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**When you read wiring diagrams:**

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

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

# DIAGNOSTIC TROUBLE CODE INDEX

## Alphabetical & P No. Index for DTC

### ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC*3		Reference page
	ECM*1	CONSULT GST*2	
Unable to access ECCS	—	—	EC-76
*COOLANT TEMP SEN	0908	P0125	EC-124
ABSOL PRESS SEN- SOR	0803	P0105	EC-100
CAMSHAFT POSI SEN	0101	P0340	EC-171
CLOSED LOOP	0307	P0130	EC-134
CLOSED THRL POS SW	0203	P0510	EC-226
COOLANT TEMP SEN*4	0103	P0115	EC-113
CRANK P/S (OBD) COG	0905	P1336	EC-262
CRANK POS SEN (OBD)	0802	P0335	EC-166
CYL 1 MISFIRE	0608	P0301	EC-162
CYL 2 MISFIRE	0607	P0302	EC-162
CYL 3 MISFIRE	0606	P0303	EC-162
CYL 4 MISFIRE	0605	P0304	EC-162
ECM	0301	P0605	EC-230
EGR SYSTEM	0302	P0400	EC-176
EGR TEMP SENSOR	0305	P1401	EC-271
EGRC SOLENOID/V	1005	P1400	EC-267
EGRC-BPT VALVE	0306	P0402	EC-184
EVAP PURG FLOW/ MON	0111	P1447	EC-288
EVAP SYS PRES SEN	0704	P0450	EC-212
EVAP (SMALL LEAK)	0705	P0440	EC-189
FRONT O2 SENSOR	0303	P0130	EC-129
FR O2 SEN HEATER	0901	P0135	EC-135
FUEL SYS DIAG-LEAN	0115	P0171	EC-148

Items (CONSULT screen terms)	DTC*3		Reference page
	ECM*1	CONSULT GST*2	
FUEL SYS DIAG-RICH	0114	P0172	EC-153
IACV-AAC VALVE	0205	P0505	EC-221
IGN SIGNAL-PRIMARY	0201	P1320	EC-256
INT AIR TEMP SEN	0401	P0110	EC-107
MAP/BARO SW SOL/V	1302	P1105	EC-237
MASS AIR FLOW SEN*4	0102	P0100	EC-93
MULTI CYL MISFIRE	0701	P0300	EC-162
NO SELF DIAGNOSTIC FAILURE INDICATED	Flashing*5	No DTC	EC-45
<b>NO SELF DIAGNOSTIC FAILURE INDICATED</b>	<b>0505</b>	<b>P0000</b>	—
OVER HEAT	0208	P1900*6	EC-300
PARK/NEUT POSI SW	1003	P0705	EC-232
PURG CONT/V & S/V	0807	P0443	EC-199
PURG VOLUME CONT/V	1008	P1445	EC-281
REAR O2 SENSOR	0707	P0136	EC-139
RR O2 SEN HEATER	0902	P0141	EC-143
SWIRL/V CONT VC SW	0112	P1165	EC-251
SWIRL CONT S/V	1004	P1130	EC-243
TANK FUEL TEMP SEN	0402	P0180	EC-158
THROTTLE POSI SEN*4	0403	P0120	EC-118
TOR CONV CLUTCH S/V	0904	P1550	EC-295
TW CATALYST SYSTEM	0702	P0420	EC-186
VC/V BYPASS/V	0801	P1441	EC-276
VEHICLE SPEED SEN	0104	P0500	EC-217
VENT CONTROL VALVE	0903	P0446	EC-207

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

\*2: These numbers are prescribed by SAE J2012.

\*3: 1st trip DTC No. is the same as DTC No.

\*4: When the fail-safe operation occurs, the MIL illuminates.

\*5: While engine is running.

\*6: Since this diagnosis does not meet P1900 of SAE J2012, it is indicated only by CONSULT.

