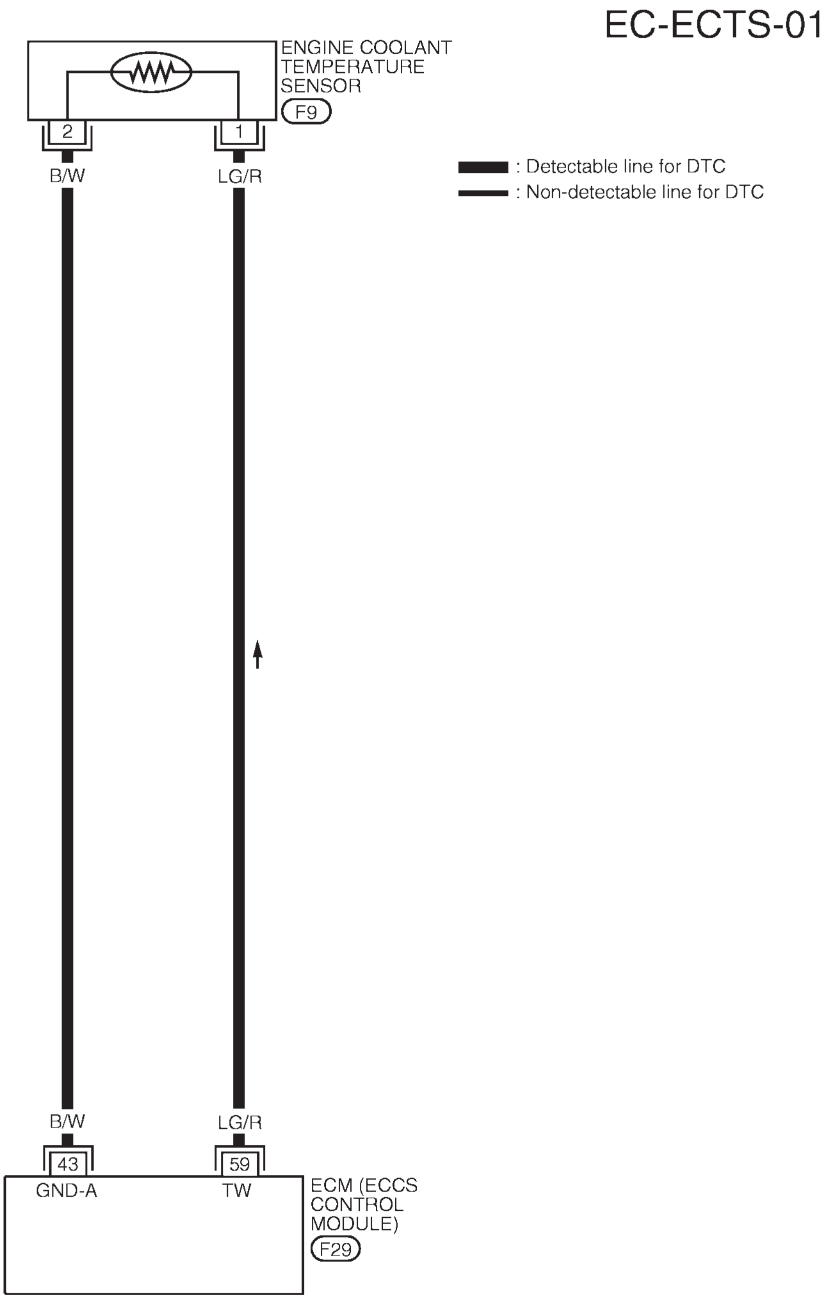
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 7" with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

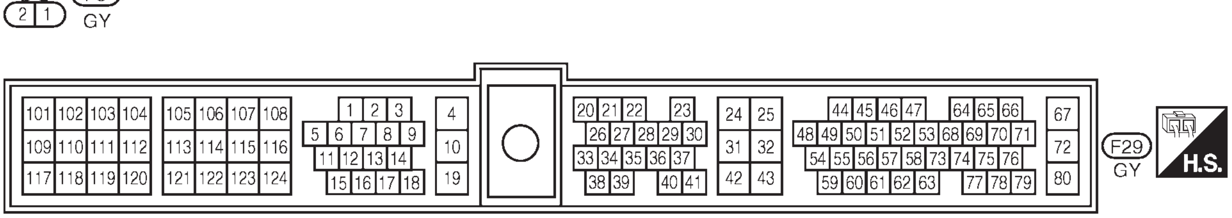
OR

NO TOOLS

1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-129.

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

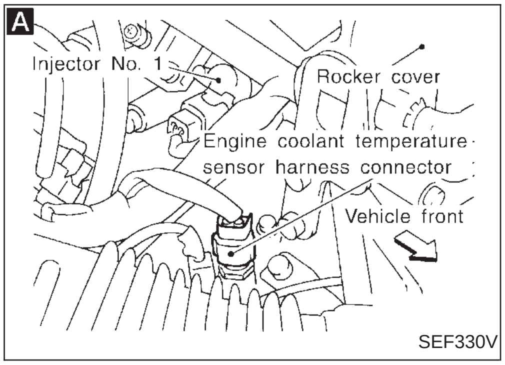




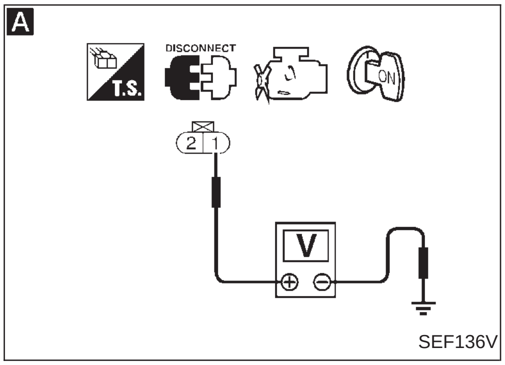
AEC522A

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

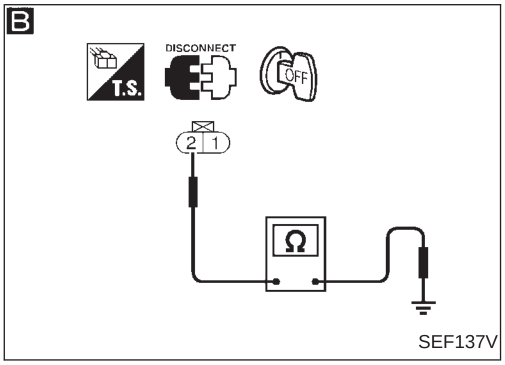
DIAGNOSTIC PROCEDURE



SEF330V



SEF136V



SEF137V

INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch ''OFF''.
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage:
   Approximately 5V

NG → Repair harness or connectors.

OK

B

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

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

OK

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace engine coolant temperature sensor.

OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

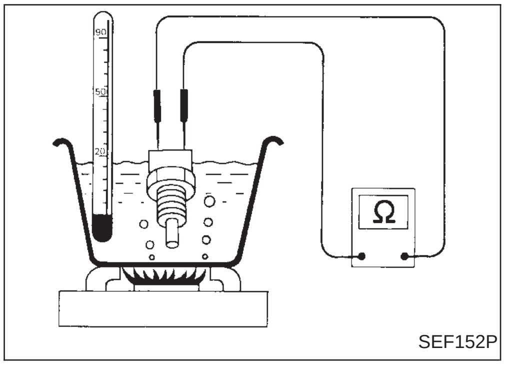
INSPECTION END

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

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

COMPONENT INSPECTION

Engine coolant temperature sensor



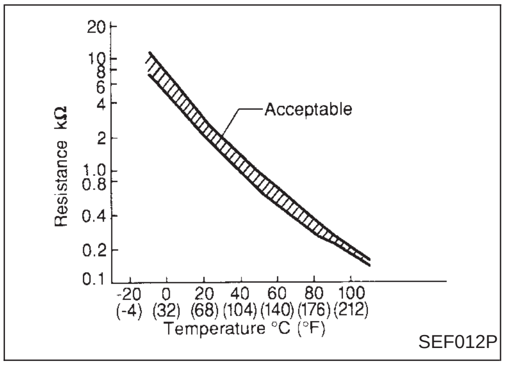
SEF152P

Check resistance as shown in the figure.

<Reference data>

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

If NG, replace engine coolant temperature sensor.



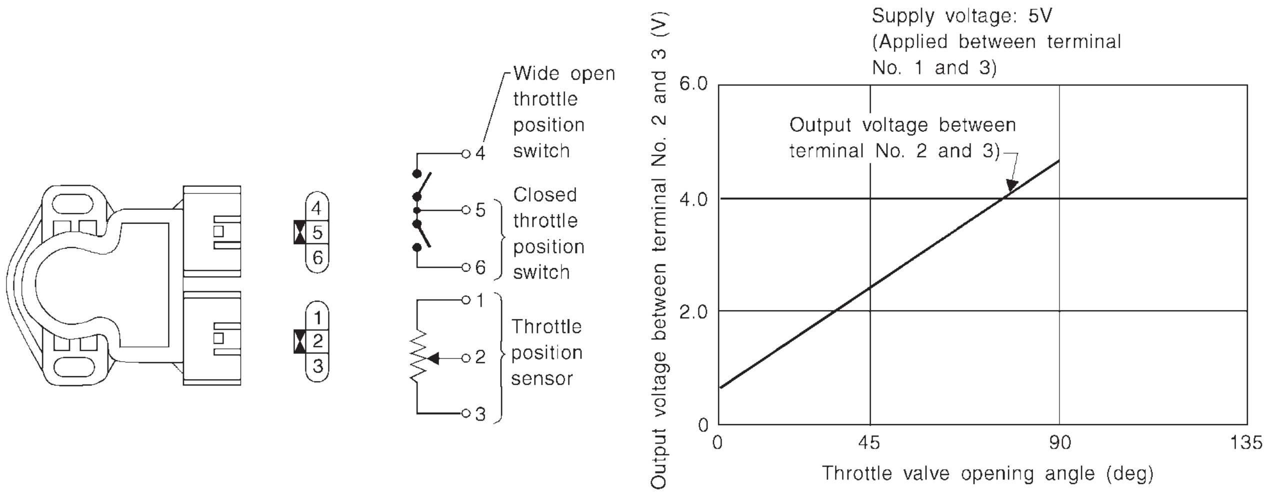
SEF012P

Throttle Position Sensor

Note: If DTC P0510 (0203) is displayed with P0120 (0403), perform TROUBLE DIAGNOSIS FOR DTC P0510 first. (See EC-314.)

COMPONENT DESCRIPTION

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



SEF105S

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Ignition switch: ON (Engine stopped) ● Engine: After warming up	Throttle valve: fully closed	0.2 - 0.8V
		Throttle valve: fully opened	3.5 - 4.5V
ABSOL TH·P/S	● Ignition switch: ON (Engine stopped) ● Engine: After warming up	Throttle valve: fully closed	0.0%
		Throttle valve: fully opened	Approx. 80%

TROUBLE DIAGNOSIS FOR DTC P0120

Throttle Position Sensor (Cont’d)

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
23	L	Throttle position sensor	Ignition switch “ON” (Warm-up condition) └ Accelerator pedal fully released	0.2 - 0.8V
			Ignition switch “ON” └ Accelerator pedal fully depressed	3.5 - 4.5V
42	BR	Sensors’ power supply	Ignition switch “ON”	Approximately 5V
43	B/W	Sensors’ ground	Engine is running. └ Idle speed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	A) An excessively low or high voltage from the sensor is sent to ECM.*	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor
	B) A high voltage from the sensor is sent to ECM under light load driving condition.	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Throttle position sensor ● Fuel injector ● Camshaft position sensor ● Mass air flow sensor
	C) A low voltage from the sensor is sent to ECM under heavy load driving condition.	● Harness or connectors (The throttle position sensor circuit is open or shorted.) ● Intake air leaks ● Throttle position sensor

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

Detected items	Engine operating condition in fail-safe mode
Throttle position sensor circuit	Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.

Condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

Throttle Position Sensor (Cont’d)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

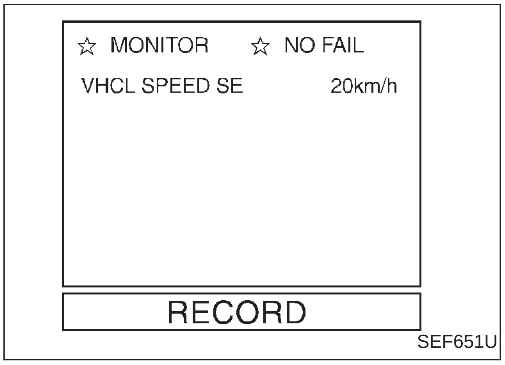
NOTE:
If “DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE” has been previously conducted, always turn ignition switch “OFF” and wait at least 5 seconds before conducting the next test.

Procedure for malfunction A

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.**



☆ MONITOR ☆ NO FAIL

VHCL SPEED SE 20km/h

SEF651U

1) Turn ignition switch “ON” and select “DATA MONITOR” mode with CONSULT.
2) Start engine and maintain the following conditions for at least 5 consecutive seconds.
   VHCL SPEED SE: More than 4 km/h (2 MPH)
   Selector lever: Suitable position except “P” or “N” position
3) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-138.

OR

GST

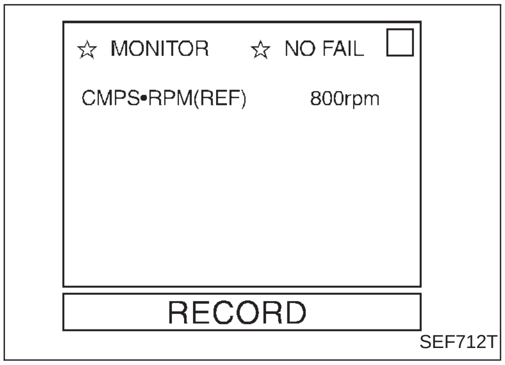
1) Start engine and maintain the following conditions for at least 5 consecutive seconds.
   Vehicle speed: More than 4 km/h (2 MPH)
   Selector lever: Suitable position except “P” or “N” position
2) Select “MODE 7” with GST.
3) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-138.

OR

NO TOOLS

1) Start engine and maintain the following conditions for at least 5 consecutive seconds.
   Vehicle speed: More than 4 km/h (2 MPH)
   Selector lever: Suitable position except “P” or “N” position
2) Turn ignition switch “OFF” and wait at least 5 seconds.
3) Turn ignition switch “ON” and perform “Diagnostic Test Mode II (Self-diagnostic results)” with ECM.
4) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-138.

Throttle Position Sensor (Cont'd)



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

SEF712T

Procedure for malfunction B

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT.
3) Start engine and let it idle for at least 10 seconds.
   If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.
   A/T model
   Selector lever: Suitable position except ''P'' or ''N''
   Brake pedal: Depressed
   Vehicle speed: 0 km/h (0 MPH)
   M/T model
   Selector lever: Suitable position except ''N''
   (Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)
   Accelerator pedal: Released
   Vehicle speed: As slow as possible
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-138.

OR

1) Start engine and let it idle for at least 10 seconds.
   If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.
   A/T model
   Selector lever: Suitable position except ''P'' or ''N''
   Brake pedal: Depressed
   Vehicle speed: 0 km/h (0 MPH)
   M/T model
   Selector lever: Suitable position except ''N''
   (Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)
   Accelerator pedal: Released
   Vehicle speed: As slow as possible
2) Select ''MODE 7'' with GST.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-138.

OR

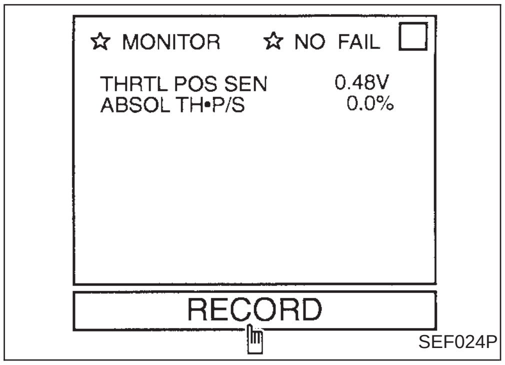
1) Start engine and let it idle for at least 10 seconds.
   If idle speed is over 1,100 rpm, maintain the following conditions for at least 10 seconds to keep engine speed below 1,100 rpm.
   A/T model
   Selector lever: Suitable position except ''P'' or ''N''
   Brake pedal: Depressed
   Vehicle speed: 0 km/h (0 MPH)
   M/T model
   Selector lever: Suitable position except ''N''
   (Higher gear position such as 3rd or 4th position is better to keep engine rpm low.)
   Accelerator pedal: Released
   Vehicle speed: As slow as possible
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Turn ignition switch ''ON'' and perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-138.

Throttle Position Sensor (Cont'd)

Procedure for malfunction C

CAUTION:

Always drive vehicle at a safe speed.

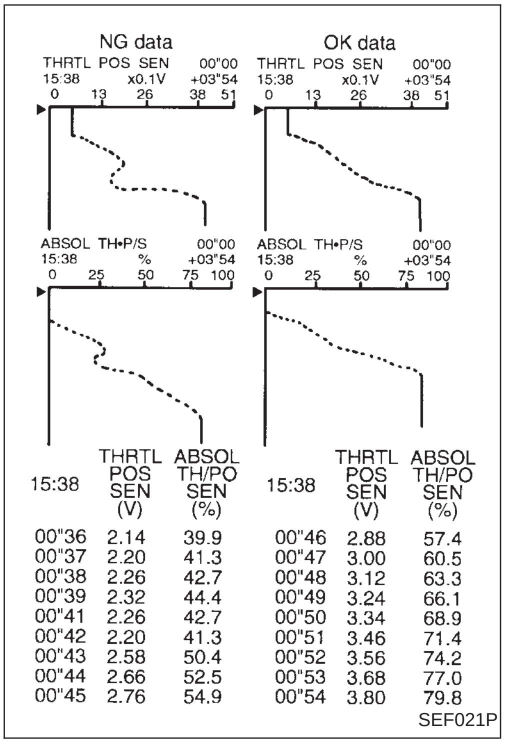

☆ MONITOR ☆ NO FAIL ☐

THRTL POS SEN 0.48V
ABSOL TH•P/S 0.0%

RECORD

SEF024P

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON".
4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
5) Select "THRTL POS SEN" and "ABSOL TH·P/S" in "DATA MONITOR" mode with CONSULT.
6) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.



15:38	THRTL POS SEN (V)	ABSOL TH/PO SEN (%)
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

15:38	THRTL POS SEN (V)	ABSOL TH/PO SEN (%)
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

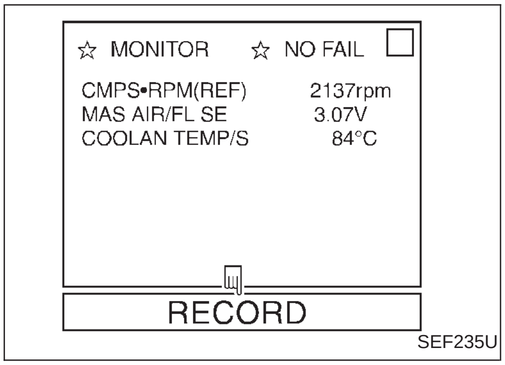
SEF021P

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-138.

  If OK, go to following step.

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


☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 2137rpm
MAS AIR/FL SE 3.07V
COOLAN TEMP/S 84°C

RECORD

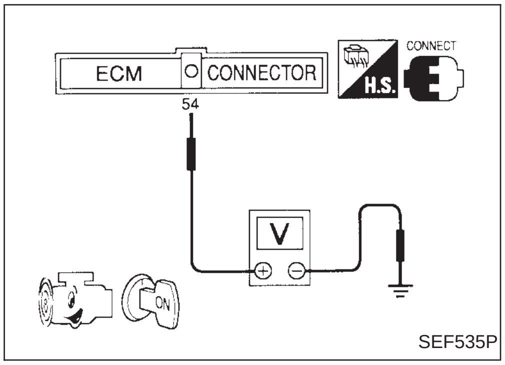
SEF235U

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

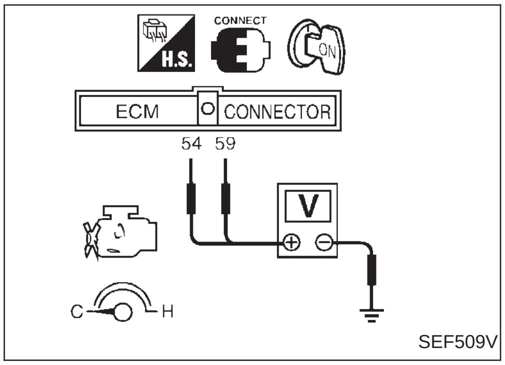
   CMPS·RPM (REF): More than 2,000 rpm
   MAS AIR/FL SE: More than 3V
   COOLAN TEMP/S: More than 70°C (158°F)
   Selector lever: Suitable position
   Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

10) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-138.

Throttle Position Sensor (Cont’d)



SEF535P



SEF509V

OR

GST

1) Maintain the following conditions for at least 10 consecutive seconds.
Gear position: Suitable position
Engine speed: More than 2,000 rpm
Engine coolant temperature: More than 70°C (158°F)
Voltage between ECM terminal (54) and ground:
More than 3V
2) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-138.

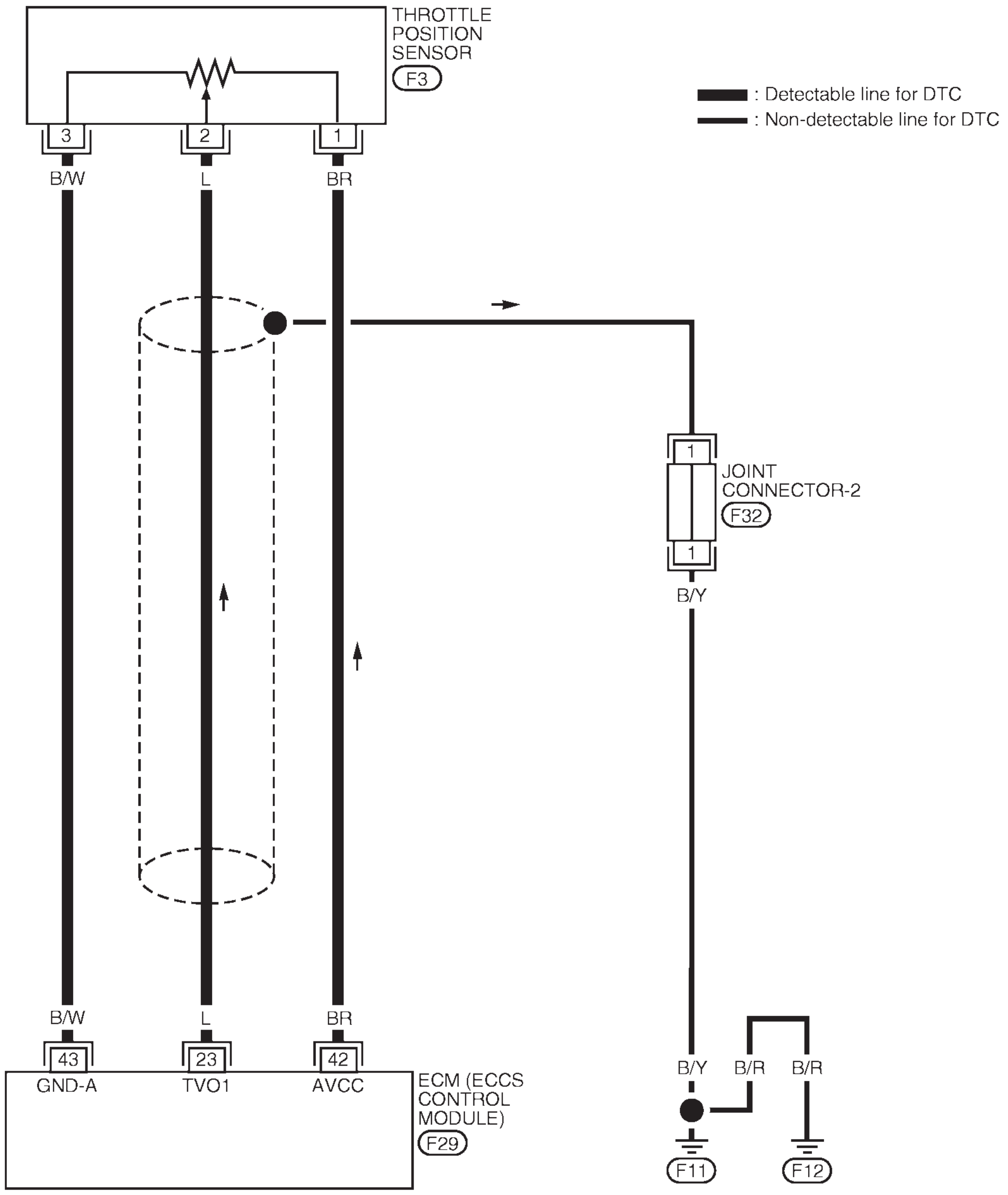
OR

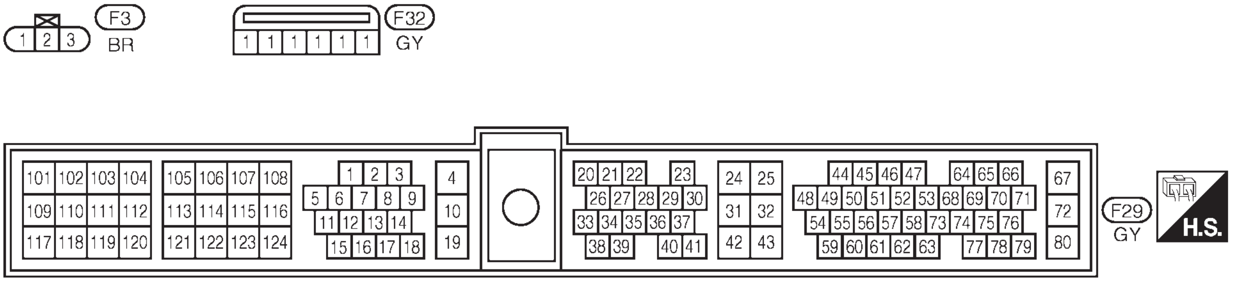
NO TOOLS

1) Maintain the following conditions for at least 10 consecutive seconds.
Gear position: Suitable position
Engine speed: More than 2,000 rpm
Voltage between ECM terminal (54) and ground:
More than 3V
Voltage between ECM terminal (59) and ground:
Less than 1.5V.
2) Stop the vehicle, turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
3) Perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
4) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE”, EC-138.

Throttle Position Sensor (Cont'd)

EC-TPS-01



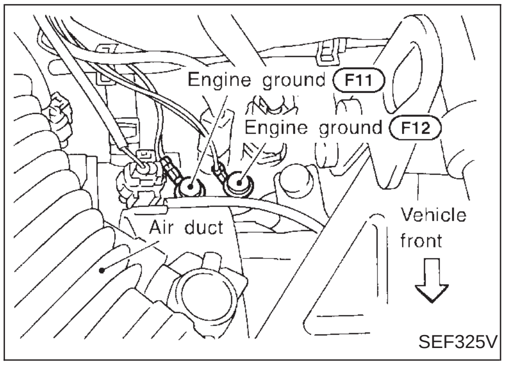


AEC523A

Throttle Position Sensor (Cont’d)

DIAGNOSTIC PROCEDURE

If the trouble is duplicated after “Procedure for malfunction A”, perform “Procedure A” below. If the trouble is duplicated after “Procedure for malfunction B”, perform “Procedure B” on EC-140. If the trouble is duplicated after “Procedure for malfunction C”, perform “Procedure C” on EC-142.



SEF325V

Procedure A

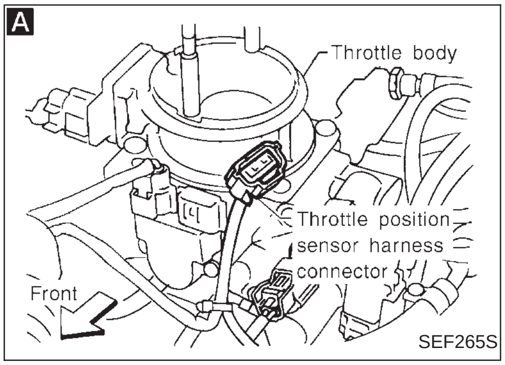
INSPECTION START

↓

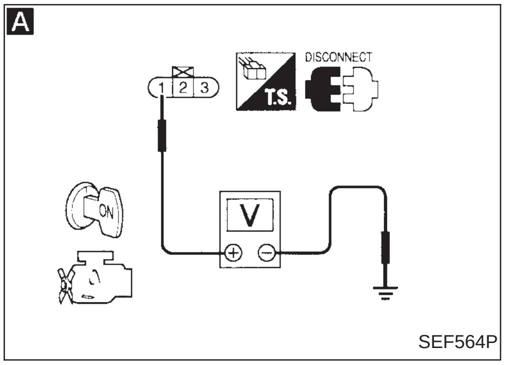
1. Turn ignition switch “OFF”.
2. Loosen and retighten engine ground screws.

↓

A



SEF265S



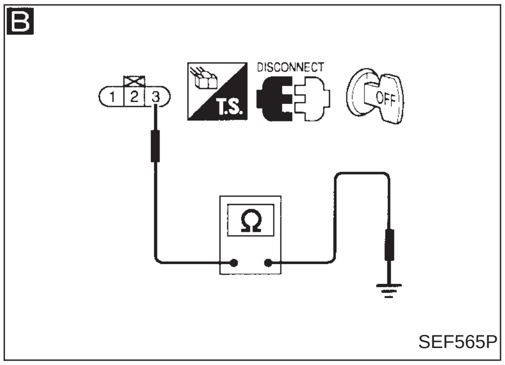
SEF564P

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

NG → Repair harness or connectors.

OK ↓

B



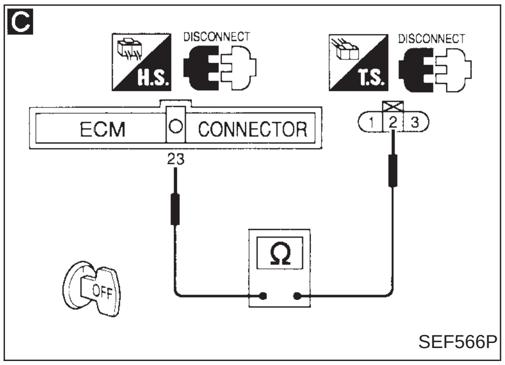
SEF565P

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

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

OK ↓

C



SEF566P

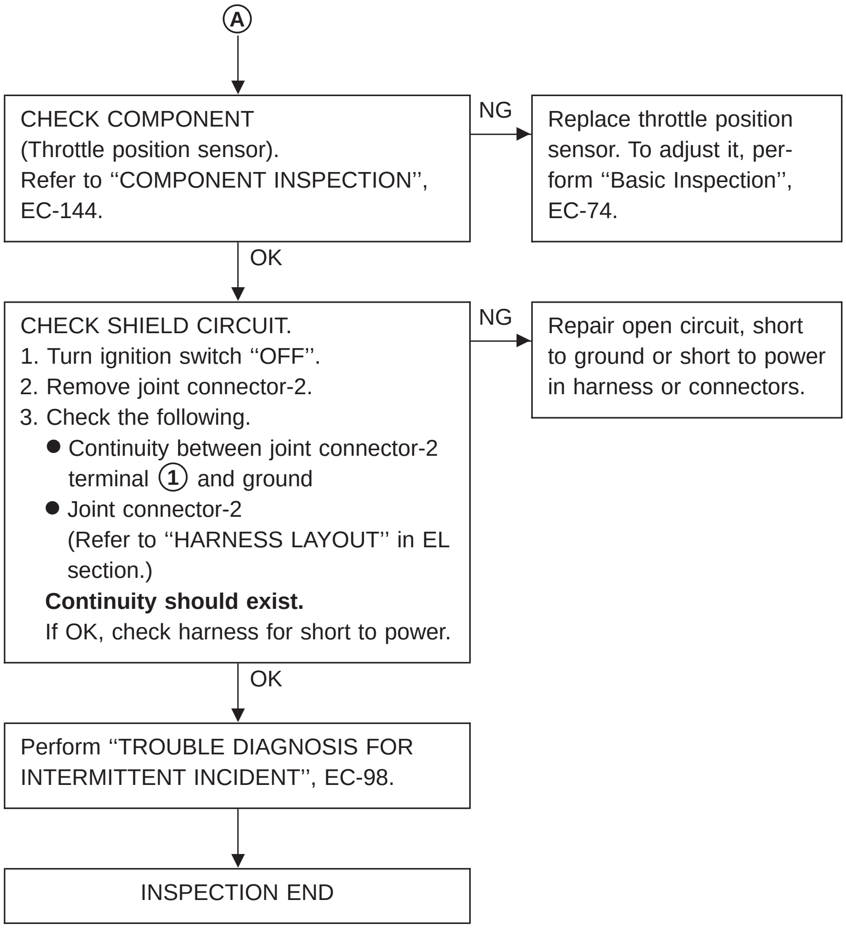
CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉓ and terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

Ⓐ

(Go to next page.)



CHECK COMPONENT
(Throttle position sensor).
Refer to ''COMPONENT INSPECTION'', EC-144.

Replace throttle position sensor. To adjust it, perform ''Basic Inspection'', EC-74.

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

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

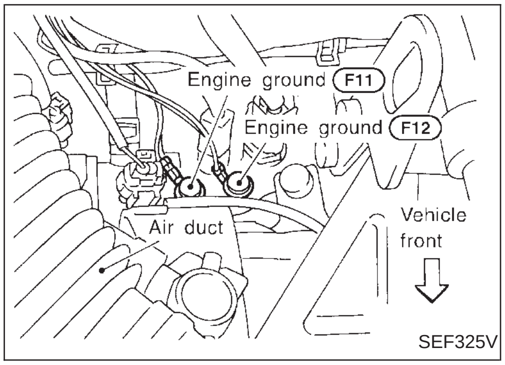
Repair open circuit, short to ground or short to power in harness or connectors.

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

INSPECTION END

Throttle Position Sensor (Cont'd)

Procedure B

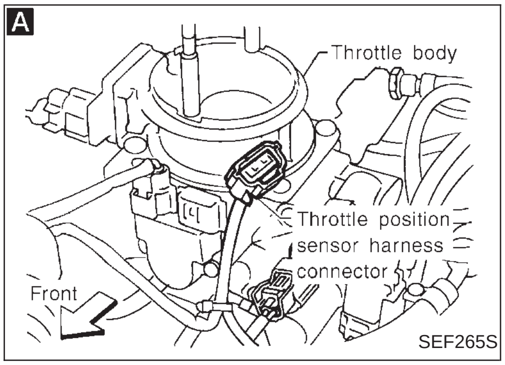


SEF325V

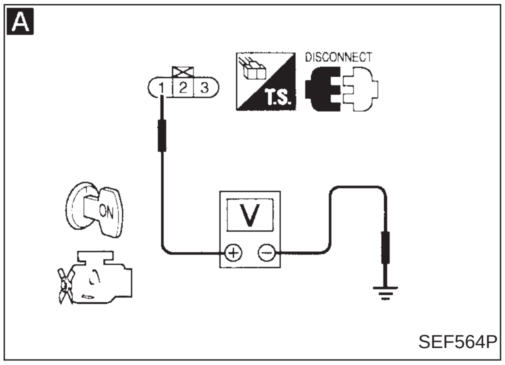
INSPECTION START

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

A



SEF265S



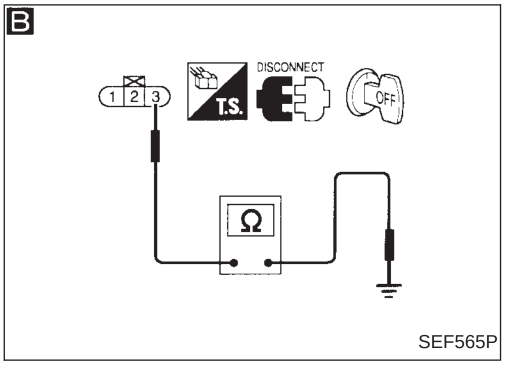
SEF564P

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

NG → Repair harness or connectors.

OK ↓

B



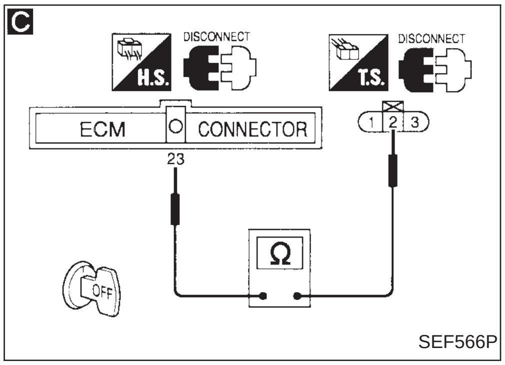
SEF565P

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

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

OK ↓

C



SEF566P

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

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

OK ↓

CHECK COMPONENT
(Throttle position sensor).
Refer to "COMPONENT INSPECTION", EC-144.

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-74.

OK ↓

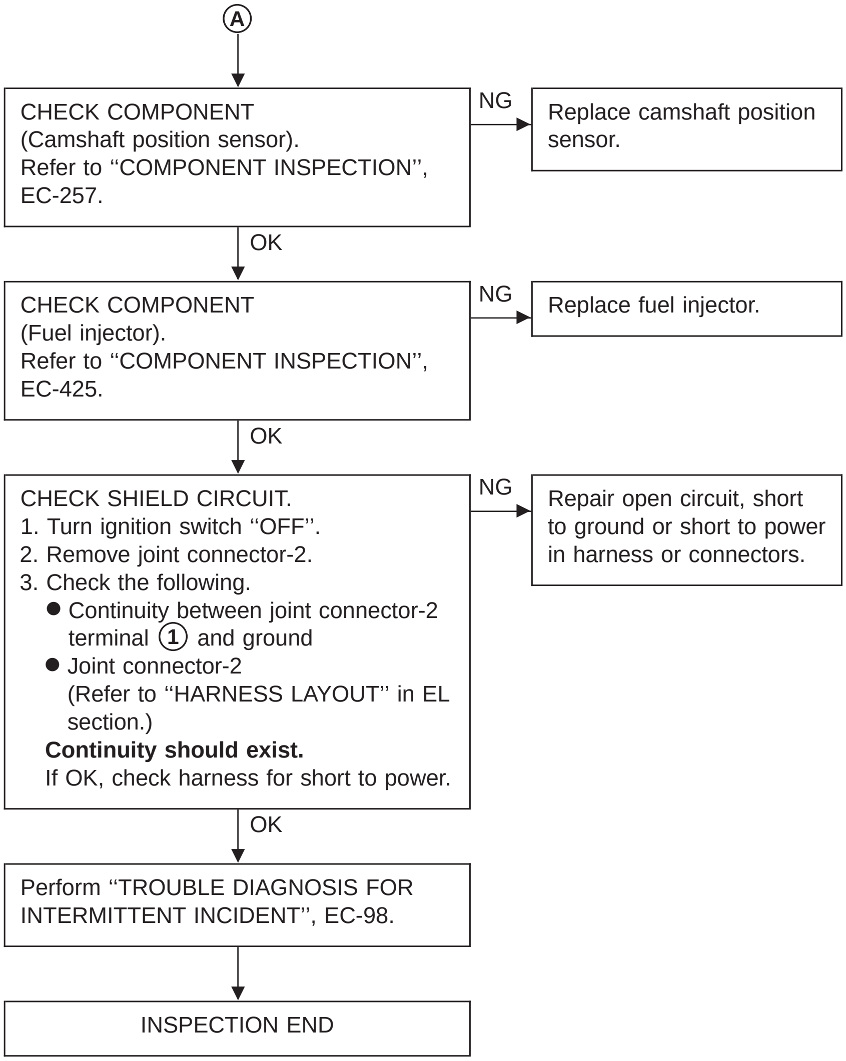
CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-112.

NG → Replace mass air flow sensor.

OK ↓

Ⓐ
(Go to next page.)

Throttle Position Sensor (Cont'd)



CHECK COMPONENT
(Camshaft position sensor).
Refer to "COMPONENT INSPECTION", EC-257.

Replace camshaft position sensor.

CHECK COMPONENT
(Fuel injector).
Refer to "COMPONENT INSPECTION", EC-425.

Replace fuel injector.

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

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

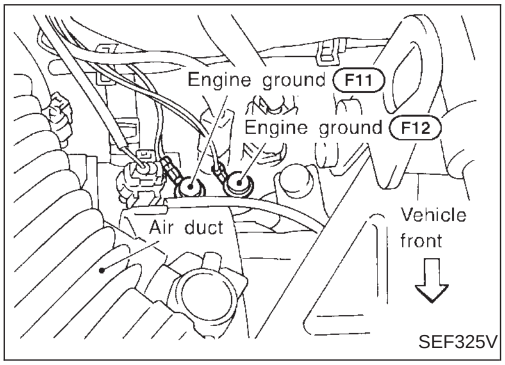
Repair open circuit, short to ground or short to power in harness or connectors.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END

Throttle Position Sensor (Cont'd)

Procedure C



SEF325V

INSPECTION START

↓

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-74.

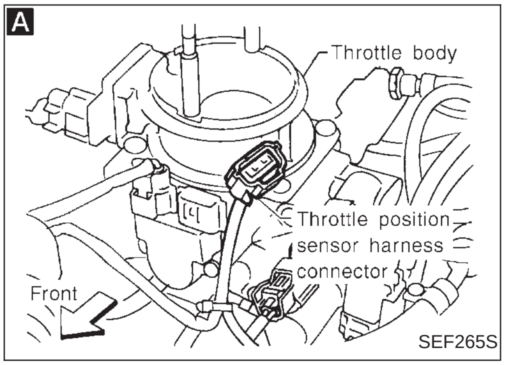
↓ OK

CHECK INTAKE SYSTEM.
Check the followings for connection.
- Air duct
- Air cleaner
- Vacuum hoses
- Intake air passage between air duct to collector

If disconnected, reconnect the parts.

NG → Reconnect the parts.

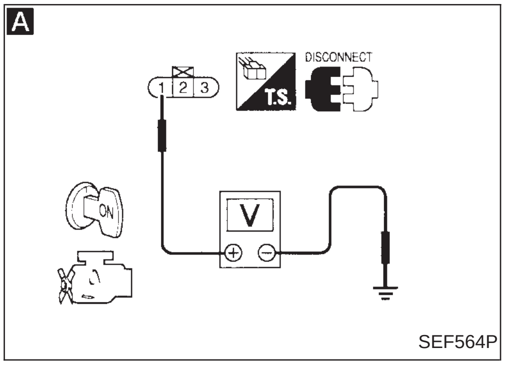
↓ OK



SEF265S

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

↓



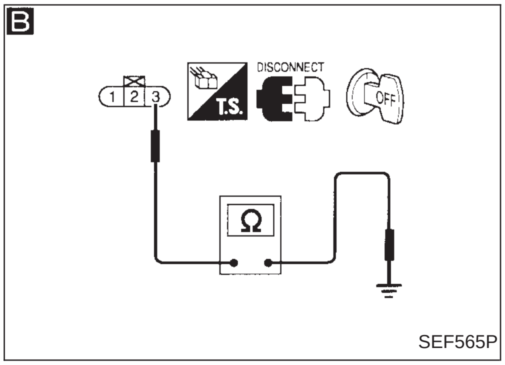
SEF564P

A

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

NG → Repair harness or connectors.

↓ OK



SEF565P

B

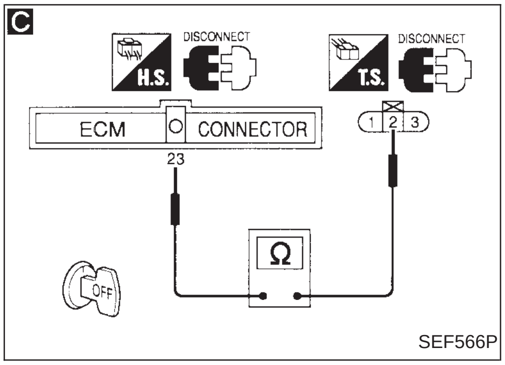
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ③ and engine ground.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

↓ OK

Ⓐ
(Go to next page.)

Throttle Position Sensor (Cont'd)



SEF566P

Ⓐ

C

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

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

OK ↓

CHECK COMPONENT
(Throttle position sensor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace throttle position sensor. To adjust it, perform "Basic Inspection", EC-74.

OK ↓

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

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

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

OK ↓

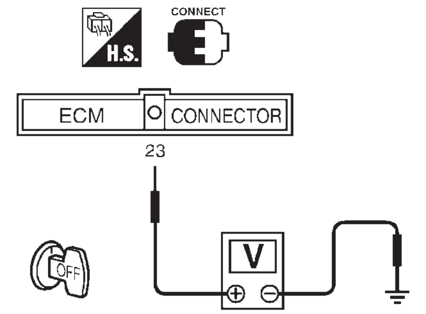
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

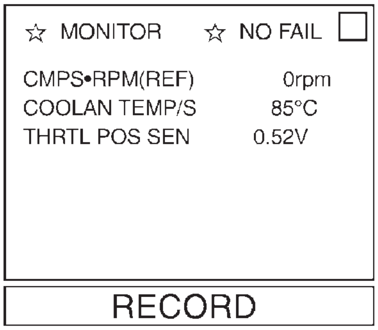
INSPECTION END

Throttle Position Sensor (Cont'd)

COMPONENT INSPECTION



SEF767W



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm
COOLAN TEMP/S 85°C
THRTL POS SEN 0.52V

RECORD

SEF765W

Throttle position sensor

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT.
4. Check voltage of "THRTL POS SEN".

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

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

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC- 74.

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

OR

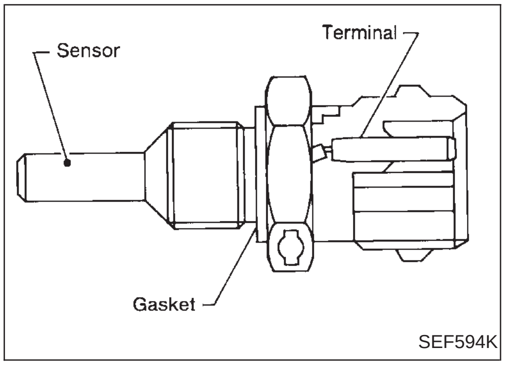
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch "ON".
3. Check voltage between ECM terminal ㉓ (Throttle position sensor signal) and ground.

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

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

If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-74.

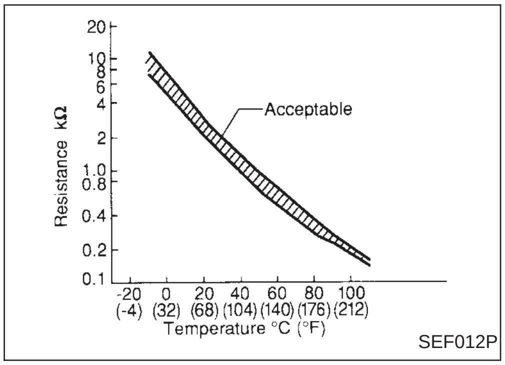
4. If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace throttle position sensor.



Engine Coolant Temperature (ECT) Sensor

COMPONENT DESCRIPTION

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



<Reference data>

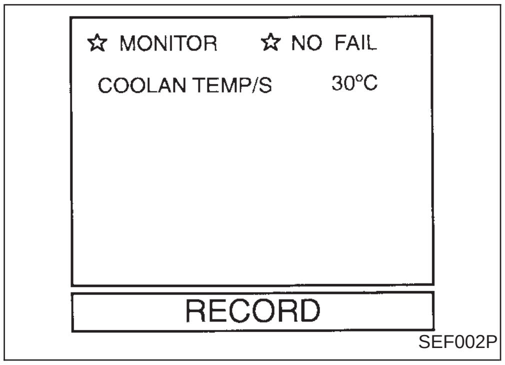
Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
−10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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

ON BOARD DIAGNOSIS LOGIC

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

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



☆ MONITOR ☆ NO FAIL

COOLAN TEMP/S 30°C

SEF002P

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Be careful not to overheat engine.

NOTE:

- **If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform "TROUBLE DIAGNOSIS FOR DTC P0115". Refer to EC-126.**
- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

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

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

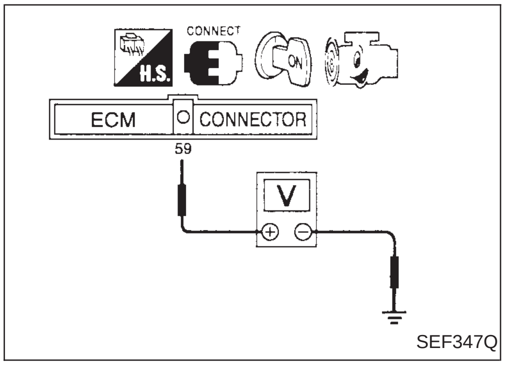
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.

OR

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

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

3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.



SEF347Q

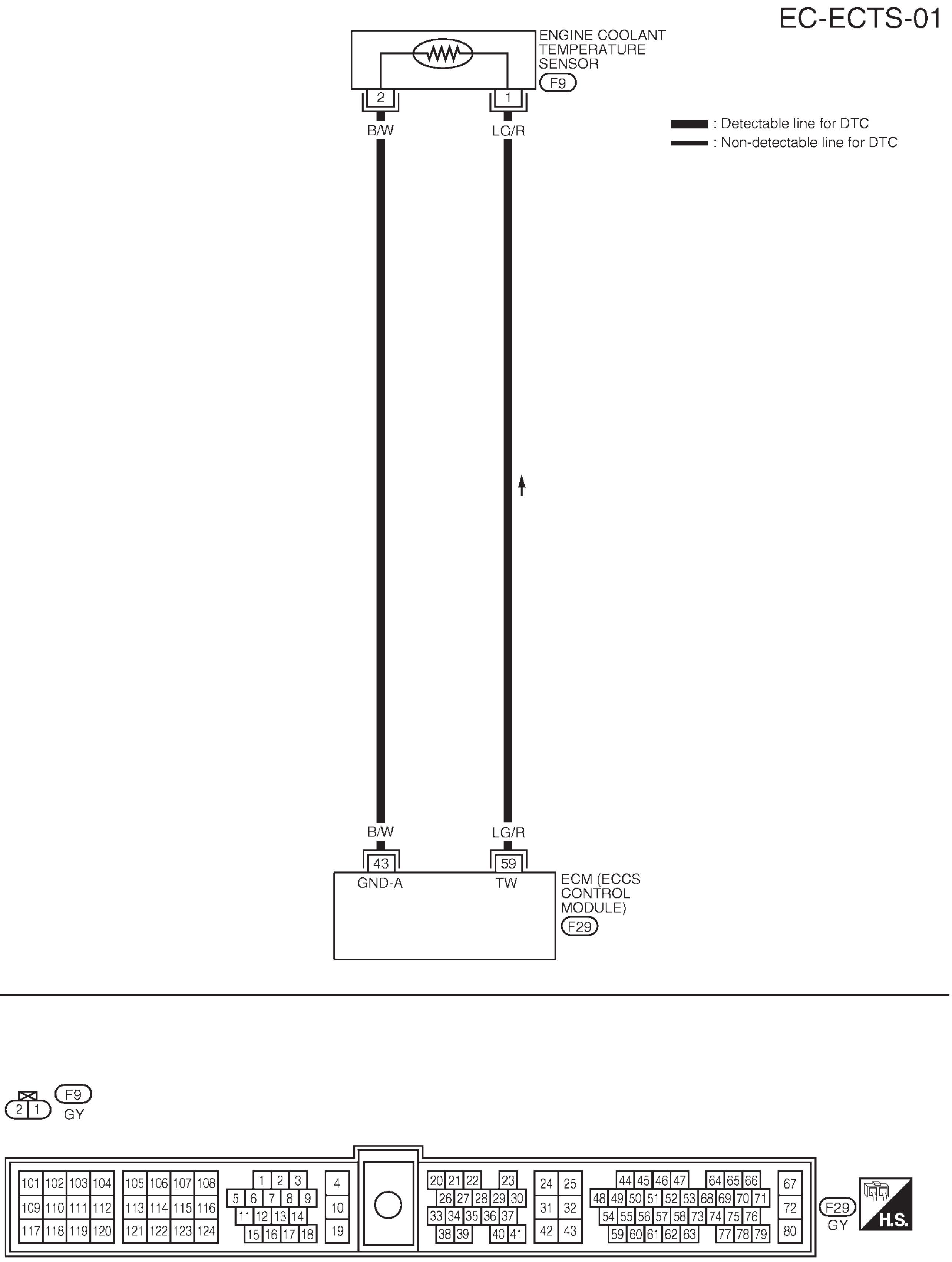
OR

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

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

4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-148.

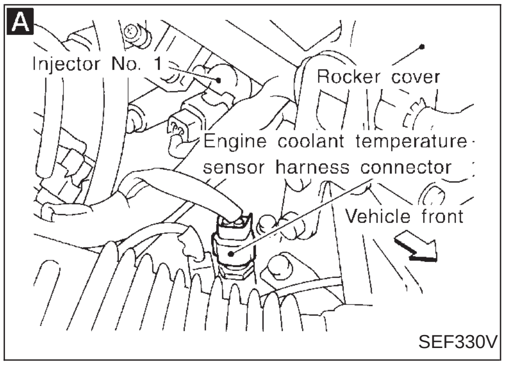
Engine Coolant Temperature (ECT) Sensor (Cont'd)

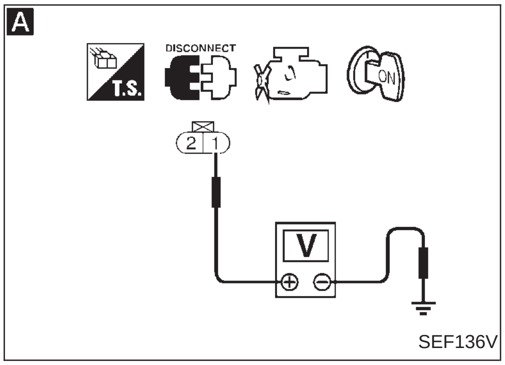


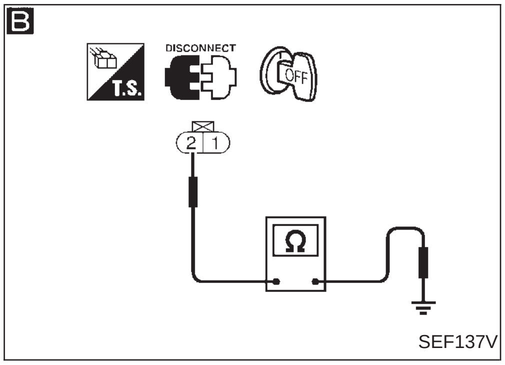
AEC522A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect engine coolant temperature sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage:
   Approximately 5V

NG → Repair harness or connectors.

OK ↓

B

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

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

OK ↓

CHECK COMPONENT
(Engine coolant temperature sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace engine coolant temperature sensor.

OK ↓

CHECK THERMOSTAT OPERATION.
When the engine is cooled [lower than 76.5°C (170°F)], hold lower radiator hose and confirm the engine coolant does not flow.

NG → CHECK COMPONENT
(Thermostat).
Refer to LC section ("Thermostat").
If NG, replace it.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

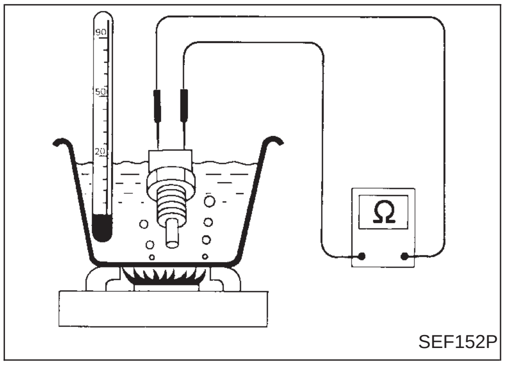
INSPECTION END

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

COMPONENT INSPECTION

Engine coolant temperature sensor

Check resistance as shown in the figure.

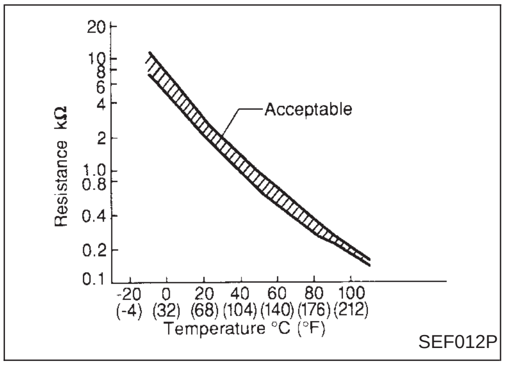


SEF152P

<Reference data>

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

If NG, replace engine coolant temperature sensor.

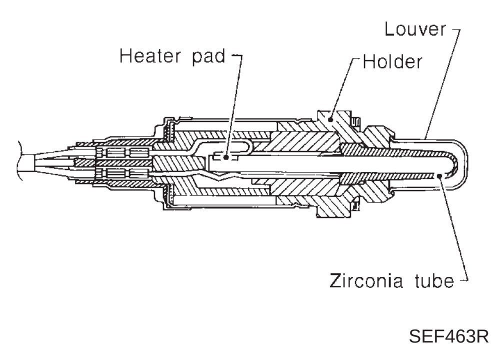


SEF012P

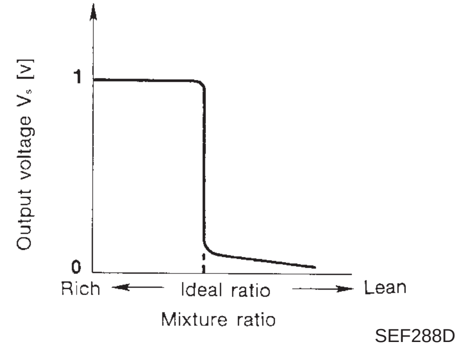
GI
MA
EM
LC
EC
FE
CL
MT
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX

Front Heated Oxygen Sensor (Circuit) (Front HO2S)

COMPONENT DESCRIPTION



SEF463R



SEF288D

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

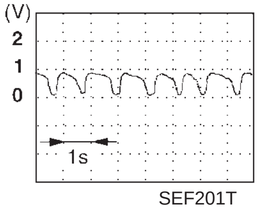
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

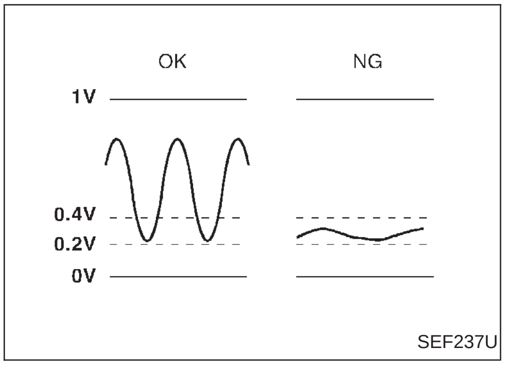
ECM TERMINALS AND REFERENCE VALUE

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

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

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

ON BOARD DIAGNOSIS LOGIC

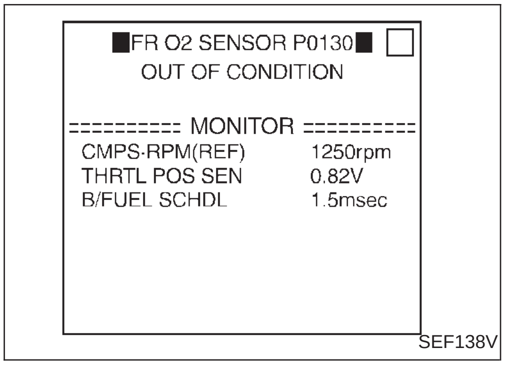


SEF237U

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0303	● The voltage from the sensor is constantly approx. 0.3V.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor

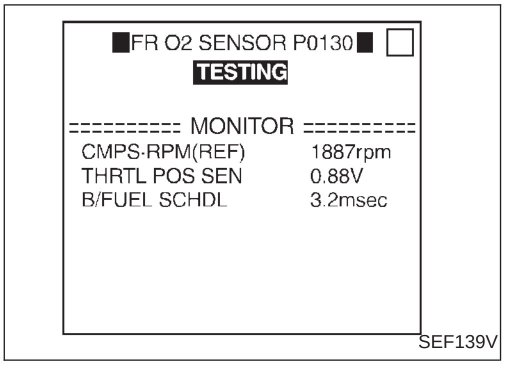
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



```
■FR O2 SENSOR P0130■ ☐
  OUT OF CONDITION

========== MONITOR ==========
CMPS·RPM(REF)      1250rpm
THRTL POS SEN      0.82V
B/FUEL SCHDL       1.5msec
```

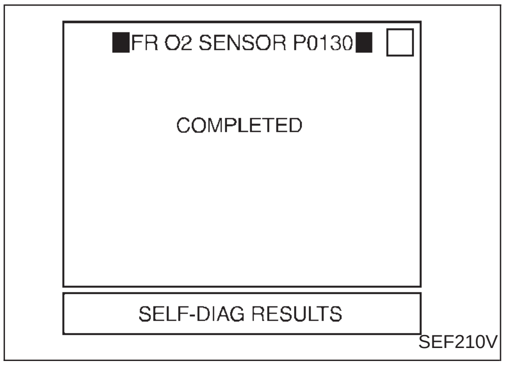
SEF138V



```
■FR O2 SENSOR P0130■ ☐
      TESTING

========== MONITOR ==========
CMPS·RPM(REF)      1887rpm
THRTL POS SEN      0.88V
B/FUEL SCHDL       3.2msec
```

SEF139V



```
■FR O2 SENSOR P0130■ ☐

      COMPLETED

  SELF-DIAG RESULTS
```

SEF210V

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1) Start engine and warm it up to normal operating temperature.
2) Select "FR O2 SENSOR P0130" of "FRONT O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
3) Touch "START".
4) Let it idle for at least 3 minutes.

NOTE:

Never raise engine speed above 3,000 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 screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 10 to 60 seconds.)

CMPS·RPM (REF): 1,200 - 2,700 rpm (A/T)
1,400 - 3,200 rpm (M/T)
Vehicle speed: 70 - 100 km/h (43 - 62 MPH)
B/FUEL SCHDL: 1.0 - 4.8 msec (A/T)
1.0 - 5.2 msec (M/T)
Selector lever: Suitable position

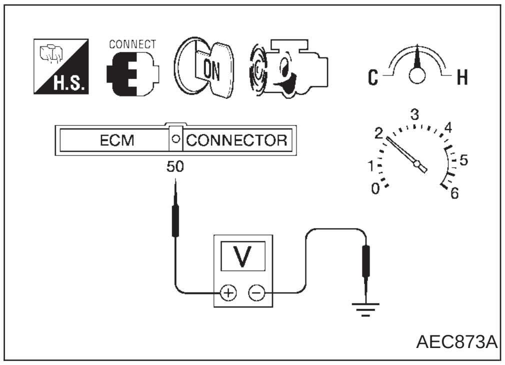
Front Heated Oxygen Sensor (Circuit) (Front HO2S) (Cont’d)

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

6) Make sure that ‘‘OK’’ is displayed after touching ‘‘SELF-DIAG RESULTS’’. If ‘‘NG’’ is displayed, refer to ‘‘DIAGNOSTIC PROCEDURE’’, EC-154.

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

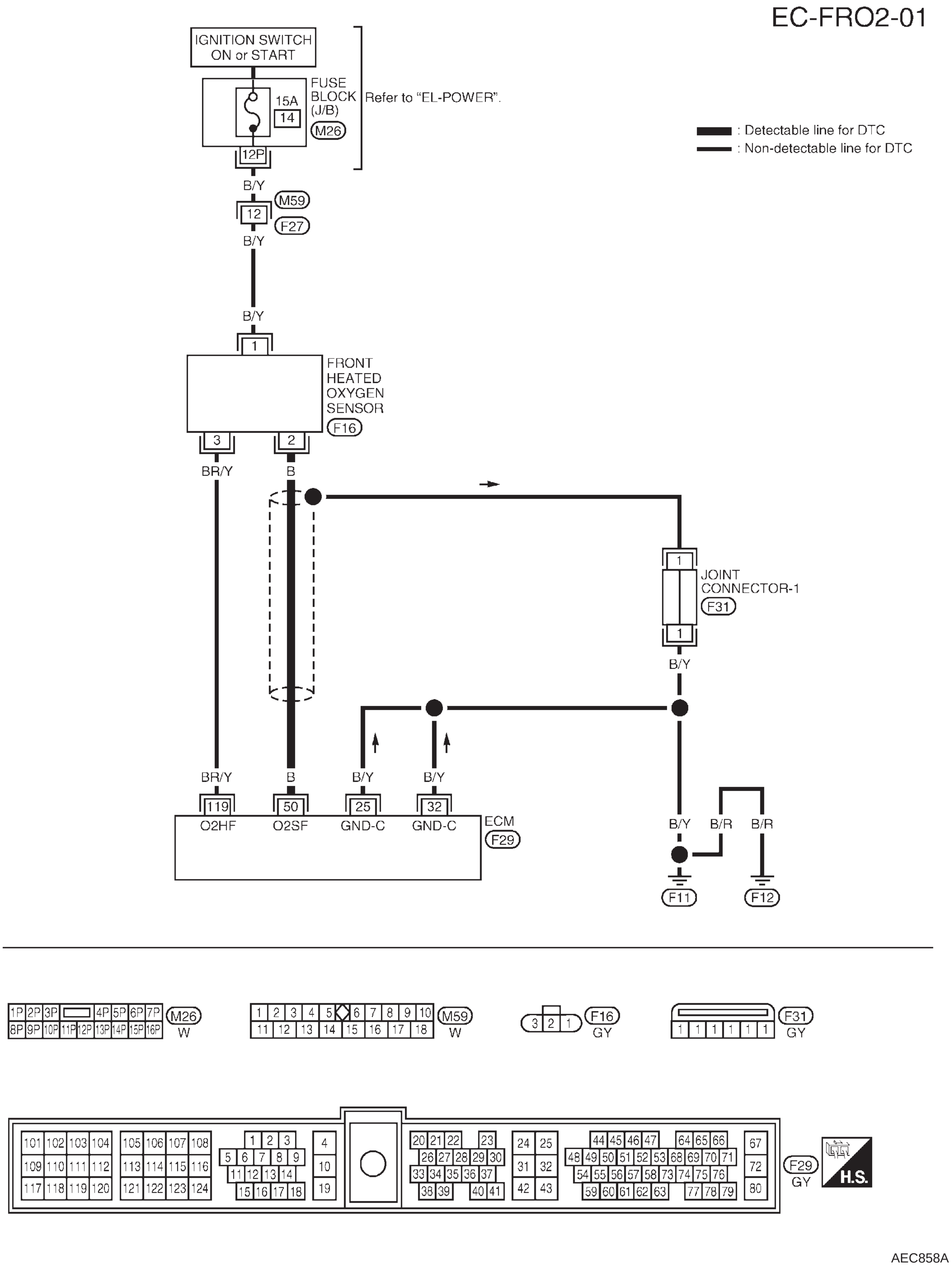
OR



OVERALL FUNCTION CHECK

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

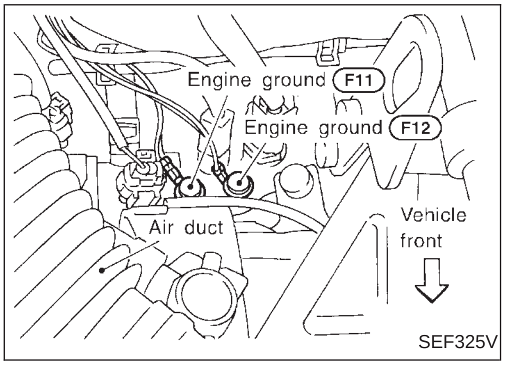
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal ㊿ (sensor signal) and ECM ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.
- The voltage does not remain in the range of 0.2 - 0.4V.
4) If NG, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-154.


EC-FRO2-01
IGNITION SWITCH ON or START
FUSE BLOCK (J/B)
15A
14
M26
12P
Refer to "EL-POWER".
: Detectable line for DTC
: Non-detectable line for DTC
B/Y
M59
12
F27
B/Y
B/Y
1
FRONT HEATED OXYGEN SENSOR
F16
3
2
BR/Y
B
JOINT CONNECTOR-1
1
F31
1
B/Y
BR/Y
B
B/Y
B/Y
119
50
25
32
O2HF
O2SF
GND-C
GND-C
ECM
F29
B/Y
B/R
B/R
F11
F12
1P 2P 3P 4P 5P 6P 7P
8P 9P 10P 11P 12P 13P 14P 15P 16P
M26
W
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18
M59
W
3 2 1
F16
GY
1 1 1 1 1 1
F31
GY
101 102 103 104 105 106 107 108
109 110 111 112 113 114 115 116
117 118 119 120 121 122 123 124
1 2 3
5 6 7 8 9
11 12 13 14
15 16 17 18
4
10
19
20 21 22 23
26 27 28 29 30
33 34 35 36 37
38 39 40 41
24 25
31 32
42 43
44 45 46 47 64 65 66
48 49 50 51 52 53 68 69 70 71
54 55 56 57 58 73 74 75 76
59 60 61 62 63 77 78 79
67
72
80
F29
GY
H.S.

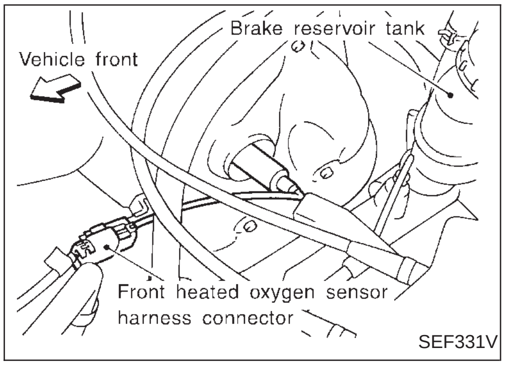
AEC858A

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

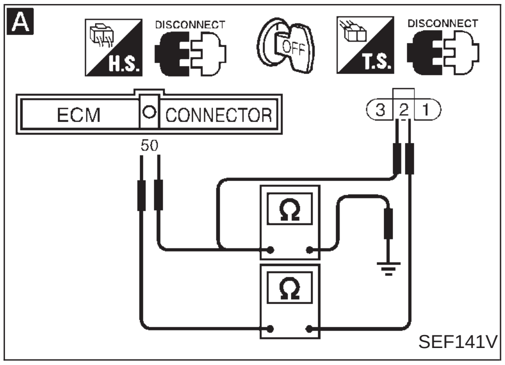
DIAGNOSTIC PROCEDURE



SEF325V



SEF331V



SEF141V

INSPECTION START

↓

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

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal ㊿ and terminal ②.
   Continuity should exist.
3. Check harness continuity between ECM terminal ㊿ (or terminal ②) and ground.
   Continuity should not exist.

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

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

OK ↓

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

NG → Replace front heated oxygen sensor.

OK ↓

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

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

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

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

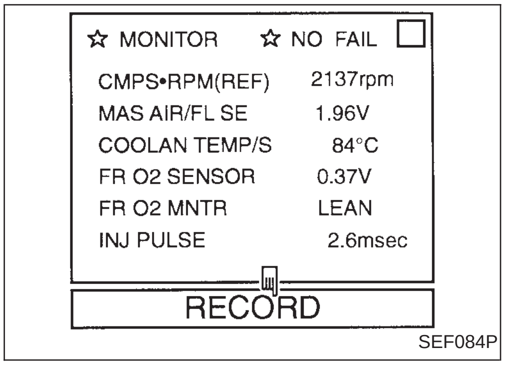
↓

INSPECTION END

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

COMPONENT INSPECTION

Front heated oxygen sensor



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 2137rpm
MAS AIR/FL SE 1.96V
COOLAN TEMP/S 84°C
FR O2 SENSOR 0.37V
FR O2 MNTR LEAN
INJ PULSE 2.6msec

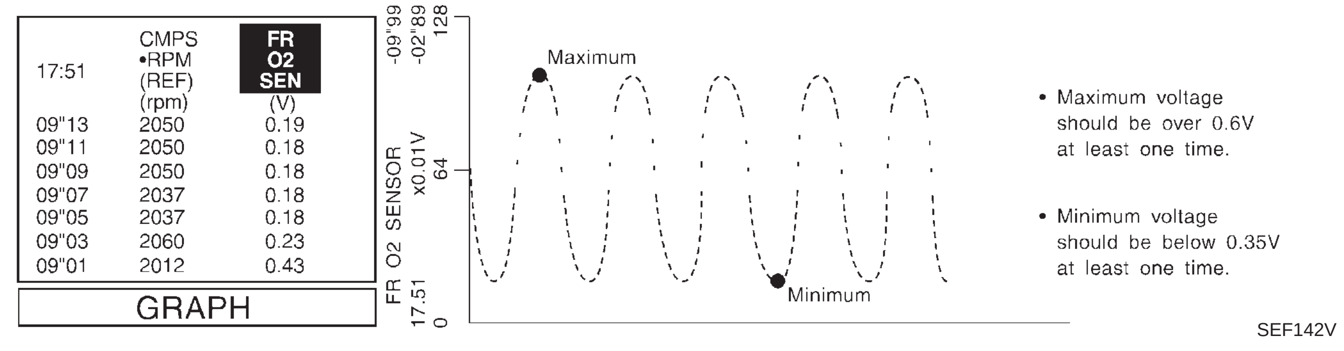
SEF084P

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

- "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below:

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

  R = "FR O2 MNTR", "RICH"
  L = "FR O2 MNTR", "LEAN"
- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.



17:51	CMPS •RPM (REF) (rpm)	FR O2 SEN (V)
09"13	2050	0.19
09"11	2050	0.18
09"09	2050	0.18
09"07	2037	0.18
09"05	2037	0.18
09"03	2060	0.23
09"01	2012	0.43

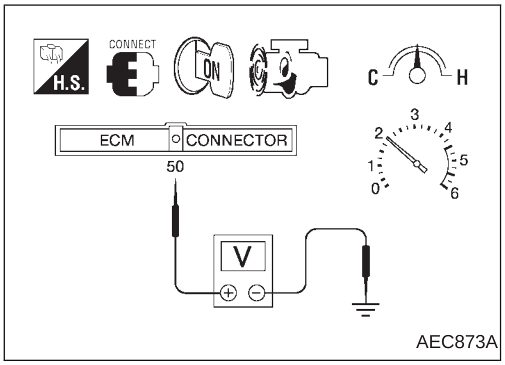
- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.35V at least one time.

SEF142V

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J43897-12 and approved anti-seize lubricant.**

OR



AEC873A

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

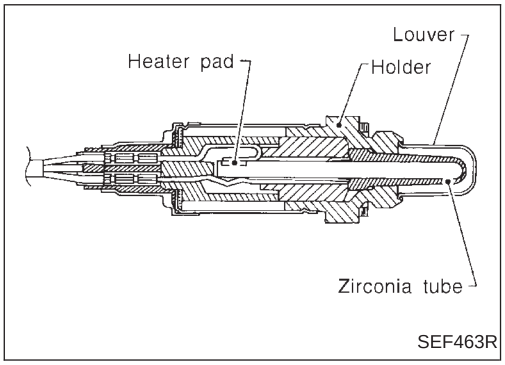
- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.35V at least one time.

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

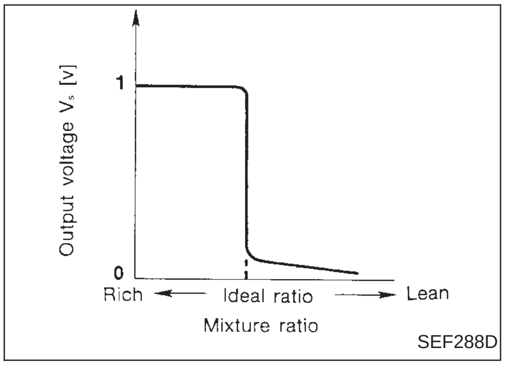
- The voltage never exceeds 1.0V.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J43897-12 and approved anti-seize lubricant.**



SEF463R



SEF288D

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

COMPONENT DESCRIPTION

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

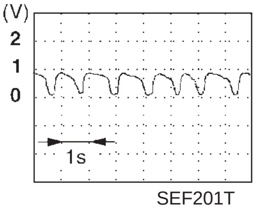
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

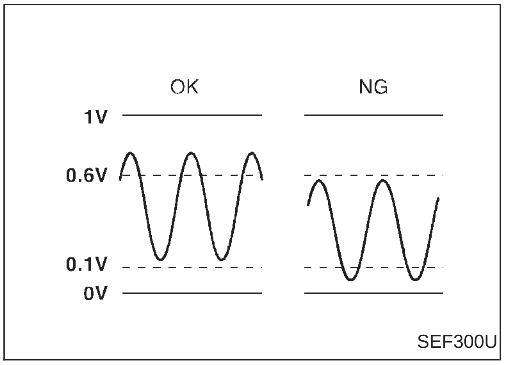
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SENSOR .... FR O2 MNTR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM TERMINALS AND REFERENCE VALUE

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

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

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

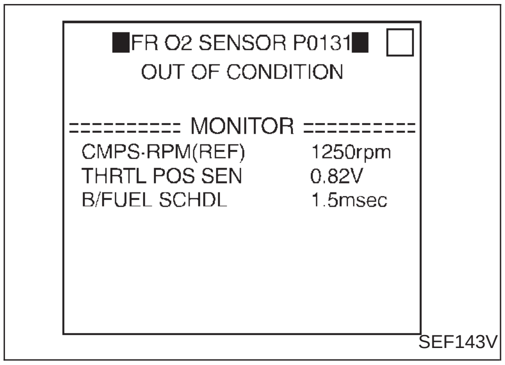


SEF300U

ON BOARD DIAGNOSIS LOGIC

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

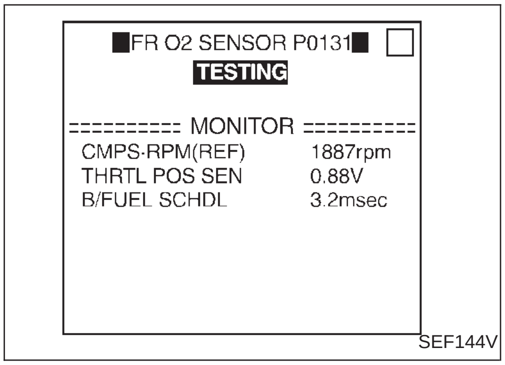
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0131 0411	● The maximum and minimum voltages from the sensor are not reached to the specified voltages.	● Front heated oxygen sensor ● Front heated oxygen sensor heater ● Fuel pressure ● Injectors ● Intake air leaks



```
■FR O2 SENSOR P0131■ ☐
   OUT OF CONDITION

========== MONITOR ==========
CMPS·RPM(REF)      1250rpm
THRTL POS SEN      0.82V
B/FUEL SCHDL       1.5msec
```

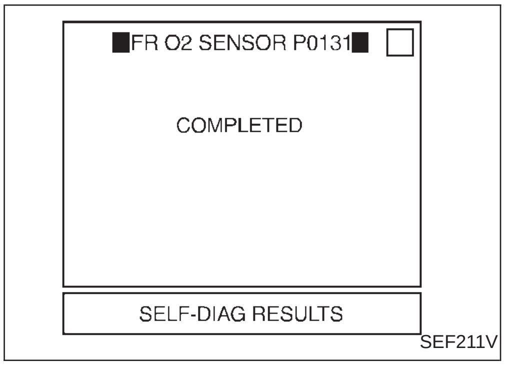
SEF143V



```
■FR O2 SENSOR P0131■ ☐
       TESTING

========== MONITOR ==========
CMPS·RPM(REF)      1887rpm
THRTL POS SEN      0.88V
B/FUEL SCHDL       3.2msec
```

SEF144V



```
■FR O2 SENSOR P0131■ ☐


      COMPLETED




   SELF-DIAG RESULTS
```

SEF211V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Always perform at a temperature above −10°C (14°F).

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 5 seconds.
3) Turn ignition switch ''ON'' and select ''FR O2 SENSOR P0131'' of ''FRONT O2 SENSOR'' in ''DTC WORK SUPPORT'' mode with CONSULT.
4) Touch ''START''.
5) Start engine and let it idle for at least 1.5 minutes.

NOTE:

Never raise engine speed above 3,000 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 screen. Maintain the conditions continuously until ''TESTING'' changes to ''COMPLETED''. (It will take approximately 50 seconds or more.)

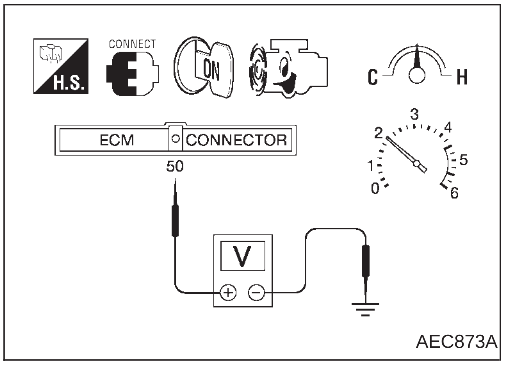
CMPS·RPM (REF):1,700 - 2,600 rpm (2WD model)
1,700 - 3,000 rpm (4WD model)
Vehicle speed: 80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL: 1.0 - 4.8 msec
Selector lever: Suitable position

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

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

7) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-160.

OR



OVERALL FUNCTION CHECK

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

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

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

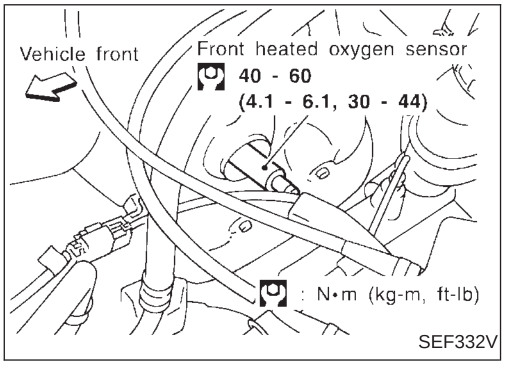
OR

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

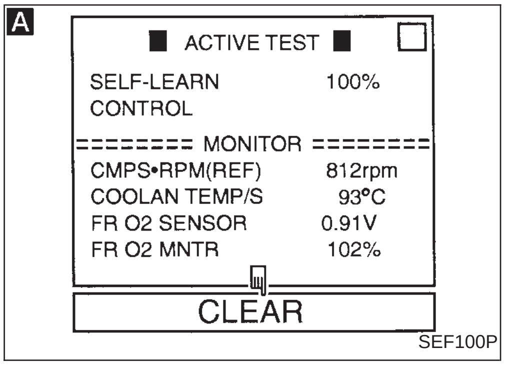
4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-160.

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

DIAGNOSTIC PROCEDURE



SEF332V



■ ACTIVE TEST ■ ☐

SELF-LEARN CONTROL 100%

======== MONITOR ========

CMPS•RPM(REF) 812rpm

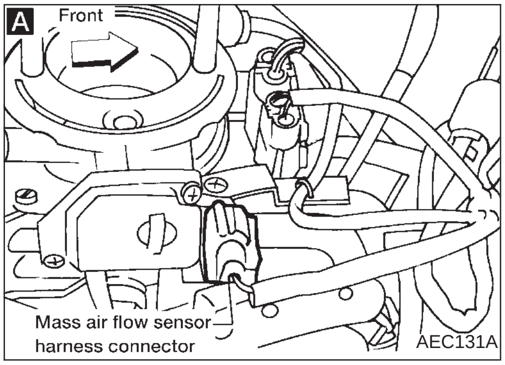
COOLAN TEMP/S 93°C

FR O2 SENSOR 0.91V

FR O2 MNTR 102%

CLEAR

SEF100P



AEC131A

INSPECTION START

↓

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

↓

A

CLEAR THE SELF-LEARNING DATA.

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

OR

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

Yes → Go to ''TROUBLE DIAGNOSIS FOR DTC P0171'', EC-224.

No ↓

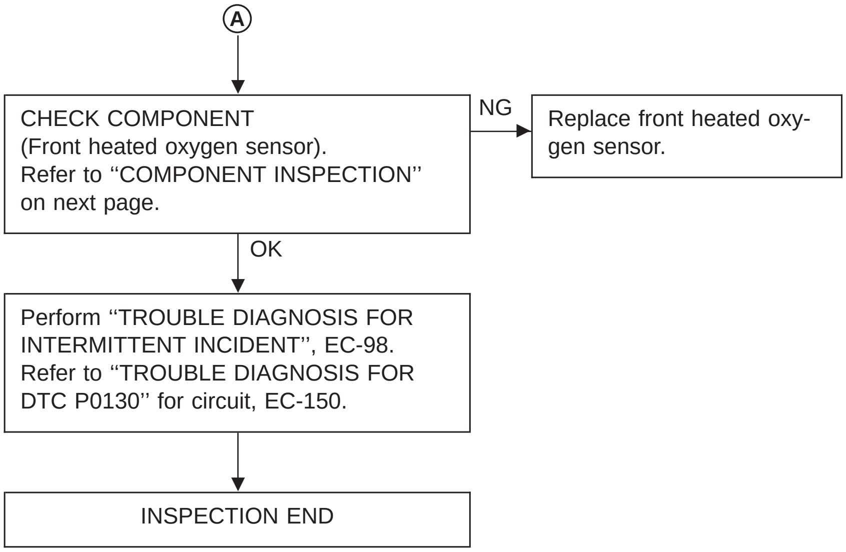
CHECK COMPONENT
(Front heated oxygen sensor heater).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace front heated oxygen sensor.

OK ↓

Ⓐ
(Go to next page.)

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

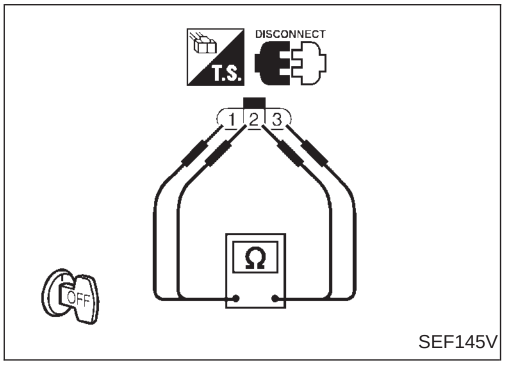


CHECK COMPONENT
(Front heated oxygen sensor).
Refer to "COMPONENT INSPECTION" on next page.

Replace front heated oxygen sensor.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.
Refer to "TROUBLE DIAGNOSIS FOR DTC P0130" for circuit, EC-150.

INSPECTION END



SEF145V

COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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

GI
MA
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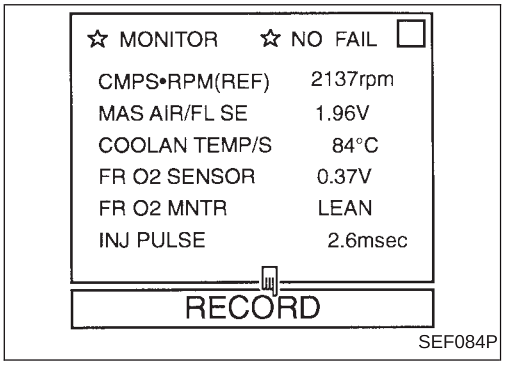
IDX

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



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 2137rpm

MAS AIR/FL SE 1.96V

COOLAN TEMP/S 84°C

FR O2 SENSOR 0.37V

FR O2 MNTR LEAN

INJ PULSE 2.6msec

SEF084P

Front heated oxygen sensor

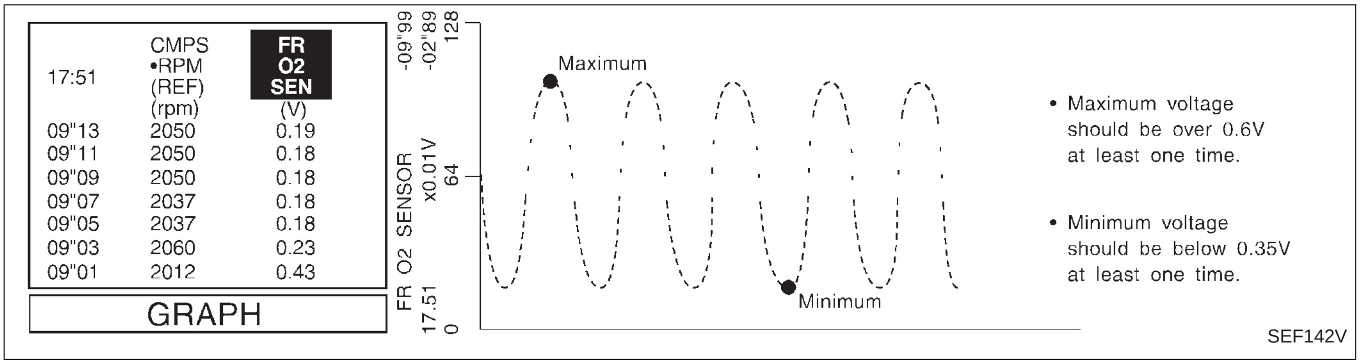
1) Start engine and warm it up to normal operating temperature.
2) Select “MANU TRIG’’ and “HI SPEED’’ in “DATA MONITOR’’ mode with CONSULT, and select “FR O2 SENSOR’’ and “FR O2 MNTR’’.
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch “RECORD’’ on CONSULT screen.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

- “FR O2 MNTR’’ in “DATA MONITOR’’ mode changes from “RICH’’ to “LEAN’’ to “RICH’’ 5 times in 10 seconds.

  5 times (cycles) are counted as shown below:

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

  R = “FR O2 MNTR’’, “RICH’’
  L = “FR O2 MNTR’’, “LEAN’’
- “FR O2 SENSOR’’ voltage goes above 0.6V at least once.
- “FR O2 SENSOR’’ voltage goes below 0.35V at least once.
- “FR O2 SENSOR’’ voltage never exceeds 1.0V.



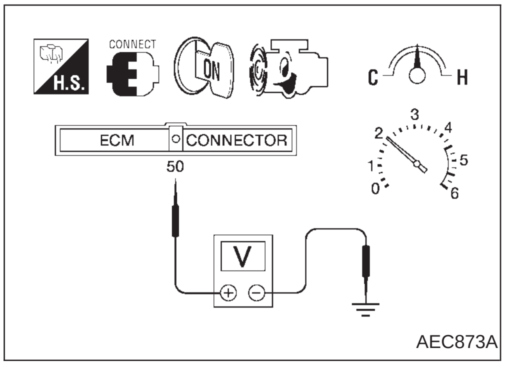
17:51	CMPS •RPM (REF) (rpm)	FR O2 SEN (V)
09"13	2050	0.19
09"11	2050	0.18
09"09	2050	0.18
09"07	2037	0.18
09"05	2037	0.18
09"03	2060	0.23
09"01	2012	0.43

- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.35V at least one time.

SEF142V

CAUTION:

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



AEC873A

OR

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

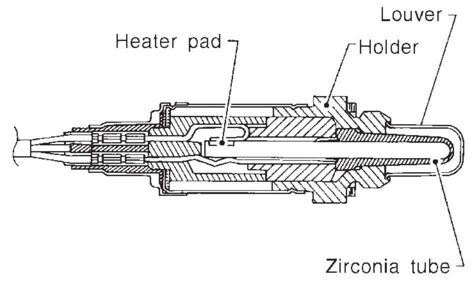
- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.35V at least one time.

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

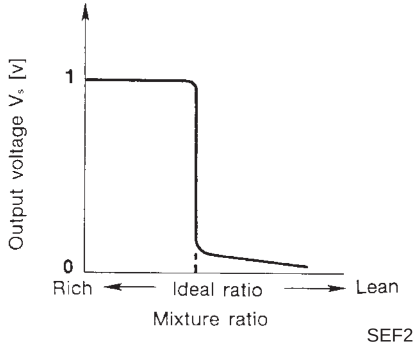
- The voltage never exceeds 1.0V.

CAUTION:

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



SEF463R



SEF288D

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

COMPONENT DESCRIPTION

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

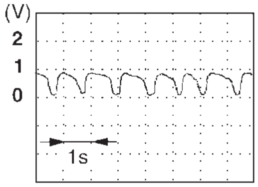
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

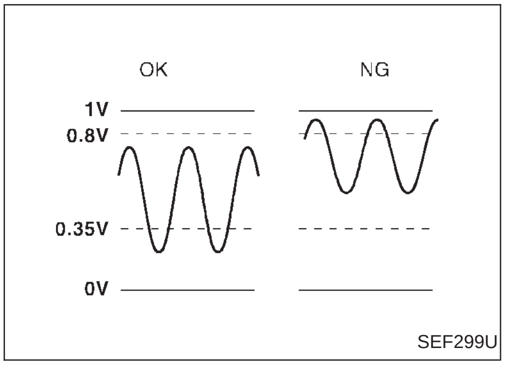
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

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



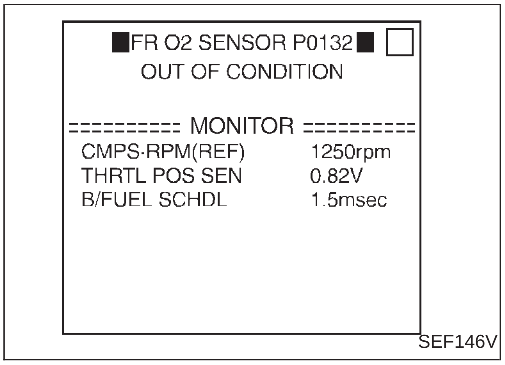
SEF299U

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

ON BOARD DIAGNOSIS LOGIC

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

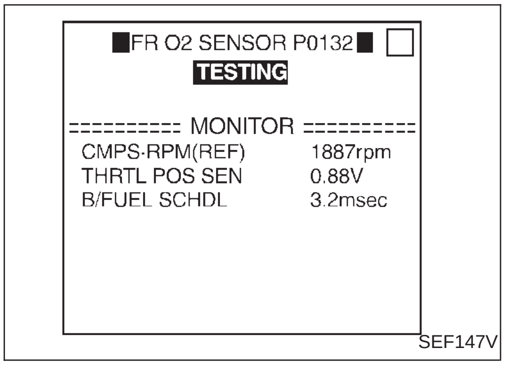
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0132 0410	● The maximum and minimum voltages from the sensor are beyond the specified voltages.	● Front heated oxygen sensor ● Front heated oxygen sensor heater ● Fuel pressure ● Injectors



```
■FR O2 SENSOR P0132■ ☐
   OUT OF CONDITION

========== MONITOR ==========
CMPS·RPM(REF)        1250rpm
THRTL POS SEN        0.82V
B/FUEL SCHDL         1.5msec
```

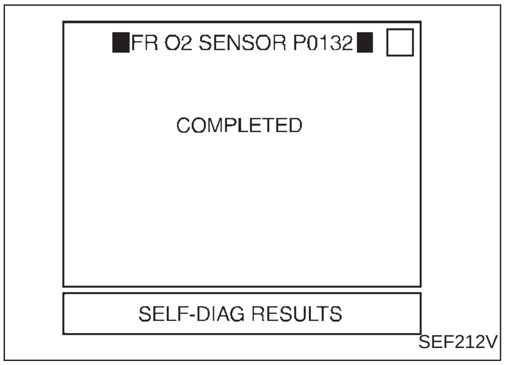
SEF146V



```
■FR O2 SENSOR P0132■ ☐
       TESTING

========== MONITOR ==========
CMPS·RPM(REF)        1887rpm
THRTL POS SEN        0.88V
B/FUEL SCHDL         3.2msec
```

SEF147V



```
■FR O2 SENSOR P0132■ ☐


      COMPLETED



   SELF-DIAG RESULTS
```

SEF212V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Always perform at a temperature above −10°C (14°F).

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 5 seconds.
3) Turn ignition switch ''ON'' and select ''FR O2 SENSOR P0132'' of ''FRONT O2 SENSOR'' in ''DTC WORK SUPPORT'' mode with CONSULT.
4) Touch ''START''.
5) Start engine and let it idle for at least 1.5 minutes.

NOTE:

Never raise engine speed above 3,000 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 screen. Maintain the conditions continuously until ''TESTING'' changes to ''COMPLETED''. (It will take approximately 50 seconds or more.)

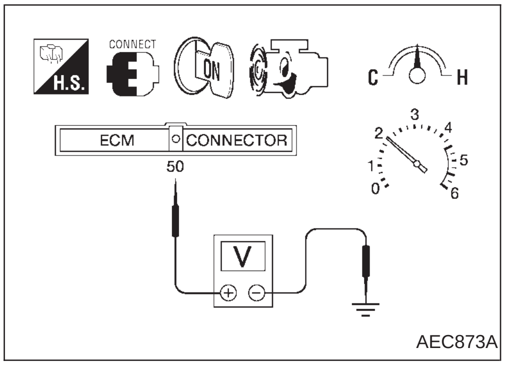
CMPS·RPM (REF): 1,700 - 2,600 rpm (2WD model)
1,700 - 3,000 rpm (4WD model)
Vehicle speed: 80 - 100 km/h (50 - 62 MPH)
B/FUEL SCHDL: 1.0 - 4.8 msec
Selector lever: Suitable position

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

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

7) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''. If ''NG'' is displayed, refer to ''DIAGNOSTIC PROCEDURE'', EC-167.

OR



OVERALL FUNCTION CHECK

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

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

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

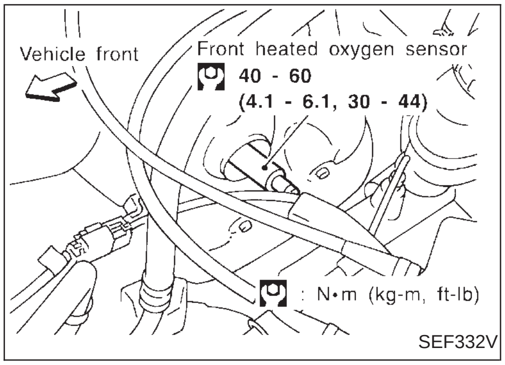
OR

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

4) If NG, go to ''DIAGNOSTIC PROCEDURE'', EC-167.

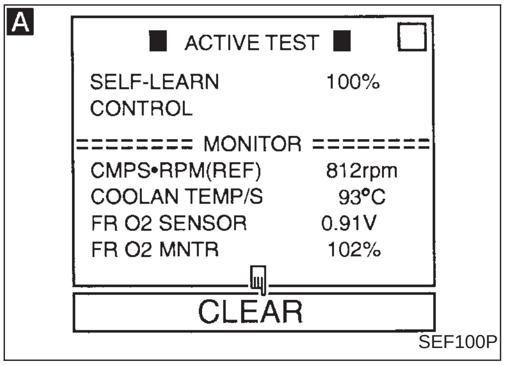
Front Heated Oxygen Sensor (Rich Shift Monitoring) (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE



SEF332V

A



■ ACTIVE TEST ■

SELF-LEARN CONTROL	100%

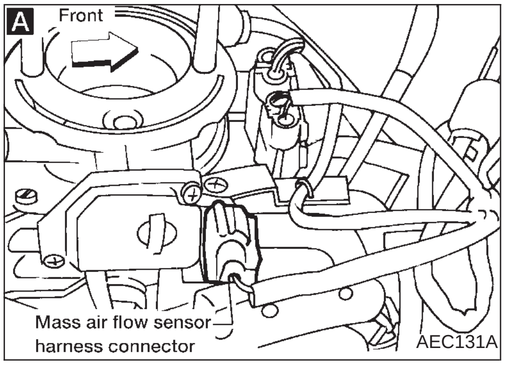
======== MONITOR ========

CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	93°C
FR O2 SENSOR	0.91V
FR O2 MNTR	102%

CLEAR

SEF100P

A



AEC131A

INSPECTION START

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

A

CLEAR THE SELF-LEARNING DATA

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

OR

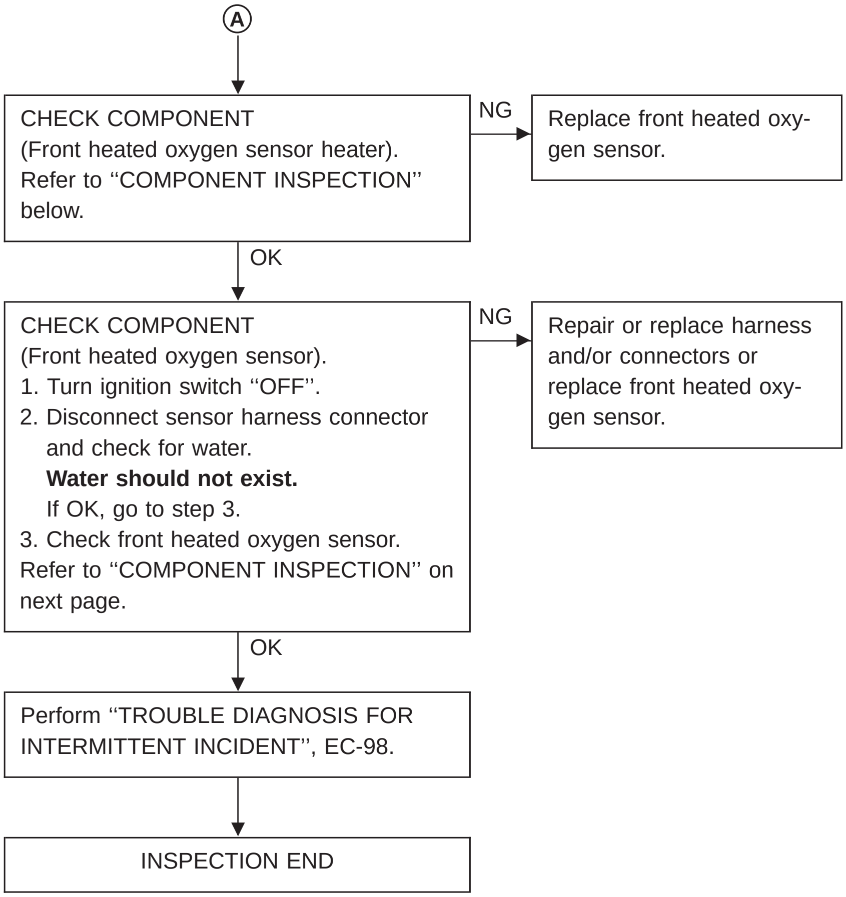
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode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

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0172", EC-229.

No

Ⓐ
(Go to next page.)

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



Ⓐ

CHECK COMPONENT
(Front heated oxygen sensor heater).
Refer to "COMPONENT INSPECTION" below.

NG → Replace front heated oxygen sensor.

OK

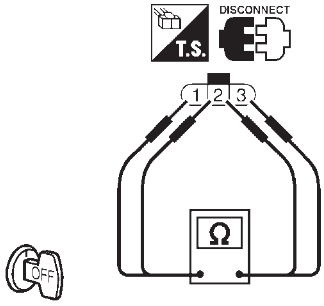
CHECK COMPONENT
(Front heated oxygen sensor).
1. Turn ignition switch "OFF".
2. Disconnect sensor harness connector and check for water.
Water should not exist.
If OK, go to step 3.
3. Check front heated oxygen sensor.
Refer to "COMPONENT INSPECTION" on next page.

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

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END



SEF145V

COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

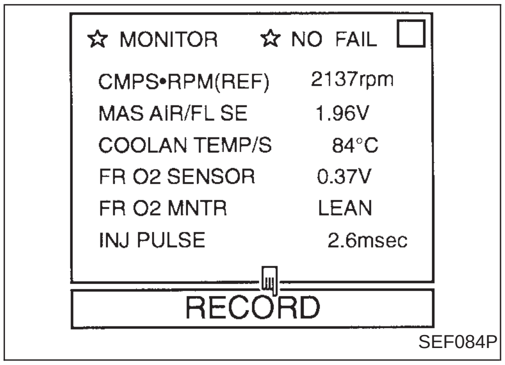
Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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

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



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	2137rpm
MAS AIR/FL SE	1.96V
COOLAN TEMP/S	84°C
FR O2 SENSOR	0.37V
FR O2 MNTR	LEAN
INJ PULSE	2.6msec

SEF084P

Front heated oxygen sensor

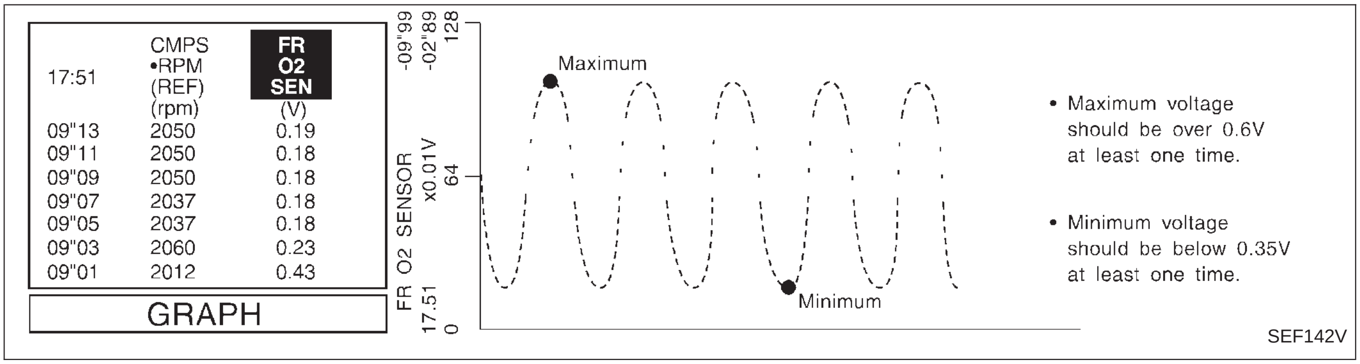
1) Start engine and warm it up to normal operating temperature.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT screen.
5) Check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

- "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

  5 times (cycles) are counted as shown below:

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

  R = "FR O2 MNTR", "RICH"
  L = "FR O2 MNTR", "LEAN"
- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.



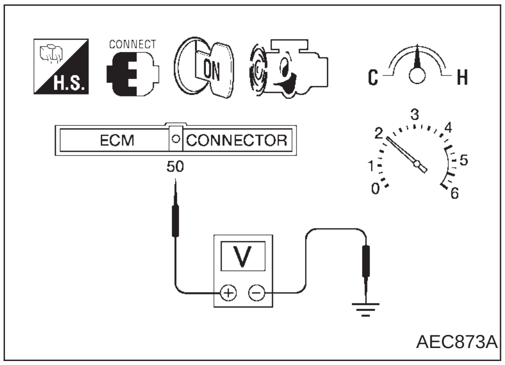
17:51	CMPS •RPM (REF) (rpm)	FR O2 SEN (V)
09"13	2050	0.19
09"11	2050	0.18
09"09	2050	0.18
09"07	2037	0.18
09"05	2037	0.18
09"03	2060	0.23
09"01	2012	0.43

- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.35V at least one time.

SEF142V

CAUTION:

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



AEC873A

OR

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

- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.35V at least one time.

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

- The voltage never exceeds 1.0V.

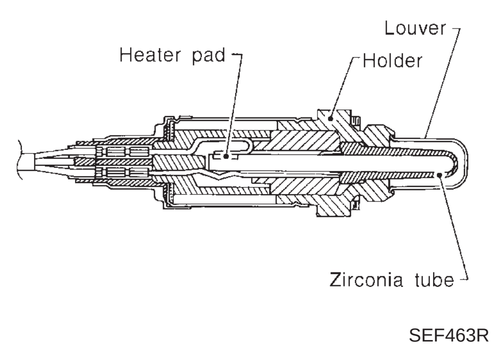
CAUTION:

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

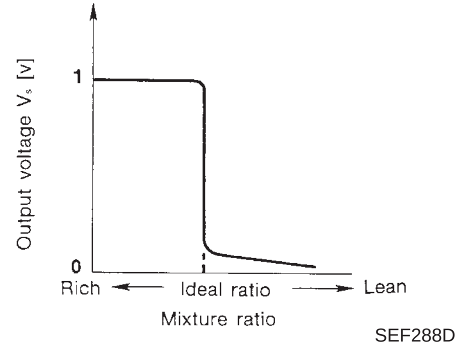
Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S)

COMPONENT DESCRIPTION

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



SEF463R



SEF288D

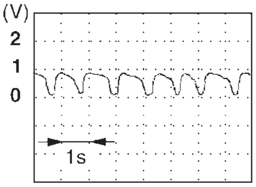
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

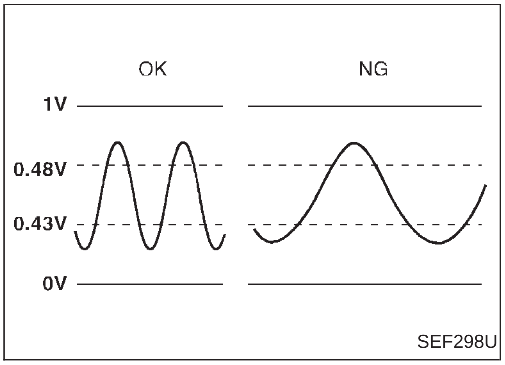
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SENSOR .... FR O2 MNTR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM TERMINALS AND REFERENCE VALUE

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

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

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



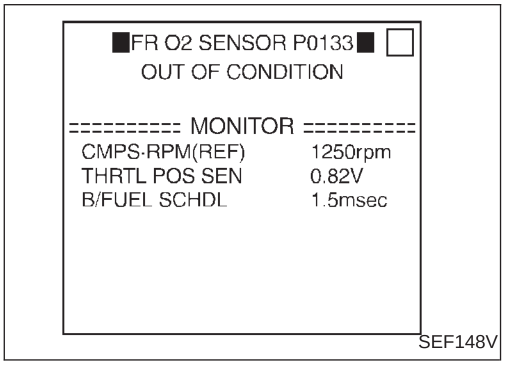
SEF298U

ON BOARD DIAGNOSIS LOGIC

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0133 0409	● The response of the voltage signal from the sensor takes more than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor ● Front heated oxygen sensor heater ● Fuel pressure ● Injectors ● Intake air leaks ● Exhaust gas leaks ● PCV ● Mass air flow sensor

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



■FR O2 SENSOR P0133■ ☐

OUT OF CONDITION

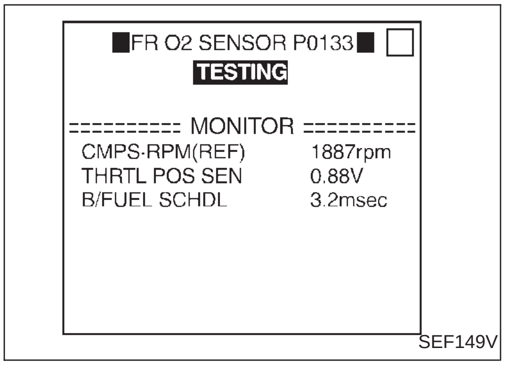
========== MONITOR ==========

CMPS·RPM(REF) 1250rpm

THRTL POS SEN 0.82V

B/FUEL SCHDL 1.5msec

SEF148V



■FR O2 SENSOR P0133■ ☐

TESTING

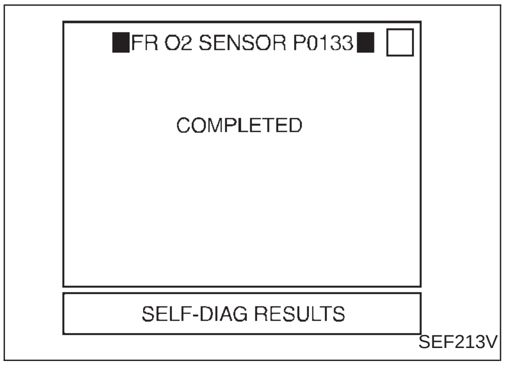
========== MONITOR ==========

CMPS·RPM(REF) 1887rpm

THRTL POS SEN 0.88V

B/FUEL SCHDL 3.2msec

SEF149V



■FR O2 SENSOR P0133■ ☐

COMPLETED

SELF-DIAG RESULTS

SEF213V

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

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

1) Start engine and warm it up to normal operating temperature.
2) Stop engine and wait at least 5 seconds.
3) Turn ignition switch “ON” and select “FR O2 SENSOR P0133” of “FRONT O2 SENSOR” in “DTC WORK SUPPORT” mode with CONSULT.
4) Touch “START”.
5) Start engine and let it idle for at least 1.5 minutes.

NOTE: Never raise engine speed above 3,000 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 screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 20 seconds or more.)

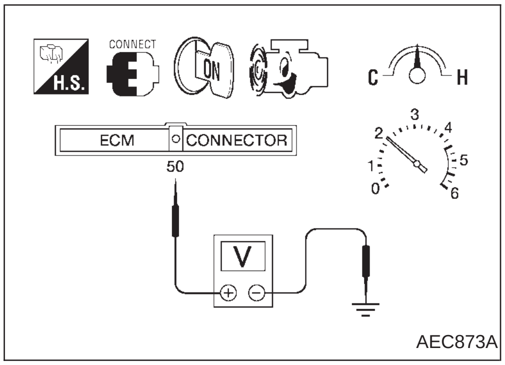
CMPS·RPM (REF): 1,700 - 3,000 rpm (A/T)
1,700 - 3,200 rpm (M/T)
Vehicle speed: 80 - 120 km/h (50 - 75 MPH)
B/FUEL SCHDL: 1.1 - 4.8 msec
Selector lever: Suitable position

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

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

7) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''. If ''NG'' is displayed, refer to ''DIAGNOSTIC PROCEDURE'', EC-175.

OR



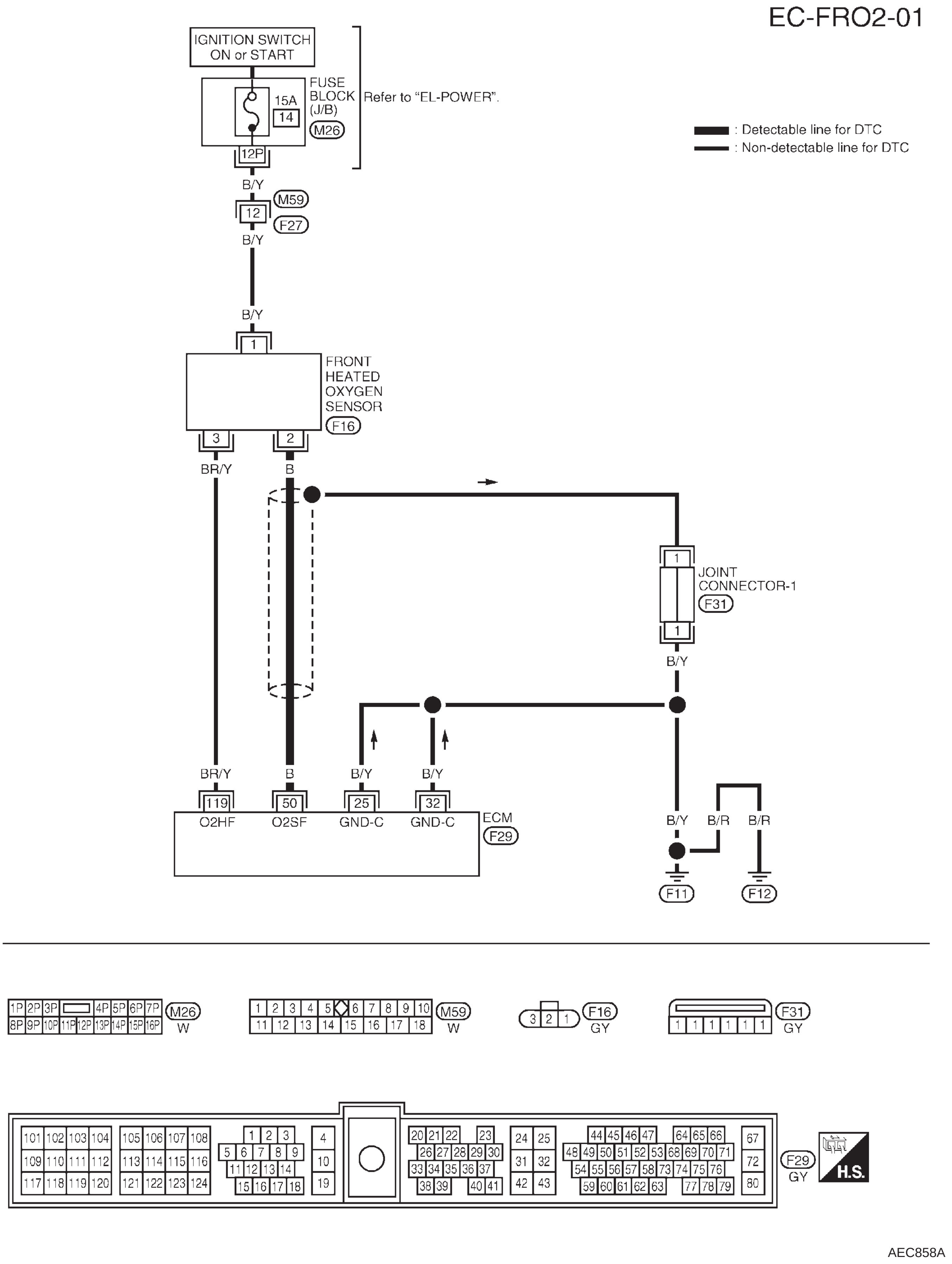
OVERALL FUNCTION CHECK

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

1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal ㊿ (sensor signal) and ECM ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.
- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).

4) If NG, go to ''DIAGNOSTIC PROCEDURE'', EC-175.

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



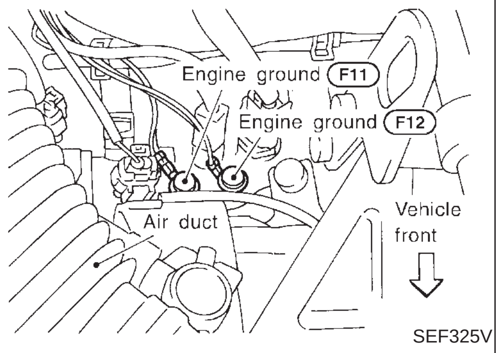
Front Heated Oxygen Sensor (Response Monitoring) (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

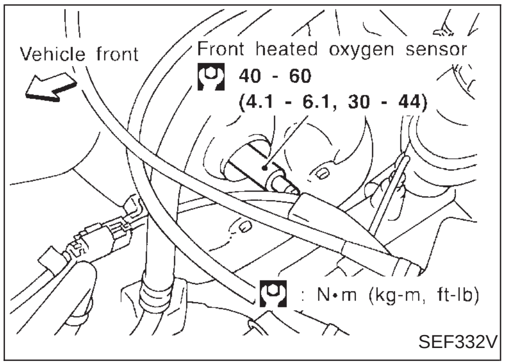
1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.



SEF325V

↓

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



SEF332V

↓

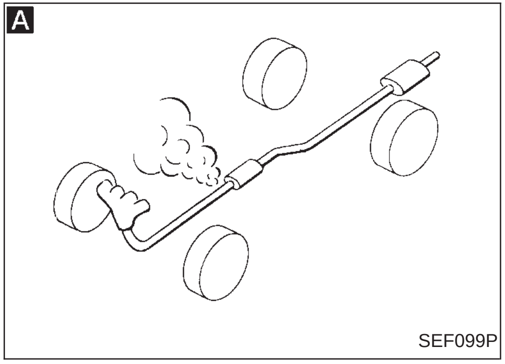
A

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

NG → Repair or replace.

OK ↓

A



SEF099P

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

NG → Repair or replace.

OK ↓

B

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

OR

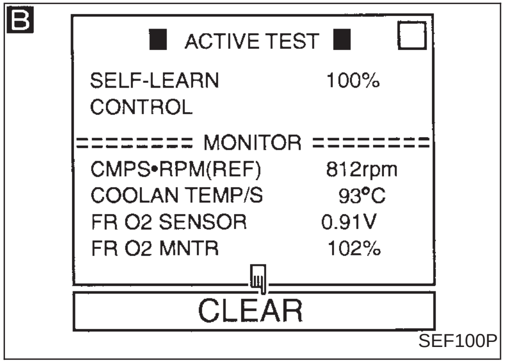
2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode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

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171", EC-224 or "TROUBLE DIAGNOSIS FOR DTC P0172", EC-229.

No ↓

Ⓐ
(Go to next page.)

B



■ ACTIVE TEST ■ ☐

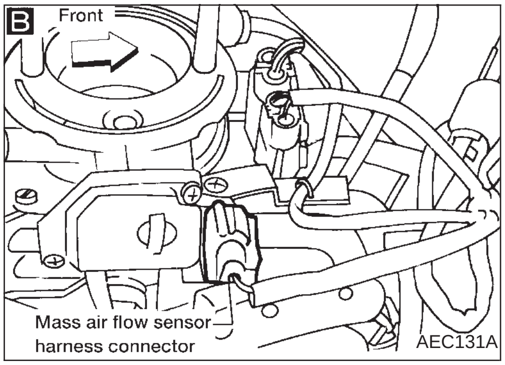
SELF-LEARN CONTROL 100%

======== MONITOR ========

CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	93°C
FR O2 SENSOR	0.91V
FR O2 MNTR	102%

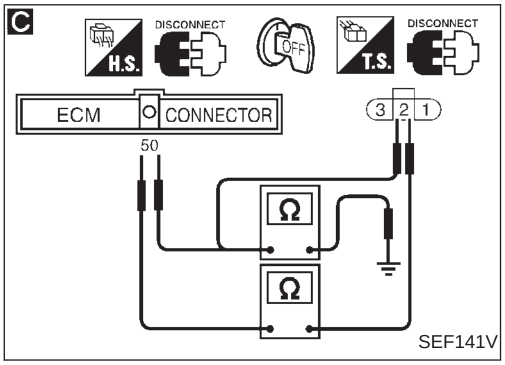
SEF100P

B



AEC131A

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



SEF141V

Ⓐ

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal ㊿ and terminal ②.
   Continuity should exist.
3. Check harness continuity between ECM terminal ㊿ (or terminal ②) and ground.
   Continuity should not exist.

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

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

OK ↓

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

NG → Replace front heated oxygen sensor.

OK ↓

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

NG → Replace front heated oxygen sensor.

OK ↓

CHECK COMPONENT
(Mass air flow sensor).
Refer to "COMPONENT INSPECTION", EC-112.

NG → Replace mass air flow sensor.

OK ↓

CHECK COMPONENT
(PCV valve).
Refer to "COMPONENT INSPECTION" on EC-28.

NG → Repair or replace PCV valve.

OK ↓

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

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

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

OK ↓

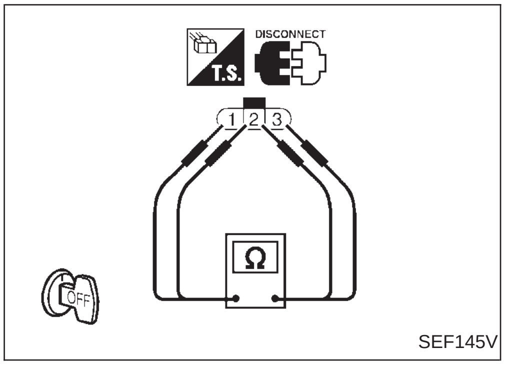
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

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

COMPONENT INSPECTION



SEF145V

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

Resistance: 2.3 - 4.3Ω at 25°C (77°F)

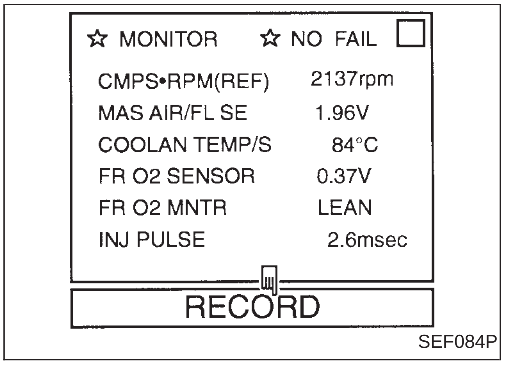
Check continuity between terminals ② and ①, ③ and ②.

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

CAUTION:

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



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	2137rpm
MAS AIR/FL SE	1.96V
COOLAN TEMP/S	84°C
FR O2 SENSOR	0.37V
FR O2 MNTR	LEAN
INJ PULSE	2.6msec

SEF084P

Front heated oxygen sensor

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

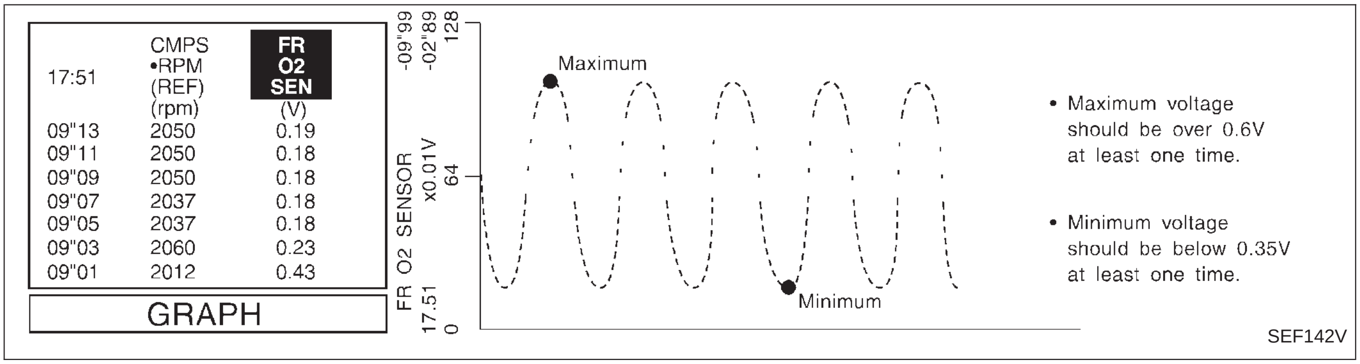
- "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.

  5 times (cycles) are counted as shown below:

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

  R = "FR O2 MNTR", "RICH"
  L = "FR O2 MNTR", "LEAN"
- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.

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



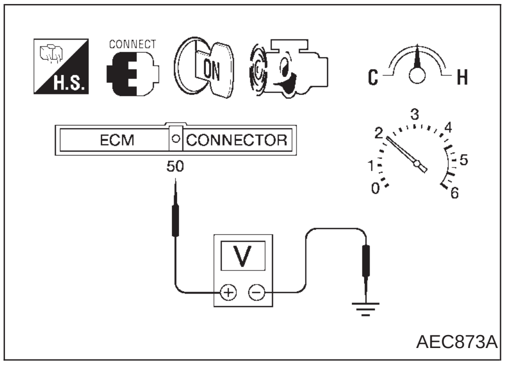
17:51	CMPS •RPM (REF) (rpm)	FR O2 SEN (V)
09"13	2050	0.19
09"11	2050	0.18
09"09	2050	0.18
09"07	2037	0.18
09"05	2037	0.18
09"03	2060	0.23
09"01	2012	0.43

- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.35V at least one time.

SEF142V

CAUTION:

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



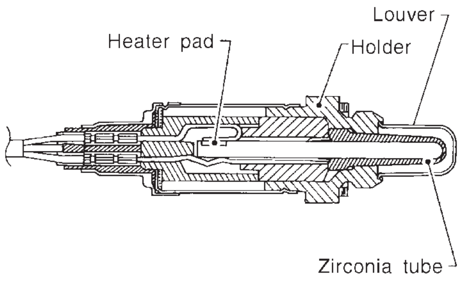
AEC873A

OR

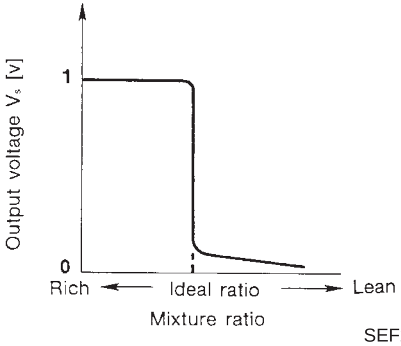
1) Start engine and warm it up to normal operating temperature.
2) Set voltmeter probes between ECM terminal ㊿ (sensor signal) and ECM ground.
3) Check the following with engine speed held at 2,000 rpm constant under no load.
   - Malfunction indicator lamp goes on more than 5 times within 10 seconds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

CAUTION:

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



SEF463R



SEF288D

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

COMPONENT DESCRIPTION

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

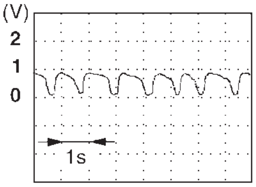
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

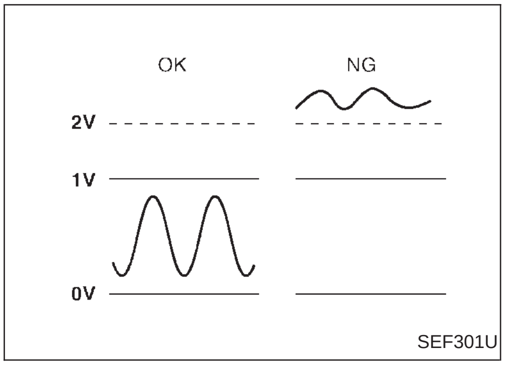
MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SENSOR .... FR O2 MNTR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

ECM TERMINALS AND REFERENCE VALUE

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

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

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

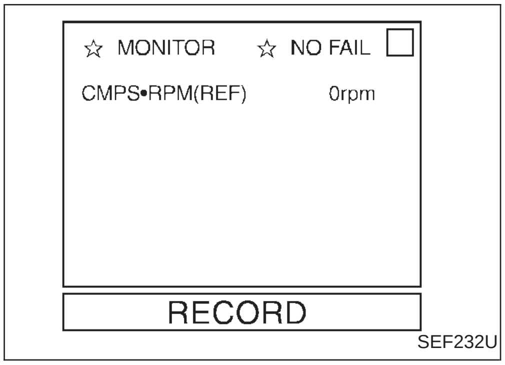


SEF301U

ON BOARD DIAGNOSIS LOGIC

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0134 0412	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor


☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

SEF232U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF'' and wait at least 5 seconds.
3) Turn ignition switch "ON''.
4) Select "DATA MONITOR'' mode with CONSULT.
5) Restart engine and let it idle for 5.5 minutes.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE'', EC-183.

OR

GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF'' and wait at least 5 seconds.
3) Restart engine and let it idle for 5.5 minutes.
4) Turn ignition switch "OFF'' and wait at least 5 seconds.
5) Restart engine and let it idle for 5.5 minutes.
6) Select "MODE 3'' with GST.
7) If DTC is detected, go to "DIAGNOSTIC PROCEDURE'', EC-183.

OR

NO TOOLS

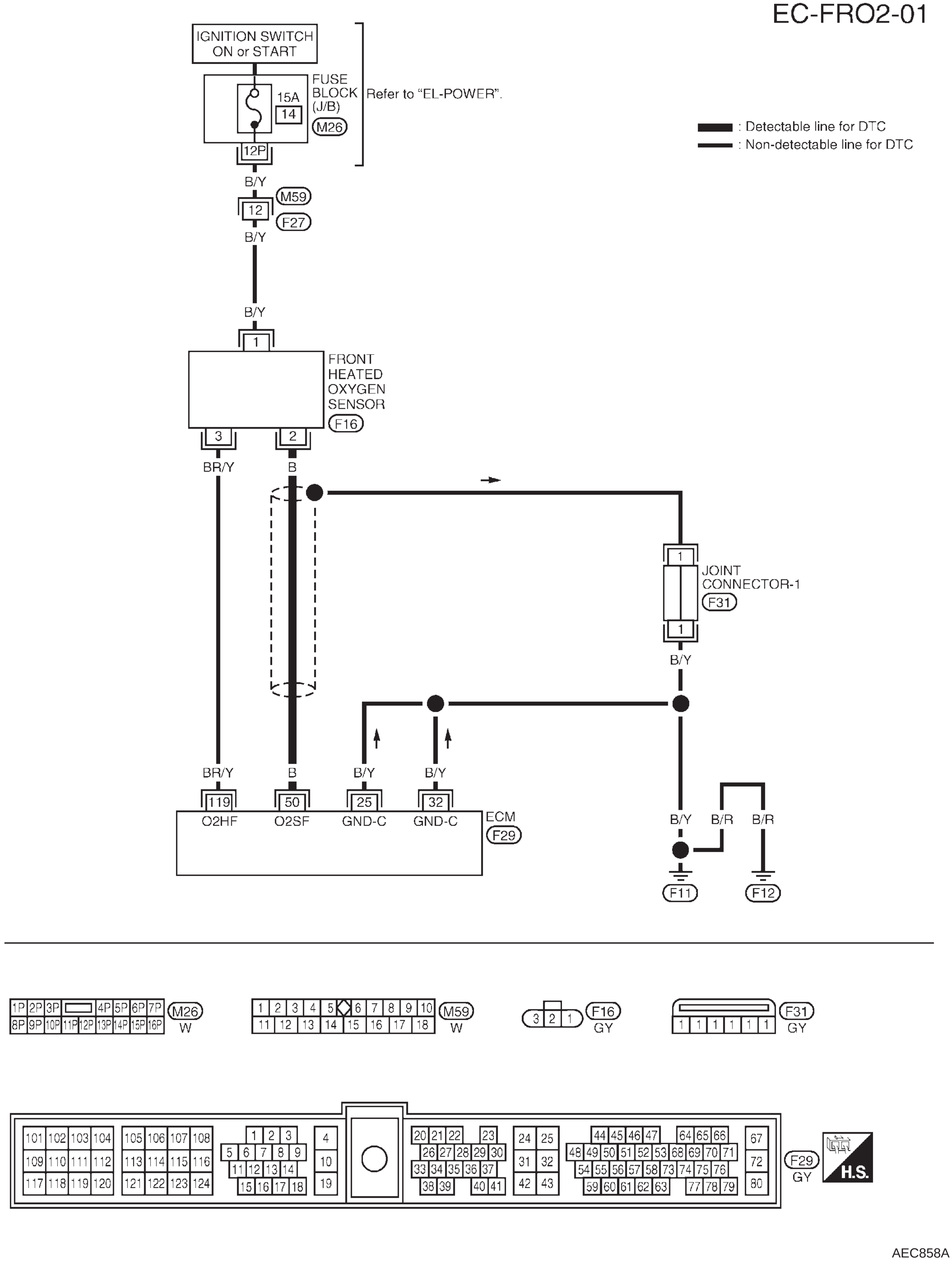
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF'' and wait at least 5 seconds.
3) Restart engine and let it idle for 5.5 minutes.
4) Turn ignition switch "OFF'', wait at least 5 seconds and then turn "ON''.
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE'', EC-183.

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

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

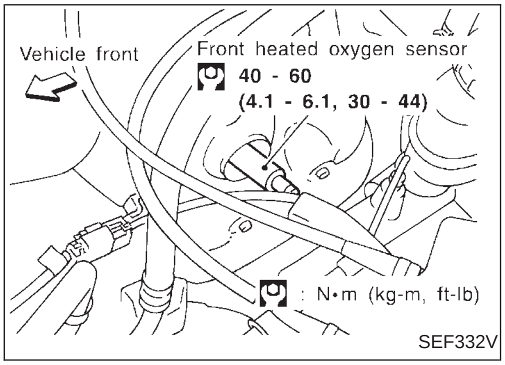
Front Heated Oxygen Sensor (High Voltage) (Front HO2S) (Cont'd)

EC-FRO2-01

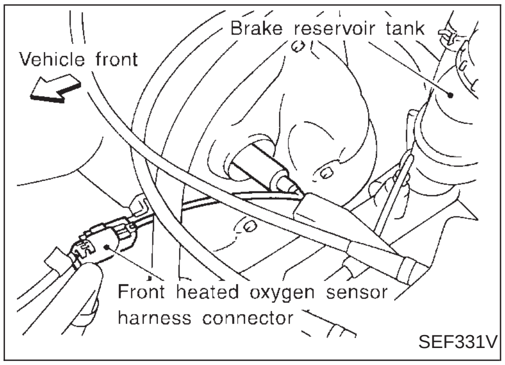


Front Heated Oxygen Sensor (High Voltage) (Front HO2S) (Cont'd)

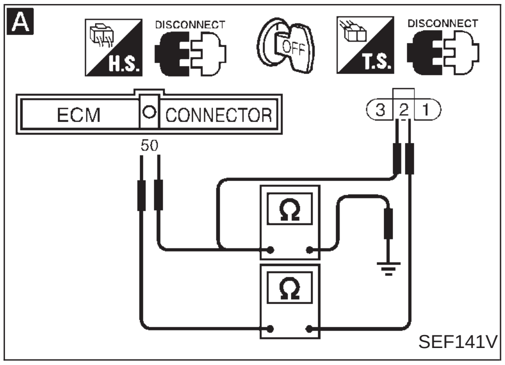
DIAGNOSTIC PROCEDURE



SEF332V



SEF331V



SEF141V

INSPECTION START

↓

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

↓

A

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (50) and terminal ②.
   Continuity should exist.
3. Check harness continuity between ECM terminal (50) (or terminal ②) and ground.
   Continuity should not exist.

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

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

↓ OK

CHECK COMPONENT
(Front heated oxygen sensor).
1. Turn ignition switch "OFF".
2. Disconnect sensor harness connector and check for water.
   Water should not exist.
   If OK, go to step 3.
3. Check front heated oxygen sensor.

Refer to "COMPONENT INSPECTION" on next page.

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

↓ OK

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

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

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

↓ OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

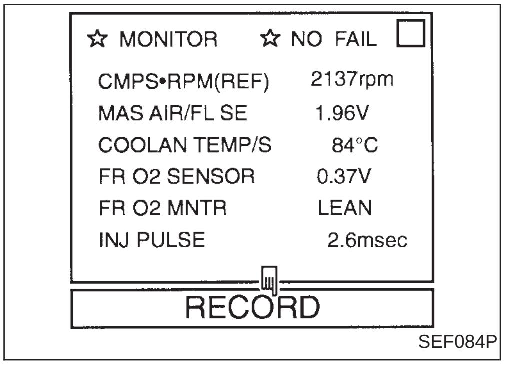
↓

INSPECTION END

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

COMPONENT INSPECTION

Front heated oxygen sensor



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	2137rpm
MAS AIR/FL SE	1.96V
COOLAN TEMP/S	84°C
FR O2 SENSOR	0.37V
FR O2 MNTR	LEAN
INJ PULSE	2.6msec

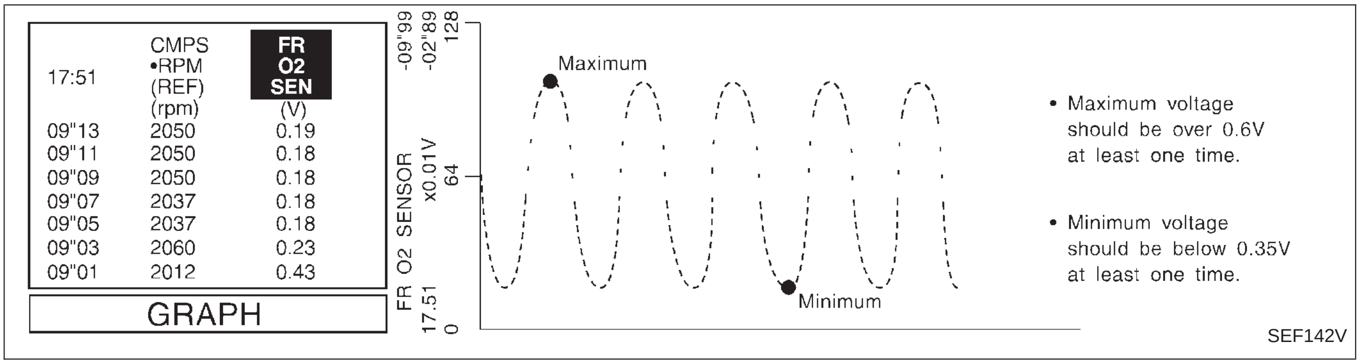
SEF084P

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

- "FR O2 MNTR" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds. 5 times (cycles) are counted as shown below:

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

  R = "FR O2 MNTR", "RICH"
  L = "FR O2 MNTR", "LEAN"
- "FR O2 SENSOR" voltage goes above 0.6V at least once.
- "FR O2 SENSOR" voltage goes below 0.35V at least once.
- "FR O2 SENSOR" voltage never exceeds 1.0V.



17:51	CMPS •RPM (REF) (rpm)	FR O2 SEN (V)
09"13	2050	0.19
09"11	2050	0.18
09"09	2050	0.18
09"07	2037	0.18
09"05	2037	0.18
09"03	2060	0.23
09"01	2012	0.43

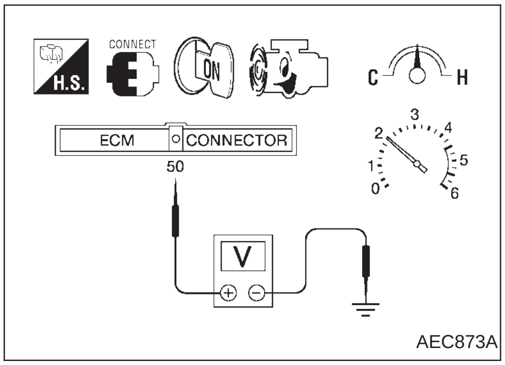
- Maximum voltage should be over 0.6V at least one time.
- Minimum voltage should be below 0.35V at least one time.

SEF142V

CAUTION:

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

OR



AEC873A

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

- Malfunction indicator lamp goes on more than 5 times within 10 seconds in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).
- The maximum voltage is over 0.6V at least one time.
- The minimum voltage is below 0.35V at least one time.

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

- The voltage never exceeds 1.0V.

CAUTION:

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

Front Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION

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

OPERATION

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 HEATER	● Engine speed: Below 3,000 rpm (All models) For 6 seconds after engine speed exceeds 3,000 rpm (4WD models only)	ON
	● Engine speed: Above 3,000 rpm (2WD models) More than 6 seconds after engine speed exceeds 3,000 rpm (4WD models)	OFF

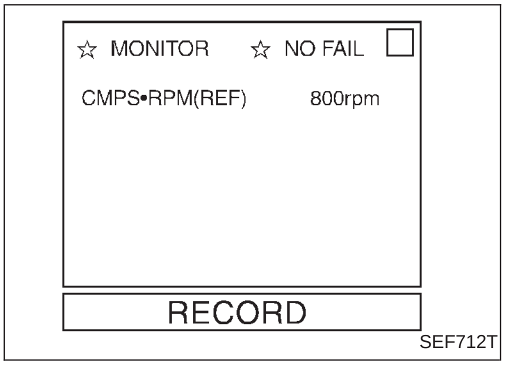
ECM TERMINALS AND REFERENCE VALUE

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

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0135 0901	● The current amperage in the front heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.)	● Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) ● Front heated oxygen sensor heater



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

RECORD

SEF712T

Front Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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

1) Turn ignition switch ''ON'' and select ''DATA MONITOR'' mode with CONSULT.
2) Start engine and run it for at least 6 seconds at idle speed.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-189.

OR

GST

1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Start engine and run it for at least 6 seconds at idle speed.
4) Select ''MODE 3'' with GST.
5) If DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-189.

OR

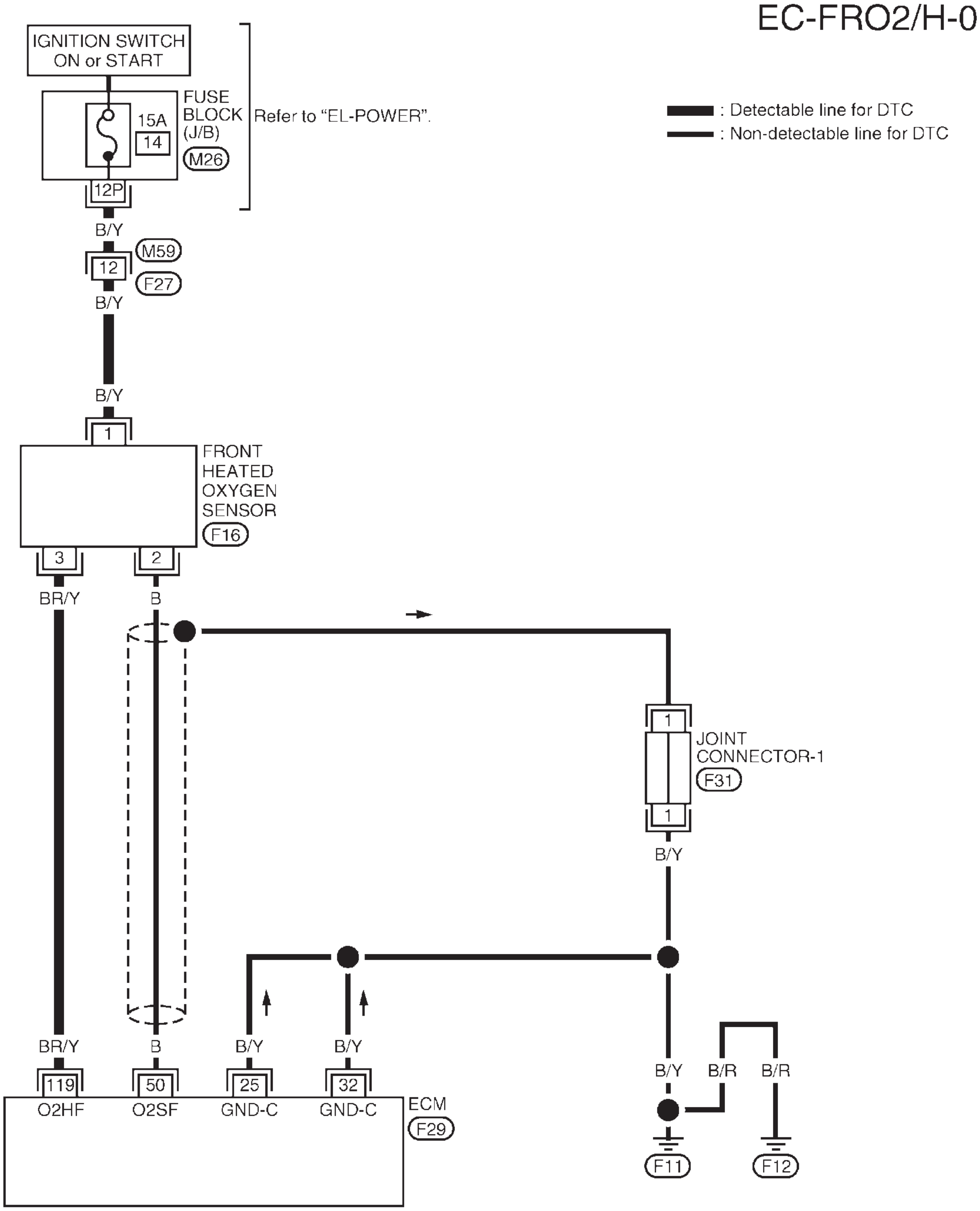
NO TOOLS

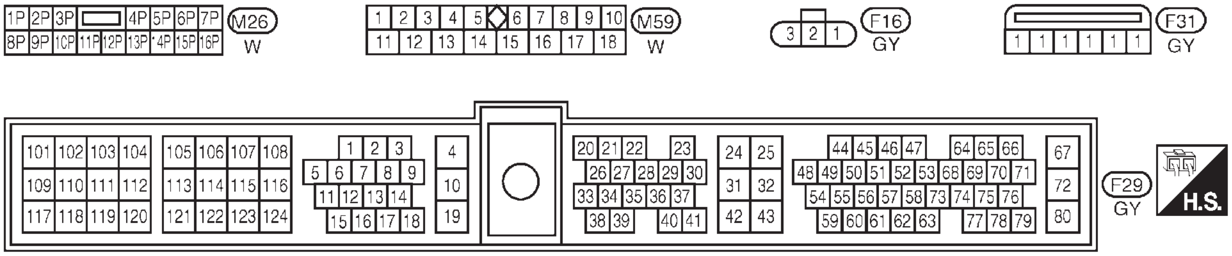
1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
3) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-189.

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

Front Heated Oxygen Sensor Heater (Cont'd)

EC-FRO2/H-01

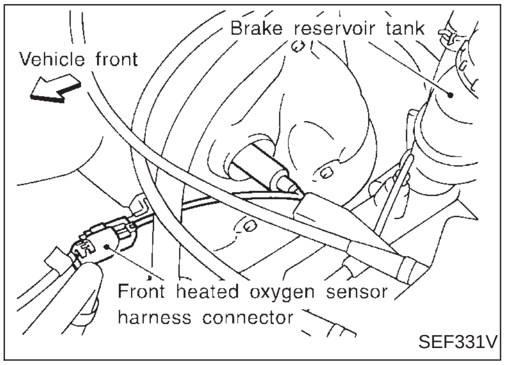




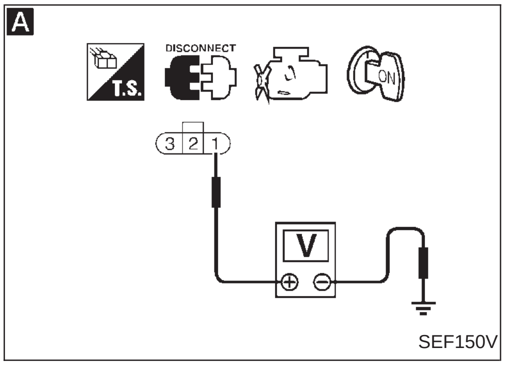
AEC859A

Front Heated Oxygen Sensor Heater (Cont'd)

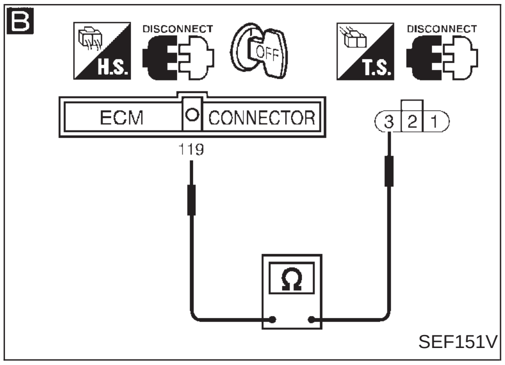
DIAGNOSTIC PROCEDURE



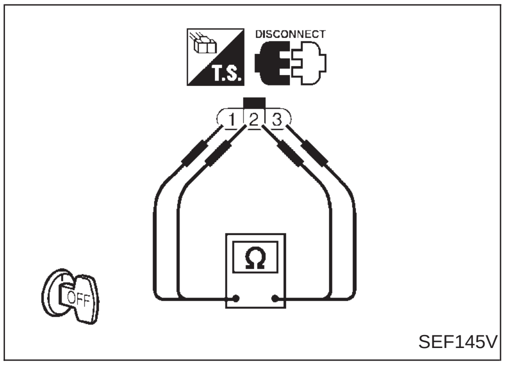
SEF331V



SEF150V



SEF151V



SEF145V

INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- 15A fuse
- Harness connectors (M59), (F27)
- Harness for open or short between front heated oxygen sensor and 15A fuse

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ③ and ECM terminal (119).
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

CHECK COMPONENT
(Front heated oxygen sensor heater).
Refer to "COMPONENT INSPECTION" below.

NG → Replace front heated oxygen sensor.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END

COMPONENT INSPECTION

Front heated oxygen sensor heater

Check resistance between terminals ③ and ①.

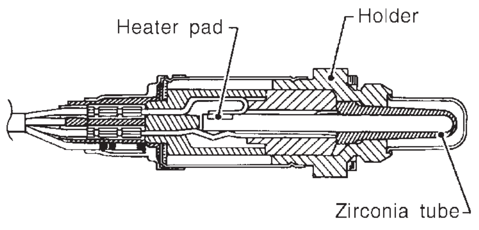
Resistance: 2.3 - 4.3Ω at 25°C (77°F)

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

Continuity should not exist.

If NG, replace the front heated oxygen sensor.

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



SEF327R

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

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

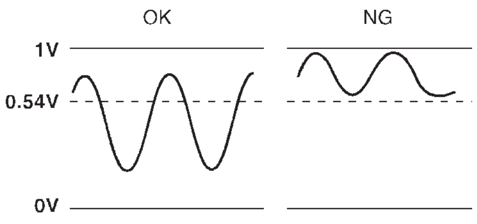
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

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

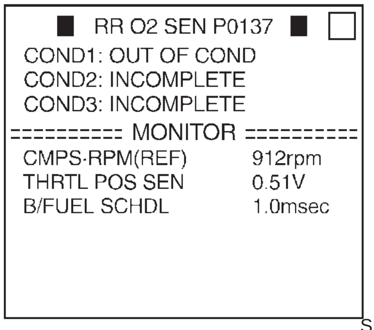


SEF304U

ON BOARD DIAGNOSIS LOGIC

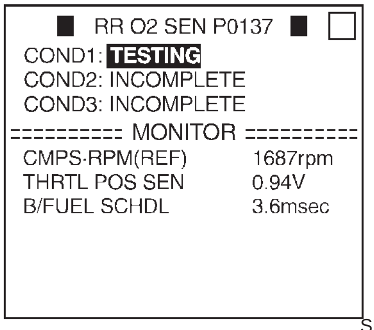
The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge malfunctions of the rear heated oxygen sensor, ECM monitors whether the minimum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

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



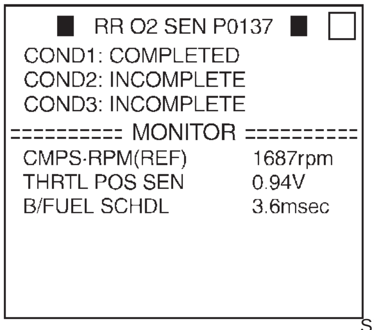
```
■ RR O2 SEN P0137 ■ ☐
COND1: OUT OF COND
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)        912rpm
THRTL POS SEN        0.51V
B/FUEL SCHDL         1.0msec
```

SEF152V



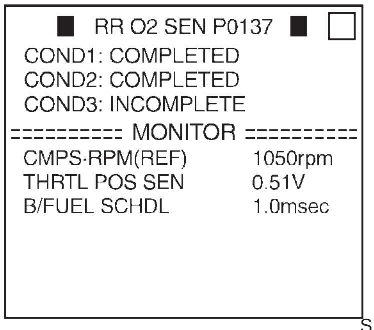
```
■ RR O2 SEN P0137 ■ ☐
COND1: TESTING
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)        1687rpm
THRTL POS SEN        0.94V
B/FUEL SCHDL         3.6msec
```

SEF153V



```
■ RR O2 SEN P0137 ■ ☐
COND1: COMPLETED
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)        1687rpm
THRTL POS SEN        0.94V
B/FUEL SCHDL         3.6msec
```

SEF154V



```
■ RR O2 SEN P0137 ■ ☐
COND1: COMPLETED
COND2: COMPLETED
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)        1050rpm
THRTL POS SEN        0.51V
B/FUEL SCHDL         1.0msec
```

SEF155V

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Never stop engine during this test. If the engine is stopped, reperform this test from step 2).

Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "RR O2 SENSOR P0137" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 10 seconds.
6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT screen, go to step 11).
   If "COMPLETED" does not appear on CONSULT screen, go to the following step.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)
   CMPS·RPM (REF): 1,200 - 3,000 rpm (A/T)
   1,400 - 3,200 rpm (M/T)
   Vehicle speed: 64 - 120 km/h (40 - 75 MPH)
   B/FUEL SCHDL: 0.5 - 4.8 msec (A/T)
   0.5 - 5.2 msec (M/T)
   Selector lever: Suitable position

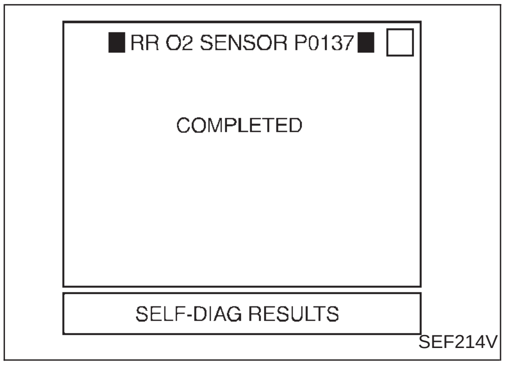
NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2).**
- **If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 9).**

Procedure for COND2

9) While driving, release accelerator pedal completely [with "O/D" OFF (A/T models only)] from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". [It will take approximately 4 seconds.]

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



SEF214V

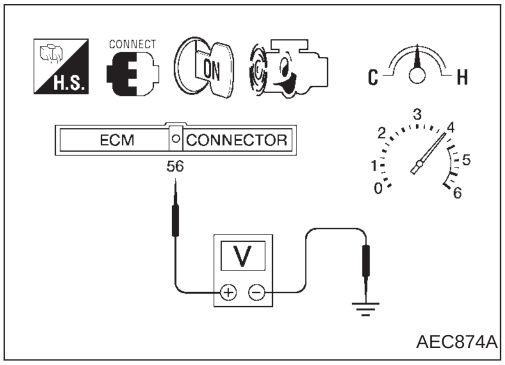
NOTE:

- **If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 10).**

Procedure for COND3

10) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
11) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-194.

OR



AEC874A

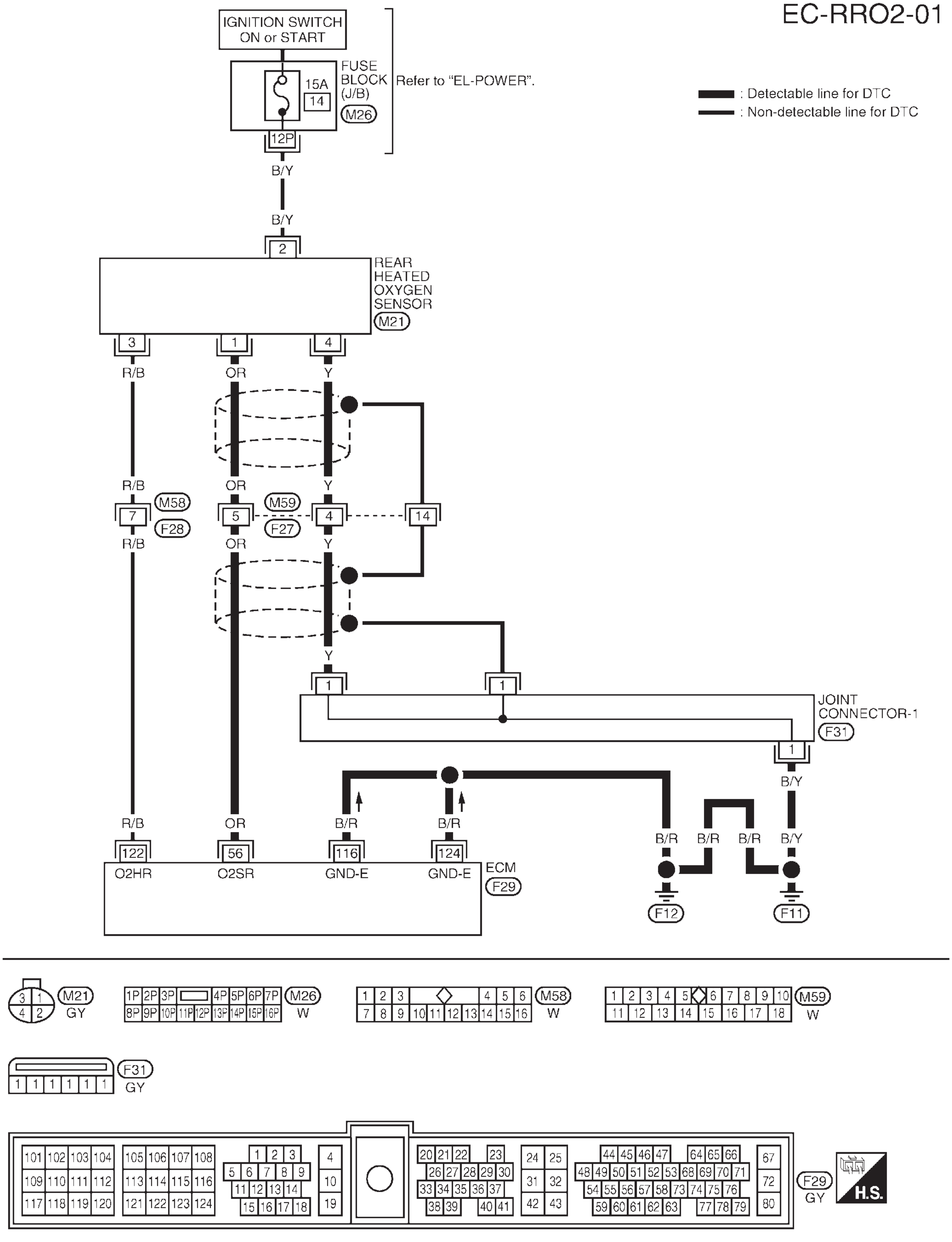
OVERALL FUNCTION CHECK

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

1) Start engine and 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 (56) (sensor signal) and ECM ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.54V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle 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 "O/D" OFF (A/T).
   The voltage should be below 0.54V at least once during this procedure.
6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-194.

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

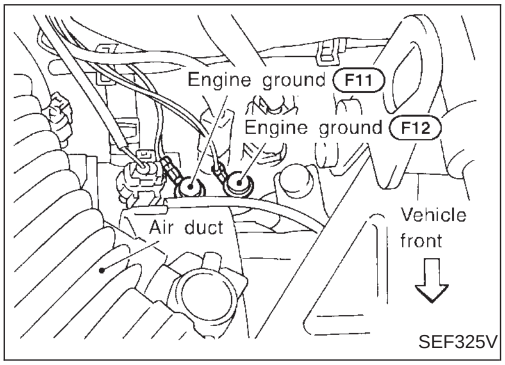
EC-RRO2-01



AEC860A

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

DIAGNOSTIC PROCEDURE



SEF325V

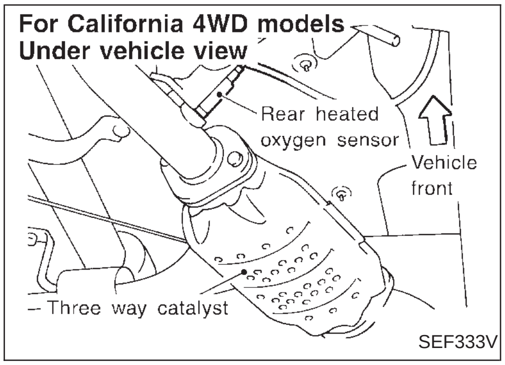
INSPECTION START

↓

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

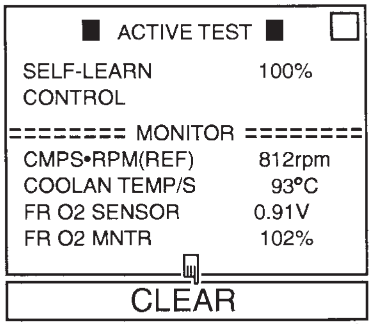
↓

A



SEF333V

A


■ ACTIVE TEST ■ ☐

SELF-LEARN CONTROL 100%

======== MONITOR ========

CMPS•RPM(REF) 812rpm

COOLAN TEMP/S 93°C

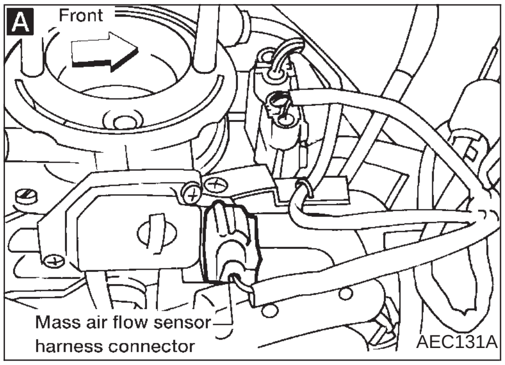
FR O2 SENSOR 0.91V

FR O2 MNTR 102%

CLEAR

SEF100P

A



AEC131A

CLEAR THE SELF-LEARNING DATA.

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

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

OR

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

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

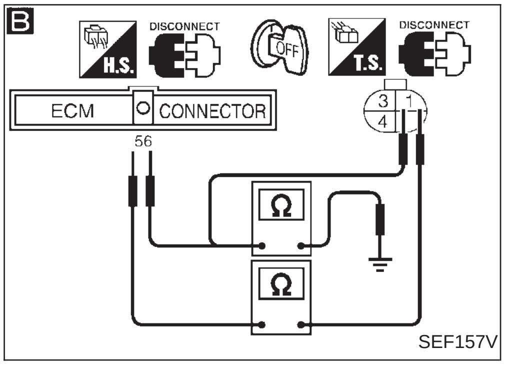
Yes → Go to ''TROUBLE DIAGNOSIS FOR DTC P0172'', EC-229.

No ↓

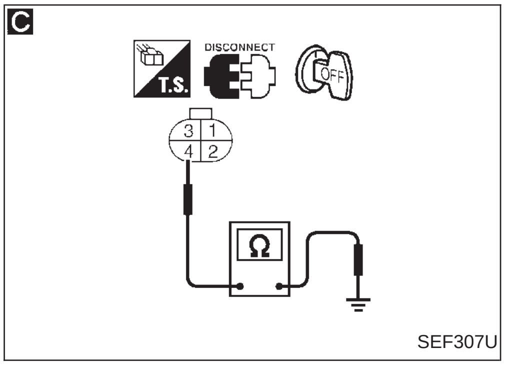
Ⓐ

(Go to next page.)

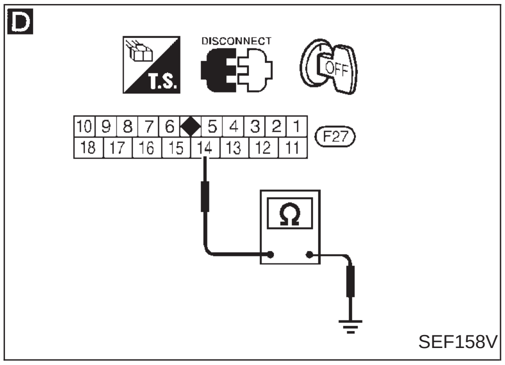
Rear Heated Oxygen Sensor (Min. Voltage Monitoring) (Rear HO2S) (Cont'd)



SEF157V



SEF307U



SEF158V

Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (56) and terminal ①.
   Continuity should exist.
3. Check harness continuity between ECM terminal (56) (or terminal ①) and ground.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors M59, F27
- Harness for open or short between rear heated oxygen sensor and ECM

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

OK

C

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ④ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between rear heated oxygen sensor and ground

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

OK

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

NG → Replace rear heated oxygen sensor.

OK

D

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect harness connector F27.
3. Check harness continuity between harness connector F27 terminal ⑭ and ground.
   Continuity should exist.
   If OK, check harness for short to power.

NG → Check the following.
- Joint connector-1
- Harness for open or short between harness connector F27 and ground

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

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

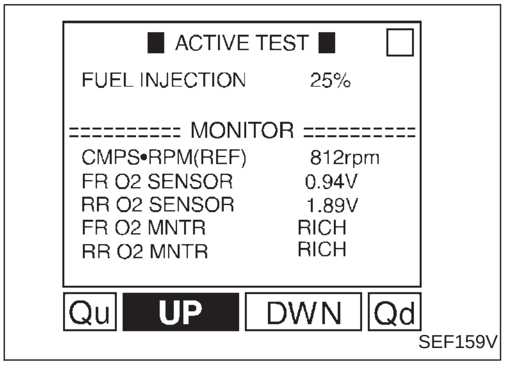
↓

INSPECTION END

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

COMPONENT INSPECTION

Rear heated oxygen sensor



■ ACTIVE TEST ■ ☐

FUEL INJECTION 25%

========== MONITOR ==========

CMPS•RPM(REF) 812rpm
FR O2 SENSOR 0.94V
RR O2 SENSOR 1.89V
FR O2 MNTR RICH
RR O2 MNTR RICH

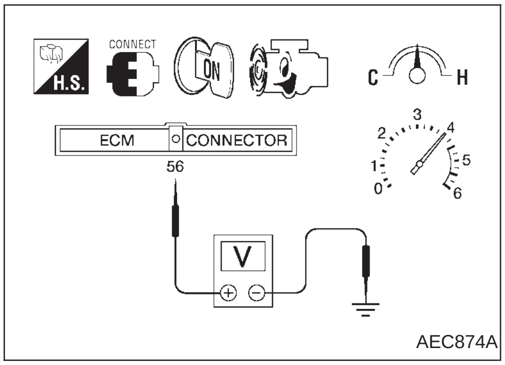
SEF159V

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 ''RR O2 SENSOR'' as the monitor item with CONSULT.
4) Check ''RR O2 SENSOR'' at idle speed when adjusting ''FUEL INJECTION'' to ±25%.
   ''RR O2 SENSOR'' should be above 0.56V at least once when the ''FUEL INJECTION'' is +25%.
   ''RR O2 SENSOR'' should be below 0.54V at least once when the ''FUEL INJECTION'' is −25%.

CAUTION:

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

OR



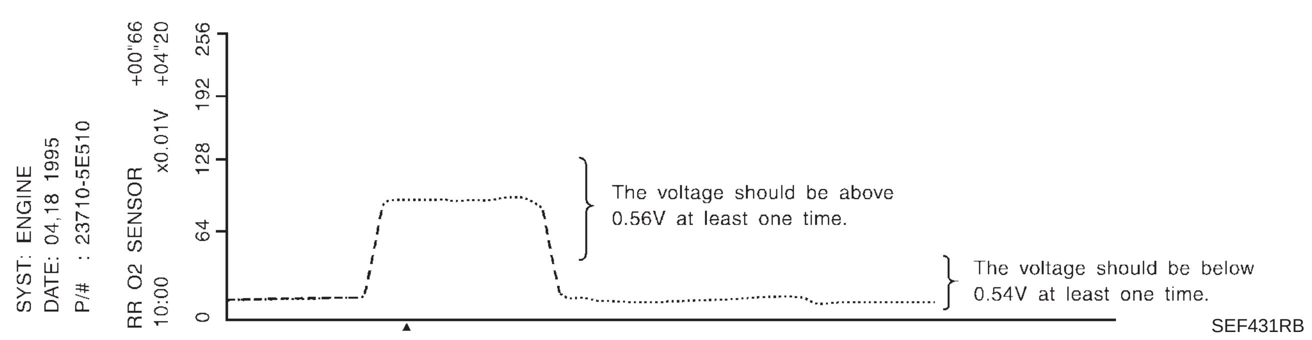
AEC874A

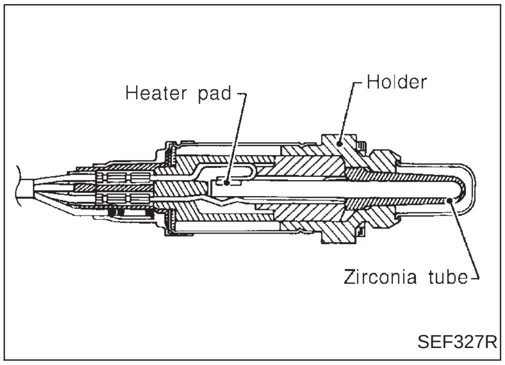
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal (56) (sensor signal) and ECM ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 5,000 rpm under no load. Or keep vehicle 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 ''O/D'' OFF (A/T).
   The voltage should be below 0.54V at least once.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43987-12 and approved anti-seize lubricant.**

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





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

COMPONENT DESCRIPTION

The rear heated oxygen sensor (rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

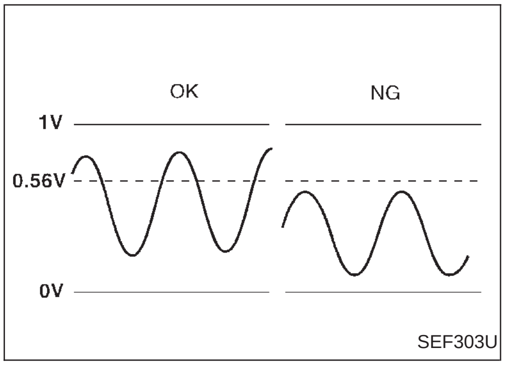
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

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

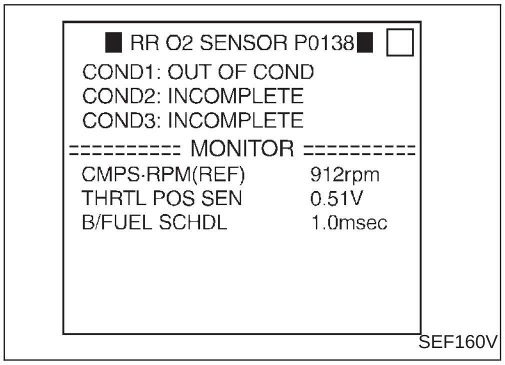


ON BOARD DIAGNOSIS LOGIC

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

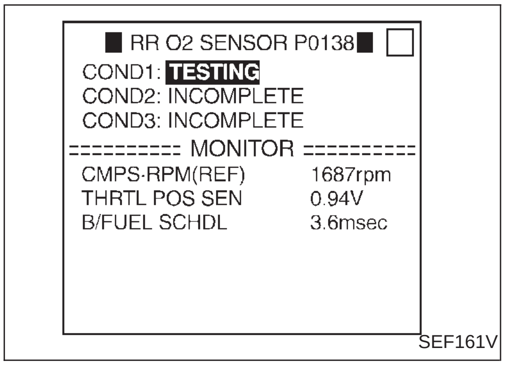
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0138 0510	● The maximum voltage from the sensor has not reached the specified voltage.	● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

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



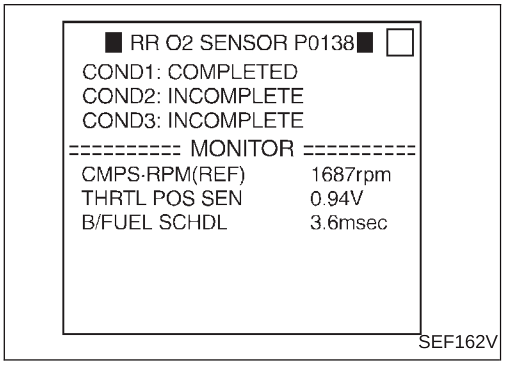
```
■ RR O2 SENSOR P0138■ ☐
COND1: OUT OF COND
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)      912rpm
THRTL POS SEN      0.51V
B/FUEL SCHDL       1.0msec
```

SEF160V



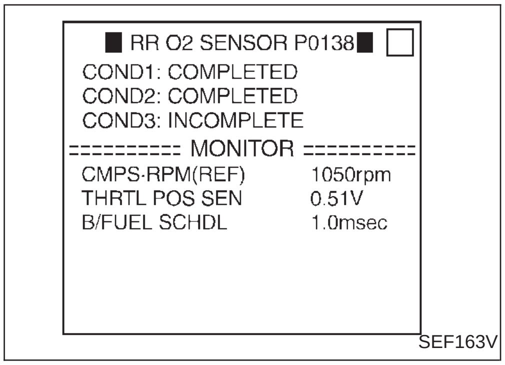
```
■ RR O2 SENSOR P0138■ ☐
COND1: TESTING
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)      1687rpm
THRTL POS SEN      0.94V
B/FUEL SCHDL       3.6msec
```

SEF161V



```
■ RR O2 SENSOR P0138■ ☐
COND1: COMPLETED
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)      1687rpm
THRTL POS SEN      0.94V
B/FUEL SCHDL       3.6msec
```

SEF162V



```
■ RR O2 SENSOR P0138■ ☐
COND1: COMPLETED
COND2: COMPLETED
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)      1050rpm
THRTL POS SEN      0.51V
B/FUEL SCHDL       1.0msec
```

SEF163V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Never stop engine during this test. If the engine is stopped, reperform this test from step 2).

Procedure for COND1

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "RR O2 SENSOR P0138" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 10 seconds.
6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT screen, go to step 11).
   If "COMPLETED" does not appear on CONSULT screen, go to the following step.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)
   CMPS·RPM (REF): 1,200 - 3,000 rpm (A/T)
   1,400 - 3,200 rpm (M/T)
   Vehicle speed: 64 - 120 km/h (40 - 75 MPH)
   B/FUEL SCHDL: 0.5 - 4.8 msec (A/T)
   0.5 - 5.2 msec (M/T)
   Selector lever: Suitable position

NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2).**
- **If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 9).**

Procedure for COND2

9) While driving, release accelerator pedal completely [with "O/D" OFF (A/T models only)] from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT screen is turned to "COMPLETED". [It will take approximately 4 seconds.]

GI
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FE
CL
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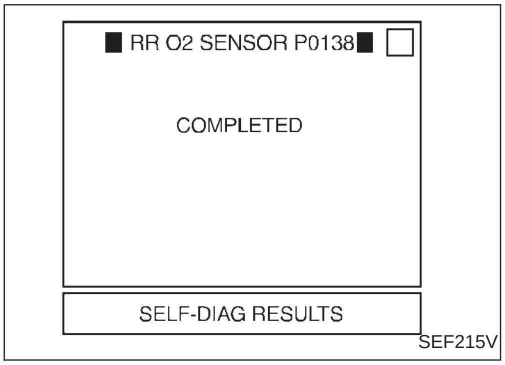
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX

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



RR O2 SENSOR P0138

COMPLETED

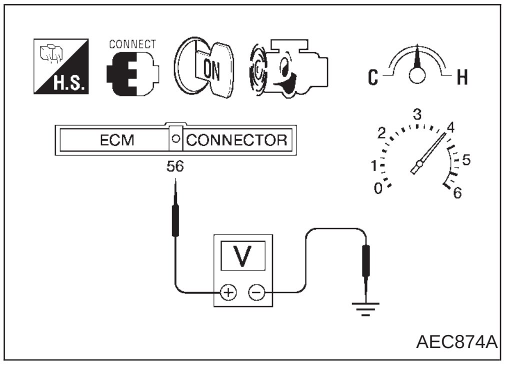
SEF215V

NOTE:

- **If "COMPLETED" already appears at "COND3" on CONSULT screen before "Procedure for COND3" is conducted, it is unnecessary to conduct step 10).**

Procedure for COND3

10) Stop vehicle and let it idle until "INCOMPLETE" of "COND3" on CONSULT screen has turned to "COMPLETED". (It will take a maximum of approximately 6 minutes.)
11) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS".
    If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-202.



AEC874A

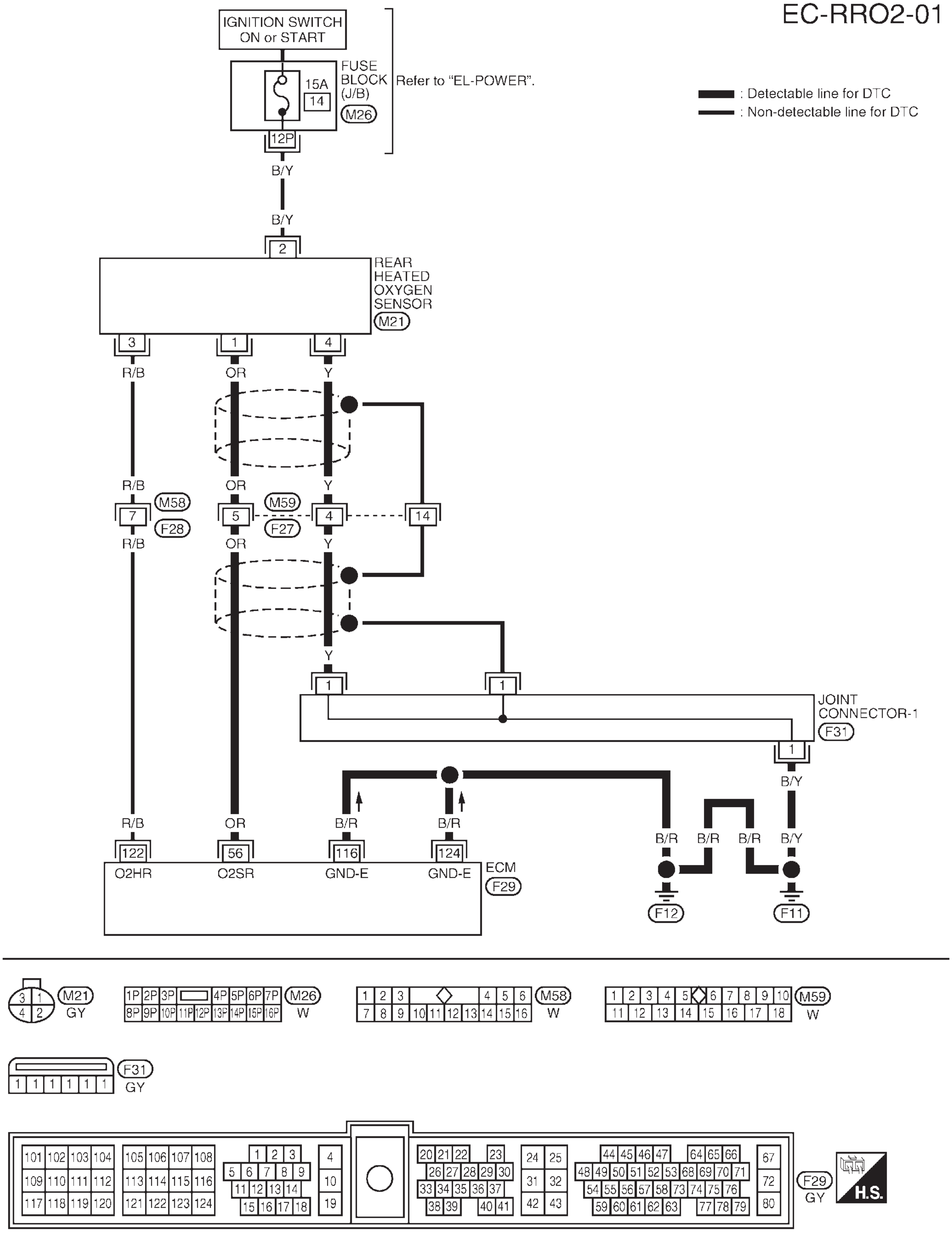
OR

OVERALL FUNCTION CHECK

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

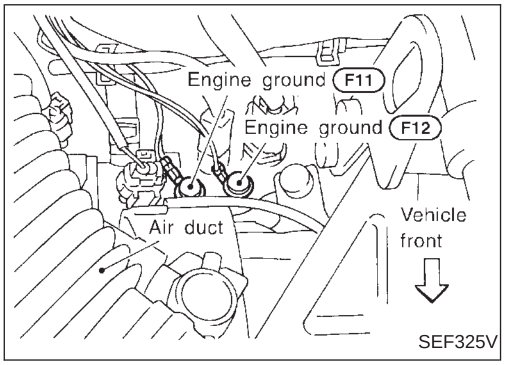
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal (56) (sensor signal) and ECM ground.
4) Check the voltage when revving engine up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.56V at least once during this procedure.
   If the voltage can be confirmed in step 4, step 5 is not necessary.
5) Keep vehicle 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 "O/D" OFF (A/T).
   The voltage should be above 0.56V at least once during this procedure.
6) If NG, go to "DIAGNOSTIC PROCEDURE", EC-202.

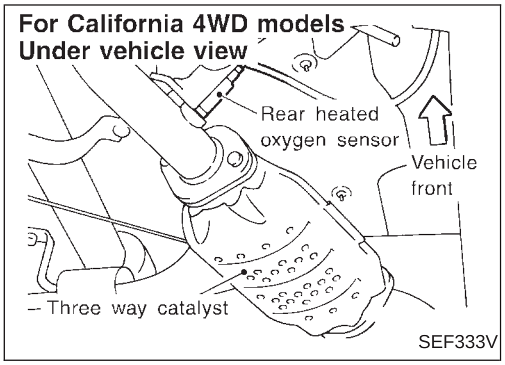
Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)

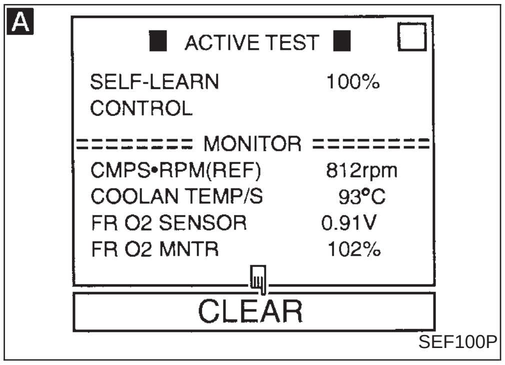


AEC860A

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



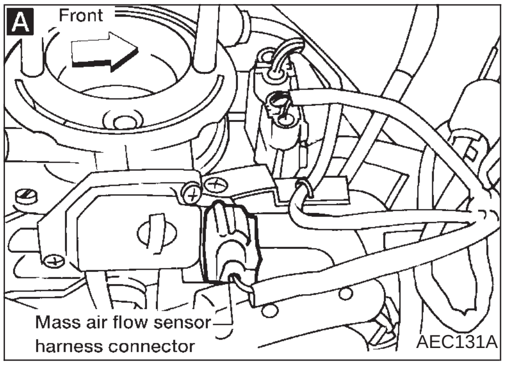




■ ACTIVE TEST ■

SELF-LEARN CONTROL	100%
======== MONITOR ========	
CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	93°C
FR O2 SENSOR	0.91V
FR O2 MNTR	102%

CLEAR



DIAGNOSTIC PROCEDURE

INSPECTION START

↓

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

↓

A

CLEAR THE SELF-LEARNING DATA

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

Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

OR

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

Is the 1st trip DTC 0115 detected? Is it difficult to start engine?

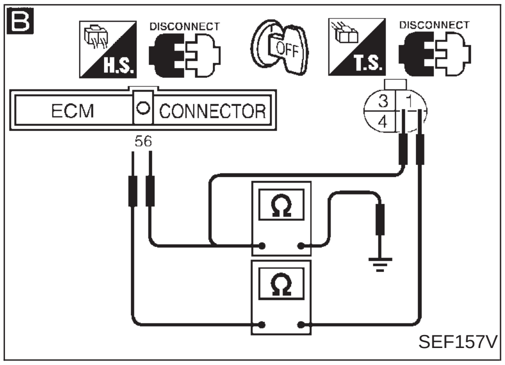
Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171", EC-224.

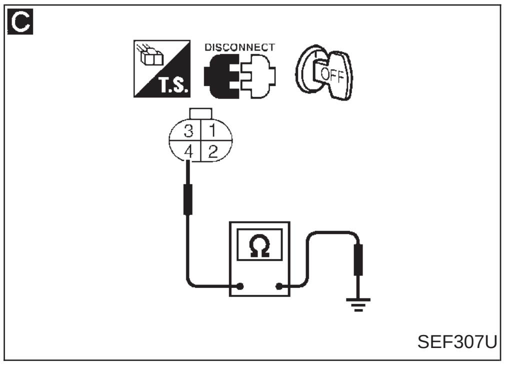
↓ No

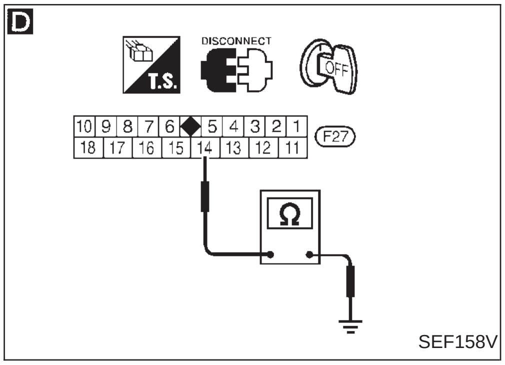
Ⓐ

(Go to next page.)

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







Ⓐ

B

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (56) and terminal ①.
   Continuity should exist.
3. Check harness continuity between ECM terminal (56) (or terminal ①) and ground.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- ● Harness connectors M59, F27
- ● Harness for open or short between rear heated oxygen sensor and ECM

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

OK

C

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ④ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.
- ● Harness connectors M59, F27
- ● Joint connector-1
- ● Harness for open or short between rear heated oxygen sensor and ground

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

OK

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

NG → Replace rear heated oxygen sensor.

OK

D

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect harness connector F27.
3. Check harness continuity between harness connector F27 terminal ⑭ and ground.
   Continuity should exist.
   If OK, check harness for short to power.

NG → Check the following.
- ● Joint connector-1
- ● Harness for open or short between harness connector F27 and ground

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

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

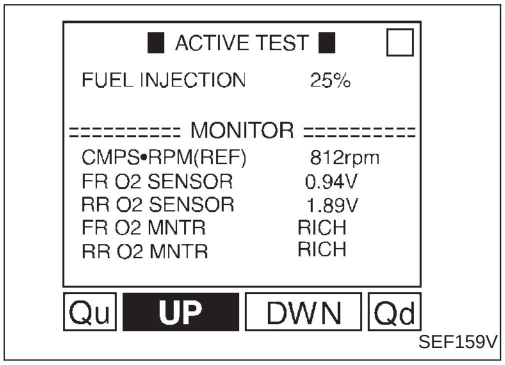
↓

INSPECTION END

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

COMPONENT INSPECTION

Rear heated oxygen sensor



■ ACTIVE TEST ■ ☐

FUEL INJECTION 25%

========== MONITOR ==========

CMPS•RPM(REF) 812rpm

FR O2 SENSOR 0.94V

RR O2 SENSOR 1.89V

FR O2 MNTR RICH

RR O2 MNTR RICH

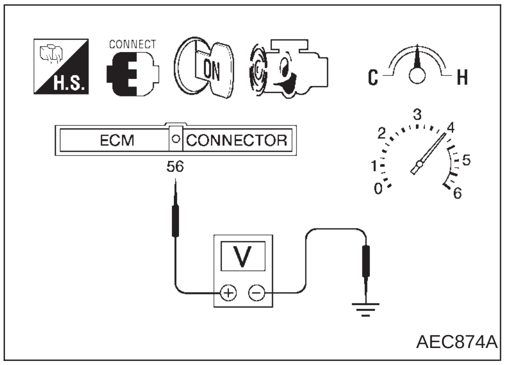
SEF159V

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 "RR O2 SENSOR" as the monitor item with CONSULT.
4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
   "RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

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

OR



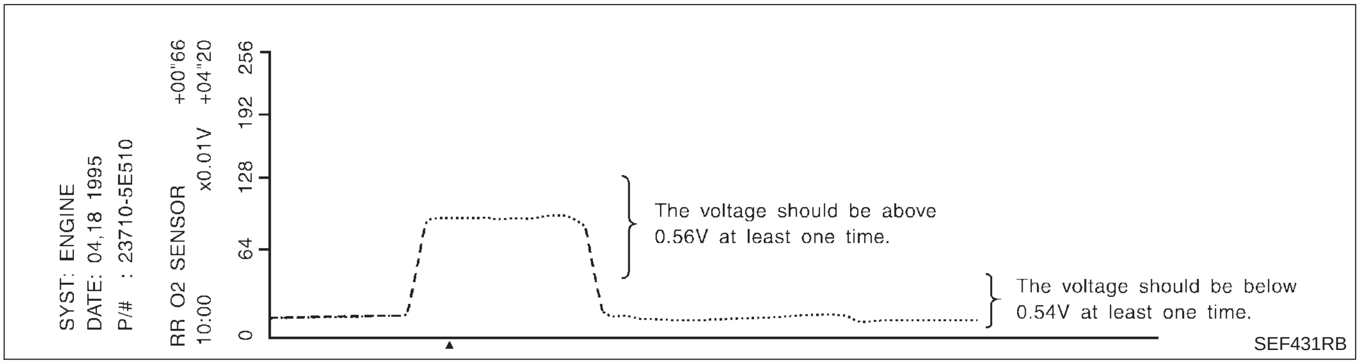
AEC874A

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 (56) (sensor signal) and ECM 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 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 5,000 rpm under no load. Or keep vehicle 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 "O/D" OFF (A/T).
   The voltage should be below 0.54V at least once.

CAUTION:

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

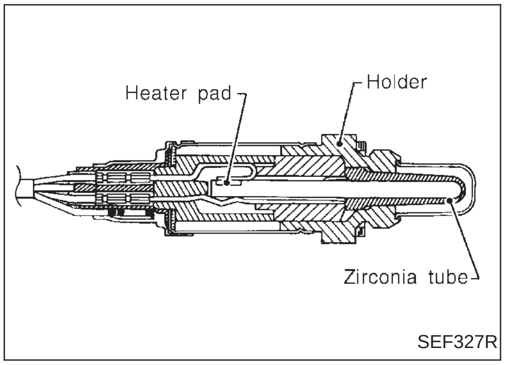
Rear Heated Oxygen Sensor (Max. Voltage Monitoring) (Rear HO2S) (Cont'd)



The voltage should be above 0.56V at least one time.

The voltage should be below 0.54V at least one time.

SEF431RB



SEF327R

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

COMPONENT DESCRIPTION

The rear heated oxygen sensor (rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

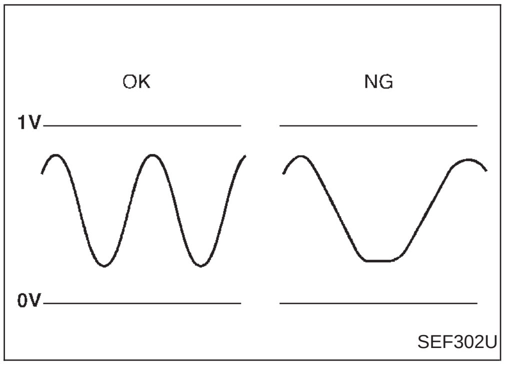
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

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



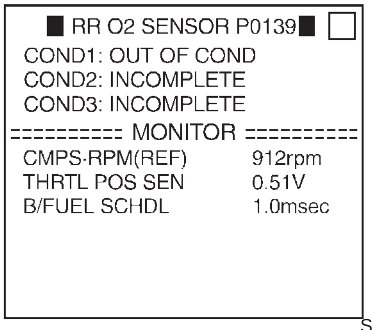
SEF302U

ON BOARD DIAGNOSIS LOGIC

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

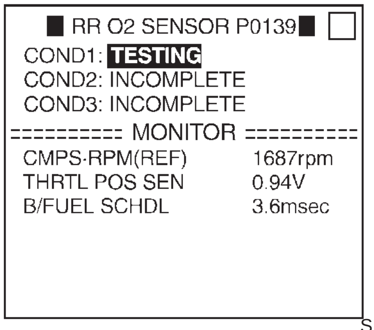
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0139 0707	● It takes more time for the sensor to respond between rich and lean than the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

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



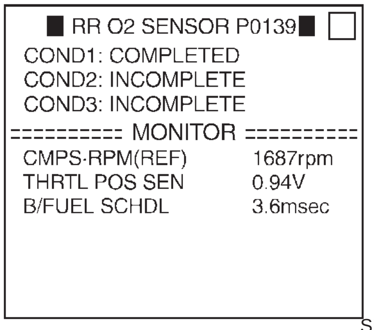
```
■ RR O2 SENSOR P0139■ ☐
COND1: OUT OF COND
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)       912rpm
THRTL POS SEN       0.51V
B/FUEL SCHDL        1.0msec
```

SEF164V



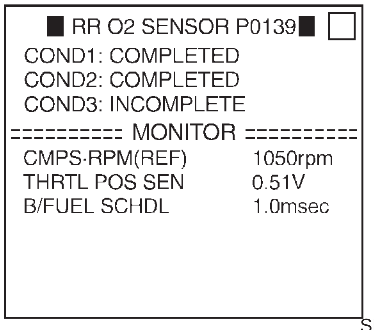
```
■ RR O2 SENSOR P0139■ ☐
COND1: TESTING
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)       1687rpm
THRTL POS SEN       0.94V
B/FUEL SCHDL        3.6msec
```

SEF165V



```
■ RR O2 SENSOR P0139■ ☐
COND1: COMPLETED
COND2: INCOMPLETE
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)       1687rpm
THRTL POS SEN       0.94V
B/FUEL SCHDL        3.6msec
```

SEF166V



```
■ RR O2 SENSOR P0139■ ☐
COND1: COMPLETED
COND2: COMPLETED
COND3: INCOMPLETE
========== MONITOR ==========
CMPS·RPM(REF)       1050rpm
THRTL POS SEN       0.51V
B/FUEL SCHDL        1.0msec
```

SEF167V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Never stop engine during this test. If the engine is stopped, reperform this test from step 2).

Procedure for COND1

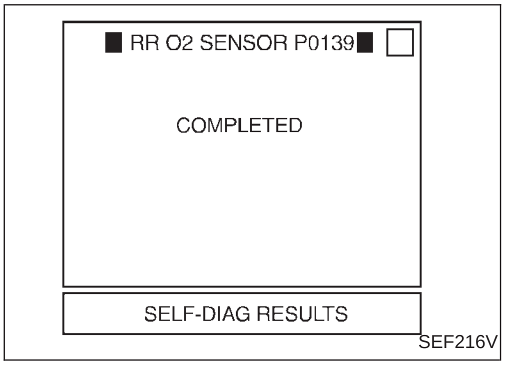
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "RR O2 SENSOR P0139" of "REAR O2 SENSOR" in "DTC WORK SUPPORT" mode with CONSULT.
4) Touch "START".
5) Start engine and let it idle for at least 10 seconds.
6) Rev engine up to 2,000 rpm 2 or 3 times quickly under no load.
   If "COMPLETED" appears on CONSULT screen, go to step 11).
   If "COMPLETED" does not appear on CONSULT screen, go to the following step.
7) Drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
8) When the following conditions are met, "TESTING" will be displayed at "COND1" on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take approximately 60 seconds.)
   CMPS·RPM (REF): 1,200 - 3,000 rpm (A/T)
   1,400 - 3,200 rpm (M/T)
   Vehicle speed: 64 - 120 km/h (40 - 75 MPH)
   B/FUEL SCHDL: 0.5 - 4.8 msec (A/T)
   0.5 - 5.2 msec (M/T)
   Selector lever: Suitable position

NOTE:

- **If "TESTING" is not displayed after 5 minutes, retry from step 2).**
- **If "COMPLETED" already appears at "COND2" on CONSULT screen before "Procedure for COND2" is conducted, it is unnecessary to conduct step 9).**

Procedure for COND2

9) While driving, release accelerator pedal completely [with "O/D" OFF (A/T models only)] from the above condition [step 8] until "INCOMPLETE" at "COND2" on CONSULT screen has turned to "COMPLETED". [It will take approximately 4 seconds.]



■ RR O2 SENSOR P0139■ ☐

COMPLETED

SELF-DIAG RESULTS

SEF216V

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

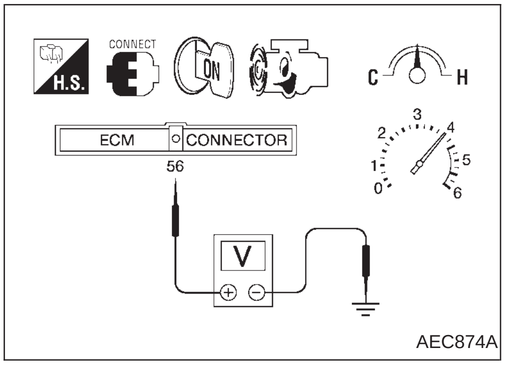
NOTE:

- **If "COMPLETED'' already appears at "COND3'' on CONSULT screen before "Procedure for COND3'' is conducted, it is unnecessary to conduct step 10).**

Procedure for COND3

10) Stop vehicle and let it idle until ''INCOMPLETE'' of "COND3'' on CONSULT screen has turned to "COMPLETED''. (It will take a maximum of approximately 6 minutes.)
11) Make sure that ''OK'' is displayed after touching ''SELF-DIAG RESULTS''.
    If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE'', EC-210.

OR



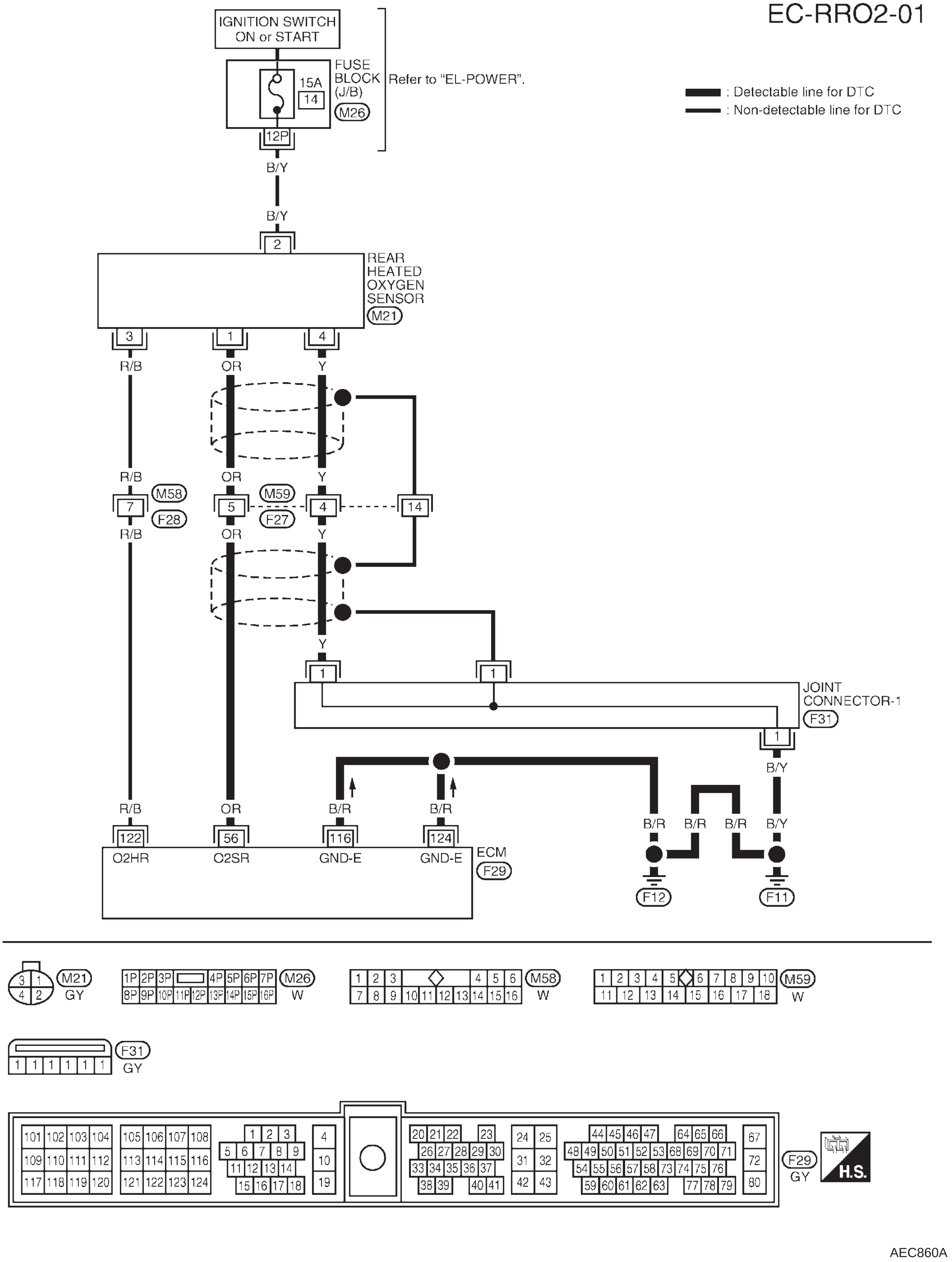
AEC874A

OVERALL FUNCTION CHECK

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

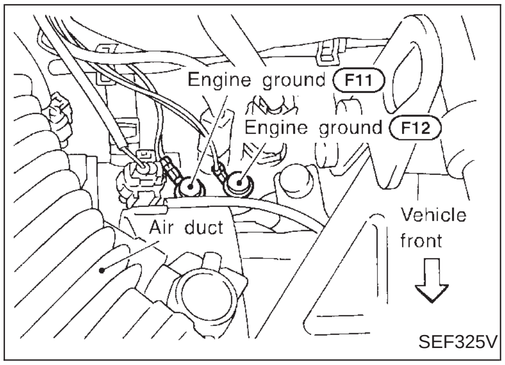
1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Stop vehicle with engine running.
3) Set voltmeter probes between ECM terminal ㊻(sensor signal) and ECM ground.
4) Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should 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 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 "O/D'' 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-210.

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

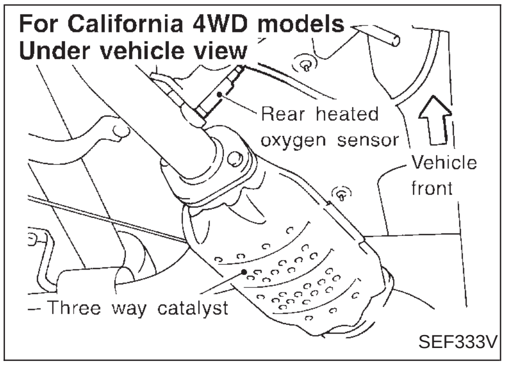


Rear Heated Oxygen Sensor (Response Monitoring) (Rear HO2S) (Cont'd)

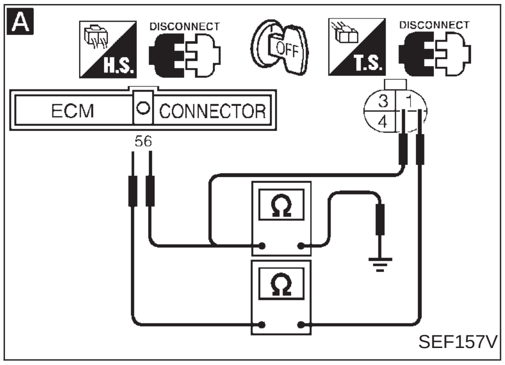
DIAGNOSTIC PROCEDURE



SEF325V



SEF333V



SEF157V

INSPECTION START

↓

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

↓

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

OR

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

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171", EC-224 or "TROUBLE DIAGNOSIS FOR DTC P0172", EC-229.

↓ No

A

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (56) and terminal ①.
   Continuity should exist.
3. Check harness continuity between ECM terminal (56) (or terminal ①) and ground.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

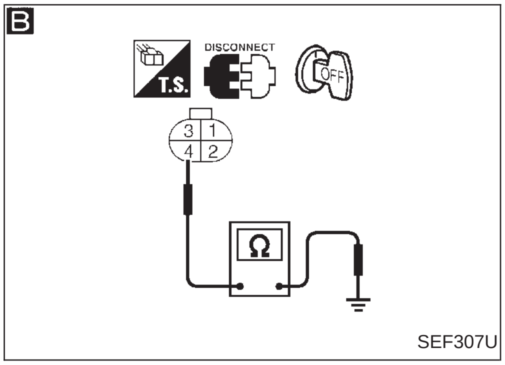
NG → Check the following.
- Harness connectors M59, F27
- Harness for open or short between rear heated oxygen sensor and ECM

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

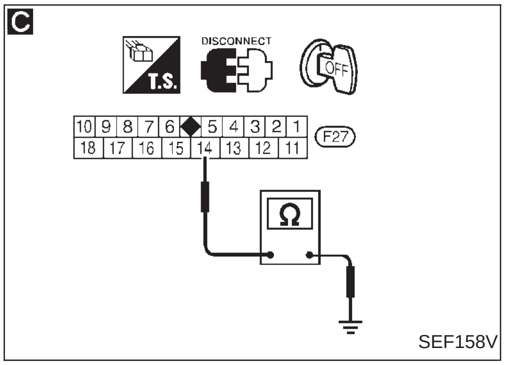
↓ OK

Ⓐ
(Go to next page.)

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



SEF307U



SEF158V

Ⓐ

↓

B

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ④ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between rear heated oxygen sensor and ground

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

OK ↓

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

NG → Replace rear heated oxygen sensor.

OK ↓

C

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect harness connector F27.
3. Check harness continuity between harness connector F27 terminal ⑭ and ground.
   Continuity should exist.
   If OK, check harness for short to power.

NG → Check the following.
- Joint connector-1
- Harness for open or short between harness connector F27 and ground

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

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

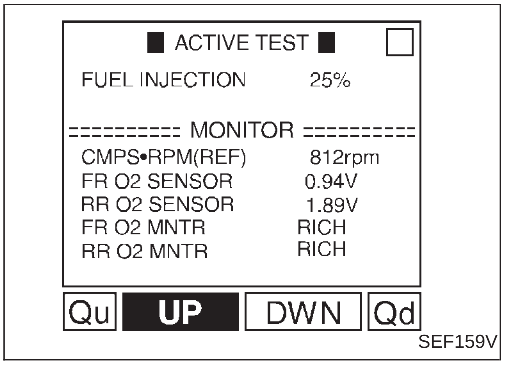
↓

INSPECTION END

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

COMPONENT INSPECTION

Rear heated oxygen sensor



■ ACTIVE TEST ■ ☐

FUEL INJECTION 25%

========== MONITOR ==========

CMPS•RPM(REF)	812rpm
FR O2 SENSOR	0.94V
RR O2 SENSOR	1.89V
FR O2 MNTR	RICH
RR O2 MNTR	RICH

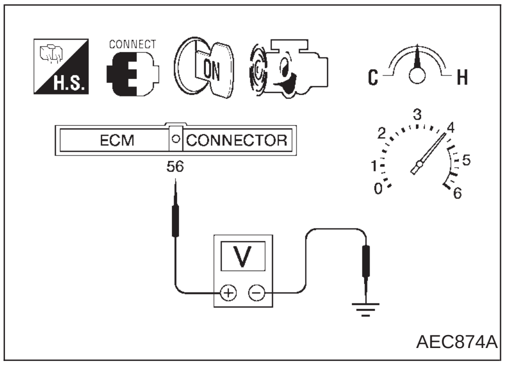
SEF159V

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 "RR O2 SENSOR" as the monitor item with CONSULT.
4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
   "RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

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

OR

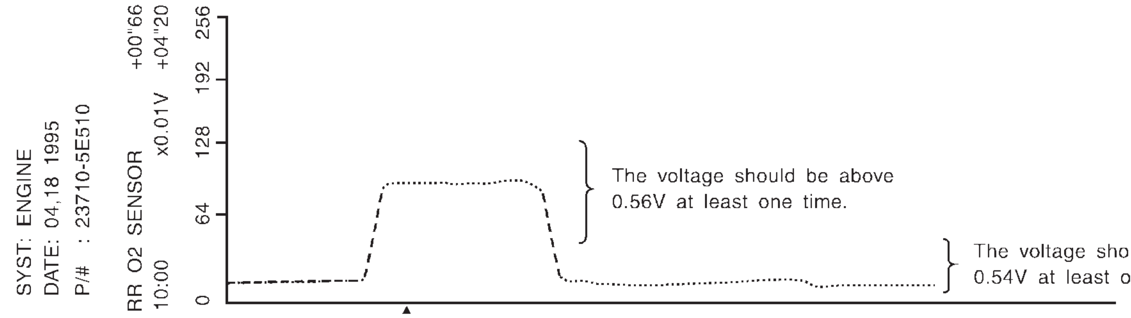


AEC874A

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 (56) (sensor signal) and ECM 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 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 5,000 rpm under no load. Or keep vehicle 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 "O/D" OFF (A/T).
   The voltage should be below 0.54V at least once.

CAUTION:

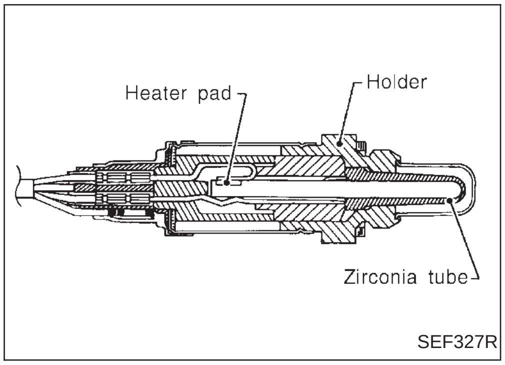
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool J-43897-18 or J-43897-12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



The voltage should be above 0.56V at least one time.

The voltage should be below 0.54V at least one time.

SEF431RB



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

COMPONENT DESCRIPTION

The rear heated oxygen sensor (rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

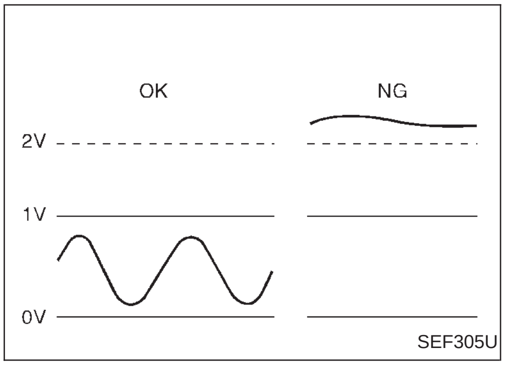
Specification data are reference values.

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

ECM TERMINALS AND REFERENCE VALUE

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

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

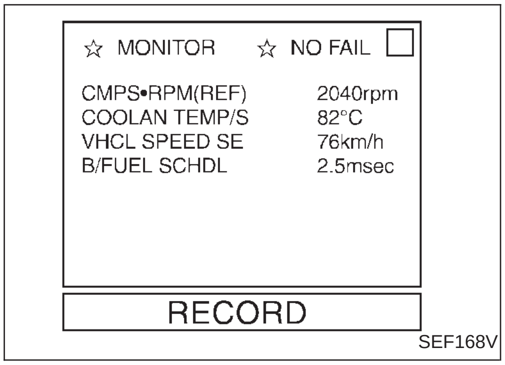


ON BOARD DIAGNOSIS LOGIC

The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge malfunctions of the rear heated oxygen sensor, ECM monitors whether or not the voltage is too high during various driving conditions such as fuel-cut.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0140 0512	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Rear heated oxygen sensor

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

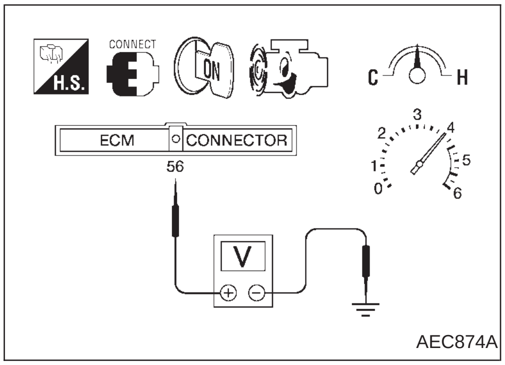


☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	2040rpm
COOLAN TEMP/S	82°C
VHCL SPEED SE	76km/h
B/FUEL SCHDL	2.5msec

RECORD

SEF168V



AEC874A

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) Maintain the following conditions at least 5 consecutive seconds.
   CMPS·RPM (REF): 1,200 - 3,000 rpm (A/T)
   1,400 - 3,200 rpm (M/T)
   VHCL SPEED SE: 64 - 120 km/h (40 - 75 MPH)
   B/FUEL SCHDL: 0.5 - 4.8 msec (A/T)
   0.5 - 5.2 msec (M/T)
   COOLAN TEMP/S: 70 - 100°C (158 - 212°F)
   Selector lever: Suitable position
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-217.