# DIAGNOSTIC TROUBLE CODE INDEX

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

### P NO. INDEX FOR DTC

DTC*3		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	ECM*1		
—	—	Unable to access ECCS	EC-76
No DTC	Flashing*5	NO SELF DIAGNOSTIC FAILURE INDICATED	EC-45
<b>P0000</b>	<b>0505</b>	<b>NO SELF DIAGNOSTIC FAILURE INDICATED</b>	—
P0100	0102	MASS AIR FLOW SEN*4	EC-93
P0105	0803	ABSOL PRESS SEN- SOR	EC-100
P0110	0401	INT AIR TEMP SEN	EC-107
P0115	0103	COOLANT TEMP SEN*4	EC-113
P0120	0403	THROTTLE POSI SEN*4	EC-118
P0125	0908	*COOLANT TEMP SEN	EC-124
P0130	0307	CLOSED LOOP	EC-134
P0130	0303	FRONT O2 SENSOR	EC-129
P0135	0901	FR O2 SEN HEATER	EC-135
P0136	0707	REAR O2 SENSOR	EC-139
P0141	0902	RR O2 SEN HEATER	EC-143
P0171	0115	FUEL SYS DIAG-LEAN	EC-148
P0172	0114	FUEL SYS DIAG-RICH	EC-153
P0180	0402	TANK FUEL TEMP SEN	EC-158
P0300	0701	MULTI CYL MISFIRE	EC-162
P0301	0608	CYL 1 MISFIRE	EC-162
P0302	0607	CYL 2 MISFIRE	EC-162
P0303	0606	CYL 3 MISFIRE	EC-162
P0304	0605	CYL 4 MISFIRE	EC-162
P0335	0802	CRANK POS SEN (OBD)	EC-166
P0340	0101	CAMSHAFT POSI SEN	EC-171
P0400	0302	EGR SYSTEM	EC-176
P0402	0306	EGRC-BPT VALVE	EC-184
P0420	0702	TW CATALYST SYSTEM	EC-186
P0440	0705	EVAP (SMALL LEAK)	EC-189
P0443	0807	PURG CONT/V & S/V	EC-199
P0446	0903	VENT CONTROL VALVE	EC-207
P0450	0704	EVAP SYS PRES SEN	EC-212

DTC*3		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	ECM*1		
P0500	0104	VEHICLE SPEED SEN	EC-217
P0505	0205	IACV-AAC VALVE	EC-221
P0510	0203	CLOSED THRL POS SW	EC-226
P0605	0301	ECM	EC-230
P0705	1003	PARK/NEUT POSI SW	EC-232
P1105	1302	MAP/BARO SW SOL/V	EC-237
P1130	1004	SWIRL CONT S/V	EC-243
P1165	0112	SWIRL/V CONT VC SW	EC-251
P1320	0201	IGN SIGNAL-PRIMARY	EC-256
P1336	0905	CRANK P/S (OBD) COG	EC-262
P1400	1005	EGRC SOLENOID/V	EC-267
P1401	0305	EGR TEMP SENSOR	EC-271
P1441	0801	VCV BYPASS/V	EC-276
P1445	1008	PURG VOLUME CONT/V	EC-281
P1447	0111	EVAP PURG FLOW/ MON	EC-288
P1550	0904	TOR CONV CLUTCH S/V	EC-295
P1900*6	0208	OVER HEAT	EC-300

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

\*2: These numbers are prescribed by SAE J2012.

\*3: 1st trip DTC No. is the same as DTC No.

\*4: When the fail-safe operation occurs, the MIL illuminates.

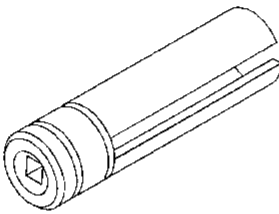
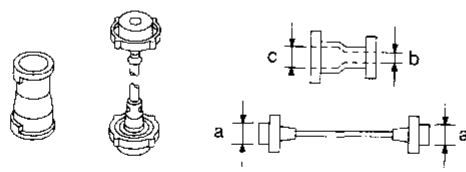
\*5: While engine is running.

\*6: Since this diagnosis does not meet P1900 of SAE J2012, it is indicated only by CONSULT.