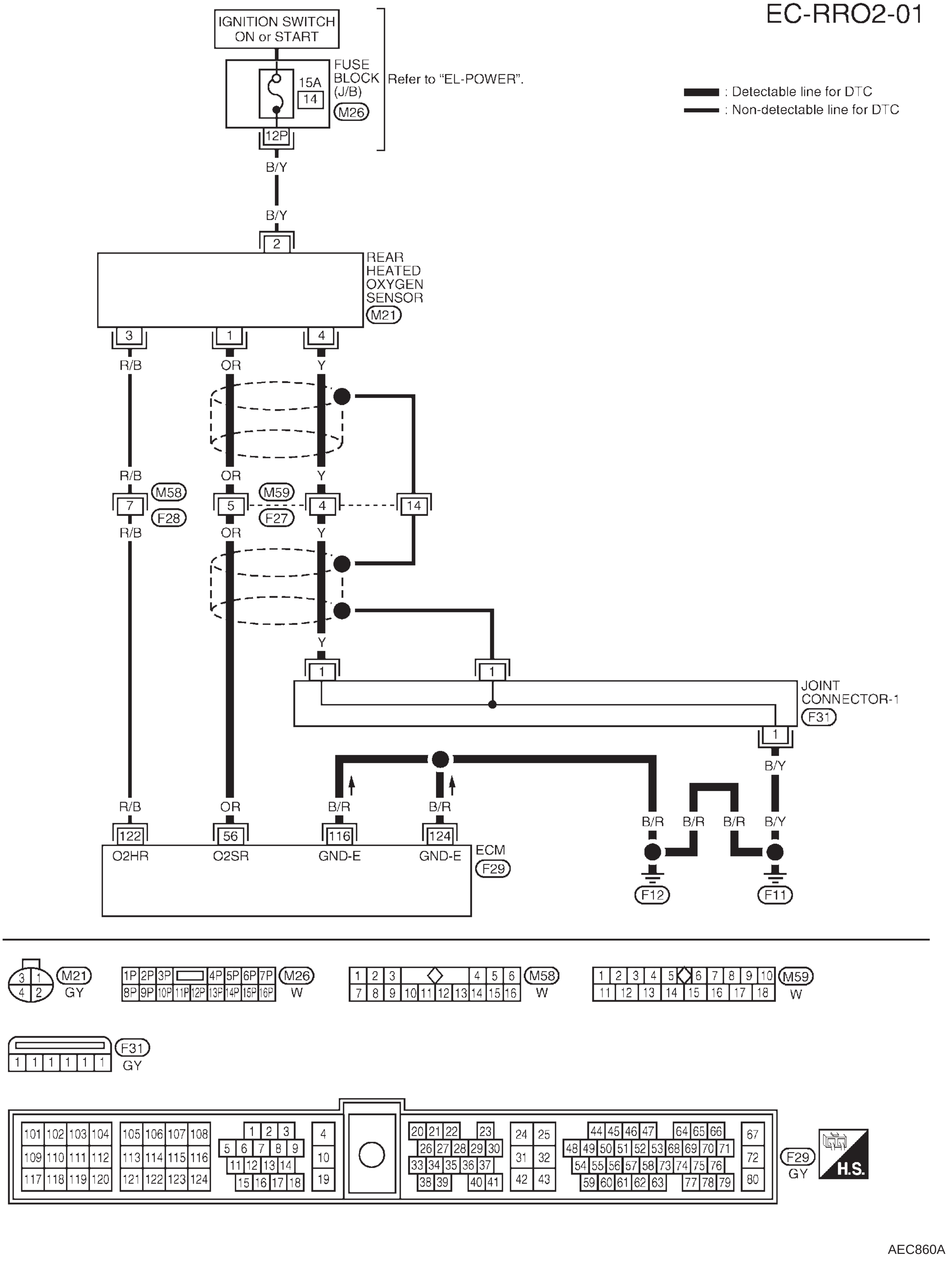
OR

OVERALL FUNCTION CHECK

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

1) Start engine and 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 (56) (sensor signal) and ECM ground.
4) Check the voltage after revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 2V during this procedure.
5) If NG, go to "DIAGNOSTIC PROCEDURE", EC-217.

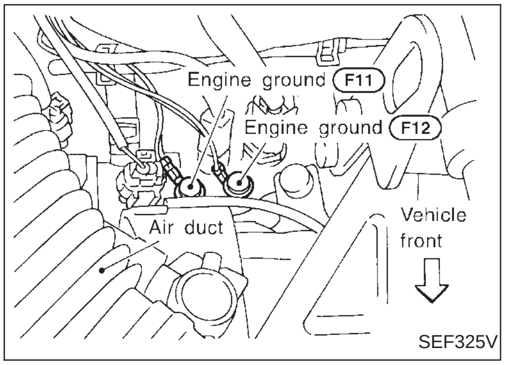
Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont'd)



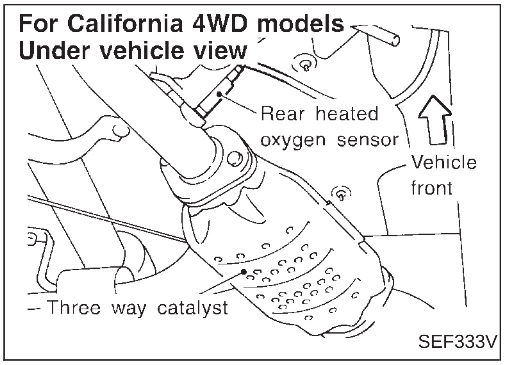
AEC860A

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

DIAGNOSTIC PROCEDURE



SEF325V



SEF333V

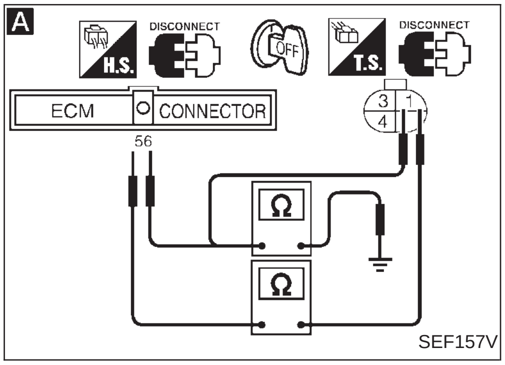
INSPECTION START

↓

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

↓

A



SEF157V

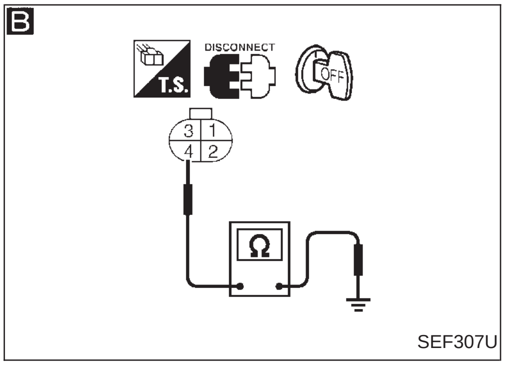
CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal (56) and terminal ①.
   Continuity should exist.
3. Check harness continuity between ECM terminal (56) (or terminal ①) and ground.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors M59, F27
- Harness for open or short between rear heated oxygen sensor and ECM

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

↓ OK

B



SEF307U

CHECK GROUND CIRCUIT.
Check harness continuity between terminal ④ and engine ground.
Continuity should exist.
If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors M59, F27
- Joint connector-1
- Harness for open or short between rear heated oxygen sensor and ground

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

↓ OK

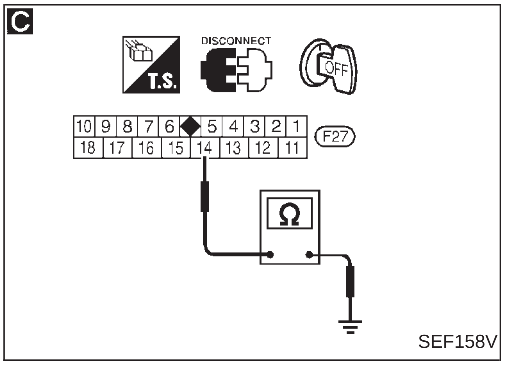
CHECK COMPONENT
(Rear heated oxygen sensor).
1. Turn ignition switch "OFF".
2. Disconnect sensor harness connector and check for water.
   Water should not exist.
   If OK, go to step 3.
3. Check rear heated oxygen sensor.

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace rear heated oxygen sensor.

↓ OK

C



SEF158V

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect harness connector F27.
3. Check harness continuity between harness connector F27 terminal ⑭ and ground.
   Continuity should exist.
   If OK, check harness for short to power.

NG → Check the following.
- Joint connector-1
- Harness for open or short between harness connector F27 and ground

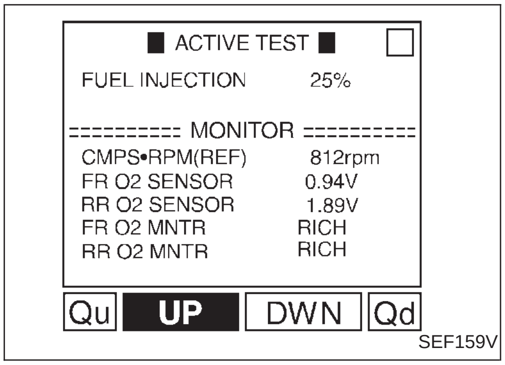
If NG, repair open circuit or short to power in harness or connectors.

↓ OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END



ACTIVE TEST

FUEL INJECTION 25%

MONITOR

CMPS•RPM(REF) 812rpm

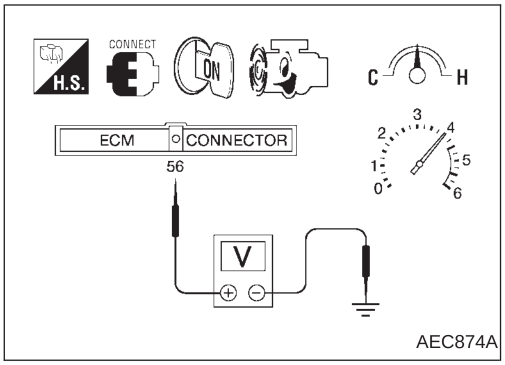
FR O2 SENSOR 0.94V

RR O2 SENSOR 1.89V

FR O2 MNTR RICH

RR O2 MNTR RICH

SEF159V



AEC874A

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

COMPONENT INSPECTION

Rear heated oxygen sensor

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 "RR O2 SENSOR" as the monitor item with CONSULT.
4) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to ±25%.
   "RR O2 SENSOR" should be above 0.56V at least once when the "FUEL INJECTION" is +25%.
   "RR O2 SENSOR" should be below 0.54V at least once when the "FUEL INJECTION" is −25%.

CAUTION:

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

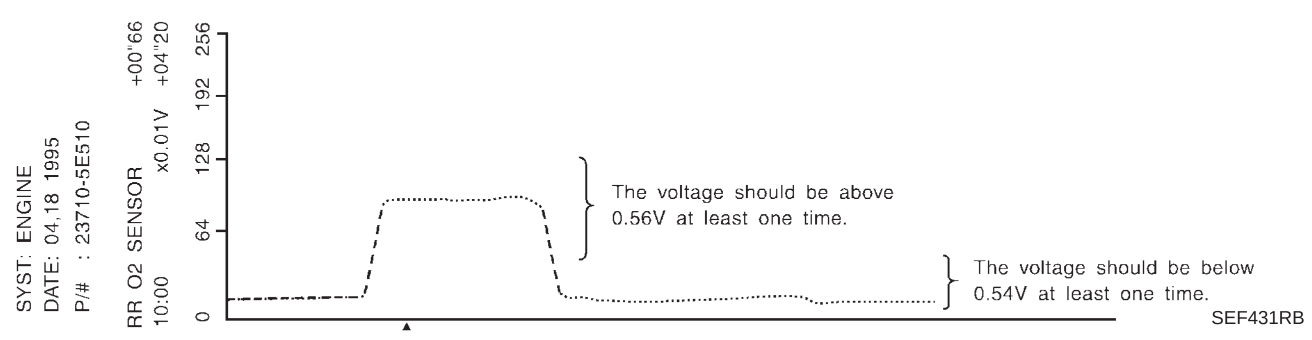
OR

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 (56) (sensor signal) and ECM 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 0.56V at least once.
   If the voltage is above 0.56V at step 4, step 5 is not necessary.
5) Check the voltage when revving up to 5,000 rpm under no load. Or keep vehicle 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 "O/D" OFF (A/T).
   The voltage should be below 0.54V at least once.

CAUTION:

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

Rear Heated Oxygen Sensor (High Voltage) (Rear HO2S) (Cont’d)



The voltage should be above 0.56V at least one time.

The voltage should be below 0.54V at least one time.

SEF431RB

Rear Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION

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

OPERATION

Engine speed rpm	Rear heated oxygen sensor heater
Ignition switch ‘‘ON’’ (Engine is stopped.)	OFF
Engine is running.	ON

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 HEATER	● Engine speed: Idle after driving 2 minutes at 70 km/h (43 MPH) or more	ON
	● Ignition switch: ON (Engine stopped)	OFF

ECM TERMINALS AND REFERENCE VALUE

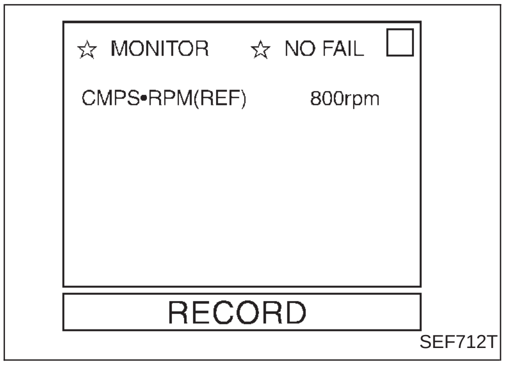
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
122	R/B	Rear heated oxygen sensor heater	Engine is running. Idle speed after driving 2 minutes at 70 km/h (43 MPH) or more	Approximately 0.4V
			Ignition switch ‘‘ON’’ Engine is not running.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0141 0902	● The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.)	● Harness or connectors (The rear heated oxygen sensor heater circuit is open or shorted.) ● Rear heated oxygen sensor heater

Rear Heated Oxygen Sensor Heater (Cont'd)



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

RECORD

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 10.5V at idle.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-223.

OR

GST

1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
4) Select "MODE 3" with GST.
5) If DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-223.

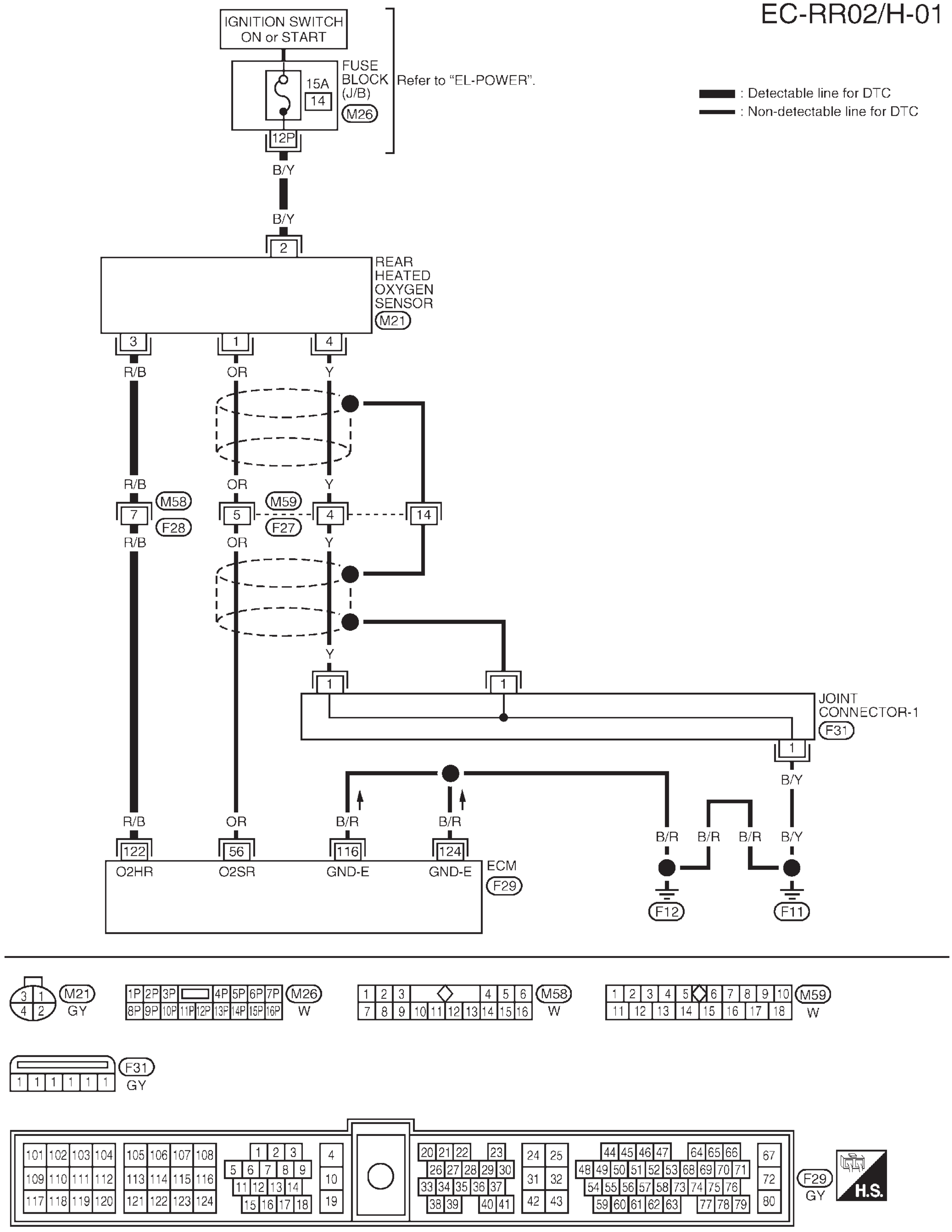
OR

NO TOOLS

1) Start engine and drive vehicle at a speed of more than 70 km/h (43 MPH) for 2 consecutive minutes.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-223.

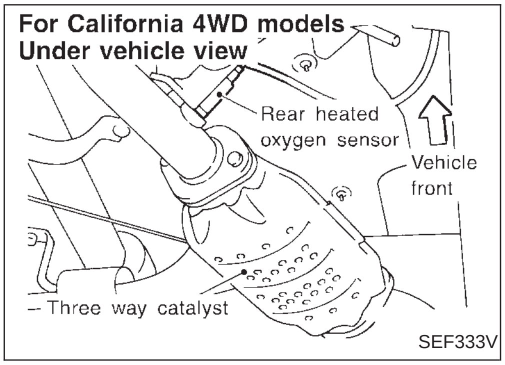
- **When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.**

Rear Heated Oxygen Sensor Heater (Cont'd)



AEC861A

Rear Heated Oxygen Sensor Heater (Cont'd)



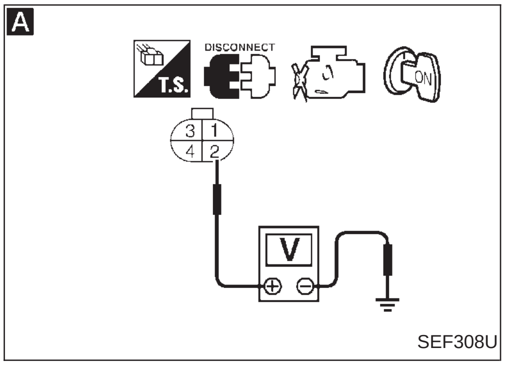
SEF333V

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

A



SEF308U

CHECK POWER SUPPLY.

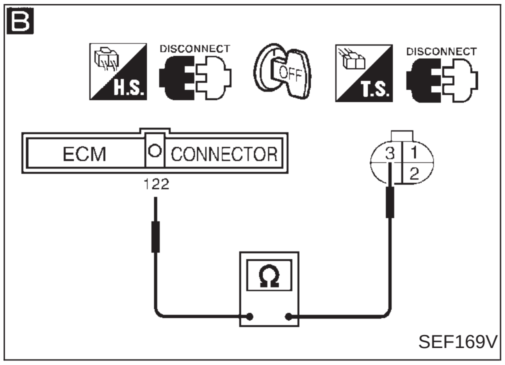
1. Turn ignition switch ''OFF''.
2. Disconnect rear heated oxygen sensor harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ② and ground.
   Voltage: Battery voltage

NG → Check the following.
- 15A fuse
- Harness for open or short between rear heated oxygen sensor and 15A fuse

If NG, repair harness or connectors.

OK ↓

B



SEF169V

CHECK GROUND CIRCUIT.

1. Turn ignition switch ''OFF''.
2. Disconnect ECM harness connector.
3. Check harness continuity between terminal ③ and ECM terminal (122).
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (M58), (F28)
- Harness for open or short between rear heated oxygen sensor and ECM

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

OK ↓

CHECK COMPONENT
(Rear heated oxygen sensor heater).
Refer to ''COMPONENT INSPECTION'' below.

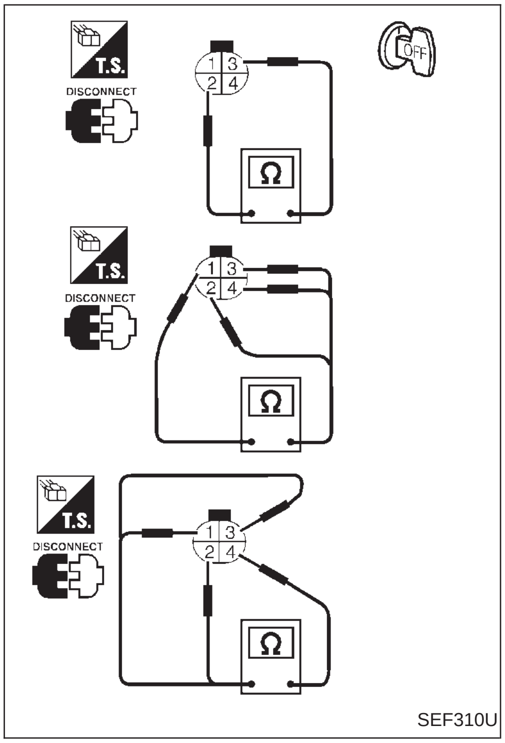
NG → Replace rear heated oxygen sensor.

OK ↓

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

INSPECTION END



SEF310U

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

1. Check resistance between terminals ② and ③.
   Resistance: 2.3 - 4.3Ω at 25°C (77°F)
2. Check continuity.

Terminal No.	Continuity
① and ②, ③, ④	No
④ and ①, ②, ③	

If NG, replace the rear heated oxygen sensor.

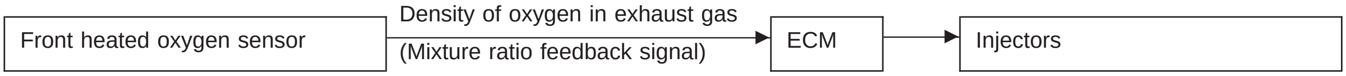
CAUTION:

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

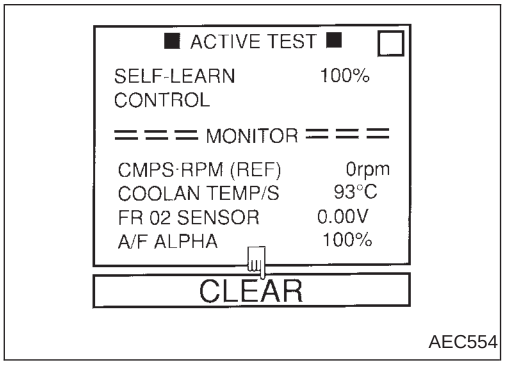
Fuel Injection System Function (Lean side)

ON BOARD DIAGNOSIS LOGIC

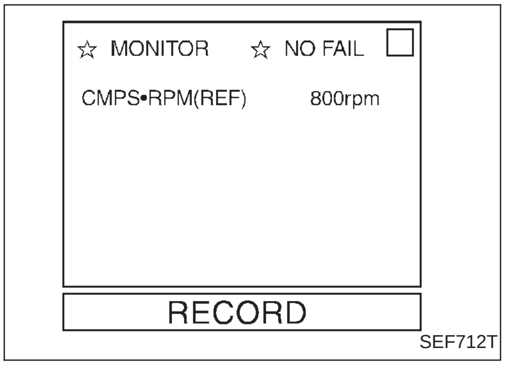
With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought close to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and theoretical ratios.
If the amount of the compensation value is extremely large (The actual mixture ratio is too lean.), the ECM judges the condition as a fuel injection system malfunction and lights up the MIL (2 trip detection logic).



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0171 0115	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	● Intake air leaks ● Front heated oxygen sensor ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Lack of fuel ● Mass air flow sensor


■ ACTIVE TEST ■ ☐
SELF-LEARN CONTROL 100%
=== MONITOR ===
CMPS·RPM (REF) 0rpm
COOLAN TEMP/S 93°C
FR 02 SENSOR 0.00V
A/F ALPHA 100%

AEC554


☆ MONITOR ☆ NO FAIL ☐
CMPS•RPM(REF) 800rpm

SEF712T

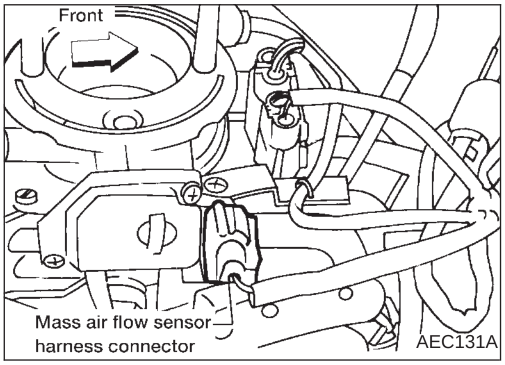
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
4) Clear the self-learning control coefficient by touching "CLEAR".
5) Select "DATA MONITOR" mode with CONSULT.
6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-227. If engine does not start, visually check for exhaust and intake air leak.

OR

Fuel Injection System Function (Lean side) (Cont'd)

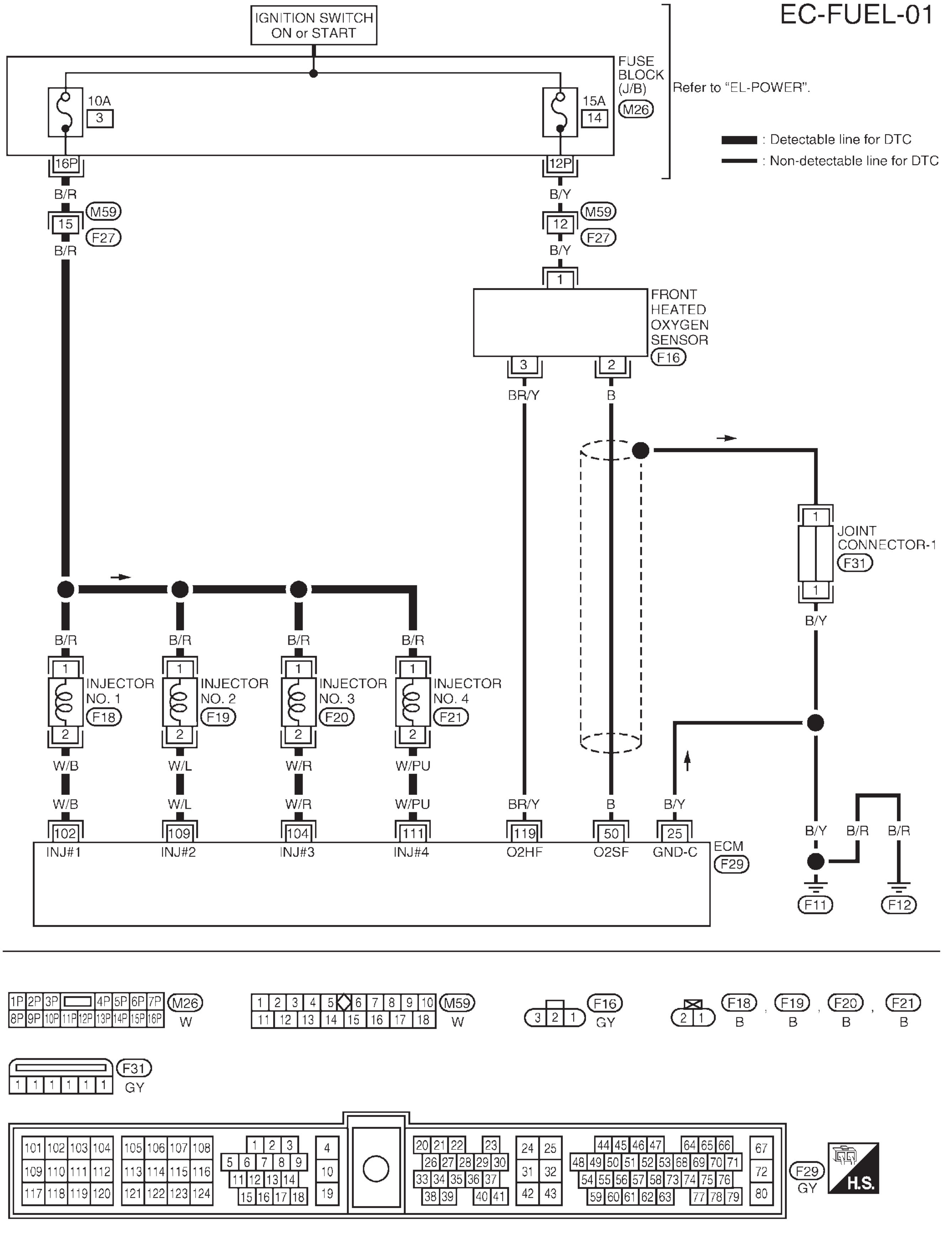


1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select ''MODE 7'' with GST. Make sure 1st trip DTC P0100 is detected.
6) Select ''MODE 4'' with GST and erase the 1st trip DTC P0100.
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select ''MODE 7'' with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to ''DIAGNOSTIC PROCEDURE'', EC-227. If engine does not start, visually check for exhaust and intake air leak.

OR

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Turn ignition switch ''ON''.
6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
7) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
8) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
9) Start engine again and run it for at least 10 minutes at idle speed.
   The 1st trip DTC 0115 should be detected at this stage, if a malfunction exists.
10) If it is difficult to start engine at step 9, the fuel injection system also has a malfunction.
11) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to ''DIAGNOSTIC PROCEDURE'', EC-227. If engine does not start, visually check for exhaust and intake air leak.

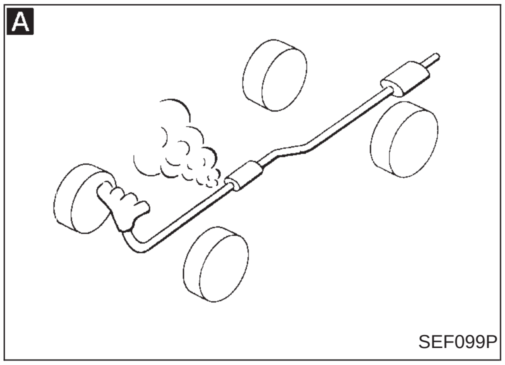
Fuel Injection System Function (Lean side) (Cont'd)

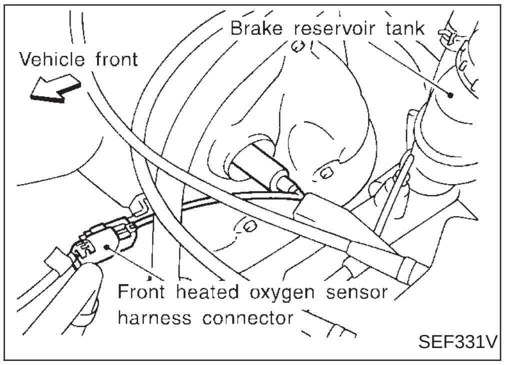


AEC862A

Fuel Injection System Function (Lean side) (Cont'd)

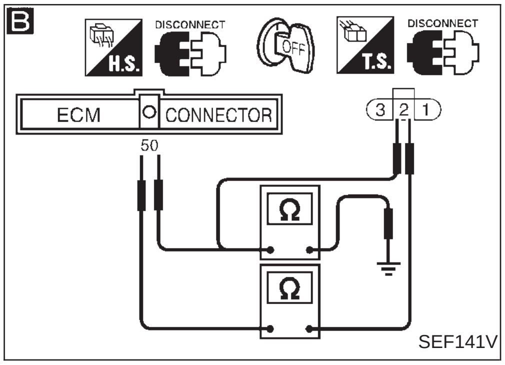
A


SEF099P



SEF331V

B



SEF141V

DIAGNOSTIC PROCEDURE

INSPECTION START

A

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

NG → Repair or replace.

OK

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

NG → Repair or replace.

OK

B

CHECK FRONT HEATED OXYGEN SENSOR.

1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ㊿ and terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM terminal ㊿ (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

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

OK

CHECK FUEL PRESSURE.

1. Release fuel pressure to zero.
   Refer to EC-29.
2. Install fuel pressure gauge and check fuel pressure.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   235 kPa
   (2.4 kg/cm^2, 34 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   294 kPa
   (3.0 kg/cm^2, 43 psi)

NG → Check the following.

- Fuel pump and circuit
  Refer to EC-429.
- Fuel pressure regulator
  Refer to EC-29.
- Fuel lines
  Refer to "ENGINE MAINTENANCE" in MA section.
- Fuel filter for clogging

If NG, repair or replace.

OK

CHECK MASS AIR FLOW SENSOR.

1. Start engine and warm it up to normal operating temperature.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
   0.9 - 5.8 g·m/sec: at idling
   7.5 - 13.2 g·m/sec: at 2,500 rpm

OR

2. Check "MASS AIR FLOW" in MODE 1 with GST.
   0.9 - 5.8 g·m/sec: at idling
   7.5 - 13.2 g·m/sec: at 2,500 rpm

OR

2. Check voltage between ECM terminal ㊼ and ground.
   0.9 - 1.8V: at idling
   1.9 - 2.3V: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-104.

OK

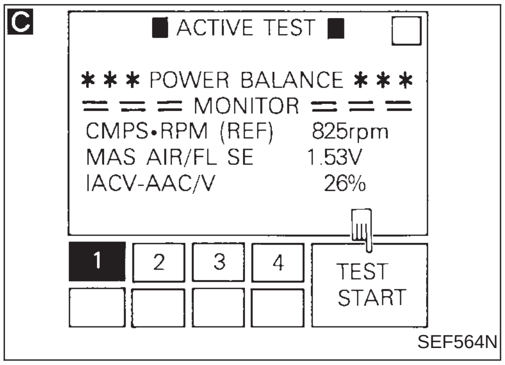
Ⓐ

(Go to next page.)

Fuel Injection System Function (Lean side) (Cont'd)

Ⓐ

C



■ ACTIVE TEST ■

✱✱✱ POWER BALANCE ✱✱✱

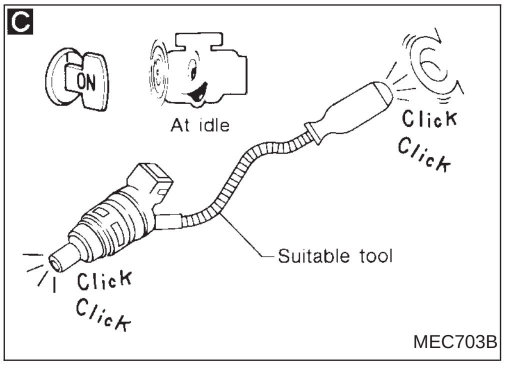
═══ MONITOR ═══

CMPS•RPM (REF) 825rpm

MAS AIR/FL SE 1.53V

IACV-AAC/V 26%

SEF564N



MEC703B

CHECK FUNCTION OF INJECTORS.
1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
4. Make sure that each circuit produces a momentary engine speed drop.

OR

3. Listen to each injector operating sound.
   Clicking noise should be heard.

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-423. Repair harness or connectors.

OK ↓

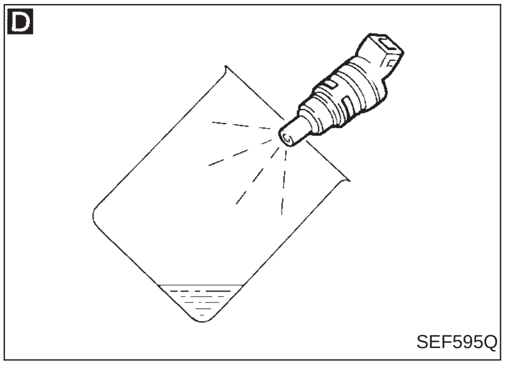
Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

↓

1. Turn ignition switch "OFF".
2. Remove injector with fuel tube assembly.
   Refer to EC-30.
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors should remain connected.

↓

D



SEF595Q

1. Disconnect all ignition coil harness connectors.
2. Place pans or saucers under each cylinder.
3. Crank engine for about 3 seconds.
   Make sure that fuel sprays out from injectors.
   Fuel should be sprayed evenly for each cylinder.

NG → Replace injectors from which fuel does not spray out. Refer to EC-30. Always replace O-ring with new one.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

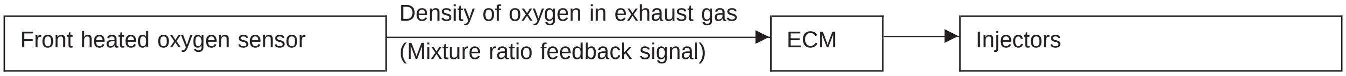
INSPECTION END

Fuel Injection System Function (Rich side)

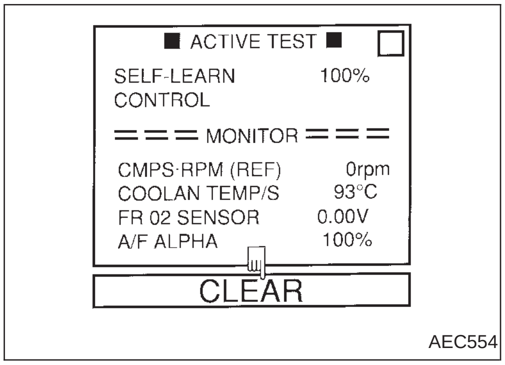
ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought close to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and theoretical ratios.

If the amount of the compensation value is extremely large (the actual mixture ratio is too rich.), the ECM judges the condition as a fuel injection system malfunction and lights up the MIL (2 trip detection logic).



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0172 0114	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Front heated oxygen sensor ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor



■ ACTIVE TEST ■ ☐

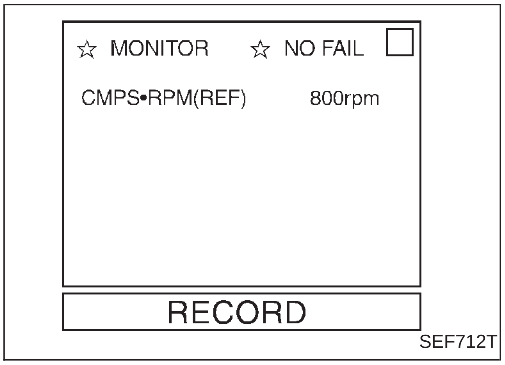
SELF-LEARN CONTROL 100%

=== MONITOR ===

CMPS·RPM (REF) 0rpm
COOLAN TEMP/S 93°C
FR 02 SENSOR 0.00V
A/F ALPHA 100%

CLEAR

AEC554



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

RECORD

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

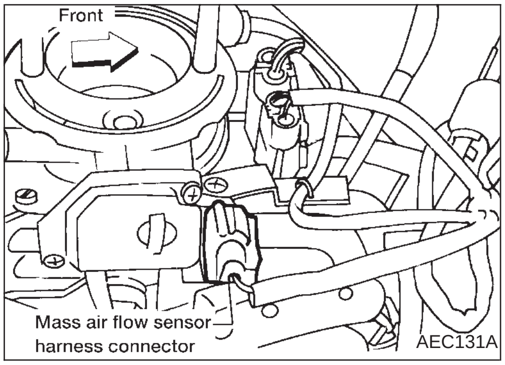
NOTE:

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

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
4) Clear the self-learning control coefficient by touching "CLEAR".
5) Select "DATA MONITOR" mode with CONSULT.
6) Start engine again and let it idle for at least 10 minutes. The 1st trip DTC P0172 should be detected at this stage, if a malfunction exists.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction.
8) Crank engine while depressing accelerator pedal. If 1st trip DTC is detected and engine starts, go to "DIAGNOSTIC PROCEDURE", EC-232. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

Fuel Injection System Function (Rich side) (Cont'd)

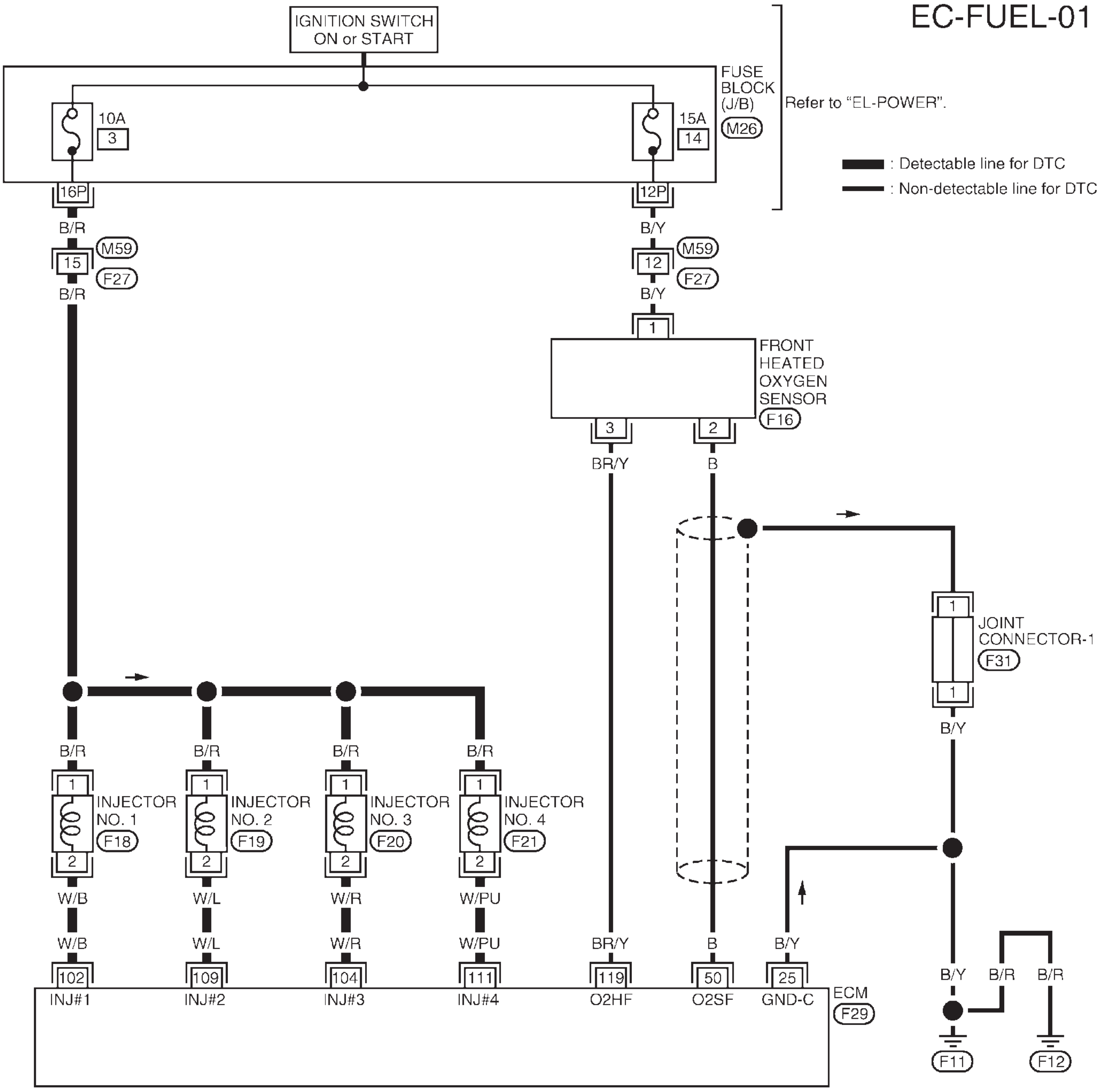


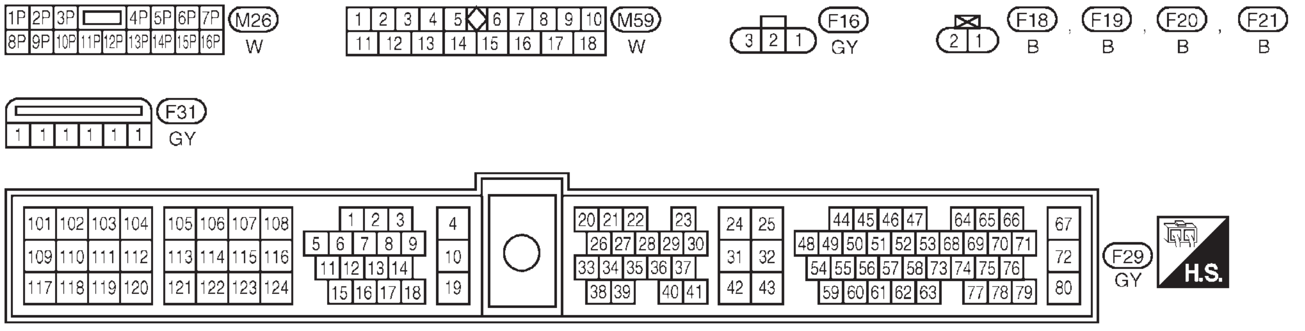
1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select ‘‘MODE 7’’ with GST. Make sure 1st trip DTC P0100 is detected.
6) Select ‘‘MODE 4’’ with GST and erase the 1st trip DTC P0100.
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select ‘‘MODE 7’’ with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 7, the fuel injection system has a malfunction.
10) Crank engine while depressing accelerator pedal.
    If 1st trip DTC is detected and engine starts, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-232. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart engine and run it for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Turn ignition switch ‘‘ON’’.
6) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
7) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
8) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
9) Start engine again and run it for at least 10 minutes at idle speed.
    The 1st trip DTC 0114 should be detected at this stage, if a malfunction exists.
10) If it is difficult to start engine at step 9, the fuel injection system also has a malfunction.
11) Crank engine while depressing accelerator pedal.
    If 1st trip DTC is detected and engine starts, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-232. If engine does not start, remove ignition plugs and check for fouling, etc.

Fuel Injection System Function (Rich side) (Cont'd)

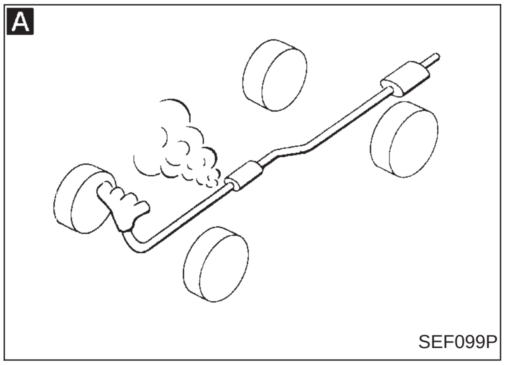




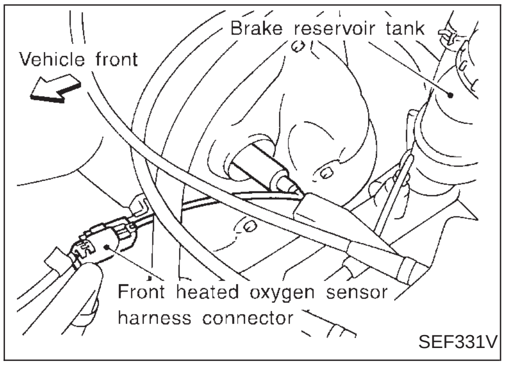
AEC862A

Fuel Injection System Function (Rich side) (Cont'd)

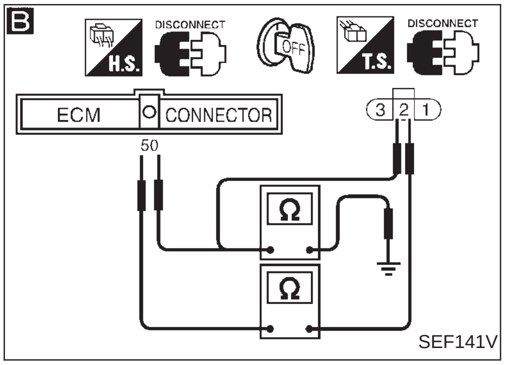
DIAGNOSTIC PROCEDURE



SEF099P



SEF331V



SEF141V

INSPECTION START

↓

A

CHECK FOR EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the warm-up three way catalyst (California model), the three way catalyst (Non-California model).

NG → Repair or replace.

↓ OK

B

CHECK FRONT HEATED OXYGEN SENSOR.
1. Turn ignition switch ''OFF''.
2. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ㊿ and terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM terminal ㊿ (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short to ground and short to power.

NG → Repair harness or connectors.

↓ OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero.
   Refer to EC-29.
2. Install fuel pressure gauge and check fuel pressure.
   At idling:
   When fuel pressure regulator valve vacuum hose is connected.
   Approximately 235 kPa ($2.4 kg/cm^2$, 34 psi)
   When fuel pressure regulator valve vacuum hose is disconnected.
   Approximately 294 kPa ($3.0 kg/cm^2$, 43 psi)

NG → Check the following.
- Fuel pump and circuit
  Refer to EC-429.
- Fuel pressure regulator
  Refer to EC-29.

If NG, repair or replace.

↓ OK

CHECK MASS AIR FLOW SENSOR.
1. Start engine and warm it up to normal operating temperature.
2. Check ''MASS AIR FLOW'' in ''DATA MONITOR'' mode with CONSULT.
   0.9 - 5.8 g·m/sec: at idling
   7.5 - 13.2 g·m/sec: at 2,500 rpm

OR

GST
2. Check ''MASS AIR FLOW'' in MODE 1 with GST.
   0.9 - 5.8 g·m/sec: at idling
   7.5 - 13.2 g·m/sec: at 2,500 rpm

OR

NO TOOLS
2. Check voltage between ECM terminal ㊼ and ground.
   0.9 - 1.8V: at idling
   1.9 - 2.3V: at 2,500 rpm

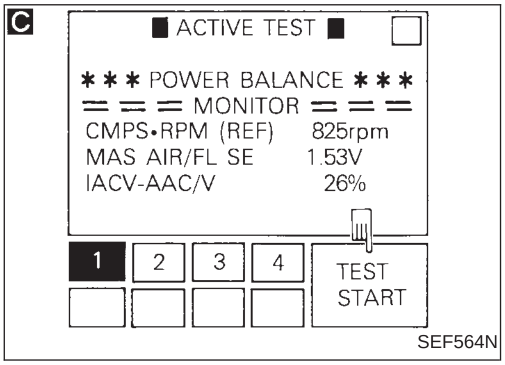
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-104.

↓ OK

Ⓐ

(Go to next page.)

Fuel Injection System Function (Rich side) (Cont'd)



■ ACTIVE TEST ■

✱✱✱ POWER BALANCE ✱✱✱

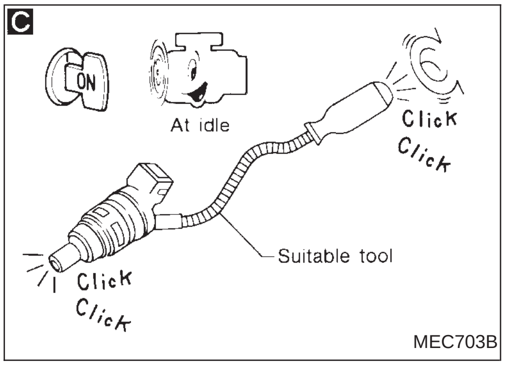
═══ MONITOR ═══

CMPS•RPM (REF) 825rpm

MAS AIR/FL SE 1.53V

IACV-AAC/V 26%

SEF564N



MEC703B

Ⓐ

C

CHECK FUNCTION OF INJECTORS.
1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
4. Make sure that each circuit produces a momentary engine speed drop.

OR

3. Listen to each injector operating sound.
Clicking noise should be heard.

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-423.
Repair harness or connectors.

OK ↓

Remove injector assembly.
Refer to EC-30.
Keep fuel hose and all injectors connected to injector gallery.

↓

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

↓

1. Disconnect all injector harness connectors.
2. Disconnect all ignition coil harness connectors.
3. Crank engine for about 3 seconds.
Make sure fuel does not drip from injector.

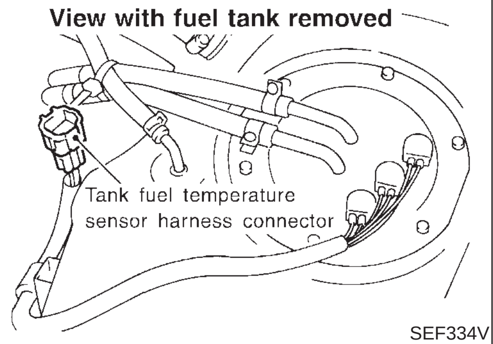
Drips → Replace any injectors from which fuel is dripping.

Does not drip. ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

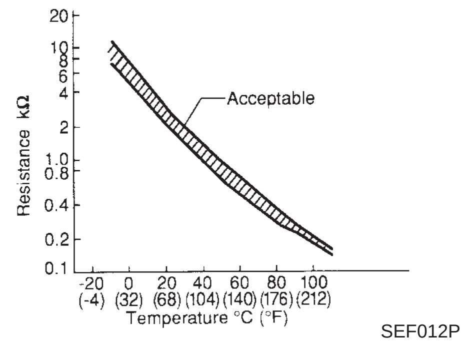


SEF334V

Tank Fuel Temperature Sensor

COMPONENT DESCRIPTION

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



SEF012P

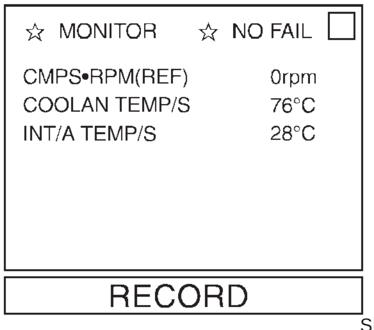
<Reference data>

Fluid temperature °C (°F)	Voltage* V	Resistance kΩ
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminal (60) (Tank fuel temperature sensor) and ECM terminal ㉜ (ECM ground).

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Causes)
P0180 0402	● 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.	● Harness or connectors (The sensor circuit is open or shorted.) ● Tank fuel temperature sensor


☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	0rpm
COOLAN TEMP/S	76°C
INT/A TEMP/S	28°C

SEF311U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Wait at least 10 seconds.
   If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-237.
   If the result is OK, go to following step.

NOTE: If "COOLAN TEMP/S" is already less than 60°C (140°F) before step 4), the result will be OK.
If "COOLAN TEMP/S" is above 60°C (140°F), go to the following step.

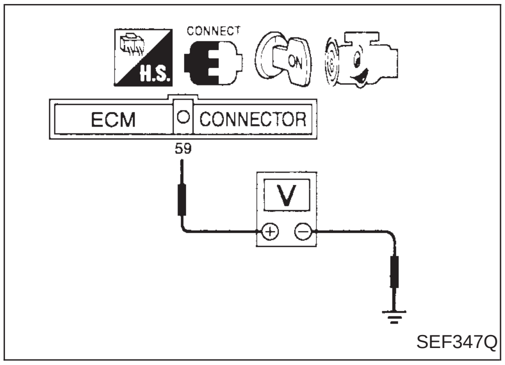
4) Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
5) Wait at least 10 seconds.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-237.

Tank Fuel Temperature Sensor (Cont'd)

OR

GST

1) Turn ignition switch ''ON'' and wait at least 10 seconds.
2) Select ''MODE 7'' with GST.
   If the result is NG, go to ''DIAGNOSTIC PROCEDURE'', EC-237.
   If the result is OK, go to following step.
3) Select ''MODE 1'' with GST and check for the engine coolant temperature.
4) Cool engine down until the engine coolant temperature is less than 60°C (140°F). If the temperature is already less than 60°C (140°F) before step 4), the result will be OK.
5) Wait at least 10 seconds.
6) Select ''MODE 7'' with GST.
7) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-237.



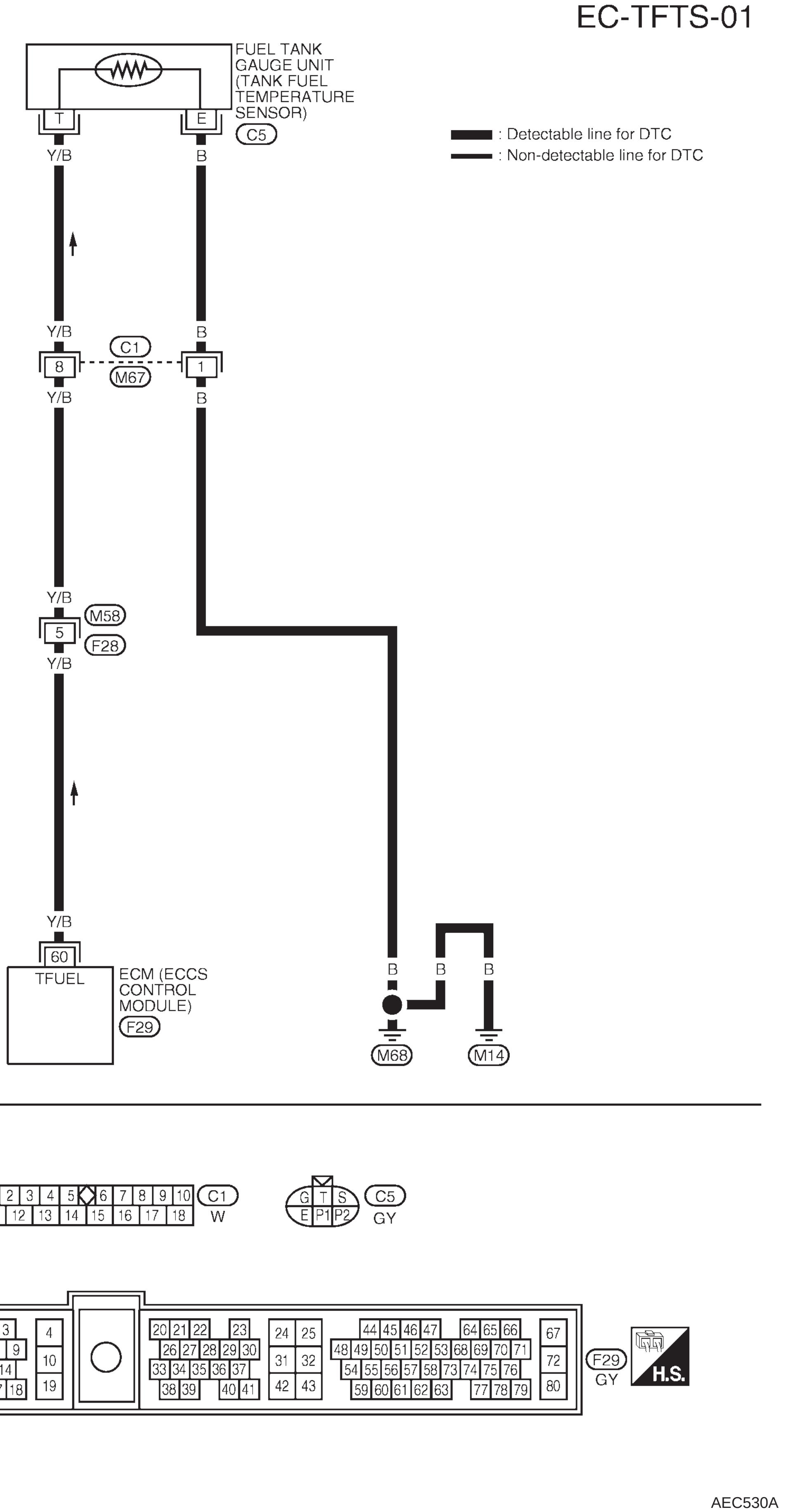
SEF347Q

OR

NO TOOLS

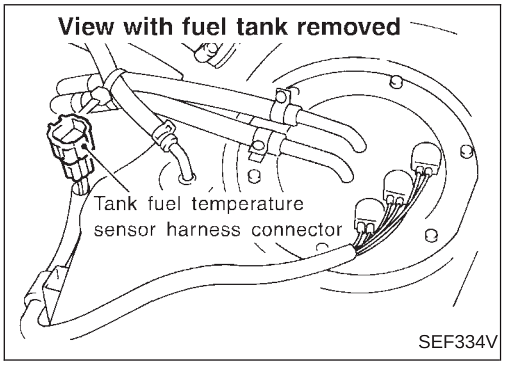
1) Turn ignition switch ''ON'' and wait at least 10 seconds.
2) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
3) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
   If the result is NG, go to ''DIAGNOSTIC PROCEDURE'', EC-237.
   If the result is OK, go to following step.
4) Cool engine down until the voltage between ECM terminal (59) (Engine coolant temperature sensor) and ground becomes more than 1.0V.
   If the voltage is already more than 1.0V before step 4), the result will be OK.
5) Wait at least 10 seconds.
6) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
7) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
8) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-237.

Tank Fuel Temperature Sensor (Cont'd)

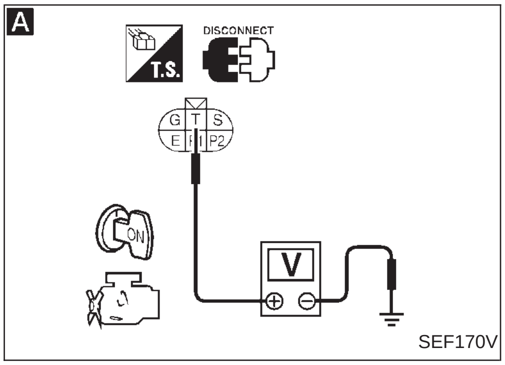


Tank Fuel Temperature Sensor (Cont'd)

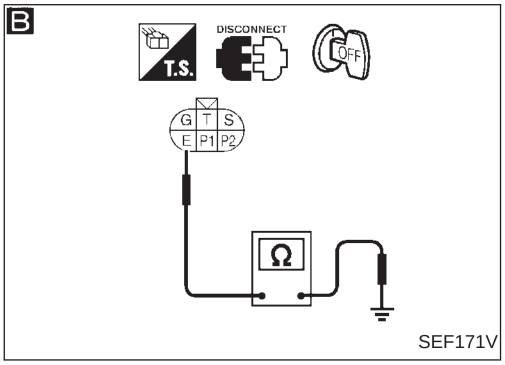
DIAGNOSTIC PROCEDURE



SEF334V



SEF170V



SEF171V

INSPECTION START

↓

A

CHECK POWER SUPPLY.

1. Turn ignition switch "OFF".
2. Disconnect tank fuel temperature sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal Ⓣ and ground with CONSULT or tester.
   Voltage: Approximately 5V

NG → Check the following.

- Harness connectors C1, M67
- Harness connectors M58, F28
- Harness for open or short between ECM and tank fuel temperature sensor

If NG, repair harness or connector.

OK ↓

B

CHECK GROUND CIRCUIT.

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

NG → Check the following.

- Harness connectors C1, M67
- Harness for open or short between ECM and body ground

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

OK ↓

CHECK COMPONENT
(Tank fuel temperature sensor).
Refer to "COMPONENT INSPECTION" below.

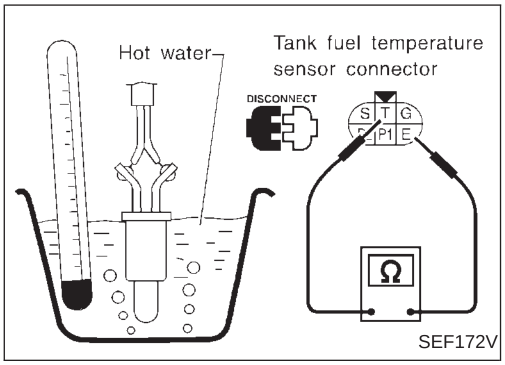
NG → Replace tank fuel temperature sensor.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END



SEF172V

COMPONENT INSPECTION

Tank fuel temperature sensor

Check resistance by heating with hot water as shown in the figure or a heat gun.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire

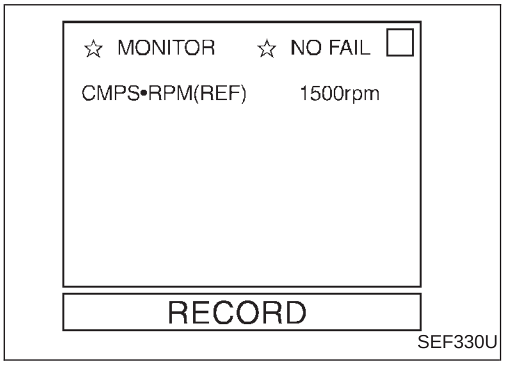
ON BOARD DIAGNOSIS LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the CKP sensor signal to vary, ECM can determine that a misfire is occurring.

Crankshaft position sensor (OBD)	Engine speed →	ECM

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 revolutions. A misfire malfunction can be detected on any one cylinder or on multiple cylinders.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 (0701)	● Multiple cylinders misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● EGR valve ● The injector circuit is open or shorted ● Injectors ● Intake air leak ● The ignition secondary circuit is open or shorted ● Lack of fuel ● Drive plate/Flywheel ● Front heated oxygen sensor ● Incorrect distributor rotor
P0301 (0608)	● No. 1 cylinder misfires.	
P0302 (0607)	● No. 2 cylinder misfires.	
P0303 (0606)	● No. 3 cylinder misfires.	
P0304 (0605)	● No. 4 cylinder misfires.	



CMPS•RPM(REF) 1500rpm

SEF330U

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

1) Turn ignition switch "ON'', and select "DATA MONITOR'' mode with CONSULT.
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch "OFF'' and wait at least 5 seconds.
4) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   Note: Refer to the freeze frame data for the test driving conditions.
5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE" on next page.

OR

GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF'' and wait at least 5 seconds.
3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
   Note: Refer to the freeze frame data for the test driving conditions.
4) Select "MODE 7'' with GST.
5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE" on next page.

OR

NO TOOLS

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF'' and wait at least 5 seconds.
3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible.
4) Turn ignition switch "OFF'', wait at least 5 seconds, and then turn "ON''.
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE" on next page.

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

CHECK FOR INTAKE AIR LEAK.
Start engine and run it at idle speed. Listen for the sound of the intake air leak.

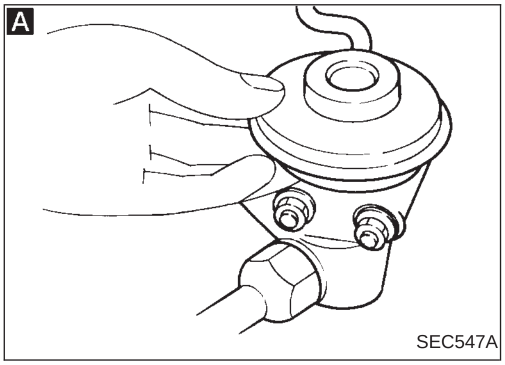
NG → Discover air leak location and repair.

OK ↓

CHECK FOR EXHAUST SYSTEM CLOGGING.
Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

NG → Repair or replace it.

OK ↓



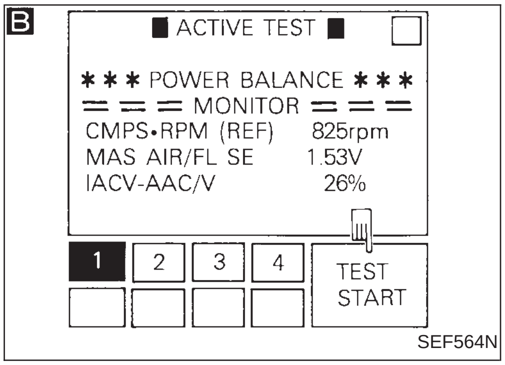
SEC547A

A

CHECK EGR FUNCTION.
Perform DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE for EGR Function.
Refer to EC-356.

NG → Repair EGR system.

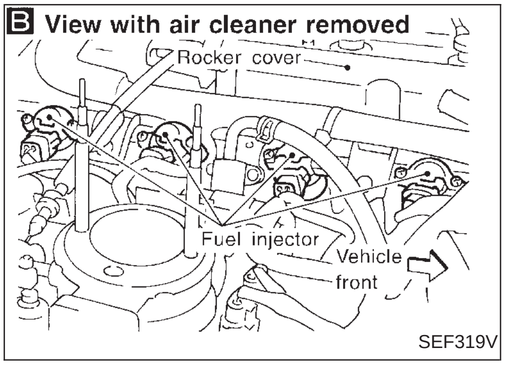
OK ↓



■ ACTIVE TEST ■

*** POWER BALANCE ***
=== MONITOR ===
CMPS•RPM (REF) 825rpm
MAS AIR/FL SE 1.53V
IACV-AAC/V 26%

SEF564N



SEF319V

B

PERFORM POWER BALANCE TEST.

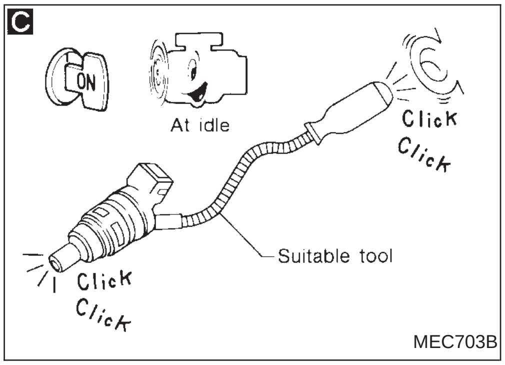
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to **E** on next page.

Yes ↓



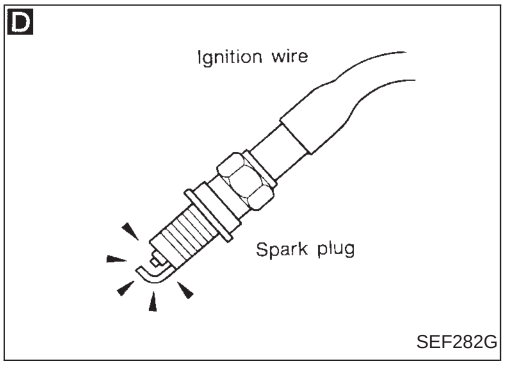
MEC703B

C

CHECK INJECTOR.
Does each injector make an operating sound at idle?

No → Check injector(s) and circuit(s). Refer to EC-423.

Yes ↓



SEF282G

D

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.

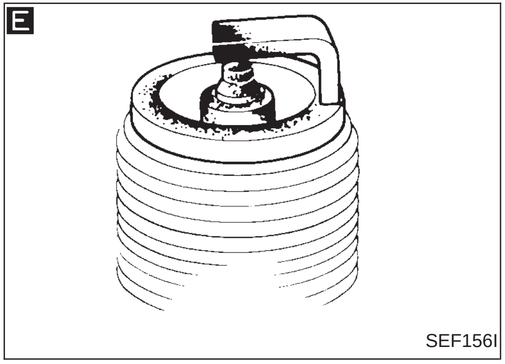
NG → CHECK COMPONENT (Ignition wires).
Refer to "COMPONENT INSPECTION", EC-242.

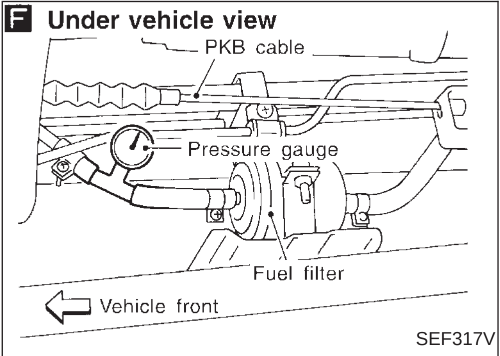
- NG → Replace.
- OK → Check distributor rotor head for incorrect parts.
Check ignition coil, power transistor and their circuits.
Refer to EC-333.

OK ↓

Ⓐ
(Go to next page.)

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)





Ⓐ

E

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s) with standard type one(s).
For spark plug type, refer to "ENGINE MAINTENANCE" in MA section.

OK ↓

CHECK COMPRESSION PRESSURE.
Refer to EM section.
- Check compression pressure.
  Standard:
  kPa (kg/cm^2, psi)/300 rpm
  1,226 (12.5, 178)
  Minimum:
  kPa (kg/cm^2, psi)/300 rpm
  1,030 (10.5, 149)
  Difference between each cylinder:
  kPa (kg/cm^2, psi)/300 rpm
  98 (1.0, 14)

NG → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

OK ↓

F

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-29.
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa
   (2.4 kg/cm^2, 34 psi)

NG → Check the following.
- Fuel pump and circuit
  Refer to EC-429.
- Fuel pressure regulator
  Refer to EC-29.
- Fuel lines
  Refer to "ENGINE MAINTENANCE" in MA section.
- Fuel filter for clogging

If NG, repair or replace.

OK ↓

CHECK IGNITION TIMING.
Perform "Basic Inspection", EC-74.

NG → Adjust ignition timing.

OK ↓

CHECK COMPONENT
(Front heated oxygen sensor).
Refer to "COMPONENT INSPECTION", EC-162.

NG → Replace front heated oxygen sensor.

OK ↓

CHECK MASS AIR FLOW SENSOR.

Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
0.9 - 5.8 g·m/sec: at idling
7.5 - 13.2 g·m/sec: at 2,500 rpm

OR

GST Check "MASS AIR FLOW" in MODE 1 with GST.
0.9 - 5.8 g·m/sec: at idling
7.5 - 13.2 g·m/sec: at 2,500 rpm

OR

NO TOOLS Check voltage between ECM terminal ㊼ and ground.
0.9 - 1.8V: at idling
1.9 - 2.3V: at 2,500 rpm

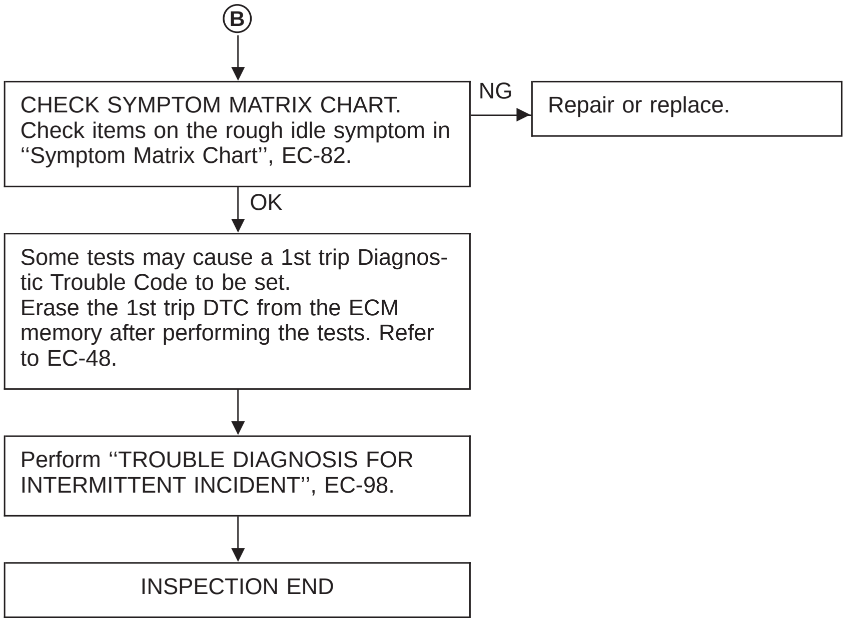
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-104.
If NG, repair or replace it.

OK ↓

Ⓑ

(Go to next page.)

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)



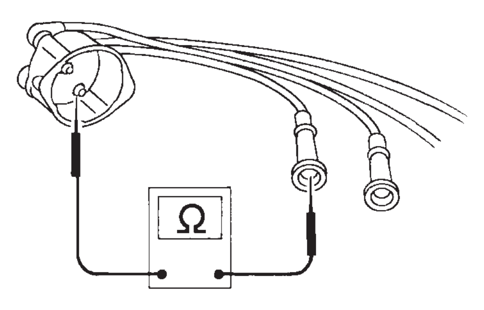
CHECK SYMPTOM MATRIX CHART.
Check items on the rough idle symptom in "Symptom Matrix Chart", EC-82.

Repair or replace.

Some tests may cause a 1st trip Diagnostic Trouble Code to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-48.

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END



SEF174P

COMPONENT INSPECTION

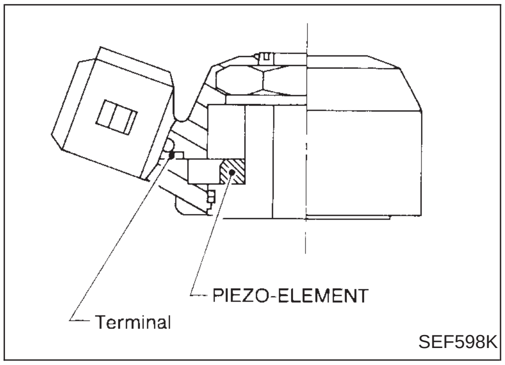
Ignition wires

1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

   Resistance:

   13.6 - 18.4 kΩ/m (4.15 - 5.61 kΩ/ft) at 25°C (77°F)

   If the resistance exceeds the above specification, inspect ignition wire to distributor cap connection. Clean connection or replace the ignition wire with a new one.



SEF598K

Knock Sensor (KS)

COMPONENT DESCRIPTION

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

*** Freeze frame data will not be stored in the ECM for the knock sensor. The MIL will not light for knock sensor malfunction. The knock sensor has one trip detection logic.**

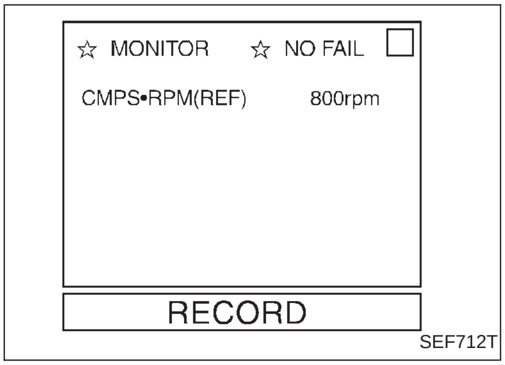
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
64	W	Knock sensor	Engine is running. Idle speed	Approximately 2.4V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0325 0304	● An excessively low or high voltage from the knock sensor is sent to ECM.	● Harness or connectors (The knock sensor circuit is open or shorted.) ● Knock sensor



CMPS•RPM(REF) 800rpm

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 10V at idle.

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and run it for at least 5 seconds at idle speed.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-246.

OR

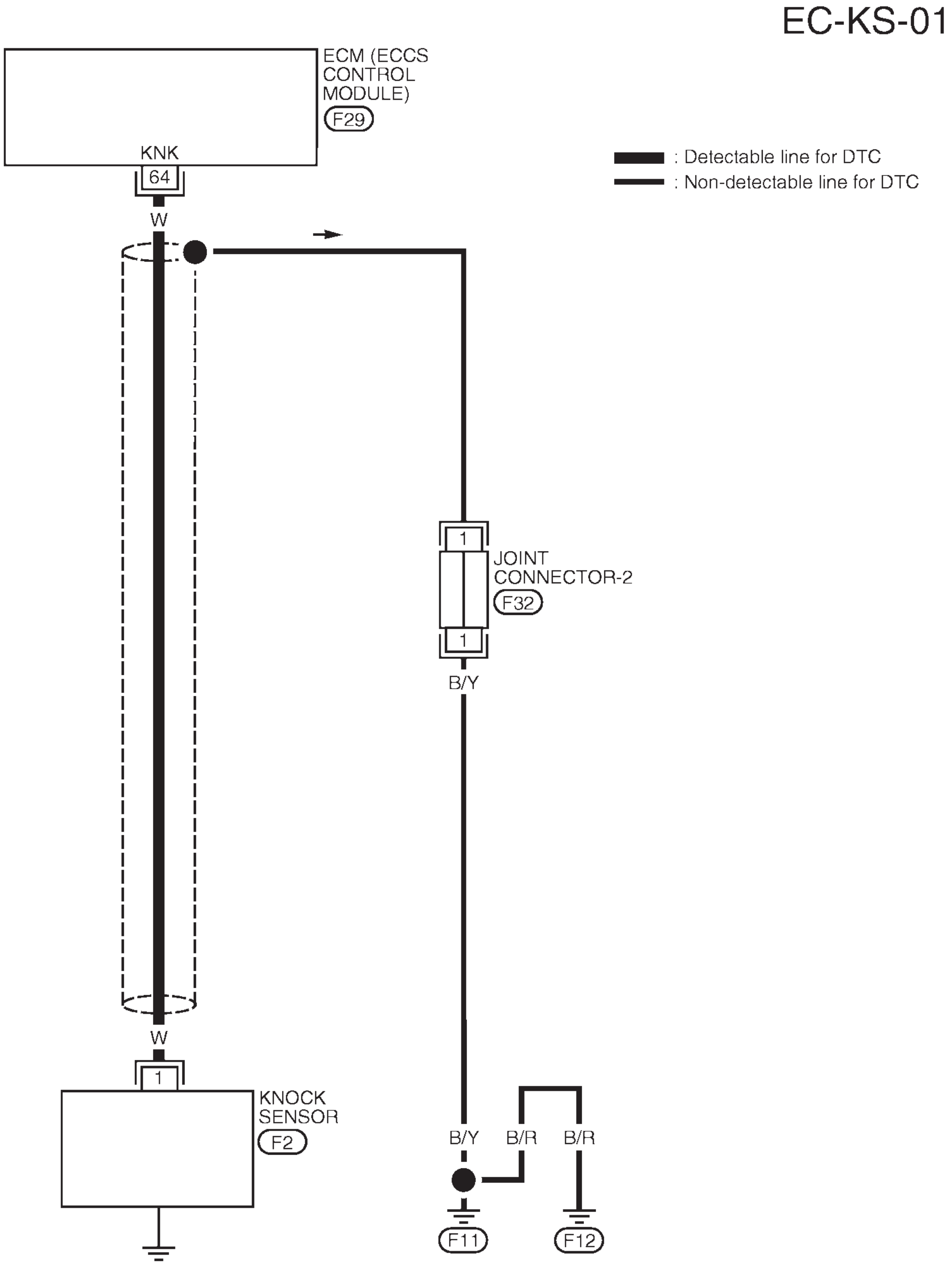
1) Start engine and run it for at least 5 seconds at idle speed.
2) Select "MODE 3" with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-246.

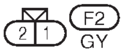
Knock Sensor (KS) (Cont’d)

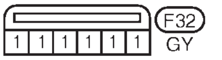
OR

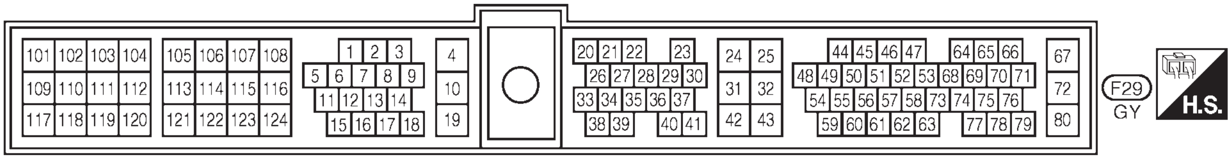
NO TOOLS

1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-246.


EC-KS-01
ECM (ECCS CONTROL MODULE)
F29
KNK
64
W
: Detectable line for DTC
: Non-detectable line for DTC
1
JOINT CONNECTOR-2
F32
1
B/Y
W
1
KNOCK SENSOR
F2
B/Y
B/R
B/R
F11
F12


2 1
F2
GY

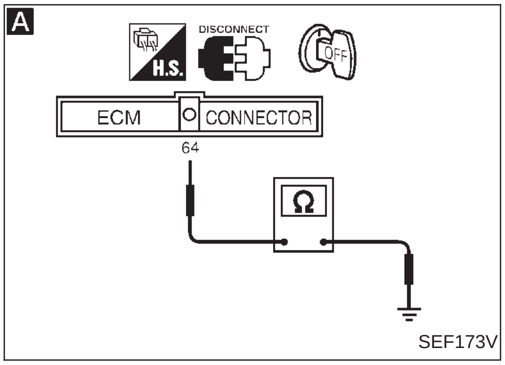

1 1 1 1 1 1
F32
GY


101 102 103 104
109 110 111 112
117 118 119 120
105 106 107 108
113 114 115 116
121 122 123 124
1 2 3
5 6 7 8 9
11 12 13 14
15 16 17 18
4
10
19
20 21 22 23
26 27 28 29 30
33 34 35 36 37
38 39 40 41
24 25
31 32
42 43
44 45 46 47 64 65 66
48 49 50 51 52 53 68 69 70 71
54 55 56 57 58 73 74 75 76
59 60 61 62 63 77 78 79
67
72
80
F29
GY
H.S.

AEC529A

Knock Sensor (KS) (Cont'd)

DIAGNOSTIC PROCEDURE



SEF173V

INSPECTION START

↓

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch ''OFF''.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (64) and ground.

   Resistance:

   Approximately 500 - 620 kΩ
   [at 25°C (77°F)]

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

   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

NG → Check the following.

- Harness for open or short between knock sensor and ECM

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

- Knock sensor (Refer to ''COMPONENT INSPECTION'' below.)

If NG, replace knock sensor.

↓ OK

CHECK SHIELD CIRCUIT.

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

   Continuity should exist.

   If OK, check harness for short to power.

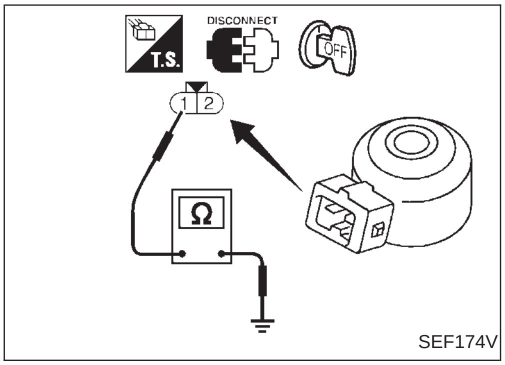
NG → Repair open circuit, short to ground or short to power in harness or connectors.

↓ OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

INSPECTION END



SEF174V

COMPONENT INSPECTION

Knock sensor

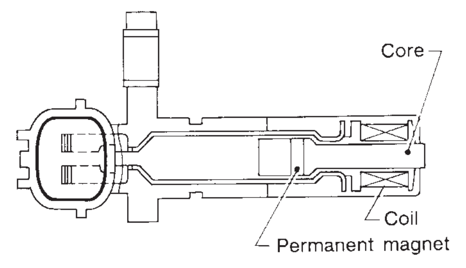
- Use an ohmmeter which can measure more than 10 MΩ.

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ① and ground.

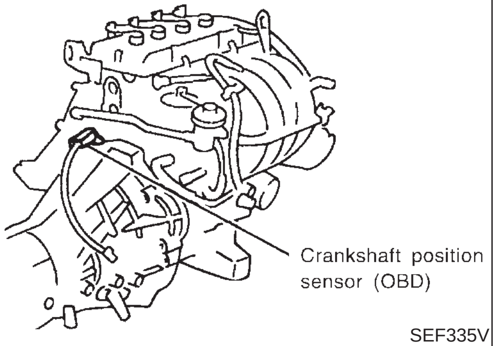
   Resistance: 500 - 620 kΩ [at 25°C (77°F)]

CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.



SEF956N



SEF335V

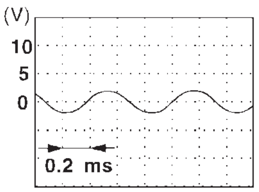
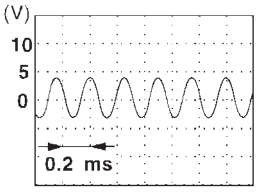
Crankshaft Position Sensor (CKPS) (OBD)

COMPONENT DESCRIPTION

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system. It is used only for the on board diagnosis.

ECM TERMINALS AND REFERENCE VALUE

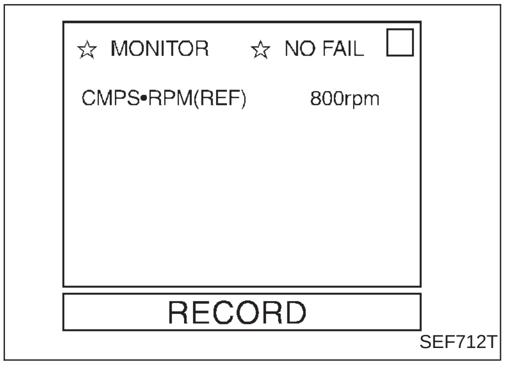
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (AC Voltage)
47	L	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) Idle speed	Approximately 0V  SEF112V
			Engine is running. Engine speed is 2,000 rpm.	Approximately 0V  SEF113V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0335 0802	● The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed.	● Harness or connectors (The crankshaft position sensor (OBD) circuit is open.) ● Crankshaft position sensor (OBD) ● Dead battery

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)



CMPS•RPM(REF) 800rpm

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

1) Turn ignition switch ''ON'' and select ''DATA MONITOR'' mode with CONSULT.
2) Start engine and run it for at least 15 seconds at idle speed.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-250.

OR

GST

1) Start engine and run it for at least 15 seconds at idle speed.
2) Select ''MODE 7'' with GST.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-250.

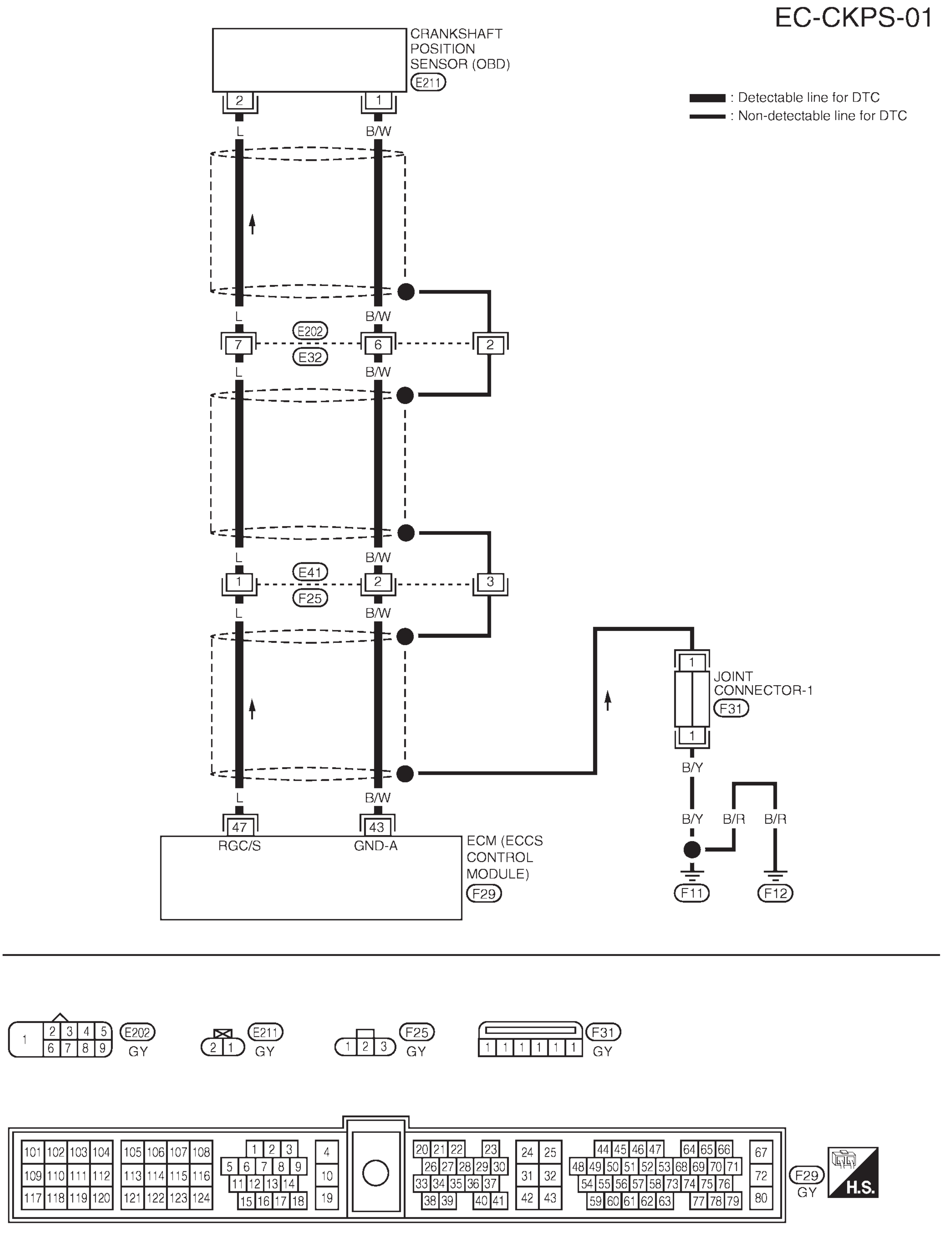
OR

NO TOOLS

1) Start engine and run it for at least 15 seconds at idle speed.
2) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
3) Perform ''Diagnostic Test Mode II'' (Self-diagnostic results) with ECM.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-250.

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

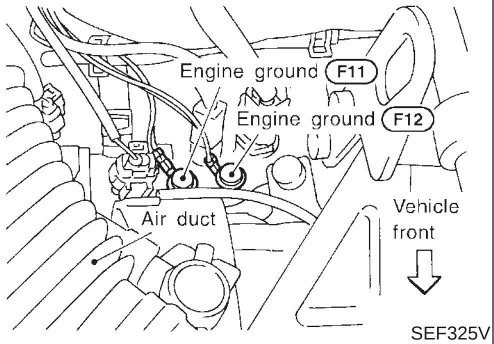
GI
MA
EM
LC
EC
FE
CL
MT
AT
TF
PD
FA
RA
BR
ST
RS
BT
HA
EL
IDX



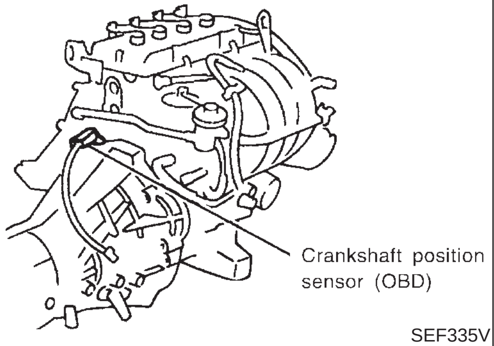
AEC531A

Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

DIAGNOSTIC PROCEDURE



SEF325V



SEF335V

INSPECTION START

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

A

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.
2. Check continuity between ECM terminal ㊼ and terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors E202 , E32
- Harness connectors E41 , F25
- Harness for open or short between ECM and crankshaft position sensor (OBD)

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

OK ↓

B

CHECK GROUND CIRCUIT.
1. Reconnect ECM harness connector.
2. Check harness continuity between terminal ① and engine ground.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors E202 , E32
- Harness connectors E41 , F25
- Harness for open or short between crankshaft position sensor (OBD) and ECM

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

OK ↓

CHECK COMPONENT
[Crankshaft position sensor (OBD)].
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (OBD).

OK ↓

C

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect harness connector E32 .
3. Check harness continuity between harness connector E32 terminal ② and ground.
   Continuity should exist.
   If OK, check harness for short to power.

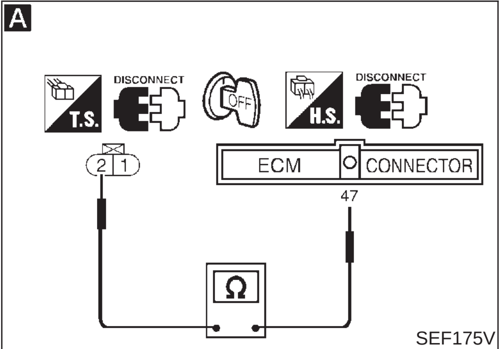
NG → Check the following.
- Harness connectors E41 , F25
- Joint connector-1
- Harness for open or short between harness connector E32 and ground

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

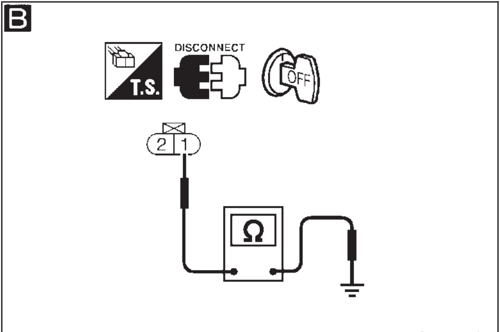
OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

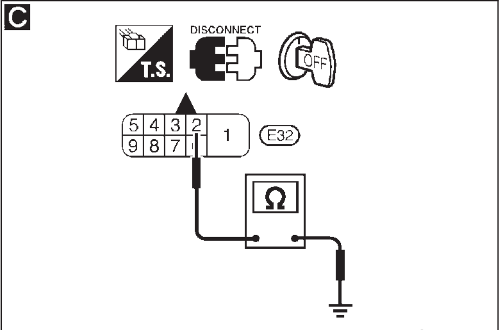
INSPECTION END



SEF175V



SEF176V

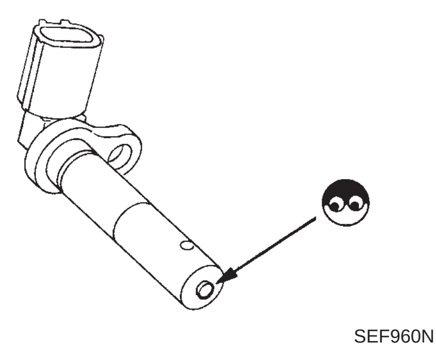


SEF177V

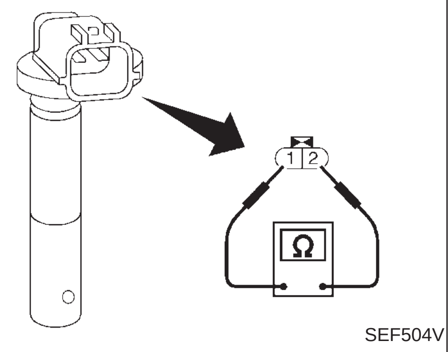
Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

COMPONENT INSPECTION

Crankshaft position sensor (OBD)

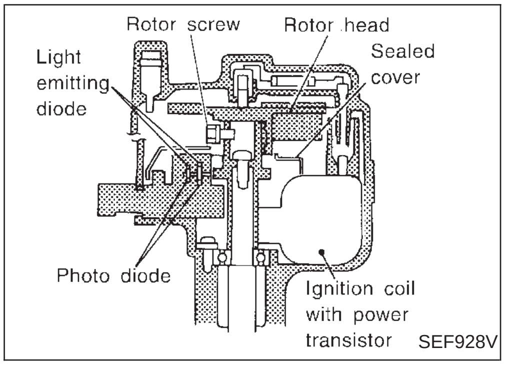

SEF960N

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.

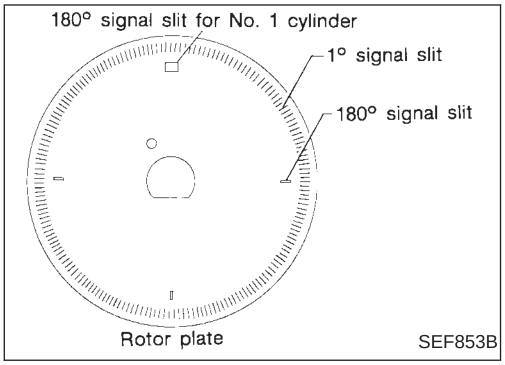


SEF504V

5. Check resistance as shown in the figure.
   Resistance: Approximately 512 - 632Ω
   [at 20°C (68°F)]
   If NG, replace crankshaft position sensor (OBD).



SEF928V



SEF853B

Camshaft Position Sensor (CMPS)

COMPONENT DESCRIPTION

The camshaft position sensor is a basic component of the engine control system. It monitors engine speed and piston position. These input signals to the ECM are used to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for a 1° (POS) signal and 4 slits for a 180° (REF) signal. The wave-forming circuit consists of Light Emitting Diodes (LED) and photo diodes.

The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photo diode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.

The distributor is not repairable and must be replaced as an assembly except distributor cap and rotor head.

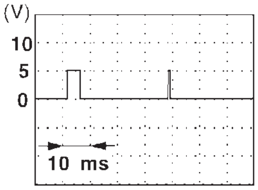
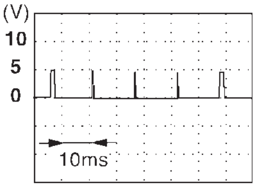
NOTE:

The rotor screw which secures the distributor rotor head to the distributor shaft must be tightened properly.

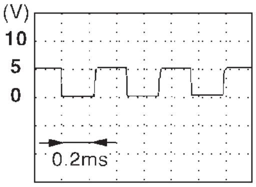
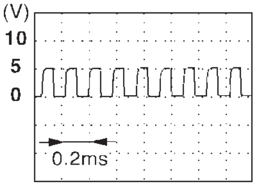
: 3.3 - 3.9 N·m (0.34 - 0.40 kg-m, 29.5 - 34.7 in-lb)

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	LG/R	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" More than a few seconds after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
44	PU	Camshaft position sensor (Reference signal)	Engine is running. (Warm-up condition) Idle speed	0.2 - 0.5V  SEF114V
48	PU		Engine is running. Engine speed is 2,000 rpm.	0 - 0.5V  SEF200T

Camshaft Position Sensor (CMPS) (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	LG	Camshaft position sensor (Position signal)	Engine is running. (Warm-up condition) Idle speed	Approximately 2.6V  SEF195T
			Engine is running. Engine speed is 2,000 rpm.	Approximately 2.5 - 2.6V  SEF196T
67	B/P	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
72	B/P			
117	B/P	Current return	Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)

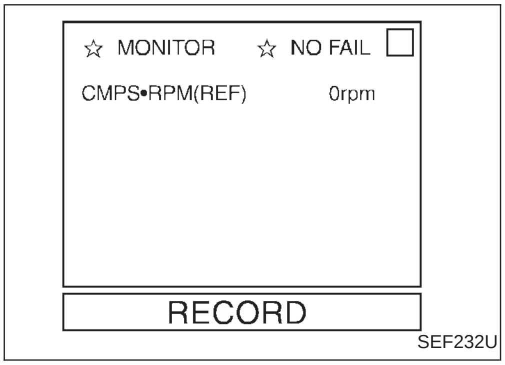
ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0340 0101	A) Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking. B) Either 1° or 180° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed. C) The relation between 1° and 180° signal is not in the normal range during the specified engine speed.	● Harness or connectors (The camshaft position sensor circuit is open or shorted.) ● Camshaft position sensor ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● Dead (Weak) battery

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

Camshaft Position Sensor (CMPS) (Cont’d)



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

RECORD

SEF232U

Procedure for malfunction A

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

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 10.5V.

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT.
3) Crank engine for at least 2 seconds.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-256.

OR

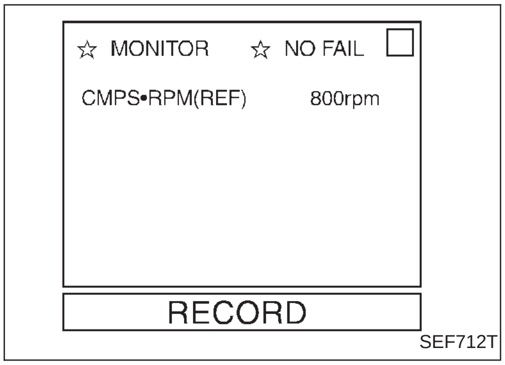
GST

1) Crank engine for at least 2 seconds.
2) Select ‘‘MODE 7’’ with GST.
3) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-256.

OR

NO TOOLS

1) Crank engine for at least 2 seconds.
2) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-256.



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

RECORD

SEF712T

Procedure for malfunction B and C

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

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 10.5V.

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT.
3) Start engine and run it for at least 2 seconds at idle speed.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-256.

OR

GST

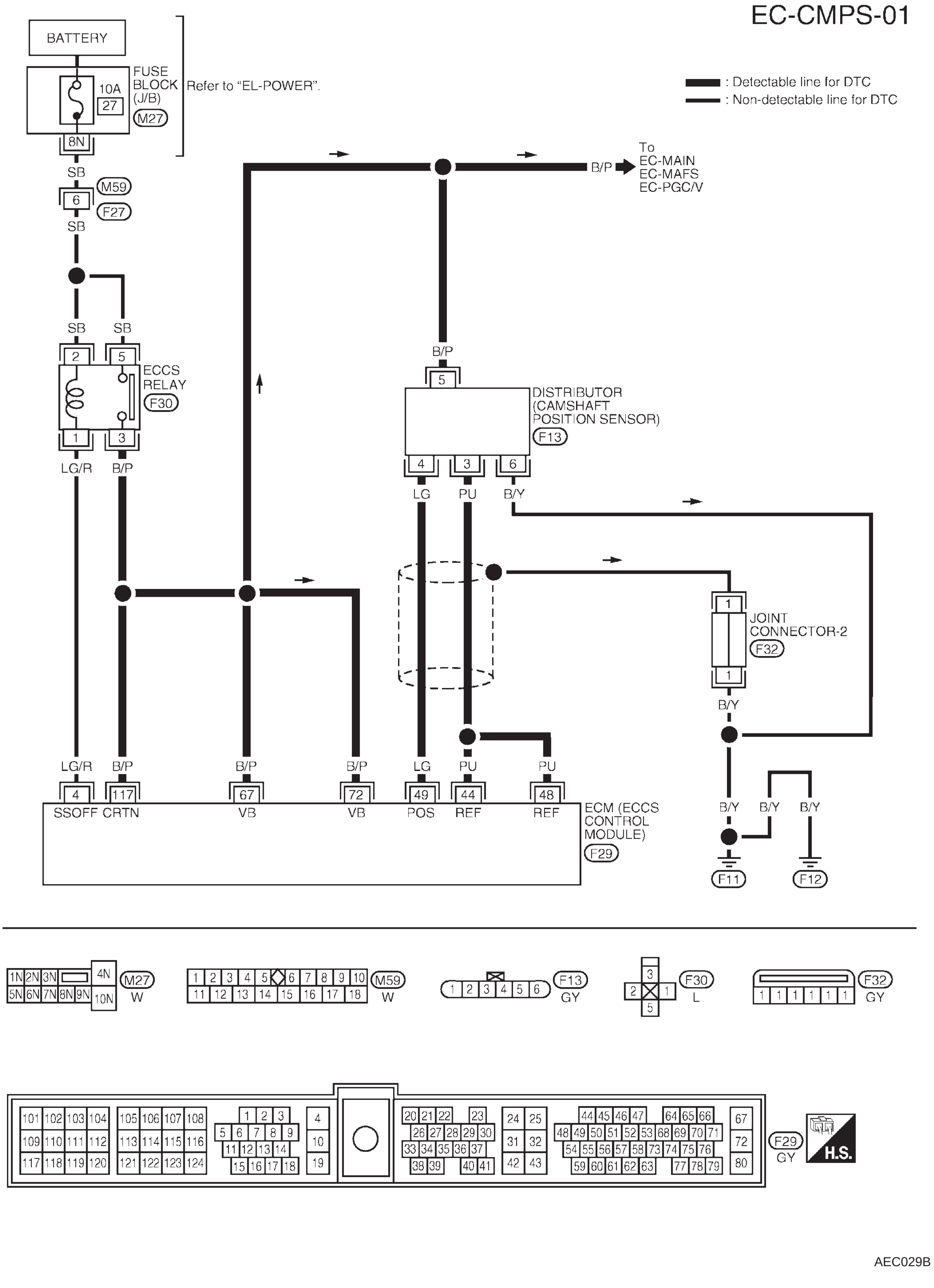
1) Start engine and run it for at least 2 seconds at idle speed.
2) Select ‘‘MODE 7’’ with GST.
3) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-256.

OR

NO TOOLS

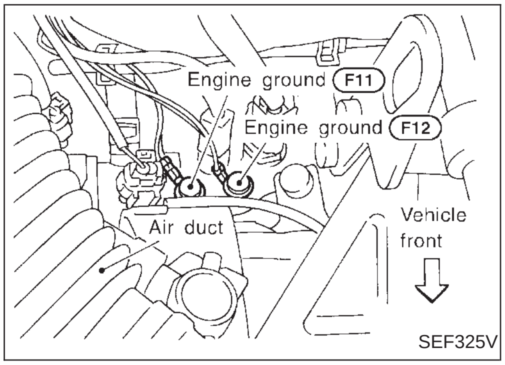
1) Start engine and run it for at least 2 seconds at idle speed.
2) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-256.

Camshaft Position Sensor (CMPS) (Cont’d)

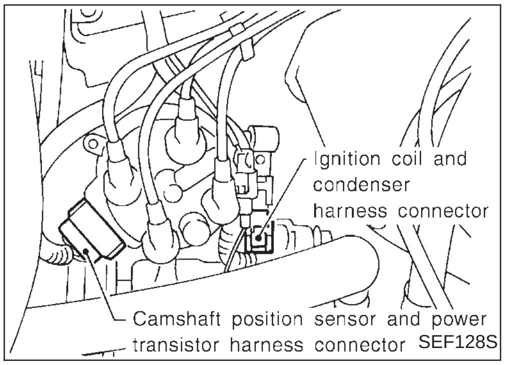


Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)

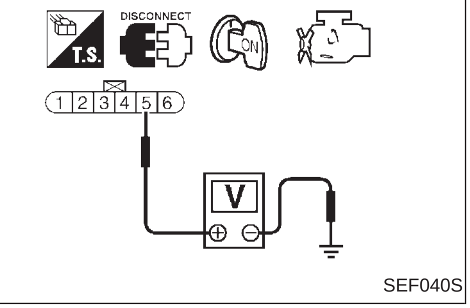


SEF325V



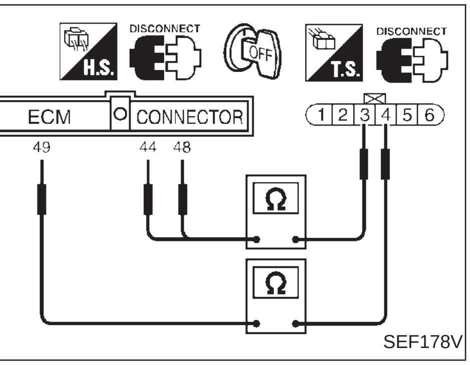
SEF128S

A



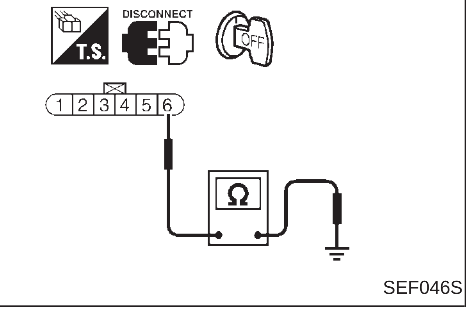
SEF040S

B



SEF178V

C



SEF046S

INSPECTION START

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

A

CHECK POWER SUPPLY.
1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch ''ON''.
3. Check voltage between terminal ⑤ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness for open or short between camshaft position sensor and ECM
- Harness for open or short between camshaft position sensor and ECCS relay

If NG, repair harness or connectors.

OK

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch ''OFF''.
2. Disconnect ECM harness connector.
3. Check harness continuity between sensor terminal ④ and ECM terminal ㊾, sensor terminal ③ and ECM terminals ㊹, ㊽.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch ''OFF''.
2. Disconnect camshaft position sensor harness connector.
3. Check harness continuity between sensor terminal ⑥ and engine ground.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

CHECK COMPONENT
(Camshaft position sensor).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace camshaft position sensor.

OK

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

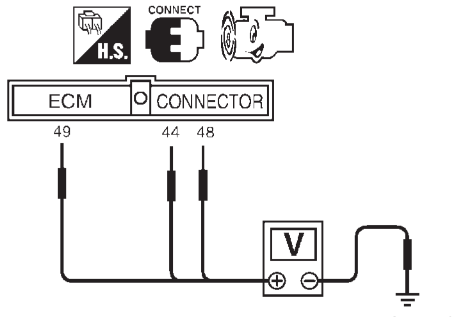
   Continuity should exist.
   If OK, check harness for short to power.

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

OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

INSPECTION END



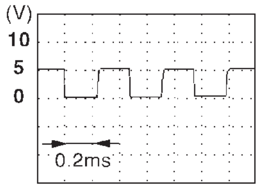
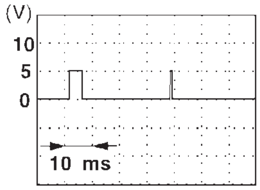
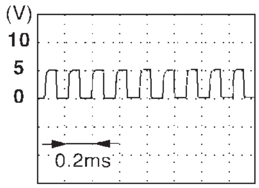
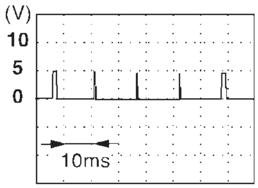
SEF179V

Camshaft Position Sensor (CMPS) (Cont’d)

COMPONENT INSPECTION

Camshaft position sensor

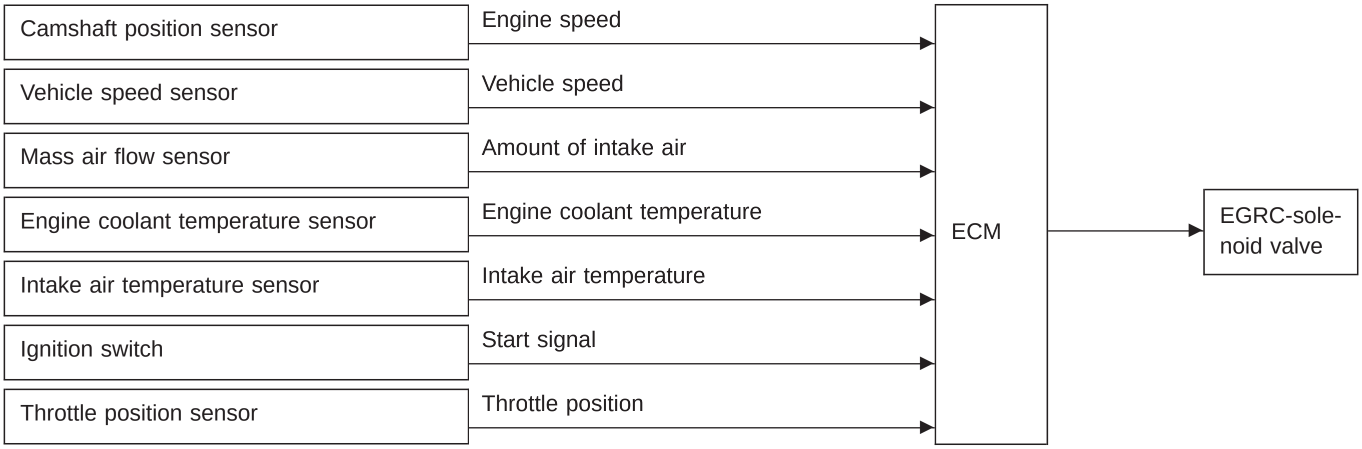
1. Start engine and warm it up to the normal operating temperature.
2. Check voltage between ECM terminal ㊾ and ground, ECM terminal ㊹ or ㊽ and ground.

Condition	Terminal	Voltage
Engine running at idle	㊾ and ground	Approximately 2.6V  SEF195T
	㊹ or ㊽ and ground	0.2 - 0.5V  SEF114V
Engine speed is 2,000 rpm	㊾ and ground	Approximately 2.5 - 2.6V  SEF196T
	㊹ or ㊽ and ground	0 - 0.5V  SEF200T

If NG, replace distributor assembly with camshaft position sensor.

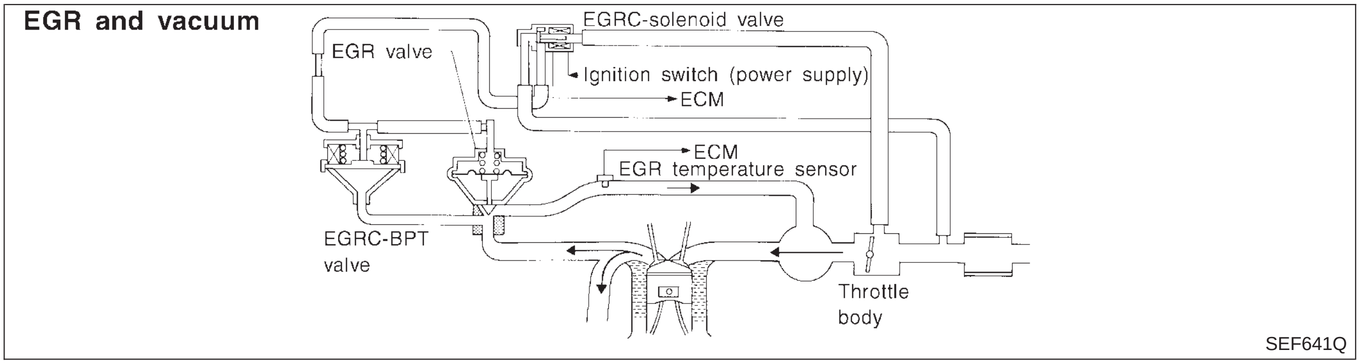
EGR Function (Close)

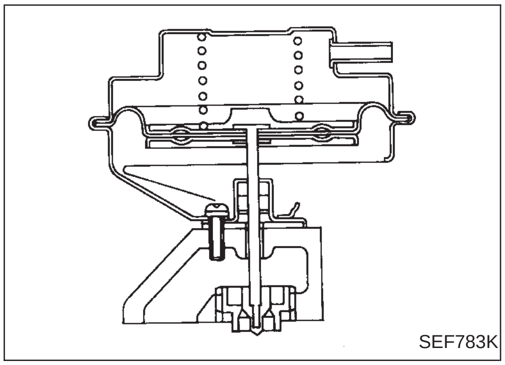
SYSTEM DESCRIPTION



This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-solenoid valve. When the ECM detects any of the following conditions, current flows through the solenoid valve. This causes the port vacuum to be discharged into the atmosphere. The EGR valve remains closed.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction
- Low intake air temperature



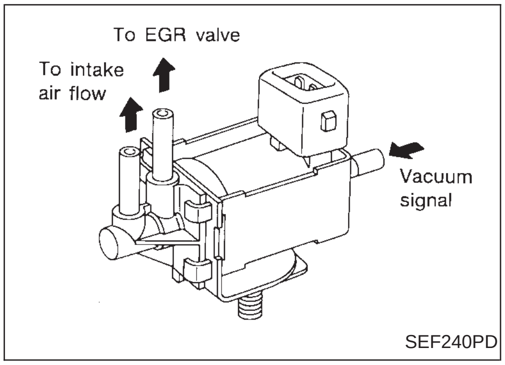


COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.

EGR Function (Close) (Cont'd)

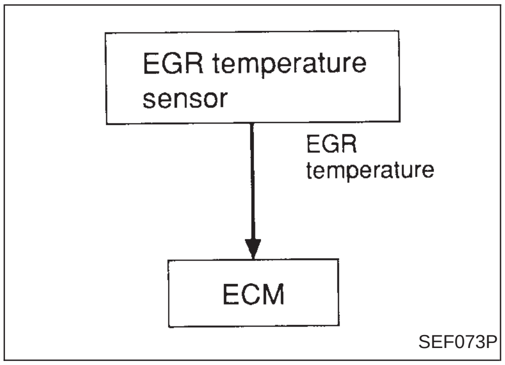


SEF240PD

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. A plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.

When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.



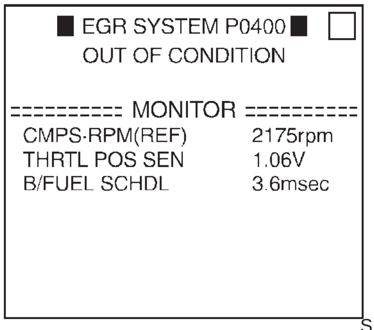
SEF073P

ON BOARD DIAGNOSIS LOGIC

If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0302	● No EGR flow is detected under condition that calls for EGR.	● EGR valve stuck closed ● EGRC-BPT valve ● Vacuum hose ● EGRC-solenoid valve ● EGR passage ● EGR temperature sensor ● Exhaust gas leaks

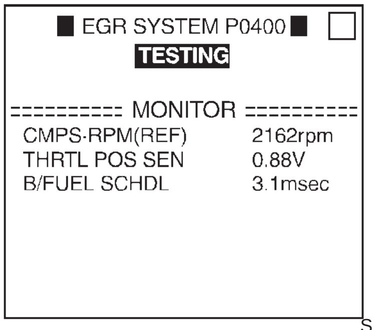
EGR Function (Close) (Cont'd)



```
■ EGR SYSTEM P0400 ■  ☐
    OUT OF CONDITION

========== MONITOR ==========
 CMPS·RPM(REF)        2175rpm
 THRTL POS SEN        1.06V
 B/FUEL SCHDL         3.6msec
```

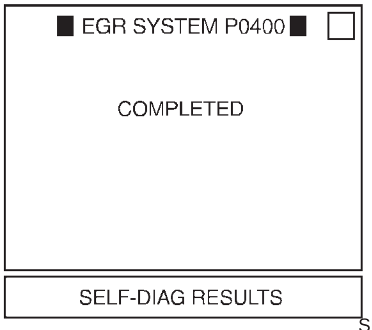
SEF180V



```
■ EGR SYSTEM P0400 ■  ☐
        TESTING

========== MONITOR ==========
 CMPS·RPM(REF)        2162rpm
 THRTL POS SEN        0.88V
 B/FUEL SCHDL         3.1msec
```

SEF181V



```
■ EGR SYSTEM P0400 ■  ☐

       COMPLETED

   SELF-DIAG RESULTS
```

SEF269U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**
- **P0400 will not be displayed at "SELF-DIAG RESULTS" mode with CONSULT even though DTC work support test result is "NG".**

TESTING CONDITION:

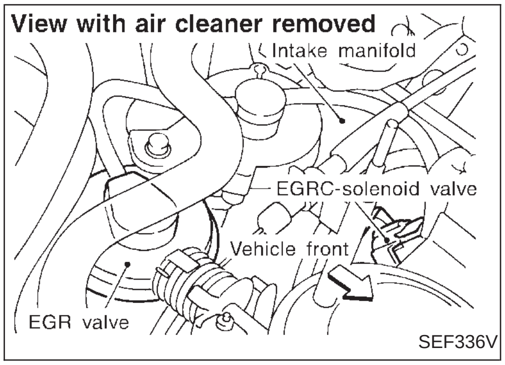
For best results, perform at a temperature above 5°C (41°F).

1) Turn ignition switch "ON"
2) Check "COOLAN TEMP/S" in "DATA MONITOR" mode witch CONSULT.
   Confirm COOLAN TEMP/S value is within the range listed below.
   COOLAN TEMP/S: Less than 40°C (104°F)
   If the value is out of range, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to lower the coolant temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.
3) Start engine and let it idle monitoring the value of "COOLAN TEMP/S". When the engine coolant temperature reaches 70°C (158°F), immediately go to the next step.
4) Select "EGR SYSTEM P0400" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
5) Touch "START".
6) Accelerate vehicle to a speed of 40 km/h (25 MPH) once and then stop vehicle with engine running.
   If "COMPLETED" with "OK" appears on CONSULT screen, go to step 9).
   If "COMPLETED" does not appear on CONSULT screen, go to the following step.
7) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
8) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions until "TESTING" changes to "COMPLETED". (It will take approximately 40 seconds or more.)
   CMPS·RPM (REF): 1,800 - 2,600 rpm (A/T)
   2,000 - 2,600 rpm (M/T)
   Vehicle speed: 10 km/h (6MPH) or more
   B/FUEL SCHDL: 3.0 - 3.5 msec (A/T)
   2.5 - 3.5 msec (M/T)
   THRTL POS SEN: (X + 0.23) − (X + 0.73) V
   X = Voltage value measured at step 7)
   Selector lever: Suitable position

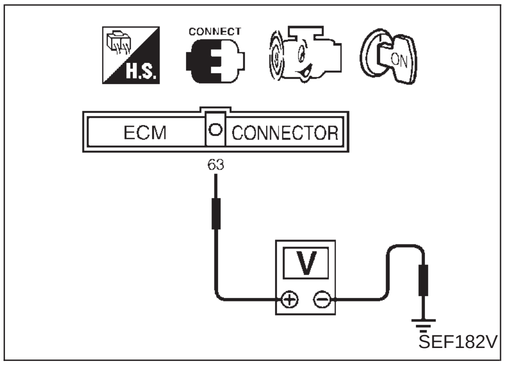
If "TESTING" is not displayed after 5 minutes, retry from step 2).

9) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-263.

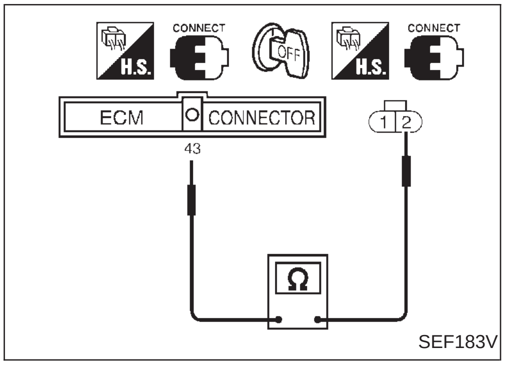
EGR Function (Close) (Cont'd)



SEF336V



SEF182V



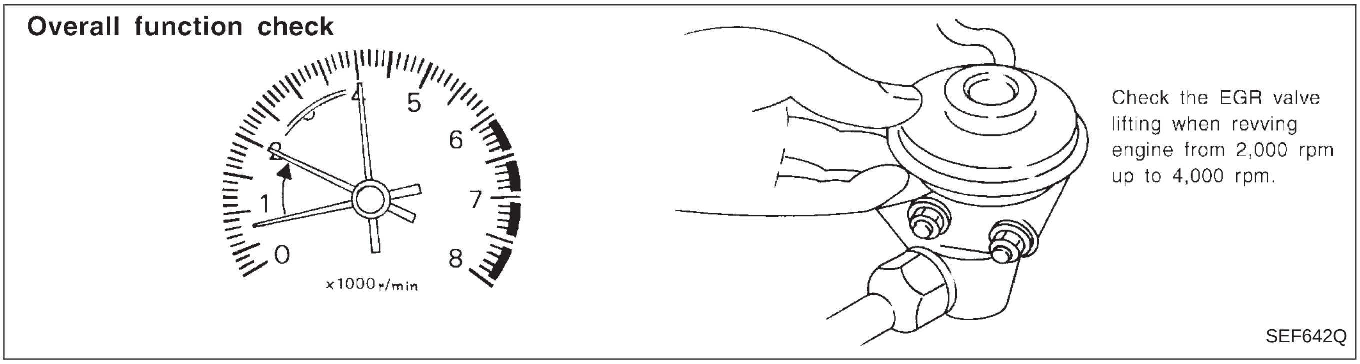
SEF183V

OR

OVERALL FUNCTION CHECK

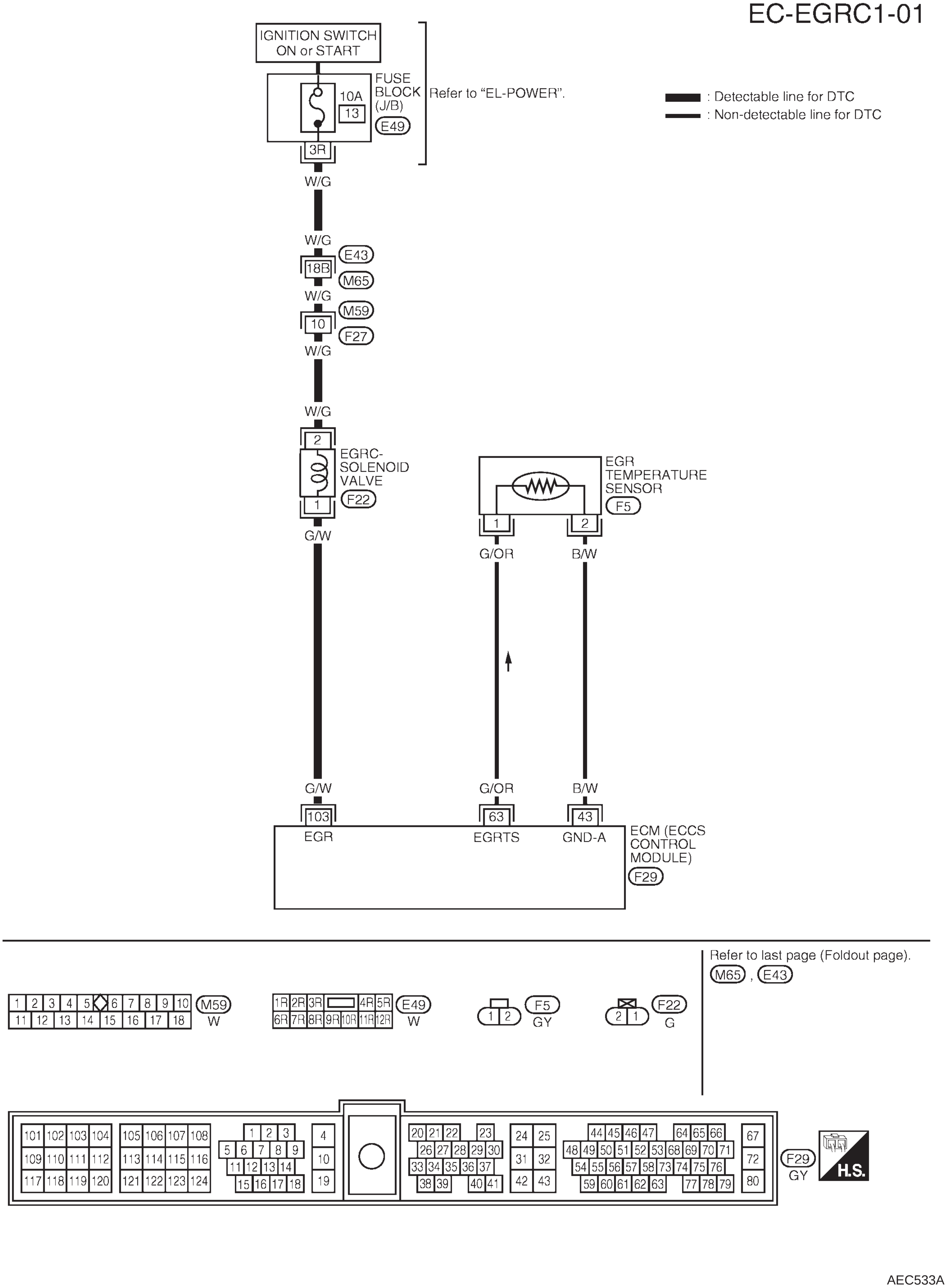
Use this procedure to check the overall EGR function. During this check, a 1st trip DTC might not be confirmed.

1) Start engine and warm it up to normal operating temperature.
2) Check the EGR valve lifting when revving engine from 2,000 rpm to 4,000 rpm quickly under no load using the following methods.
   - Disconnect EGRC-solenoid valve harness connector. (The DTC for EGRC-solenoid valve will be displayed, however, ignore it.)
   EGR valve should lift up, and go down without sticking.
   If NG, go to **A** in DIAGNOSTIC PROCEDURE on EC-263.
3) Check voltage between ECM terminal (63) (EGR temperature sensor) and ground at idle speed.
   Less than 4.5V should exist.
4) Turn ignition switch "OFF".
5) Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal (43) (ECM ground).
   Continuity should exist.
6) Perform "COMPONENT INSPECTION", "EGR temperature sensor". Refer to EC-265.



SEF642Q

EGR Function (Close) (Cont'd)

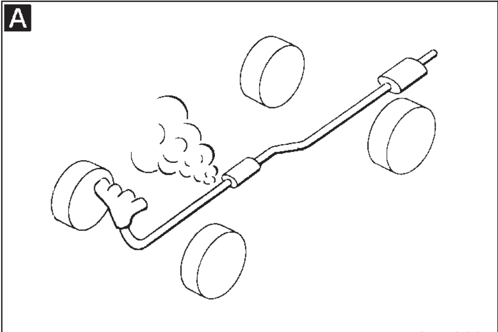


EGR Function (Close) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

A



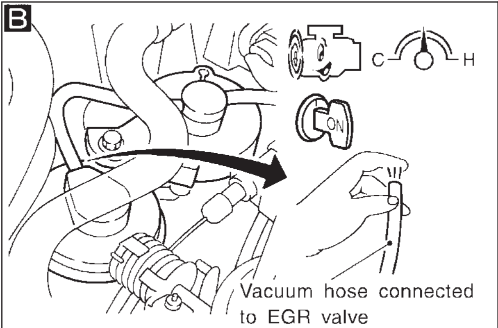
SEF099P

CHECK EXHAUST SYSTEM.
Check exhaust pipes and muffler for leaks.

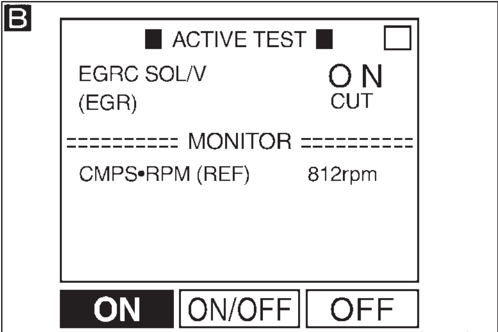
NG → Repair or replace exhaust system.

OK

B



SEF337V



■ ACTIVE TEST ■ ☐

EGRC SOL/V (EGR) ON CUT

========== MONITOR ==========

CMPS•RPM (REF) 812rpm

SEF184V

CHECK VACUUM SOURCE TO EGR VALVE.

1. Start engine and warm it up to normal operating temperature.
2. Disconnect vacuum hose to EGR valve.
3. Check for vacuum existence.
4. Check for vacuum existence when revving engine from 2,000 rpm up to 4,000 rpm with the following methods.
   Vacuum should not exist at idle.
   - Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
     Vacuum should exist when revving engine.

   OR

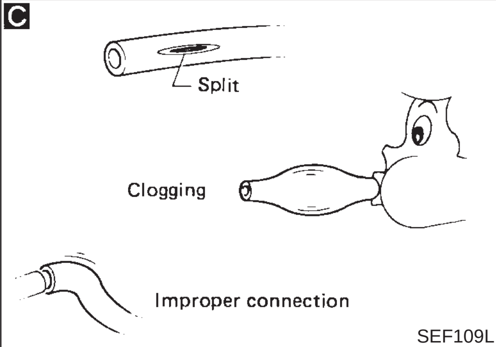
   - Disconnect EGRC-solenoid valve harness connector. (The 1st trip DTC for EGRC-solenoid valve will be displayed, but ignore it.)
     Vacuum should exist when revving engine.

OK → CHECK COMPONENT (EGR valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR valve.

NG

C



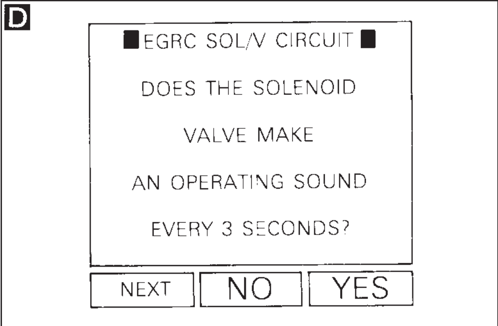
SEF109L

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection.
Refer to "Vacuum Hose Drawing", EC-16.

NG → Repair or replace vacuum hose.

OK

D



■EGRC SOL/V CIRCUIT■

DOES THE SOLENOID VALVE MAKE AN OPERATING SOUND EVERY 3 SECONDS?

MEF957D

CHECK EGRC-SOLENOID VALVE CIRCUIT.

1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Turn ignition switch "ON".
2. Check operating sound of the solenoid valve when disconnecting and reconnecting EGRC-solenoid valve harness connector. (The DTC or the 1st trip DTC for the EGRC-solenoid valve will be displayed, however, ignore it.)

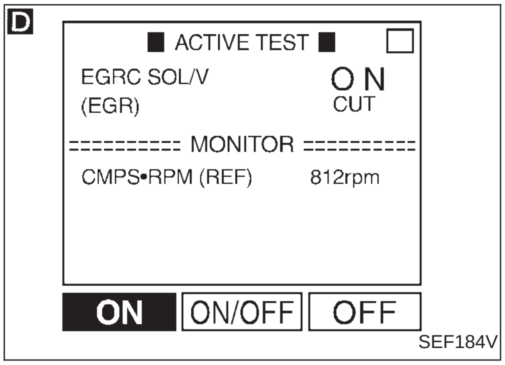
NG → Check the following.
- Harness connectors E43, M65
- Harness connectors M59, F27
- 10A fuse
- Harness for open or short between fuse block and EGRC-solenoid valve
- Harness for open or short between ECM and EGRC-solenoid valve

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

OK

Ⓐ
(Go to next page.)

EGR Function (Close) (Cont'd)



■ ACTIVE TEST ■ ☐

EGRC SOL/V (EGR) ON CUT

========== MONITOR ==========

CMPS•RPM (REF) 812rpm

SEF184V

Ⓐ

↓

CHECK COMPONENT (EGRC-solenoid valve). Refer to "COMPONENT INSPECTION" below. — NG → Replace EGRC-solenoid valve.

↓ OK

CHECK COMPONENT (EGRC-BPT valve). Refer to "COMPONENT INSPECTION" on the next page. — NG → Replace EGRC-BPT valve.

↓ OK

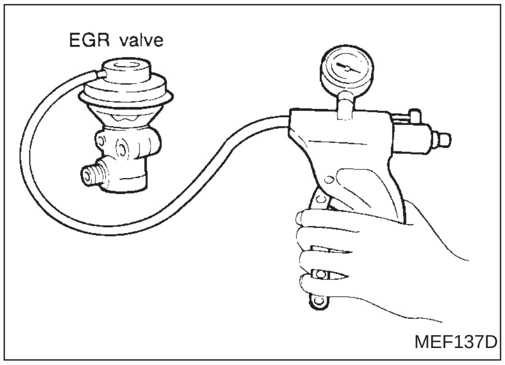
CHECK COMPONENT (EGR temperature sensor). Refer to "COMPONENT INSPECTION" on next page. — NG → Replace EGR temperature sensor.

↓ OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END



MEF137D

COMPONENT INSPECTION

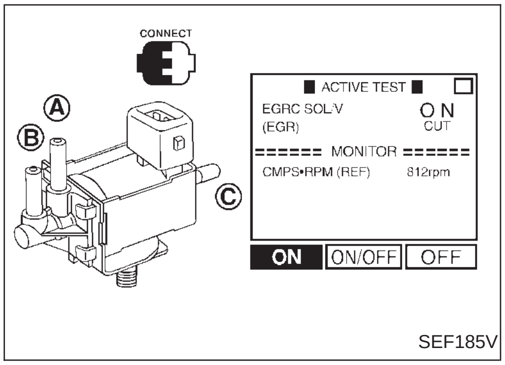
EGR valve

- Apply vacuum to EGR vacuum port with a hand vacuum pump.

EGR valve spring should lift.

- Check for sticking.

If NG, repair or replace EGR valve.



SEF185V

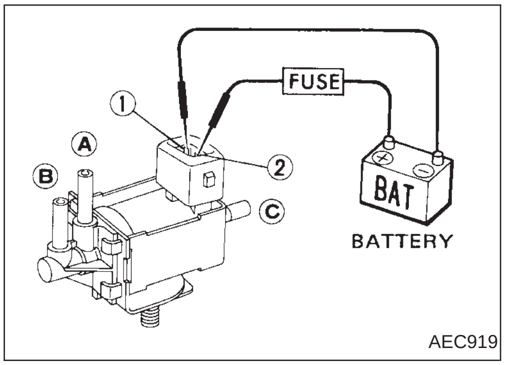
EGRC-solenoid valve

Check air passage continuity.

Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

Condition EGRC SOLENOID VALVE	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
ON	Yes	No
OFF	No	Yes

OR

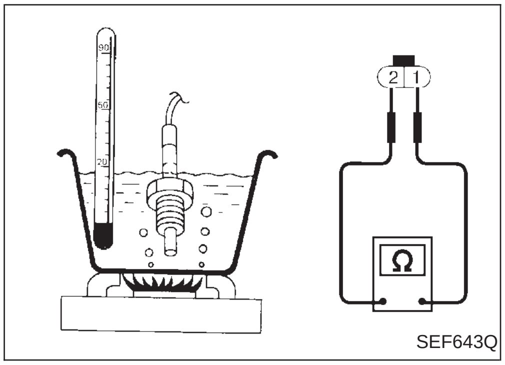


AEC919

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.

EGR Function (Close) (Cont'd)



SEF643Q

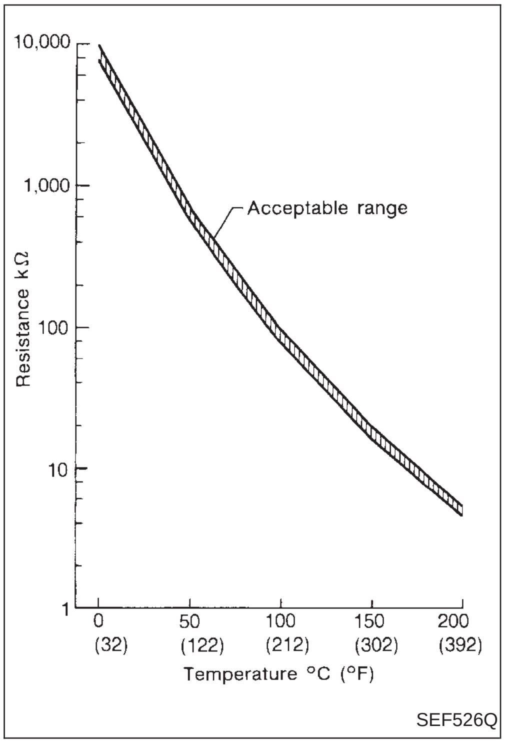
EGR temperature sensor

Check resistance change and resistance value.

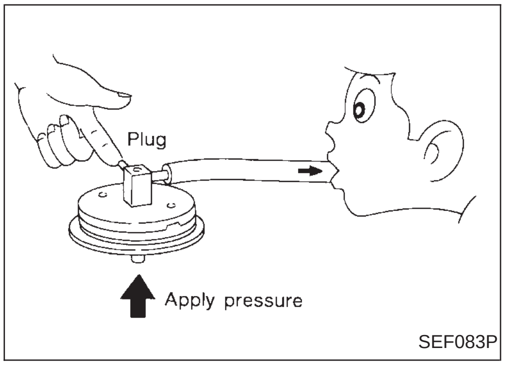
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

If NG, replace EGR temperature sensor.



SEF526Q

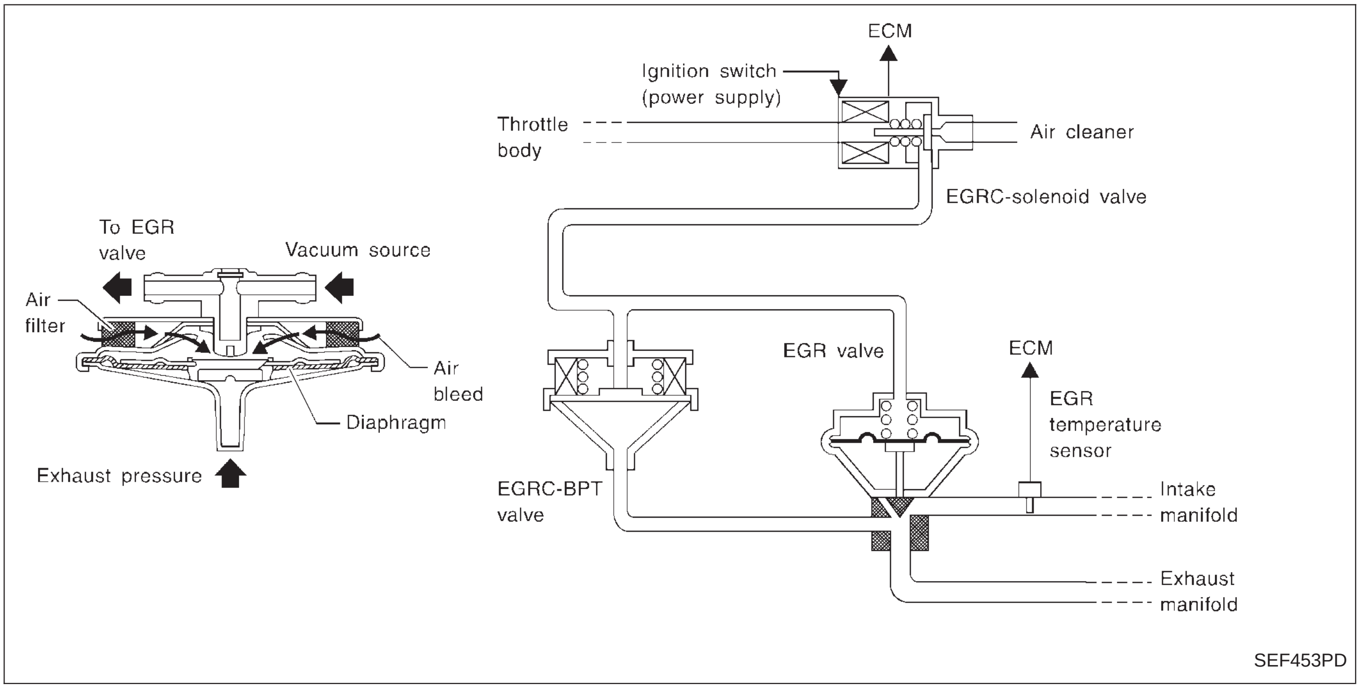


SEF083P

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH_2O, 3.94 inH_2O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

EGRC-BPT Valve Function



SYSTEM DESCRIPTION

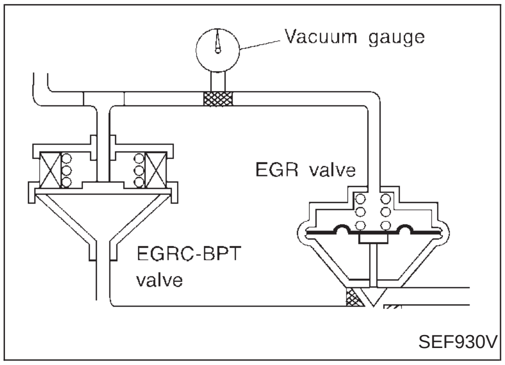
The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

ON BOARD DIAGNOSIS LOGIC

If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is large, then the vacuum to the EGR valve is interrupted through the EGRC-solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0402 0306	● The EGRC-BPT valve does not operate properly.	● EGRC-BPT valve ● EGR valve ● Misconnected rubber tube ● Blocked rubber tube ● Camshaft position sensor ● Blocked exhaust system ● Orifice ● Mass air flow sensor ● EGRC-solenoid valve

EGRC-BPT Valve Function (Cont'd)



SEF930V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

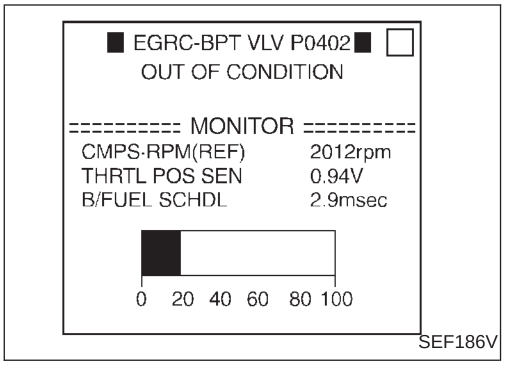
CAUTION:
Always drive vehicle at a safe speed.

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

TESTING CONDITION:

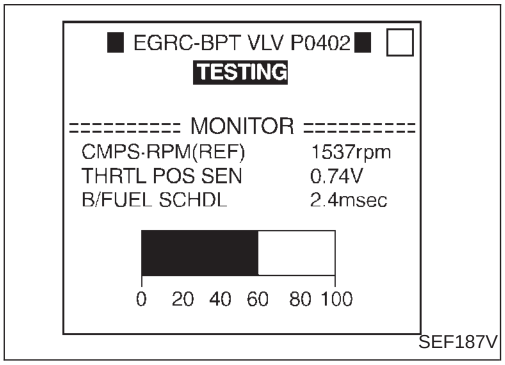
- **For best results, perform at a temperature above 5°C (41°F).**
- **Before performing the following procedure, confirm battery voltage is more than 11V at idle.**

1) Install vacuum gauge between EGRC-BPT valve and EGR valve as shown in the figure at left.
2) Start engine and warm it up to normal operating temperature.
3) Stop engine and wait at least 5 seconds.
4) Turn ignition switch "ON" and select "EGRC-BPT/V P0402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
5) Start engine and let it idle.
6) Touch "START".


■ EGRC-BPT VLV P0402 ■ ☐
OUT OF CONDITION
========== MONITOR ==========
CMPS·RPM(REF) 2012rpm
THRTL POS SEN 0.94V
B/FUEL SCHDL 2.9msec

SEF186V

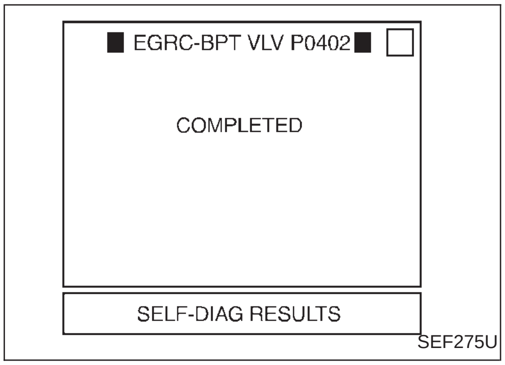
7) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
8) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen and the bar chart may increase. Maintain the conditions until "COMPLETED" appears.


■ EGRC-BPT VLV P0402 ■ ☐
TESTING
========== MONITOR ==========
CMPS·RPM(REF) 1537rpm
THRTL POS SEN 0.74V
B/FUEL SCHDL 2.4msec

SEF187V

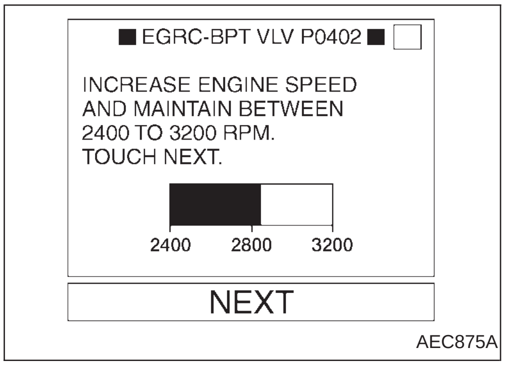
Selector lever: Suitable position
CMPS·RPM (REF): 1,400 - 1,600 rpm (A/T)
1,600 - 1,800 rpm (M/T)
Vehicle speed: 30 - 54 km/h (19 - 34 MPH) (A/T)
30 - 100 km/h (19 - 62 MPH) (M/T)
B/FUEL SCHDL: 2.0 - 2.7 msec
THRTL POS SEN: (X + 0.13) - (X + 0.89) V
X = Voltage value measured at step 7

- **The bar chart on CONSULT screen indicates the status of this test. However, the test may be finished before the bar chart becomes full scale.**
- **If the bar chart indication does not continue to progress, completely release accelerator pedal once and try to meet the conditions again.**
- **If "TESTING" does not appear on CONSULT screen, retry from step 2).**


■ EGRC-BPT VLV P0402 ■ ☐
COMPLETED

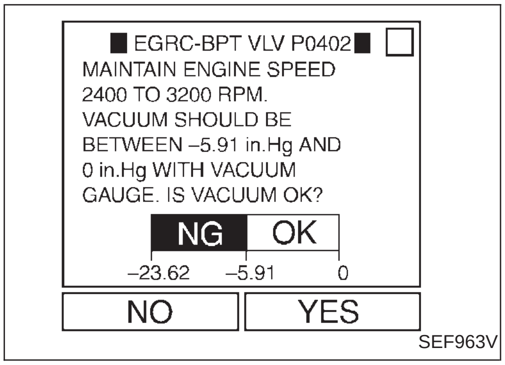
SEF275U

9) If CONSULT instructs to carry out "OVERALL FUNCTION CHECK", go to next step. If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-258.
10) Open engine hood.
11) Raise engine speed to 2,400 - 3,200 rpm under no-load and hold it. Then touch "NEXT" on the CONSULT screen.


■ EGRC-BPT VLV P0402 ■ ☐
INCREASE ENGINE SPEED
AND MAINTAIN BETWEEN
2400 TO 3200 RPM.
TOUCH NEXT.

AEC875A

EGRC-BPT Valve Function (Cont’d)

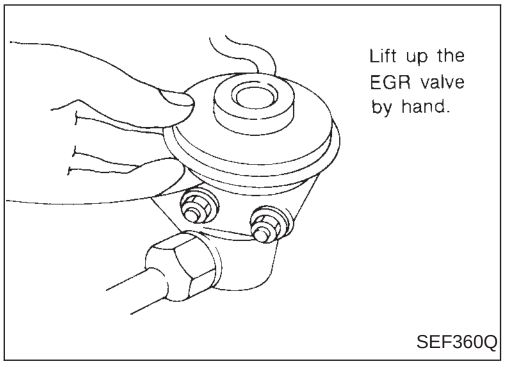


■ EGRC-BPT VLV P0402 ■ ☐
MAINTAIN ENGINE SPEED
2400 TO 3200 RPM.
VACUUM SHOULD BE
BETWEEN −5.91 in.Hg AND
0 in.Hg WITH VACUUM
GAUGE. IS VACUUM OK?

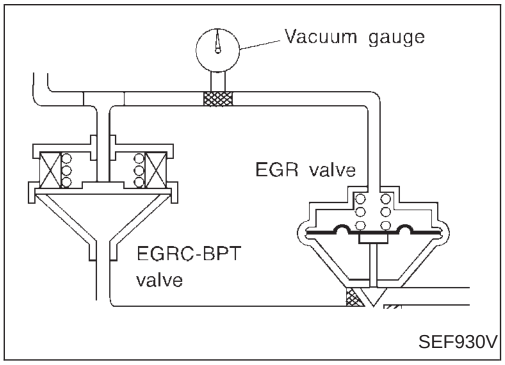
SEF963V

11) Check vacuum gauge while keeping engine speed at 2,400 - 3,200 rpm.
    Vacuum should be 0 to −150 mmHg (0 to −5.91 inHg).
    If NG, go to “DIAGNOSTIC PROCEDURE”, EC-269.
    If OK, go to next step before touching “YES” on the CONSULT screen.
12) Check the EGR valve lifting when revving from 2,000 rpm to 4,000 rpm quickly under no load.
    EGR valve should lift up, and go down without sticking when the engine is returned to idle.
    If NG, check EGR valve.
    If OK, touch “YES” on the CONSULT screen.
13) Check the rubber tube between EGR valve and EGRC-BPT valve for cracks, blockages or twists.
    If NG, repair.
    If OK, touch “YES” on the CONSULT screen.

OR



SEF360Q

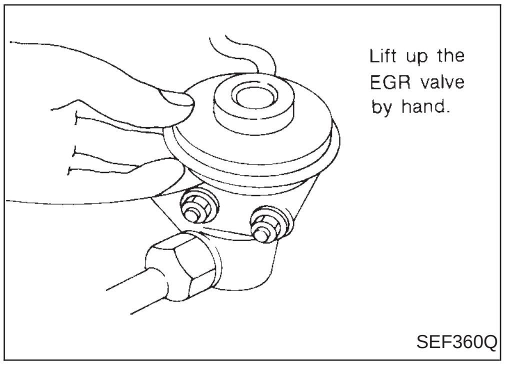


SEF930V

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGRC-BPT valve. During this check, a 1st trip DTC might not be confirmed.

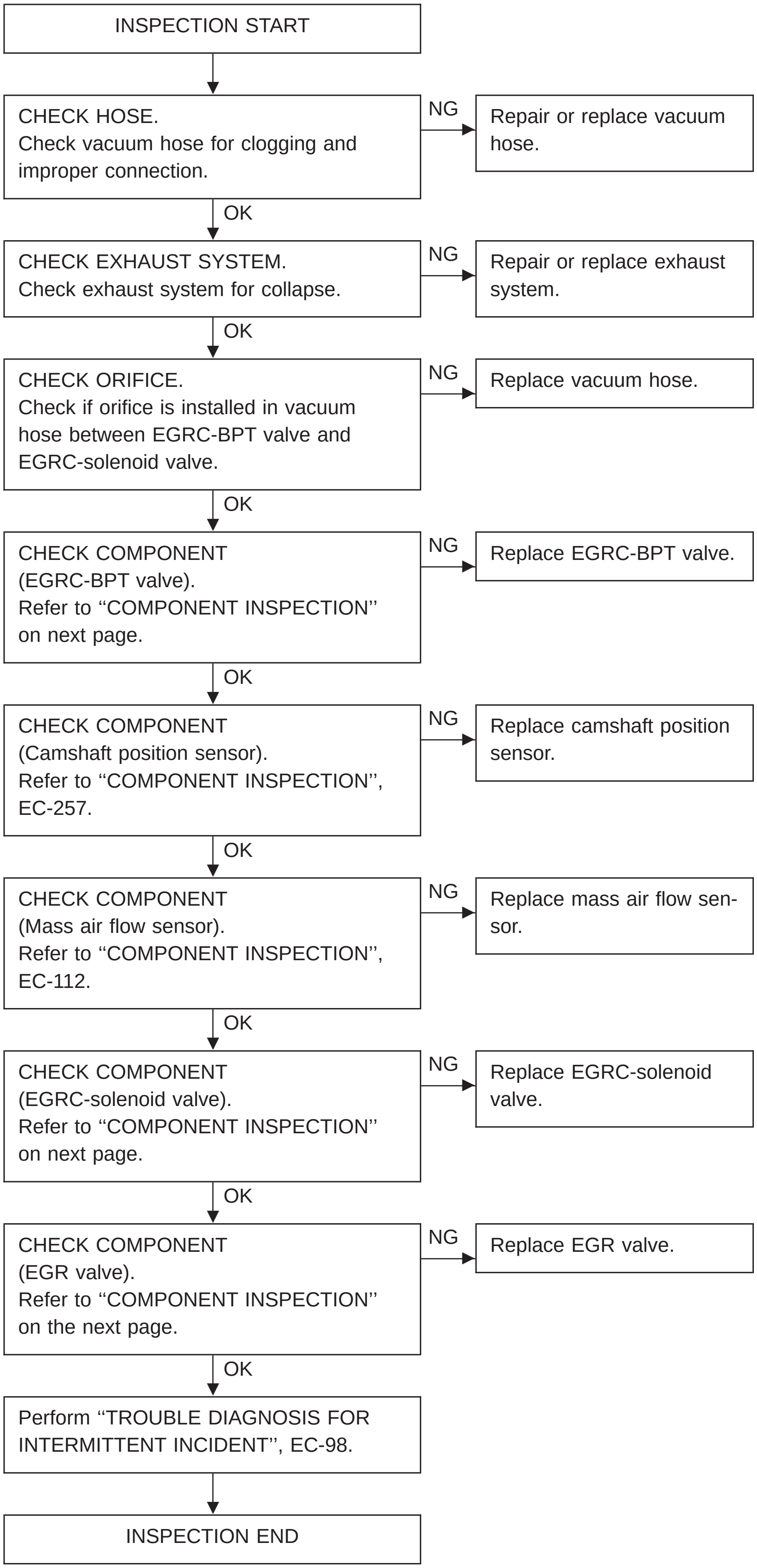
1) Install vacuum gauge between EGRC-BPT valve and EGR valve as shown in the figure at left.
2) Lift up vehicle.
3) Start engine and shift to 1st gear or 1 position.
4) Check vacuum gauge while keeping engine speed at 2,400 - 3,200 rpm.
   Vacuum should be 0 to −150 mmHg (0 to −5.91 inHg).
   If NG, go to “DIAGNOSTIC PROCEDURE”, EC-269.
   If OK, go to next step.
5) Check the EGR valve lifting when revving engine from 2,000 rpm to 4,000 rpm quickly under no load.
   EGR valve should lift up, and go down without sticking when the engine is returned to idle.
6) Check rubber tube between EGRC-solenoid valve and throttle body for misconnection, cracks or blockages.



SEF360Q

EGRC-BPT Valve Function (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK HOSE.
Check vacuum hose for clogging and improper connection.

Repair or replace vacuum hose.

CHECK EXHAUST SYSTEM.
Check exhaust system for collapse.

Repair or replace exhaust system.

CHECK ORIFICE.
Check if orifice is installed in vacuum hose between EGRC-BPT valve and EGRC-solenoid valve.

Replace vacuum hose.

CHECK COMPONENT
(EGRC-BPT valve).
Refer to ''COMPONENT INSPECTION'' on next page.

Replace EGRC-BPT valve.

CHECK COMPONENT
(Camshaft position sensor).
Refer to ''COMPONENT INSPECTION'', EC-257.

Replace camshaft position sensor.

CHECK COMPONENT
(Mass air flow sensor).
Refer to ''COMPONENT INSPECTION'', EC-112.

Replace mass air flow sensor.

CHECK COMPONENT
(EGRC-solenoid valve).
Refer to ''COMPONENT INSPECTION'' on next page.

Replace EGRC-solenoid valve.

CHECK COMPONENT
(EGR valve).
Refer to ''COMPONENT INSPECTION'' on the next page.

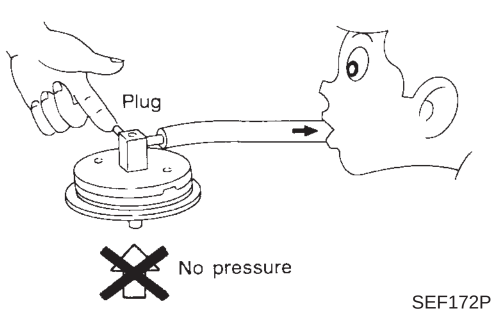
Replace EGR valve.

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

INSPECTION END

EGRC-BPT Valve Function (Cont'd)

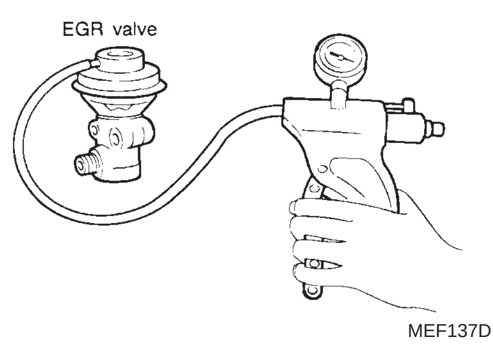
COMPONENT INSPECTION



SEF172P

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check leakage without applying any pressure from under EGR-BPT valve.
   Leakage should exist.



MEF137D

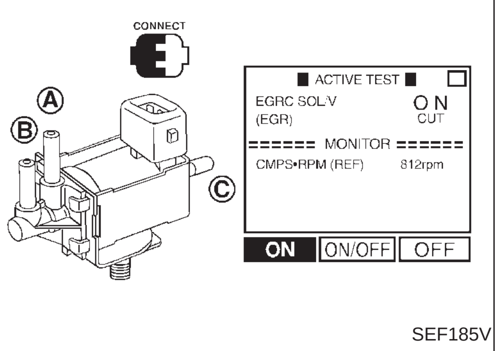
EGR valve

- Apply vacuum to EGR vacuum port with a hand vacuum pump.

EGR valve spring should lift.

- Check for sticking.

If NG, repair or replace EGR valve.



SEF185V

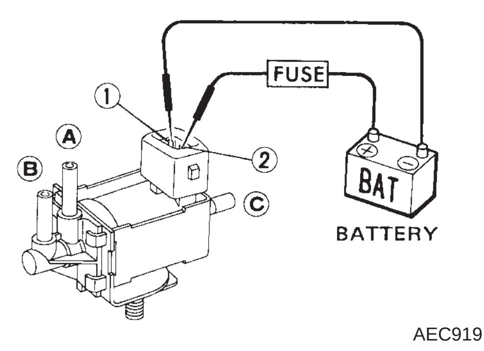
EGRC-solenoid valve

Check air passage continuity.

Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

Condition EGRC SOLENOID VALVE	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
ON	Yes	No
OFF	No	Yes

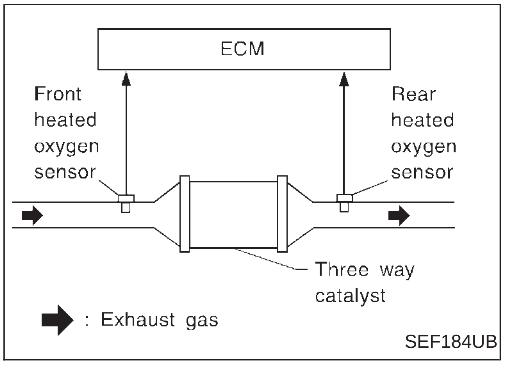
OR



AEC919

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.



Three Way Catalyst Function

ON BOARD DIAGNOSIS LOGIC

The ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.

Three way catalyst* with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.

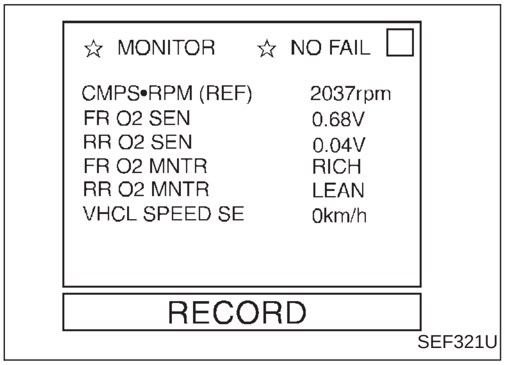
When the frequency ratio of front and rear heated oxygen sensors approaches a specified limit value, the three way catalyst* malfunction is diagnosed.

*: Warm-up three way catalyst (For California)

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0702	● Three way catalyst* does not operate properly. ● Three way catalyst* does not have enough oxygen storage capacity.	● Three way catalyst* ● Exhaust tube ● Intake air leaks ● Injectors ● Injector leaks ● Spark plug ● Improper ignition timing

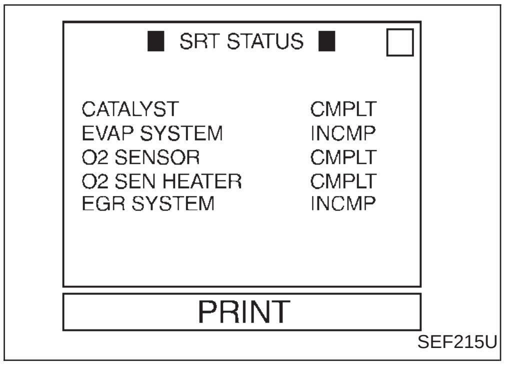
*: Warm-up three way catalyst (For California)

Three Way Catalyst Function (Cont'd)



CMPS•RPM (REF)	2037rpm
FR O2 SEN	0.68V
RR O2 SEN	0.04V
FR O2 MNTR	RICH
RR O2 MNTR	LEAN
VHCL SPEED SE	0km/h

SEF321U



CATALYST	CMPLT
EVAP SYSTEM	INCMP
O2 SENSOR	CMPLT
O2 SEN HEATER	CMPLT
EGR SYSTEM	INCMP

SEF215U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

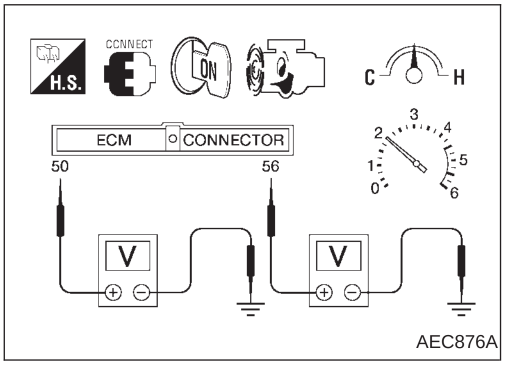
If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.

1) Start engine and 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 "MANU TRIG" and "HI SPEED", then select "FR O2 SENSOR", "RR O2 SENSOR", "FR O2 MNTR", "RR O2 MNTR" in "DATA MONITOR" mode with CONSULT.
4) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constantly under no load.
5) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 MNTR" is much less than that of "FR O2 MNTR" as shown below.
   Switching frequency ratio =

   $$\frac{\textbf{Rear heated oxygen sensor switching frequency}}{\textbf{Front heated oxygen sensor switching frequency}}$$

   This ratio should be less than 0.75.
   If the ratio is greater than above, the warm-up three way catalyst (Models for California), the three way catalyst (Models except for California) is not operating properly.
   If the "FR O2 MNTR" does not indicate "RICH" and "LEAN" periodically more than 5 times within 10 seconds at step 4), perform "TROUBLE DIAGNOSES FOR DTC P0133" first. (See EC-171.)
   If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-274.
   If the result is OK, go to following step.
6) Select "AUTO TRIG" in "DATA MONITOR" mode with CONSULT.
7) Drive vehicle at a speed of approximately 84 to 96 km/h (52 to 60 MPH) with the following for at least 10 consecutive minutes.
   (Drive the vehicle in an area where vehicle speed and accelerator pressure can be held steady and constant.)
   M/T: 5th position
   A/T: D position ("OD" ON)
   If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-274.
8) Select "SRT STATUS" in "DTC CONFIRMATION" mode with CONSULT.
9) Verify that "CATALYST" is "CMPLT".
   If not "CMPLT", repeat the test from step 5).

Three Way Catalyst Function (Cont'd)



AEC876A

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the three way catalyst.
During this check, a 1st trip DTC might not be confirmed.

1) Start engine and 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 terminal ㊿ (front heated oxygen sensor signal) and ECM ground, and ECM terminal (56) (rear heated oxygen sensor signal) and ECM 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 terminal (56) and ECM ground is much less than that of ECM terminal ㊿ and ECM ground.
   Switching frequency ratio =

$$\frac{\textbf{Rear heated oxygen sensor voltage switching frequency}}{\textbf{Front heated oxygen sensor voltage switching frequency}}$$

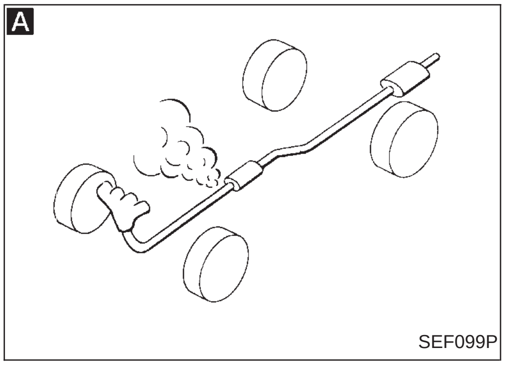
   This ratio should be less than 0.75.
   If the ratio is greater than above, it means three way catalyst does not operate properly.

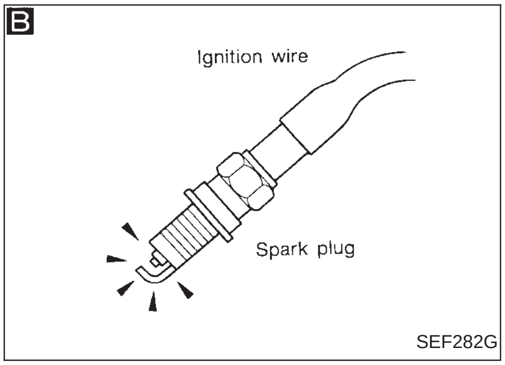
Note: If the voltage at terminal ㊿ does not switch periodically more than 5 times within 10 seconds at step 4, perform TROUBLE DIAGNOSIS FOR DTC P0133 first. (See EC-150.)

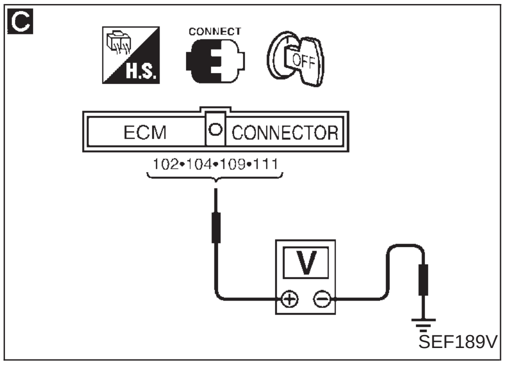
6) If NG, go to "DIAGNOSTIC PROCEDURE" on next page.

Three Way Catalyst Function (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

CHECK EXHAUST SYSTEM.
Visually check exhaust tubes and muffler for dents.

NG → Repair or replace it.

↓ OK

A

CHECK EXHAUST AIR LEAK.
Start engine and run it at idle. Listen for an exhaust air leak before the warm-up three way catalyst (California model), the three way catalyst (Non-California model).

NG → Repair or replace.

↓ OK

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

NG → Repair or replace.

↓ OK

B

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.

NG → CHECK COMPONENT (Ignition wires).
Refer to "COMPONENT INSPECTION", EC-242.

- NG → Replace.
- OK → Check ignition coil, power transistor and their circuits.
Refer to EC-333.

↓ OK

C

CHECK INJECTORS.
1. Refer to WIRING DIAGRAM for Injectors, EC-423.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals (102), (104), (109) and (111) and ground with CONSULT or tester.
Battery voltage should exist.

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injector", EC-423.
Repair harness or connectors.

↓ OK

Check for ignition timing.
Refer to "Basic Inspection", EC-74.

NG → Adjust ignition timing.

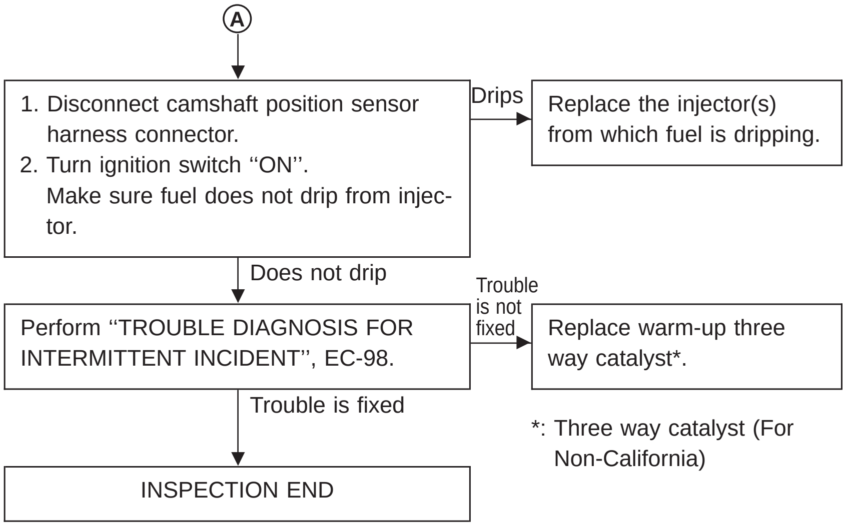
↓ OK

1. Turn ignition switch "OFF".
2. Remove injector assembly.
Refer to EC-30.
Keep fuel hose and all injectors connected to injector gallery.

↓

Ⓐ
(Go to next page.)

Three Way Catalyst Function (Cont’d)



1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch ‘‘ON’’.
   Make sure fuel does not drip from injector.

Replace the injector(s) from which fuel is dripping.

Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.

Replace warm-up three way catalyst*.

INSPECTION END

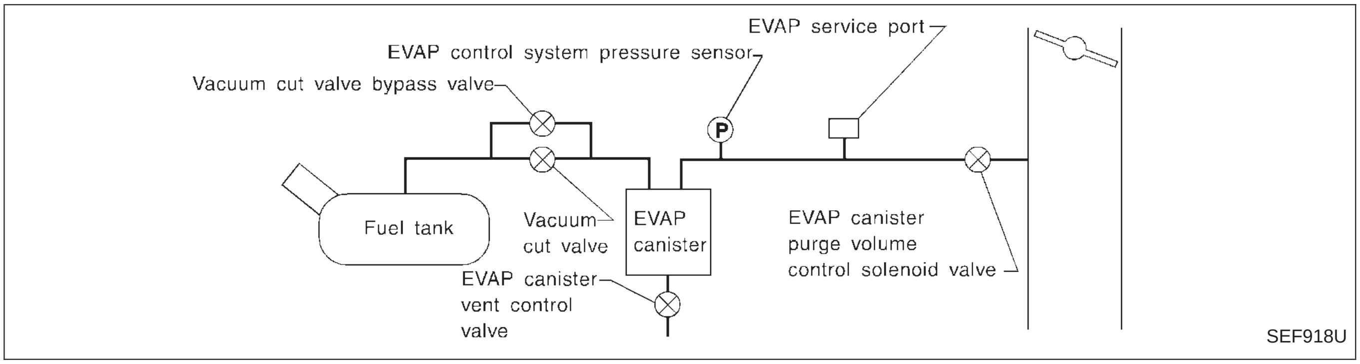
*: Three way catalyst (For Non-California)

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure)

Note: If DTC P1448 is displayed with P0440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-392.)

ON BOARD DIAGNOSIS LOGIC

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve under the following ‘‘Vacuum test’’ conditions.
The vacuum cut valve bypass valve is opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve is opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0440 0705	● EVAP control system has a leak. ● EVAP control system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● Foreign matter caught in fuel filler cap. ● Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. ● Foreign matter caught in EVAP canister vent control valve. ● EVAP canister or fuel tank leaks ● EVAP purge line (pipe and rubber tube) leaks ● EVAP purge line rubber tube bent. ● Blocked or bent rubber tube to EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve and the circuit ● Absolute pressure sensor ● Tank fuel temperature sensor ● MAP/BARO switch solenoid valve and the circuit ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● O-ring of EVAP canister vent control valve is missing or damaged. ● Water separator ● EVAP canister is saturated with water. ● EVAP control system pressure sensor

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

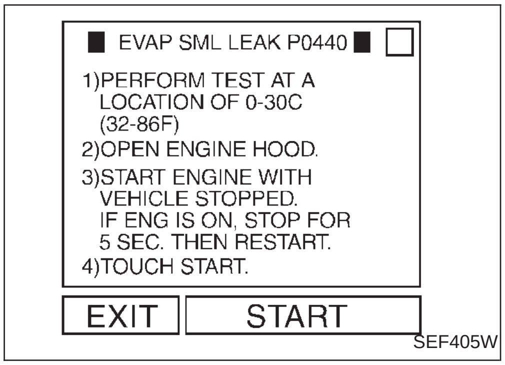
NOTE:

- **If DTC P1448 is displayed with P0440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-392.)**
- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**

TESTING CONDITION:

- **Perform "DTC WORK SUPPORT" when the fuel level is less than 3/4 full and vehicle is placed on flat level surface.**
- **Always perform at a temperature of 0 to 30°C (32 to 86°F).**
- **It is better that the fuel level is low.**

1) Turn ignition switch "ON".
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
4) Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
5) Select "EVAP SML LEAK P0440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
   Follow the instruction displayed.

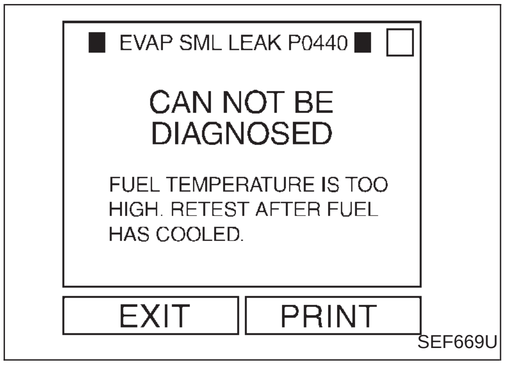

■ EVAP SML LEAK P0440 ■ ☐

1)PERFORM TEST AT A LOCATION OF 0-30C (32-86F)
2)OPEN ENGINE HOOD.
3)START ENGINE WITH VEHICLE STOPPED. IF ENG IS ON, STOP FOR 5 SEC. THEN RESTART.
4)TOUCH START.

SEF405W

NOTE:

- **If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE" becomes less than 30°C (86°F), retest. (Use a fan to reduce the stabilization time.)**
- **If the engine speed cannot be maintained within the range displayed on CONSULT screen, go to "Basic Inspection", EC-74.**


■ EVAP SML LEAK P0440 ■ ☐

CAN NOT BE DIAGNOSED

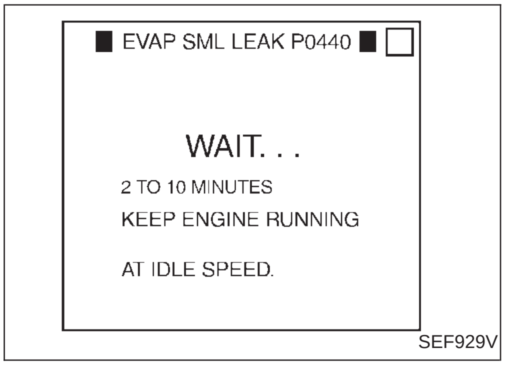
FUEL TEMPERATURE IS TOO HIGH. RETEST AFTER FUEL HAS COOLED.

SEF669U

6) Make sure that "OK" is displayed.
   If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-279.

NOTE:

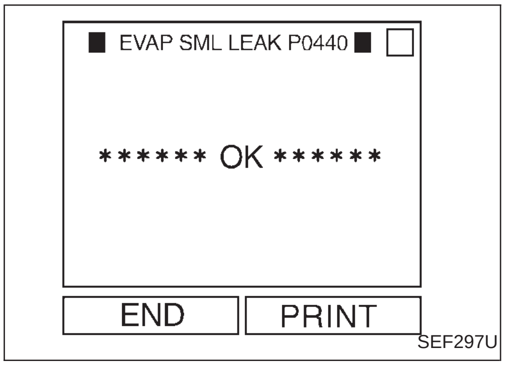
- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**


■ EVAP SML LEAK P0440 ■ ☐

WAIT. . .

2 TO 10 MINUTES
KEEP ENGINE RUNNING
AT IDLE SPEED.

SEF929V


■ EVAP SML LEAK P0440 ■ ☐

****** OK ******

SEF297U

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont’d)

OR

NOTE:
Be sure to read the explanation of ‘‘Driving pattern’’ on EC-42 before driving vehicle.

GST

1) Start engine.
2) Drive vehicle according to ‘‘Driving pattern’’, EC-42.
3) Stop vehicle.
4) Select ‘‘MODE 1’’ with GST.
- If SRT of EVAP system is not set yet, go to the following step.
- If SRT of EVAP system is set, the result will be OK.

5) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
6) Start engine.

It is not necessary to cool engine down before driving.

7) Drive vehicle again according to ‘‘Driving pattern’’, EC-42.
8) Stop vehicle.
9) Select ‘‘MODE 3’’ with GST.
- If P1447 is displayed on the screen, go to ‘‘TROUBLE DIAGNOSIS FOR DTC P1447’’, EC-386.
- If P0440 is displayed on the screen, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-279.
- If P1440 is displayed on the screen, go to ‘‘DIAGNOSTIC PROCEDURE’’ in ‘‘TROUBLE DIAGNOSIS FOR DTC P1440’’, EC-366.
- If P0440, P1440 and P1447 are not displayed on the screen, go to the following step.

10) Select ‘‘MODE 1’’ with GST.
- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 6).

OR

NOTE:
- **Be sure to read the explanation of ‘‘Driving pattern’’ on EC-42 before driving vehicle.**
- **It is better that the fuel level is low.**

NO TOOLS

1) Start engine.
2) Drive vehicle according to ‘‘Driving pattern’’, EC-42.
3) Stop vehicle.
4) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
5) Turn ignition switch ‘‘ON’’ and perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
6) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK FUEL FILLER CAP.

1. Check for genuine NISSAN fuel filler cap design.
2. Check for air releasing sound while opening the fuel filler cap.
   If the air releasing sound is heard, go to **B** .
   If the air releasing sound is not heard, check the following.
   Was the cap tightened properly?
   If Yes, check fuel filler cap vacuum relief valve.
   Refer to "EVAPORATIVE EMISSION SYSTEM", EC-23.
   If No, open fuel filler cap, then clean cap and filler neck thread using air blower. Retighten until ratcheting sound is heard.

NG → If genuine NISSAN fuel filler cap is not used, replace with genuine NISSAN fuel filler cap.

OK

B

CHECK FOR EVAP LEAK.

- **Never use compressed air or high pressure pump.**
- **Improper installation of service port may cause leaking.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**

To locate EVAP leak portion, proceed with the following steps.

1. Install the EVAP service port adapter and the pressure pump securely.
2. Turn ignition switch "ON".
   Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply vacuum into the EVAP line until the pressure indicator reaches the middle of bar graph.
4. Using EVAP leak detector, locate the leak portion. For the leak detector, refer to instruction manual for more details.
   Refer to "Evaporative Emission Line Drawing", EC-26.

OR

2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12 volts until the end of test.)
5. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg).
6. Locate the leak using a leak detector. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

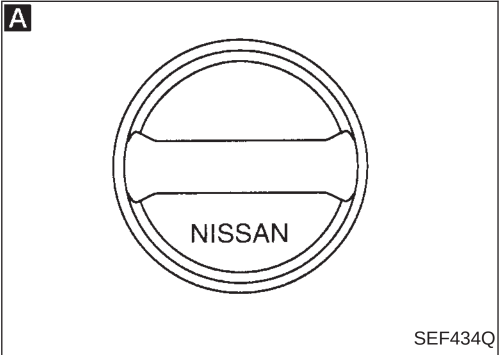
NG → Repair or replace.

OK

Ⓐ

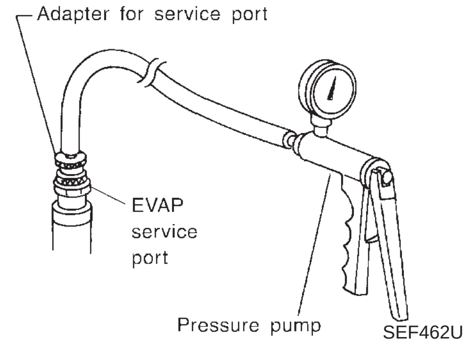
(Go to next page.)

A



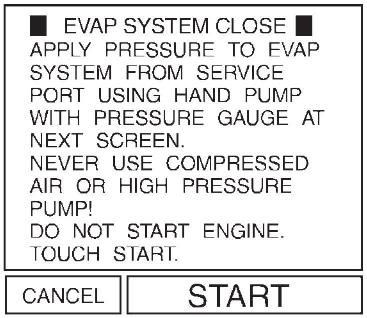
SEF434Q

B



SEF462U

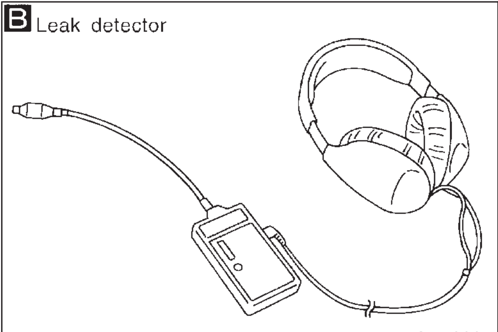
B



■ EVAP SYSTEM CLOSE ■
APPLY PRESSURE TO EVAP SYSTEM FROM SERVICE PORT USING HAND PUMP WITH PRESSURE GAUGE AT NEXT SCREEN.
NEVER USE COMPRESSED AIR OR HIGH PRESSURE PUMP!
DO NOT START ENGINE.
TOUCH START.

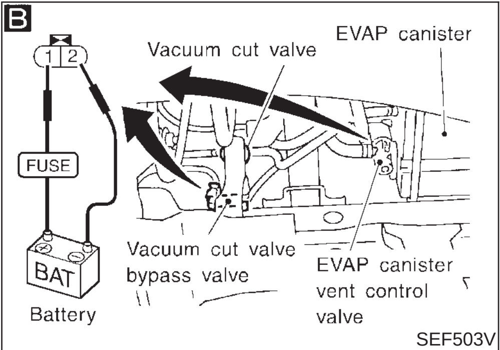
SEF658U

B



SEF200U

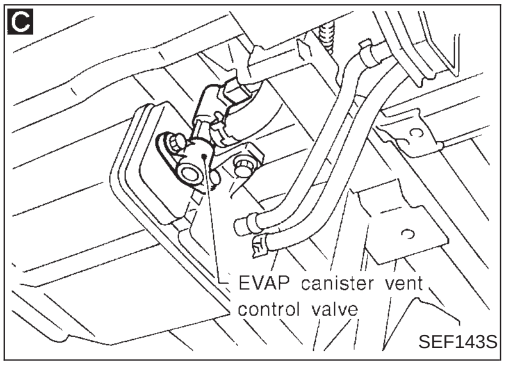
B



SEF503V

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

Ⓐ

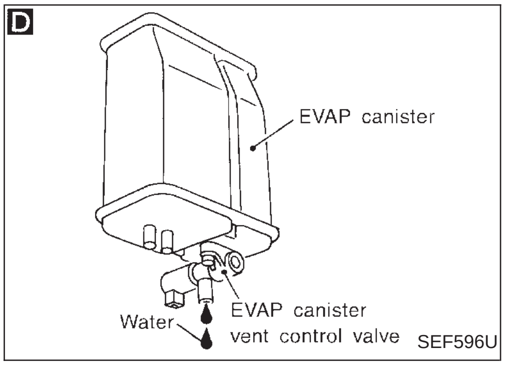


C

CHECK COMPONENT AND CIRCUIT
(EVAP canister vent control valve, O-ring and water separator).
Refer to "TROUBLE DIAGNOSIS FOR DTC P0446" for circuit, EC-292 and "COMPONENT INSPECTION", EC-296.

NG → Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

OK ↓



D

CHECK IF EVAP CANISTER SATURATED WITH WATER.

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister. If it will, weigh the EVAP canister with the EVAP canister vent control valve attached.
   If the weight is:

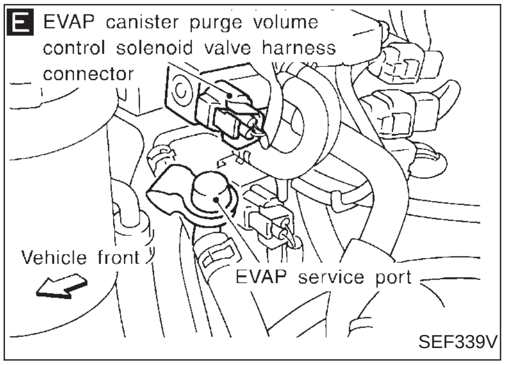
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

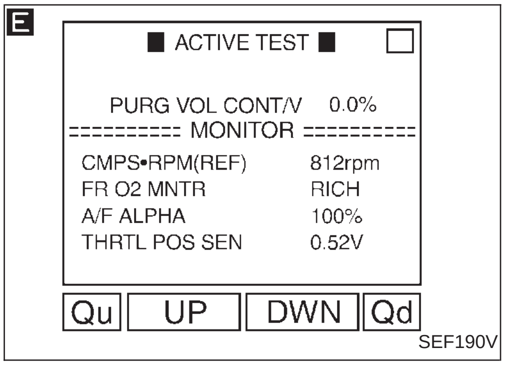
NG → Check the following.

1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator. Refer to "COMPONENT INSPECTION", EC-283.

If NG, repair hose or replace EVAP canister or water separator.

OK ↓





■ ACTIVE TEST ■ ☐

PURG VOL CONT/V 0.0%

========== MONITOR ==========

CMPS•RPM(REF)	812rpm
FR O2 MNTR	RICH
A/F ALPHA	100%
THRTL POS SEN	0.52V

E

CHECK COMPONENT (EVAP canister purge volume control solenoid valve).

1. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check EVAP hose for vacuum.
   Vacuum should exist.

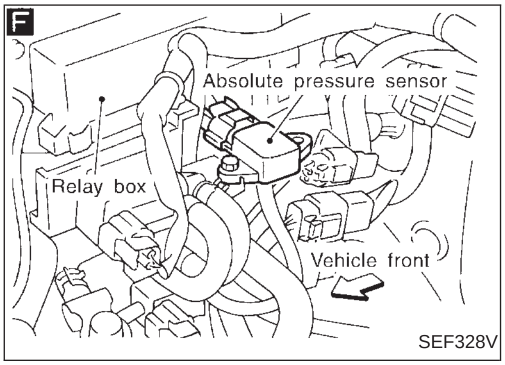
OR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve.
4. Start engine and let it idle for at least 60 seconds.
5. Check EVAP hose for vacuum.
   Vacuum should exist.

NG → Check the following.

- EVAP canister purge volume control solenoid valve
  Refer to "COMPONENT INSPECTION", EC-282.
- Vacuum hoses for clogging or disconnection
  Refer to "Vacuum Hose Drawing", EC-16.

OK ↓



F

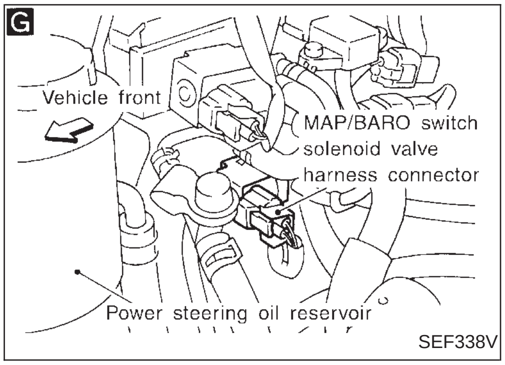
CHECK COMPONENT
(Absolute pressure sensor).
Refer to "COMPONENT INSPECTION", EC-283.

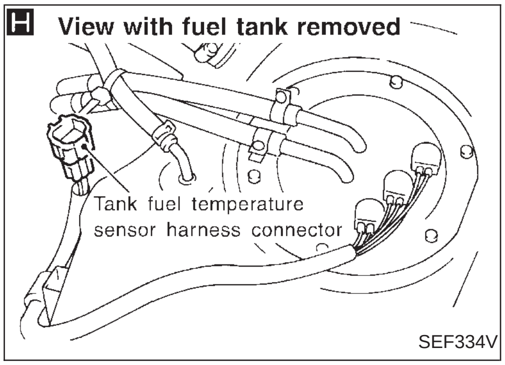
NG → Replace absolute pressure sensor.

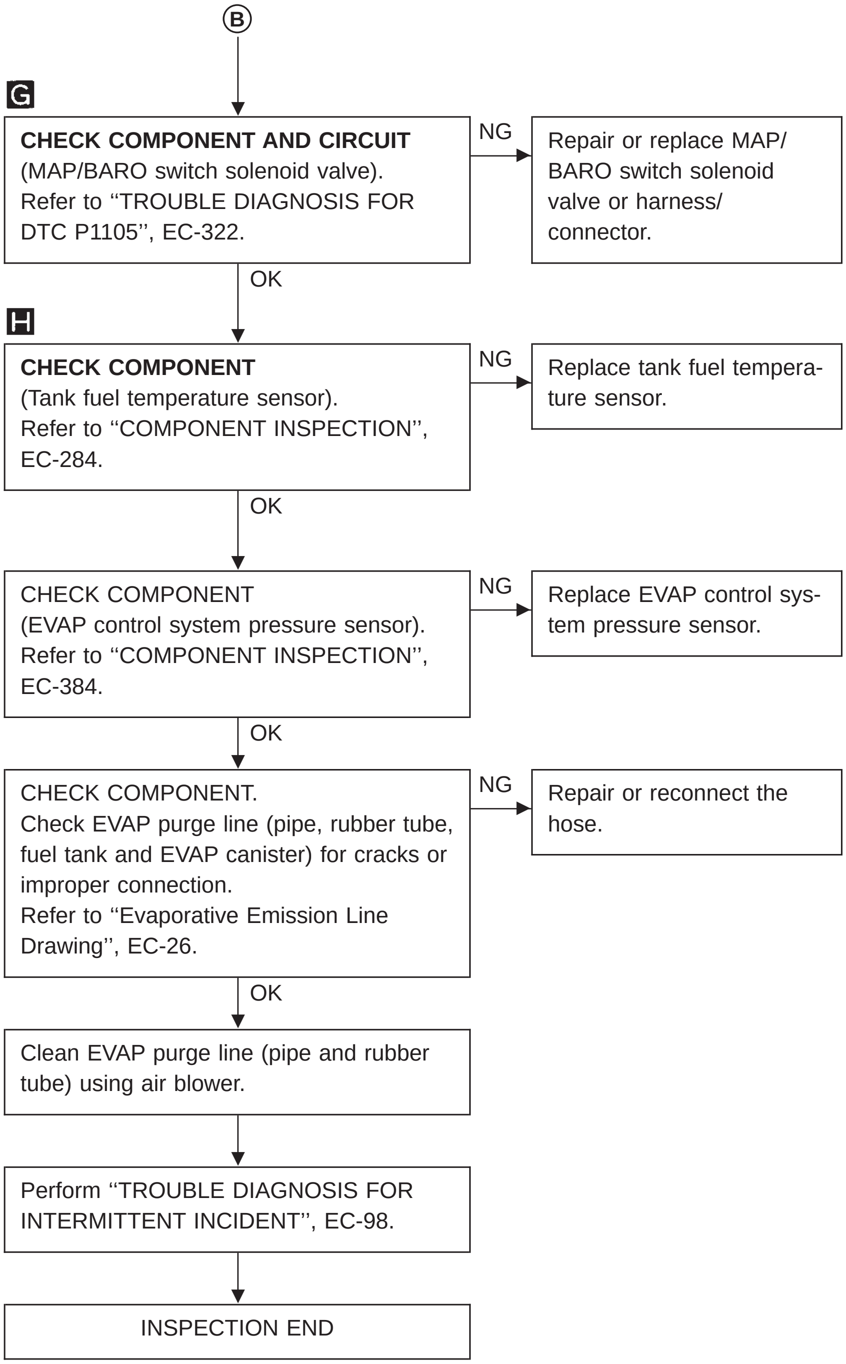
OK ↓

Ⓑ
(Go to next page.)

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)







G **CHECK COMPONENT AND CIRCUIT**
(MAP/BARO switch solenoid valve).
Refer to "TROUBLE DIAGNOSIS FOR DTC P1105", EC-322.

NG → Repair or replace MAP/BARO switch solenoid valve or harness/connector.

OK ↓

H **CHECK COMPONENT**
(Tank fuel temperature sensor).
Refer to "COMPONENT INSPECTION", EC-284.

NG → Replace tank fuel temperature sensor.

OK ↓

CHECK COMPONENT
(EVAP control system pressure sensor).
Refer to "COMPONENT INSPECTION", EC-384.

NG → Replace EVAP control system pressure sensor.

OK ↓

CHECK COMPONENT.
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to "Evaporative Emission Line Drawing", EC-26.

NG → Repair or reconnect the hose.

OK ↓

Clean EVAP purge line (pipe and rubber tube) using air blower.

↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

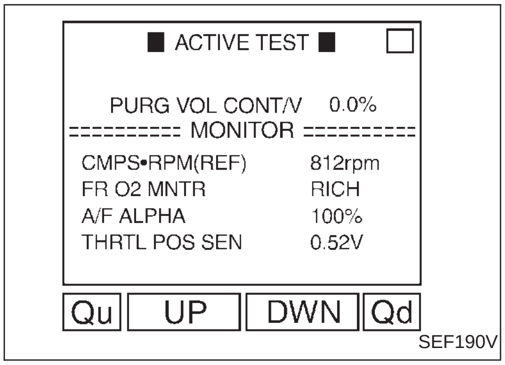
↓

INSPECTION END

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve



■ ACTIVE TEST ■ ☐

PURG VOL CONT/V 0.0%

========== MONITOR ==========

CMPS•RPM(REF) 812rpm

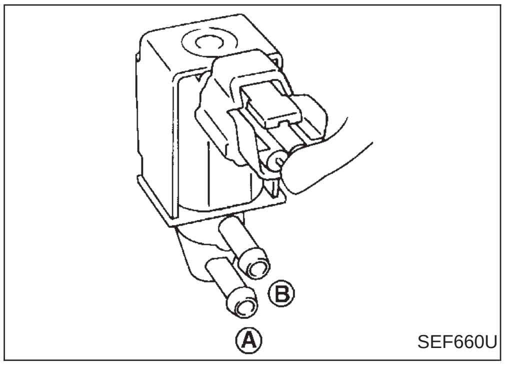
FR O2 MNTR RICH

A/F ALPHA 100%

THRTL POS SEN 0.52V

SEF190V

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
   If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



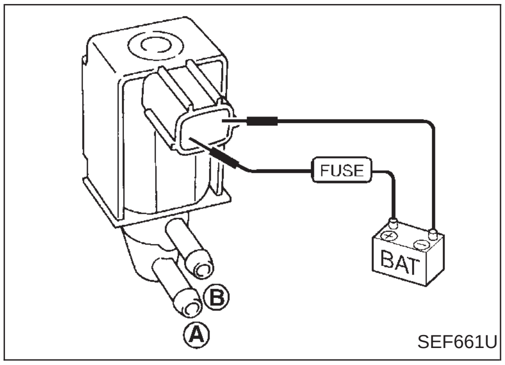
SEF660U

Condition PURG VOL CONT/V value	Air passage continuity between Ⓐ and Ⓑ
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

Check air passage continuity.

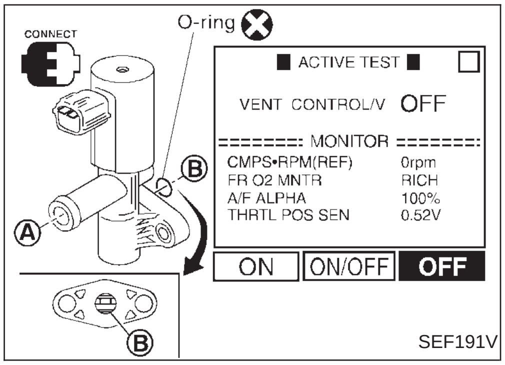


SEF661U

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace EVAP canister purge volume control solenoid valve.

EVAP canister vent control valve



■ ACTIVE TEST ■ ☐

VENT CONTROL/V OFF

======== MONITOR ========

CMPS•RPM(REF) 0rpm

FR O2 MNTR RICH

A/F ALPHA 100%

THRTL POS SEN 0.52V

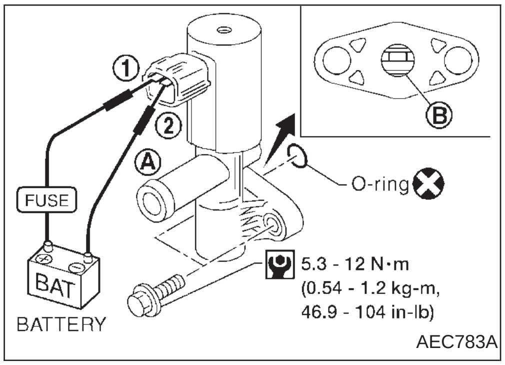
SEF191V

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

Condition VENT CONTROL/V	Air passage continuity between Ⓐ and Ⓑ
ON	No
OFF	Yes

OR



AEC783A

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	No
No supply	Yes

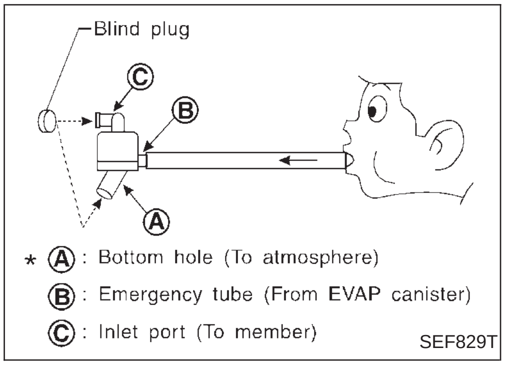
If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

If portion Ⓑ is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)

Water separator

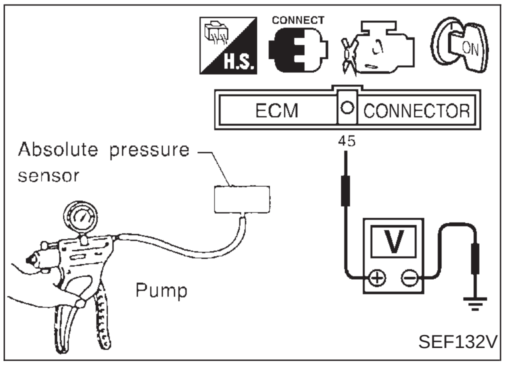


SEF829T

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 Ⓐ and Ⓒ are not clogged by blowing air into Ⓑ with Ⓐ, and then Ⓒ plugged.
5. In case of NG in items 2 - 4, replace the parts.

- **Do not disassemble water separator.**

Absolute pressure sensor



SEF132V

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

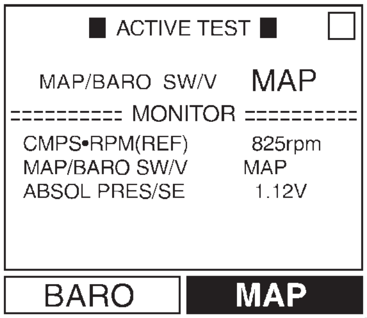
CAUTION:

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

5. If NG, replace absolute pressure sensor.

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont’d)

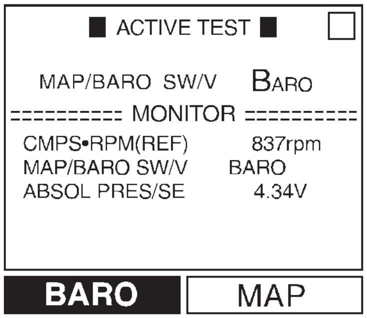
MAP/BARO switch solenoid valve



```
■ ACTIVE TEST ■                ☐

  MAP/BARO  SW/V      MAP
========== MONITOR ==========
 CMPS•RPM(REF)        825rpm
 MAP/BARO SW/V       MAP
 ABSOL PRES/SE        1.12V
```

SEF130V



```
■ ACTIVE TEST ■                ☐

  MAP/BARO  SW/V      BARO
========== MONITOR ==========
 CMPS•RPM(REF)        837rpm
 MAP/BARO SW/V     BARO
 ABSOL PRES/SE        4.34V
```

SEF131V

1. Start engine and warm it up to normal operating temperature.
2. Perform “MAP/BARO SW/V’’ in “ACTIVE TEST’’ mode with CONSULT.
3. Check the following.
   - Condition: At idle under no-load
   - CONSULT display

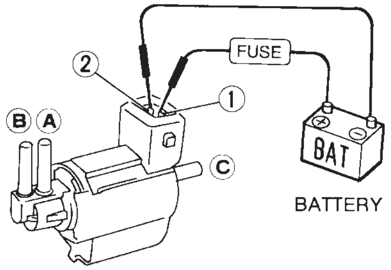
MAP/BARO	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

- Time for voltage to change

MAP/BARO SW/V	Required time to switch
BARO to MAP	Less than 1 second
MAP to BARO	

4. If NG, check solenoid valve as shown below.

OR



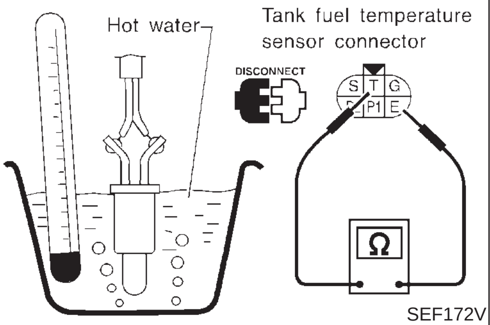
MEC488B

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

3. If NG or operation takes more than 1 second, replace solenoid valve.

Tank fuel temperature sensor



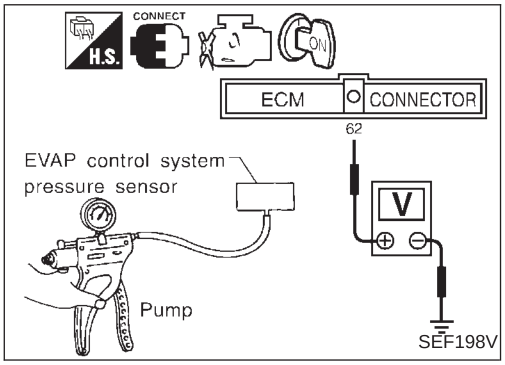
SEF172V

Check resistance by heating with hot water or heat gun as shown in the figure.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

If NG, replace tank fuel temperature sensor.

Evaporative Emission (EVAP) Control System (Small Leak) (Negative Pressure) (Cont'd)



COMPONENT INSPECTION

EVAP control system pressure sensor

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal ㊷ and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

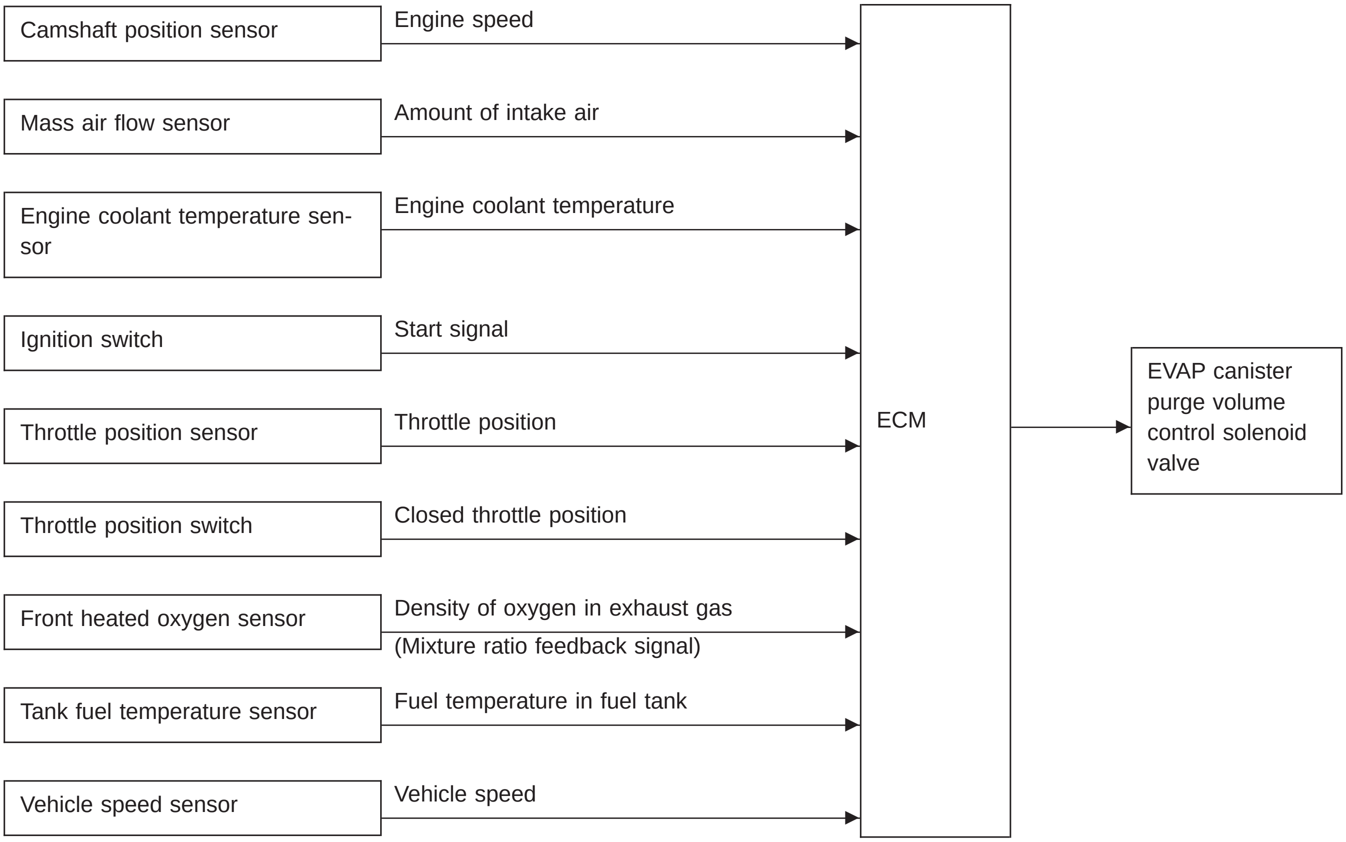
CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum below −20 kPa (−150 mmHg, −5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).**

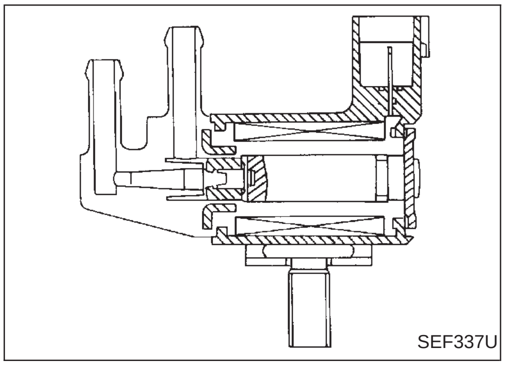
5. If NG, replace EVAP control system pressure sensor.

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

SYSTEM DESCRIPTION



This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

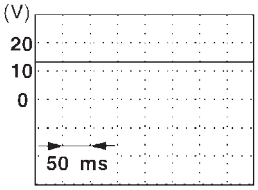
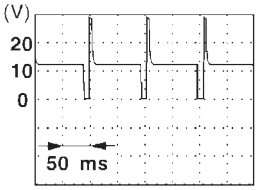
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch ''OFF'' ● No-load	Idle	0 %
		2,000 rpm (More than 200 seconds after starting engine)	—

ECM TERMINALS AND REFERENCE VALUE

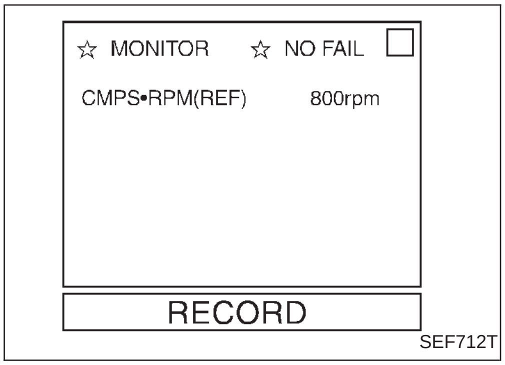
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	LG/R	ECCS relay (Self-shutoff)	Engine is running. Ignition switch ''OFF'' For a few seconds after turning ignition switch ''OFF''	0 - 1V
			Ignition switch ''OFF'' A few seconds passed after turning ignition switch ''OFF''	BATTERY VOLTAGE (11 - 14V)
5	R/Y	EVAP canister purge volume control solenoid valve	Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF109V
			Engine is running. Engine speed is 2,000 rpm. (More than 200 seconds after starting engine)	12 - 13V  SEF110V
67	B/P	Power supply for ECM	Ignition switch ''ON''	BATTERY VOLTAGE (11 - 14V)
72	B/P			
117	B/P	Current return	Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0443 1008	● An improper voltage signal is sent to ECM through the valve.	● Harness or connectors (The valve circuit is open or shorted.) ● EVAP canister purge volume control solenoid valve



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

RECORD

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle for at least 30 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-290.

OR

GST

1) Start engine and let it idle for at least 30 seconds.
2) Select "MODE 7" with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-290.