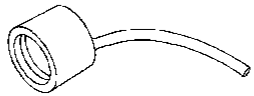
# PRECAUTIONS AND PREPARATION

## 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
(J36471-A) Heated oxygen sensor wrench	 <p style="text-align: right;">Loosening or tightening front and rear heated oxygen sensors</p> <p style="text-align: left;">NT379</p>
EG17650301 (J33984-A) Radiator cap tester adapter	 <p style="text-align: right;">Adapting radiator cap tester to radiator filler neck</p> <p style="text-align: left;">NT564</p> <p style="text-align: right;"> <b>a: 28 (1.10) dia.</b>  <b>b: 31.4 (1.236) dia.</b>  <b>c: 41.3 (1.626) dia.</b>                      Unit: mm (in)                 </p>

## Commercial Service Tool

Tool name	Description
Fuel filler cap adapter	 <p style="text-align: right;">Checking fuel tank vacuum relief valve opening pressure</p> <p style="text-align: left;">NT653</p>

## 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 in a frontal collision. The Supplemental Restraint System consists of an air bag module (located in the center of the steering wheel), a diagnosis sensor unit, warning lamp, wiring harness, crash zone sensor (4WD models) and spiral cable. Information necessary to service the system safely is included in the **RS section** of this Service Manual.

**WARNING:**

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

## Precautions for On Board Diagnostic (OBD) System of Engine

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

### CAUTION:

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

GI

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EM

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EC

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# PRECAUTIONS AND PREPARATION

## Engine Fuel & Emission Control System

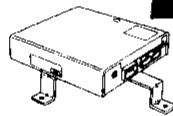
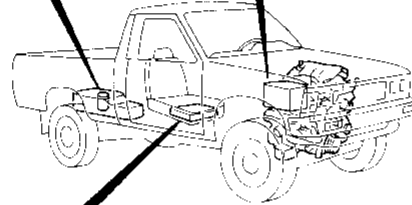
### FUEL PUMP

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



### BATTERY

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



### ECM

- Do not disassemble ECCS control module (ECM).
- Do not turn diagnosis mode selector forcibly.
- If a battery terminal is disconnected, the memory will return to the ECM value.

The ECCS 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.

### 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.

### 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.



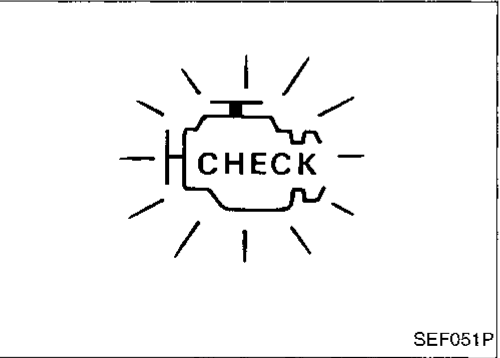
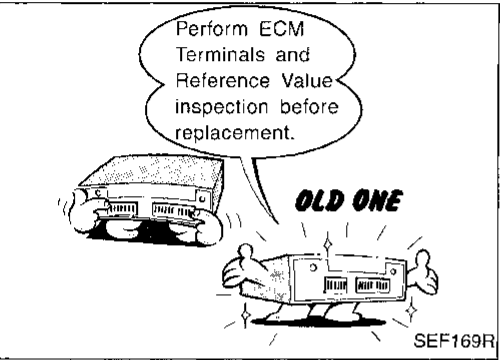
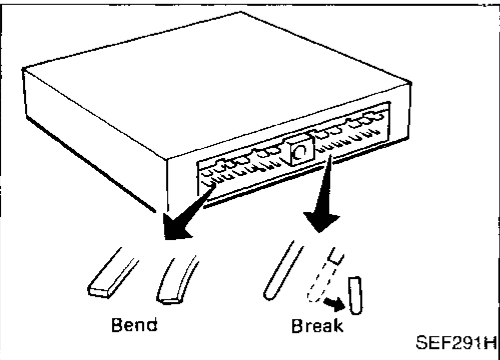
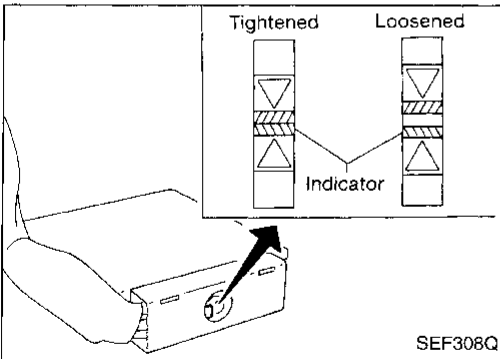
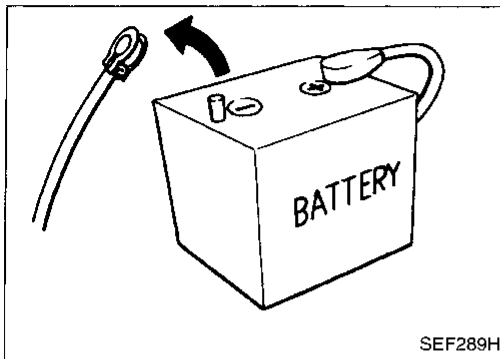
### ECCS PARTS HANDLING

- 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.