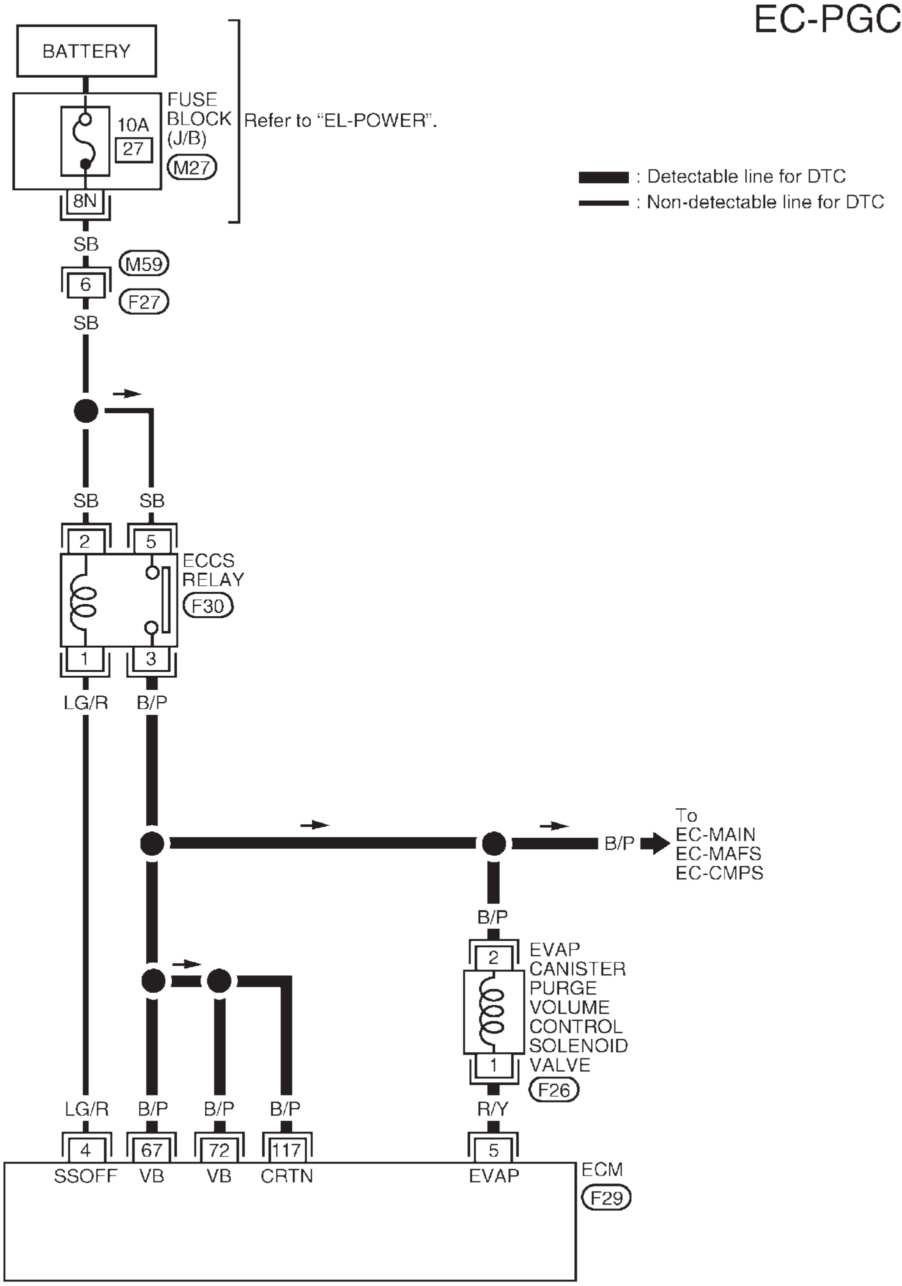
OR

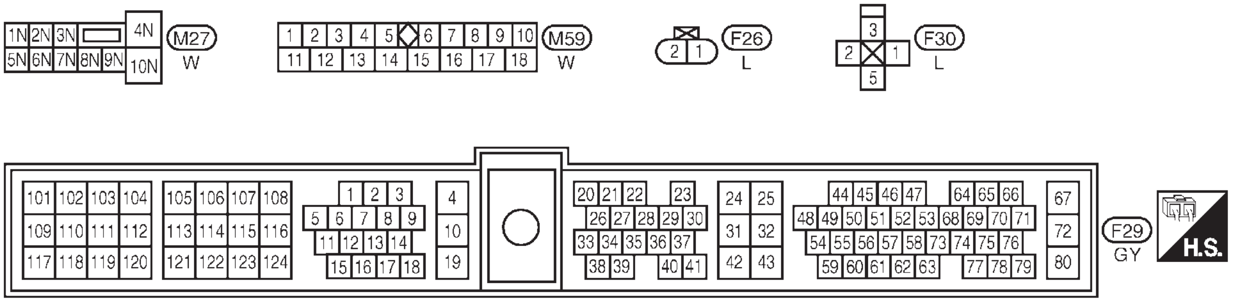
NO TOOLS

1) Start engine and let it idle for at least 30 seconds.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-290.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

EC-PGC/V-01





AEC865A

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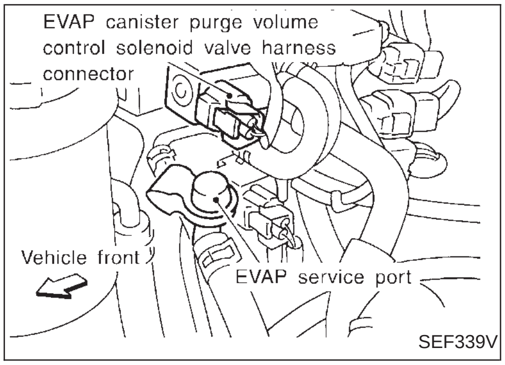
IDX

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)



SEF339V

DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK POWER SUPPLY.

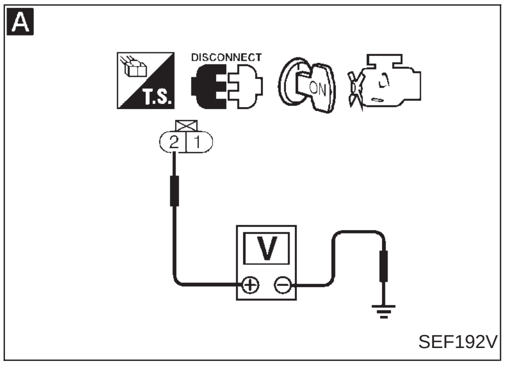
1. Turn ignition switch ''OFF''.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ② and engine ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and ECCS relay
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

If NG, repair harness or connectors.

OK



SEF192V

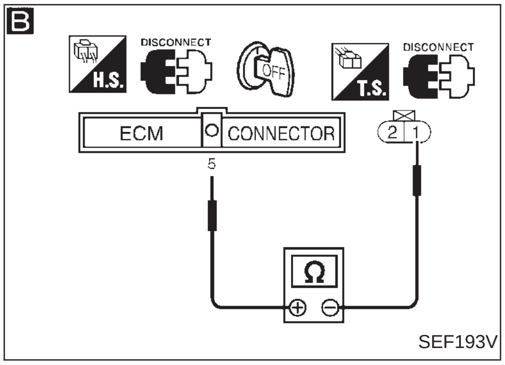
B

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch ''OFF''.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑤ and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK



SEF193V

CHECK COMPONENT
(EVAP canister purge volume control solenoid valve).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace EVAP canister purge volume control solenoid valve.

OK

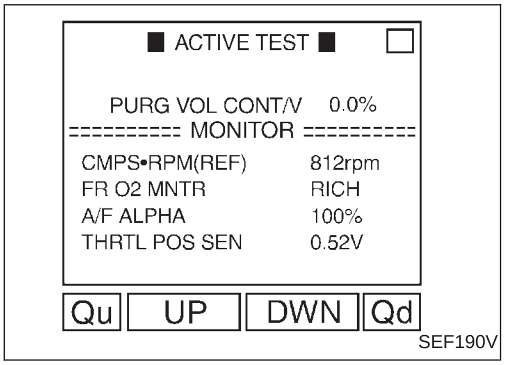
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

INSPECTION END

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

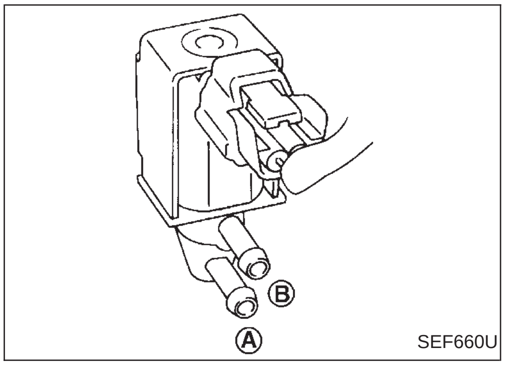


```
■ ACTIVE TEST ■      ☐

PURG VOL CONT/V   0.0%
========== MONITOR ==========
CMPS•RPM(REF)        812rpm
FR O2 MNTR           RICH
A/F ALPHA            100%
THRTL POS SEN        0.52V
```

SEF190V

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
   If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



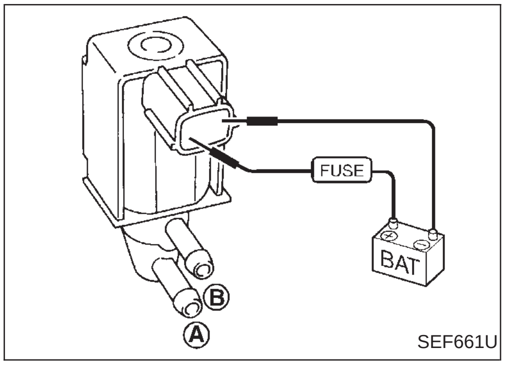
SEF660U

Condition PURG VOL CONT/V value	Air passage continuity between Ⓐ and Ⓑ
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

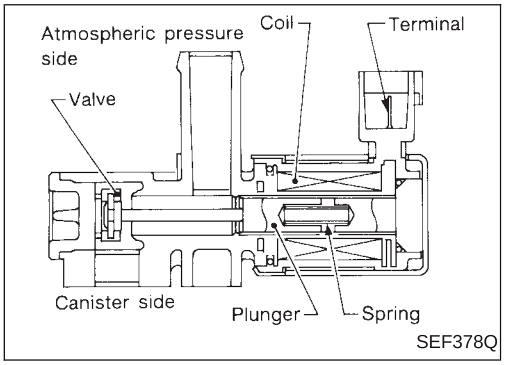
Check air passage continuity.

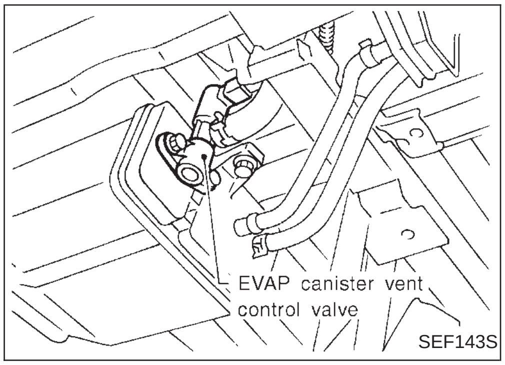


SEF661U

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace EVAP canister purge volume control solenoid valve.





Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit)

COMPONENT DESCRIPTION

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows ‘‘EVAP Control System (Small Leak)’’ diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

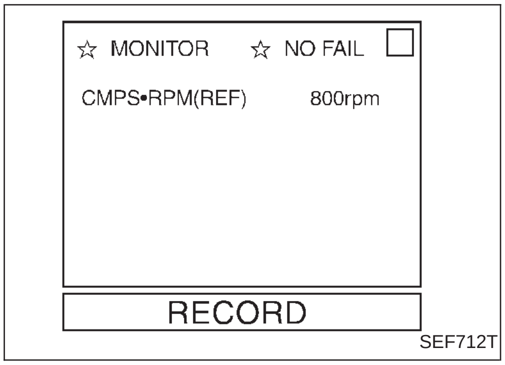
ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
108	R/G	EVAP canister vent control valve	Ignition switch ‘‘ON’’	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0446 0903	● An improper voltage signal is sent to ECM through EVAP canister vent control valve.	● Harness or connectors (EVAP canister vent control valve circuit is open or shorted.) ● EVAP canister vent control valve



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm

RECORD

SEF712T

Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1) Turn ignition switch "ON''.
2) Select "DATA MONITOR'' mode with CONSULT.
3) Start engine and wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE'', EC-295.

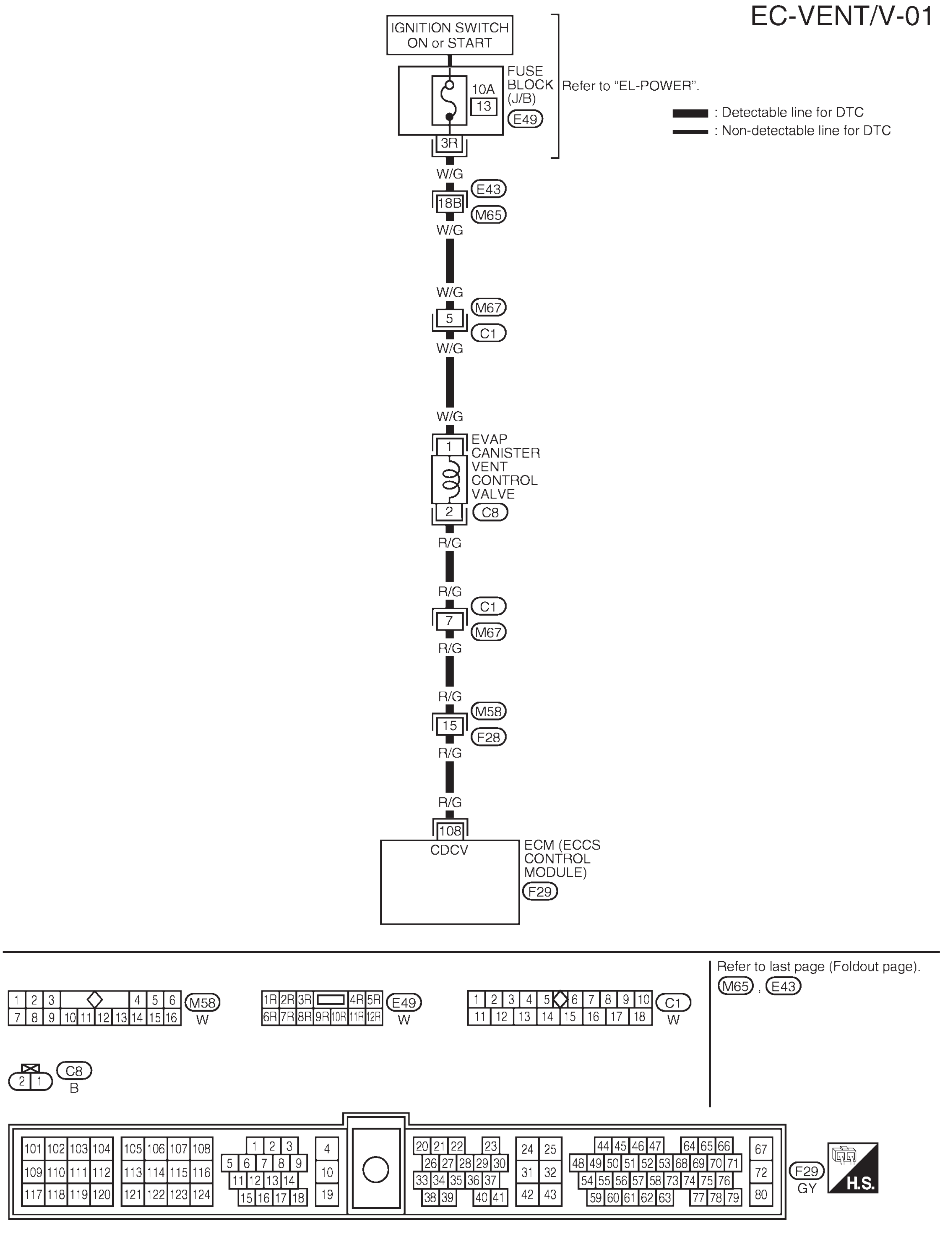
OR

1) Start engine and wait at least 5 seconds.
2) Select "MODE 7'' with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE'', EC-295.

OR

1) Start engine and wait at least 5 seconds.
2) Turn ignition switch "OFF'', wait at least 5 seconds and then turn "ON''.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE'', EC-295.

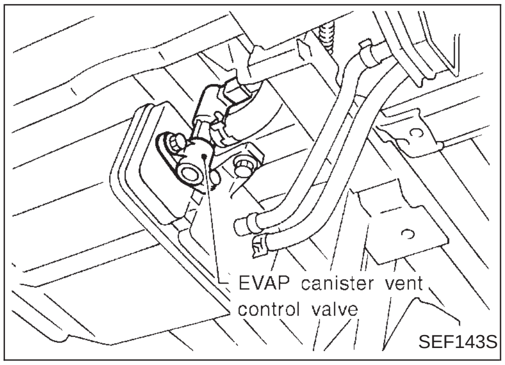
Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)



AEC534A

Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont’d)

DIAGNOSTIC PROCEDURE



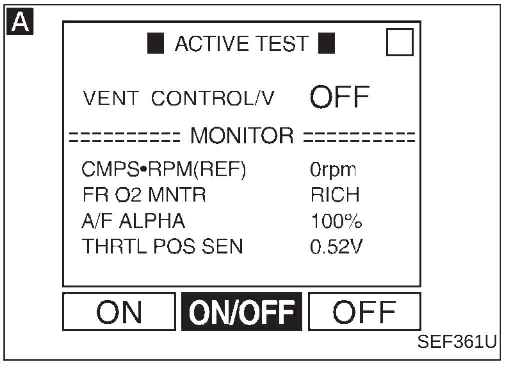
SEF143S

INSPECTION START

With CONSULT → A

Without CONSULT
Go to CHECK POWER SUPPLY B.

A



■ ACTIVE TEST ■ ☐

VENT CONTROL/V OFF

========== MONITOR ==========

CMPS•RPM(REF)	0rpm
FR O2 MNTR	RICH
A/F ALPHA	100%
THRTL POS SEN	0.52V

SEF361U

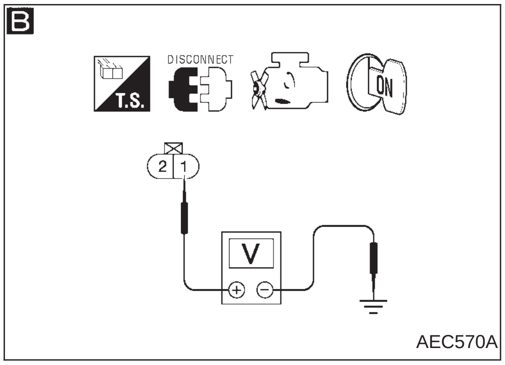
CHECK CIRCUIT.

1. Turn ignition switch ‘‘ON’’.
2. Perform ‘‘VENT CONTROL/V’’ in ‘‘ACTIVE TEST’’ mode.
3. Make sure that ratcheting sound is heard from the vent control valve.

OK → Go to ‘‘CHECK COMPONENT’’ after procedure C.

NG ↓

B



AEC570A

CHECK POWER SUPPLY.

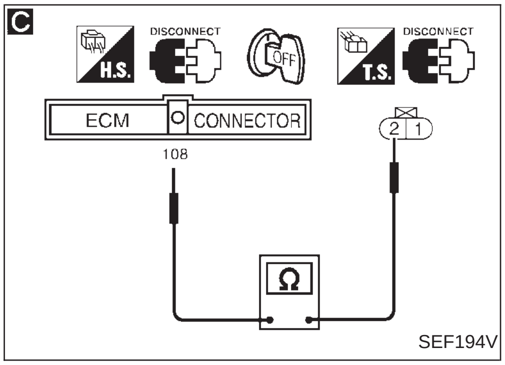
1. Disconnect EVAP canister vent control valve harness connector.
2. Turn ignition switch ‘‘ON’’.
3. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E43), (M65)
- Harness connectors (M67), (C1)
- 10A fuse
- Harness for open or short between EVAP canister vent control valve and 10A fuse

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

OK ↓

C



SEF194V

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch ‘‘OFF’’.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (108) and terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors (C1), (M67)
- Harness connectors (M58), (F28)
- Harness for open or short between EVAP canister vent control valve and ECM

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

OK ↓

CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to ‘‘COMPONENT INSPECTION’’ on next page.

NG → Replace EVAP canister vent control valve and O-ring.

OK ↓

Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.

↓

INSPECTION END

GI
MA
EM
LC
EC
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CL
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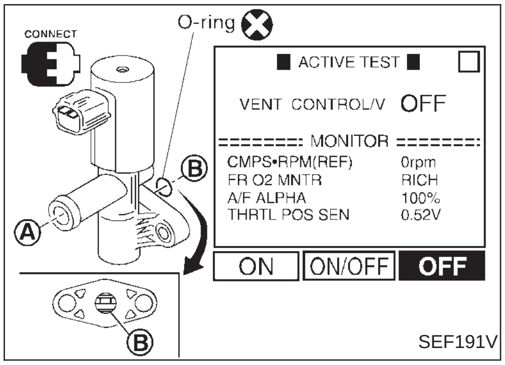
IDX

Evaporative Emission (EVAP) Canister Vent Control Valve (Circuit) (Cont'd)



■ ACTIVE TEST ■ ☐

VENT CONTROL/V OFF

======== MONITOR ========

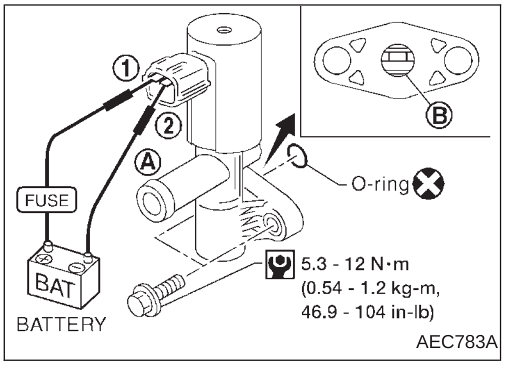
CMPS•RPM(REF) 0rpm

FR O2 MNTR RICH

A/F ALPHA 100%

THRTL POS SEN 0.52V

SEF191V



AEC783A

COMPONENT INSPECTION

EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

Condition VENT CONTROL/V	Air passage continuity between Ⓐ and Ⓑ
ON	No
OFF	Yes

OR

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	No
No supply	Yes

If NG or operation takes more than 1 second, clean valve using air blower or replace as necessary.

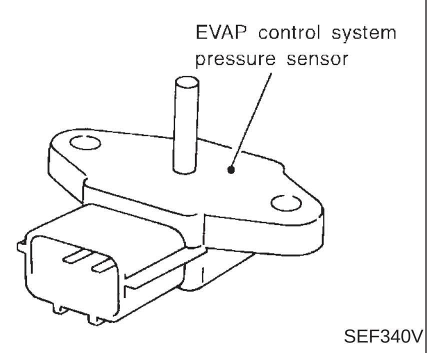
If portion Ⓑ is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.

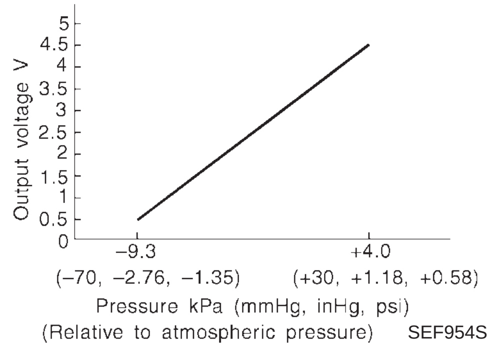
Evaporative Emission (EVAP) Control System Pressure Sensor

COMPONENT DESCRIPTION

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases. The EVAP control system pressure sensor is not used to control the engine system. It is used only for on board diagnosis.



SEF340V



SEF954S

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 3.4V

ECM TERMINALS AND REFERENCE VALUE

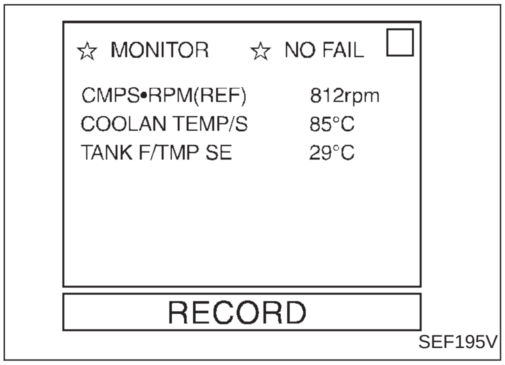
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
42	BR	Sensors' power supply	Ignition switch ''ON''	Approximately 5V
43	B/W	Sensors' ground	Engine is running. (Warm-up condition) Idle speed	Approximately 0V
62	Y	EVAP control system pressure sensor	Ignition switch ''ON''	Approximately 3.4V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0450 0704	● An improper voltage signal from EVAP control system pressure sensor is sent to ECM.	● Harness or connectors (The EVAP control system pressure sensor circuit is open or shorted.) ● Rubber hose to EVAP control system pressure is clogged, vent, kinked, disconnected or improper connection. ● EVAP control system pressure sensor ● EVAP canister vent control valve ● EVAP canister purge volume control solenoid valve ● EVAP canister ● Rubber hose from EVAP canister vent control valve to water separator

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	85°C
TANK F/TMP SE	29°C

RECORD

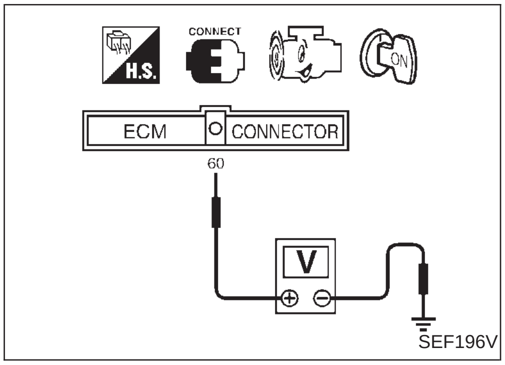
SEF195V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

TESTING CONDITION:
Always perform at a temperature above 5°C (41°F).

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON".
4) Select "DATA MONITOR" mode with CONSULT.
5) Make sure that "TANK F/TEMP SE" is more than 0°C (32°F).
6) Start engine and wait at least 11 seconds.
7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-300.



SEF196V

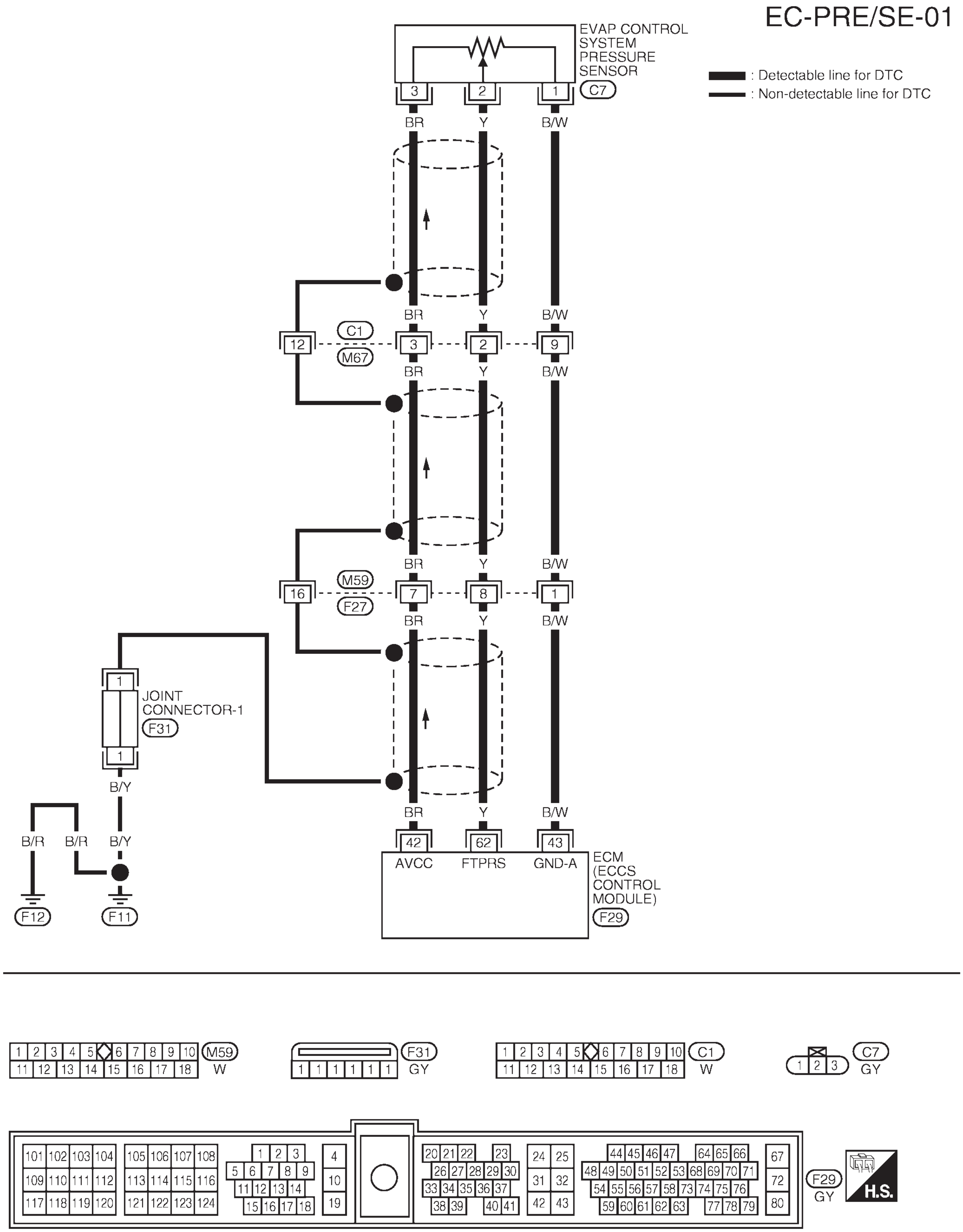
OR

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal (60) and ground is less than 4.2V.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Start engine and wait at least 11 seconds.
5) Select "MODE 7" with GST.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-300.

OR

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal (60) and ground is less than 4.2V.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Start engine and wait at least 11 seconds.
5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
7) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-300.

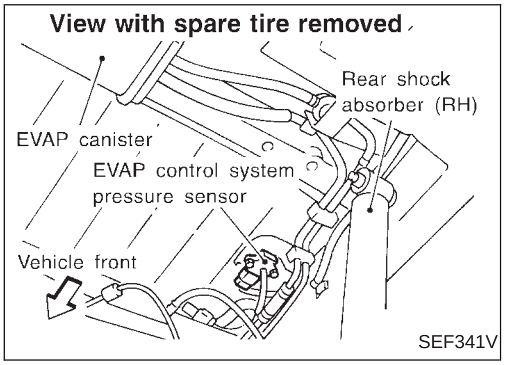
Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)



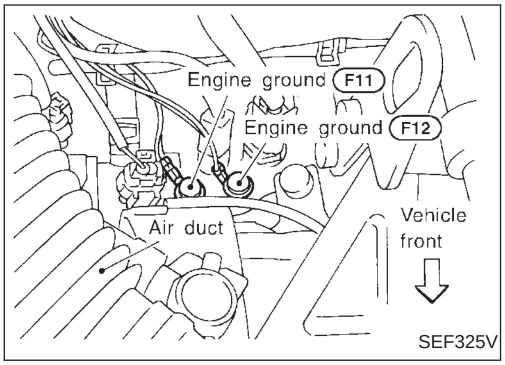
AEC535A

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



SEF341V



SEF325V

INSPECTION START

↓

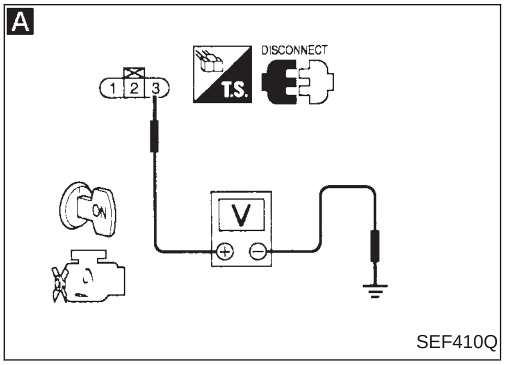
CHECK RUBBER TUBE CONNECTED TO THE SENSOR.
Check rubber tube connected to the sensor for clogging, vent, kink, disconnection or improper connection.

NG → Reconnect, repair or replace.

↓ OK

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

↓



SEF410Q

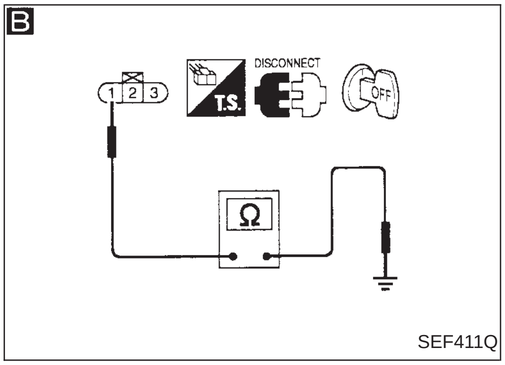
A

CHECK POWER SUPPLY.
1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.
   Water should not exist.
   If OK, go to step 3. If NG, repair or replace harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ③ and engine ground with CONSULT or tester.
   Voltage: Approximately 5V

NG → Check the following.
- Harness connectors C1, M67
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

If NG, repair harness or connectors.

↓ OK



SEF411Q

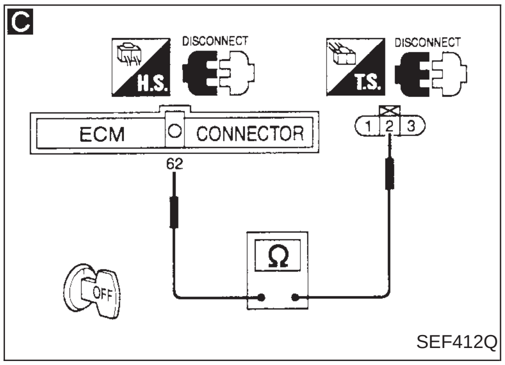
B

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

NG → Check the following.
- Harness connectors C1, M67
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

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

↓ OK



SEF412Q

C

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (62) and terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors C1, M67
- Harness connectors M59, F27
- Harness for open or short between EVAP control system pressure sensor and ECM

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

↓ OK

CHECK COMPONENT
(EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION" on EC-291.

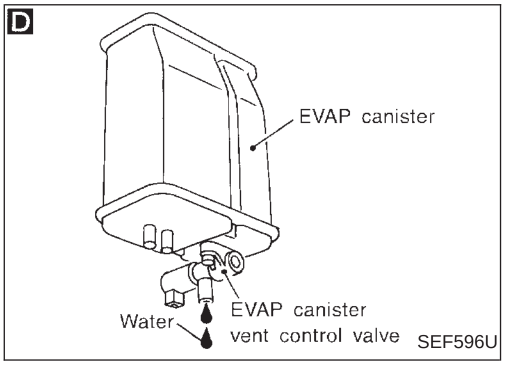
NG → Replace EVAP canister purge volume control solenoid valve.

↓ OK

Ⓐ
(Go to next page.)

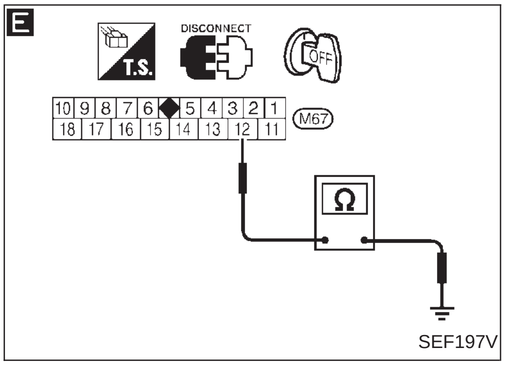
Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

D



SEF596U

E



SEF197V

Ⓐ

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-296.

- NG → Replace EVAP canister vent control valve.
- OK ↓

CHECK COMPONENT
(EVAP control system pressure sensor).
Refer to "COMPONENT INSPECTION", on next page.

- NG → Replace EVAP control system pressure sensor.
- OK ↓

CHECK RUBBER TUBE FOR CLOGGING.
Check obstructed water separator and rubber tube to EVAP canister vent control valve and clean the rubber tube using air blower.
For water separator, refer to EC-283.

- NG → Clean, repair or replace rubber tube and/or water separator.
- OK ↓

D

CHECK IF EVAP CANISTER SATURATED WITH WATER.

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister. If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

- NG → Check the following.
  1. Visually check the EVAP canister for damage.
  2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
  3. Check water separator. Refer to "COMPONENT INSPECTION", EC-283.

  If NG, repair hose or replace EVAP canister or water separator.
- OK ↓

E

CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect connector (M67).
3. Check harness continuity between harness connector (M67) terminal ⑫ and ground.
   Continuity should exist.
   If OK, check harness for short to power.

- NG → Check the following.
  - Harness connectors (M59), (F27)
  - Joint connector-1
  - Harness for open or short between harness connector (M67) and ground

  If NG, repair open circuit or short to power in harness or connectors.
- OK ↓

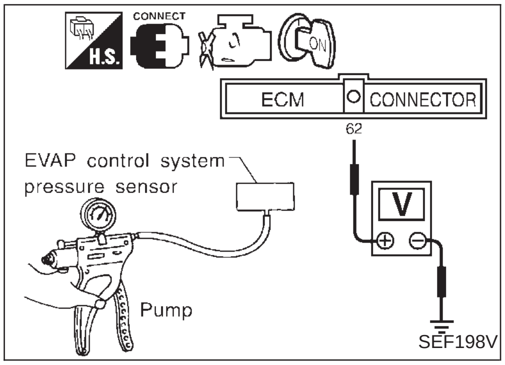
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

COMPONENT INSPECTION



SEF198V

EVAP control system pressure sensor

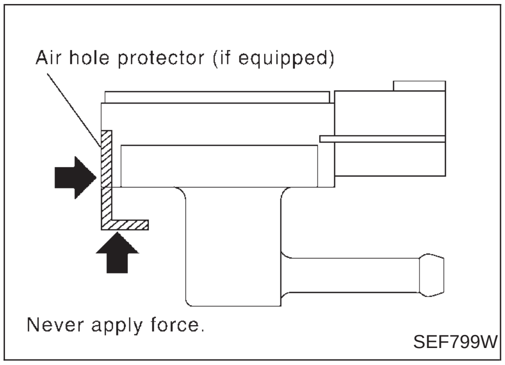
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal ㊷ and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum below −20 kPa (−150 mmHg, −5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).**

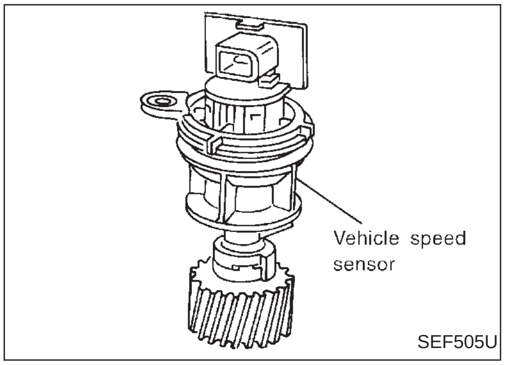
5. If NG, replace EVAP control system pressure sensor.



SEF799W

CAUTION:

- **Never apply force to the air hole protector of the sensor if equipped.**
- **Discard any 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.**



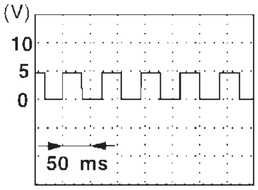
Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
29	G/B	Vehicle speed sensor	Engine is running. — Lift up the vehicle. — In 2nd gear position — 40 km/h (25 MPH)	1 - 4V  SEF111V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

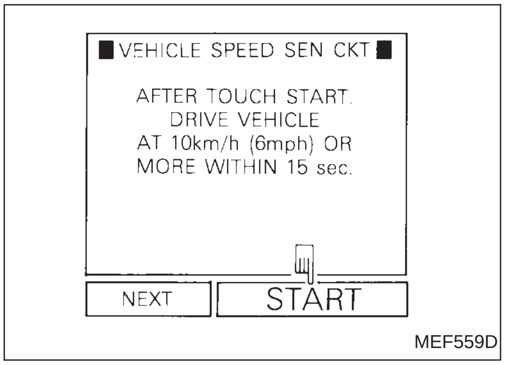
- **Always drive vehicle at a safe speed.**

NOTE:

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

TESTING CONDITION:

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.



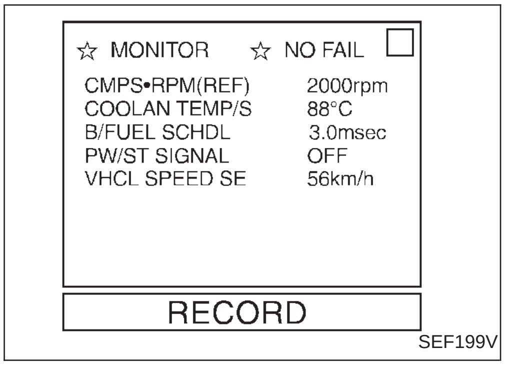
■ VEHICLE SPEED SEN CKT ■

AFTER TOUCH START.
DRIVE VEHICLE
AT 10km/h (6mph) OR
MORE WITHIN 15 sec.

MEF559D

1) Start engine.
2) Perform "VEHICLE SPEED SEN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.
   If NG, go to "DIAGNOSTIC PROCEDURE", EC-307.
   If OK, go to following step.

OR



```
☆ MONITOR    ☆ NO FAIL  ☐

CMPS•RPM(REF)     2000rpm
COOLAN TEMP/S     88°C
B/FUEL SCHDL      3.0msec
PW/ST SIGNAL      OFF
VHCL SPEED SE     56km/h
```

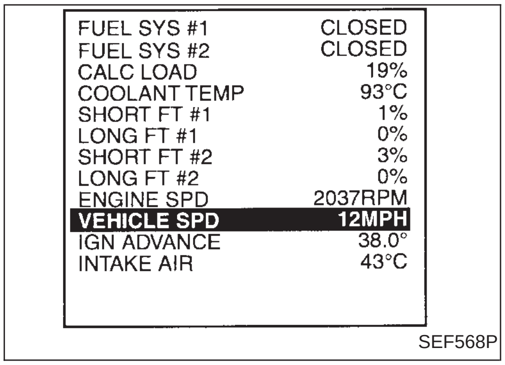
SEF199V

1) Start engine
2) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT. The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to "DIAGNOSTIC PROCEDURE", EC-296.
   If OK, go to following step.
3) Select "DATA MONITOR" mode with CONSULT.
4) Warm engine up to normal operating temperature.
5) Maintain the following conditions for at least 10 consecutive seconds.
   CMPS·RPM (REF): 1,450 - 2,550 rpm (A/T)
   1,800 - 3,000 rpm (2WD M/T)
   2,150 - 3,000 rpm (4WD M/T)
   COOLAN TEMP/S: More than 70°C (158°F)
   B/FUEL SCHDL: 2.1 - 4.8 msec (A/T)
   2.5 - 5.3 msec (M/T)
   Selector lever: Suitable position
   PW/ST SIGNAL: OFF
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-307.

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

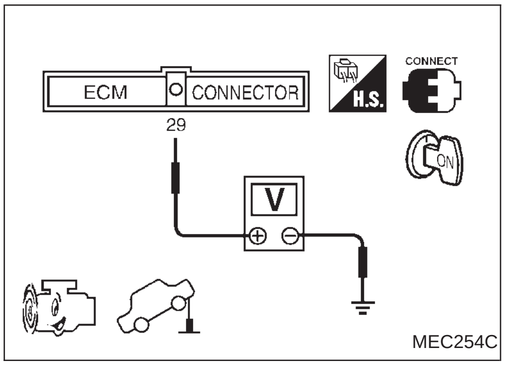


```
FUEL SYS #1        CLOSED
FUEL SYS #2        CLOSED
CALC LOAD             19%
COOLANT TEMP         93°C
SHORT FT #1            1%
LONG FT #1             0%
SHORT FT #2            3%
LONG FT #2             0%
ENGINE SPD        2037RPM
VEHICLE SPD         12MPH
IGN ADVANCE         38.0°
INTAKE AIR           43°C
```

SEF568P

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-307.

OR



MEC254C

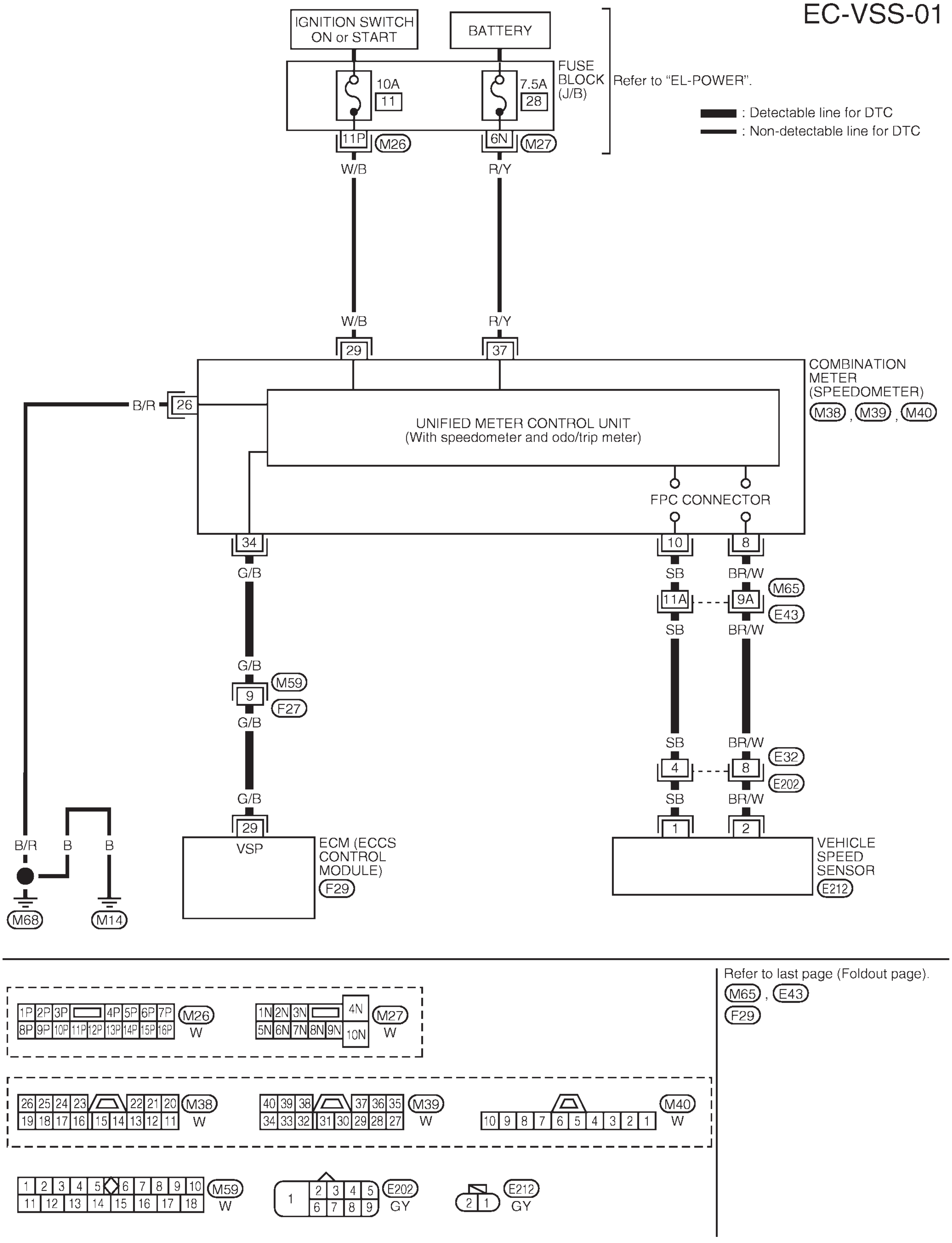
1) Lift up drive wheels.
2) Start engine.
3) Read the voltage signal between ECM terminal ㉙ (Vehicle speed sensor signal) and ground with oscilloscope.

Vehicle Speed Sensor (VSS) (Cont'd)

4) Verify that the oscilloscope screen shows the signal wave as shown at ''ECM TERMINALS AND REFERENCE VALUE'' on the previous page.

5) If NG, go to ''DIAGNOSTIC PROCEDURE'', EC-307.

Vehicle Speed Sensor (VSS) (Cont’d)

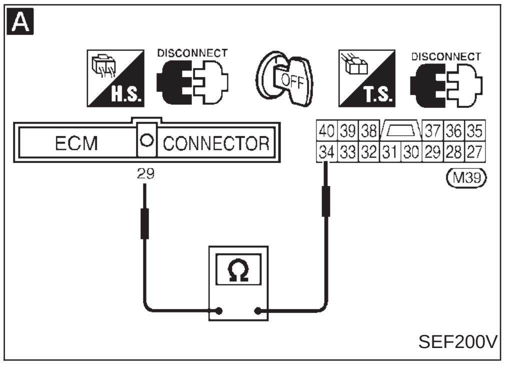


AEC536A

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE

A



SEF200V

INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector M39.
3. Check harness continuity between ECM terminal ㉙ and meter terminal ㉞.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors M59, F27
- Harness for open or short between ECM and combination meter

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

OK ↓

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check the following.

- Harness connectors E43, E65
- Harness connectors E32, E202
- Harness for open or short between combination meter and vehicle speed sensor

If NG, repair open circuit or short to ground or short to power in harness or connectors.
Check vehicle speed sensor and its circuit.
Refer to EL section.

OK ↓

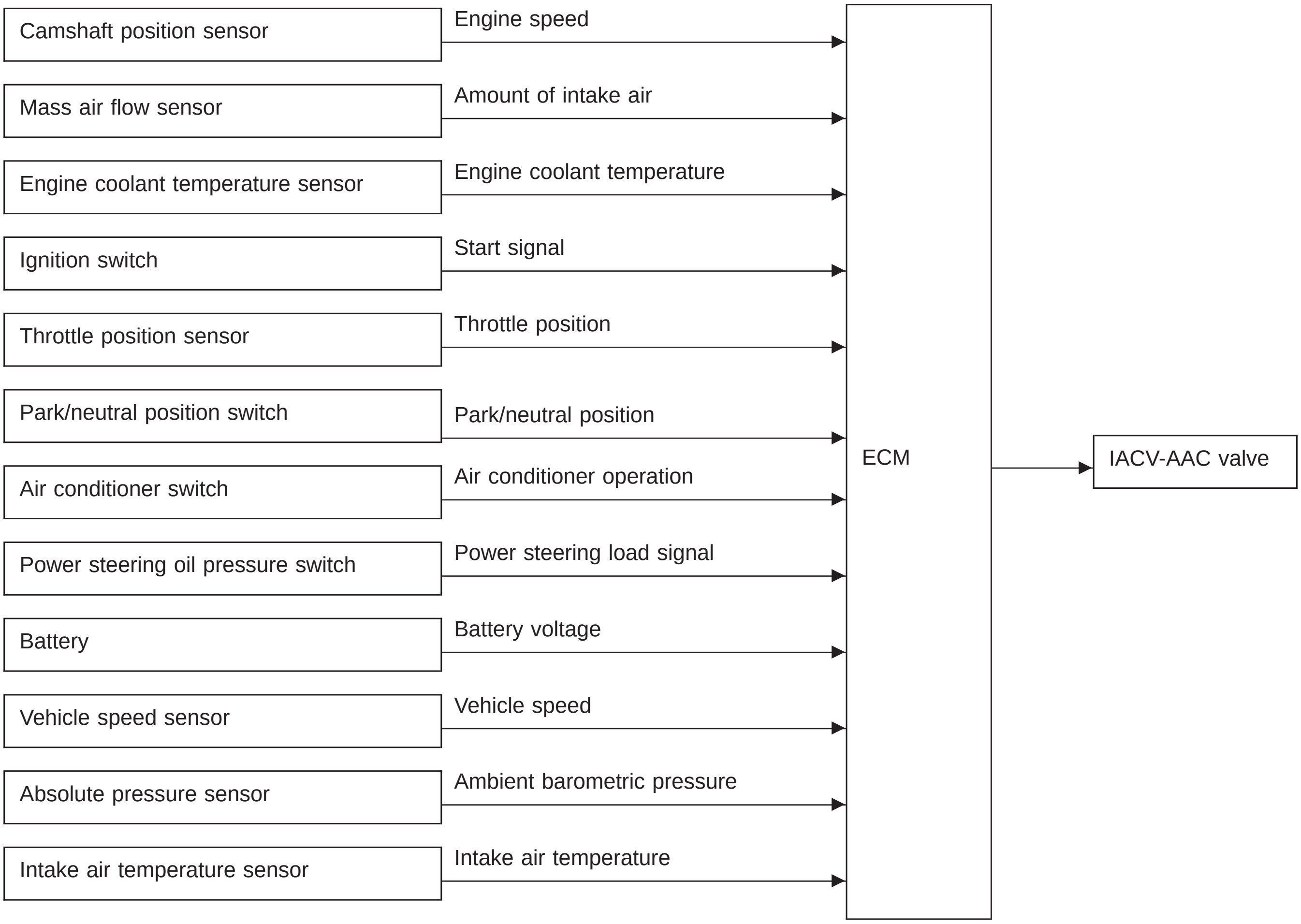
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

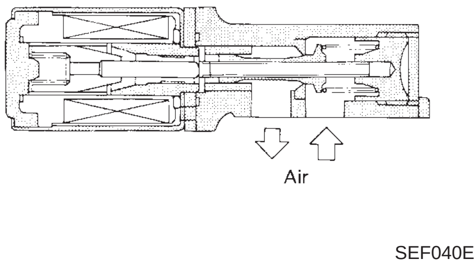
INSPECTION END

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

SYSTEM DESCRIPTION



This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warm up, deceleration, and engine load (air conditioner and power steering).



COMPONENT DESCRIPTION

IACV-AAC valve

The IACV-AAC valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of air that will flow through the valve. The more air that flows through the valve, the higher the idle speed.

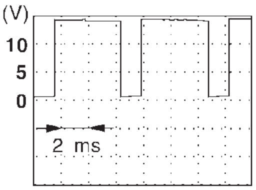
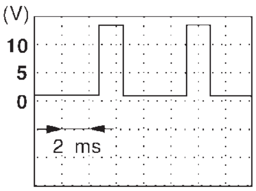
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

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	Approx. 30%
		2,000 rpm	—

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	OR/L	IACV-AAC valve	Engine is running. (Warm-up condition) Idle speed	10.5 - 11.5V  SEF645U
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	1 - 13V  SEF646U

ON BOARD DIAGNOSIS LOGIC

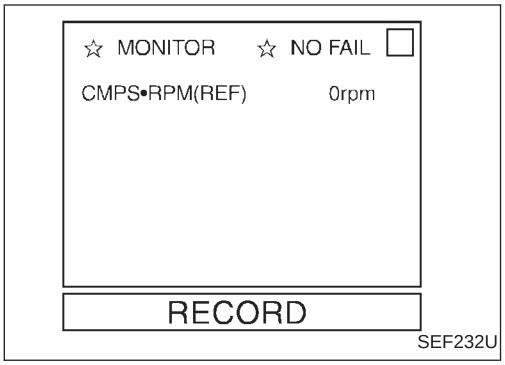
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0505 0205	A) The IACV-AAC valve does not operate properly.	● Harness or connectors (The IACV-AAC valve circuit is open.) ● IACV-AAC valve
	B) The IACV-AAC valve does not operate properly.	● Harness or connectors (The IACV-AAC valve circuit is shorted.) ● IACV-AAC valve

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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


☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

RECORD

SEF232U

Procedure for malfunction A

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 10.5V with ignition switch ''ON''.

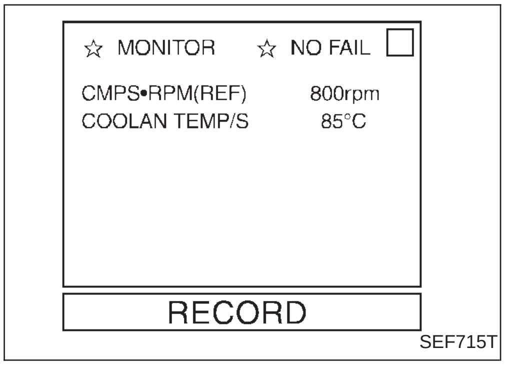
1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT.
3) Wait at least 2 seconds.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-313.

OR

1) Turn ignition switch ''ON'' and wait at least 2 seconds.
2) Select ''MODE 7'' with GST.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-313.

OR

1) Turn ignition switch ''ON'' and wait at least 2 seconds.
2) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
3) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-313.


☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 800rpm
COOLAN TEMP/S 85°C

RECORD

SEF715T

Procedure for malfunction B

TESTING CONDITION:

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

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Turn ignition switch ''ON'' again and select ''DATA MONITOR'' mode with CONSULT.
4) Start engine and run it for at least 6 minutes at idle speed.
5) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-313.

OR

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Start engine again and run it for at least 6 minutes at idle speed.
4) Select ''MODE 7'' with GST.
5) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-313.

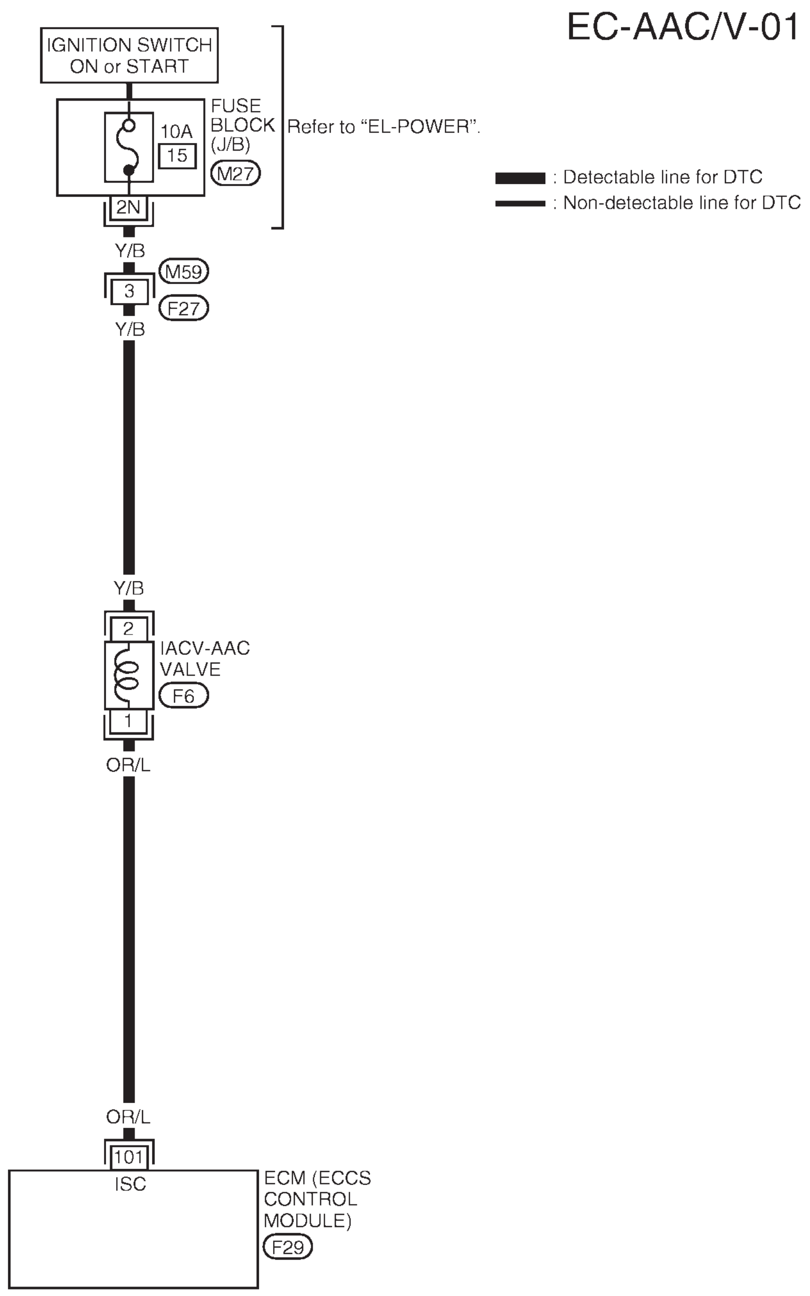
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont’d)

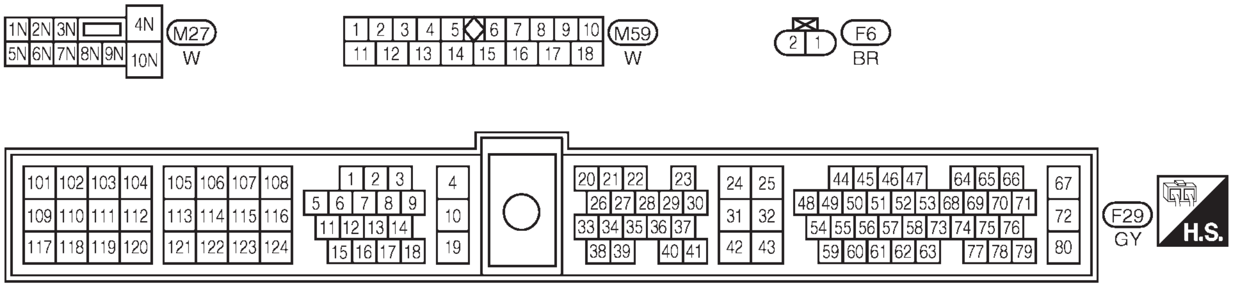
OR

NO TOOLS

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
3) Start engine again and run it for at least 6 minutes at idle speed.
4) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
5) Perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
6) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-313.

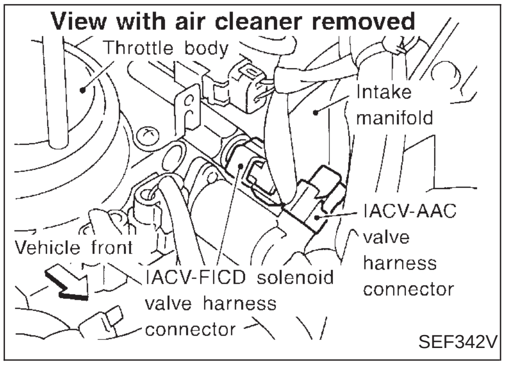
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)



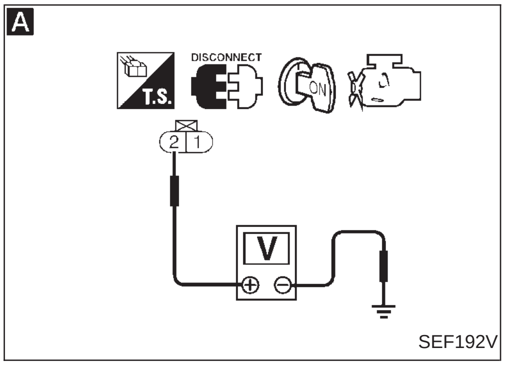


AEC537A

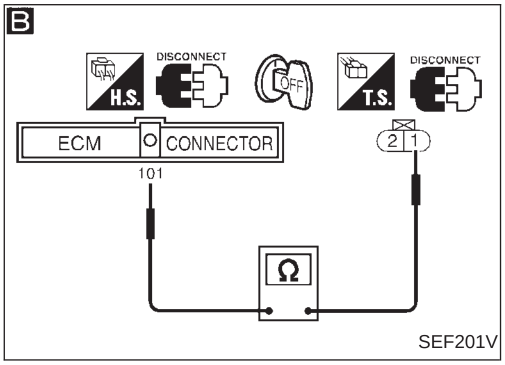
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)



SEF342V



SEF192V



SEF201V

DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M59), (F27)
- 10A fuse
- Harness for open or short between IACV-AAC valve harness connector and 10A fuse

If NG, repair harness or connectors.

OK

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (101) and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

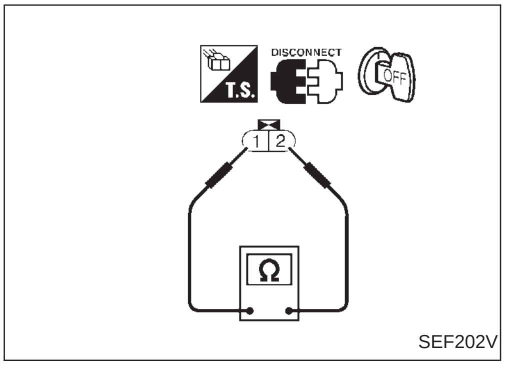
CHECK COMPONENT (IACV-AAC valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace IACV-AAC valve.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END

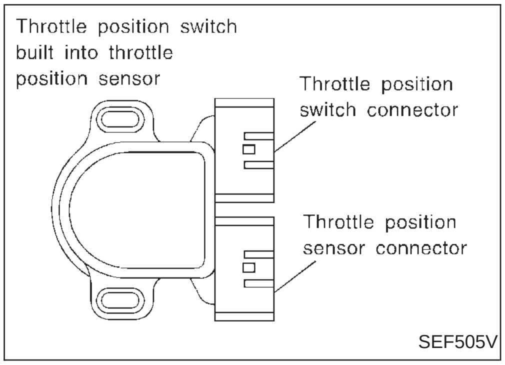


SEF202V

COMPONENT INSPECTION

IACV-AAC valve

Disconnect IACV-AAC valve harness connector.
- Check IACV-AAC valve resistance.
  Resistance:
  Approximately 10Ω [at 25°C (77°F)]
- Check plunger for seizing or sticking.
- Check for broken spring.



Closed Throttle Position Switch

COMPONENT DESCRIPTION

A closed throttle position switch and wide open throttle position switch are built into the throttle position sensor unit.

When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge volume control solenoid valve when the throttle position sensor is malfunctioning.

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
28	BR/W	Throttle position switch (Closed position)	Ignition switch “ON” (Warm-up condition) └ Accelerator pedal fully released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch “ON” └ Accelerator pedal depressed	Approximately 0V

ON BOARD DIAGNOSIS LOGIC

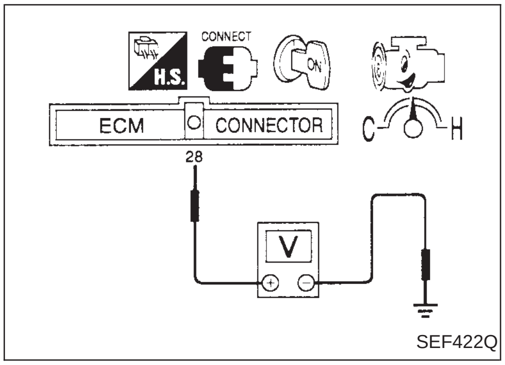
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0510 0203	● Battery voltage from the closed throttle position switch is sent to ECM with the throttle valve opened.	● Harness or connectors (The closed throttle position switch circuit is shorted.) ● Closed throttle position switch ● Throttle position sensor

Closed Throttle Position Switch (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

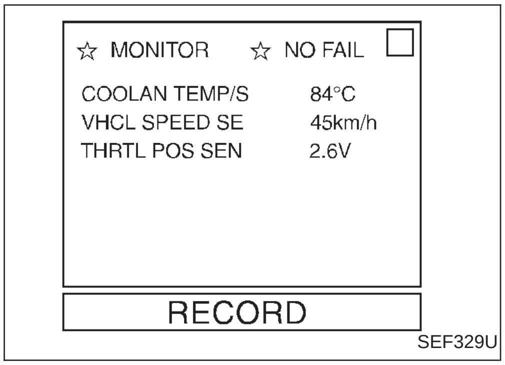
CAUTION:
Always drive vehicle at a safe speed.

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



SEF422Q

1) Start engine and warm it up to normal operating temperature.
2) Select "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT and check the value under the following conditions.
   At idle: ON
   At 2,000 rpm: OFF
   If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-317.
   If OK, go to following step.


☆ MONITOR ☆ NO FAIL ☐

COOLAN TEMP/S	84°C
VHCL SPEED SE	45km/h
THRTL POS SEN	2.6V

RECORD

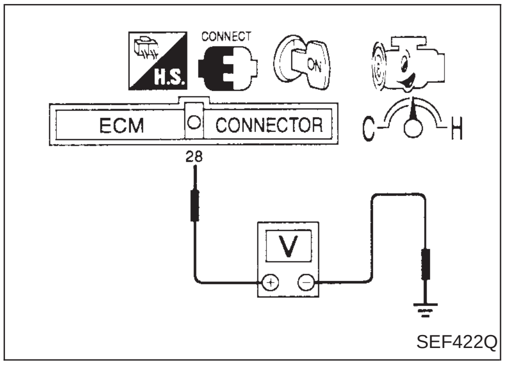
SEF329U

3) Select "DATA MONITOR" mode with CONSULT.
4) Drive the vehicle for at least 5 consecutive seconds under the following condition.
   THRTL POS SEN: More than 2.5V
   VHCL SPEED SE: More than 4 km/h (2 MPH)
   Selector lever: Suitable position
   Driving location: Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.
5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-317.

OR

OVERALL FUNCTION CHECK

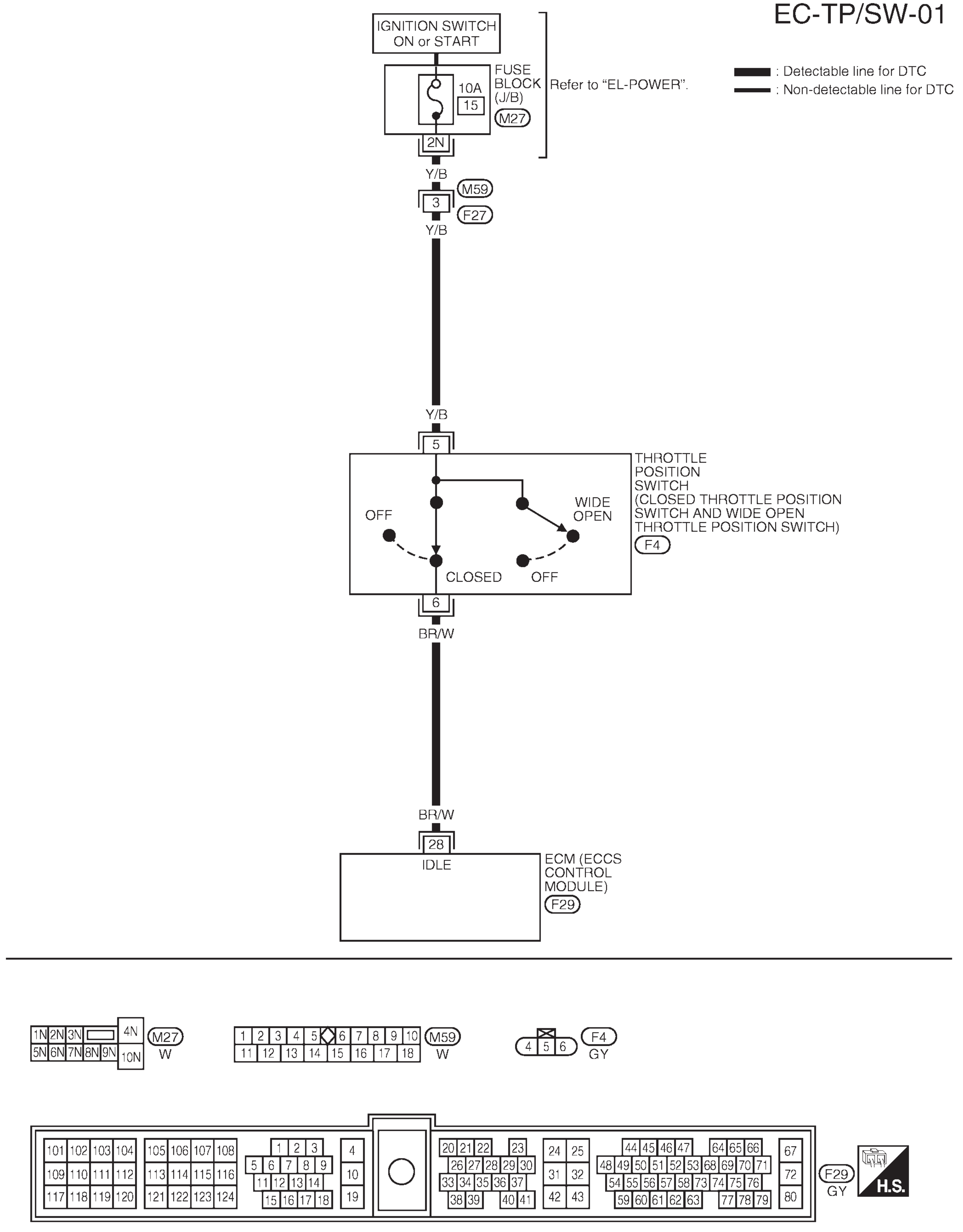
Use this procedure to check the overall function of the closed throttle position switch circuit. During this check, a 1st trip DTC might not be confirmed.



SEF422Q

1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal ㉘ and ground under the following conditions.
   At idle: Battery voltage
   At 2,000 rpm: 0 - 1V
3) If NG, go to "DIAGNOSTIC PROCEDURE", EC-317.

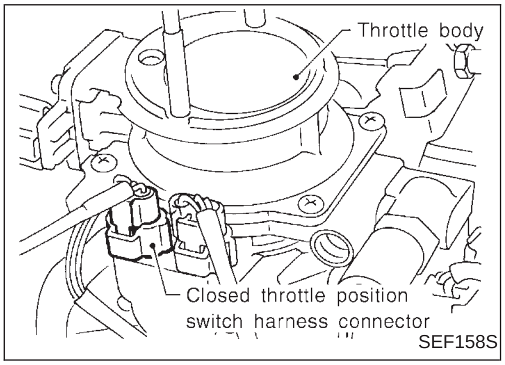
Closed Throttle Position Switch (Cont'd)



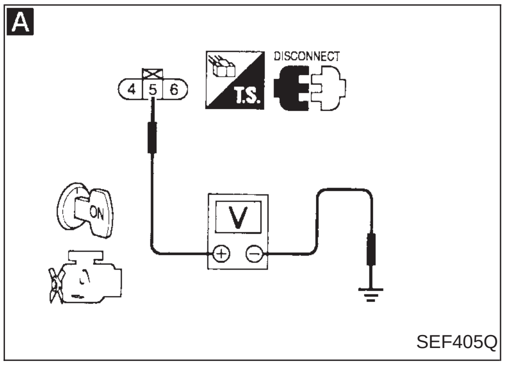
AEC538A

Closed Throttle Position Switch (Cont'd)

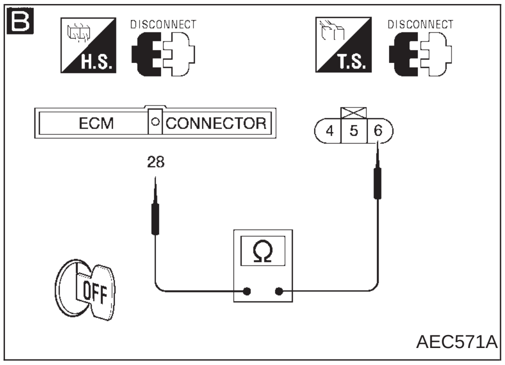
DIAGNOSTIC PROCEDURE



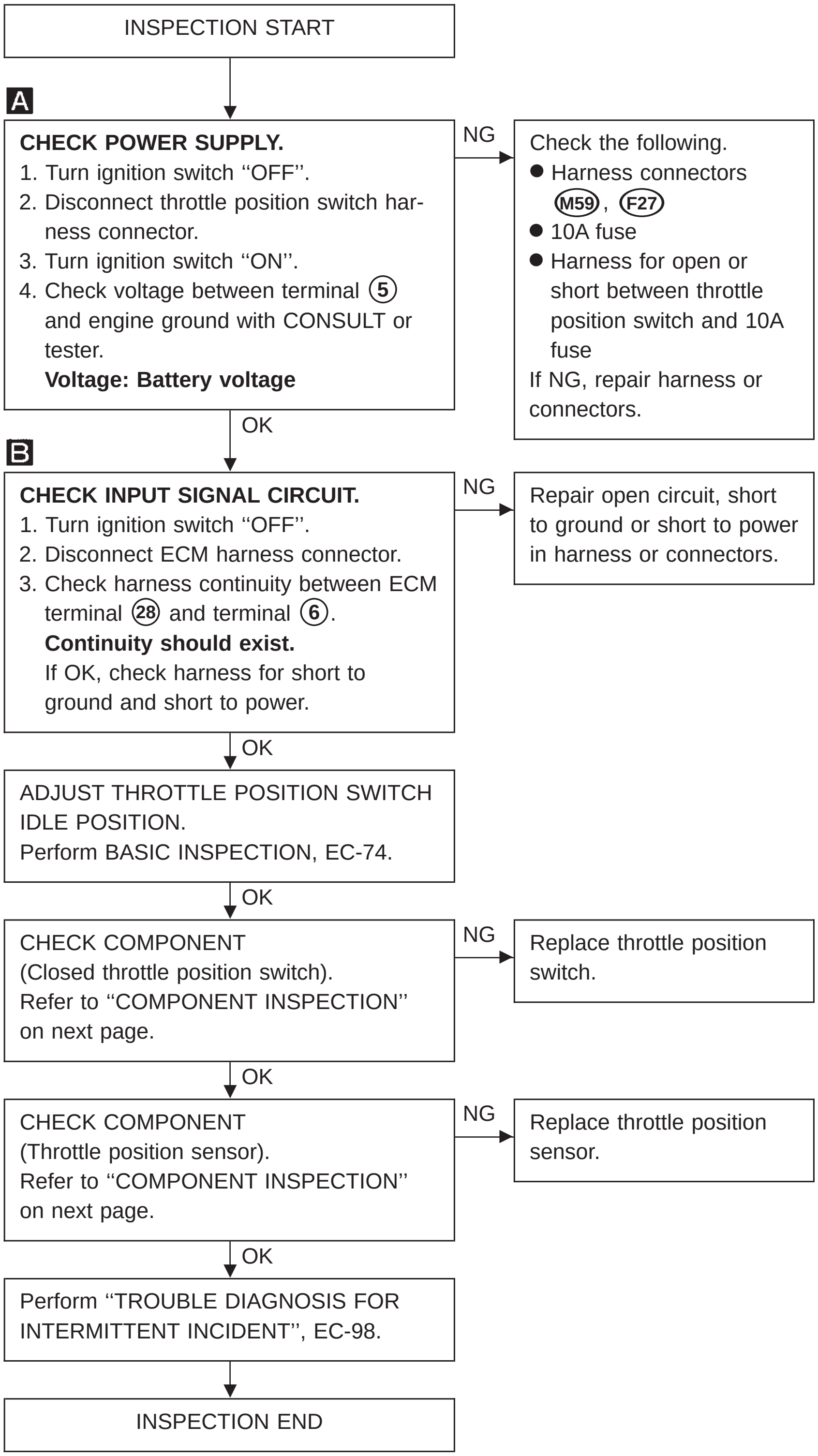
SEF158S



SEF405Q



AEC571A



INSPECTION START

A

CHECK POWER SUPPLY.

1. Turn ignition switch ''OFF''.
2. Disconnect throttle position switch harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ⑤ and engine ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M59), (F27)
- 10A fuse
- Harness for open or short between throttle position switch and 10A fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch ''OFF''.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ㉘ and terminal ⑥.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

ADJUST THROTTLE POSITION SWITCH IDLE POSITION.
Perform BASIC INSPECTION, EC-74.

OK ↓

CHECK COMPONENT
(Closed throttle position switch).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace throttle position switch.

OK ↓

CHECK COMPONENT
(Throttle position sensor).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace throttle position sensor.

OK ↓

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

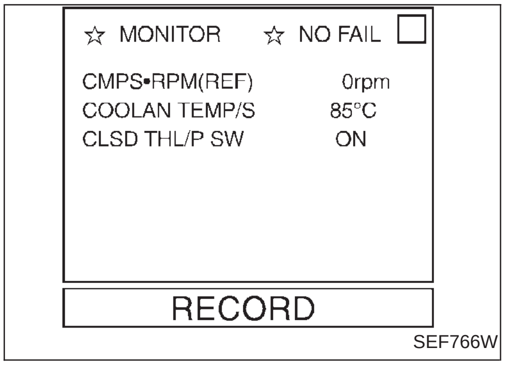
↓

INSPECTION END

Closed Throttle Position Switch (Cont'd)

COMPONENT INSPECTION

Throttle position sensor



```
☆ MONITOR    ☆ NO FAIL ☐

CMPS•RPM(REF)      0rpm
COOLAN TEMP/S      85°C
CLSD THL/P SW      ON

        RECORD
```

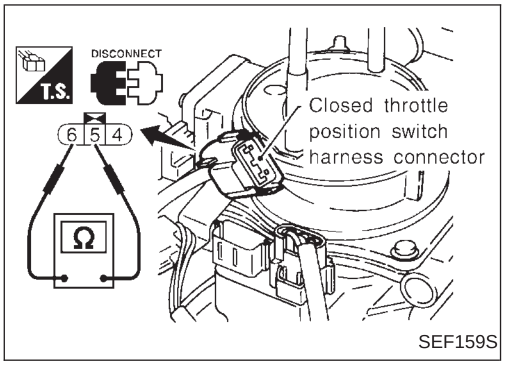
SEF766W

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch "ON".
3. Select "DATA MONITOR" mode with CONSULT.
4. Check indication of "CLSD THL/P SW".
   Measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	CLSD THL/P SW
Completely closed	ON
Partially open or completely open	OFF

   If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-74.
5. If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

OR



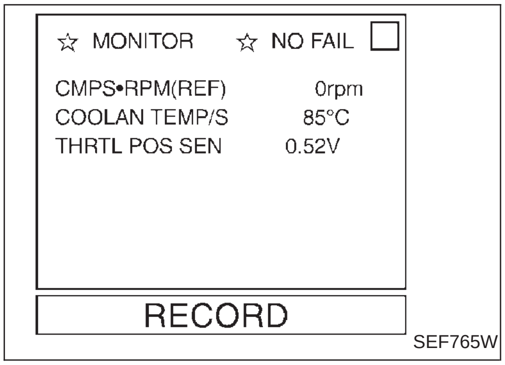
SEF159S

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Disconnect closed throttle position switch harness connector.
4. Check continuity between terminals ⑤ and ⑥.
   Resistance measurement must be made with closed throttle position switch installed in vehicle.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

   If NG, adjust closed throttle position switch. Refer to "Basic Inspection", EC-74.
5. If it is impossible to adjust closed throttle position switch in "Basic Inspection", replace closed throttle position switch.

Closed Throttle Position Switch (Cont'd)



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

COOLAN TEMP/S 85°C

THRTL POS SEN 0.52V

RECORD

SEF765W

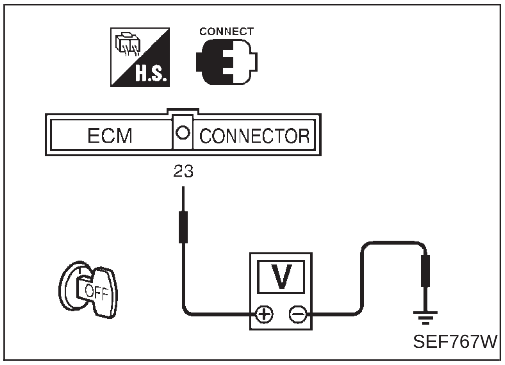
Closed throttle position switch

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch ''ON''.
3. Select ''DATA MONITOR'' mode with CONSULT.
4. Check voltage of ''THRTL POS SEN''.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

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

   If NG, adjust closed throttle position switch. Refer to ''Basic Inspection'', EC-74.
5. If it is impossible to adjust closed throttle position switch in ''Basic Inspection'', replace throttle position sensor.

OR

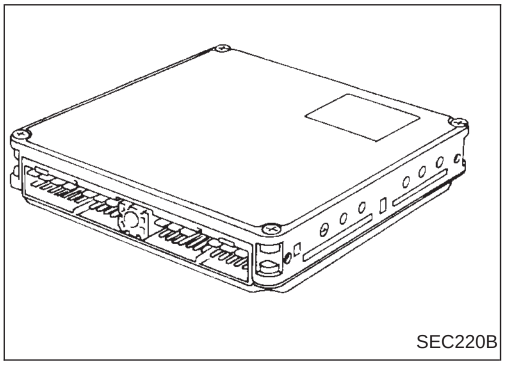


SEF767W

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and turn ignition switch ''ON''.
3. Check voltage between ECM terminal ㉓ (Throttle position sensor signal) and ground.
   Voltage measurement must be made with throttle position sensor installed in vehicle.

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

   If NG, adjust closed throttle position switch. Refer to ''Basic Inspection'', EC-74.
4. If it is impossible to adjust closed throttle position switch in ''Basic Inspection'', replace throttle position sensor.



SEC220B

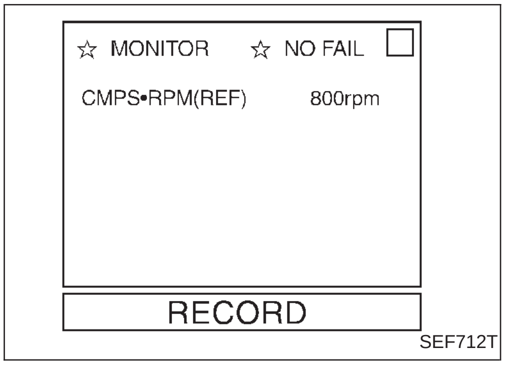
Engine Control Module (ECM)

COMPONENT DESCRIPTION

The ECM consists of a microcomputer, diagnostic test mode selector, and connectors for signal input and output and for power supply. The unit controls the engine.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Item (Possible Cause)
P0605 0301	● ECM calculation function is malfunctioning.	● ECM



CMPS•RPM(REF) 800rpm

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘DATA MONITOR’’ mode with CONSULT.
3) Start engine.
4) Run engine for at least 30 seconds at idle speed.
5) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.

OR

GST

1) Turn ignition switch ‘‘ON’’.
2) Start engine.
3) Run engine for at least 30 seconds at idle speed.
4) Select ‘‘Mode 7’’ with GST.
5) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.

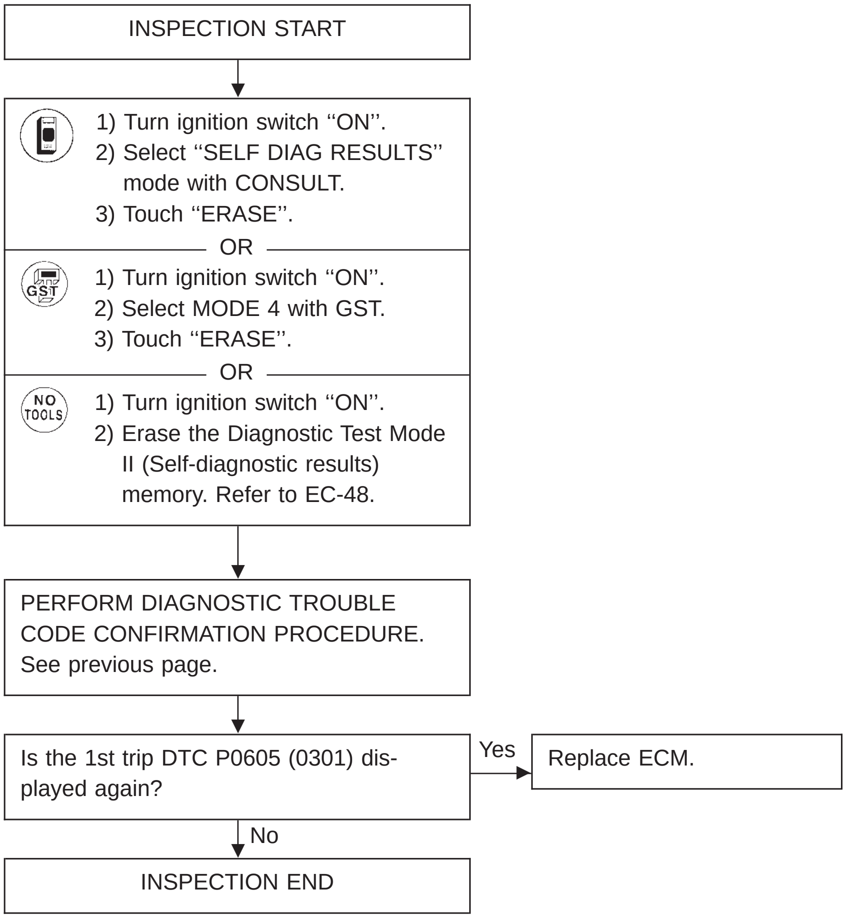
OR

NO TOOLS

1) Turn ignition switch ‘‘ON’’.
2) Start engine and wait at least 30 seconds.
3) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
4) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.
5) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.

Engine Control Module (ECM) (Cont’d)

DIAGNOSTIC PROCEDURE



INSPECTION START

1) Turn ignition switch ‘‘ON’’.
2) Select ‘‘SELF DIAG RESULTS’’ mode with CONSULT.
3) Touch ‘‘ERASE’’.

OR

GST
1) Turn ignition switch ‘‘ON’’.
2) Select MODE 4 with GST.
3) Touch ‘‘ERASE’’.

OR

NO TOOLS
1) Turn ignition switch ‘‘ON’’.
2) Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Refer to EC-48.

PERFORM DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE. See previous page.

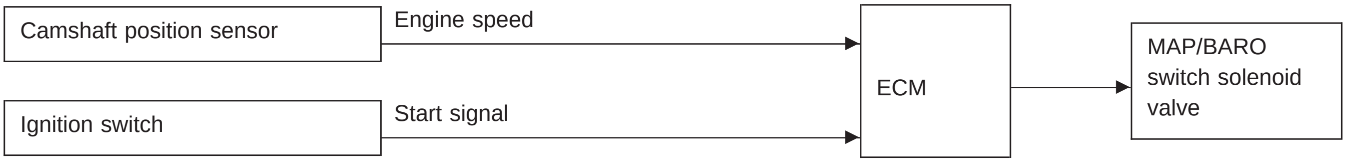
Is the 1st trip DTC P0605 (0301) displayed again?

Yes: Replace ECM.

No: INSPECTION END

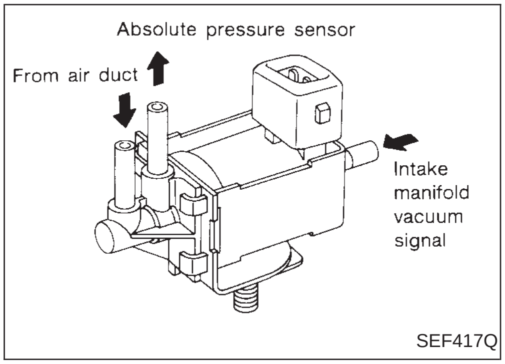
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve

SYSTEM DESCRIPTION



This system allows the absolute pressure sensor to monitor either ambient barometric pressure or intake manifold pressure. The MAP/BARO switch solenoid valve switches between two passages by ON-OFF pulse signals from the ECM. (One passage is from the intake air duct, the other is from the intake manifold.) Either ambient barometric pressure or intake manifold pressure is applied to the absolute pressure sensor.

Solenoid	Conditions
ON	● For 5 seconds after turning ignition switch ON (Engine is not running.) OR ● For 5 seconds after starting engine OR ● More than 5 minutes after the solenoid valve shuts OFF. and ● Engine running



COMPONENT DESCRIPTION

The MAP/BARO switch solenoid valve switches its air flow passage according to the voltage signal sent from the ECM. When voltage is supplied from the ECM, the MAP/BARO switch solenoid turns ‘‘ON’’. Then, the absolute pressure sensor can monitor the ambient barometric pressure. When voltage is not supplied from the ECM, the MAP/BARO switch solenoid valve turns ‘‘OFF’’. Then, the sensor monitors intake manifold pressure.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
MAP/BARO SW/V	● Engine: For 5 seconds after starting engine	BARO
	● Ignition switch: More than 5 seconds after turning ignition switch ‘‘ON’’ ● Engine: More than 5 seconds after starting engine	MAP

ECM TERMINALS AND REFERENCE VALUE

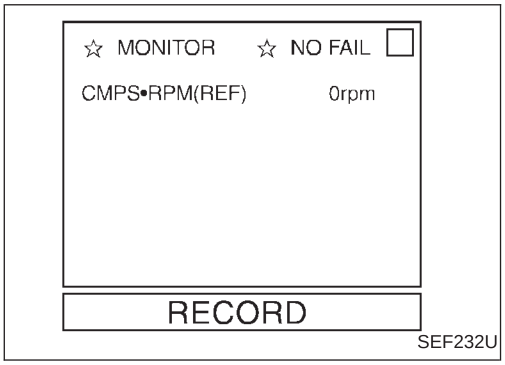
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
118	LG/B	MAP/BARO switch solenoid valve	Ignition switch ‘‘ON’’ └ For 5 seconds after turning ignition switch ‘‘ON’’ Engine is running. └ For 5 seconds after starting engine	0 - 1V
			Ignition switch ‘‘ON’’ └ More than 5 seconds after turning ignition switch ‘‘ON’’ Engine is running. └ More than 5 seconds after starting engine	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1105 1302	A) MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve.	● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● MAP/BARO switch solenoid valve
	B) There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and voltage at intake manifold pressure.	● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.) ● Hoses (Hoses are clogged, vent, kinked, disconnected or improper connection.) ● Absolute pressure sensor ● MAP/BARO switch solenoid valve

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

RECORD

SEF232U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform ''Procedure for malfunction A'' first. If the 1st trip DTC cannot be confirmed, perform ''Procedure for malfunction B''.

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

Procedure for malfunction A

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11V with ignition switch ''ON''.

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT.
3) Wait at least 10 seconds.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-327.

OR

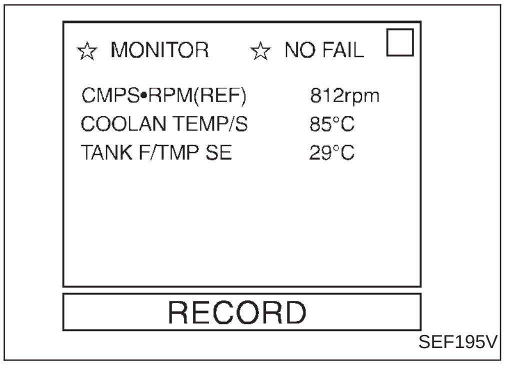
GST

1) Turn ignition switch ''ON'' and wait at least 10 seconds.
2) Select ''Mode 7'' with GST.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-327.

OR

NO TOOLS

1) Turn ignition switch ''ON'' and wait at least 10 seconds.
2) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
3) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-327.



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	85°C
TANK F/TMP SE	29°C

RECORD

SEF195V

Procedure for malfunction B

TESTING CONDITION:
Always perform at a temperature above 5°C (41°F).

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Turn ignition switch ''ON'' again and select ''DATA MONITOR'' mode with CONSULT.
4) Make sure that ''TANK/F/TEMP SE'' is more than 0°C (32°F).
5) Start engine and let it idle for at least 10 seconds.
6) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-327.

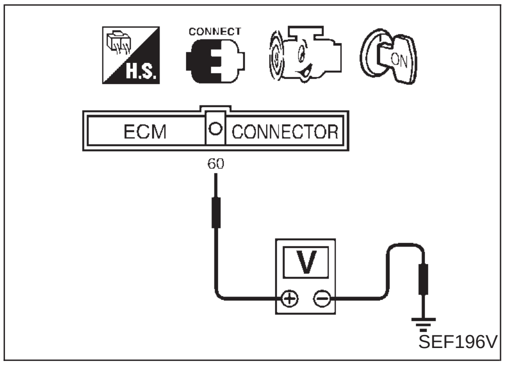
OR

GST

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Turn ignition switch ''ON''.
4) Check that voltage between ECM terminal (60) and ground is less than 4.2V.

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

5) Start engine and let it idle for at least 10 seconds.
6) Select ''MODE 7'' with GST.
7) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-327.

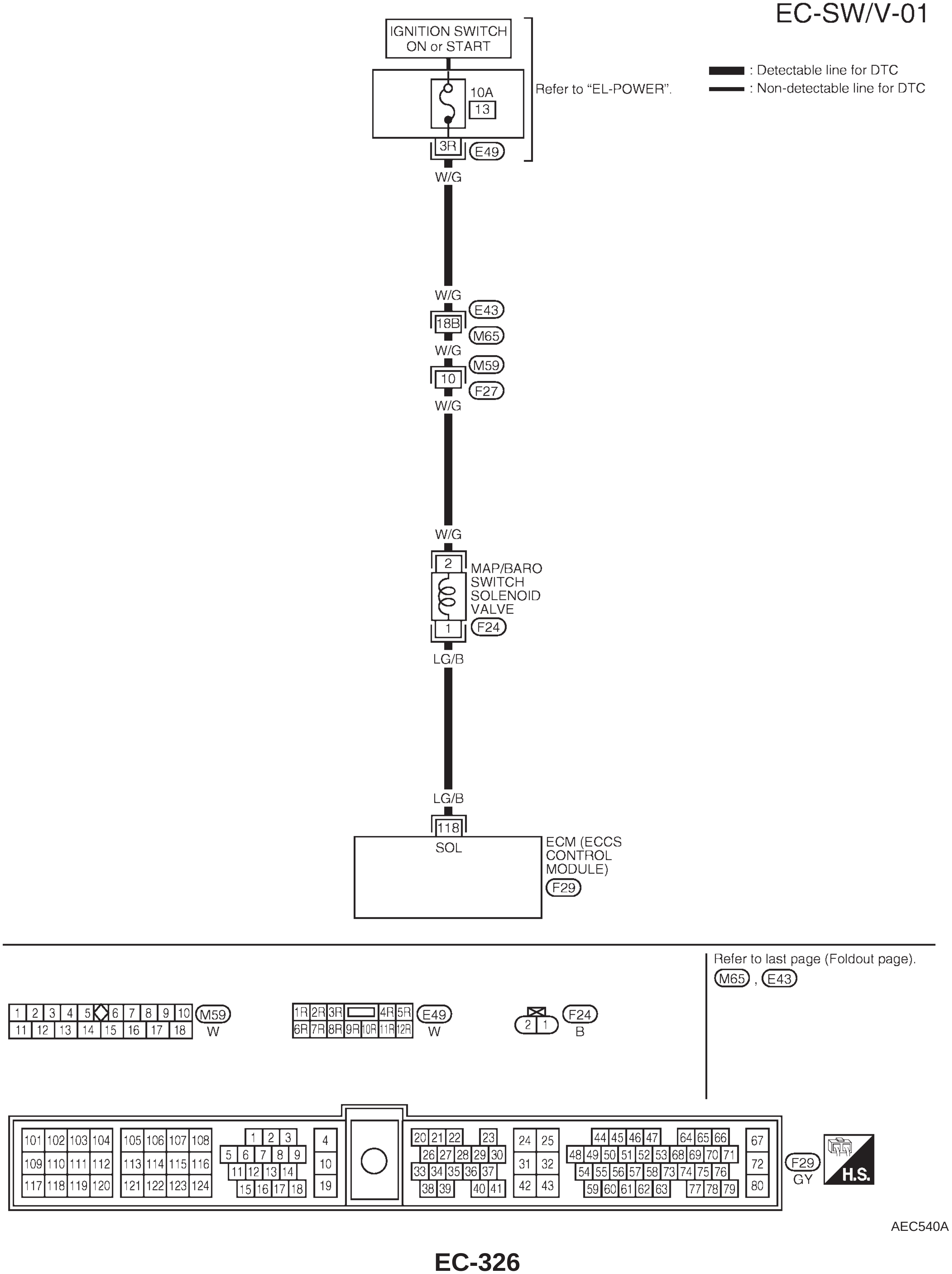


OR

NO TOOLS

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch ''OFF'' and wait at least 5 seconds.
3) Turn ignition switch ''ON''.
4) Check that voltage between ECM terminal ⑥⓪ and ground is less than 4.2V.
5) Start engine and let it idle for at least 10 seconds.
6) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
7) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
8) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-327.

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

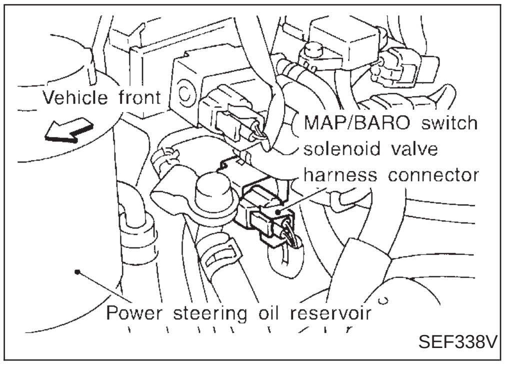


Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE

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

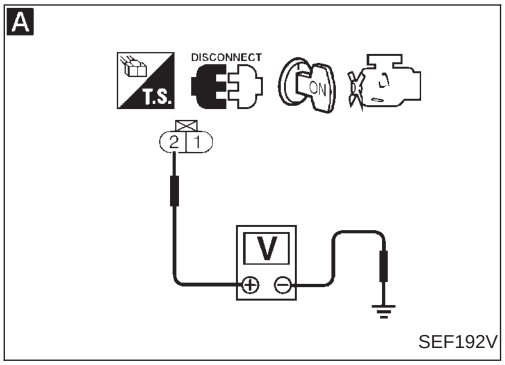
Procedure A



SEF338V

INSPECTION START

↓



SEF192V

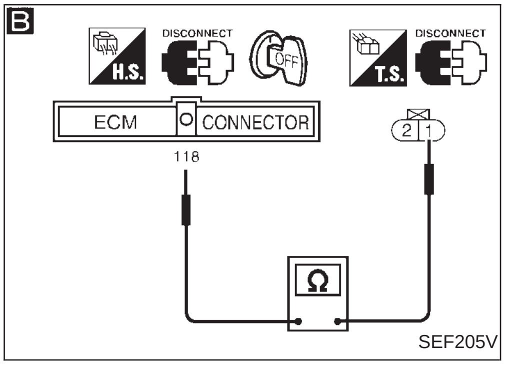
A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect MAP/BARO switch solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and engine ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E43, M65
- Harness connectors M59, F27
- 10A fuse
- Harness for open or short between MAP/BARO switch solenoid valve and 10A fuse

If NG, repair harness or connectors.

OK ↓



SEF205V

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (118) and terminal ① with CONSULT or tester.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK COMPONENT
(MAP/BARO switch solenoid valve).
Refer to "COMPONENT INSPECTION", EC-330.

NG → Replace MAP/BARO switch solenoid valve.

OK ↓

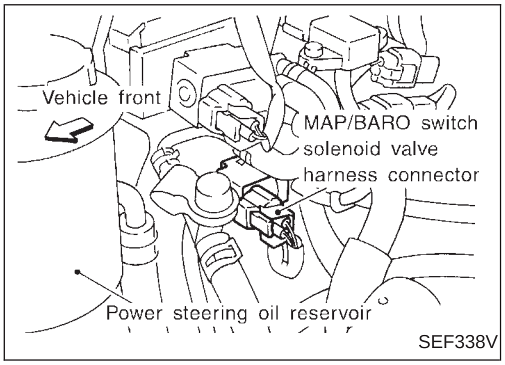
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

Procedure B

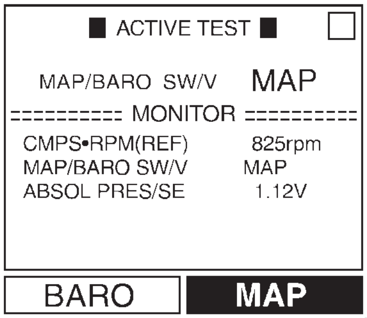


SEF338V

INSPECTION START

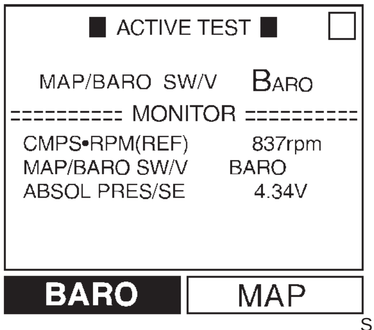
↓

A



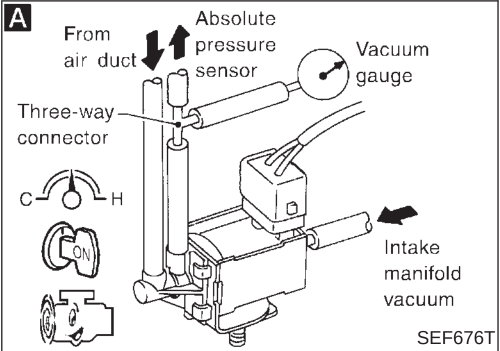
```
■ ACTIVE TEST ■          ☐

MAP/BARO SW/V       MAP
========== MONITOR ==========
CMPS•RPM(REF)       825rpm
MAP/BARO SW/V       MAP
ABSOL PRES/SE       1.12V
```

SEF130V



```
■ ACTIVE TEST ■          ☐

MAP/BARO SW/V       BARO
========== MONITOR ==========
CMPS•RPM(REF)       837rpm
MAP/BARO SW/V       BARO
ABSOL PRES/SE       4.34V
```

SEF131V



SEF676T

CHECK VACUUM SOURCE AND CIRCUIT TO MAP/BARO SWITCH SOLENOID VALVE.

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

MAP/BARO SW/V	Vacuum
BARO	Should not exist.
MAP	Should exist.

OR

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

OK → CHECK COMPONENT (Absolute pressure sensor).
1. Check for disconnection of vacuum hose connected to the sensor.
2. Check sensor harness connector for water.
   Water should not exist.

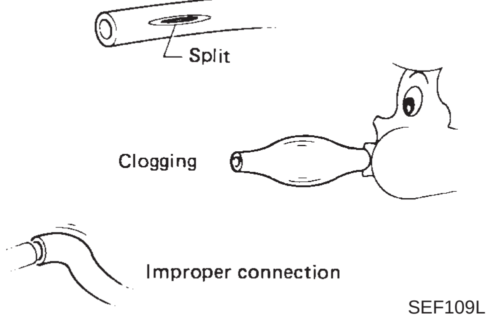
Refer to ''COMPONENT INSPECTION'', EC-283.

NG → Replace absolute pressure sensor.

OK → Go to ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

NG ↓

B



SEF109L

CHECK HOSE.

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

NG → Clean, repair or reconnect the hose.
If NG, check vacuum port for clogging.

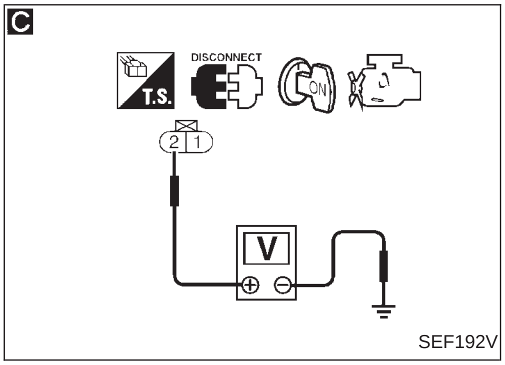
OK → CHECK INTAKE SYSTEM.
Check the intake system for air leaks.

OK ↓

Ⓐ
(Go to next page.)

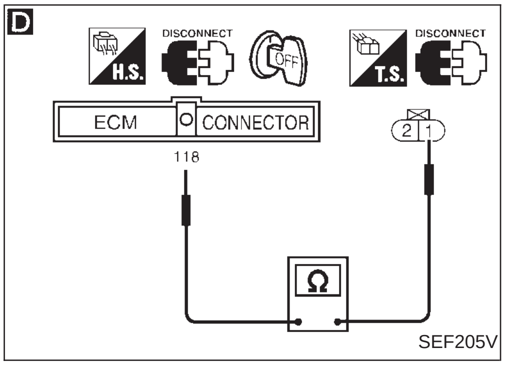
Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

C



SEF192V

D



SEF205V

Ⓐ

C

CHECK POWER SUPPLY.
1. Turn ignition switch ''OFF''.
2. Disconnect MAP/BARO switch solenoid valve harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ② and engine ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E43, M65
- Harness connectors M59, F27
- 10A fuse
- Harness for open or short between MAP/ BARO switch solenoid valve and 10A fuse

If NG, repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch ''OFF''.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (118) and terminal ① with CONSULT or tester.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK COMPONENT (MAP/BARO switch solenoid valve).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace MAP/BARO switch solenoid valve.

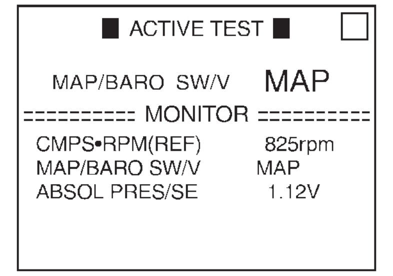
OK ↓

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

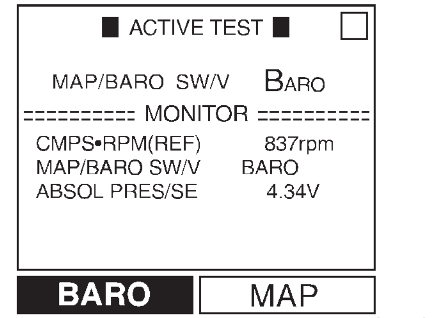
INSPECTION END

Manifold Absolute Pressure (MAP)/ Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



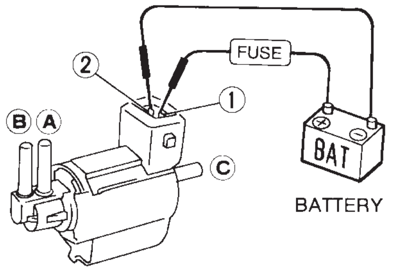
```
■ ACTIVE TEST ■            ☐

MAP/BARO SW/V    MAP
========== MONITOR ==========
CMPS•RPM(REF)       825rpm
MAP/BARO SW/V       MAP
ABSOL PRES/SE       1.12V

BARO                MAP
```

SEF130V



```
■ ACTIVE TEST ■            ☐

MAP/BARO SW/V    BARO
========== MONITOR ==========
CMPS•RPM(REF)       837rpm
MAP/BARO SW/V       BARO
ABSOL PRES/SE       4.34V

BARO                MAP
```

SEF131V



MEC488B

COMPONENT INSPECTION

MAP/BARO switch solenoid valve

1. Start engine and warm it up to normal operating temperature.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
   - Condition: At idle under no-load
   - CONSULT display

MAP/BARO	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

- Time for voltage to change

MAP/BARO SW/V	Required time to switch
BARO to MAP	Less than 1 second
MAP to BARO	

4. If NG, check MAP/BARO switch solenoid valve as shown below.

OR

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

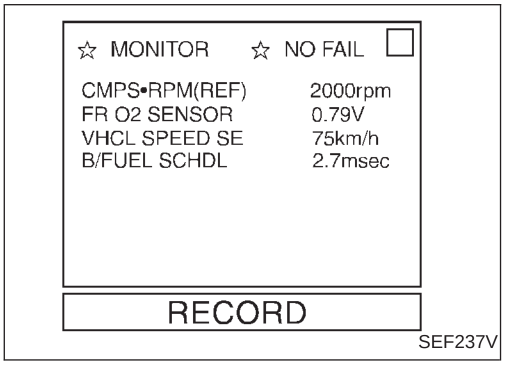
3. If NG or operation takes more than 1 second, replace MAP/BARO switch solenoid valve.

Closed Loop Control

ON BOARD DIAGNOSIS LOGIC

★ The closed loop control has the one trip detection logic.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1148 0307	● The closed loop control function does not operate even when vehicle is driving in the specified condition.	● The front heated oxygen sensor circuit is open or shorted. ● Front heated oxygen sensor ● Front heated oxygen sensor heater



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	2000rpm
FR O2 SENSOR	0.79V
VHCL SPEED SE	75km/h
B/FUEL SCHDL	2.7msec

RECORD

SEF237V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V at idle.

1) Start engine and warm it up to normal operating temperature.
2) Select "DATA MONITOR" mode with CONSULT.
3) Hold engine speed at 2,000 rpm.
4) While holding engine speed at 2,000 rpm, check the following.

- "FR O2 SENSOR" voltage should go above 0.70V at least once.

OR

- "FR O2 SENSOR" voltage should go below 0.21V at least once.

  If the check result is NG, perform "DIAGNOSIS PROCEDURE" on next page.

  If the check result is OK, perform the following step.

5) Let engine idle at least 3 minutes.

NOTE:

Never raise engine speed above 3,000 rpm after this step. If the engine speed limit is exceeded, return to step 5).

6) Maintain the following condition at least 50 consecutive seconds.

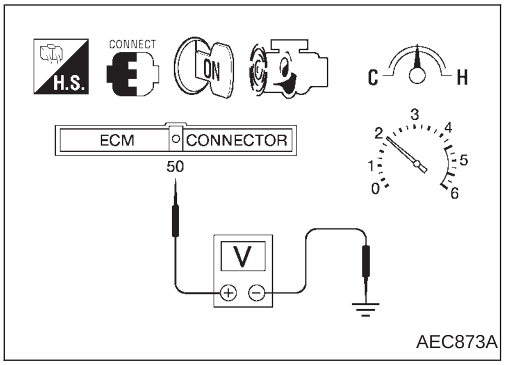
Closed Loop Control (Cont’d)

B/FUEL SCHDL: 1.5 msec or more (A/T)
1.3 msec or more (M/T)
CMPS·RPM (REF): 1,500 - 3,000 rpm (A/T)
1,700 - 3,000 rpm (M/T)
Selector lever: Suitable position
VHCL SPEED SE: More than 70 km/h (43 MPH)

During this test, P0130 may be displayed on the CONSULT screen.

7) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE” below.

OR



OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the closed loop control. During this check, a 1st trip DTC might not be confirmed.

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

- The voltage should go above 0.7V at least once.

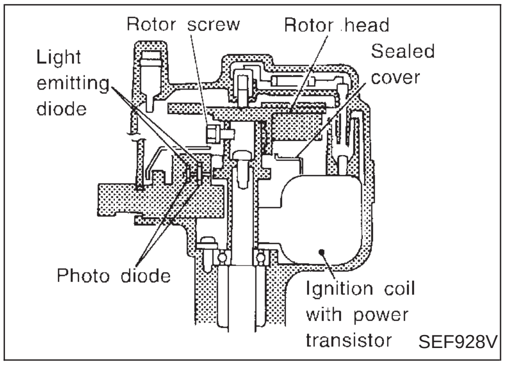
OR

- The voltage should go below 0.21V at least once.

4) If NG, go to “DIAGNOSTIC PROCEDURE” below.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0133, EC-175.



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor

The ignition signal from the ECM is sent to the power transistor. The power transistor switches the ignition coil primary circuit on and off. As the primary circuit is turned on and off, the proper high voltage is induced in the coil secondary circuit.
The distributor is not repairable and must be replaced as an assembly except distributor cap and rotor head.

NOTE:
The rotor screw which secures the distributor rotor head to the distributor shaft must be tightened properly.
: 3.3 - 3.9 N·m (0.34 - 0.40 kg-m, 29.5 - 34.7 in-lb)

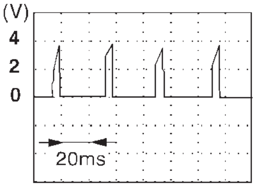
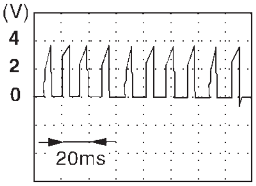
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

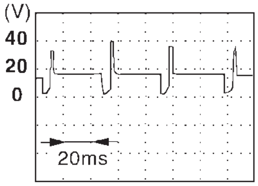
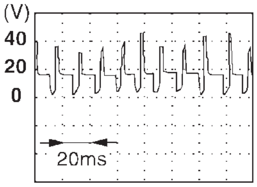
MONITOR ITEM	CONDITION		SPECIFICATION
IGNITION SW	● Ignition switch: ON → OFF → ON		ON → OFF → ON
IGN TIMING	● Engine: After warming up ● Air conditioner switch: "OFF" ● Shift lever: "N" ● No-load	Idle	Approx. 20° BTDC
		2,000 rpm	More than 25° BTDC

ECM TERMINALS AND REFERENCE VALUE

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

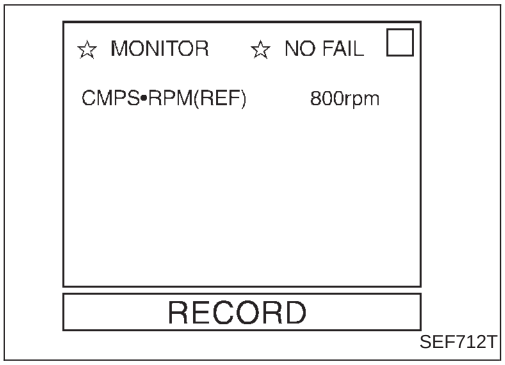
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	PU/W	Ignition signal	Engine is running. (Warm-up condition) Idle speed	0 - 0.5V  SEF186T
			Engine is running. Engine speed is 2,000 rpm.	0.2 - 1.0V  SEF187T

Ignition Signal (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	B	Ignition check	Engine is running. (Warm-up condition) Idle speed	12 - 14V  SEF188T
			Engine is running. Engine speed is 2,000 rpm.	12 - 13V  SEF189T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 0201	● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running.	● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit. ● Resistor ● Camshaft position sensor ● Camshaft position sensor circuit



CMPS•RPM(REF) 800rpm

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**
- **If both DTC P0340 (0101) and P1320 (0201) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340 first. Refer to EC-252.**

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-337.

OR

1) Turn ignition switch "ON".
2) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
3) Select MODE 7 with GST.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-337.

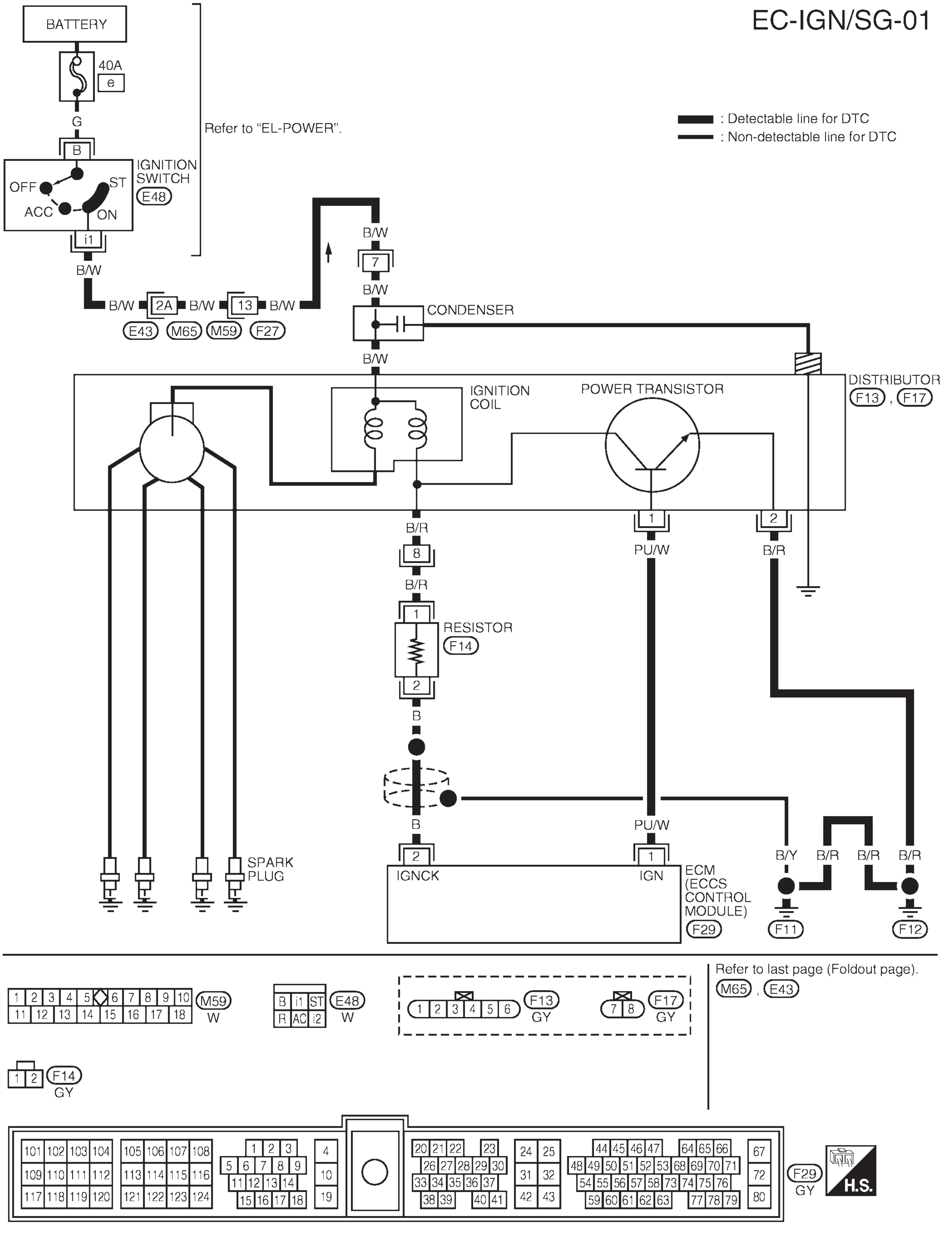
Ignition Signal (Cont’d)

OR

NO TOOLS

1) Turn ignition switch ‘‘ON’’.
2) Start engine. (If engine does not run, turn ignition switch to ‘‘START’’ for at least 5 seconds.)
3) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds, then turn ‘‘ON’’.
4) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.
5) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-337.

Ignition Signal (Cont’d)

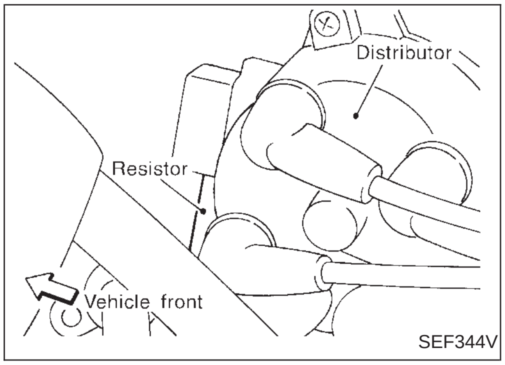


AEC541A

TROUBLE DIAGNOSIS FOR DTC P1320

Ignition Signal (Cont’d)

DIAGNOSTIC PROCEDURE



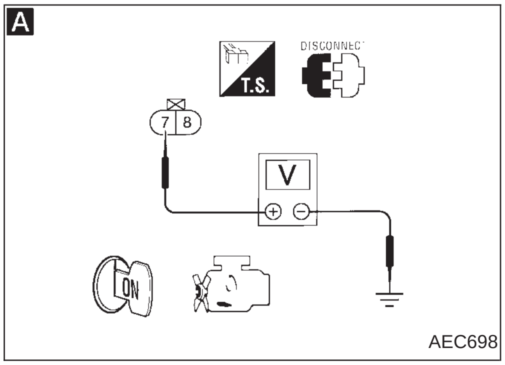
SEF344V

INSPECTION START

Turn ignition switch “OFF”, and restart engine.
Is engine running?

Yes → Ⓐ (Go to next page.)

No



AEC698

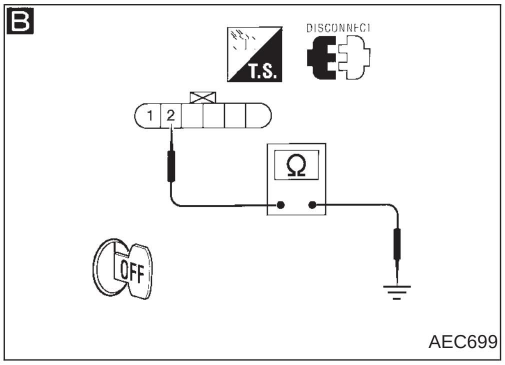
A

CHECK POWER SUPPLY.
1. Turn ignition switch “OFF”.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch “ON”.
4. Check voltage between terminal ⑦ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E43, M65
- Harness connectors M59, F27
- Harness for open or short between ignition coil and ignition switch

If NG, repair harness or connectors.

OK



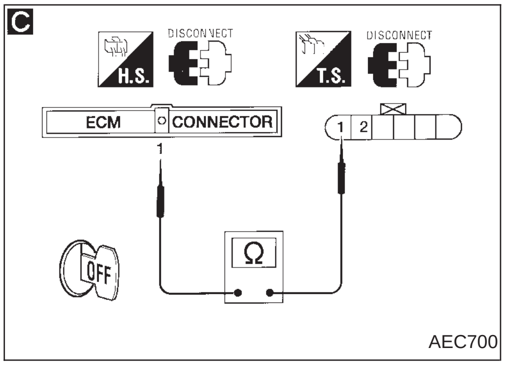
AEC699

B

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

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

OK



AEC700

C

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

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

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to “COMPONENT INSPECTION”, EC-338.

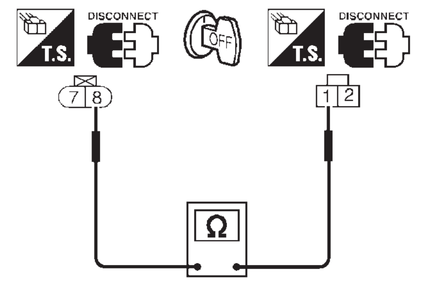
NG → Replace malfunctioning component(s).

OK

Ⓐ
(Go to next page.)

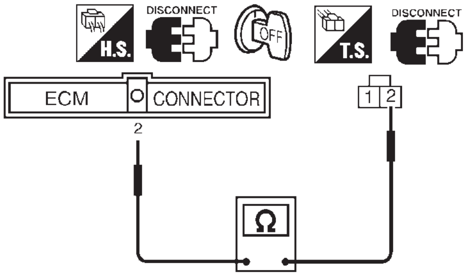
Ignition Signal (Cont'd)

D



SEF238V

D



SEF239V

Ⓐ

D

CHECK INPUT SIGNAL CIRCUIT.
1. Stop engine.
2. Disconnect ignition coil harness connector.
3. Strip tape covering resistor and condenser.
4. Disconnect resistor harness connector.
5. Disconnect ECM harness connector.
6. Check harness continuity between ignition coil terminal ⑧ and resistor terminal ①, resistor terminal ② and ECM terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK

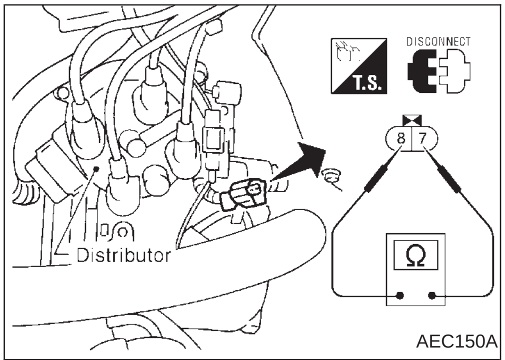
CHECK COMPONENTS (Resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace resistor.

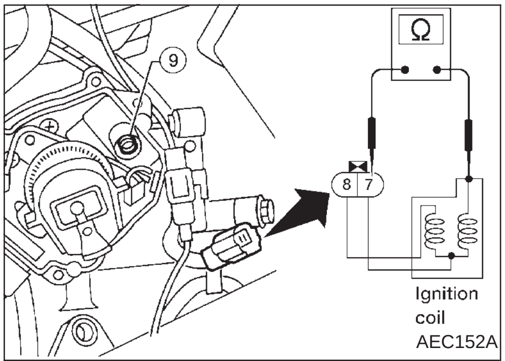
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END



AEC150A



AEC152A

COMPONENT INSPECTION

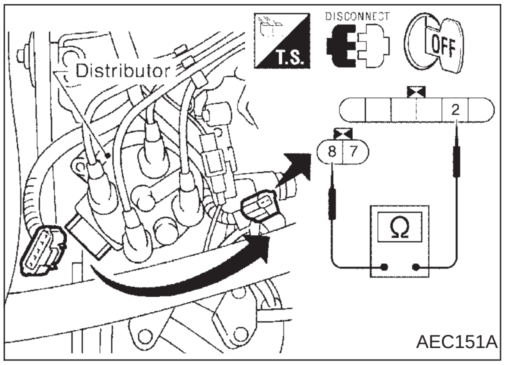
Ignition coil

1. Disconnect ignition coil harness connector.
2. Remove distributor cap.
3. Check resistance as shown in the figure.

Terminal	Resistance [at 25°C (77°F)]
⑦ - ⑧	Less than 1Ω
⑦ - ⑨	7 - 13 kΩ

If NG, replace distributor assembly as a unit.

Ignition Signal (Cont’d)

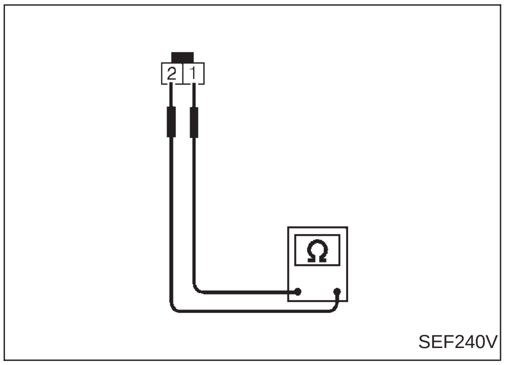


Power transistor

1. Disconnect camshaft position sensor & power transistor harness connector and ignition coil harness connector.
2. Check power transistor resistance between terminals ② and ⑧.

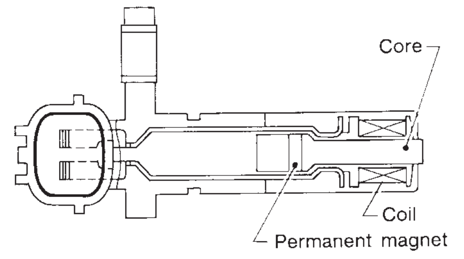
Terminals	Resistance	Result
② and ⑧	Except 0Ω	OK
	0Ω	NG

If NG, replace distributor assembly.

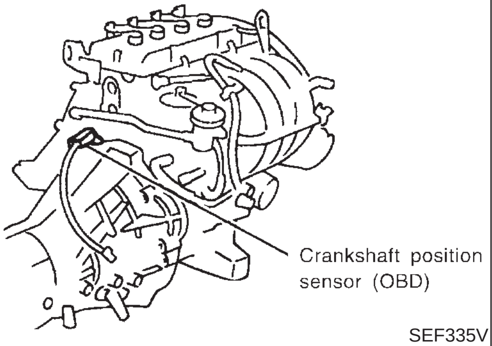


Resistor

1. Disconnect resistor harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]
   If NG, replace resistor.



SEF956N



SEF335V

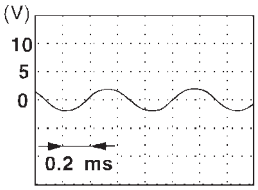
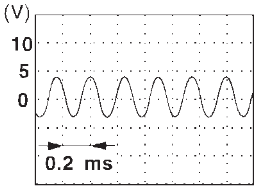
Crankshaft Position Sensor (CKPS) (OBD) (COG)

COMPONENT DESCRIPTION

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet, core and coil.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
This sensor is not directly used to control the engine system.
It is used only for the on board diagnosis.

ECM TERMINALS AND REFERENCE VALUE

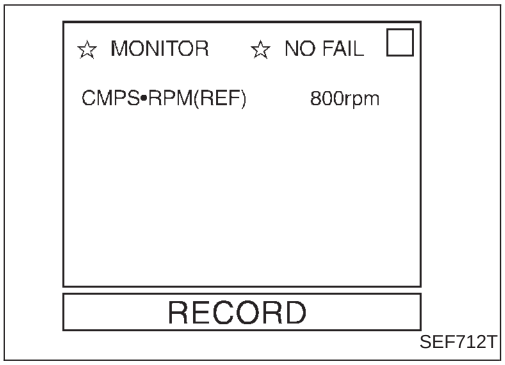
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
43	B/W	Sensors' ground	Engine is running. └ Idle speed	Approximately 0V
47	L	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V  SEF112V
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0V  SEF113V

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont’d)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1336 0905	● A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.	● Harness or connectors ● Crankshaft position sensor (OBD) ● Drive plate/Flywheel



CMPS•RPM(REF) 800rpm

SEF712T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

1) Turn ignition switch ‘‘ON’’ and select ‘‘DATA MONITOR’’ mode with CONSULT.
2) Start engine and run it for at least 2 minutes at idle speed.
3) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-343.

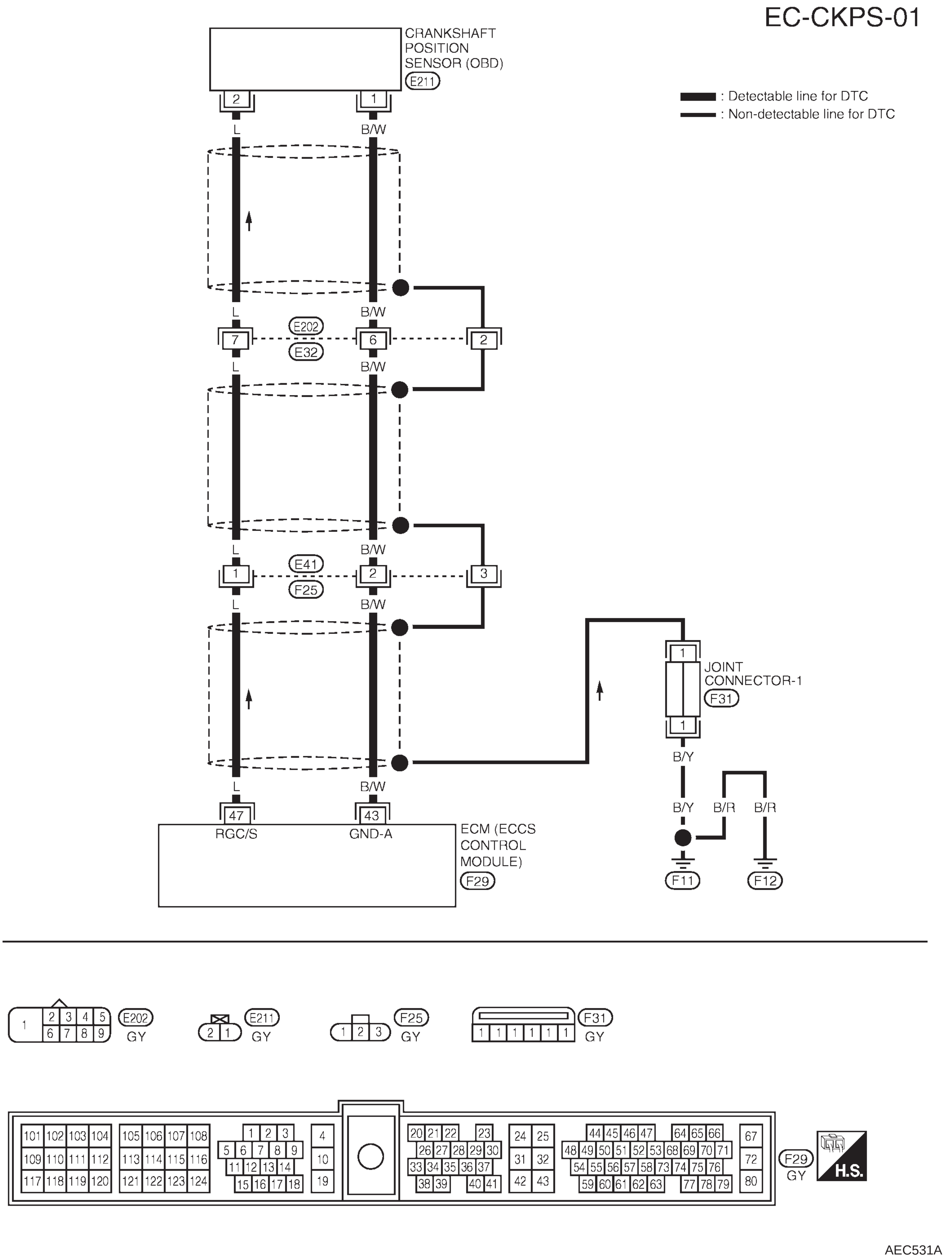
OR

1) Start engine and run it for at least 2 minutes at idle speed.
2) Select ‘‘MODE 7’’ with GST.
3) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-343.

OR

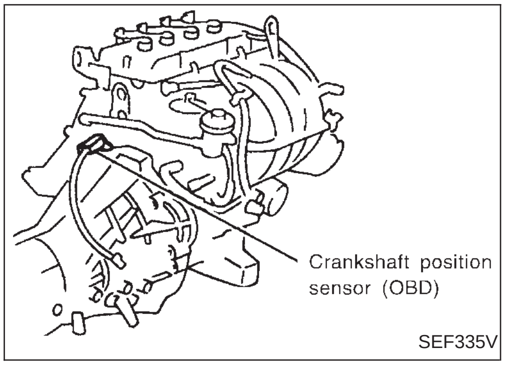
1) Start engine and run it for at least 2 minutes at idle speed.
2) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
3) Perform ‘‘Diagnostic Test Mode II’’ (Self-diagnostic results) with ECM.
4) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-343.

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)



Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont’d)

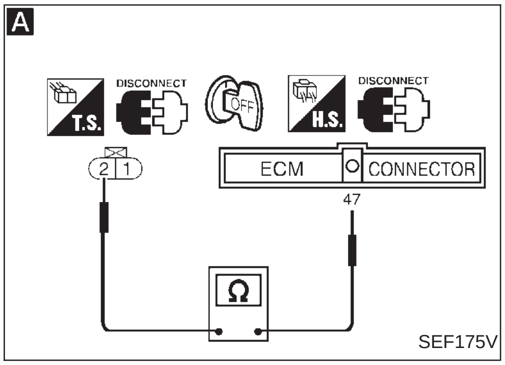
DIAGNOSTIC PROCEDURE



SEF335V

INSPECTION START

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



SEF175V

A

CHECK INPUT SIGNAL CIRCUIT.

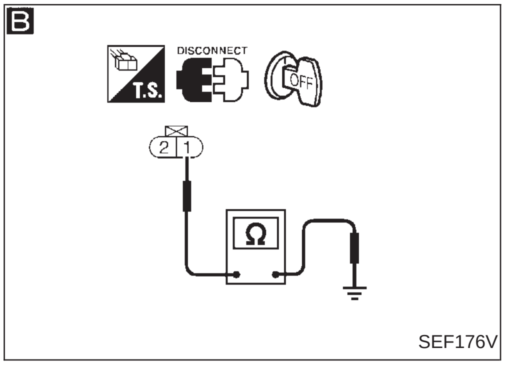
1. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.
2. Check continuity between ECM terminal ㊼ and terminal ②.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors E202 , E32
- Harness connectors E41 , F25
- Harness for open or short between ECM and crankshaft position sensor (OBD)

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

OK



SEF176V

B

CHECK GROUND CIRCUIT.

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

NG → Check the following.

- Harness connectors E202 , E32
- Harness connectors E41 , F25
- Harness for open or short between crankshaft position sensor (OBD) and ECM

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

OK

Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.

Trouble is not fixed.

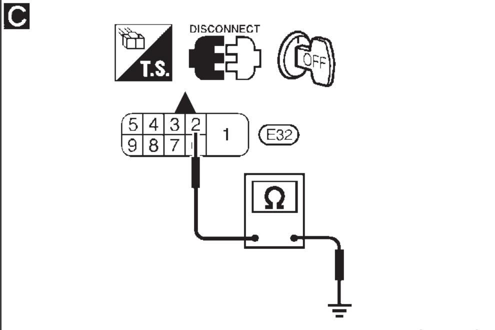
CHECK COMPONENT
[Crankshaft position sensor (OBD)].
Refer to ‘‘COMPONENT INSPECTION’’ on next page.

NG → Replace crankshaft position sensor (OBD).

OK

Ⓐ
(Go to next page.)

Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)



SEF552V

Ⓐ

C

CHECK SHIELD CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect connector E32.
3. Check harness continuity between harness connector E32 terminal ② and ground.
   Continuity should exist.
   If OK, check harness for short to power.

NG → Check the following.
- Harness connectors E41, F25
- Joint connector-1
- Harness for open or short between harness connector E32 and ground

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

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

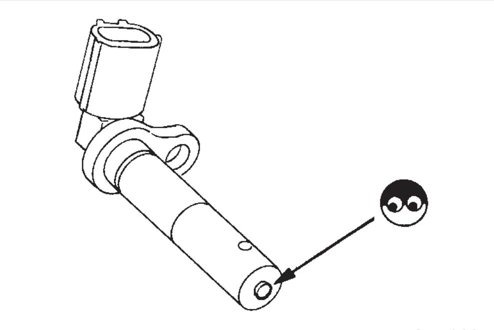
Trouble is not fixed. ↓

Visually check for chipping flywheel or drive plate gear tooth (cog).

NG → Replace the flywheel or drive plate.

OK ↓

INSPECTION END

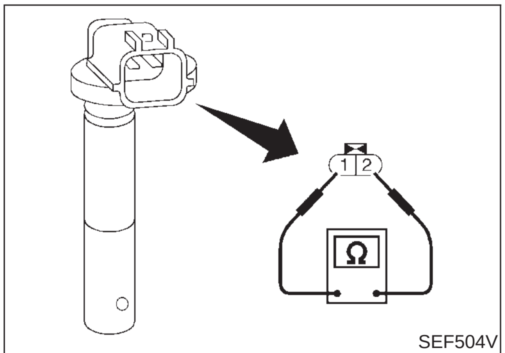


SEF960N

COMPONENT INSPECTION

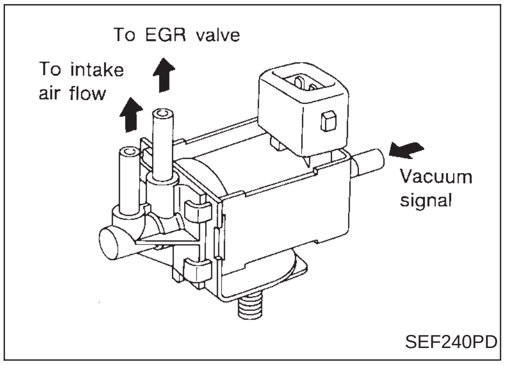
Crankshaft position sensor (OBD)

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



SEF504V

5. Check resistance as shown in the figure.
   Resistance: Approximately 512 - 632Ω
   [at 20°C (68°F)]



EGRC-Solenoid Valve

COMPONENT DESCRIPTION

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve.
When the ECM sends an ON signal, a plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: ‘‘OFF’’ ● Shift lever: ‘‘N’’ ● No-load	Idle	ON
		Engine speed: Revving engine from idle to 3,000 rpm quickly	OFF

ECM TERMINALS AND REFERENCE VALUE

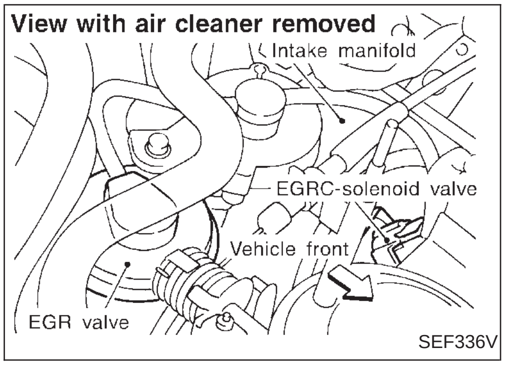
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
103	G/W	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Idle speed	0 - 1V
			Engine is running. (Warm-up condition) └ Revving engine from idle to 3,000 rpm quickly	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1400 1005	● The improper voltage signal is sent to ECM through EGRC-solenoid valve.	● Harness or connectors (The EGRC-solenoid valve circuit is open or shorted.) ● EGRC-solenoid valve

EGRC-Solenoid Valve (Cont'd)



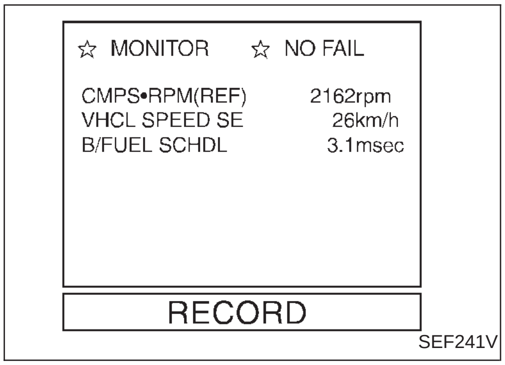
SEF336V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:
Always drive vehicle at a safe speed.

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

TESTING CONDITION:
Always perform at a temperature above −10°C (14°F).

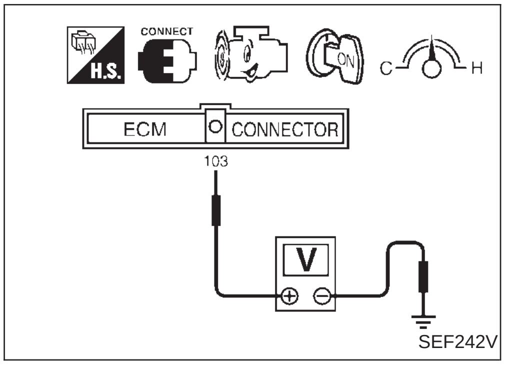


```
☆ MONITOR      ☆ NO FAIL

CMPS•RPM(REF)        2162rpm
VHCL SPEED SE         26km/h
B/FUEL SCHDL         3.1msec

           RECORD
```

SEF241V

1) Start engine and warm it up to normal operating temperature.
2) Select "DATA MONITOR" mode with CONSULT.
3) Maintain the following conditions for at least 5 consecutive seconds.
   CMPS·RPM (REF): 1,000 - 3,400 rpm
   B/FUEL SCHDL: 2 msec or more
   VHCL SPEED SE: Suitable speed
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-348.

OR



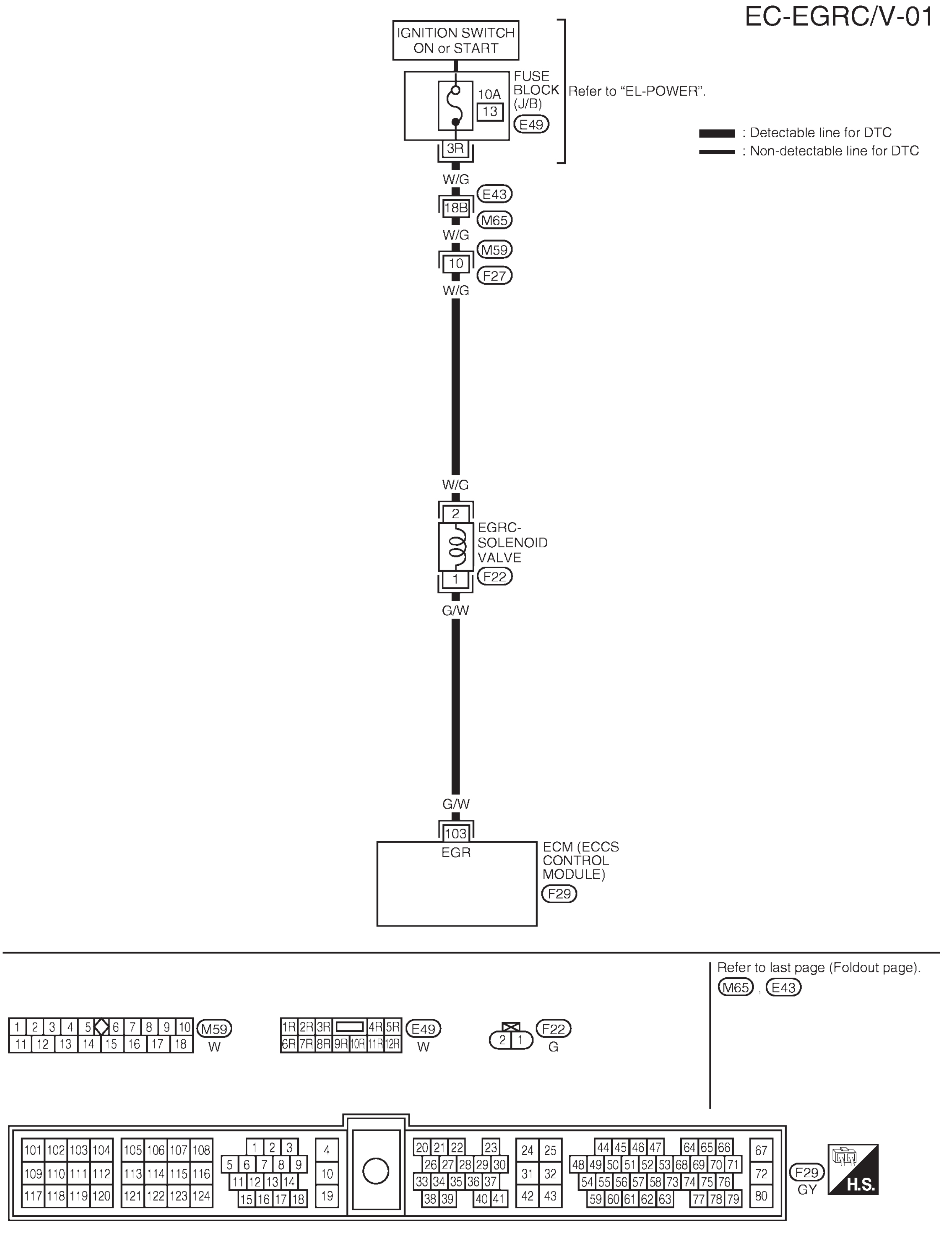
SEF242V

OVERALL FUNCTION CHECK

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

1) Start engine and warm it up to normal operating temperature.
2) Check the voltage between ECM terminal (103) and ground at idle.
   Voltage: 0 - 1V
3) Check that the voltage changes to battery voltage and returns to 0 - 1V when revving the engine from idle to 3,000 rpm quickly.
4) If NG, go to "DIAGNOSTIC PROCEDURE", EC-348.

EGRC-Solenoid Valve (Cont'd)



AEC542A

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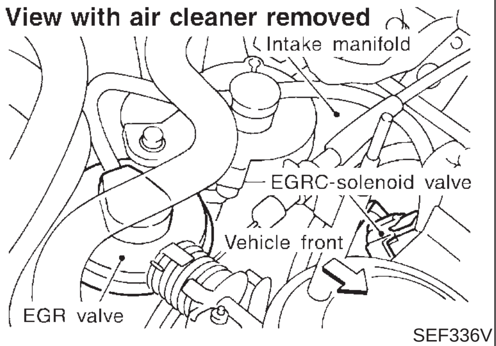
EGRC-Solenoid Valve (Cont'd)



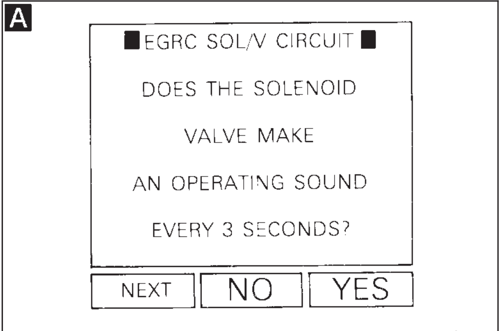
SEF336V

DIAGNOSTIC PROCEDURE

INSPECTION START

↓

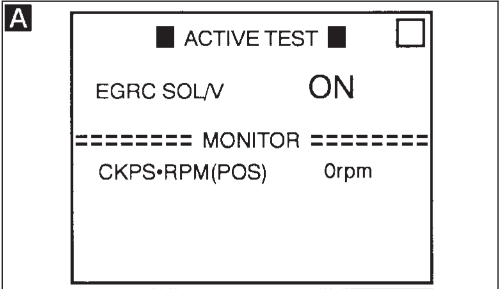
A



■EGRC SOL/V CIRCUIT■

DOES THE SOLENOID VALVE MAKE AN OPERATING SOUND EVERY 3 SECONDS?

MEF957D



■ ACTIVE TEST ■

EGRC SOL/V ON

======== MONITOR ========

CKPS•RPM(POS) 0rpm

SEF594P

CHECK COMPONENT
(EGRC-solenoid valve.)

1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

If this mode is not available, use the "ACTIVE TEST" mode.

OR

1. Turn ignition switch "ON".
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

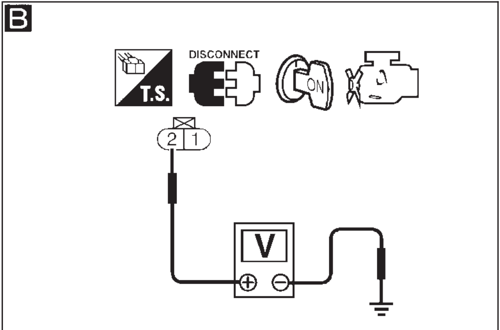
OR

1. Start engine and rev engine up to 3,000 rpm quickly.
2. When disconnecting and reconnecting the EGRC-solenoid valve harness connector, make sure that the EGRC-solenoid valve makes operating sound. (The DTC or the 1st trip DTC for the EGRC-solenoid valve will be displayed, however, ignore it.)

OK → Go to "COMPONENT INSPECTION on next page.
If NG, repair or replace EGRC-solenoid valve or repair circuit.

↓ NG

B



SEF192V

CHECK POWER SUPPLY.

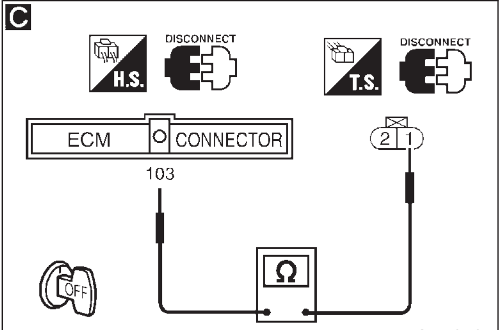
1. Turn ignition switch "OFF".
2. Disconnect EGRC-solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E43, M65
- Harness connectors M59, F27
- 10A fuse
- Harness for open or short between EGRC-solenoid valve and 10A fuse

If NG, repair harness or connectors.

↓ OK

C



SEF243V

CHECK OUTPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (103) and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

↓ OK

CHECK COMPONENT
(EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGRC-solenoid valve.

↓ OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

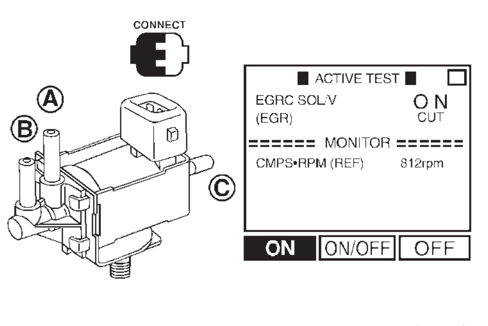
↓

INSPECTION END

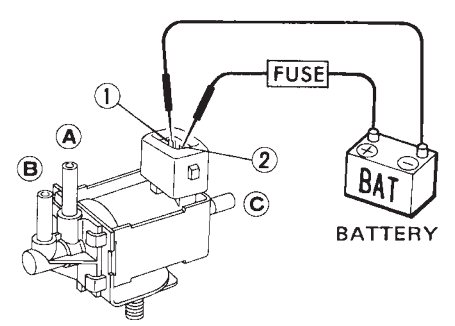
EGRC-Solenoid Valve (Cont'd)

COMPONENT INSPECTION

EGRC-solenoid valve



SEF185V



AEC919

Check air passage continuity.

Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

Condition EGRC SOLENOID VALVE	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
ON	Yes	No
OFF	No	Yes

OR

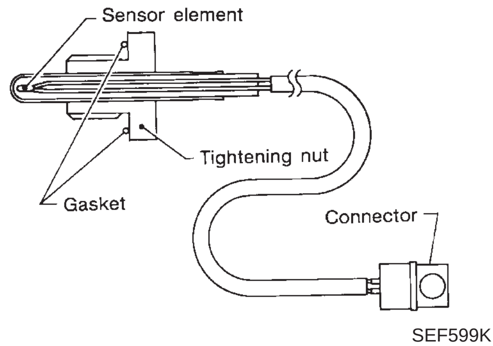
Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.

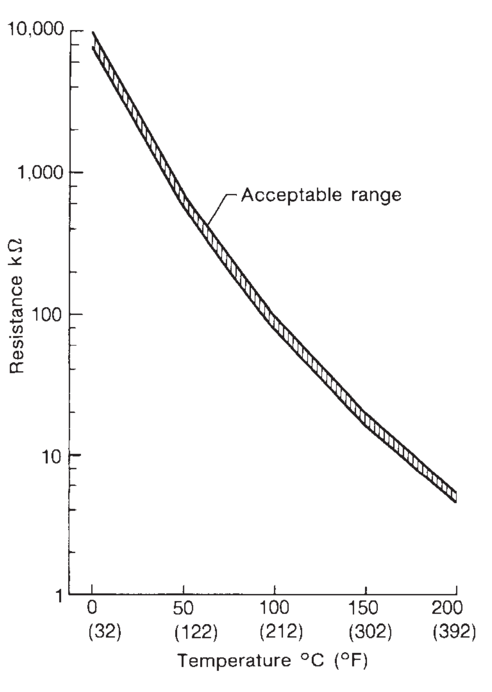
EGR Temperature Sensor

COMPONENT DESCRIPTION

The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases. This sensor is not used to control the engine system.
It is used only for the on board diagnosis.



SEF599K



SEF526Q

<Reference data>

EGR temperature °C (°F)	Voltage* V	Resistance MΩ
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

*: These data are reference values and are measured between ECM terminal (63) (EGR temperature sensor) and ECM terminal ㉜ (ECM ground).
When EGR system is operating.
Voltage: 0 - 1.5V

ON BOARD DIAGNOSIS LOGIC

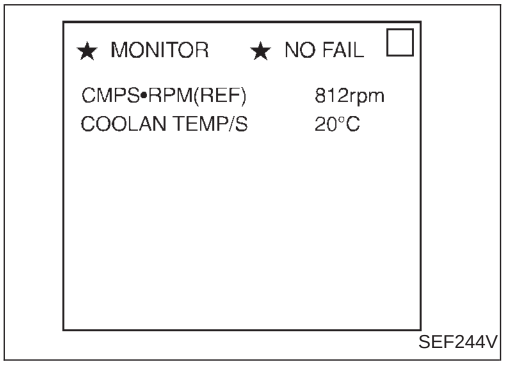
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	● Harness or connectors (The EGR temperature sensor circuit is shorted.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve
	B) An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.	● Harness or connectors (The EGR temperature sensor circuit is open.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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



★ MONITOR ★ NO FAIL ☐

CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	20°C

SEF244V

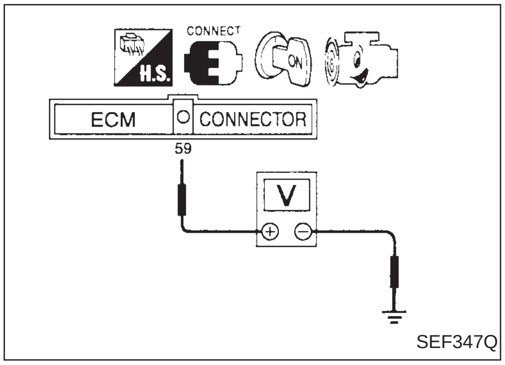
Procedure for malfunction A

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Verify that engine coolant temperature is less than 40°C (104°F).
If the engine coolant temperature is above the range, cool the engine down.
4) Start engine and let it idle for at least 8 seconds.
5) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354.

OR

GST

1) Turn ignition switch "ON".
2) Select "MODE 1" with GST.
3) Verify that engine coolant temperature is less than 40°C (104°F).
If the engine coolant temperature is above the range, cool the engine down.
4) Start engine and let it idle for at least 8 seconds.
5) Select "MODE 7" with GST.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354.



SEF347Q

OR

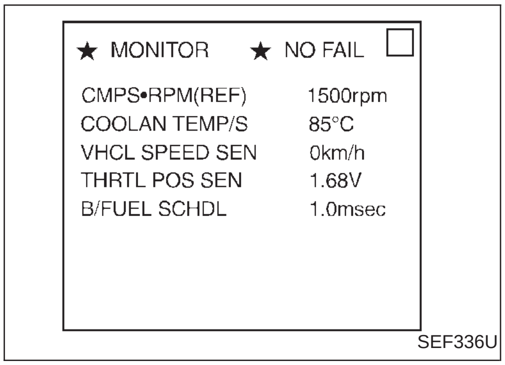
NO TOOLS

1) Turn ignition switch "ON".
2) Verify that voltage between ECM terminal (59) (engine coolant temperature) and ground is more 2.7V.
If the voltage is below the range, cool the engine down.
3) Start engine and let it idle for at least 8 seconds.
4) Turn ignition switch "OFF" and wait at least 5 seconds.
5) Turn ignition switch "ON" and perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.
6) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354.

Procedure for malfunction B

CAUTION:
Always drive vehicle at a safe speed.

TESTING CONDITION:
Always perform at a temperature above 5°C (41°F).



★ MONITOR ★ NO FAIL ☐

CMPS•RPM(REF)	1500rpm
COOLAN TEMP/S	85°C
VHCL SPEED SEN	0km/h
THRTL POS SEN	1.68V
B/FUEL SCHDL	1.0msec

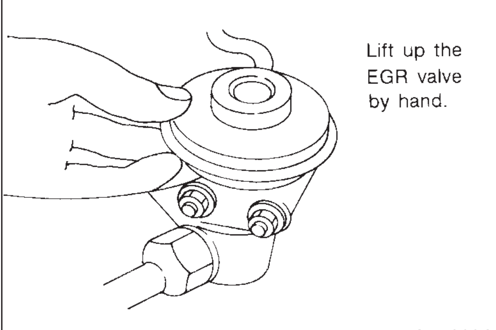
SEF336U

1) Start engine and warm it up to normal operating temperature.
2) Run engine at idle for at least 2 minutes.
3) Confirm that EGR valve is not lifting.
If the check result is NG, go to "TROUBLE DIAGNOSES FOR DTC P1402", EC-356.
4) Select "DATA MONITOR" mode with CONSULT.
5) Read "EGR TEMP SEN" at about 1,500 rpm while holding the EGR valve in full open position by hand.
Voltage should decrease to less than 1.0V.

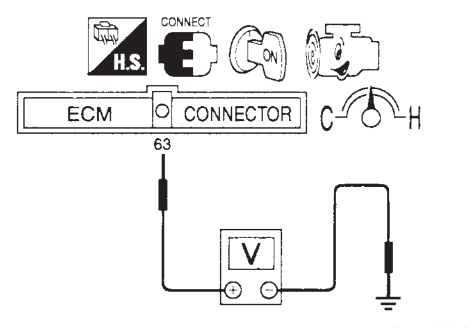
EGR Temperature Sensor (Cont'd)

If the check result is NG, go to "DIAGNOSTIC PROCEDURE", EC-354.
If the check result is OK, go to following step.

6) Turn ignition switch "OFF" and wait at least 5 seconds.
7) Turn ignition switch "ON".
8) Check the output voltage of "THRTL POS SEN" (at closed throttle position) and note it.
9) Start engine.
10) Maintain the following conditions for at least 5 consecutive seconds.
    CMPS·RPM (REF): 1,800 - 2,600 rpm (A/T)
    2,000 - 2,600 rpm (M/T)
    VHCL SPEED SE: 10km/h (6MPH) or more
    B/FUEL SCHDL: 3.0 - 3.5 msec (A/T)
    2.5 - 3.5 msec (M/T)
    THRTL POS SEN: (X + 0.23) − (X + 0.73) V
    X = Voltage value measured at step 8)
    Selector lever: Suitable position
11) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-354.



SEF360Q



SEF362Q

OR

OVERALL FUNCTION CHECK

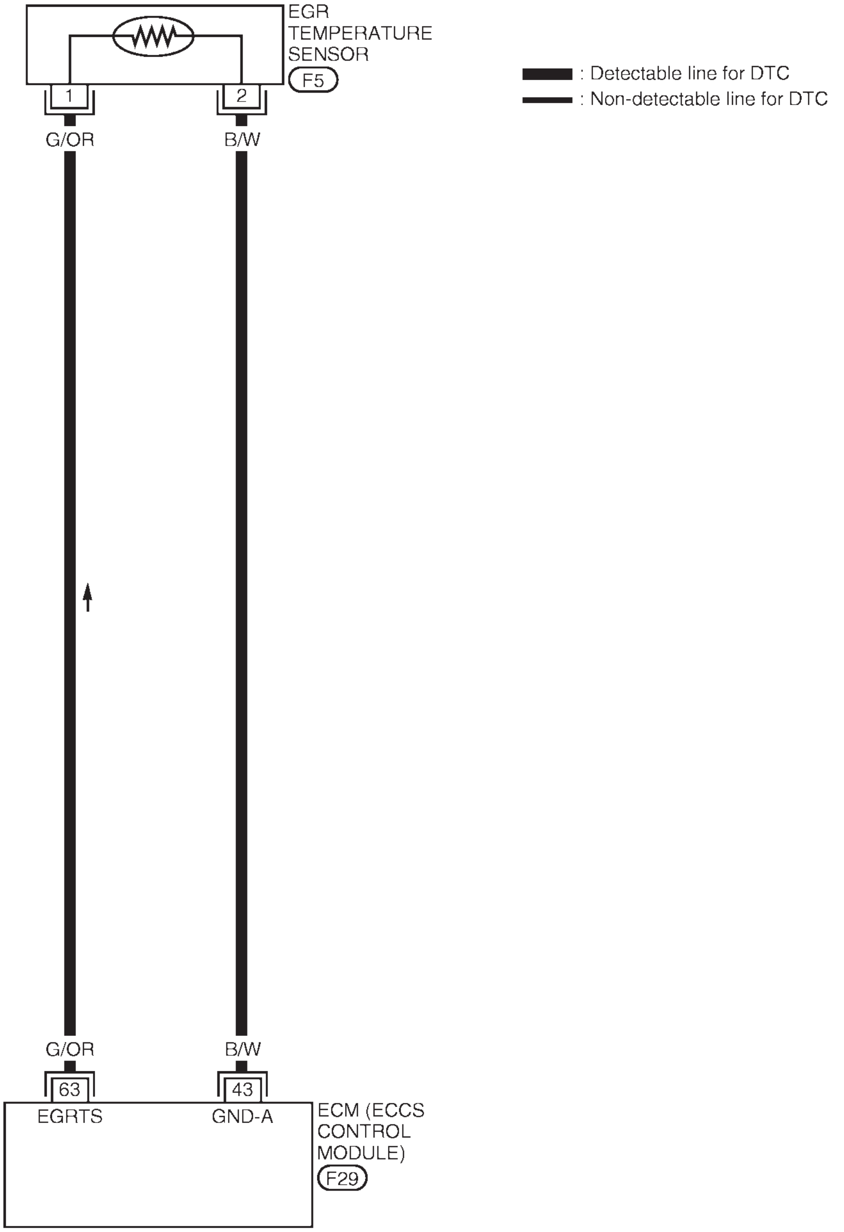
Use this procedure to check the overall function of the EGR temperature sensor. During this check, a 1st trip DTC might not be confirmed.

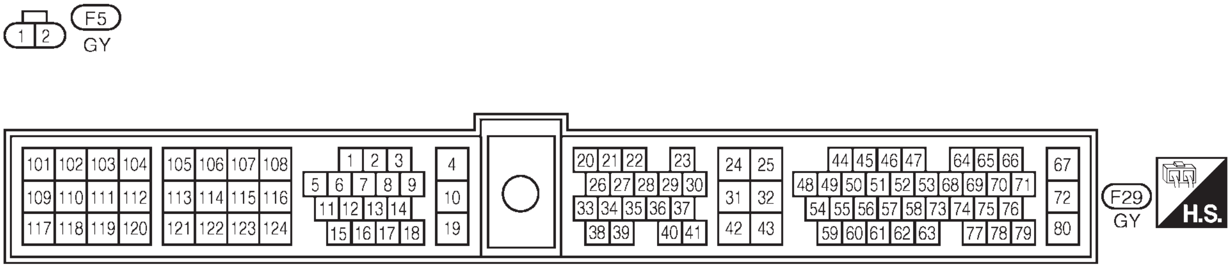
Procedure for malfunction B

1) Start engine and warm it up to normal operating temperature.
2) Run engine at idle for at least 2 minutes.
3) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P1402, EC-356.
4) Check voltage between ECM terminal (63) (EGR temperature sensor) and ground at about 1,500 rpm with EGR valve lifted up to the full position by hand.
   Voltage should decrease to less than 1.0V.
5) If step 4 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400 and P1400 (See pages EC-258 and EC-345).
6) If step 4 is NG, go to "DIAGNOSTIC PROCEDURE", EC-354.

EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01

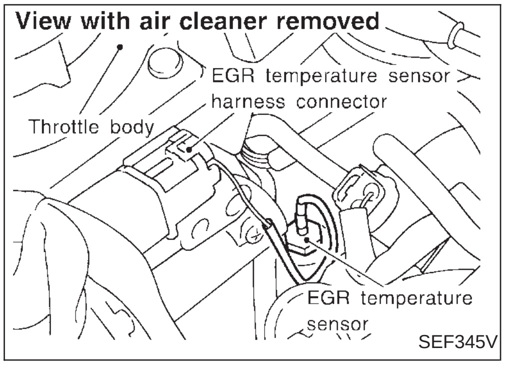




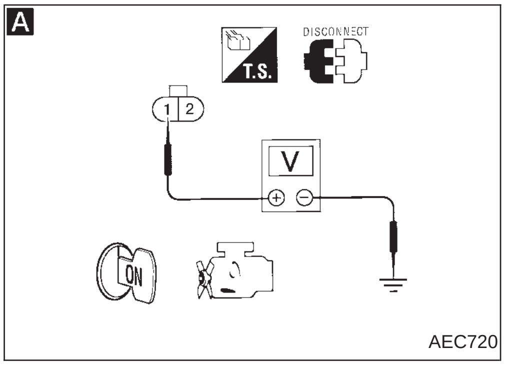
AEC543A

EGR Temperature Sensor (Cont'd)

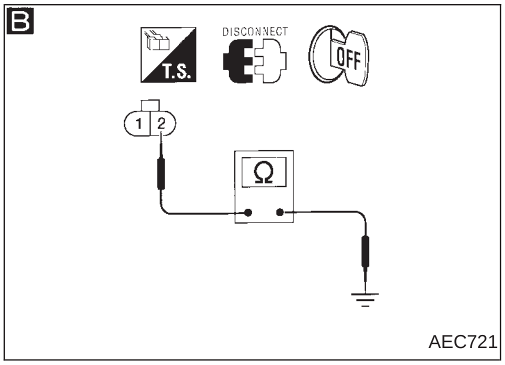
DIAGNOSTIC PROCEDURE



SEF345V



AEC720



AEC721

INSPECTION START

A

CHECK POWER SUPPLY.

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

NG → Repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.

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

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

OK

CHECK COMPONENT
(EGR temperature sensor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR temperature sensor.

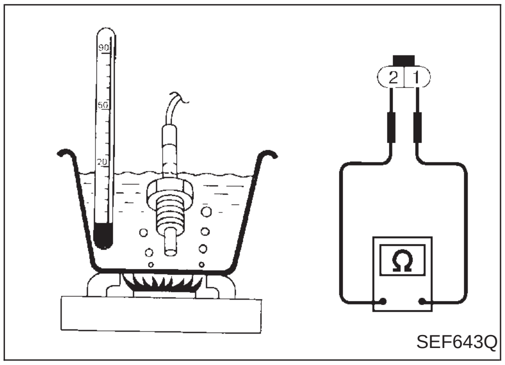
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

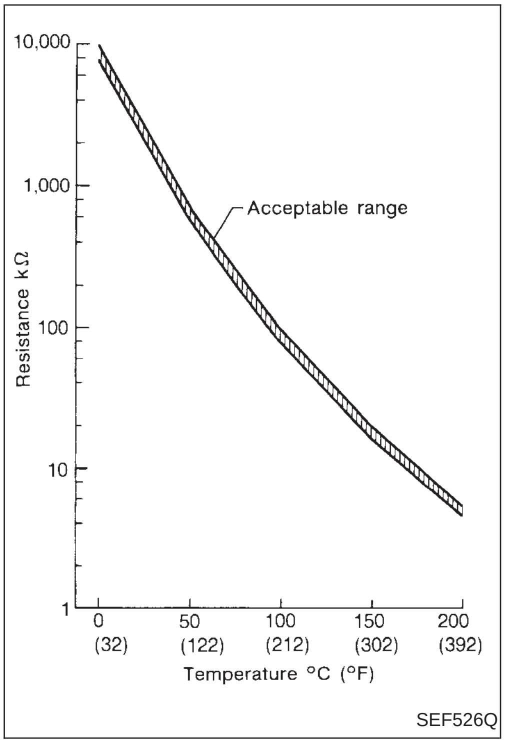
INSPECTION END

EGR Temperature Sensor (Cont’d)

COMPONENT INSPECTION



SEF643Q



SEF526Q

EGR temperature sensor

Check resistance change and resistance value.

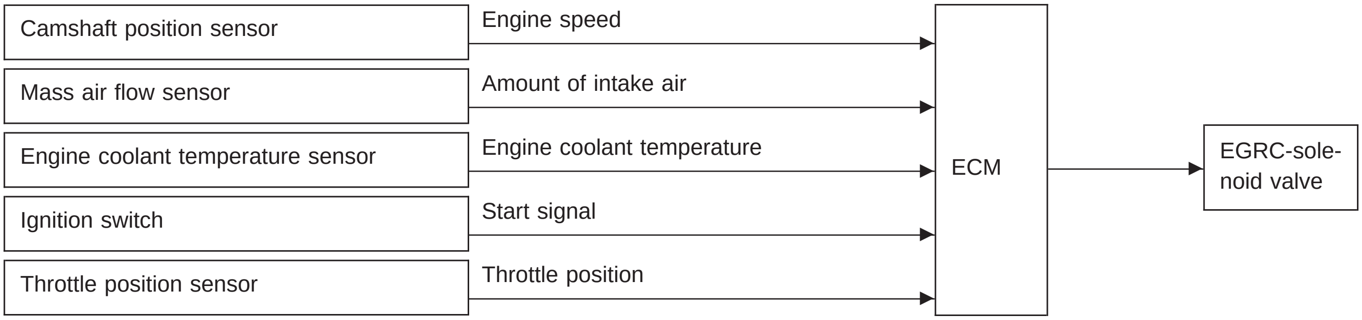
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

If NG, replace EGR temperature sensor.

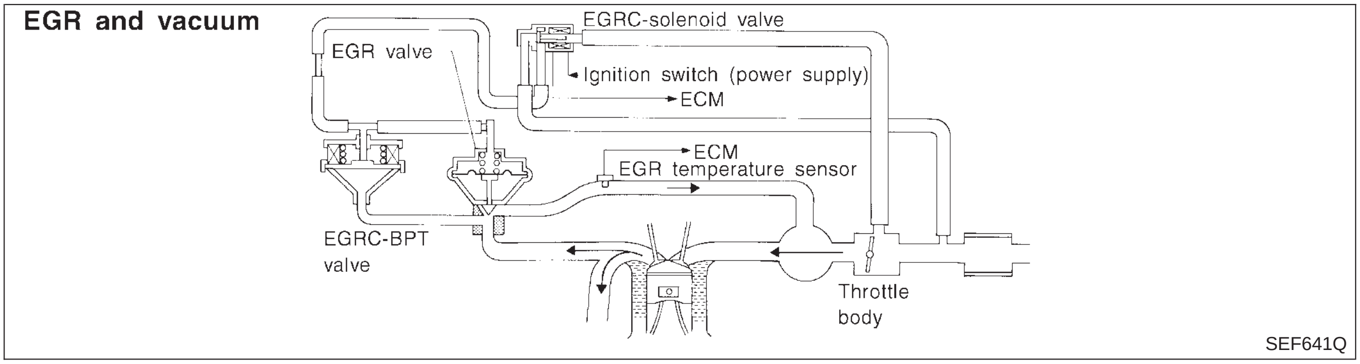
EGR Function (Open)

SYSTEM DESCRIPTION



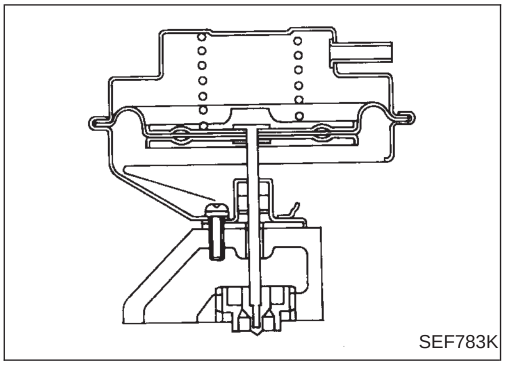
This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGRC-solenoid valve. When the ECM detects any of the following conditions, current flows through the solenoid valve. This causes the port vacuum to be cut. The EGR valve remains closed.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction



SEF641Q

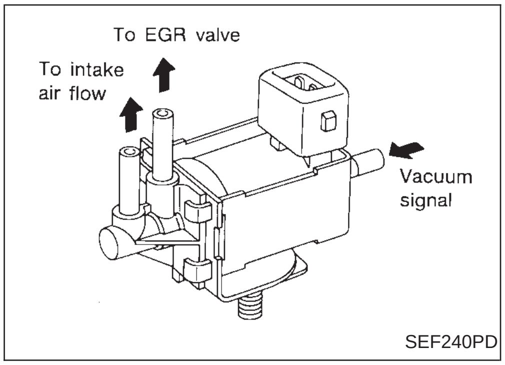
COMPONENT DESCRIPTION



SEF783K

Exhaust gas recirculation (EGR) valve

The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.



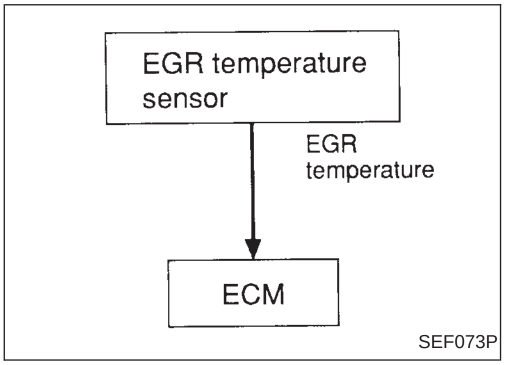
SEF240PD

EGRC-solenoid valve

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. The vacuum signal passes through the solenoid valve. A plunger will then move to cut the vacuum signal (from the throttle body to the EGR valve).

When the ECM sends an OFF signal, a plunger will then move to cut the vacuum signal from the throttle body to the EGR valve.

EGR Function (Open) (Cont'd)



SEF073P

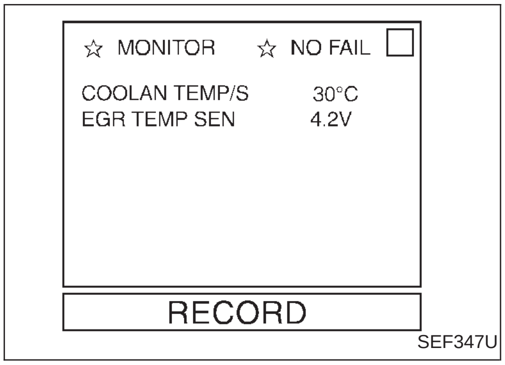
ON BOARD DIAGNOSIS LOGIC

If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

NOTE:

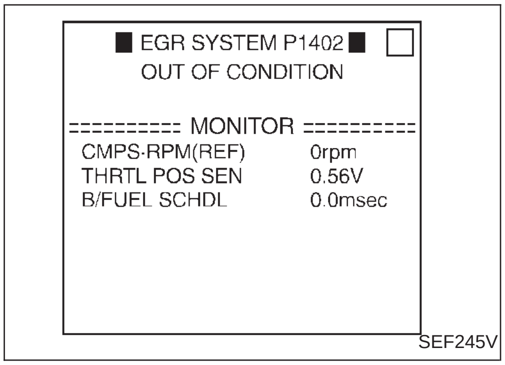
Diagnosis for this DTC will end when engine coolant temperature is approx. 50 - 60°C (122 - 140°F). Ignition switch must be turned "ON" (engine start) with engine coolant temperature below 40°C (104°F) when starting DTC confirmation procedure.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1402 0514	● EGR flow is detected under conditions that do not call for EGR.	● EGRC-solenoid valve ● EGR valve leaking or stuck open ● EGR temperature sensor ● EGRC-BPT valve


☆ MONITOR ☆ NO FAIL ☐

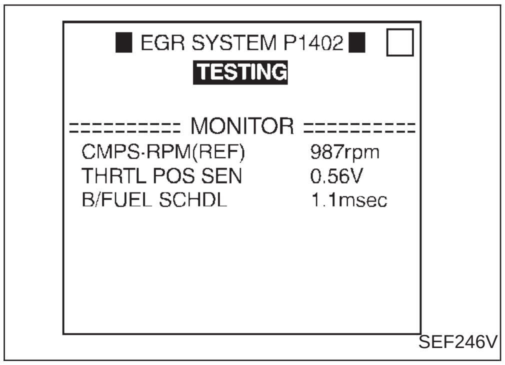
COOLAN TEMP/S 30°C
EGR TEMP SEN 4.2V

SEF347U


■ EGR SYSTEM P1402 ■ ☐
OUT OF CONDITION

========== MONITOR ==========
CMPS·RPM(REF) 0rpm
THRTL POS SEN 0.56V
B/FUEL SCHDL 0.0msec

SEF245V


■ EGR SYSTEM P1402 ■ ☐
TESTING

========== MONITOR ==========
CMPS·RPM(REF) 987rpm
THRTL POS SEN 0.56V
B/FUEL SCHDL 1.1msec

SEF246V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

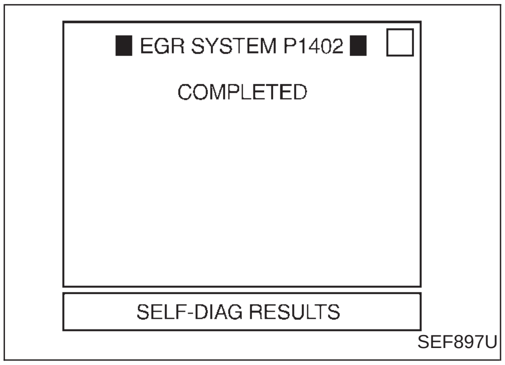
TESTING CONDITION:

- **Engine coolant temperature and EGR temperature must be verified in "DATA MONITOR" mode with CONSULT before starting DTC WORK SUPPORT test. If it is out of range below, the test cannot be conducted.**
  COOLAN TEMP/S: −10 to 40°C (14 to 104°F)
  EGR TEMP SEN: Less than 4.8V

  If the values are out of the ranges indicated above, park the vehicle in a cool place and allow the engine temperature to stabilize. Do not attempt to reduce the engine coolant temperature or EGR temperature with a fan or means other than ambient air. Doing so may produce an inaccurate diagnostic result.

1) Turn ignition switch OFF and wait at least 5 seconds. Then turn ignition switch "ON".
2) Select "EGR SYSTEM P1402" of "EGR SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
3) Follow instruction of CONSULT.
4) Start engine and let it idle until "TESTING" on CONSULT screen is turned to "COMPLETED". (It will take 60 seconds or more.)

EGR Function (Open) (Cont’d)



■ EGR SYSTEM P1402 ■ ☐

COMPLETED

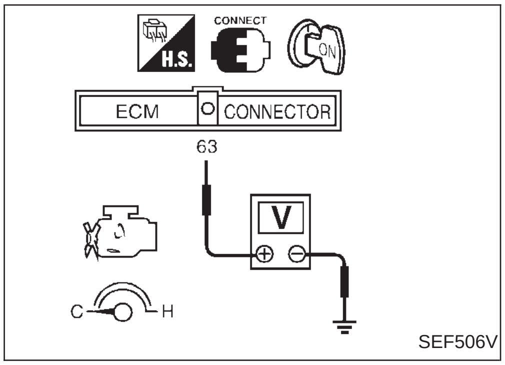
SELF-DIAG RESULTS

SEF897U

If ‘‘TESTING’’ is not displayed after 5 minutes, turn ignition ‘‘OFF’’ and cool the engine coolant temperature to the range of −10 to 40°C (14 to 104°F). Retry from step 1).

5) Make sure that ‘‘OK’’ is displayed after touching ‘‘SELF-DIAG RESULTS’’. If ‘‘NG’’ is displayed, refer to ‘‘DIAGNOSTIC PROCEDURE’’, EC-360.

OR

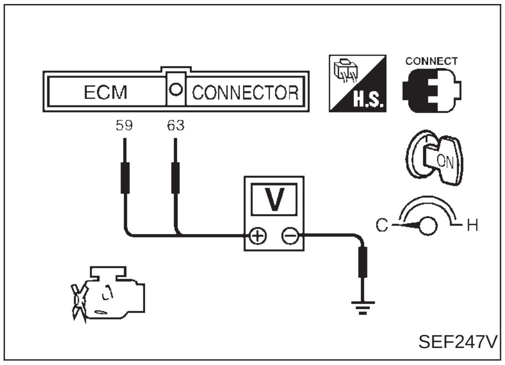


SEF506V

GST

1) Turn ignition switch ‘‘ON’’ and select ‘‘MODE 1’’ with GST.
2) Check that engine coolant temperature is within the range of −10 to 40°C (14 to 104°F).
3) Check that voltage between ECM terminal (63) (EGR temperature) and ground is less than 4.8V.
4) Start engine and let it idle for at least 60 seconds.
5) Stop engine.
6) Perform from step 1) to 4).
7) Select ‘‘MODE 3’’ with GST.
8) If DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-360.

OR

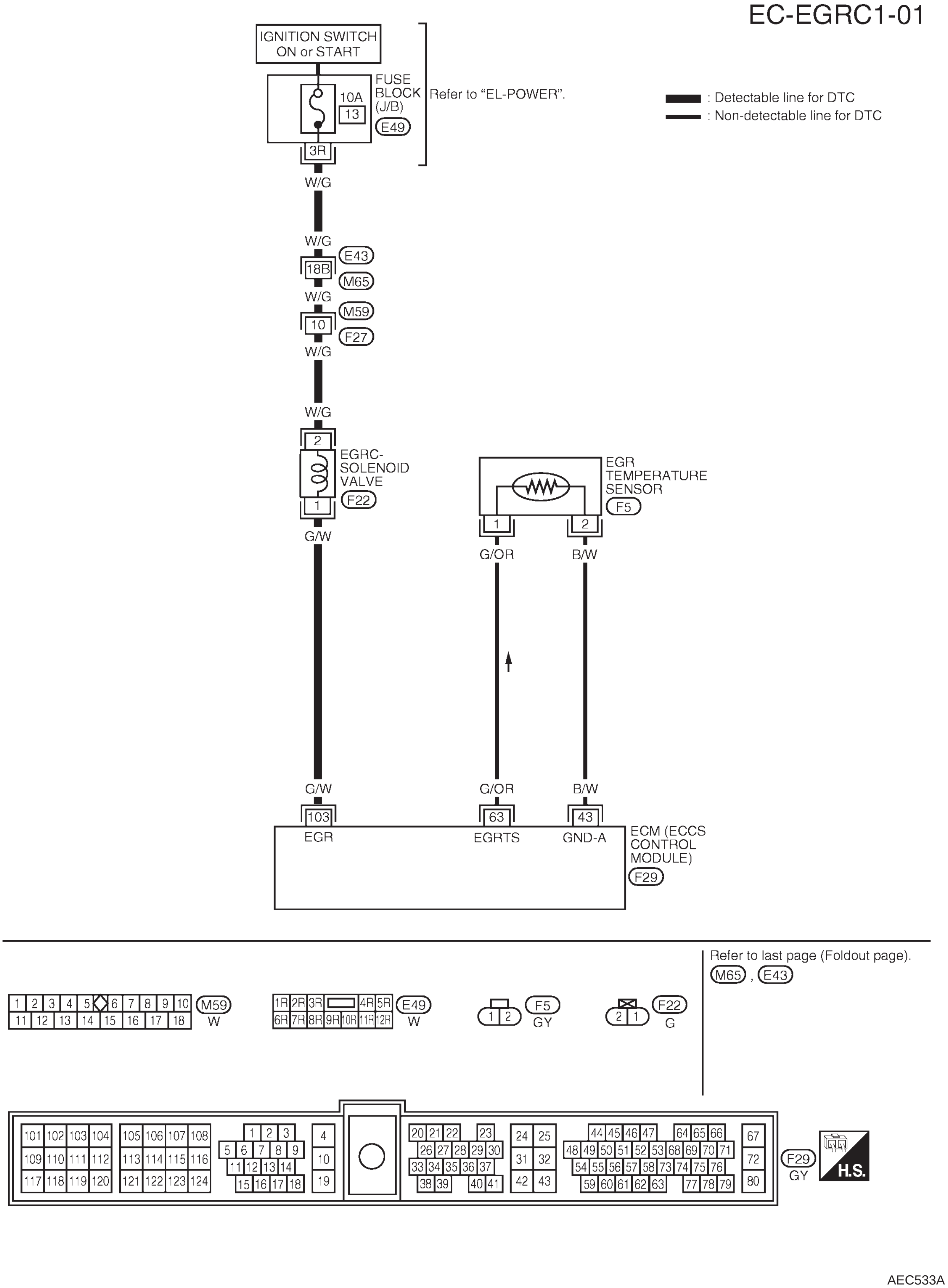


SEF247V

NO TOOLS

1) Turn ignition switch ‘‘ON’’.
2) Check the following voltages.
   ECM terminal (59) (engine coolant temperature) and ground:
   2.7 - 4.4V
   ECM terminal (63) (EGR temperature) and ground:
   Less than 4.8V
3) Start engine and let it idle for at least 60 seconds.
4) Turn ignition switch ‘‘OFF’’, wait at least 5 seconds and then turn ‘‘ON’’.
5) Perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
6) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’, EC-360.

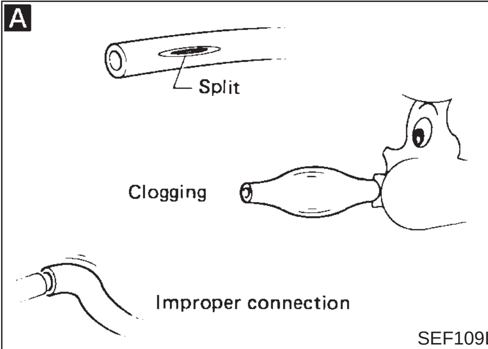
- **When using GST, ‘‘DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE’’ should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.**


EC-EGRC1-01
IGNITION SWITCH ON or START
FUSE BLOCK (J/B)
10A
13
E49
Refer to “EL-POWER”.
3R
W/G
: Detectable line for DTC
: Non-detectable line for DTC
W/G
E43
18B
M65
W/G
M59
10
F27
W/G
W/G
2
EGRC-SOLENOID VALVE
1
F22
G/W
EGR TEMPERATURE SENSOR
F5
1
2
G/OR
B/W
G/W
G/OR
B/W
103
EGR
63
EGRTS
43
GND-A
ECM (ECCS CONTROL MODULE)
F29
Refer to last page (Foldout page).
M65, E43
1 2 3 4 5 6 7 8 9 10
11 12 13 14 15 16 17 18
M59
W
1R 2R 3R 4R 5R
6R 7R 8R 9R 10R 11R 12R
E49
W
1 2
F5
GY
2 1
F22
G
101 102 103 104 105 106 107 108
109 110 111 112 113 114 115 116
117 118 119 120 121 122 123 124
1 2 3 4
5 6 7 8 9 10
11 12 13 14
15 16 17 18 19
20 21 22 23 24 25
26 27 28 29 30
31 32
33 34 35 36 37
38 39 40 41 42 43
44 45 46 47 64 65 66 67
48 49 50 51 52 53 68 69 70 71 72
54 55 56 57 58 73 74 75 76
59 60 61 62 63 77 78 79 80
F29
GY
H.S.
AEC533A

EGR Function (Open) (Cont'd)

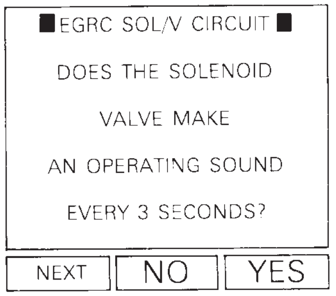
DIAGNOSTIC PROCEDURE

A



SEF109L

B

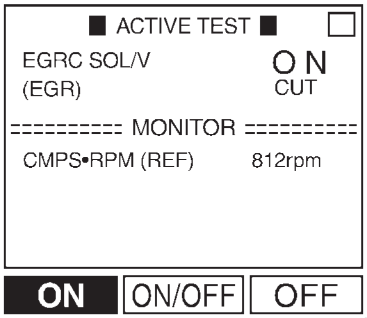


■ EGRC SOL/V CIRCUIT ■

DOES THE SOLENOID VALVE MAKE AN OPERATING SOUND EVERY 3 SECONDS?

MEF957D

B



■ ACTIVE TEST ■ ☐

EGRC SOL/V (EGR) ON CUT

========== MONITOR ==========

CMPS•RPM (REF) 812rpm

SEF184V

INSPECTION START

A

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks or improper connection.
Refer to "Vacuum Hose Drawing", EC-16.

NG → Repair or replace vacuum hose.

OK ↓

B

CHECK EGRC-SOLENOID VALVE CIRCUIT.

1. Turn ignition switch "ON".
2. Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Turn EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

1. Turn ignition switch "ON".
2. Check operating sound of the solenoid valve when disconnecting and reconnecting EGRC-solenoid valve harness connector. (The DTC or the 1st trip DTC for the EGRC-solenoid valve will be displayed, however, ignore it.)

NG → Check the following.
- Harness connectors (E43), (M65)
- Harness connectors (M59), (F27)
- 10A fuse
- Harness for open or short between fuse block and EGRC-solenoid valve
- Harness for open or short between ECM and EGRC-solenoid valve

If NG, repair open circuit or short to power in harness or connector.

OK ↓

CHECK COMPONENT
(EGRC-solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGRC-solenoid valve.

OK ↓

CHECK COMPONENT
(EGR valve).
Refer to "COMPONENT INSPECTION" on the next page.

NG → Replace EGR valve.

OK ↓

CHECK COMPONENT
(EGRC-BPT valve).
Refer to "COMPONENT INSPECTION" on EC-362.

NG → Replace EGRC-BPT valve.

OK ↓

CHECK COMPONENT
(EGR temperature sensor).
Refer to "COMPONENT INSPECTION" on EC-362.

NG → Replace EGR temperature sensor.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

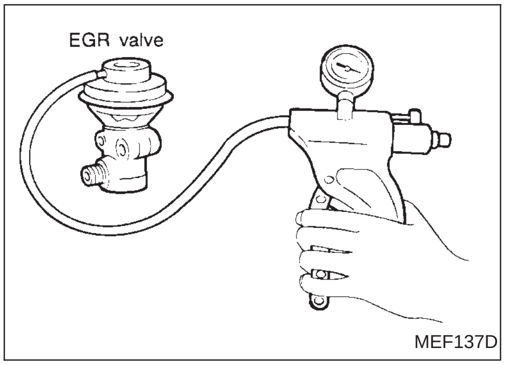
↓

INSPECTION END

EGR Function (Open) (Cont'd)

COMPONENT INSPECTION

EGR valve



MEF137D

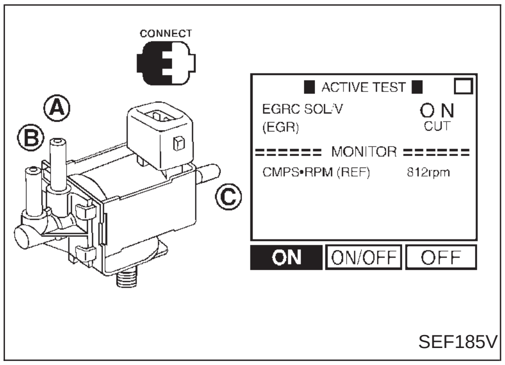
- Apply vacuum to EGR vacuum port with a hand vacuum pump.

EGR valve spring should lift.

- Check for sticking

If NG, repair or replace EGR valve.

EGRC-solenoid valve



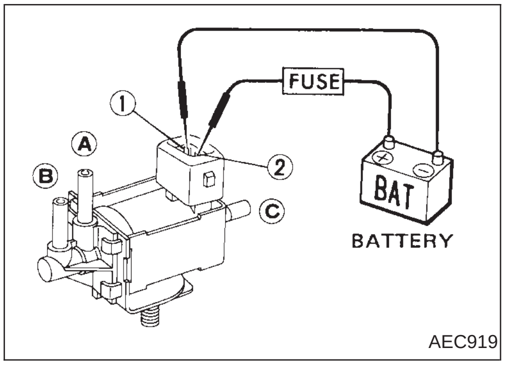
SEF185V

Check air passage continuity.

Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode.

Condition EGRC SOLENOID VALVE	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
ON	Yes	No
OFF	No	Yes

OR



AEC919

Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG or operation takes more than 1 second, replace EGRC-solenoid valve.

EGR Function (Open) (Cont'd)

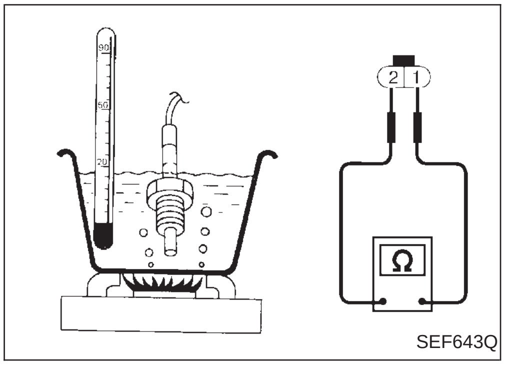
EGR temperature sensor

Check resistance change and resistance value.

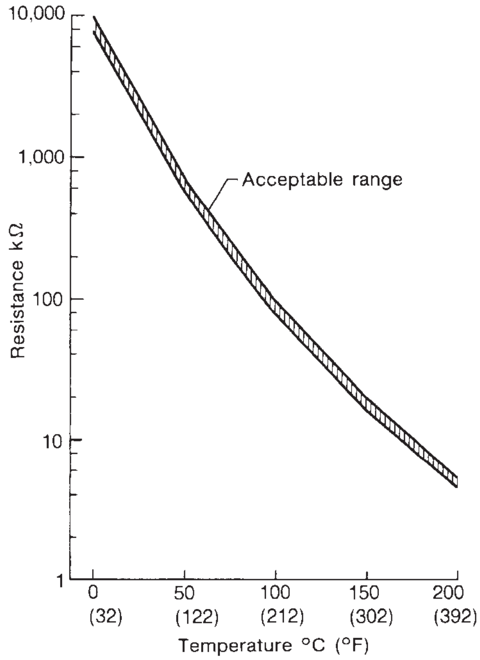
<Reference data>

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

If NG, replace EGR temperature sensor.



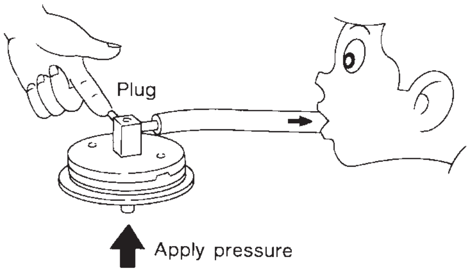
SEF643Q



SEF526Q

EGRC-BPT valve

1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH$_2$O, 3.94 inH$_2$O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.



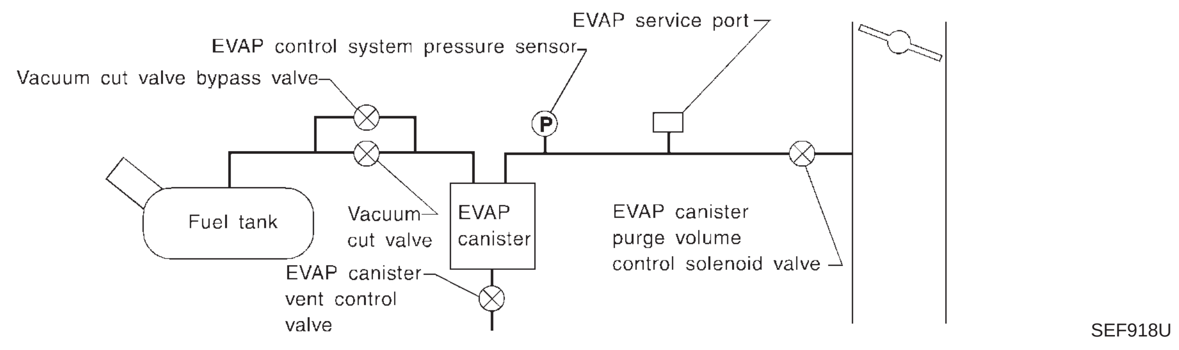
SEF083P

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure)

Note: If DTC P1448 is displayed with P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-392.)

ON BOARD DIAGNOSIS LOGIC

This diagnosis detects leaks in the EVAP purge line using vapor pressure in the fuel tank.
The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge volume control solenoid valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank.
If pressure increases, the ECM will check for leaks in the line between the vacuum cut valve and EVAP canister purge volume control solenoid valve.



SEF918U

ON BOARD DIAGNOSIS LOGIC

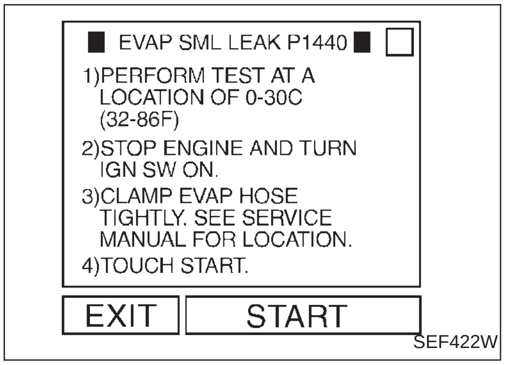
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1440 0213	● EVAP control system has a leak. ● EVAP control system does not operate properly.	● Incorrect fuel tank vacuum relief valve ● Incorrect fuel filler cap used ● Fuel filler cap remains open or fails to close. ● 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 ● EVAP control system pressure sensor ● Loose or disconnected rubber tube ● EVAP canister vent control valve and the circuit ● EVAP canister purge volume control solenoid valve ● Absolute pressure sensor ● Tank fuel temperature sensor ● MAP/BARO switch solenoid valve ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● O-ring of EVAP canister vent control valve is missing or damaged. ● Water separator ● EVAP canister is saturated with water.

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.**
- **If the fuel filler cap is not tightened properly, the MIL may come on.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



■ EVAP SML LEAK P1440 ■ ☐

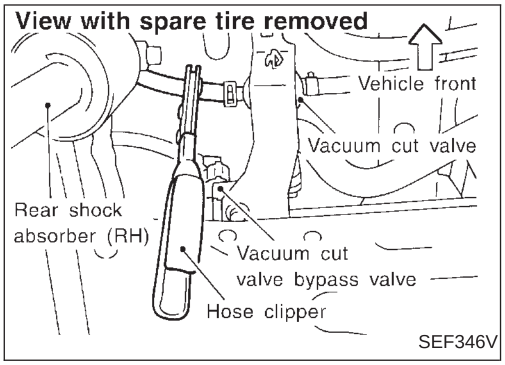
1)PERFORM TEST AT A LOCATION OF 0-30C (32-86F)

2)STOP ENGINE AND TURN IGN SW ON.

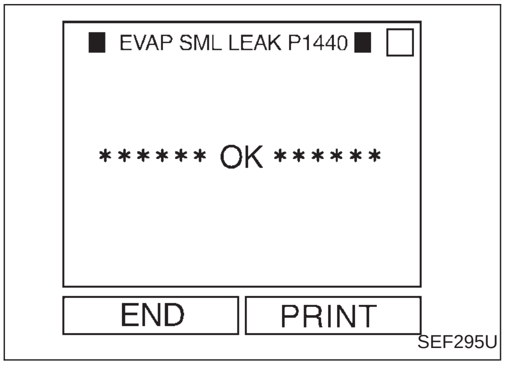
3)CLAMP EVAP HOSE TIGHTLY. SEE SERVICE MANUAL FOR LOCATION.

4)TOUCH START.

SEF422W



SEF346V



■ EVAP SML LEAK P1440 ■ ☐

****** OK ******

SEF295U

CAUTION:

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

NOTE:

- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" has been previously conducted, always turn ignition switch "OFF" and wait at least 5 seconds before conducting the next test.**
- **Always remove service port adapter from service port when applying air up to 0.69 to 1.38 kPa (5.14 to 10.34 mmHg, 0.202 to 0.407 inHg).**
- **During the test, clamp the EVAP hose tightly as shown at left.**
- **If DTC P1448 is displayed with P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first. (See EC-392.)**

1) Turn ignition switch "OFF".
2) Clamp EVAP hose as shown at left.
3) Turn ignition switch "ON".
4) Select "EVAP SML LEAK P1440" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
   Follow the instruction displayed.
5) Make sure that "OK" is displayed.
   If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-366.

OR

NOTE:

Be sure to read the explanation of "Driving pattern" on EC-42 before driving vehicle.

1) Start engine.
2) Drive vehicle according to "Driving pattern", EC-42.
3) Stop vehicle.
4) Select "MODE 1" with GST.
   - If SRT of EVAP system is not set yet, go to the following step.
   - If SRT of EVAP system is set, the result will be OK.
5) Turn ignition switch "OFF" and wait at least 5 seconds.
6) Start engine.

It is not necessary to cool engine down before driving.

7) Drive vehicle again according to the "Driving pattern", EC-42.
8) Stop vehicle.
9) Select "MODE 3" with GST.
   - If P1447 is displayed on the screen, go to "TROUBLE DIAGNOSIS FOR DTC P1447", EC-386.
   - If P0440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC P0440", EC-279.
   - If P1440 is displayed on the screen, go to "DIAGNOSTIC PROCEDURE" in "TROUBLE DIAGNOSIS FOR DTC P1440", EC-366.
   - If P0440, P1440 and P1447 are not displayed on the screen, go to the following step.
10) Select "MODE 1" with GST.

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont’d)

- If SRT of EVAP system is set, the result will be OK.
- If SRT of EVAP system is not set, go to step 5).

OR

NOTE:

- **Be sure to read the explanation of ‘‘Driving pattern’’ on EC-42 before driving vehicle.**
- **It is better that the fuel level is low.**

NO TOOLS

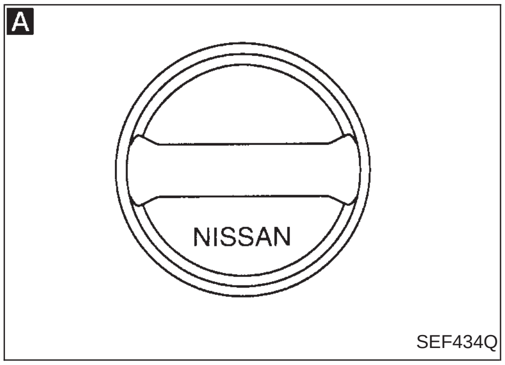
1) Start engine.
2) Drive vehicle according to ‘‘Driving pattern’’, EC-42.
3) Stop vehicle.
4) Turn ignition switch ‘‘OFF’’ and wait at least 5 seconds.
5) Turn ignition switch ‘‘ON’’ and perform ‘‘Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
6) If 1st trip DTC is detected, go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

↓



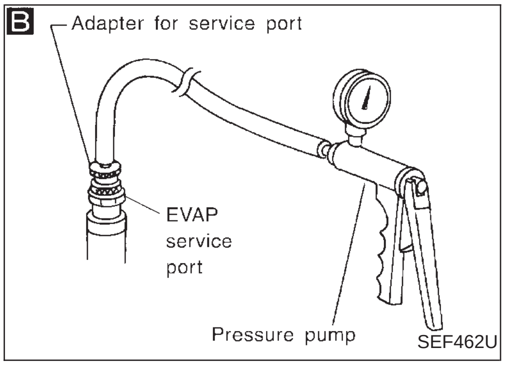
SEF434Q

A

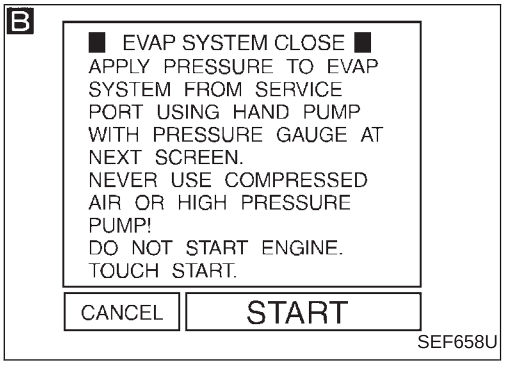
CHECK FUEL FILLER CAP.
1. Check for genuine NISSAN fuel filler cap design.
2. Check for air releasing sound while opening the fuel filler cap.
   If the air releasing sound is heard, go to **B**.
   If the air releasing sound is not heard, check the following.
   Was the cap tightened properly?
   If Yes, check fuel filler cap vacuum relief valve.
   Refer to "EVAPORATIVE EMISSION SYSTEM", EC-23.
   If No, open fuel filler cap, then clean cap and filler neck thread using air blower. Retighten until ratcheting sound is heard.

NG → If genuine NISSAN fuel filler cap is not used, replace with genuine NISSAN fuel filler cap.

↓ OK

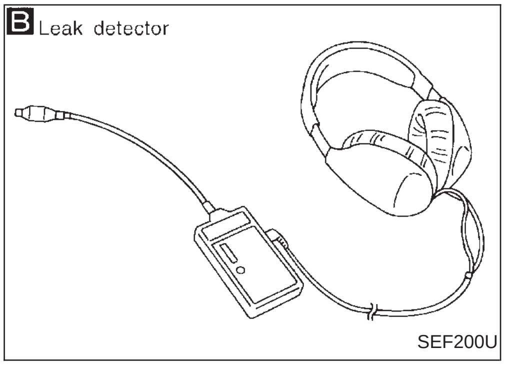


SEF462U

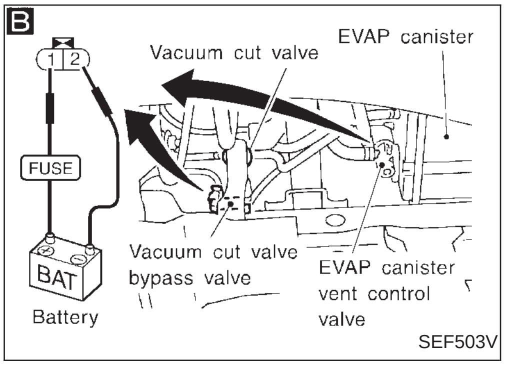


■ EVAP SYSTEM CLOSE ■
APPLY PRESSURE TO EVAP SYSTEM FROM SERVICE PORT USING HAND PUMP WITH PRESSURE GAUGE AT NEXT SCREEN.
NEVER USE COMPRESSED AIR OR HIGH PRESSURE PUMP!
DO NOT START ENGINE.
TOUCH START.

SEF658U



SEF200U



SEF503V

B

CHECK FOR EVAP LEAK.
- **Never use compressed air or high pressure pump.**
- **Improper installation of service port may cause leaking.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**

To locate EVAP leak portion, proceed with the following steps.
1. Install the EVAP service port adapter and the pressure pump securely.
2. Turn ignition switch "ON". Select "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT.
3. Touch "START" and apply vacuum into the EVAP line until the pressure indicator reaches the middle of bar graph.
4. Using EVAP leak detector, locate the leak portion. For the leak detector, refer to instruction manual for more details.
   Refer to "Evaporative Emission Line Drawing", EC-26.

OR

2. Turn ignition switch "OFF".
3. Apply 12 volts DC to EVAP canister vent control valve. The valve will close. (Continue to apply 12 volts until the end of test.)
4. Apply 12 volts DC to vacuum cut valve bypass valve. The valve will open. (Continue to apply 12 volts until the end of test.)
5. Pressurize the EVAP line using pressure pump with 1.3 to 2.7 kPa (10 to 20 mmHg, 0.39 to 0.79 inHg).
6. Locate the leak using a leak detector. Refer to the instruction manual for more details about the leak detector. Refer to "Evaporative Emission Line Drawing", EC-26.

NG → Repair or replace.

↓ OK

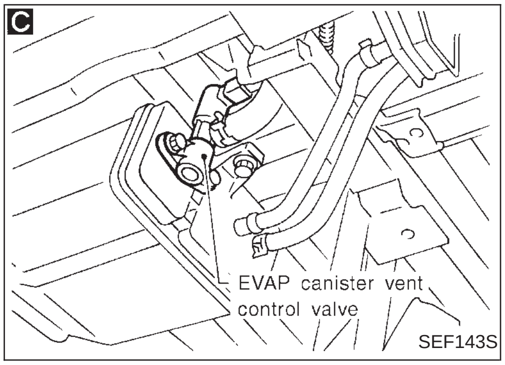
Ⓐ

(Go to next page.)

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

Ⓐ

C

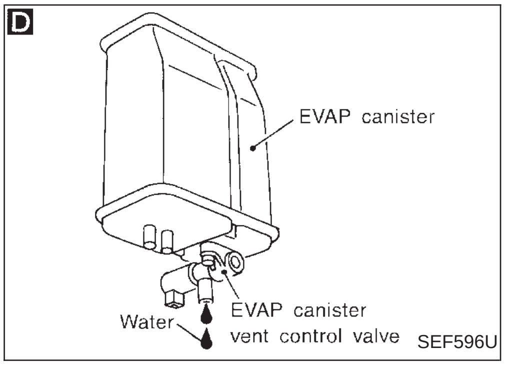


CHECK COMPONENT AND CIRCUIT (EVAP canister vent control valve, O-ring and water separator).
Refer to "TROUBLE DIAGNOSIS FOR DTC P0446", EC-292.

NG → Repair or replace EVAP canister vent control valve and O-ring or harness/connector.

OK ↓

D



CHECK IF EVAP CANISTER IS SATURATED WITH WATER.

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.
   If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:

More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

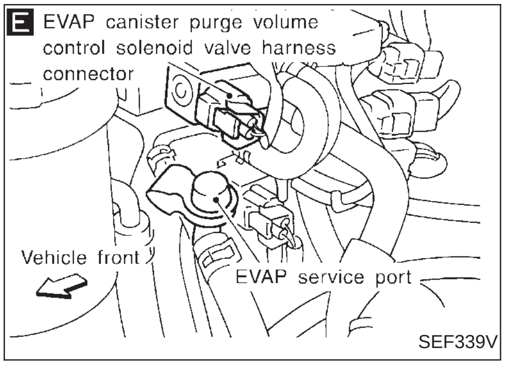
NG → Check the following.

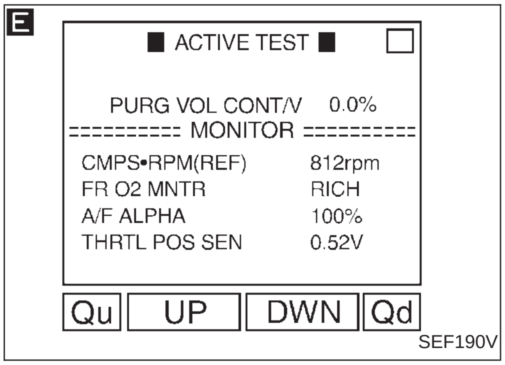
1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator.
   Refer to "COMPONENT INSPECTION", EC-370.

If NG, repair hose or replace EVAP canister or water separator.

OK ↓

E





■ ACTIVE TEST ■ ☐

PURG VOL CONT/V 0.0%

========== MONITOR ==========

CMPS•RPM(REF)	812rpm
FR O2 MNTR	RICH
A/F ALPHA	100%
THRTL POS SEN	0.52V

Qu | UP | DWN | Qd

CHECK COMPONENT (EVAP canister purge volume control solenoid valve).

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qu" on CONSULT screen to increase "PURG VOL CONT/V" opening to 100.0%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   Vacuum should exist.