### ECCS HARNESS HANDLING

- Securely connect ECCS 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 ECCS harness at least 10 cm (3.9 in) away from adjacent harnesses, to prevent an ECCS system malfunction due to receiving external noise.
- Keep ECM parts and harnesses dry.
- Before removing parts, turn off ignition switch and then disconnect battery ground cable.

# PRECAUTIONS AND PREPARATION



## Precautions

- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned off.
- When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.  
⚙️: 3 - 5 N·m (0.3 - 0.5 kg·m, 26 - 43 in·lb)
- When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).  
Make sure that there are not any bends or breaks on ECM pin terminal when connecting pin connectors.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-83.
- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE". The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed.

GI

MA

EM

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EC

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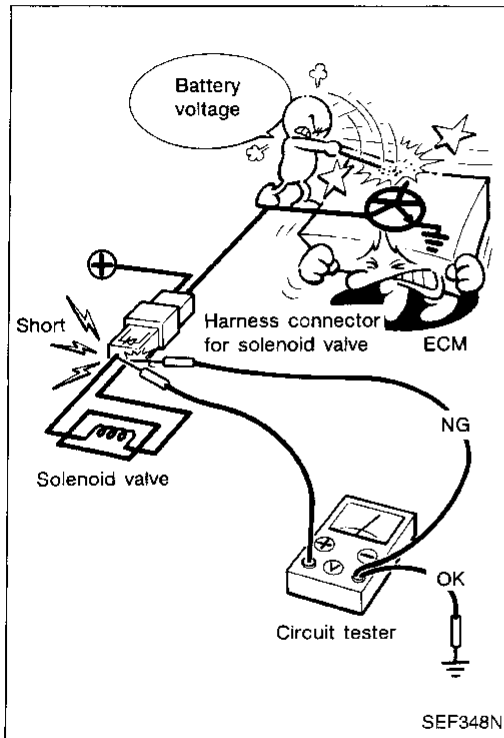
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## PRECAUTIONS AND PREPARATION