OR

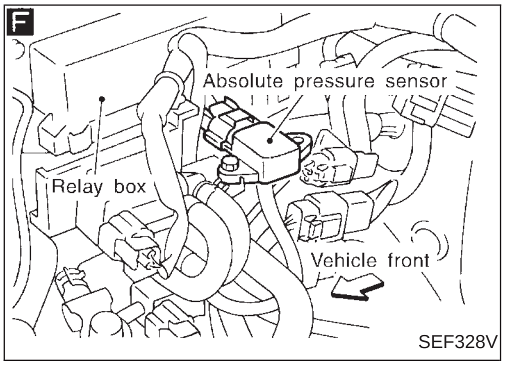
1. Start engine and warm it up to normal operating temperature.
2. Stop engine and let it idle for at least 60 seconds.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
4. Start engine.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   Vacuum should exist.

NG → Check the following.

- EVAP canister purge volume control solenoid valve
  Refer to "COMPONENT INSPECTION", EC-369.
- Vacuum hoses for clogging or disconnection
  Refer to "Vacuum Hose Drawing", EC-16.

OK ↓

F



CHECK COMPONENT (Absolute pressure sensor).
Refer to "COMPONENT INSPECTION", EC-371.

NG → Replace absolute pressure sensor.

OK ↓

Ⓑ
(Go to next page.)

GI
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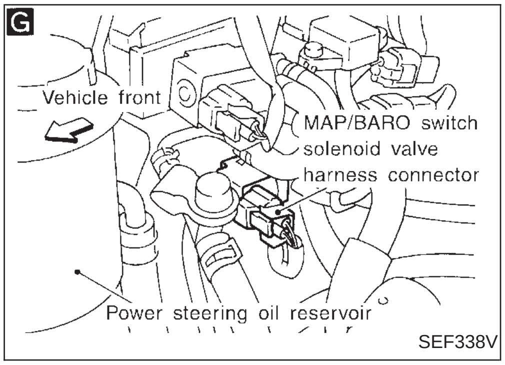
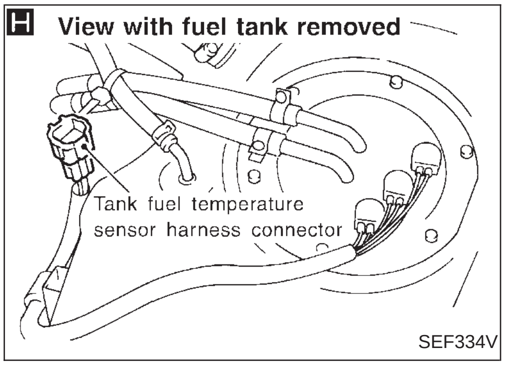
IDX

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)





Ⓑ

G

CHECK COMPONENT
(MAP/BARO switch solenoid valve).
Refer to ''COMPONENT INSPECTION'', EC-371.

NG → Replace MAP/BARO switch solenoid valve.

OK

H

CHECK COMPONENT
(Tank fuel temperature sensor).
Refer to ''COMPONENT INSPECTION'', EC-372.

NG → Replace tank fuel temperature sensor.

OK

CHECK COMPONENT
(EVAP control system pressure sensor)
Refer to ''COMPONENT INSPECTION'', EC-369.

NG → Replace EVAP control system pressure sensor.

OK

CHECK COMPONENT.
Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to ''Evaporative Emission Line Drawing'', EC-26.

NG → Repair or reconnect the hose.

OK

Clean EVAP purge line (pipe and rubber tube) using air blower.

↓

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

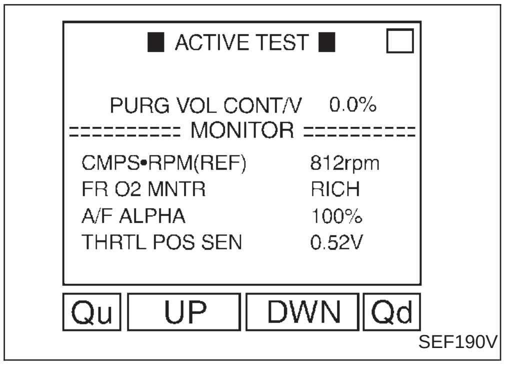
↓

INSPECTION END

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

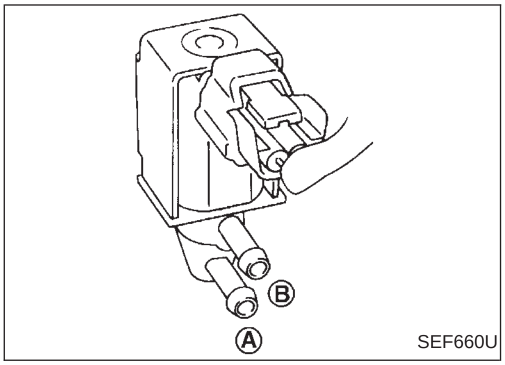


```
■ ACTIVE TEST ■                ☐

PURG VOL CONT/V    0.0%
========== MONITOR ==========
CMPS•RPM(REF)         812rpm
FR O2 MNTR            RICH
A/F ALPHA             100%
THRTL POS SEN         0.52V
```

SEF190V

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
   If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



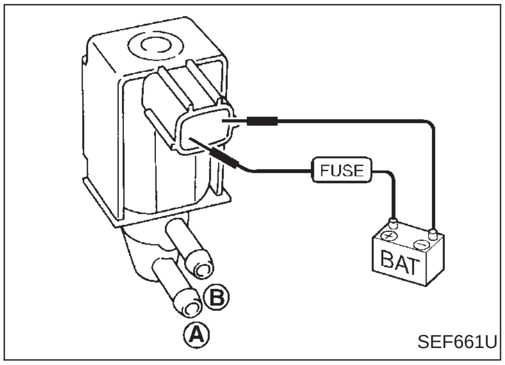
SEF660U

Condition PURG VOL CONT/V value	Air passage continuity between Ⓐ and Ⓑ
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

Check air passage continuity.

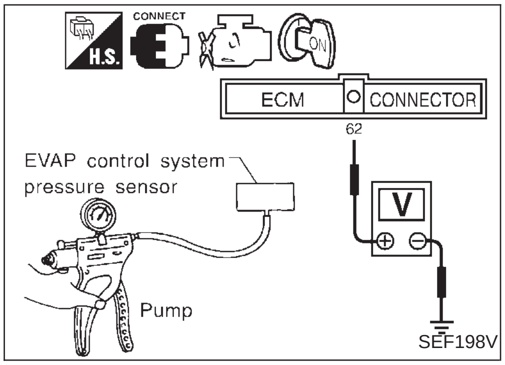


SEF661U

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace EVAP canister purge volume control solenoid valve.

EVAP control system pressure sensor



SEF198V

1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal (62) and engine ground.

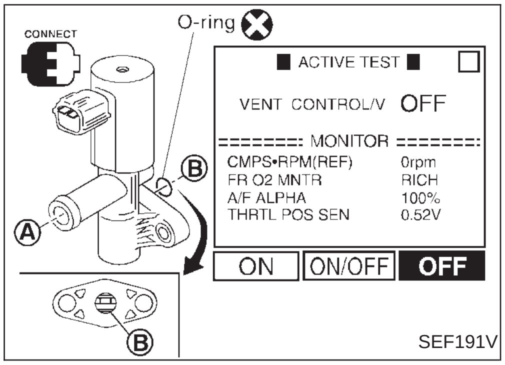
Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum below −20 kPa (−150 mmHg, −5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).**

5. If NG, replace EVAP control system pressure sensor.

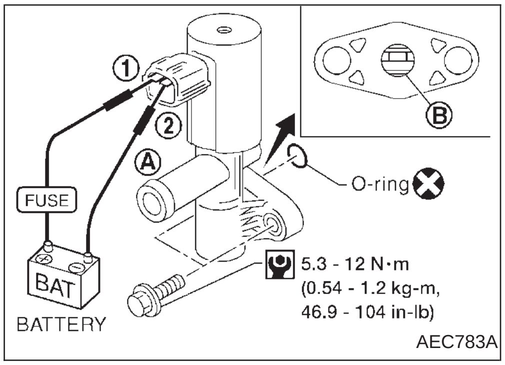
Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



ACTIVE TEST ☐

VENT CONTROL/V OFF

```
======== MONITOR ========
CMPS•RPM(REF)     0rpm
FR O2 MNTR        RICH
A/F ALPHA         100%
THRTL POS SEN     0.52V
```



EVAP canister vent control valve

Check air passage continuity.

Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.

Condition VENT CONTROL/V	Air passage continuity between Ⓐ and Ⓑ
ON	No
OFF	Yes

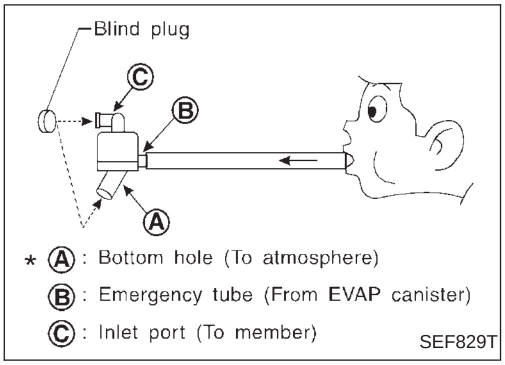
OR

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	No
No supply	Yes

If NG or operation takes more than 1 second, clean EVAP canister vent control valve using air blower or replace as necessary.

If the portion Ⓑ is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



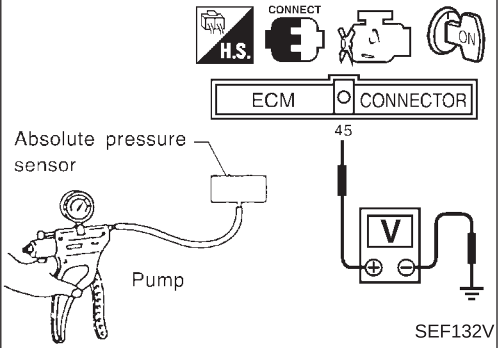
* Ⓐ : Bottom hole (To atmosphere)
Ⓑ : Emergency tube (From EVAP canister)
Ⓒ : Inlet port (To member)

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 Ⓐ and Ⓒ are not clogged by blowing air into Ⓑ with Ⓐ, and then Ⓒ plugged.
5. In case of NG in items 2 - 4, replace the parts.

- **Do not disassemble water separator.**

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont’d)



SEF132V

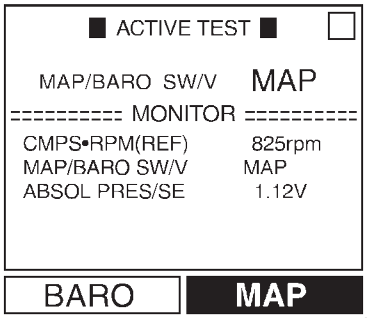
Absolute pressure sensor

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

CAUTION:

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

5. If NG, replace absolute pressure sensor.



■ ACTIVE TEST ■ ☐

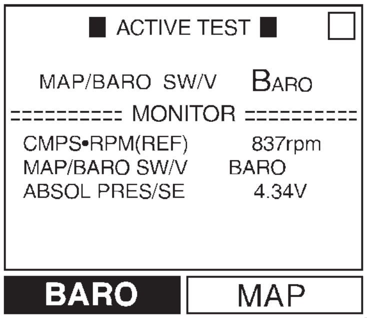
MAP/BARO SW/V MAP

========== MONITOR ==========

CMPS•RPM(REF)	825rpm
MAP/BARO SW/V	MAP
ABSOL PRES/SE	1.12V

BARO MAP

SEF130V



■ ACTIVE TEST ■ ☐

MAP/BARO SW/V BARO

========== MONITOR ==========

CMPS•RPM(REF)	837rpm
MAP/BARO SW/V	BARO
ABSOL PRES/SE	4.34V

BARO MAP

SEF131V

MAP/BARO switch solenoid valve

1. Start engine and warm it up to normal operating temperature.
2. Perform “MAP/BARO SW/V” in “ACTIVE TEST” mode with CONSULT.
3. Check the following.
   - Condition: At idle under no-load
   - CONSULT display

MAP/BARO	ABSOL PRES/SE (Voltage)
BARO	More than 2.6V
MAP	Less than the voltage at BARO

- Time for voltage to change

MAP/BARO SW/V	Required time to switch
BARO to MAP	Less than 1 second
MAP to BARO	

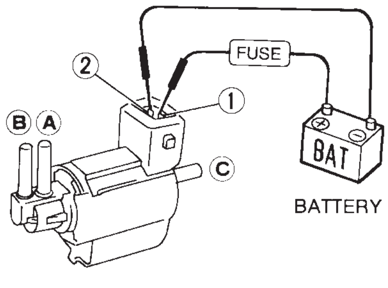
4. If NG, check MAP/BARO switch solenoid valve as shown below.

OR

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

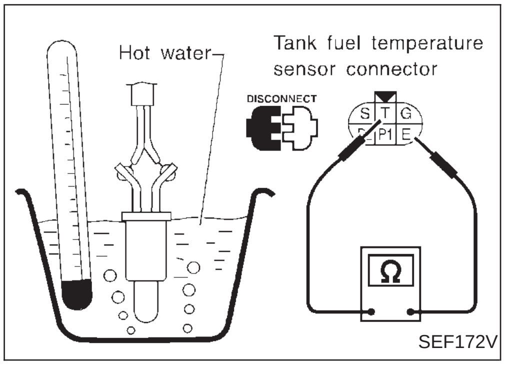
Condition	Air passage continuity between Ⓐ and Ⓑ	Air passage continuity between Ⓐ and Ⓒ
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

3. If NG or operation takes more than 1 second, replace MAP/BARO switch solenoid valve.



MEC488B

Evaporative Emission (EVAP) Control System (Small Leak) (Positive Pressure) (Cont'd)



SEF172V

Tank fuel temperature sensor

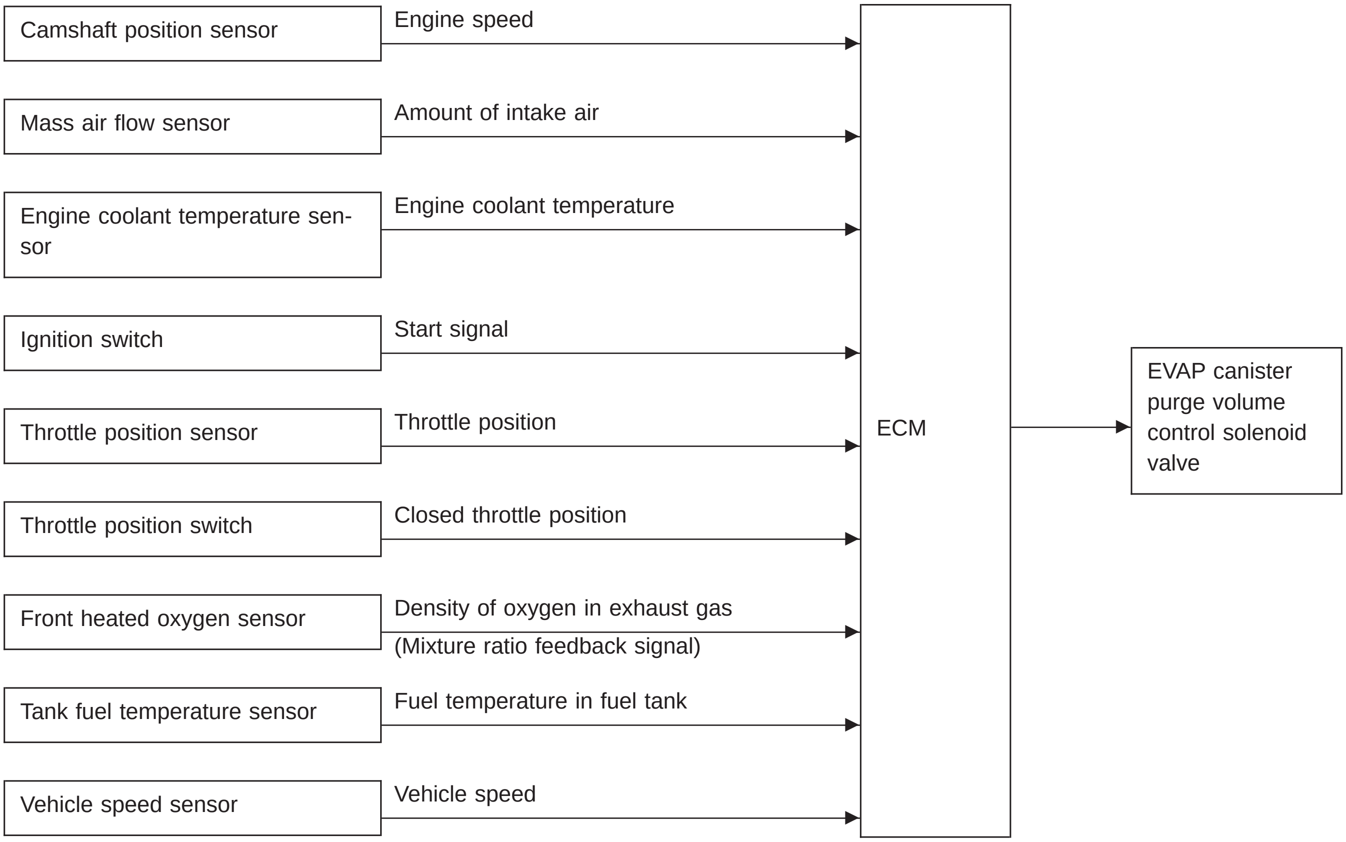
Check resistance by heating with hot water as shown in the figure or heat gun.

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

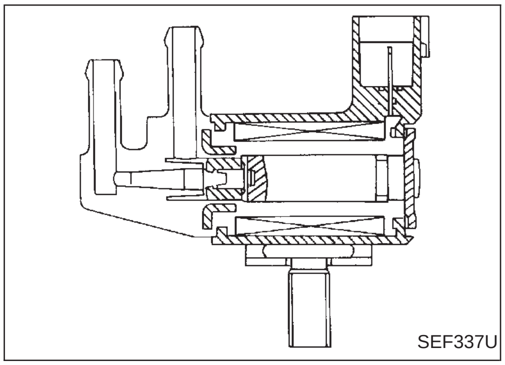
If NG, replace tank fuel temperature sensor.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve

SYSTEM DESCRIPTION



This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.



COMPONENT DESCRIPTION

The EVAP canister purge volume control solenoid valve uses ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.

TROUBLE DIAGNOSIS FOR DTC P1444

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

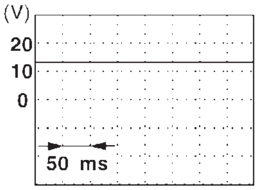
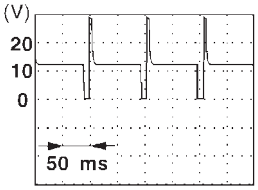
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	● Engine: After warming up ● Air conditioner switch ''OFF'' ● No-load	Idle	0%
		2,000 rpm (200 seconds after starting engine)	—

ECM TERMINALS AND REFERENCE VALUE

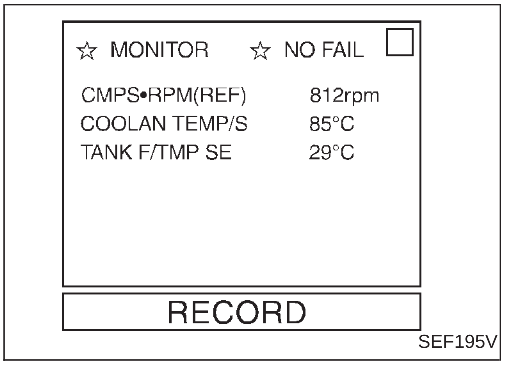
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	LG/R	ECCS relay (Self-shutoff)	Engine is running. Ignition switch ''OFF'' For a few seconds after turning ignition switch ''OFF''	0 - 1V
			Ignition switch ''OFF'' A few seconds passed after turning ignition switch ''OFF''	BATTERY VOLTAGE (11 - 14V)
5	R/Y	EVAP canister purge volume control solenoid valve		BATTERY VOLTAGE (11 - 14V)  SEF109V
			Engine is running. Idle speed	12 - 13V  SEF110V
67	B/P	Power supply for ECM	Ignition switch ''ON''	BATTERY VOLTAGE (11 - 14V)
72	B/P			
117	B/P	Current return	Engine is running. Idle speed	BATTERY VOLTAGE (11 - 14V)

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1444 0214	● The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	● EVAP control system pressure sensor ● 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.)

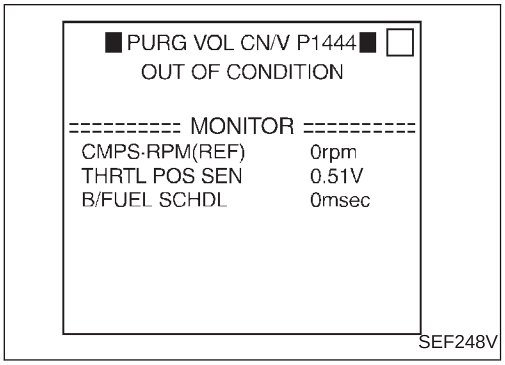


```
☆ MONITOR    ☆ NO FAIL  ☐

CMPS•RPM(REF)       812rpm
COOLAN TEMP/S       85°C
TANK F/TMP SE       29°C

         RECORD
```

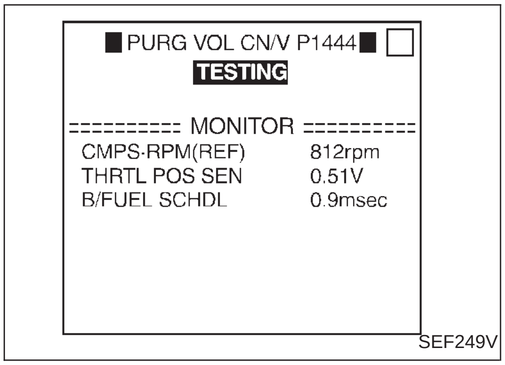
SEF195V



```
■ PURG VOL CN/V P1444 ■ ☐
     OUT OF CONDITION

========== MONITOR ==========
CMPS·RPM(REF)       0rpm
THRTL POS SEN       0.51V
B/FUEL SCHDL        0msec
```

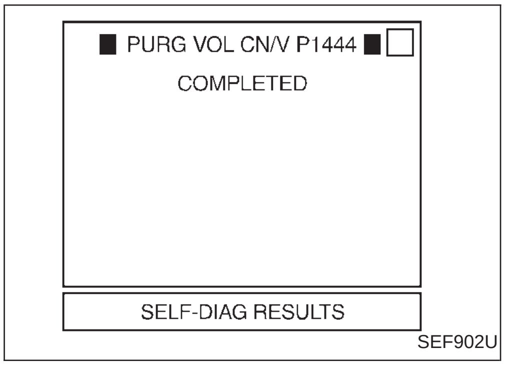
SEF248V



```
■ PURG VOL CN/V P1444 ■ ☐
         TESTING

========== MONITOR ==========
CMPS·RPM(REF)       812rpm
THRTL POS SEN       0.51V
B/FUEL SCHDL        0.9msec
```

SEF249V



```
■ PURG VOL CN/V P1444 ■ ☐
        COMPLETED

     SELF-DIAG RESULTS
```

SEF902U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

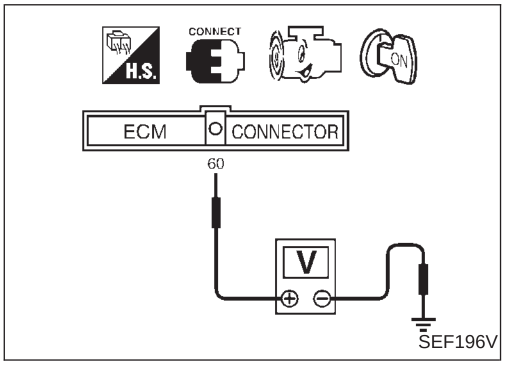
TESTING CONDITION:
Always perform at a temperature above 5°C (41°F).

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON".
4) Select "DATA MONITOR" mode with CONSULT.
5) Check that TANK F/TMP SE is 0°C (32°F) or more.
6) Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
7) Touch "START".
8) Start engine and let it idle until "TESTING" on CONSULT changes to "COMPLETED". (It will take at least 10 seconds.)

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

9) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-378.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)



OR

GST

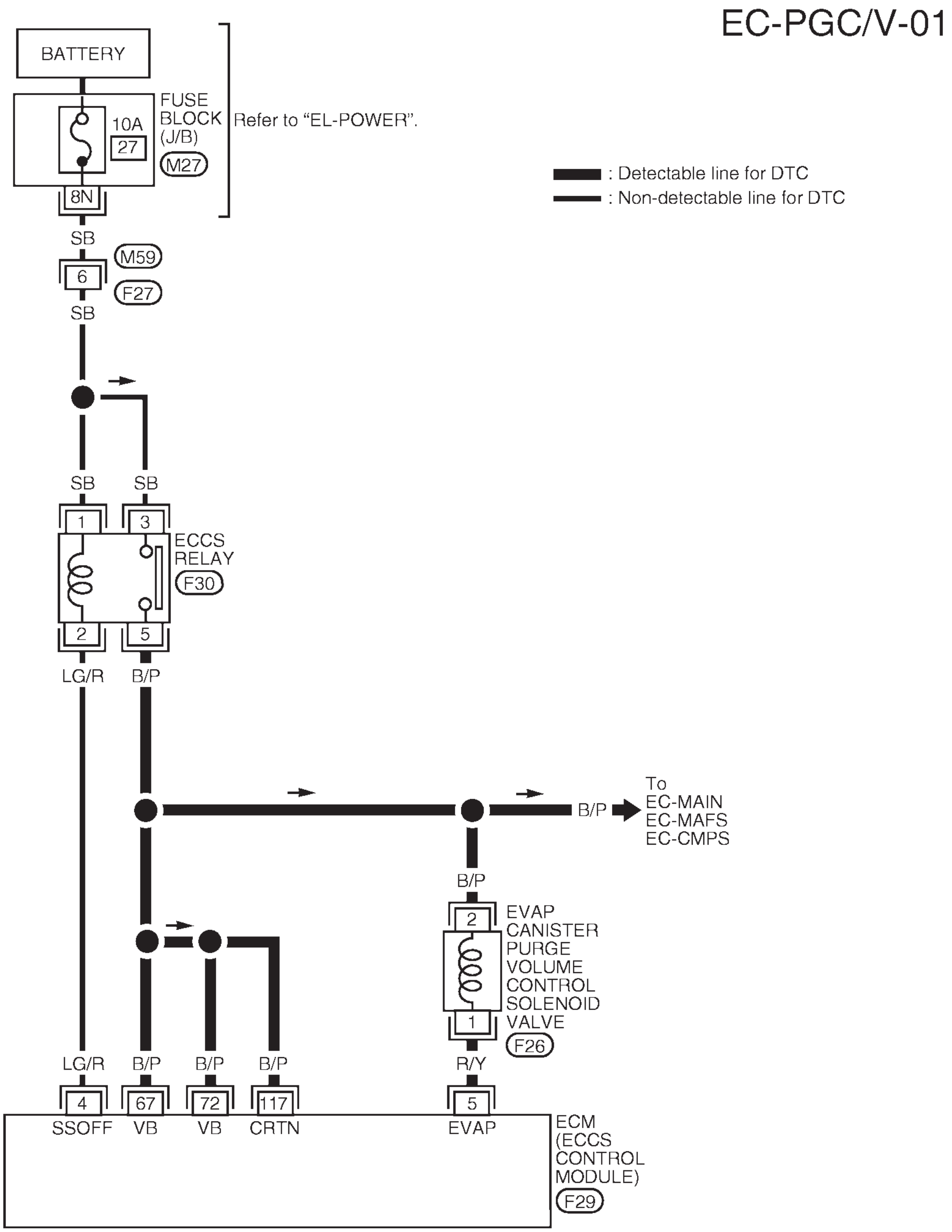
1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal (60) (tank fuel temperature sensor signal) and ground is less than 4.2V.
3) Turn ignition switch ''OFF'' and wait at least 5 seconds.
4) Start engine and let it idle for at least 20 seconds.
5) Select ''MODE 7'' with GST.
6) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-378.

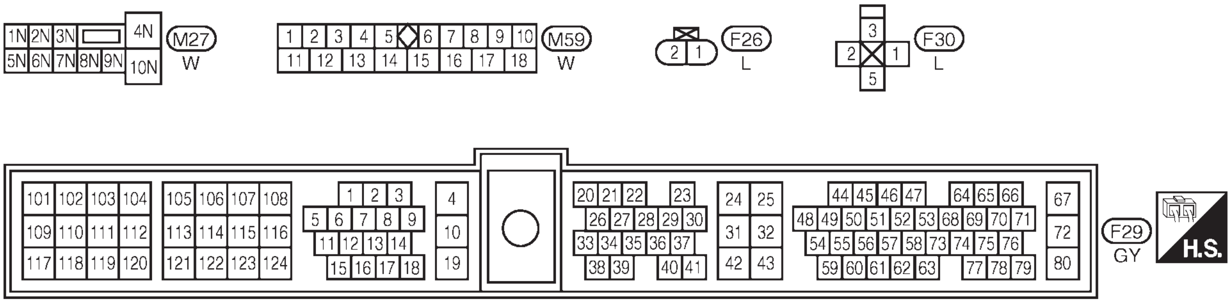
OR

NO TOOLS

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal (60) (tank fuel temperature sensor signal) and ground is less than 4.2V.
3) Turn ignition switch ''OFF'' and wait at least 5 seconds.
4) Start engine and let it idle for at least 20 seconds.
5) Turn ignition switch ''OFF'' and wait at least 5 seconds.
6) Turn ignition switch ''ON'' and perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
7) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-378.

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

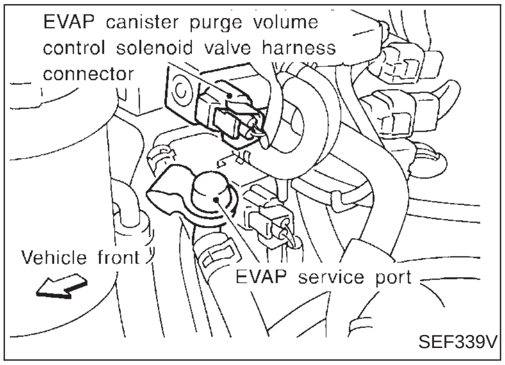




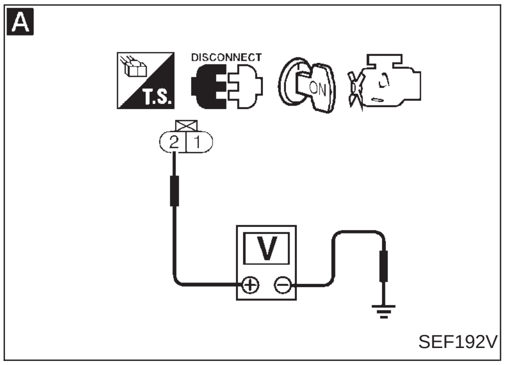
AEC545A

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)

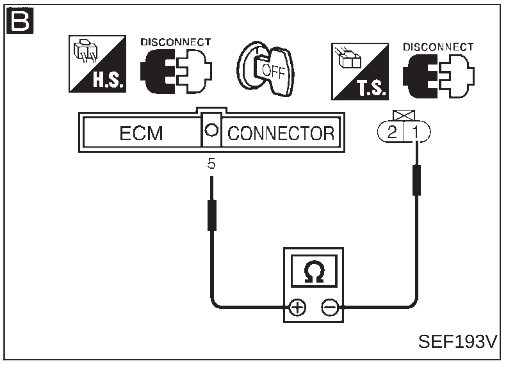
DIAGNOSTIC PROCEDURE



SEF339V



SEF192V



SEF193V

INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and engine ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECCS relay
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ⑤ and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK COMPONENT
(EVAP control system pressure sensor).
Refer to "COMPONENT INSPECTION", EC-369.

NG → Replace EVAP control system pressure sensor.

OK ↓

CHECK COMPONENT
(EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-380.

NG → Replace EVAP canister purge volume control solenoid valve.

OK ↓

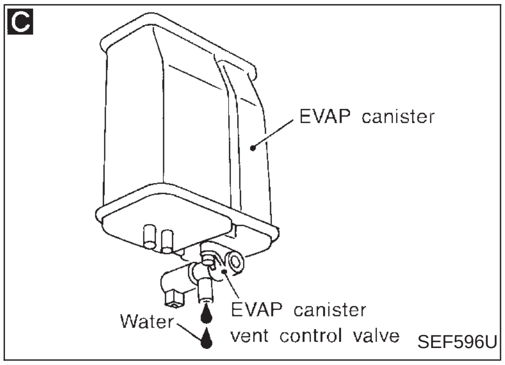
CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-370.

NG → Replace EVAP canister vent control valve.

OK ↓

Ⓐ
(Go to next page.)

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont'd)



Ⓐ

CHECK RUBBER TUBE FOR CLOGGING.
Check for obstructed water separator and rubber tube to EVAP canister vent control valve and clean the rubber tube using air blower.
For water separator, refer to EC-385.

NG → Clean, repair or replace rubber tube and/or water separator.

OK

C

CHECK IF EVAP CANISTER IS SATURATED WITH WATER.

1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.
   If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Check the following.
1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator. Refer to "COMPONENT INSPECTION", EC-385.

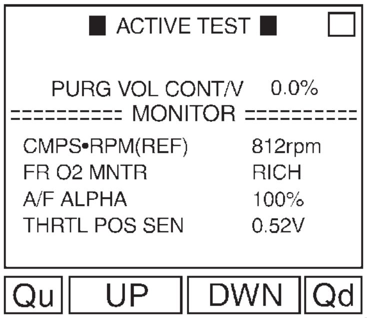
If NG, repair hose or replace EVAP canister or water separator.

OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

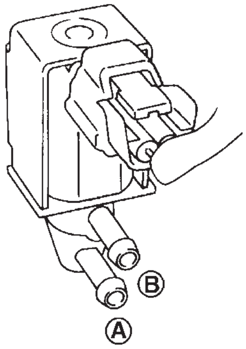
INSPECTION END



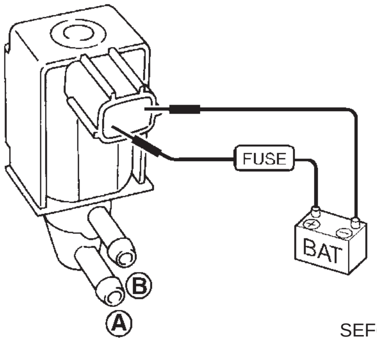
```
■ ACTIVE TEST ■                ☐

PURG VOL CONT/V    0.0%
========== MONITOR ==========
CMPS•RPM(REF)        812rpm
FR O2 MNTR           RICH
A/F ALPHA            100%
THRTL POS SEN        0.52V
```

SEF190V



SEF660U



SEF661U

Evaporative Emission (EVAP) Canister Purge Volume Control Solenoid Valve (Cont’d)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.
   If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.

Condition PURG VOL CONT/V value	Air passage continuity between Ⓐ and Ⓑ
100.0%	Yes
0.0%	No

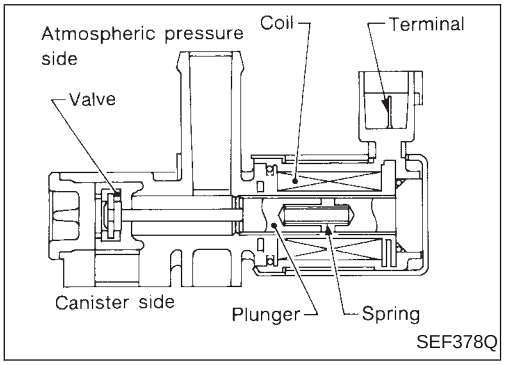
If NG, replace the EVAP canister purge volume control solenoid valve.

OR

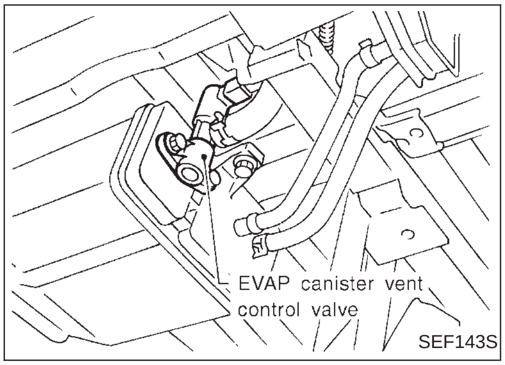
Check air passage continuity.

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace EVAP canister purge volume control solenoid valve.



SEF378Q



SEF143S

Evaporative Emission (EVAP) Canister Vent Control Valve (Close)

COMPONENT DESCRIPTION

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows ‘‘EVAP Control System (Small Leak)’’ diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

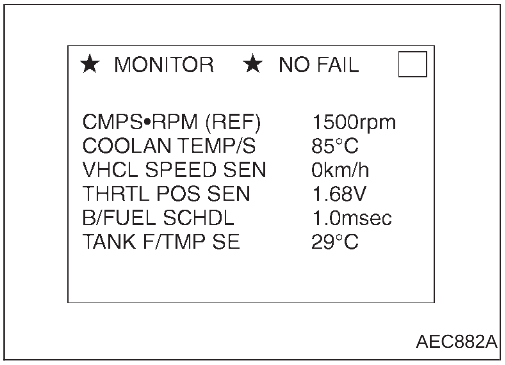
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
108	R/G	EVAP canister vent control valve	Ignition switch ‘‘ON’’	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1446 0215	● EVAP canister vent control valve remains closed under specified driving conditions.	● 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.

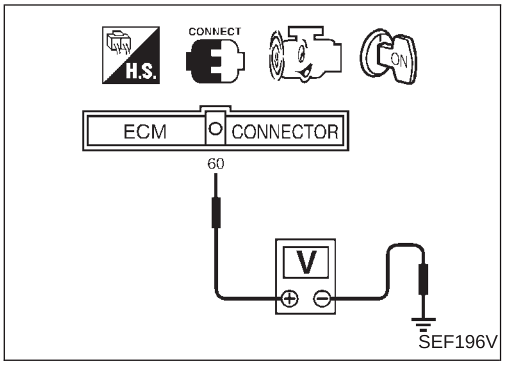
Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont’d)



★ MONITOR ★ NO FAIL ☐

CMPS•RPM (REF)	1500rpm
COOLAN TEMP/S	85°C
VHCL SPEED SEN	0km/h
THRTL POS SEN	1.68V
B/FUEL SCHDL	1.0msec
TANK F/TMP SE	29°C

AEC882A



SEF196V

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Always perform at a temperature above 0°C (32°F).

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF’’ and wait at least 5 seconds.
3) Turn ignition switch “ON’’.
4) Select “DATA MONITOR’’ mode with CONSULT.
5) Check that TANK F/TMP SE is 0°C (32°F) or more.
6) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for a maximum of 15 minutes.
7) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE” on next page.

NOTE:

If a malfunction exists, NG result may be displayed quicker.

OR

GST

1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal 60 (tank fuel temperature sensor signal) and ground is less than 4.2V.
3) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
4) Select “MODE 7’’ with GST.
5) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE” on next page.

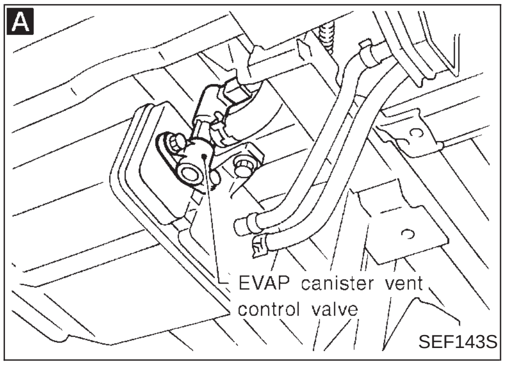
OR

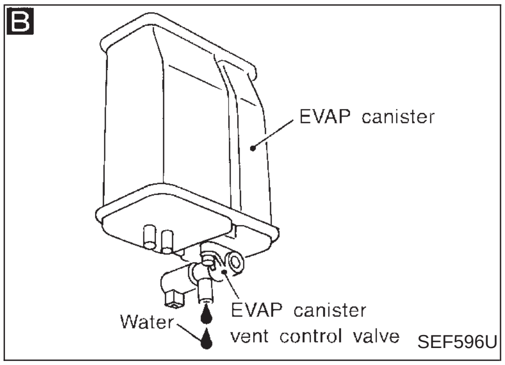
NO TOOLS

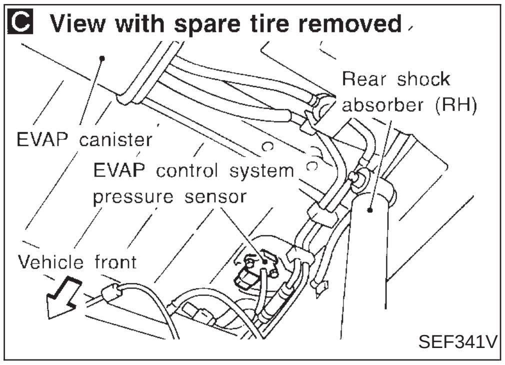
1) Start engine and warm it up to normal operating temperature.
2) Check that voltage between ECM terminal 60 (tank fuel temperature sensor signal) and ground is less than 4.2V.
3) Drive vehicle at a speed of approximately 80 km/h (50 MPH) for 15 minutes.
4) Turn ignition switch “OFF’’ and wait at least 5 seconds.
5) Turn ignition switch “ON’’ and perform “Diagnostic Test Mode II (Self-diagnostic results)’’ with ECM.
6) If 1st trip DTC is detected, go to “DIAGNOSTIC PROCEDURE” on next page.

Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

CHECK RUBBER TUBE FOR CLOGGING.
Check obstructed water separator and rubber tube to EVAP canister vent control valve and clean the rubber tube using air blower.
For water separator, refer to EC-385.

NG → Clean, repair or replace rubber tube and/or water separator.

OK ↓

A

CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EVAP canister vent control valve and O-ring.

OK ↓

B

CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.
   If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Check the following.
1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator. Refer to "COMPONENT INSPECTION", EC-385.

If NG, repair hose or replace EVAP canister or water separator.

OK ↓

C

CHECK COMPONENT AND CIRCUIT
(EVAP control system pressure sensor).
1. Check for disconnection of hose connected to the sensor.
2. Check sensor harness connector for water.
   Water should not exist.
   If OK, go to step 3.
3. Check EVAP control system pressure sensor.

Refer to "COMPONENT INSPECTION" on next page.

NG → Repair or replace harness and/or connectors or replace EVAP control system pressure sensor.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

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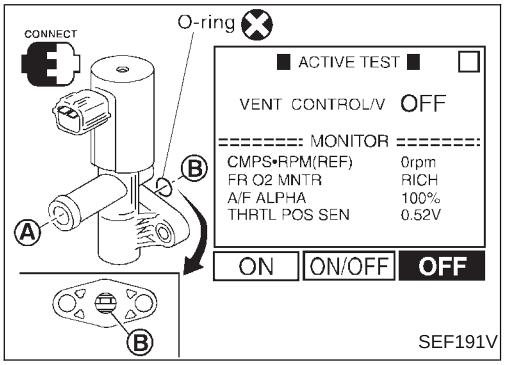
Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont’d)

COMPONENT INSPECTION



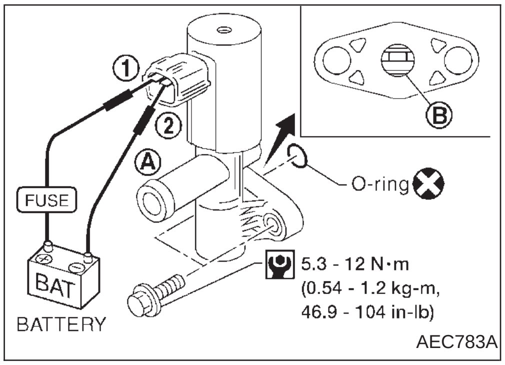
EVAP canister vent control valve

Check air passage continuity.

Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

Condition VENT CONTROL/V	Air passage continuity between Ⓐ and Ⓑ
ON	No
OFF	Yes

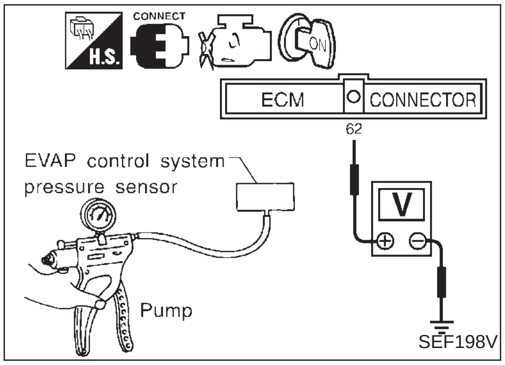
OR



Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	No
No supply	Yes

If NG or operation takes more than 1 second, clean EVAP canister vent control valve using air blower or replace as necessary.

If the portion Ⓑ is rusted, replace EVAP canister vent control valve.
Make sure new O-ring is installed properly.



EVAP control system pressure sensor

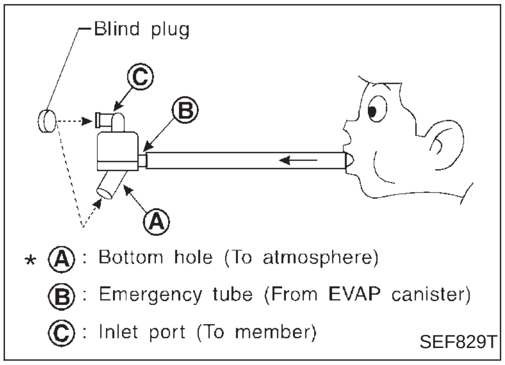
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal (62) and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum below −20 kPa (−150 mmHg, −5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).**

5. If NG, replace EVAP control system pressure sensor.



Evaporative Emission (EVAP) Canister Vent Control Valve (Close) (Cont'd)

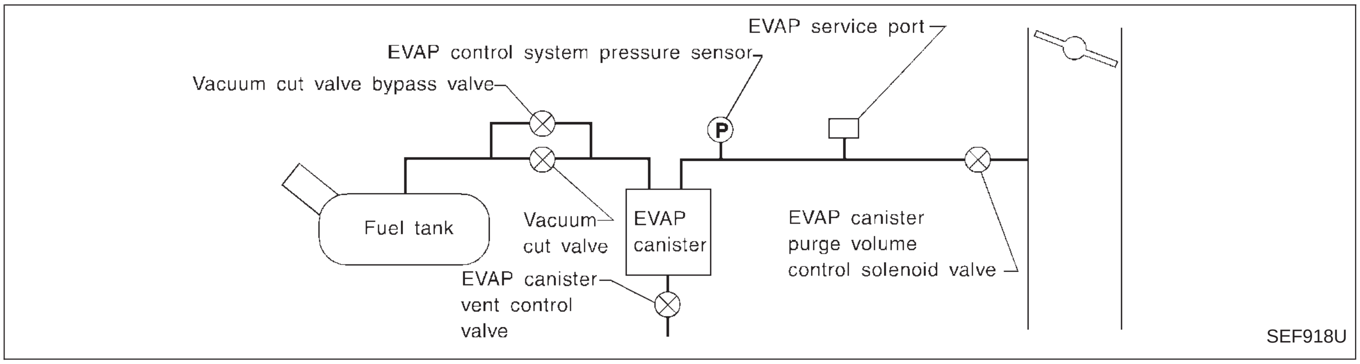
Water separator

1. Check visually for insect nests in the water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that Ⓐ and Ⓒ are not clogged by blowing air into Ⓑ with Ⓐ, and then Ⓒ plugged.
5. In case of NG in items 2 - 4, replace the parts.

- **Do not disassemble water separator.**

Evaporative Emission (EVAP) Control System Purge Flow Monitoring

Note: If DTC P1447 is displayed with P0510, perform TROUBLE DIAGNOSIS FOR DTC P0510 first. (See EC-314.)



SEF918U

SYSTEM DESCRIPTION

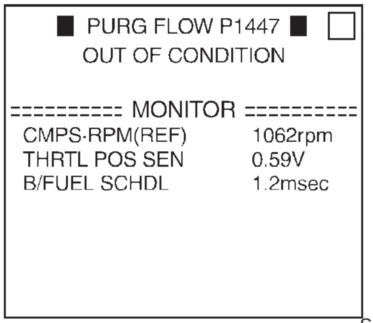
In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

ON BOARD DIAGNOSIS LOGIC

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a fault is determined.

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1447 0111	● EVAP control system does not operate properly. ● EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	● EVAP canister purge volume control solenoid valve stuck closed ● EVAP control system pressure sensor ● Loose, disconnected or improper connection of rubber tube ● Blocked rubber tube ● Blocked or bent rubber tube to MAP/BARO switch solenoid valve ● Cracked EVAP canister ● EVAP canister purge volume control solenoid valve circuit ● Closed throttle position switch ● Blocked purge port ● EVAP canister vent control valve

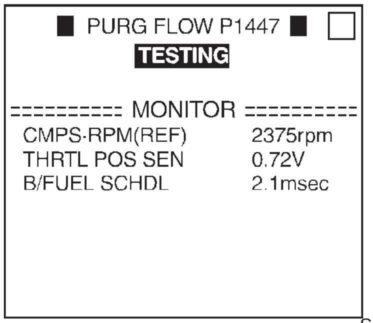
Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



```
■ PURG FLOW P1447 ■ ☐
   OUT OF CONDITION

========== MONITOR ==========
 CMPS·RPM(REF)       1062rpm
 THRTL POS SEN       0.59V
 B/FUEL SCHDL        1.2msec
```

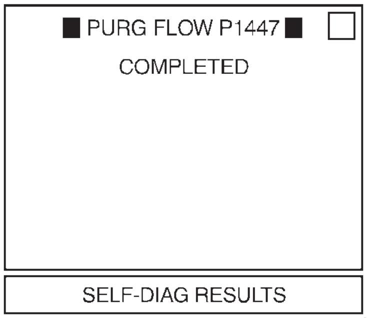
SEF250V



```
■ PURG FLOW P1447 ■ ☐
       TESTING

========== MONITOR ==========
 CMPS·RPM(REF)       2375rpm
 THRTL POS SEN       0.72V
 B/FUEL SCHDL        2.1msec
```

SEF251V



```
■ PURG FLOW P1447 ■ ☐
      COMPLETED

   SELF-DIAG RESULTS
```

SEF905U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Always perform at a temperature above 5°C (41°F).

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and let it idle for at least 1 minute.
4) Select "PURG FLOW P1447" of "EVAPORATIVE SYSTEM" in "DTC CONFIRMATION" mode with CONSULT.
5) Touch "START".
6) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)
   Selector lever: Suitable position
   Vehicle speed: 32 - 120 km/h (20 - 75 MPH)
   CMPS·RPM (REF): 500 - 3,100 rpm (A/T)
   500 - 3,400 rpm (M/T)
   B/FUEL SCHDL: 1.6 - 3.5 msec
   Engine coolant temperature: 70 - 100°C (158 - 212°F)

If "TESTING" does not change 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-389.

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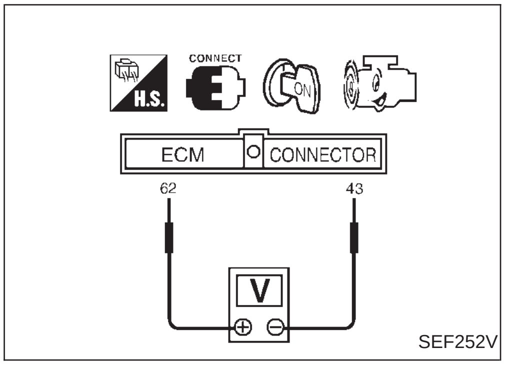
Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall monitoring function of the EVAP control system purge flow. During this check, a 1st trip DTC might not be confirmed.

1) Lift up drive wheels.
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch ''OFF'', wait at least 5 seconds.
4) Start engine and wait at least 60 seconds.
5) Set voltmeter probes to ECM terminals (62) (EVAP control system pressure sensor signal) and (43) (ground).
6) Check EVAP control system pressure sensor value at idle speed.
7) Establish and maintain the following conditions for at least 1 minute.
   Air conditioner switch: ON
   Steering wheel: Fully turned
   Headlamp switch: ON
   Engine speed: Approx. 3,000 rpm
   Gear position:
     M/T models
       Any position other than ''Neutral'' or ''Reverse''
     A/T models
       Any position other than ''P'', ''N'' or ''R''
   Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed for at least 1 second.
8) If NG, go to ''DIAGNOSTIC PROCEDURE'' on next page.

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Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

DIAGNOSTIC PROCEDURE

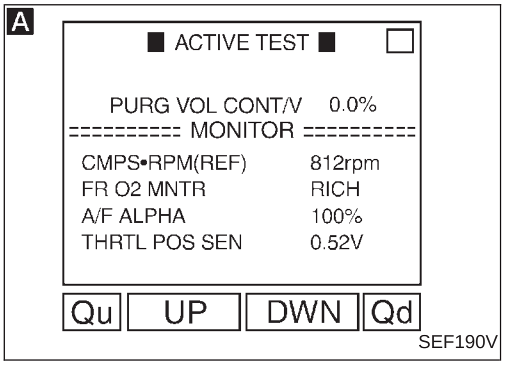
INSPECTION START

CHECK EVAP CANISTER.
Check EVAP canister for cracks.

NG → Replace EVAP canister.

OK ↓

A



■ ACTIVE TEST ■ ☐

PURG VOL CONT/V 0.0%

========== MONITOR ==========

CMPS•RPM(REF)	812rpm
FR O2 MNTR	RICH
A/F ALPHA	100%
THRTL POS SEN	0.52V

SEF190V

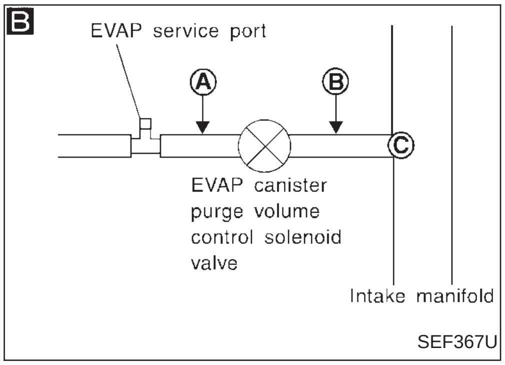
CHECK PURGE FLOW.

1. Disconnect EVAP hose to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
2. Start engine and let it idle.
3. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode.
4. Touch "Qd" and "Qu" on CONSULT screen to adjust "PURG VOL CONT/V" opening.
   100.0%: Vacuum should exist.
   0.0%: Vacuum should not exist.

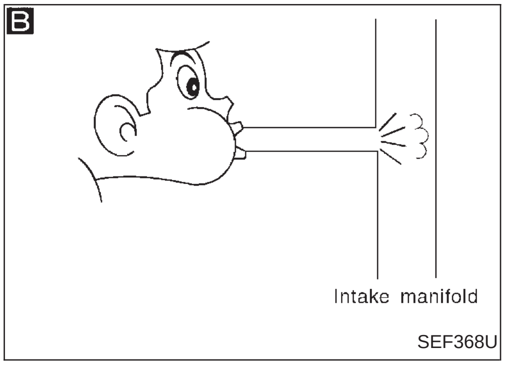
OR

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge.
4. Start engine and let it idle for at least 60 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.
   While operating EVAP canister purge volume control solenoid valve, vacuum should exist.
6. Release the accelerator pedal and let engine idle.
   Vacuum should not exist.

NG → **B**



SEF367U



SEF368U

CHECK EVAP PURGE LINE.
Check EVAP purge line for improper connection, disconnection and blocked purge port.

1. Turn ignition switch "OFF".
2. Disconnect purge hoses connected to EVAP canister purge volume control solenoid valve (Ⓑ) and EVAP service port (Ⓐ).
3. Blow air into each hose and check that air flows freely.
4. Check EVAP purge port Ⓒ.

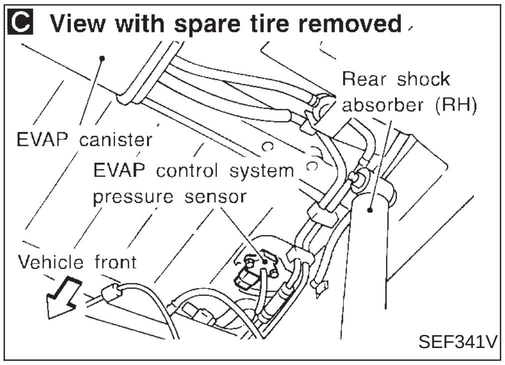
If NG, repair or clean hoses and/or purge port.

OK ↓

CHECK COMPONENT (EVAP canister purge volume control solenoid valve).
Refer to "COMPONENT INSPECTION", EC-391.

OK ↓

C



SEF341V

CHECK COMPONENT
(EVAP control system pressure sensor).

1. Check for disconnection of hose connected to the EVAP control system pressure sensor.
2. Check sensor harness connector for water.
   Water should not exist.
   If OK, go to step 3.
3. Check EVAP control system pressure sensor.

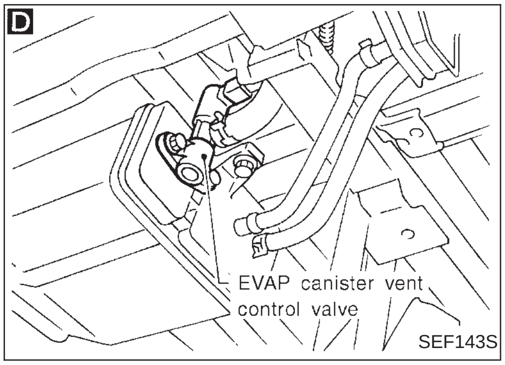
Refer to "COMPONENT INSPECTION", EC-391.

NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.

OK ↓

Ⓐ
(Go to next page.)

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont’d)



Ⓐ

D

CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to ‘‘COMPONENT INSPECTION’’, EC-396.

NG → Replace EVAP canister vent control valve and O-ring.

OK ↓

CHECK COMPONENT
(Closed throttle position switch).
Refer to ‘‘COMPONENT INSPECTION’’, EC-318.

NG → Replace throttle position sensor with throttle position switch.

OK ↓

CHECK EVAP PURGE LINE.
Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

NG → Replace it.

OK ↓

Clean EVAP purge line (pipe and rubber tube) using air blower.

↓

Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.

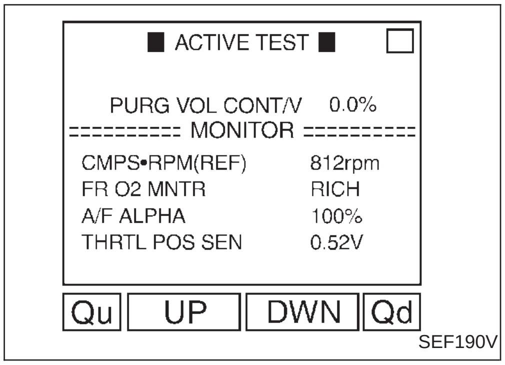
↓

INSPECTION END

Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

COMPONENT INSPECTION

EVAP canister purge volume control solenoid valve

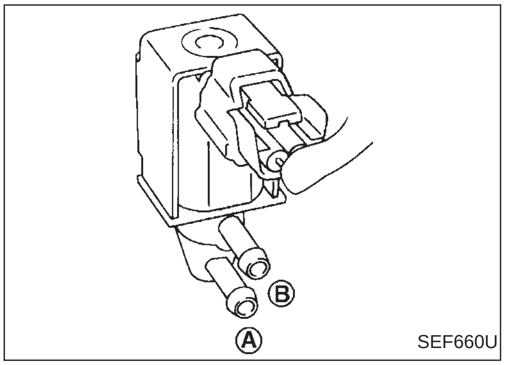


```
■ ACTIVE TEST ■                 ☐

PURG VOL CONT/V     0.0%
========== MONITOR ==========
CMPS•RPM(REF)        812rpm
FR O2 MNTR           RICH
A/F ALPHA            100%
THRTL POS SEN        0.52V
```

SEF190V

1. Start engine.
2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that engine speed varies according to the valve opening.
   If OK, inspection end. If NG, go to following step.
3. Check air passage continuity.



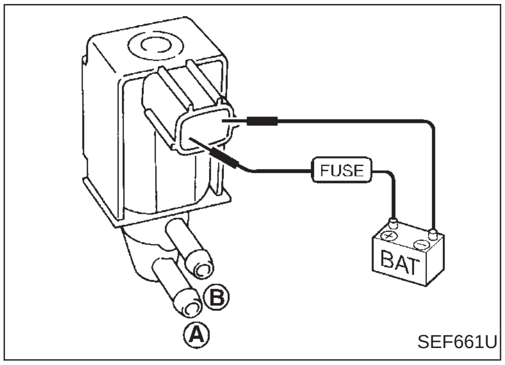
SEF660U

Condition PURG VOL CONT/V value	Air passage continuity between Ⓐ and Ⓑ
100.0%	Yes
0.0%	No

If NG, replace the EVAP canister purge volume control solenoid valve.

OR

Check air passage continuity.

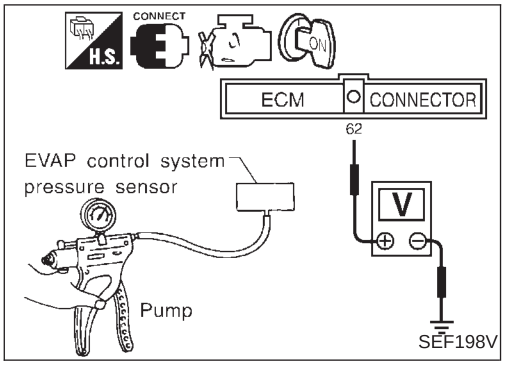


SEF661U

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace EVAP canister purge volume control solenoid valve.

EVAP control system pressure sensor



SEF198V

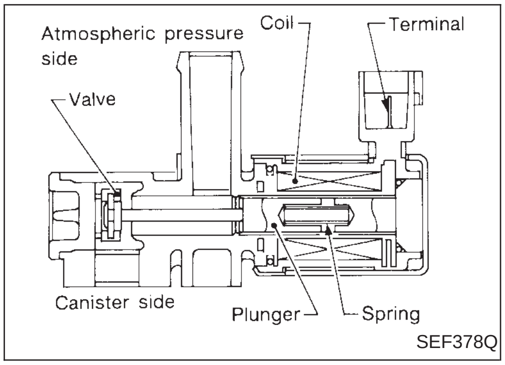
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal ㉖ and engine ground.

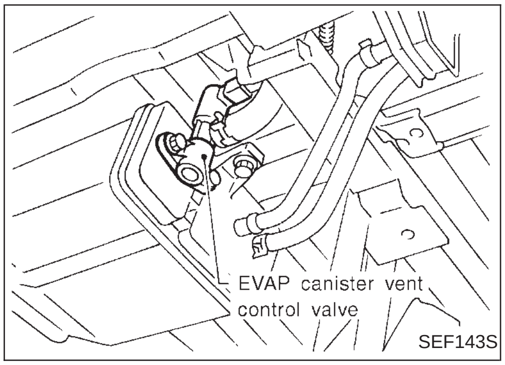
Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum below −20 kPa (−150 mmHg, −5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).**

5. If NG, replace EVAP control system pressure sensor.





Evaporative Emission (EVAP) Canister Vent Control Valve (Open)

COMPONENT DESCRIPTION

NOTE:
If DTC P1448 is displayed with P0440 or P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first.

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.

This solenoid (the EVAP canister vent control valve) responds to signals from the ECM.

When the ECM sends an ON signal, the coil in the solenoid valve is energized.

A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.

This solenoid valve is used only for diagnosis, and usually remains opened.

When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows ‘‘EVAP Control System (Small Leak)’’ diagnosis.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
108	R/G	EVAP canister vent control valve	Ignition switch ‘‘ON’’	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1448 0309	● EVAP canister vent control valve remains opened under specified driving conditions.	● EVAP canister vent control valve ● EVAP control system pressure sensor ● Blocked rubber tube to EVAP canister vent control valve ● Water separator ● EVAP canister is saturated with water ● Vacuum cut valve

Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

- **If DTC P1448 is displayed with P0440 or P1440, perform TROUBLE DIAGNOSIS FOR DTC P1448 first.**
- **If "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE'' has been previously conducted, always turn ignition switch "OFF'' and wait at least 5 seconds before conducting the next test.**

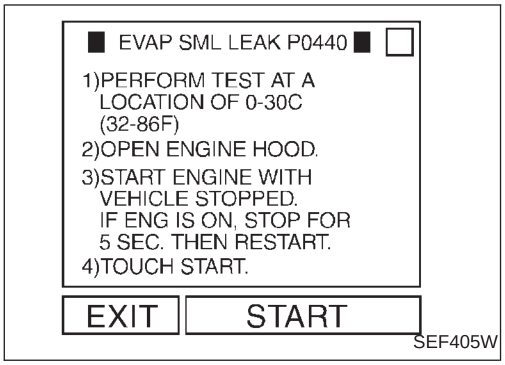
TESTING CONDITION:

- **Perform "DTC WORK SUPPORT'' when the fuel level is less than 3/4 full and vehicle is placed on flat level surface.**
- **Always perform at a temperature of 0 to 30°C (32 to 86°F).**
- **It is better that the fuel level is low.**

1) Turn ignition switch "ON''.
2) Turn ignition switch "OFF'' and wait at least 5 seconds.
3) Turn ignition switch "ON'' and select "DATA MONITOR'' mode with CONSULT.
4) Make sure that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
5) Select "EVAP SML LEAK P0440'' of "EVAPORATIVE SYSTEM'' in "DTC WORK SUPPORT'' mode with CONSULT.
   Follow the instruction displayed.

   NOTE:
   - **If the CONSULT screen shown at left is displayed, stop the engine and stabilize the vehicle temperature at 25°C (77°F) or cooler. After "TANK F/TMP SE'' becomes less than 30°C (86°F), retest.**
     (Use a fan to reduce the stabilization time.)
   - **If the engine speed cannot be maintained within the range displayed on CONSULT screen, go to "Basic Inspection", EC-74.**
   - **The engine idle portion of this test (See illustration at left.) will take approximately 5 minutes.**
6) Make sure that "OK'' is displayed.
   If "NG'' is displayed, go to the following step.

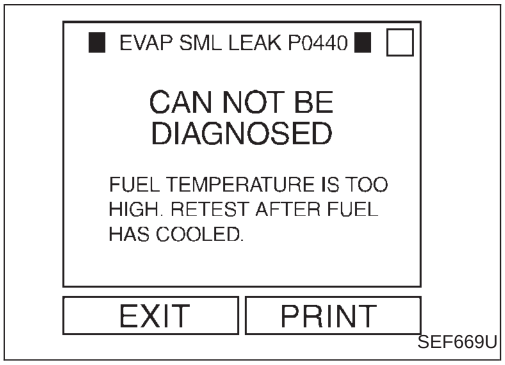
   NOTE:
   Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.
7) Stop engine and wait at least 5 seconds, then turn "ON''.
8) Disconnect hose from water separator.
9) Select "VENT CONTROL/V'' of "ACTIVE TEST'' mode with CONSULT.
10) Touch "ON'' and "OFF'' alternately.



EVAP SML LEAK P0440

1)PERFORM TEST AT A LOCATION OF 0-30C (32-86F)
2)OPEN ENGINE HOOD.
3)START ENGINE WITH VEHICLE STOPPED. IF ENG IS ON, STOP FOR 5 SEC. THEN RESTART.
4)TOUCH START.

SEF405W

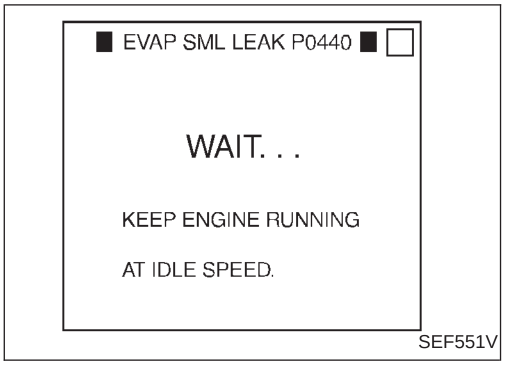


EVAP SML LEAK P0440

CAN NOT BE DIAGNOSED

FUEL TEMPERATURE IS TOO HIGH. RETEST AFTER FUEL HAS COOLED.

SEF669U

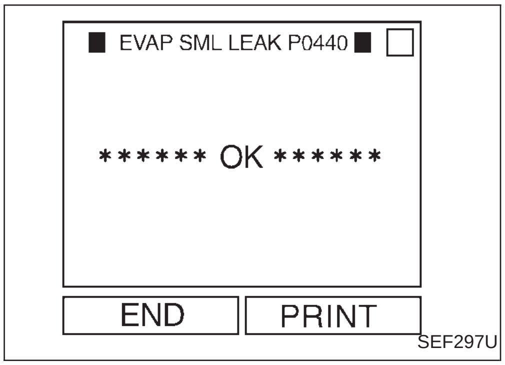


EVAP SML LEAK P0440

WAIT. . .

KEEP ENGINE RUNNING AT IDLE SPEED.

SEF551V

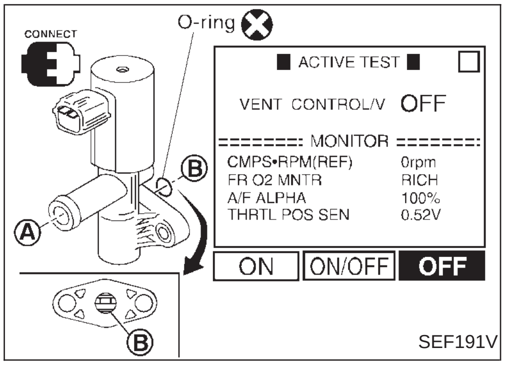


EVAP SML LEAK P0440

****** OK ******

SEF297U

Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)


■ ACTIVE TEST ■

VENT CONTROL/V OFF

======== MONITOR ========

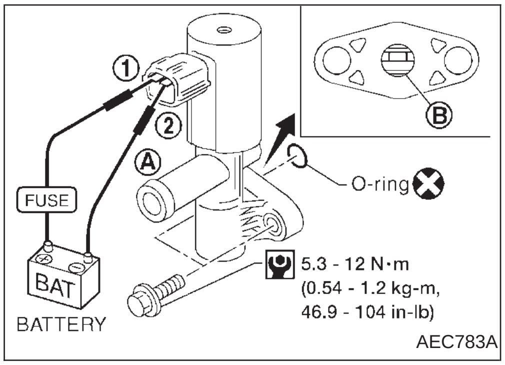
CMPS•RPM(REF) 0rpm

FR O2 MNTR RICH

A/F ALPHA 100%

THRTL POS SEN 0.52V

SEF191V



AEC783A

11) Make sure of the following.

Condition VENT CONTROL/V	Air passage continuity between Ⓐ and Ⓑ
ON	No
OFF	Yes

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-395.
If the result is OK, go to "DIAGNOSTIC PROCEDURE" for "TROUBLE DIAGNOSIS FOR DTC P0440", EC-279.

OR

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a DTC might not be confirmed.

1) Disconnect hose from water separator.
2) Disconnect EVAP canister vent control valve harness connector.
3) Verify the following.

Condition	Air passage continuity
12V direct current supply between terminals ① and ②	No
No supply	Yes

If the result is NG, go to "DIAGNOSTIC PROCEDURE", EC-395.
If the result is OK, go to "TROUBLE DIAGNOSIS FOR DTC P0440", EC-276.

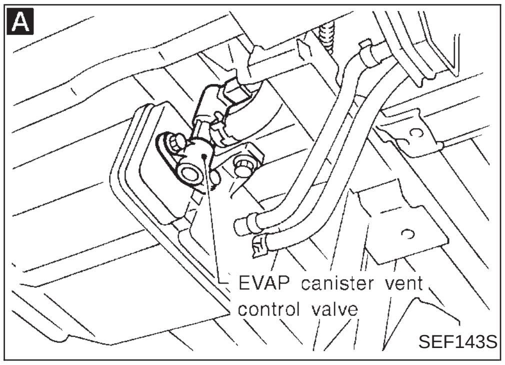
Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START

CHECK RUBBER TUBE FOR DISCONNECTION.
Check disconnection of rubber tube to EVAP canister vent control valve and clean the rubber hose and/or vent control valve then install properly.

OK

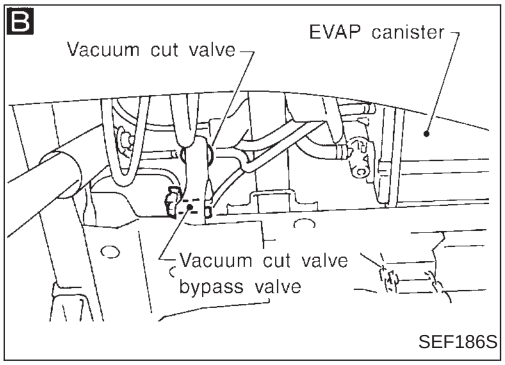


A

CHECK COMPONENT
(EVAP canister vent control valve and O-ring).
Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace EVAP canister vent control valve and O-ring.

OK

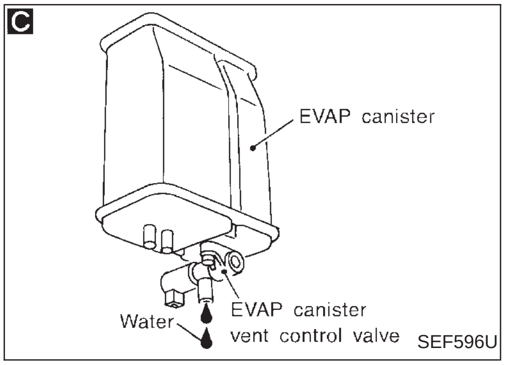


B

CHECK COMPONENT
(Vacuum cut valve).
Refer to ''COMPONENT INSPECTION'', EC-406.

NG → Replace vacuum cut valve.

OK



C

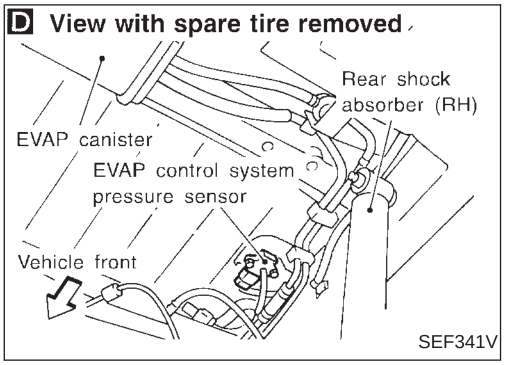
CHECK IF EVAP CANISTER IS SATURATED WITH WATER.
1. Remove EVAP canister with EVAP canister vent control valve attached.
2. Check if water will drain from the EVAP canister.
   If it will, weigh the EVAP canister with the vent control valve attached.

If the weight is:
More than 1.8 kg (4.0 lb) → NG
Less than 1.8 kg (4.0 lb) → OK

NG → Check the following.
1. Visually check the EVAP canister for damage.
2. Check hose connection between EVAP canister and water separator for clogging and poor connection.
3. Check water separator.
   Refer to ''COMPONENT INSPECTION'', EC-385.

If NG, repair hose or replace EVAP canister or water separator.

OK



D

CHECK COMPONENT
(EVAP control system pressure sensor).
1. Check for disconnection of hose connected to the sensor.
2. Check harness connector for water in the sensor connectors.
   Water should not exist.
   If OK, go to step 3.
3. Check EVAP control system pressure sensor.

Refer to ''COMPONENT INSPECTION'' on next page.

NG → Replace EVAP control system pressure sensor and repair or replace harness and connector.

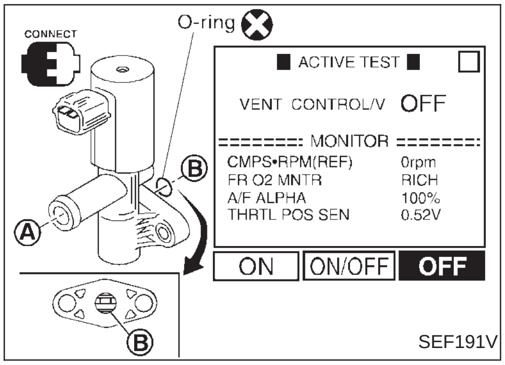
OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

INSPECTION END

Evaporative Emission (EVAP) Canister Vent Control Valve (Open) (Cont’d)

COMPONENT INSPECTION



■ ACTIVE TEST ■ ☐
VENT CONTROL/V OFF
======== MONITOR ========
CMPS•RPM(REF) 0rpm
FR O2 MNTR RICH
A/F ALPHA 100%
THRTL POS SEN 0.52V
ON | ON/OFF | OFF

SEF191V

EVAP canister vent control valve

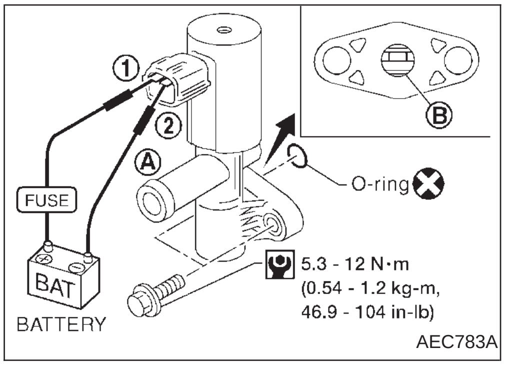
Check air passage continuity.

Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

Condition VENT CONTROL/V	Air passage continuity between Ⓐ and Ⓑ
ON	No
OFF	Yes

OR

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals ① and ②	No
No supply	Yes

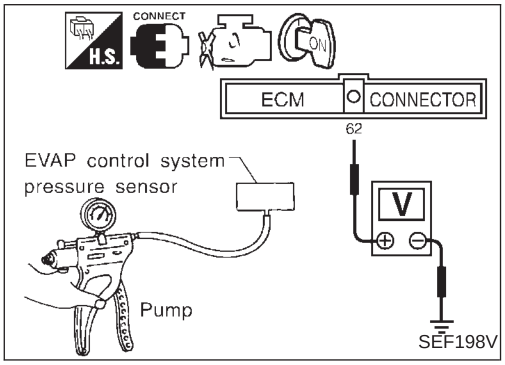


AEC783A

If NG or operation takes more than 1 second, clean EVAP canister vent control valve using air blower or replace as necessary.

If the portion Ⓑ is rusted, replace EVAP canister vent control valve.

Make sure new O-ring is installed properly.



SEF198V

EVAP control system pressure sensor

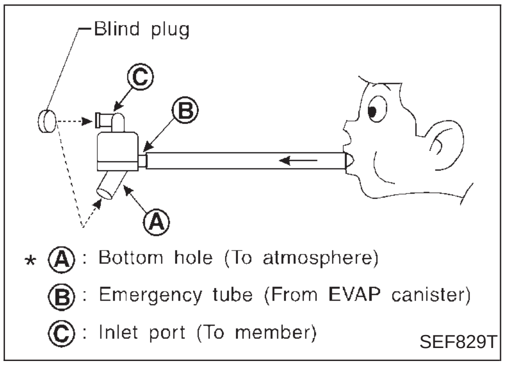
1. Remove EVAP control system pressure sensor with its harness connector connected.
2. Remove hose from EVAP control system pressure sensor.
3. Use pump to apply vacuum and pressure to EVAP control system pressure sensor as shown in figure.
4. Check output voltage between ECM terminal (62) and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg)	3.0 - 3.6
−9.3 kPa (−70 mmHg, −2.76 inHg)	0.4 - 0.6

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum below −20 kPa (−150 mmHg, −5.91 inHg) or pressure over 20.0 kPa (150 mmHg, 5.91 inHg).**

5. If NG, replace EVAP control system pressure sensor.



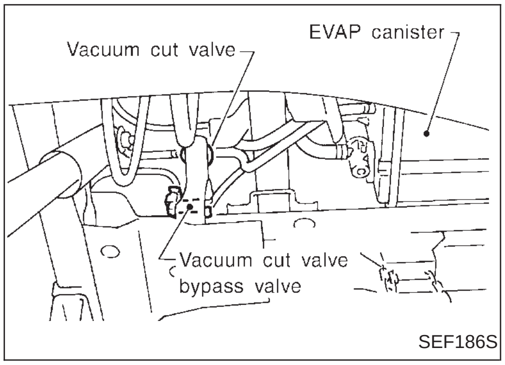
* Ⓐ : Bottom hole (To atmosphere)
Ⓑ : Emergency tube (From EVAP canister)
Ⓒ : Inlet port (To member)

SEF829T

Water separator

1. Check visually for insect nests in water separator air inlet.
2. Check visually for cracks or flaws in the appearance.
3. Check visually for cracks or flaws in the hose.
4. Check that Ⓐ and Ⓒ are not clogged by blowing air into Ⓑ with Ⓐ, and then Ⓒ plugged.
5. In case of NG in items 2 - 4, replace the parts.

- **Do not disassemble water separator.**

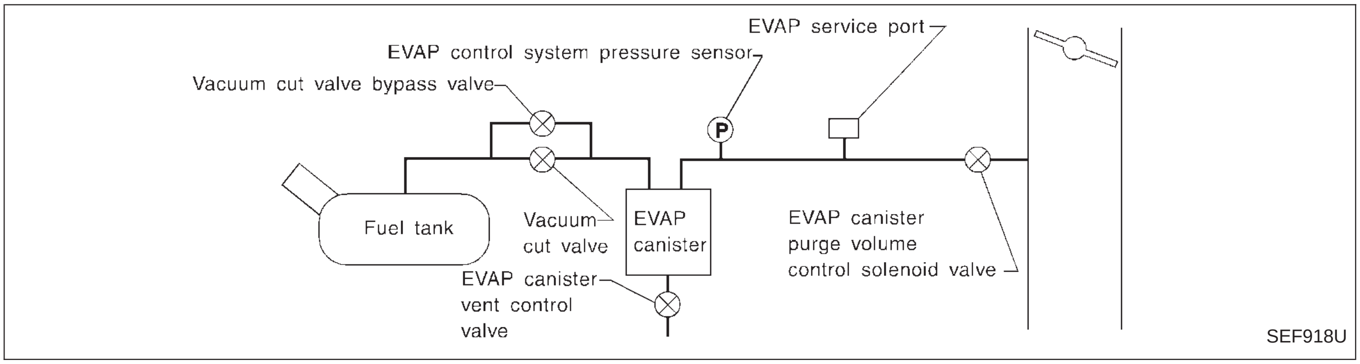


Vacuum Cut Valve Bypass Valve (Circuit)

COMPONENT DESCRIPTION

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
120	P/B	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

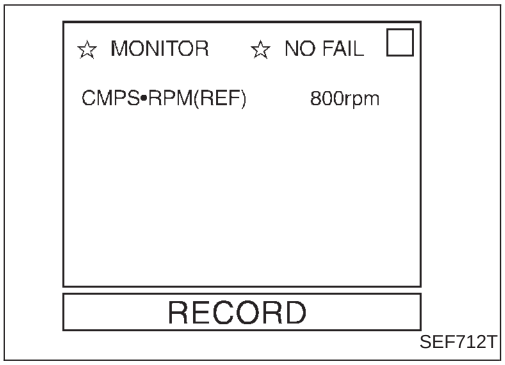
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1490 0801	● An improper voltage signal is sent to ECM through vacuum cut valve bypass valve.	● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted.) ● Vacuum cut valve bypass valve

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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



☆ MONITOR ☆ NO FAIL ☐
CMPS•RPM(REF) 800rpm
RECORD

SEF712T

1) Turn ignition switch ''ON''.
2) Select ''DATA MONITOR'' mode with CONSULT.
3) Start engine and wait at least 5 seconds.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-400.

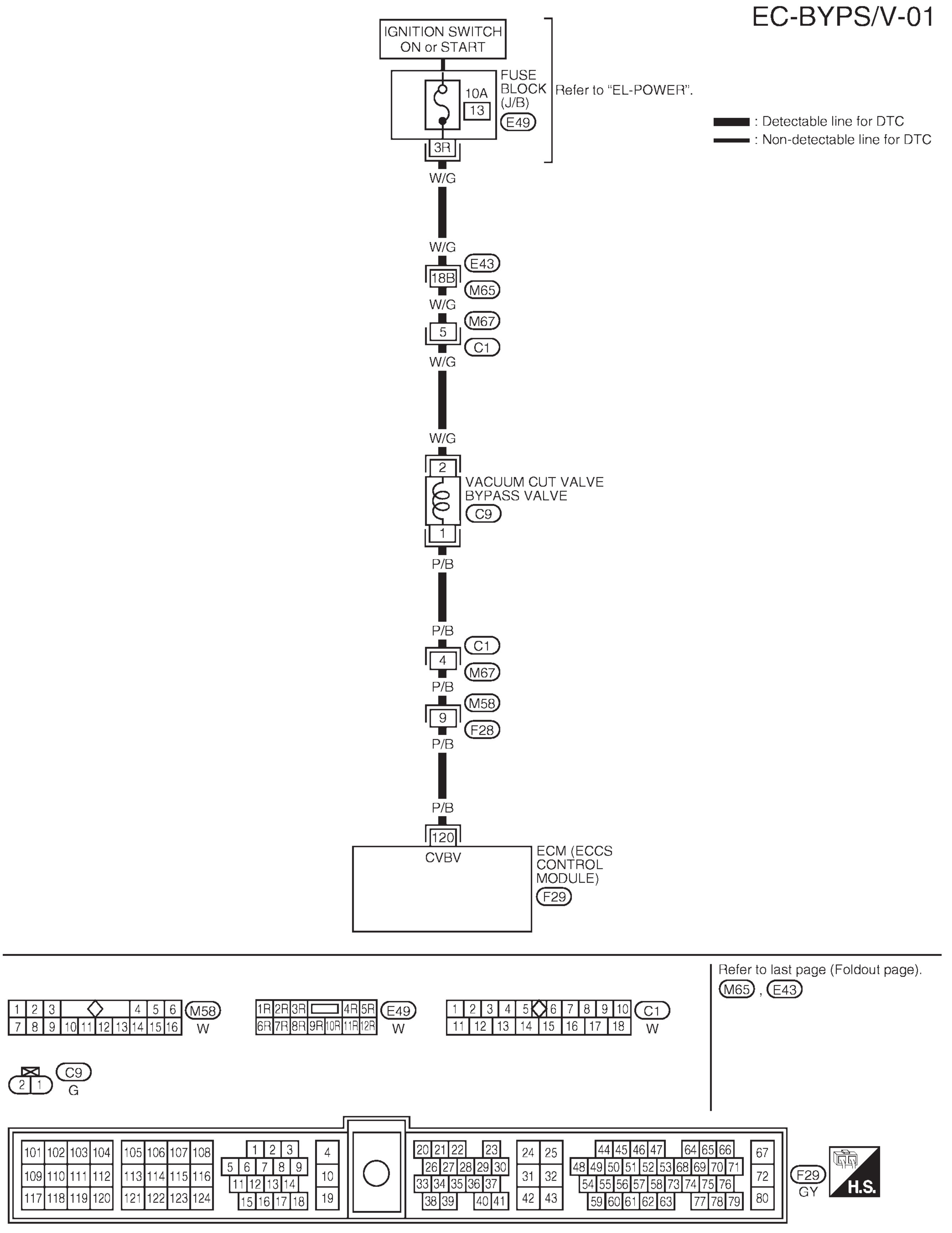
OR

GST
1) Start engine and wait at least 5 seconds.
2) Select ''MODE 7'' with GST.
3) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-400.

OR

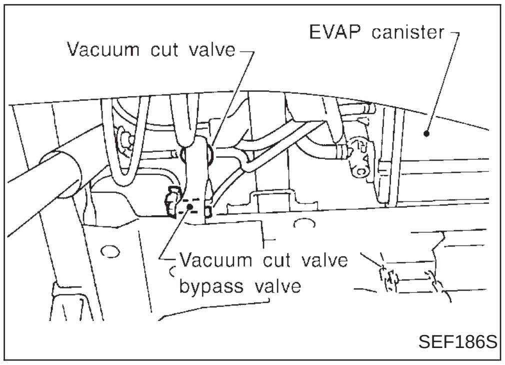
NO TOOLS
1) Start engine and wait at least 5 seconds.
2) Turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
3) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'', EC-400.

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)



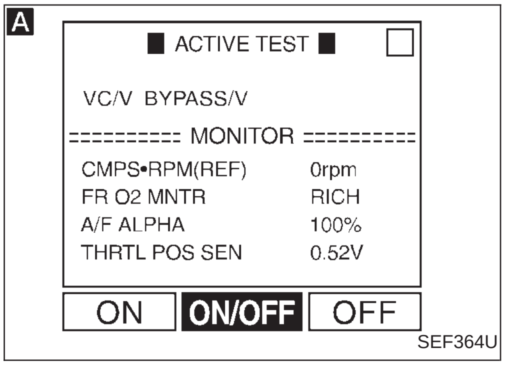
AEC544A

Vacuum Cut Valve Bypass Valve (Circuit) (Cont’d)



SEF186S

A



■ ACTIVE TEST ■ ☐

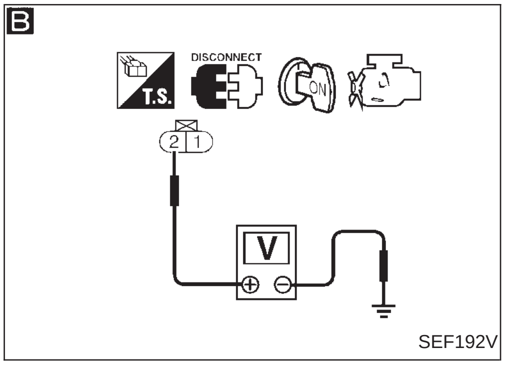
VC/V BYPASS/V

========== MONITOR ==========

CMPS•RPM(REF)	0rpm
FR O2 MNTR	RICH
A/F ALPHA	100%
THRTL POS SEN	0.52V

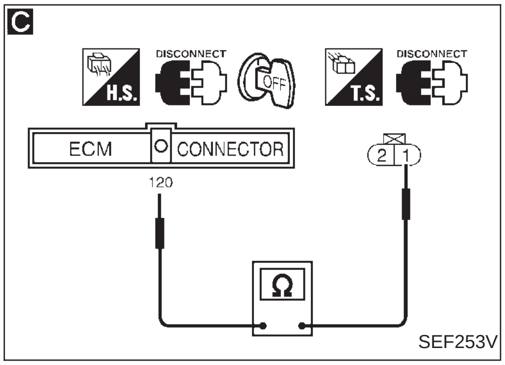
SEF364U

B



SEF192V

C



SEF253V

DIAGNOSTIC PROCEDURE

INSPECTION START

With CONSULT → A

Without CONSULT
Go to CHECK POWER SUPPLY B.

A

CHECK VACUUM CUT VALVE BYPASS VALVE CIRCUIT.
1. Turn ignition switch “ON’’.
2. Perform “VC/V BYPASS/V’’ in “ACTIVE TEST’’ mode.
3. Make sure that clicking sound is heard from the vacuum cut bypass valve.

OK → Go to “CHECK COMPONENT’’ after procedure C.

NG ↓

B

CHECK POWER SUPPLY.
1. Turn ignition switch “OFF’’.
2. Disconnect vacuum cut valve bypass valve harness connector.
3. Turn ignition switch “ON’’.
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E43, M65
- Harness connectors M67, C1
- 10A fuse
- Harness for open or short between vacuum cut valve bypass valve and 10A fuse

If NG, repair harness or connector.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch “OFF’’.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (120) and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors M67, C1
- Harness connectors M58, F28
- Harness for open or short between vacuum cut valve bypass valve and ECM

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

OK ↓

CHECK COMPONENT
(Vacuum cut valve bypass valve).
Refer to “COMPONENT INSPECTION’’ on next page.

NG → Replace vacuum cut valve bypass valve.

OK ↓

Perform “TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.

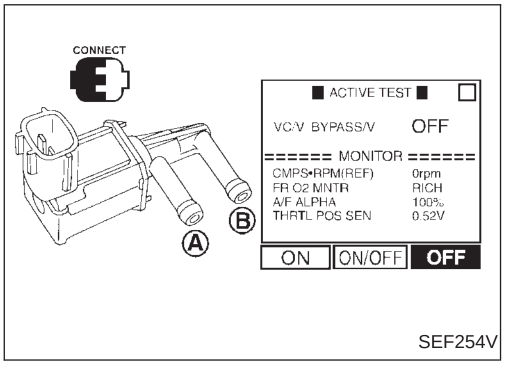
↓

INSPECTION END

Vacuum Cut Valve Bypass Valve (Circuit) (Cont'd)

COMPONENT INSPECTION

Vacuum cut valve bypass valve



```
VC/V  BYPASS/V          OFF
====== MONITOR ======
CMPS•RPM(REF)           0rpm
FR O2 MNTR              RICH
A/F ALPHA               100%
THRTL POS SEN           0.52V
```

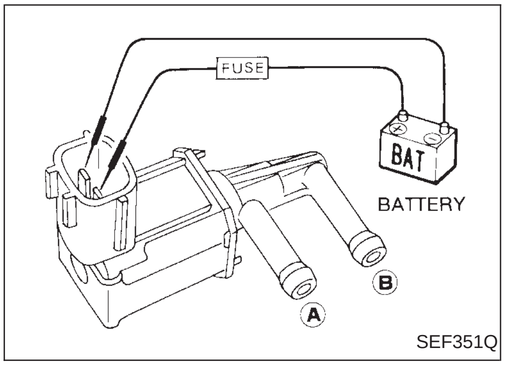
SEF254V

Check air passage continuity.

Perform ''VC/V BYPASS/V'' in ''ACTIVE TEST'' mode.

Condition VC/V BYPASS/V	Air passage continuity between Ⓐ and Ⓑ
ON	Yes
OFF	No

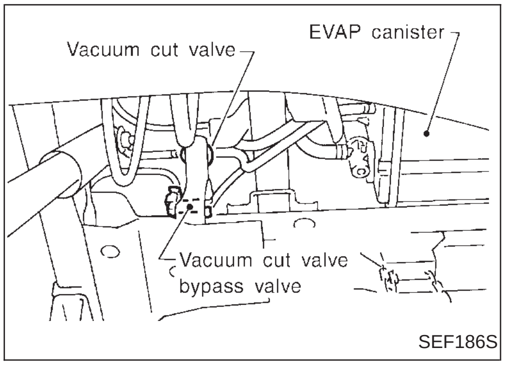
OR



SEF351Q

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

If NG or operation takes more than 1 second, replace vacuum cut valve bypass valve.

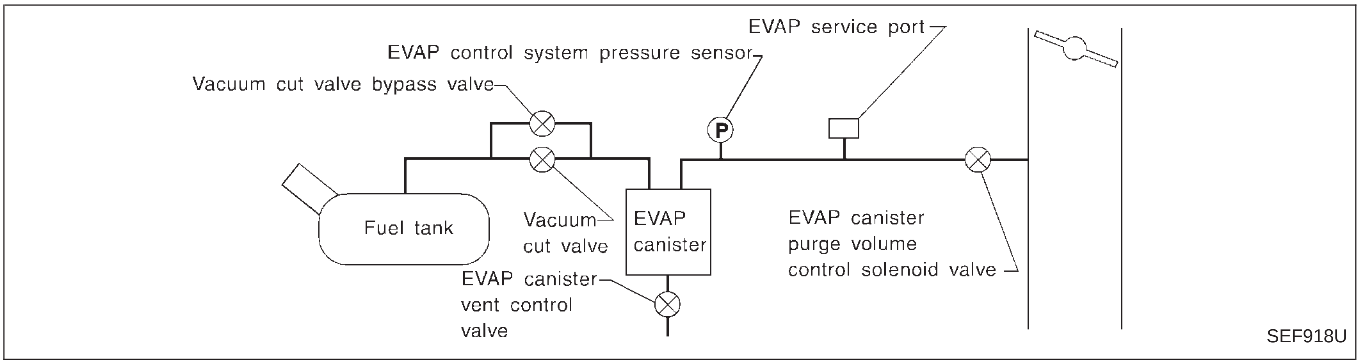


Vacuum Cut Valve Bypass Valve

COMPONENT DESCRIPTION

The vacuum cut valve and vacuum cut valve bypass valve are installed in parallel on the EVAP purge line between the fuel tank and the EVAP canister.
The vacuum cut valve prevents the intake manifold vacuum from being applied to the fuel tank.
The vacuum cut valve bypass valve is a solenoid type valve and generally remains closed. It opens only for on board diagnosis.
The vacuum cut valve bypass valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the valve is opened. The vacuum cut valve is then bypassed to apply intake manifold vacuum to the fuel tank.

EVAPORATIVE EMISSION SYSTEM DIAGRAM



CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

ECM TERMINALS AND REFERENCE VALUE

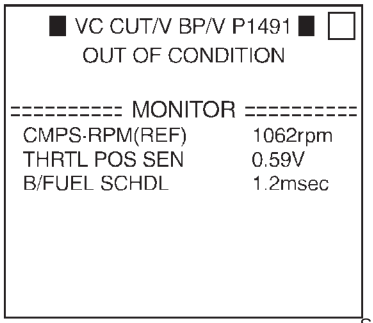
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
120	P/B	Vacuum cut valve bypass valve	Ignition switch “ON”	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1491 0311	● Vacuum cut valve bypass valve does not operate properly.	● Vacuum cut valve bypass valve ● Vacuum cut valve ● Bypass hoses for clogging ● EVAP control system pressure sensor ● EVAP canister vent control valve ● Hose between fuel tank and vacuum cut valve clogged ● Hose between vacuum cut valve and EVAP canister clogged ● EVAP canister

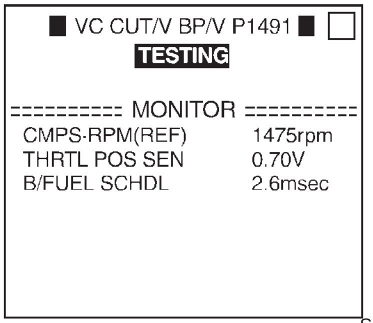
Vacuum Cut Valve Bypass Valve (Cont'd)



```
■ VC CUT/V BP/V P1491 ■ ☐
      OUT OF CONDITION

========== MONITOR ==========
 CMPS·RPM(REF)        1062rpm
 THRTL POS SEN        0.59V
 B/FUEL SCHDL         1.2msec
```

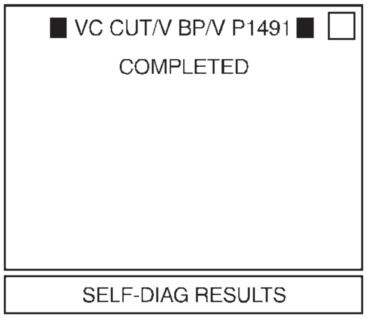
SEF255V



```
■ VC CUT/V BP/V P1491 ■ ☐
          TESTING

========== MONITOR ==========
 CMPS·RPM(REF)        1475rpm
 THRTL POS SEN        0.70V
 B/FUEL SCHDL         2.6msec
```

SEF256V



```
■ VC CUT/V BP/V P1491 ■ ☐
         COMPLETED



     SELF-DIAG RESULTS
```

SEF912U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

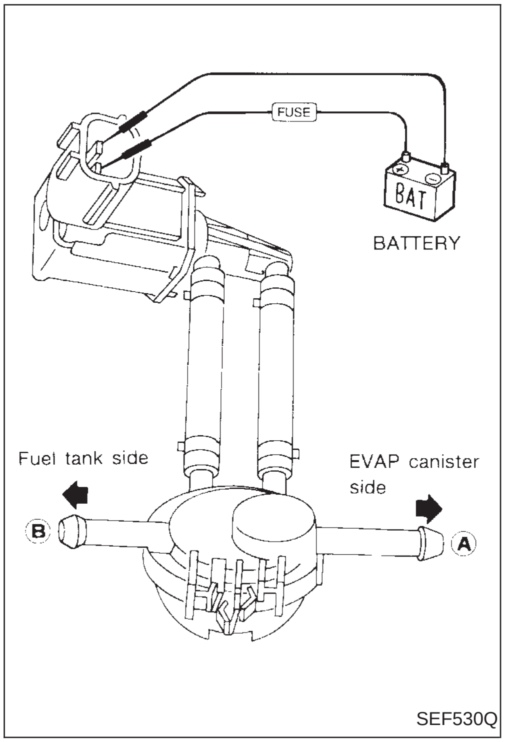
- **Always perform at a temperature of 5 to 30°C (41 to 86°F).**
- **This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.**

1) Turn ignition switch "ON".
2) Start engine and warm it up to normal operating temperature.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Start engine and let it idle for at least 1 minute.
5) Select "VC CUT/V BP/V P1491" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT.
6) Touch "START".
7) When the following conditions are met, "TESTING" will be displayed on the CONSULT screen. Maintain the conditions continuously until "TESTING" changes to "COMPLETED". (It will take at least 30 seconds.)

   CMPS·RPM (REF): 1,000 - 3,000 rpm (A/T)
   1,000 - 3,200 rpm (M/T)
   Selector lever: Suitable position
   Vehicle speed: 36 - 120 km/h (22 - 75 MPH)
   B/FUEL SCHDL: Less than 4.5 msec

   If "TESTING" is not displayed after 5 minutes, retry from step 3).
8) Make sure that "OK" is displayed after touching "SELF-DIAG RESULTS". If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE", EC-405.

Vacuum Cut Valve Bypass Valve (Cont'd)



OR

OVERALL FUNCTION CHECK

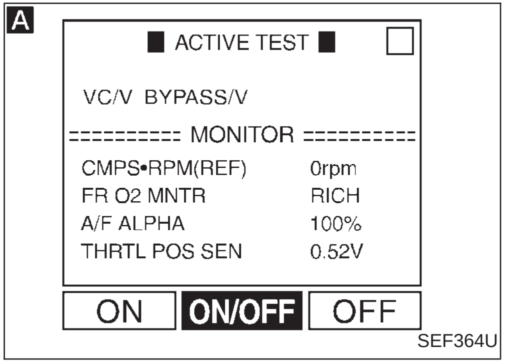
1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
2) Apply vacuum to port Ⓐ and check that there is no suction from port Ⓑ.
3) Apply vacuum to port Ⓑ and check that there is suction from port Ⓐ.
4) Blow air in port Ⓑ and check that there is a resistance to flow out of port Ⓐ.
5) Supply battery voltage to the terminal.
6) Blow air in port Ⓐ and check that air flows freely out of port Ⓑ.
7) Blow air in port Ⓑ and check that air flows freely out of port Ⓐ.
8) If NG, go to "DIAGNOSTIC PROCEDURE" on next page.

TROUBLE DIAGNOSIS FOR DTC P1491

Vacuum Cut Valve Bypass Valve (Cont'd)

DIAGNOSTIC PROCEDURE

A



■ ACTIVE TEST ■ ☐

VC/V BYPASS/V

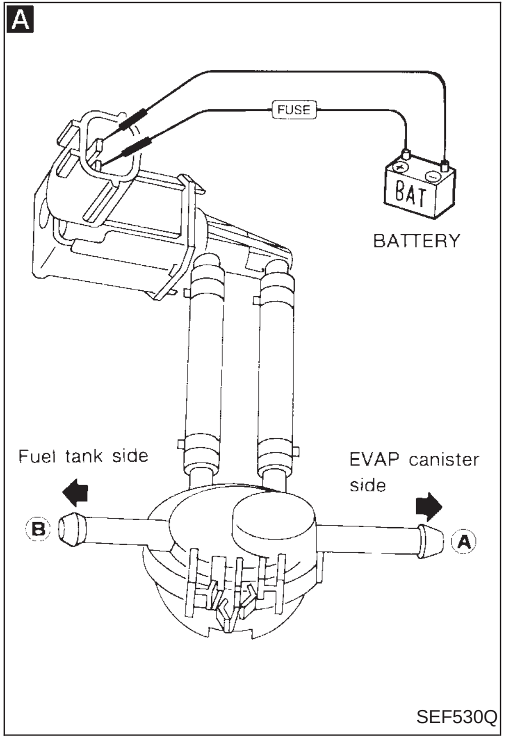
========== MONITOR ==========

CMPS•RPM(REF) 0rpm
FR O2 MNTR RICH
A/F ALPHA 100%
THRTL POS SEN 0.52V

ON | ON/OFF | OFF

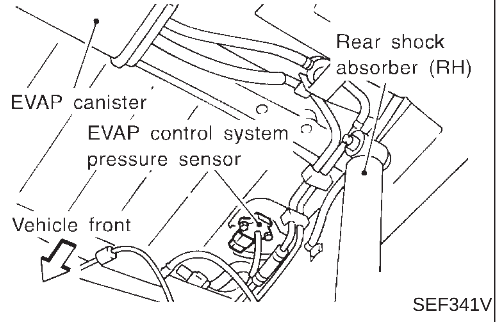
SEF364U

A



SEF530Q

B **View with spare tire removed**



SEF341V

INSPECTION START

↓

A

CHECK COMPONENT.

1. Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
2. Apply vacuum to port Ⓐ and check that there is no suction from port Ⓑ.
3. Apply vacuum to port Ⓑ and check that there is suction from port Ⓐ.
4. Blow air in port Ⓑ and check that there is a resistance to flow out of port Ⓐ.
5. Turn ignition switch "ON" and select "VC/V BYPASS/V" in "ACTIVE TEST" mode with CONSULT, and touch "ON".

OR

5. Supply battery voltage to the terminal.
6. Blow air in port Ⓐ and check that air flows freely out of port Ⓑ.
7. Blow air in port Ⓑ and check that air flows freely out of port Ⓐ.

OK → Check the following.
- EVAP purge line between EVAP canister and fuel tank for clogging or disconnection
- EVAP canister, refer to EC-23.
- EVAP purge port of fuel tank for clogging

If NG, repair or replace.

OK ↓

Go to **B** "CHECK COMPONENT (EVAP control system pressure sensor)" below.

NG ↓

Check bypass hoses for clogging.

NG → Repair or replace hoses.

OK ↓

B

CHECK COMPONENT
(Vacuum cut valve, vacuum cut valve bypass valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace malfunctioning parts.

OK ↓

B

CHECK COMPONENT
(EVAP control system pressure sensor).

1. Check for disconnection of hose connected to the EVAP control system pressure sensor.
2. Check sensor harness connector for water.
   Water should not exist.
   If OK, go to the following step.
3. Check EVAP control system pressure sensor.

Refer to "COMPONENT INSPECTION", EC-396.

NG → Repair or replace harness, connectors and/or replace EVAP control system pressure sensor.

OK ↓

CHECK COMPONENT
(EVAP canister vent control valve).
Refer to "COMPONENT INSPECTION", EC-396.

NG → Repair or replace EVAP canister vent control valve.

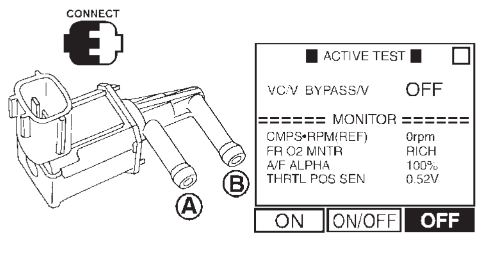
OK ↓

INSPECTION END

Vacuum Cut Valve Bypass Valve (Cont’d)

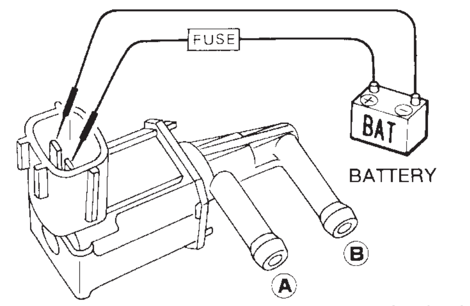
COMPONENT INSPECTION

Vacuum cut valve bypass valve

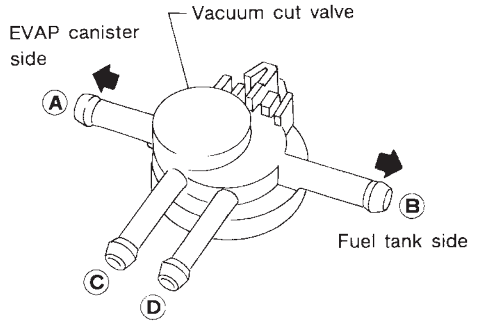


■ ACTIVE TEST ■ ☐
VC/V BYPASS/V OFF
====== MONITOR ======
CMPS•RPM(REF) 0rpm
FR O2 MNTR RICH
A/F ALPHA 100%
THRTL POS SEN 0.52V

SEF254V



SEF351Q



SEF379Q

Check air passage continuity.

Perform ‘‘VC/V BYPASS/V’’ in ‘‘ACTIVE TEST’’ mode.

Condition VC/V BYPASS/V	Air passage continuity between Ⓐ and Ⓑ
ON	Yes
OFF	No

OR

Condition	Air passage continuity between Ⓐ and Ⓑ
12V direct current supply between terminals	Yes
No supply	No

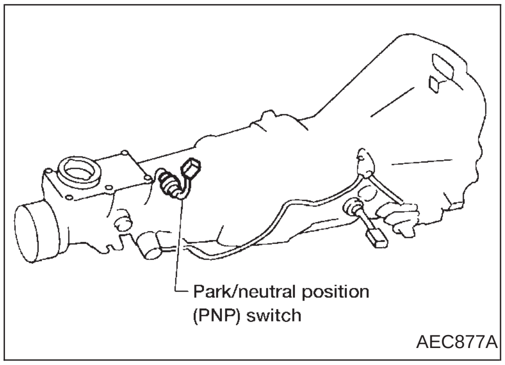
If NG or operation takes more than 1 second, replace vacuum cut valve bypass valve.

Vacuum cut valve

Check vacuum cut valve as follows:

1. Plug port Ⓒ and Ⓓ with fingers.
2. Apply vacuum to port Ⓐ and check that there is no suction from port Ⓑ.
3. Apply vacuum to port Ⓑ and check that there is suction from port Ⓐ.
4. Blow air in port Ⓑ and check that there is a resistance to flow out of port Ⓐ.
5. Open port Ⓒ and Ⓓ.
6. Blow air in port Ⓐ check that air flows freely out of port Ⓒ.
7. Blow air in port Ⓑ check that air flows freely out of port Ⓓ.

If NG, replace vacuum cut valve.



Park/Neutral Position (PNP) Switch

COMPONENT DESCRIPTION

When the gear position is ‘‘P’’ (A/T models only) or ‘‘N’’, park/neutral position (PNP) switch is ‘‘ON’’.
ECM detects the park/neutral position when continuity with ground exists.
For A/T models, the park/neutral position (PNP) switch assembly also includes a transmission range switch to detect selector lever position.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: ‘‘P’’ or ‘‘N’’	ON
		Except above	OFF

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
22	L/B	Park/neutral position (PNP) switch	Ignition switch ‘‘ON’’ └ Gear position is ‘‘N’’ or ‘‘P’’.	Approximately 0V
			Ignition switch ‘‘ON’’ └ Except the above gear position	Approximately 5V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1706 1003	● The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	● Harness or connectors (The park/neutral position (PNP) switch circuit is open or shorted.) ● Park/neutral position (PNP) switch

Park/Neutral Position (PNP) Switch (Cont’d)

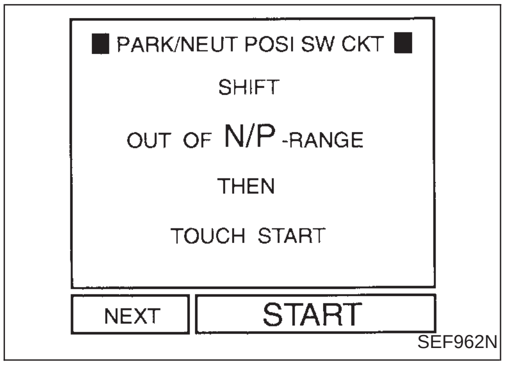
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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



■ PARK/NEUT POSI SW CKT ■

SHIFT

OUT OF N/P-RANGE

THEN

TOUCH START

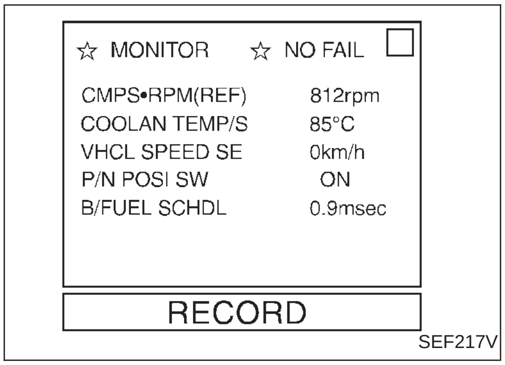
SEF962N

1) Turn ignition switch “ON’’.

2) Perform “PARK/NEUT POSI SW CKT’’ in “FUNCTION TEST’’ mode with CONSULT.
If NG, go to “DIAGNOSTIC PROCEDURE’’, EC-410.
If OK, go to following step.

OR

2) Select “P/N POSI SW’’ in “DATA MONITOR’’ mode with CONSULT. Then check the “P/N POSI SW’’ signal under the following conditions.



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF)	812rpm
COOLAN TEMP/S	85°C
VHCL SPEED SE	0km/h
P/N POSI SW	ON
B/FUEL SCHDL	0.9msec

SEF217V

Position (Selector lever)	Known good signal
“N’’ and “P’’ (A/T only) position	ON
Except the above position	OFF

If NG, go to “DIAGNOSTIC PROCEDURE’’, EC-410.
If OK, go to following step.

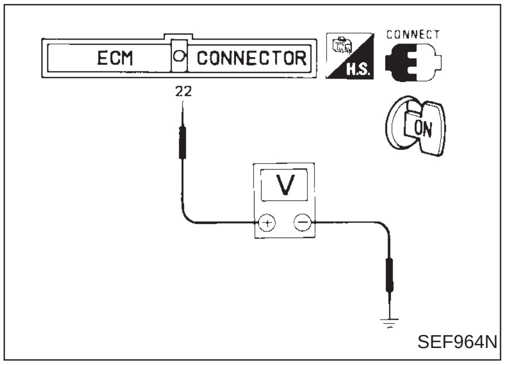
3) Select “DATA MONITOR’’ mode with CONSULT.

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

5) Maintain the following conditions for at least 60 consecutive seconds.
CMPS·RPM (REF): 1,600 - 2,700 rpm (A/T)
1,800 - 3,200 rpm (M/T)
COOLAN TEMP/S: More than 70°C (158°F)
B/FUEL SCHDL: 1 - 4.8 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-410.

OR



SEF964N

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

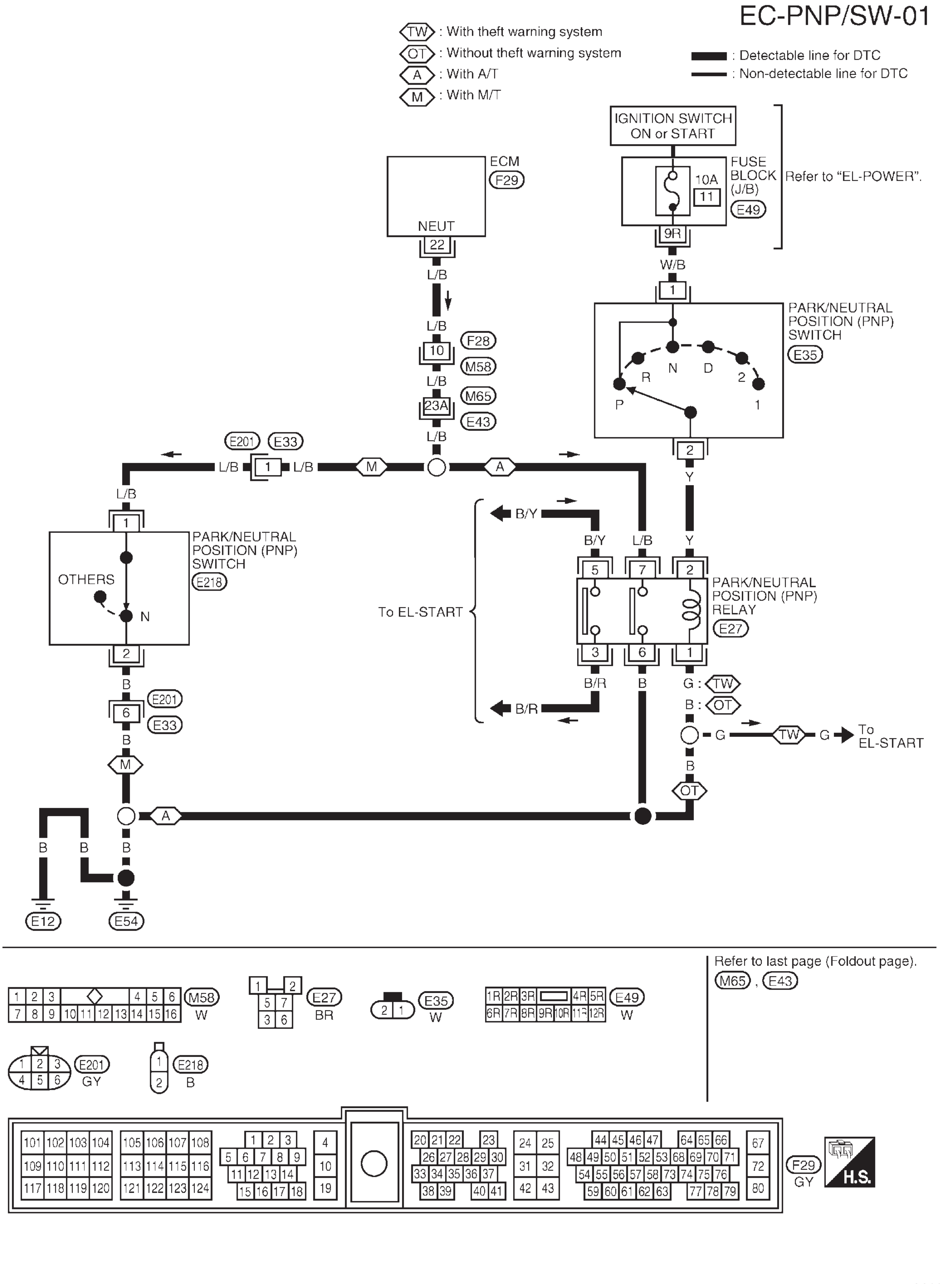
1) Turn ignition switch “ON’’.

2) Check voltage between ECM terminal ㉒ and body ground under the following conditions.

Condition (Gear position)	Voltage (V) (Known good data)
“P’’ (A/T only) and “N’’ position	Approx. 0
Except the above position	Approx. 5

3) If NG, go to “DIAGNOSTIC PROCEDURE’’, EC-410.

Park/Neutral Position (PNP) Switch (Cont'd)

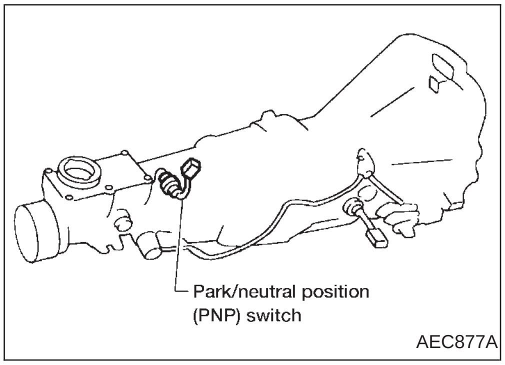


AEC863A

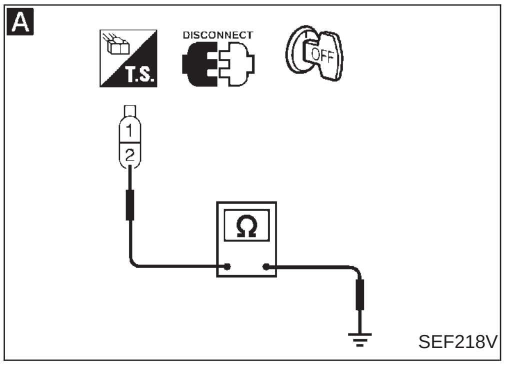
Park/Neutral Position (PNP) Switch (Cont'd)

DIAGNOSTIC PROCEDURE

Park/neutral position (PNP) switch (M/T models)



INSPECTION START



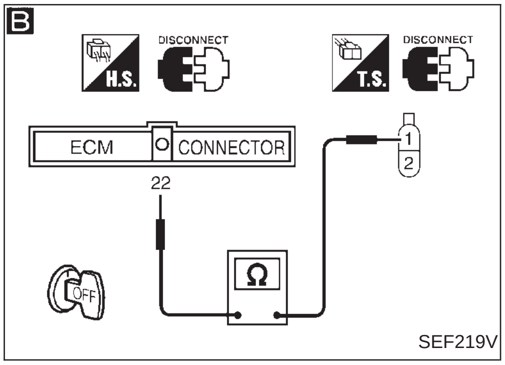
A

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect park/neutral position (PNP) switch harness connector.
3. Check harness continuity between terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short to power.

NG → Check the following.
- Harness connectors E33, E201
- Harness for open or short between park/neutral position (PNP) switch and body ground

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

OK ↓



B

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉒ and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors F28, M58
- Harness connectors M65, E43
- Harness connectors E33, E201
- Harness for open or short between ECM and park/neutral position (PNP) switch

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

OK ↓

CHECK COMPONENT
(Park/neutral position (PNP) switch).
Refer to MT section

NG → Replace park/neutral position (PNP) switch.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

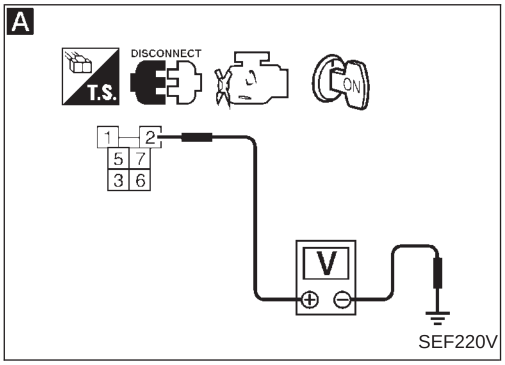
TROUBLE DIAGNOSIS FOR DTC P1706

Park/Neutral Position (PNP) Switch (Cont'd)

Park/neutral position (PNP) switch (A/T models)

INSPECTION START

A



SEF220V

CHECK POWER SUPPLY.
1. Turn ignition switch ''OFF''.
2. Disconnect park/neutral position (PNP) switch harness connector.
3. Turn ignition switch ''ON''.
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness for open or short between park/neutral position (PNP) switch and 10A fuse
- Harness for open or short between park/neutral position (PNP) relay and park/neutral position (PNP) switch

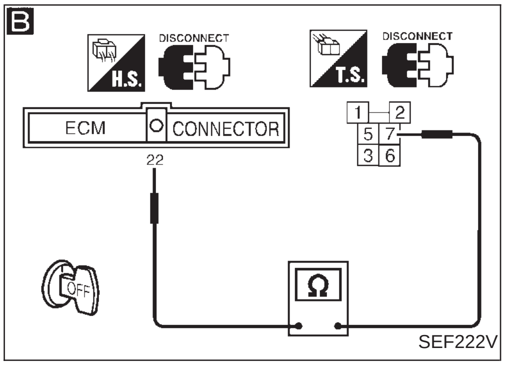
If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Park/neutral position (PNP) switch).
Refer to AT section.
If NG, replace park/neutral position (PNP) switch.

OK ↓

B



SEF222V

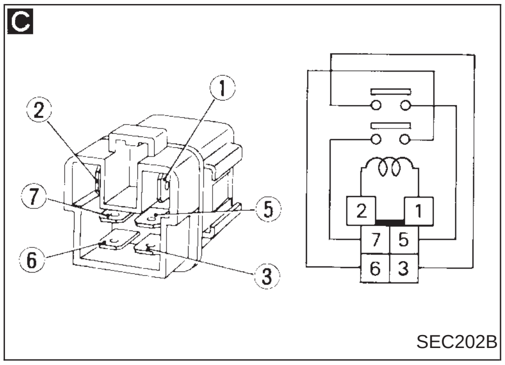
CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉒ and park/neutral position (PNP) relay terminal ⑦.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors F28, M58
- Harness connectors M65, E43
- Harness for open or short between ECM and park/neutral position (PNP) relay

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

OK ↓

C



SEC202B

PARK/NEUTRAL POSITION (PNP) RELAY
1. Apply 12V direct current between park/neutral position (PNP) relay terminals ① and ②.
2. Check continuity between park/neutral position (PNP) relay terminals ③ and ⑤, ⑥ and ⑦.
   12V (① - ②) applied:
   Continuity should exist.
   No voltage applied:
   Continuity should not exist.

NG → Replace park/neutral position (PNP) relay.

OK ↓

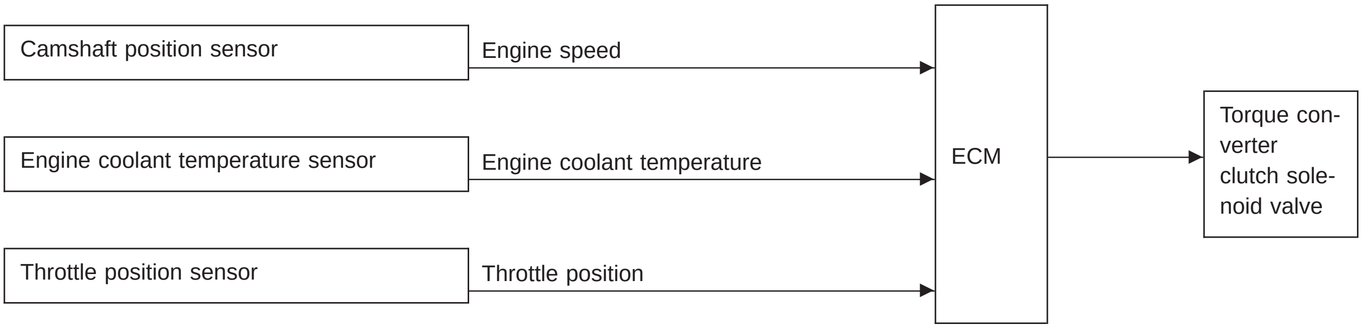
Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

↓

INSPECTION END

Torque Converter Clutch Solenoid Valve (Circuit)

SYSTEM DESCRIPTION



The ECM controls torque converter clutch solenoid valve to cancel the lock-up condition of A/T. When the solenoid valve is **turned on**, lock-up is **cancelled**. When the solenoid valve is turned off, A/T lock-up is operational.

Conditions for lock-up cancel:

Torque converter clutch solenoid valve is turned ‘‘ON’’ when;

- Throttle valve is fully closed (during idling or deceleration)
- Engine coolant temperature is below 40°C (104°F)
- Engine is stopped

Conditions for lock-up operation:

- Under 55 to 63 km/h (34 to 39 MPH) (2/8 throttle on flat road), lock-up does not operate even when the torque converter clutch solenoid valve is ‘‘OFF’’.
- Over 58 to 66 km/h (36 to 41 MPH) (2/8 throttle on flat road), lock-up should operate because the torque converter clutch solenoid valve is ‘‘OFF’’.

To confirm vehicle lock-up, the torque converter clutch solenoid valve must be in operation (‘‘ON’’ during idle and deceleration, and ‘‘OFF’’ during acceleration) and engine speed should drop.

When the accelerator pedal is depressed (less than 2/8) in lock-up, the engine speed should not change abruptly. If there is a big jump in engine speed, there will be no lock-up.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
TCC SOL/V	● Engine: After warming up	Idle	ON
		2,000 rpm	OFF

ECM TERMINALS AND REFERENCE VALUE

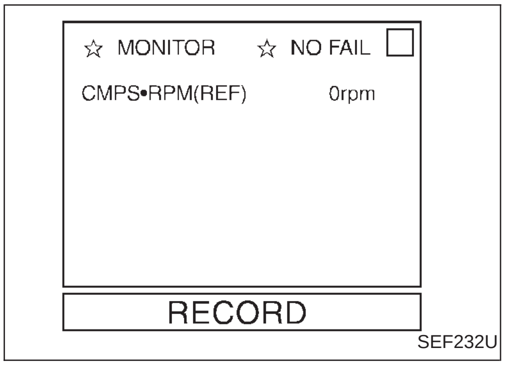
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
115	L/Y	Torque converter clutch solenoid valve (A/T models only)	Engine is running. Idle speed	Approximately 1V
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1775 0904	● An excessively low voltage from the solenoid is sent to ECM.	● Harness or connectors (The circuit is open or shorted.) ● Torque converter clutch solenoid valve



☆ MONITOR ☆ NO FAIL ☐

CMPS•RPM(REF) 0rpm

RECORD

SEF232U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

NOTE:

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

1) Turn ignition switch "ON''.
2) Select "DATA MONITOR'' mode with CONSULT.
3) Wait at least 5 seconds.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-415.

OR

GST

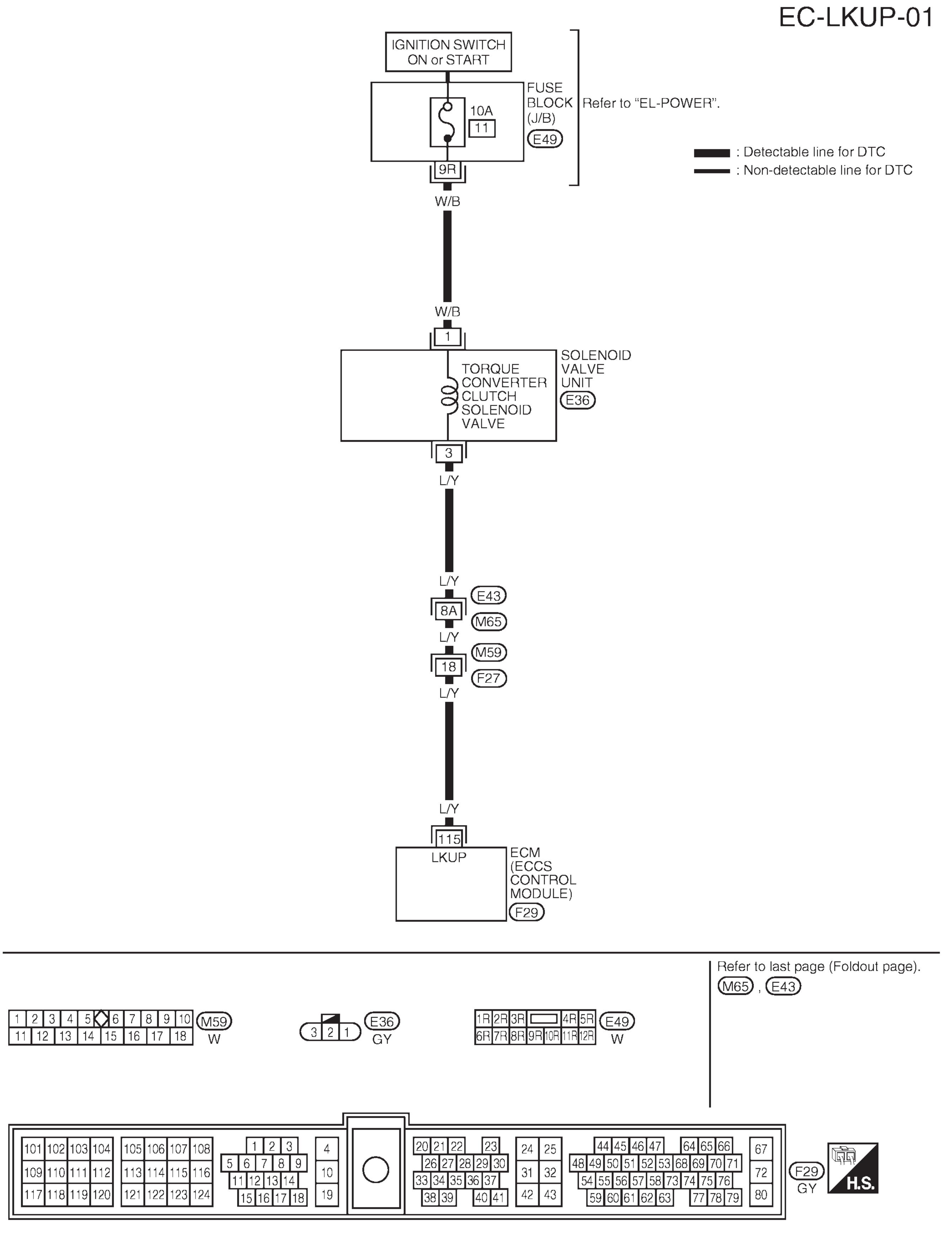
1) Turn ignition switch "ON'' and wait at least 5 seconds.
2) Select "MODE 7" with GST.
3) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-415.

OR

NO TOOLS

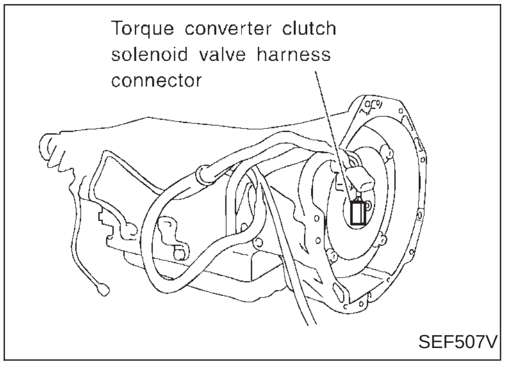
1) Turn ignition switch "ON'' and wait at least 5 seconds.
2) Turn ignition switch "OFF'', wait at least 5 seconds and then turn "ON''.
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
4) If 1st trip DTC is detected, go to "DIAGNOSTIC PROCEDURE", EC-415.

Torque Converter Clutch Solenoid Valve (Circuit) (Cont'd)



AEC546A

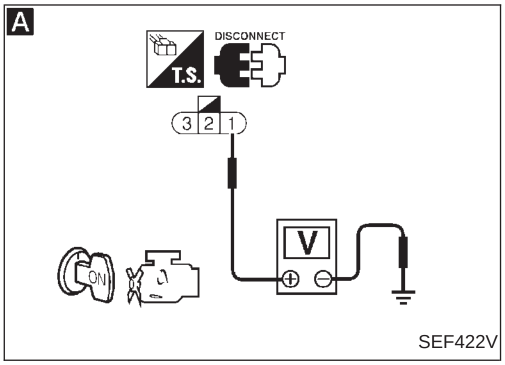
Torque Converter Clutch Solenoid Valve (Circuit) (Cont'd)



SEF507V

DIAGNOSTIC PROCEDURE

INSPECTION START



SEF422V

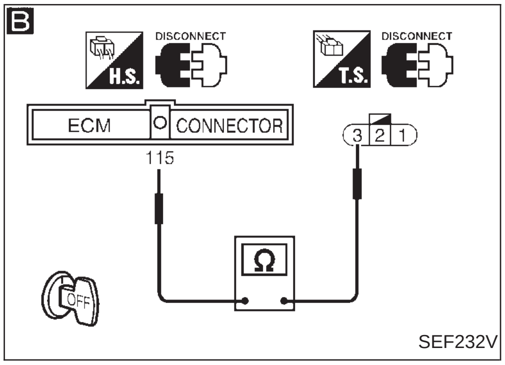
A

CHECK POWER SUPPLY.
1. Disconnect torque converter clutch solenoid valve harness connector.
2. Turn ignition switch ''ON''.
3. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the followings.
- 10A fuse
- Harness continuity between torque converter clutch solenoid valve and 10A fuse

If NG, repair harness or connectors.

OK



SEF232V

B

CHECK OUTPUT SIGNAL CIRCUIT.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (115) and terminal ③.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the followings.
- Harness connectors (E43), (M65)
- Harness connectors (M59), (F27)
- Harness continuity between torque converter clutch solenoid valve and ECM

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

OK

CHECK COMPONENT
(Torque converter clutch solenoid valve).
Refer to ''COMPONENT INSPECTION'' below.

NG → Replace torque converter clutch solenoid valve.

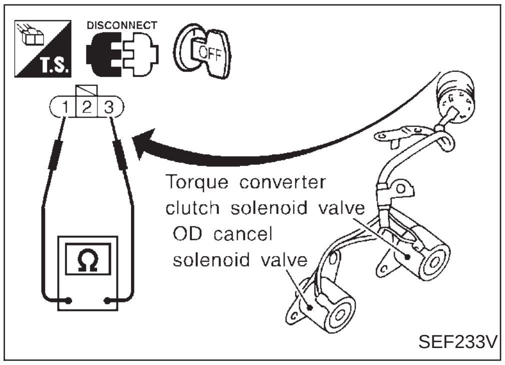
OK

Perform ''TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT'', EC-98.

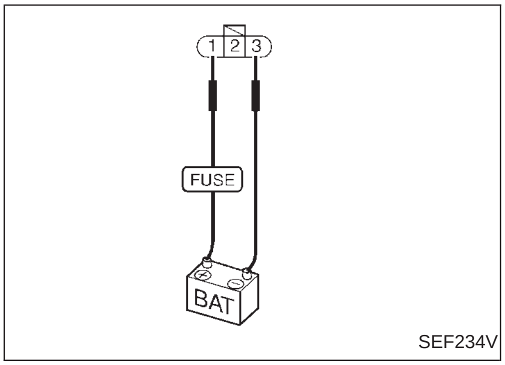
INSPECTION END

COMPONENT INSPECTION

Torque converter clutch solenoid valve



SEF233V

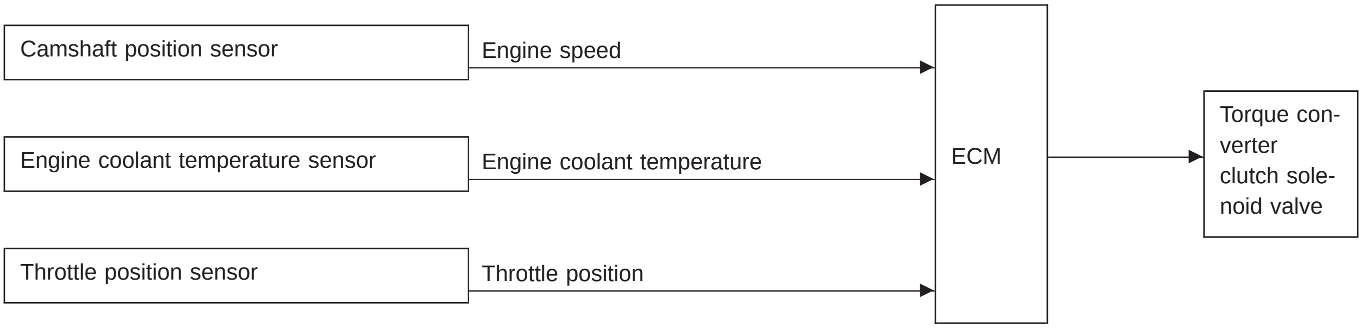


SEF234V

1. Check resistance between torque converter clutch solenoid valve terminals ① and ③.
   Resistance: Approximately 25Ω [at 25°C (77°F)]
2. Remove torque converter clutch solenoid valve. Refer to ''ON-VEHICLE SERVICE'' in AT section.
3. Supply the solenoid valve terminals ① and ③ with battery voltage and check the solenoid valve operation.
   Torque converter clutch solenoid valve should be operated.
4. If NG, replace torque converter clutch solenoid valve.

Torque Converter Clutch Solenoid Valve

SYSTEM DESCRIPTION



The ECM controls torque converter clutch solenoid valve to cancel the lock-up condition of A/T. When the solenoid valve is **turned on**, lock-up is **cancelled**. When the solenoid valve is turned off, A/T lock-up is operational.

Conditions for lock-up cancel:

Torque converter clutch solenoid valve is turned ‘‘ON’’ when;

- Throttle valve is fully closed (during idling or deceleration)
- Engine coolant temperature is below 40°C (104°F)
- Engine is stopped

Conditions for lock-up operation:

- Under 55 to 63 km/h (34 to 39 MPH) (2/8 throttle on flat road), lock-up does not operate even when the torque converter clutch solenoid valve is ‘‘OFF’’.
- Over 58 to 66 km/h (36 to 41 MPH) (2/8 throttle on flat road), lock-up should operate because the torque converter clutch solenoid valve is ‘‘OFF’’.

To confirm vehicle lock-up, the torque converter clutch solenoid valve must be in operation (‘‘ON’’ during idle and deceleration, and ‘‘OFF’’ during acceleration) and engine speed should drop.

When the accelerator pedal is depressed (less than 2/8) in lock-up, the engine speed should not change abruptly. If there is a big jump in engine speed, there will be no lock-up.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
TCC SOL/V	● Engine: After warming up	Idle	ON
		2,000 rpm	OFF

ECM TERMINALS AND REFERENCE VALUE

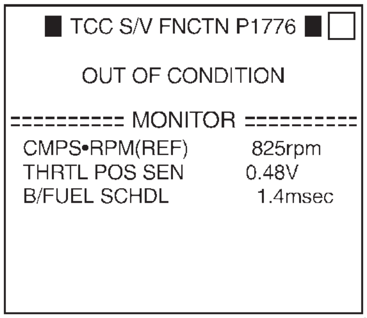
Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
115	L/Y	Torque converter clutch solenoid valve (A/T models only)	Engine is running. Idle speed	Approximately 1V
			Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)

Torque Converter Clutch Solenoid Valve (Cont’d)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1776 0513	● A/T torque converter slip is occurred in lock-up condition.	● Torque converter clutch solenoid valve ● A/T hydraulic control system ● Torque converter

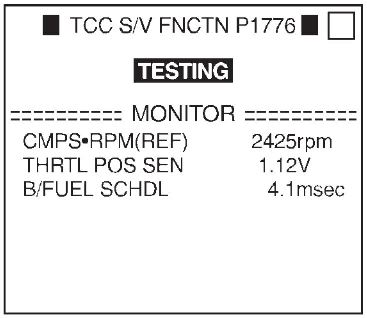


■ TCC S/V FNCTN P1776 ■ ☐

OUT OF CONDITION

```
========== MONITOR ==========
CMPS•RPM(REF)        825rpm
THRTL POS SEN        0.48V
B/FUEL SCHDL          1.4msec
```

SEF859U

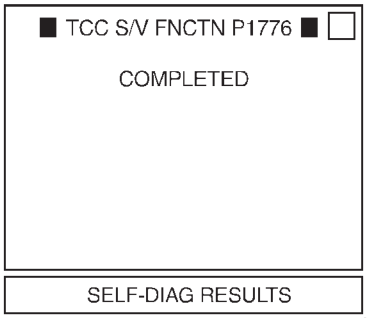


■ TCC S/V FNCTN P1776 ■ ☐

TESTING

```
========== MONITOR ==========
CMPS•RPM(REF)        2425rpm
THRTL POS SEN         1.12V
B/FUEL SCHDL           4.1msec
```

SEF235V



■ TCC S/V FNCTN P1776 ■ ☐

COMPLETED

SELF-DIAG RESULTS

SEF861U

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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

TESTING CONDITION:

Always perform at a temperature above −10°C (14°F).

1) Start engine and warm it up to normal operating temperature.
2) Turn ignition switch “OFF’’ and wait at least 5 seconds.
3) Start engine.
4) Select “TCC S/V FNCTN P1776’’ of “A/T (TCC S/V)’’ in “DTC WORK SUPPORT’’ mode with CONSULT.
5) Touch “START’’.
6) When the following conditions are met, “TESTING’’ will be displayed on the CONSULT screen. Maintain the conditions continuously until “TESTING’’ changes to “COMPLETED’’. (It will take approximately 20 seconds.)

   Selector lever: D (OD “ON’’)
   Vehicle speed: 76 - 100 km/h (47 - 62 MPH)
   CMPS·RPM (REF): Less than 2,150 rpm (Single cab model)
   Less than 2,300 rpm (King cab model)
   B/FUEL SCHDL: 2.5 - 5 msec
   THRTL POS SEN: Less than 1.3V

   If “TESTING’’ is not displayed after 5 minutes, retry from step 2).
7) Make sure that “OK’’ is displayed after touching “SELF-DIAG RESULTS’’.
   If “NG’’ is displayed, refer to “DIAGNOSTIC PROCEDURE’’, EC-419.

OR

1) Start engine and warm it up to normal operating temperature.
2) Perform test drive in “D’’ position (OD “ON’’) at least 20 consecutive seconds under the following conditions.

Torque Converter Clutch Solenoid Valve (Cont'd)

Engine speed: Less than 2,150 rpm (Single cab model)
Less than 2,300 rpm (King cab model)
Vehicle speed: 76 - 100 km/h (47 - 62 MPH)

3) Select MODE 7 with GST.
4) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'' on next page.

OR

NO TOOLS

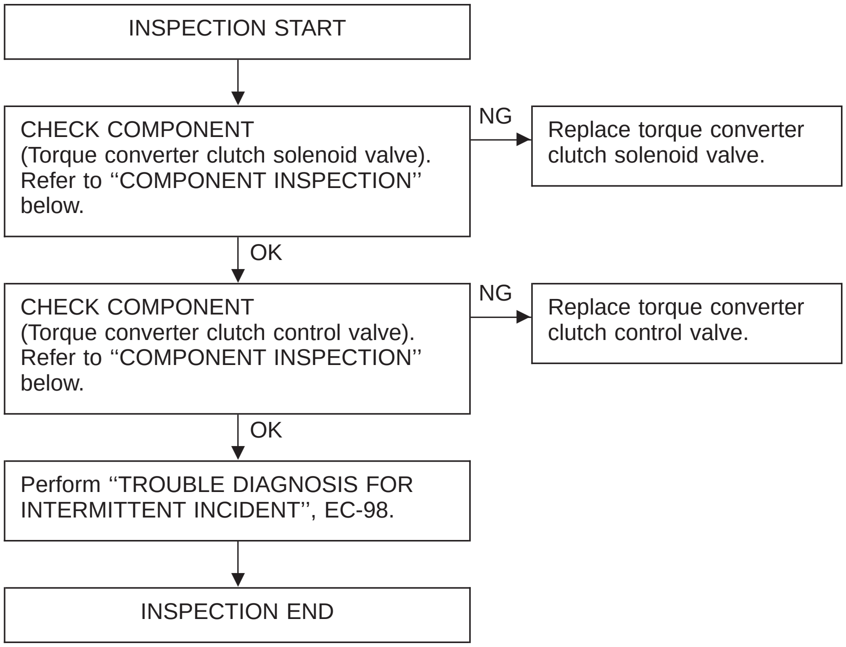
1) Start engine and warm it up to normal operating temperature.
2) Perform test drive in ''D'' position (OD ''ON'') at least 20 consecutive seconds under the following conditions.

Engine speed: Less than 2,150 rpm (Single cab model)
Less than 2,300 rpm (King cab model)
Vehicle speed: 76 - 100 km/h (47 - 62 MPH)

3) Stop the vehicle, turn ignition switch ''OFF'', wait at least 5 seconds and then turn ''ON''.
4) Perform ''Diagnostic Test Mode II (Self-diagnostic results)'' with ECM.
5) If 1st trip DTC is detected, go to ''DIAGNOSTIC PROCEDURE'' on next page.

Torque Converter Clutch Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

CHECK COMPONENT
(Torque converter clutch solenoid valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace torque converter clutch solenoid valve.

OK

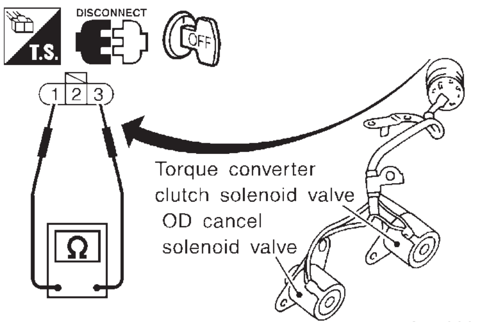
CHECK COMPONENT
(Torque converter clutch control valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace torque converter clutch control valve.

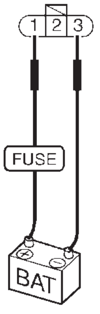
OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

INSPECTION END



SEF233V

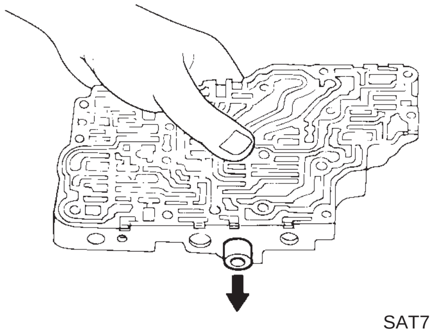


SEF234V

COMPONENT INSPECTION

Torque converter clutch solenoid valve

1. Check resistance between torque converter clutch solenoid valve terminals ① and ③.
   Resistance: Approximately 25Ω [at 25°C (77°F)]
2. Remove torque converter clutch solenoid valve. Refer to "ON-VEHICLE SERVICE" in AT section.
3. Supply the solenoid valve terminals ① and ③ with battery voltage and check the solenoid valve operation.
   Torque converter clutch solenoid valve should be operated.
4. If NG, replace torque converter clutch solenoid valve.



SAT740H

Torque converter clutch control valve

1. Disassemble torque converter clutch control valve assembly. Refer to "REPAIR FOR COMPONENT PARTS" on AT section.
2. Check torque converter clutch control valve.
   - Valve, and sleeve slide along valve bore under their own weight.
   - Valve, and sleeve are free from burrs, dents and scratches.
   - Control valve springs are free from damage, deformation and fatigue.
   - Hydraulic line is free from obstacles.
3. If NG, replace torque converter clutch control valve.

Overheat

ON BOARD DIAGNOSIS LOGIC

If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

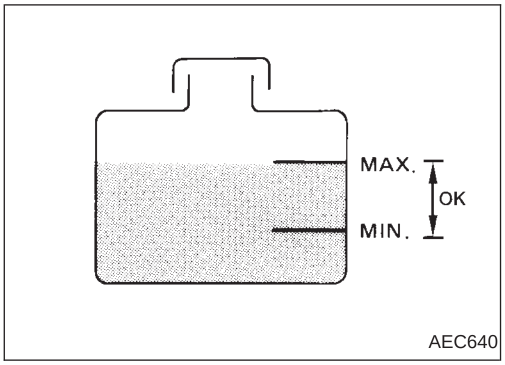
Diagnostic trouble code No.	Malfunction is detected when ...	Check Items (Possible Cause)
OVERHEAT 0208	● Engine coolant temperature reaches an abnormally high temperature.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to ‘‘MAIN 12 CAUSES OF OVERHEATING’’, EC-422.

CAUTION:

When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section (‘‘Changing Engine Coolant’’, ‘‘ENGINE MAINTENANCE’’). Also, replace the engine oil.

a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section (‘‘Anti-freeze Coolant Mixture Ratio’’, ‘‘RECOMMENDED FLUIDS AND LUBRICANTS’’).

b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.



OVERALL FUNCTION CHECK

WARNING:

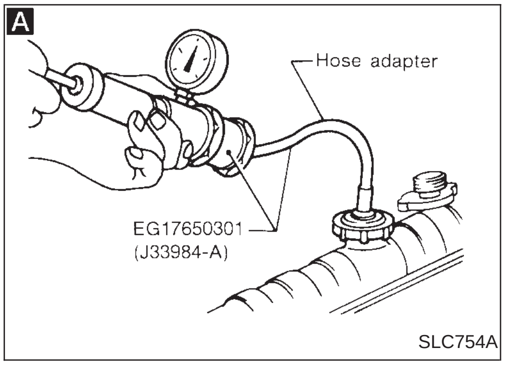
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

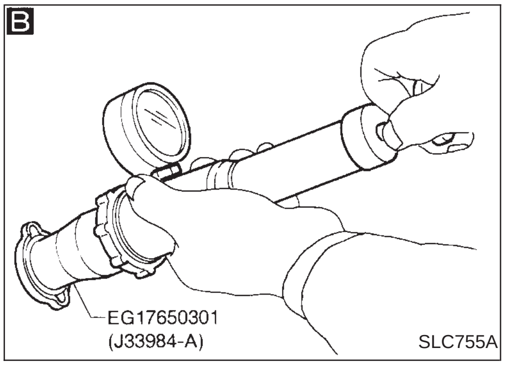
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

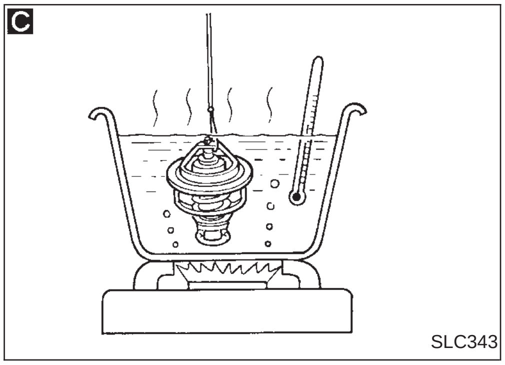
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to ‘‘DIAGNOSTIC PROCEDURE’’ on next page.

Overheat (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

↓ A

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)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

NG → Check the following for leak.
- Hose
- Radiator
- Water pump

Refer to LC section (''Water Pump'').

OK ↓ B

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi)

NG → Replace radiator cap.

OK ↓ C

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   76.5°C (170°F) [standard]
   Valve lift:
   More than 8 mm/90°C (0.31 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section (''Thermostat'').

NG → Replace thermostat

OK ↓

Check engine coolant temperature sensor. Refer to ''COMPONENT INSPECTION'', EC-130.

NG → Replace engine coolant temperature sensor.

↓

If the cause can not be isolated, go to ''MAIN 12 CAUSES OF OVERHEATING'' on next page.

↓

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warm up engine. Run the vehicle for at least 20 minutes. Pay attention to engine coolant temperature gauge on the instrument panel. If the reading shows an abnormally high temperature, another part may be malfunctioning.
2. Stop vehicle and let engine idle. Check the intake and exhaust systems for leaks by listening for noise or visually inspecting the components.
3. Allow engine to cool and visually check for oil and coolant leaks. Then, perform ''OVERALL FUNCTION CHECK''.

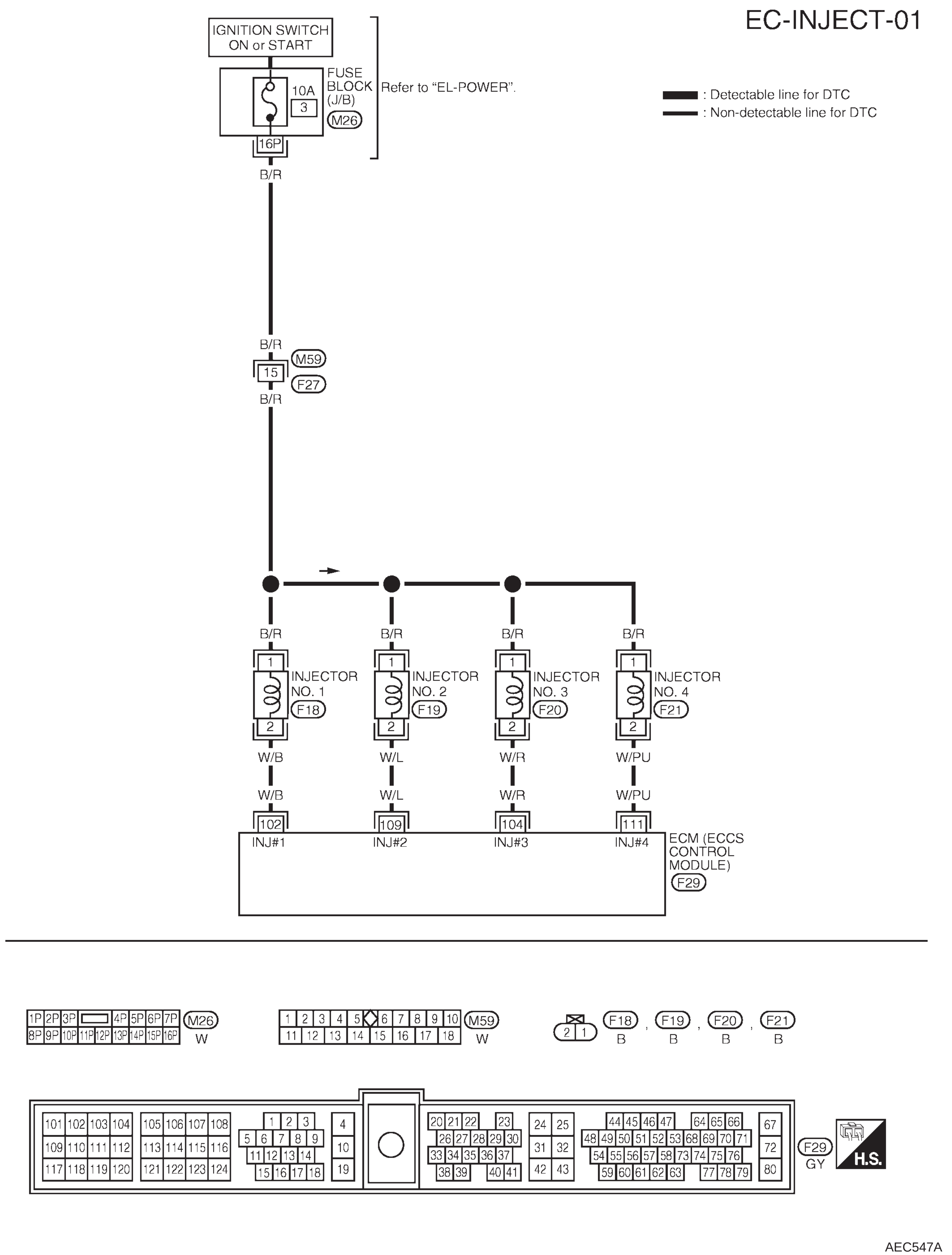
Overheat (Cont'd)

MAIN 12 CAUSES OF OVERHEATING

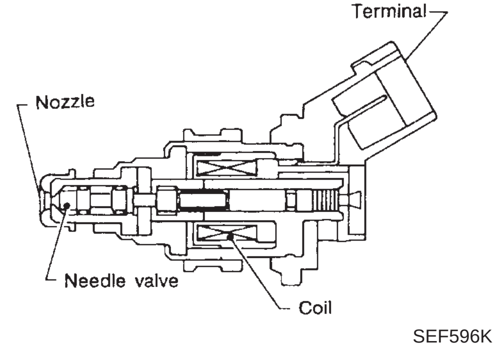
Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See ''RECOMMENDED FLUIDS AND LUBRICANTS'' in MA section.
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See ''Changing Engine Coolant'', ''ENGINE MAINTENANCE'' in MA section.
	4	● Radiator cap	● Pressure tester	78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See ''System Check'', ''ENGINE COOLING SYSTEM'' in LC section.
ON*2	5	● Coolant leaks	● Visual	No leaks	See ''System Check'', ''ENGINE COOLING SYSTEM'' in LC section.
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See ''Thermostat'' and ''Radiator'', ''ENGINE COOLING SYSTEM'' in LC section.
ON*1	7	● Cooling fan	● CONSULT	Operating	See ''Cooling Fan'', ''ENGINE COOLING SYSTEM'' in LC section.
OFF	8	● Combustion gas leak	● Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	● Coolant temperature gauge	● Visual	Gauge less than 3/4 when driving	—
		● Coolant overflow to reservoir tank	● Visual	No overflow during driving and idling	See ''Changing Engine Coolant'', ''ENGINE MAINTENANCE'' in MA section.
OFF*4	10	● Coolant return from reservoir tank to radiator	● Visual	Should be initial level in reservoir tank	See ''ENGINE MAINTENANCE'' in MA section.
OFF	11	● Cylinder head	● Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	See ''Inspection'', ''CYLINDER HEAD'' in EM section.
	12	● Cylinder block and pistons	● Visual	No scuffing on cylinder walls or piston	See ''Inspection'', ''CYLINDER BLOCK'' in EM section.

*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to ''OVERHEATING CAUSE ANALYSIS'' in LC section.

Injector


EC-INJECT-01
IGNITION SWITCH ON or START
FUSE BLOCK (J/B)
10A
3
M26
16P
Refer to "EL-POWER".
: Detectable line for DTC
: Non-detectable line for DTC
B/R
M59
15
F27
INJECTOR NO. 1
F18
INJECTOR NO. 2
F19
INJECTOR NO. 3
F20
INJECTOR NO. 4
F21
1
2
W/B
W/L
W/R
W/PU
102
109
104
111
INJ#1
INJ#2
INJ#3
INJ#4
ECM (ECCS CONTROL MODULE)
F29
W
B
GY
H.S.
AEC547A

Injector (Cont’d)

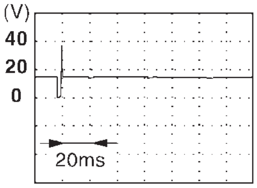
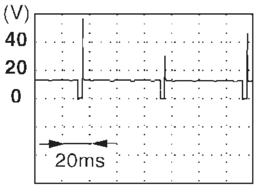


COMPONENT DESCRIPTION

The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends upon the injection pulse duration. Pulse duration is the length of time the injector remains open. The ECM controls the injection pulse duration based on engine fuel needs.

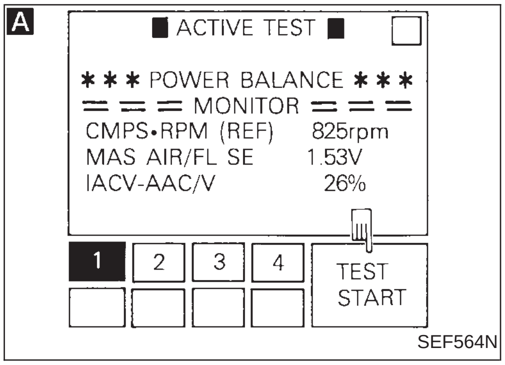
ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	W/B	Injector No. 1	Engine is running. (Warm-up condition) Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF204T
104	W/R	Injector No. 3		
109	W/L	Injector No. 2	Engine is running. (Warm-up condition) Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF205T
111	W/PU	Injector No. 4		

Injector (Cont'd)

DIAGNOSTIC PROCEDURE



■ ACTIVE TEST ■

*** POWER BALANCE ***

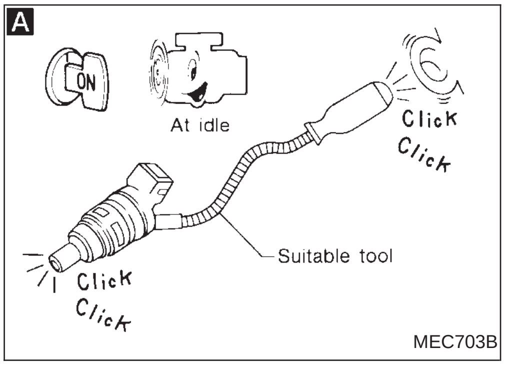
=== MONITOR ===

CMPS•RPM (REF) 825rpm

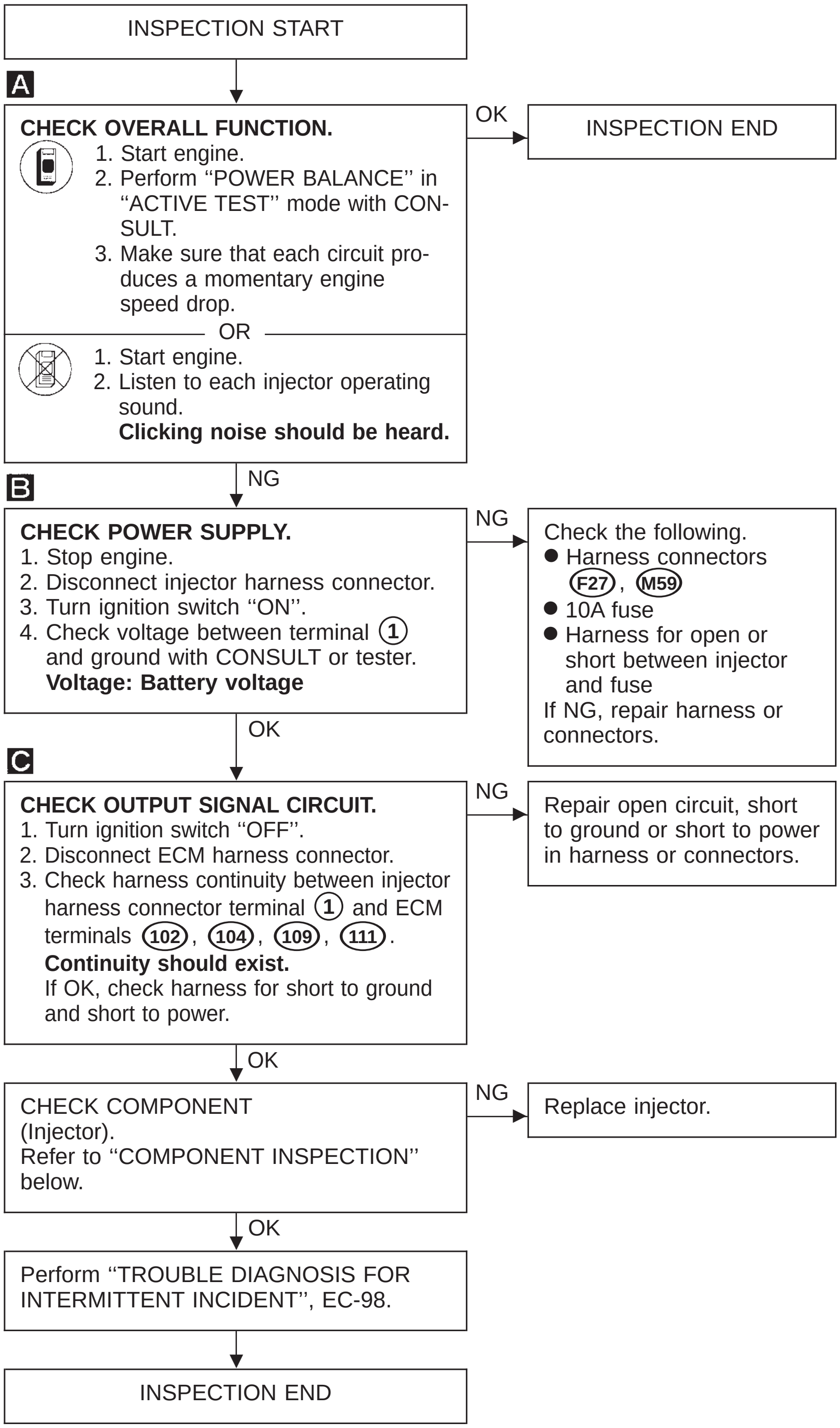
MAS AIR/FL SE 1.53V

IACV-AAC/V 26%

SEF564N



MEC703B



INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

OR

1. Start engine.
2. Listen to each injector operating sound.
   Clicking noise should be heard.

OK → INSPECTION END

NG ↓

B

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F27), (M59)
- 10A fuse
- Harness for open or short between injector and fuse

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal ① and ECM terminals (102), (104), (109), (111).
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

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

OK ↓

CHECK COMPONENT (Injector).
Refer to "COMPONENT INSPECTION" below.

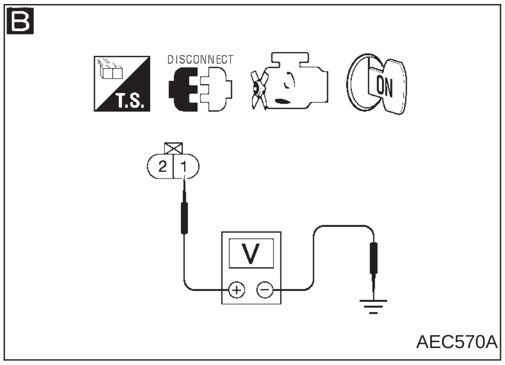
NG → Replace injector.

OK ↓

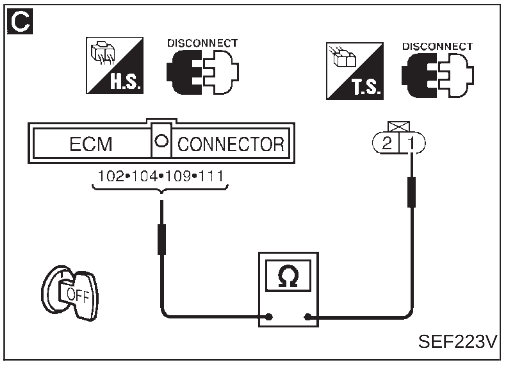
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END



AEC570A

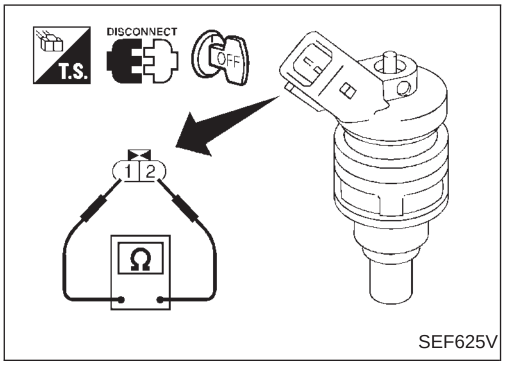


SEF223V

COMPONENT INSPECTION

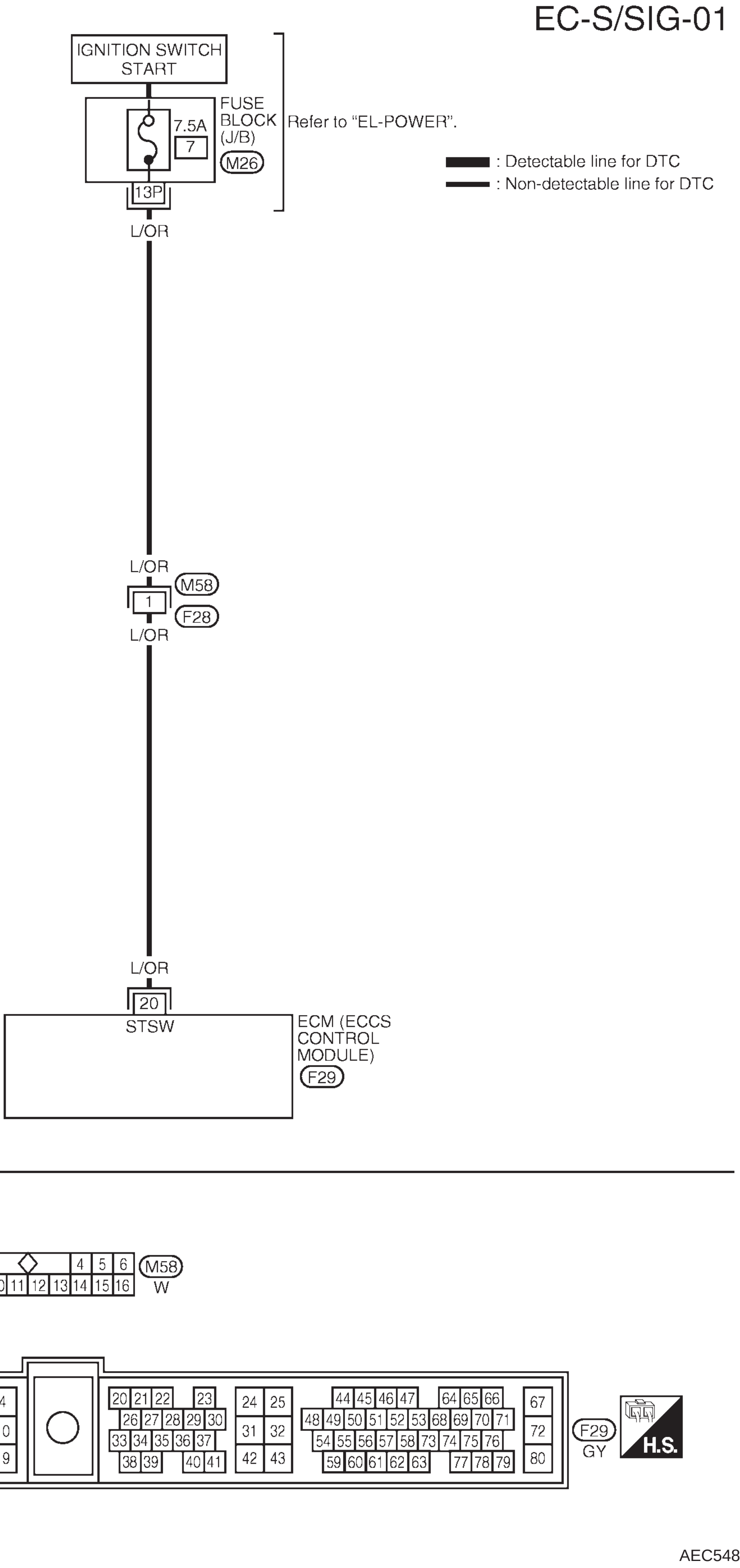
Injector

1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω [at 25°C (77°F)]
   If NG, replace injector.



SEF625V

Start Signal



Start Signal (Cont’d)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	● Ignition switch: ON → START → ON	OFF → ON → OFF

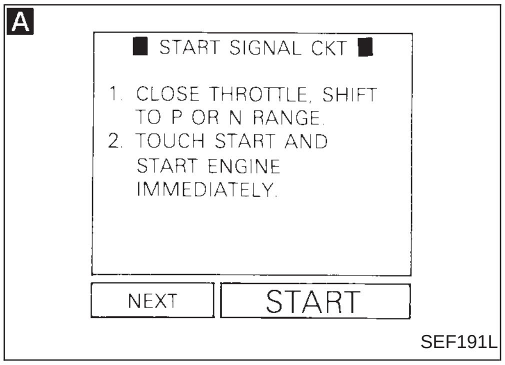
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	L/OR	Start signal	Ignition switch ‘‘ON’’	Approximately 0V
			Ignition switch ‘‘START’’	BATTERY VOLTAGE (11 - 14V)

Start Signal (Cont'd)

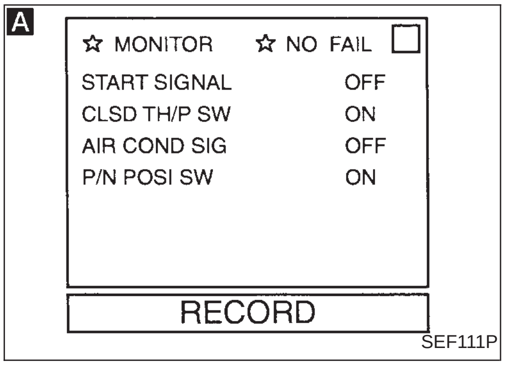
DIAGNOSTIC PROCEDURE



■ START SIGNAL CKT ■

1. CLOSE THROTTLE, SHIFT TO P OR N RANGE.
2. TOUCH START AND START ENGINE IMMEDIATELY.

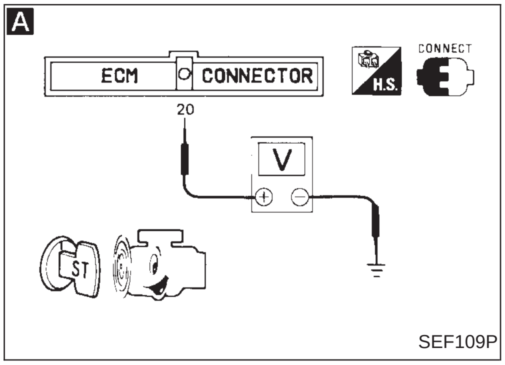
SEF191L



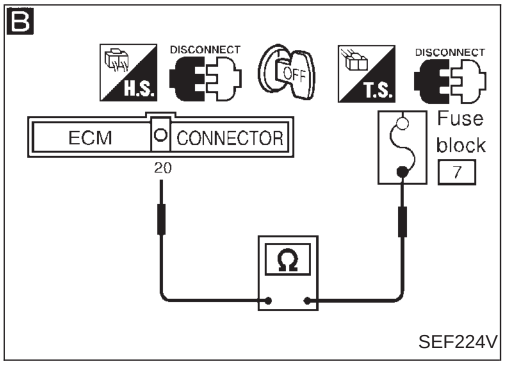
☆ MONITOR ☆ NO FAIL ☐

START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

SEF111P



SEF109P



SEF224V

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal ⑳ and ground.

Voltage:

Ignition switch "START"

Battery voltage

Except above

Approximately 0V

OK → INSPECTION END

NG ↓

Check if 7.5A fuse is OK.

NG → Replace 7.5A fuse.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and 7.5A fuse.
3. Check harness continuity between ECM terminal ⑳ and fuse block.

   Continuity should exist.

   If OK, check harness for short to ground and short to power.

NG → Check the following.

- Harness connectors M58, F28
- Harness for open or short between ECM and fuse block

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK ↓

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

GI
MA
EM
LC
EC
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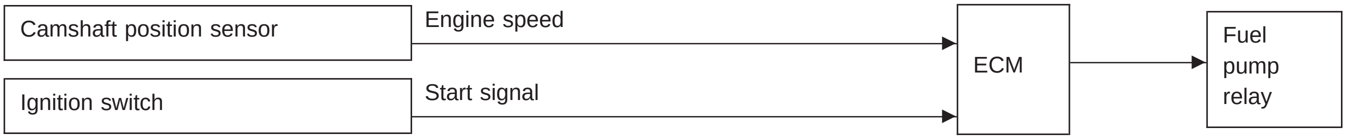
EL
IDX

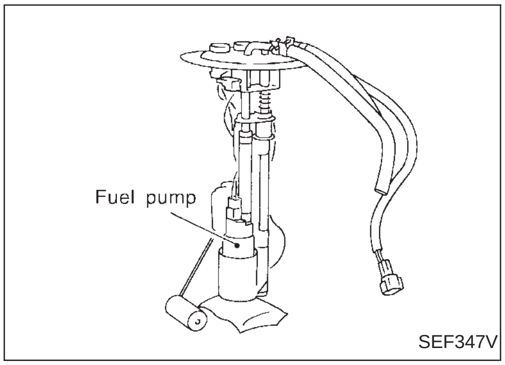
Fuel Pump

SYSTEM DESCRIPTION



The ECM activates the fuel pump for several seconds after the ignition switch is turned on to improve engine startability. If the ECM receives a 180° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to perform. If the 180° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
Except as shown above	Stops



SEF347V

COMPONENT DESCRIPTION

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

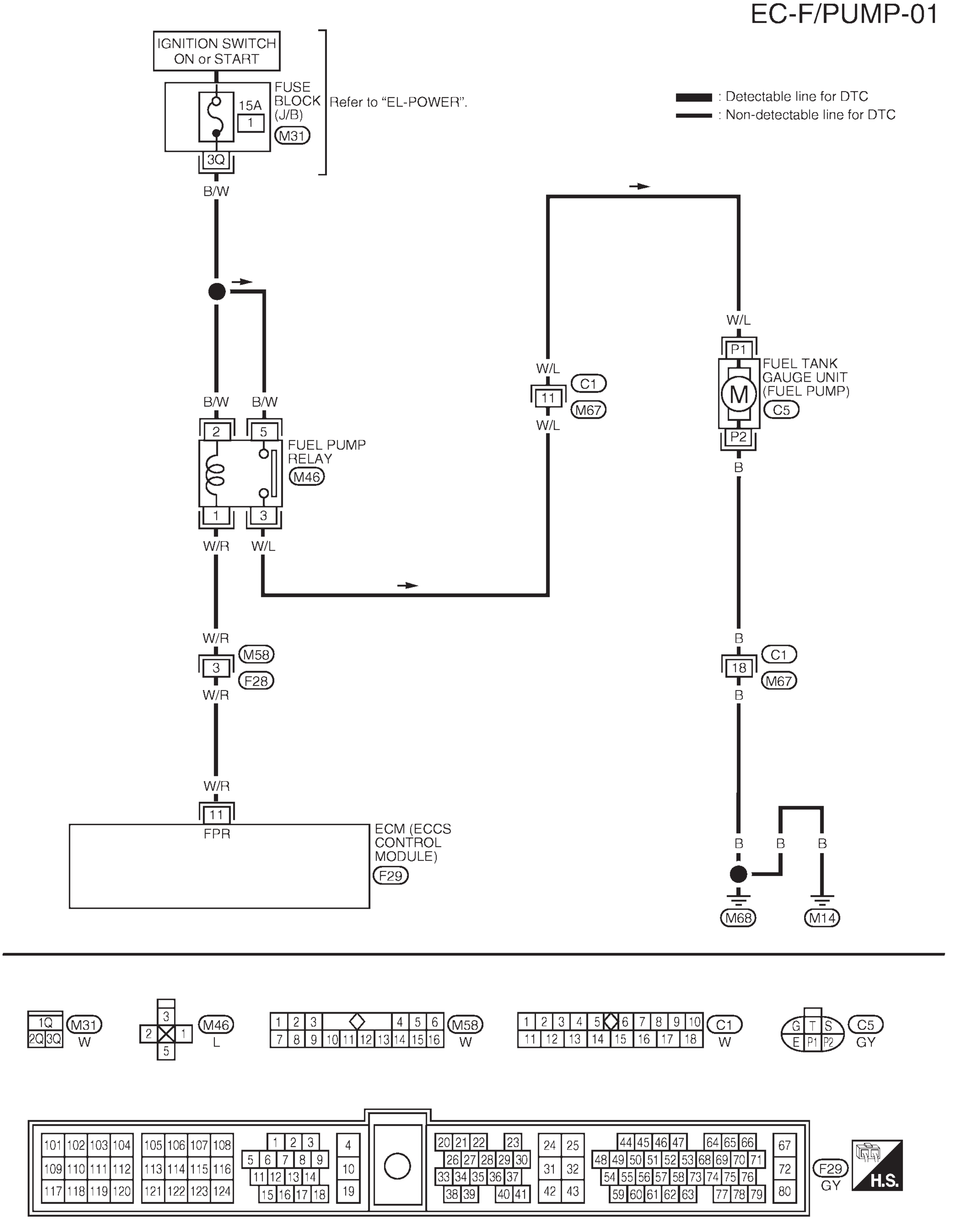
MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking	ON
	Except as shown above	OFF

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	W/R	Fuel pump relay	Ignition switch "ON" For 5 seconds after turning ignition switch "ON" Engine is running.	0 - 1V
			Ignition switch "ON" More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

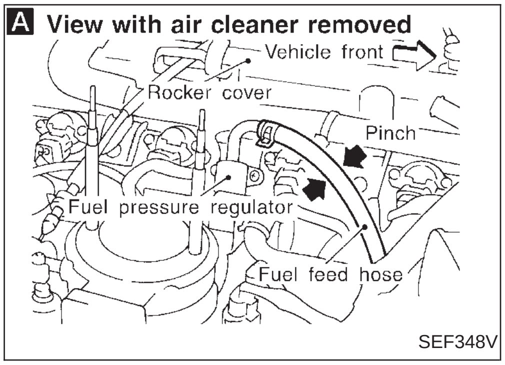
Fuel Pump (Cont’d)



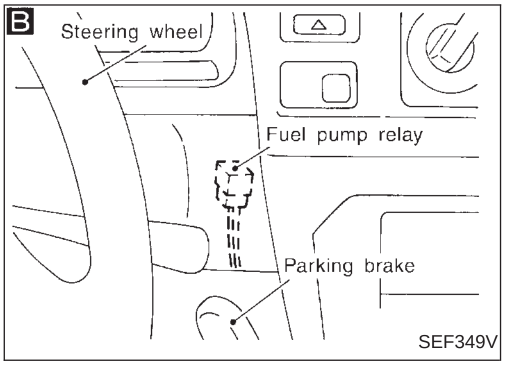
AEC549A

Fuel Pump (Cont'd)

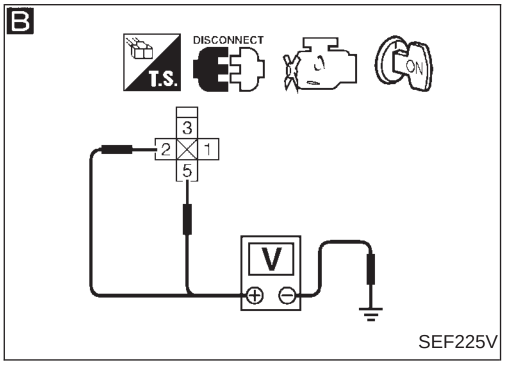
DIAGNOSTIC PROCEDURE



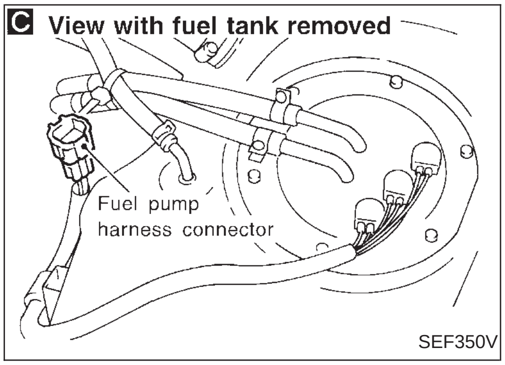
SEF348V



SEF349V



SEF225V



SEF350V

INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.
   Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".
4. Check voltage between terminals ②, ⑤ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- 15A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK

C

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal P2 and body ground, terminal P1 and fuel pump relay terminal ③.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Check the following.
- Harness connectors C1, M67
- Harness for open or short between fuel pump and body ground
- Harness for open or short between fuel pump and fuel pump relay

If NG, repair open circuit or short to ground or short to power in harness or connectors.

OK

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑪ and fuel pump relay terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

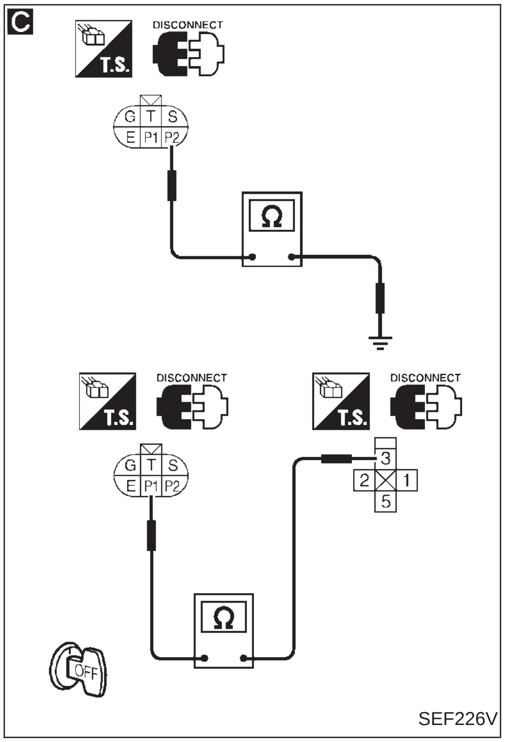
NG → Check the following.
- Harness connectors F28, M58
- Harness for open or short between ECM and fuel pump relay

If NG, repair open circuit or short to ground or short to power in harness or connectors.

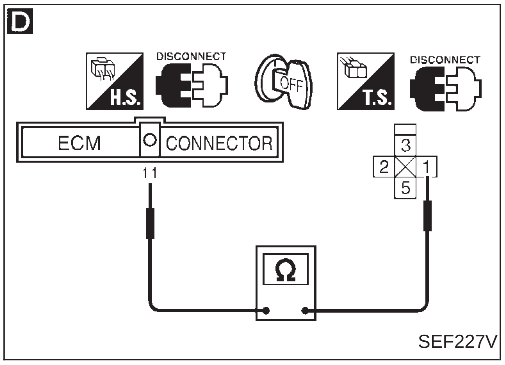
OK

Ⓐ
(Go to next page.)

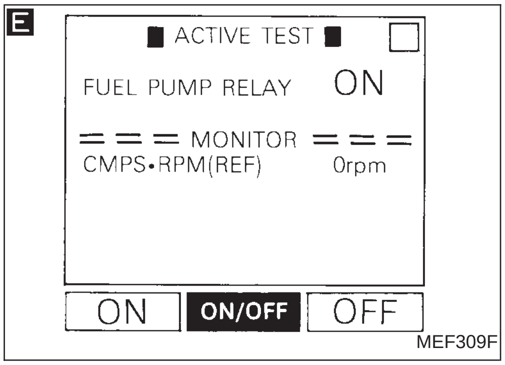
Fuel Pump (Cont'd)



SEF226V



SEF227V



■ ACTIVE TEST ■ ☐

FUEL PUMP RELAY ON

=== MONITOR ===

CMPS•RPM(REF) 0rpm

MEF309F

Ⓐ

E

CHECK COMPONENT
(Fuel pump relay).

1. Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump relay.

OK ↓

CHECK COMPONENT
(Fuel pump).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump.

OK ↓

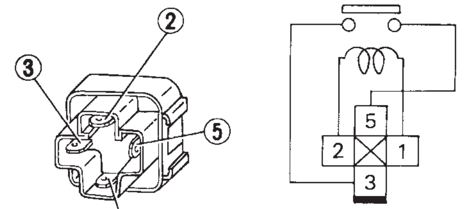
Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

Fuel Pump (Cont'd)

COMPONENT INSPECTION



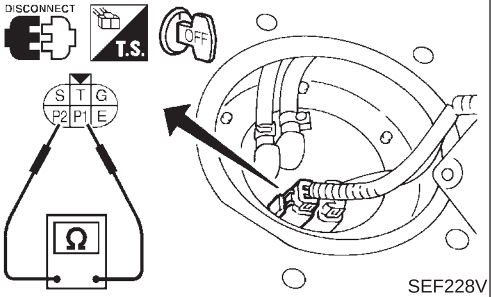
SEF511P

Fuel pump relay

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

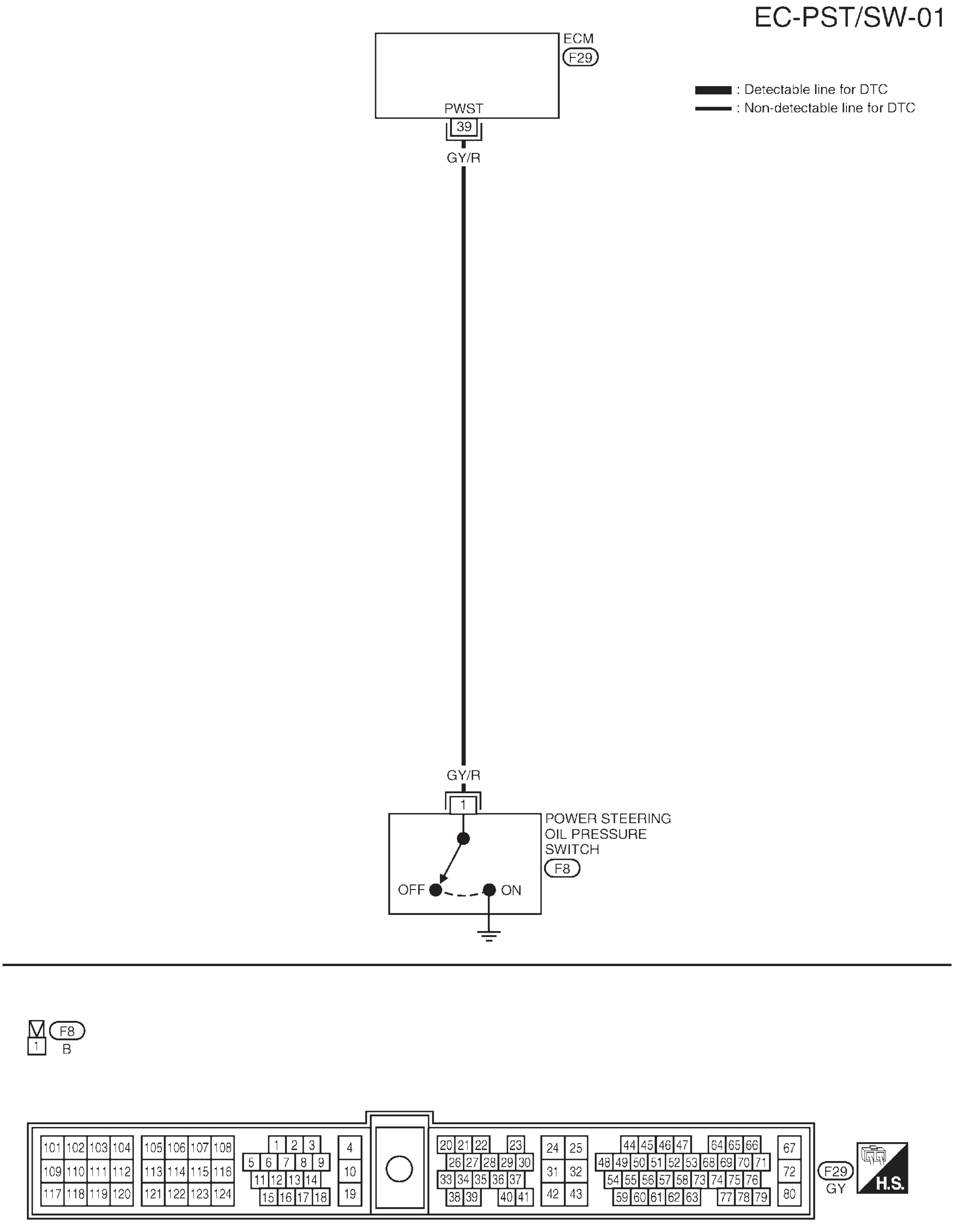


SEF228V

Fuel pump

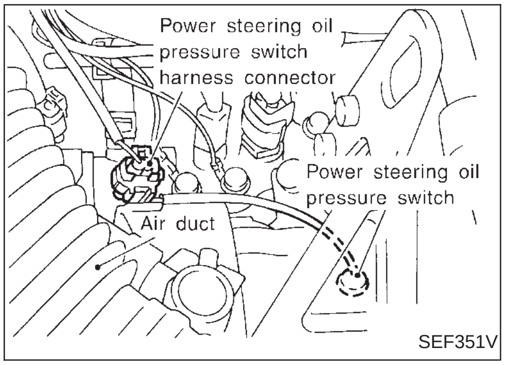
1. Disconnect fuel pump harness connector.
2. Check resistance between terminals (P1) and (P2).
   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]
   If NG, replace fuel pump.

Power Steering Oil Pressure Switch



AEC866A

Power Steering Oil Pressure Switch (Cont'd)



COMPONENT DESCRIPTION

The power steering oil pressure switch is attached to the power steering high-pressure tube and detects a power steering load. When a power steering load is detected, it signals the ECM. The ECM adjusts the IACV-AAC valve to increase the idle speed and adjust for the increased load.

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel is in neutral position (forward direction)	OFF
		The steering wheel is fully turned	ON

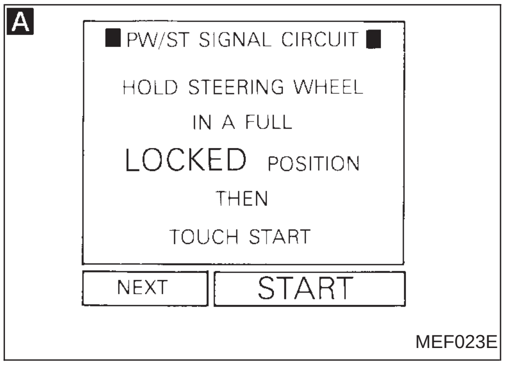
ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
39	GY/R	Power steering oil pressure switch	Engine is running. Steering wheel is fully turned.	Approximately 0V
			Engine is running. Steering wheel is not turned.	Approximately 5V

Power Steering Oil Pressure Switch (Cont'd)

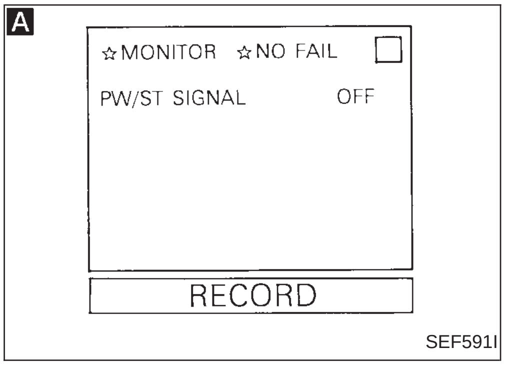
DIAGNOSTIC PROCEDURE



PW/ST SIGNAL CIRCUIT

HOLD STEERING WHEEL IN A FULL LOCKED POSITION THEN TOUCH START

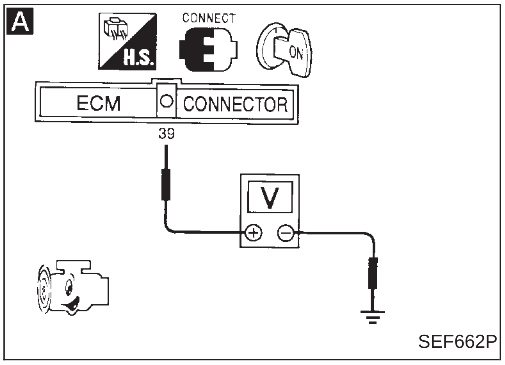
MEF023E



☆MONITOR ☆NO FAIL ☐

PW/ST SIGNAL OFF

SEF591I



SEF662P

INSPECTION START

↓

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch "ON".
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Steering is in neutral position:
   OFF
   Steering is fully turned:
   ON

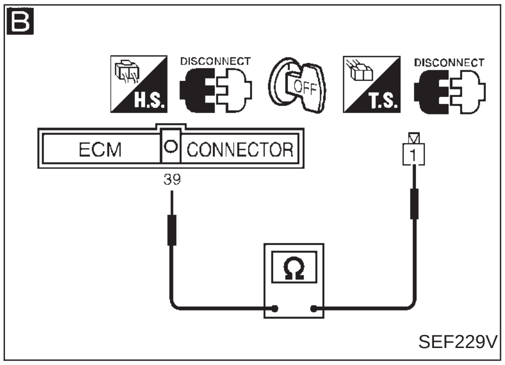
OR

1. Start engine.
2. Check voltage between ECM terminal ㊴ and ground.
   Voltage:
   When steering wheel is fully turned.
   Approximately 0V
   Except above
   Approximately 5V

OK → INSPECTION END

↓ NG

B



SEF229V

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊴ and terminal ①.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

↓ OK

CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "COMPONENT INSPECTION" below.

NG → Replace power steering oil pressure switch.

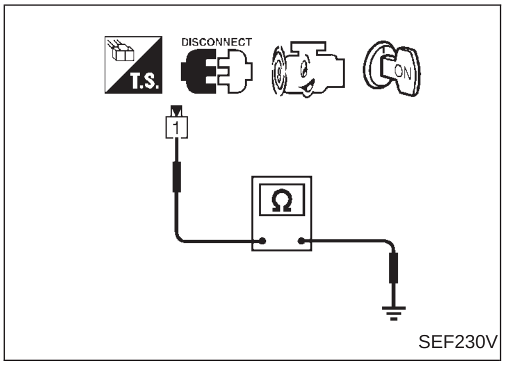
↓ OK

Perform "TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT", EC-98.

↓

INSPECTION END

COMPONENT INSPECTION



SEF230V

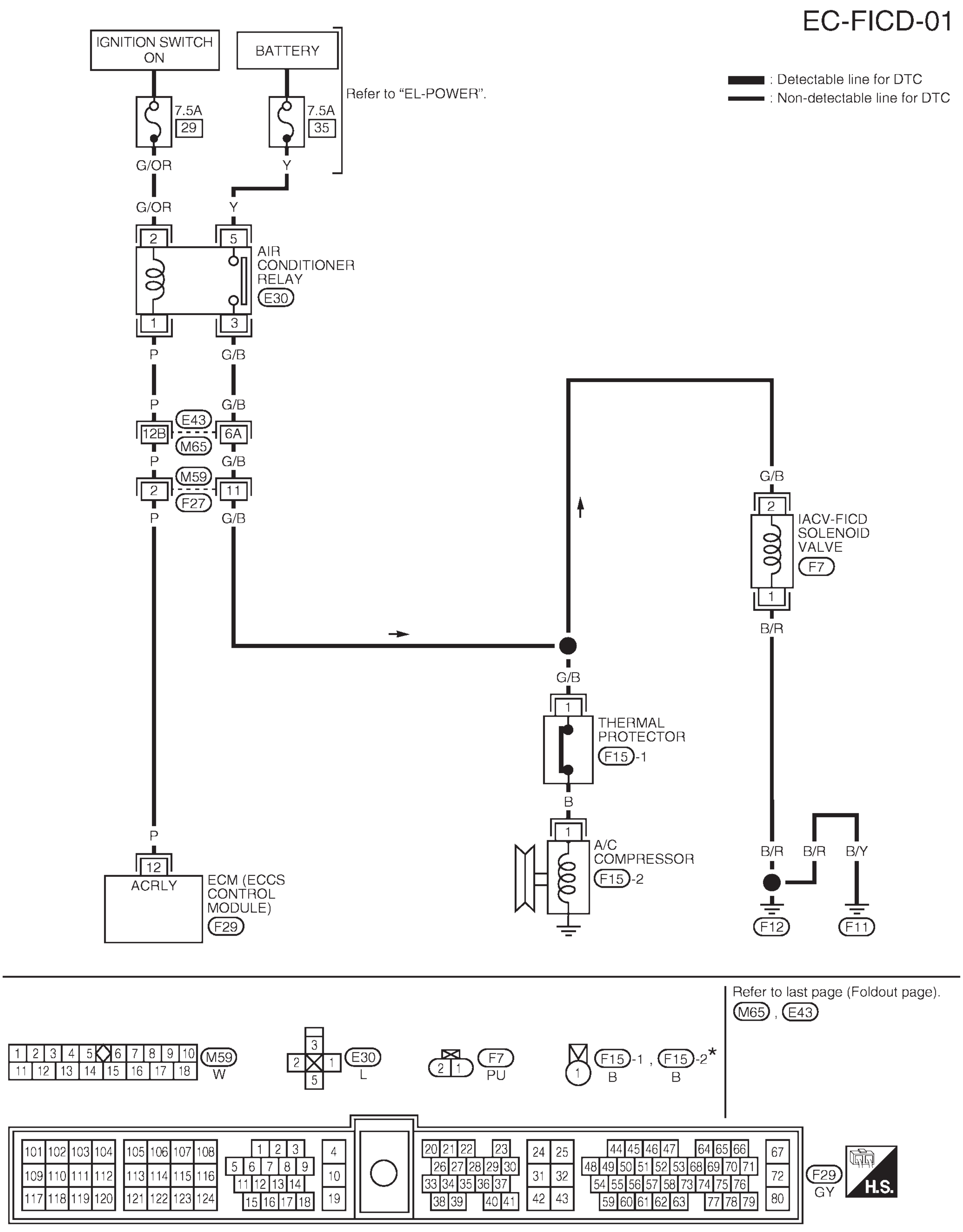
Power steering oil pressure switch

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminal ① and ground.

Conditions	Continuity
Steering wheel is fully being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

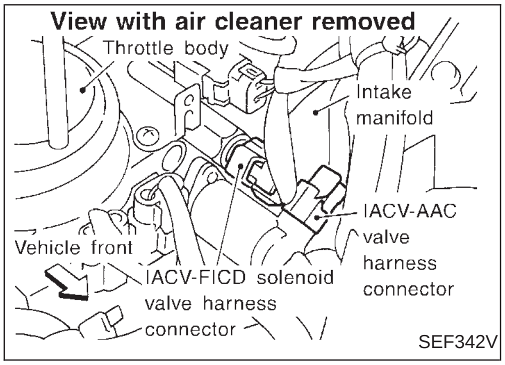
IACV-FICD Solenoid Valve



* : This connector is not shown in "HARNESS LAYOUT" of EL section.

AEC551A

IACV-FICD Solenoid Valve (Cont'd)



COMPONENT DESCRIPTION

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ㉜ (ECM ground).

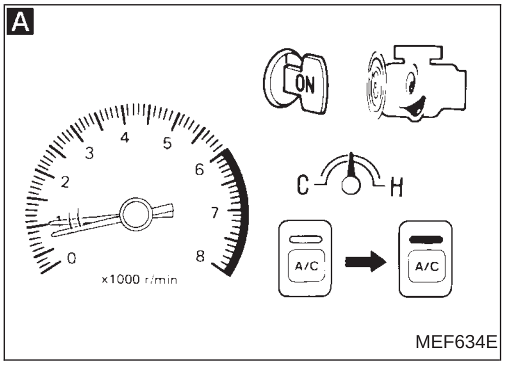
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	P	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are ''ON''*.	Approximately 0V
			Engine is running. └ A/C switch is ''OFF''.	BATTERY VOLTAGE (11 - 14V)
21	G/R	Air conditioner dual-pressure switch	Engine is running. └ Both air conditioner switch and blower switch are ''ON''. (Compressor operates)	Approximately 0V
			Engine is running. └ Air conditioner switch is ''OFF''.	BATTERY VOLTAGE (11 - 14V)

*: Ambient air temperature above 10°C (50°F) and in any mode except ''OFF''.

IACV-FICD Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE

INSPECTION START



MEF634E

A

CHECK OVERALL FUNCTION.

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   800±50 rpm (in "N" position)
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch "ON".
4. Recheck idle speed.
   875 rpm or more (in "N" position)

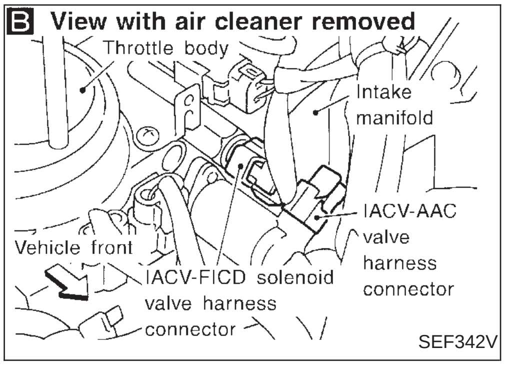
OK → INSPECTION END

NG ↓

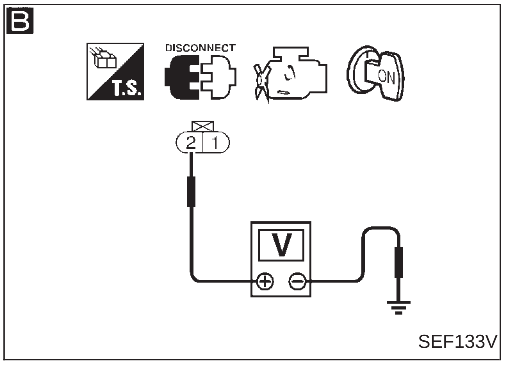
Check if air conditioner compressor functions normally.

NG → Refer to HA section ("TROUBLE DIAGNOSES").

OK ↓



SEF342V



SEF133V

B

CHECK POWER SUPPLY.

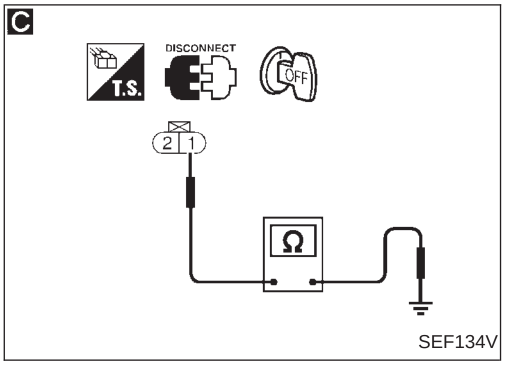
1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Start engine, then turn air conditioner switch and blower fan "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.

- Harness connectors (E43), (M65)
- Harness connectors (M59), (F27)
- Harness for open or short between IACV-FICD solenoid valve harness connector and air conditioner relay

If NG, repair open circuit, short to ground or short to power in harness or connectors.

OK ↓



SEF134V

C

CHECK GROUND CIRCUIT.

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch "OFF".
3. Check harness continuity between terminal ① and body ground.
   Continuity should exist.
   If OK, check harness for short to ground and short to power.

NG → Repair open circuit, short to ground or short to power in harness or connectors.

OK ↓

Ⓐ
(Go to next page.)

IACV-FICD Solenoid Valve (Cont'd)

Ⓐ

CHECK COMPONENT
(IACV-FICD solenoid valve).
Refer to ‘‘COMPONENT INSPECTION’’ below.

NG → Replace IACV-FICD solenoid valve.

OK ↓

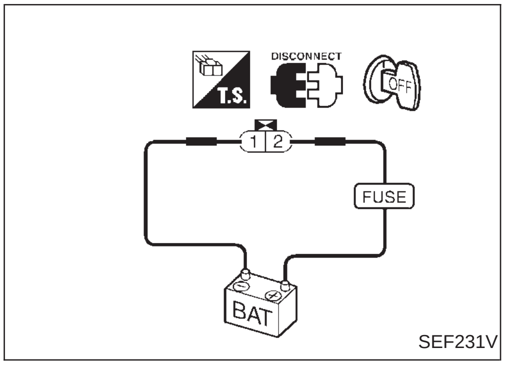
Perform ‘‘TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT’’, EC-98.

↓

INSPECTION END

COMPONENT INSPECTION

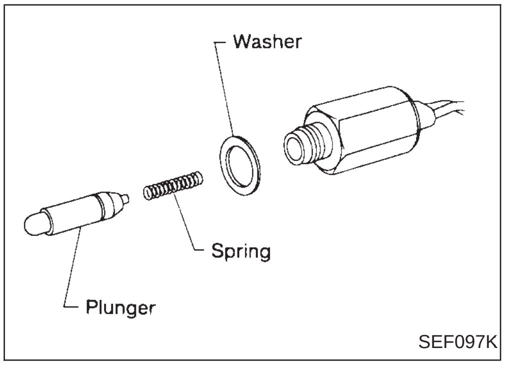
IACV-FICD solenoid valve



SEF231V

Disconnect IACV-FICD solenoid valve harness connector.

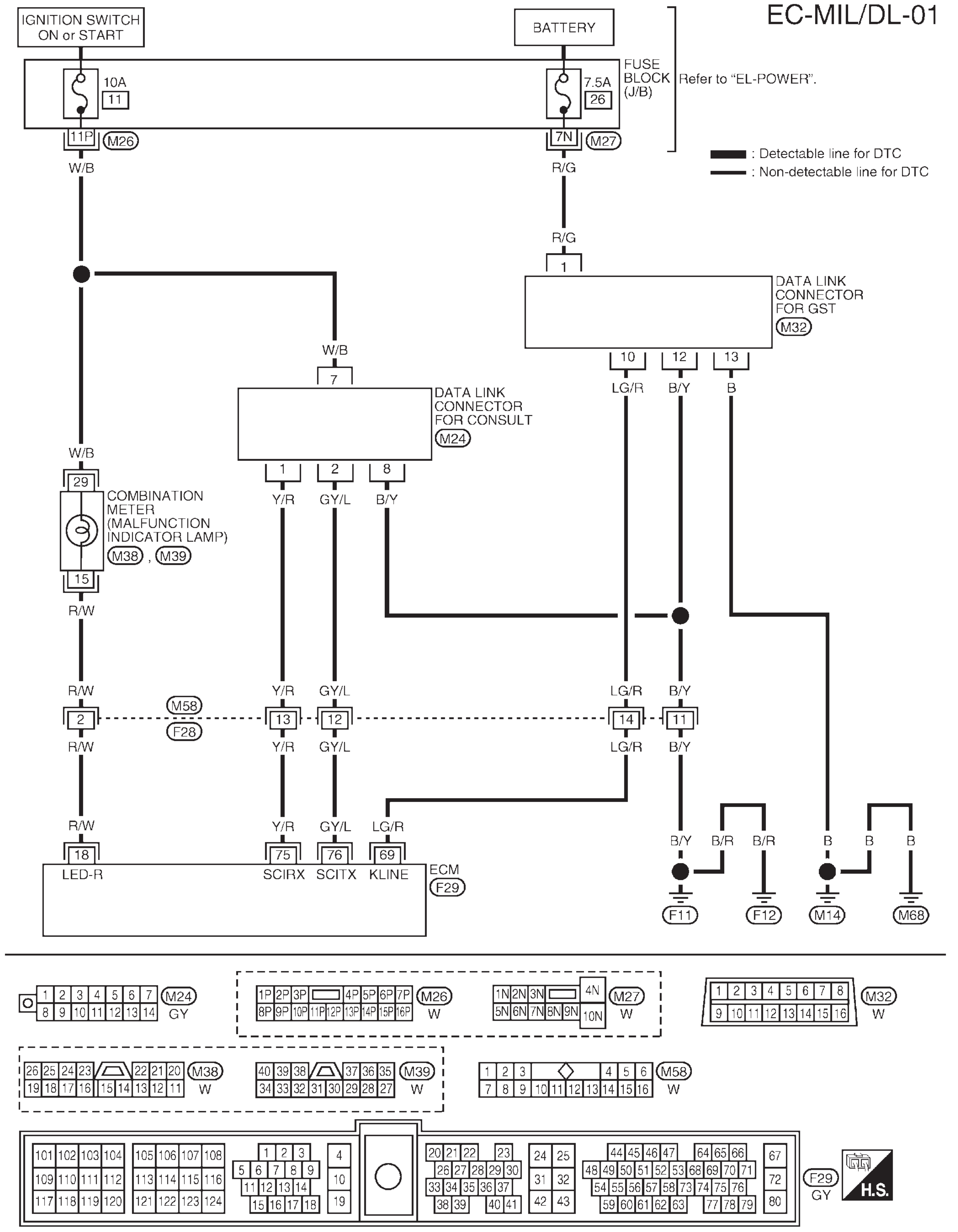
- Check for clicking sound when applying 12V direct current to terminals.



SEF097K

- Check plunger for seizing or sticking.
- Check for broken spring.

MIL & Data Link Connectors



AEC864A

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General Specifications

FUEL PRESSURE REGULATOR

Fuel pressure at idling kPa (kg/cm^2, psi)	
Vacuum hose is connected	Approximately 235 (2.4, 34)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

Inspection and Adjustment

Target idle speed*1 rpm	
No-load*2 (in ''N'' position)	800±50
Base idle speed*3 rpm	
No-load*2 (in ''N'' position)	750±50
Air conditioner: ON (in ''N'' position)	875 or more
Ignition timing	20°±2° BTDC*3

*1: Throttle position sensor harness connector connected
*2: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights & heater fan)
- Steering wheel: Kept in straight-ahead position

*3: Throttle position sensor harness connector disconnected or using CONSULT ''WORK SUPPORT''

IGNITION COIL

Primary voltage V	12
Primary resistance [at 20°C (68°F)] Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)] kΩ	Approximately 10

MASS AIR FLOW SENSOR

Supply voltage V	Battery voltage (11 - 14)
Output voltage at idle V	0.9 - 1.8*
Mass air flow (Using CONSULT or GST) g·m/sec	0.9 - 5.8 at idle* 7.5 - 13.2 at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

EGR TEMPERATURE SENSOR

EGR temperature °C (°F)	Voltage V	Resistance MΩ
0 (32)	4.81	7.9 - 9.7
50 (122)	2.81	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

FUEL PUMP

Resistance [at 25°C (77°F)] Ω	0.2 - 5.0

IACV-AAC VALVE

Resistance [at 25°C (77°F)] Ω	Approximately 10

INJECTOR

Resistance [at 25°C (77°F)] Ω	10 - 14

RESISTOR

Resistance [at 25°C (77°F)] kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

Throttle valve conditions	Voltage (at normal operating temp., engine off, ignition switch on)
Completely closed (a)	0.15 - 0.85V
Partially open	Between (a) and (b)
Completely open (b)	3.5 - 4.7V

Inspection and Adjustment (Cont’d)

CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	9.5 - 34.0%
At 2,500 rpm	13.9 - 24.9%

INTAKE AIR TEMPERATURE SENSOR

Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
80 (176)	0.27 - 0.38

REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)] Ω	2.3 - 4.3

CRANKSHAFT POSITION SENSOR (OBD)

Resistance [at 20°C (68°F)] Ω	512 - 632Ω

NOTES