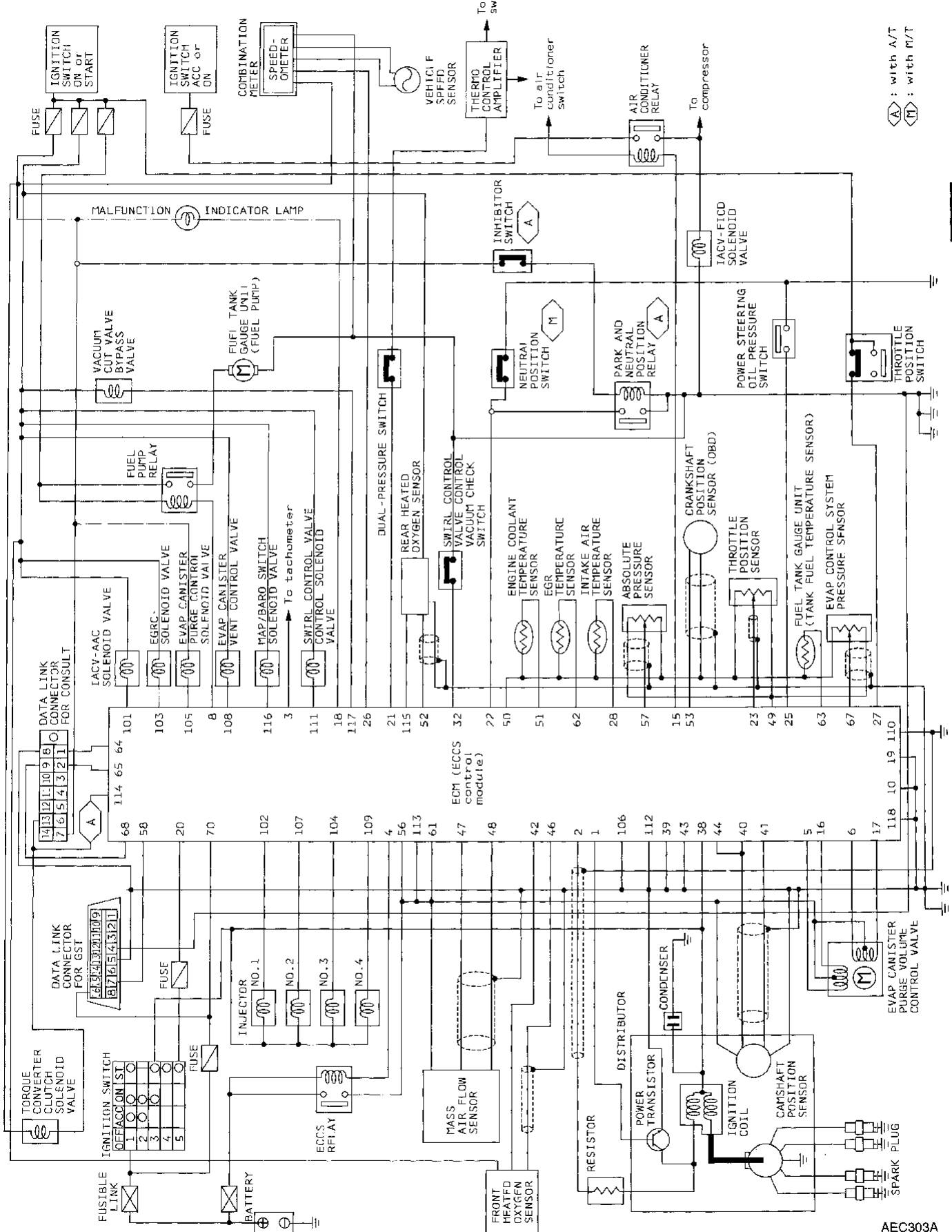
### Precautions (Cont'd)

- 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.



# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

## Circuit Diagram

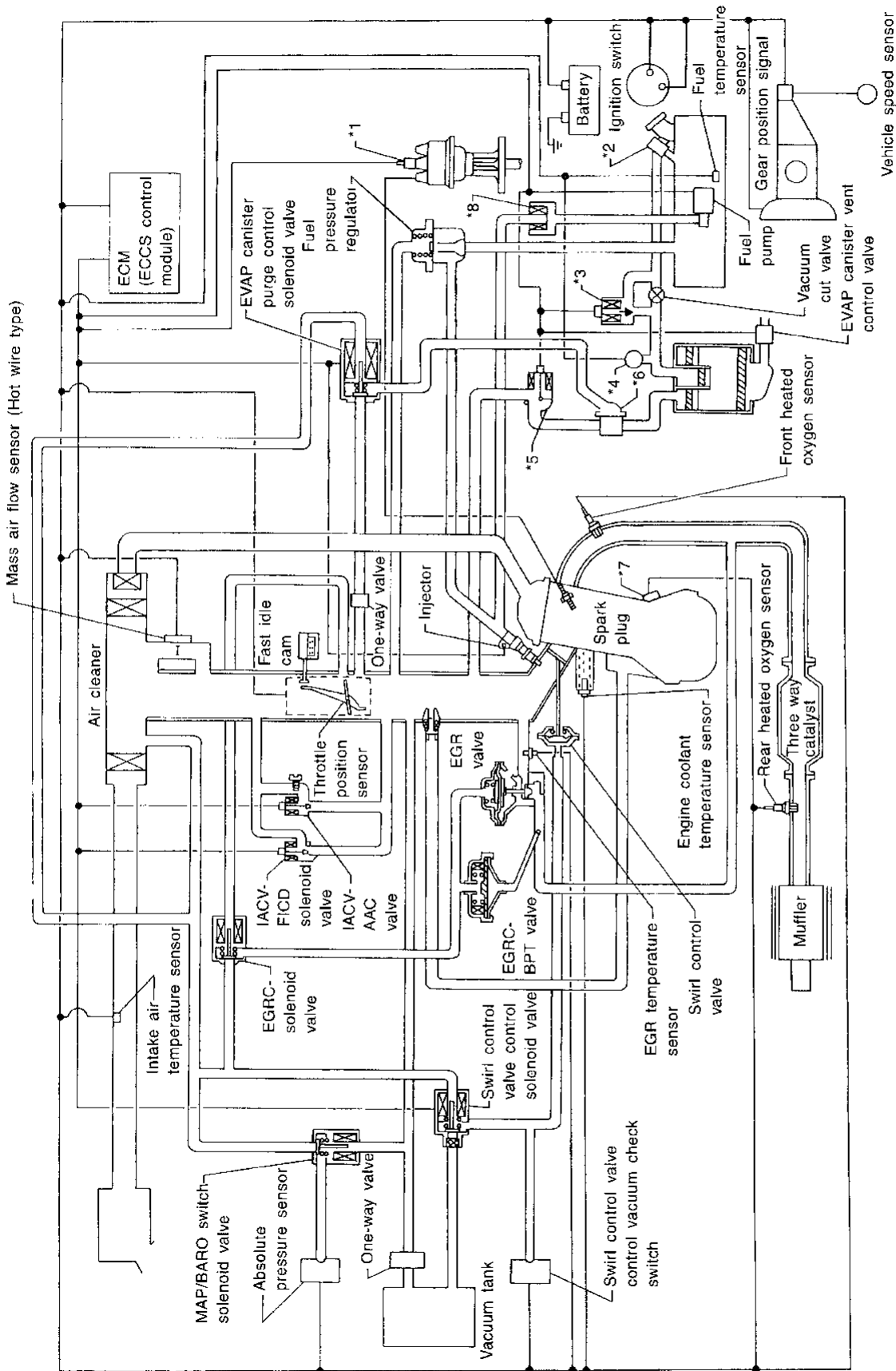


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# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

## System Diagram



- \*1: Ignition coil, power transistor and camshaft position sensor built into distributor
- \*2: EVAP shut valve
- \*3: Vacuum cut valve bypass valve
- \*4: EVAP control system pressure sensor
- \*5: EVAP canister purge volume control valve
- \*6: EVAP canister purge control valve
- \*7: Crankshaft position sensor (OBD)
- \*8: Fuel filter

## ECCS Component Parts Location

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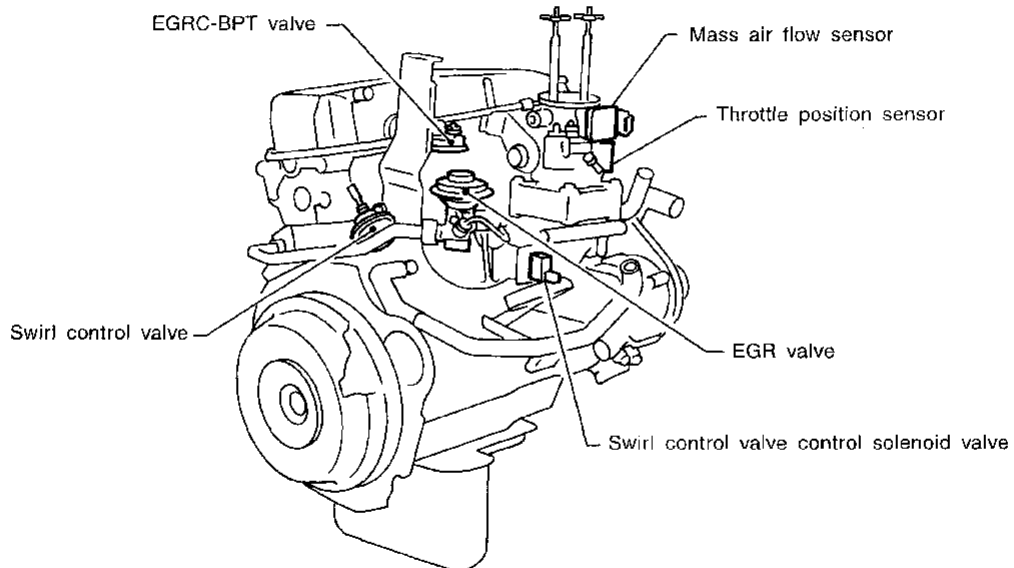
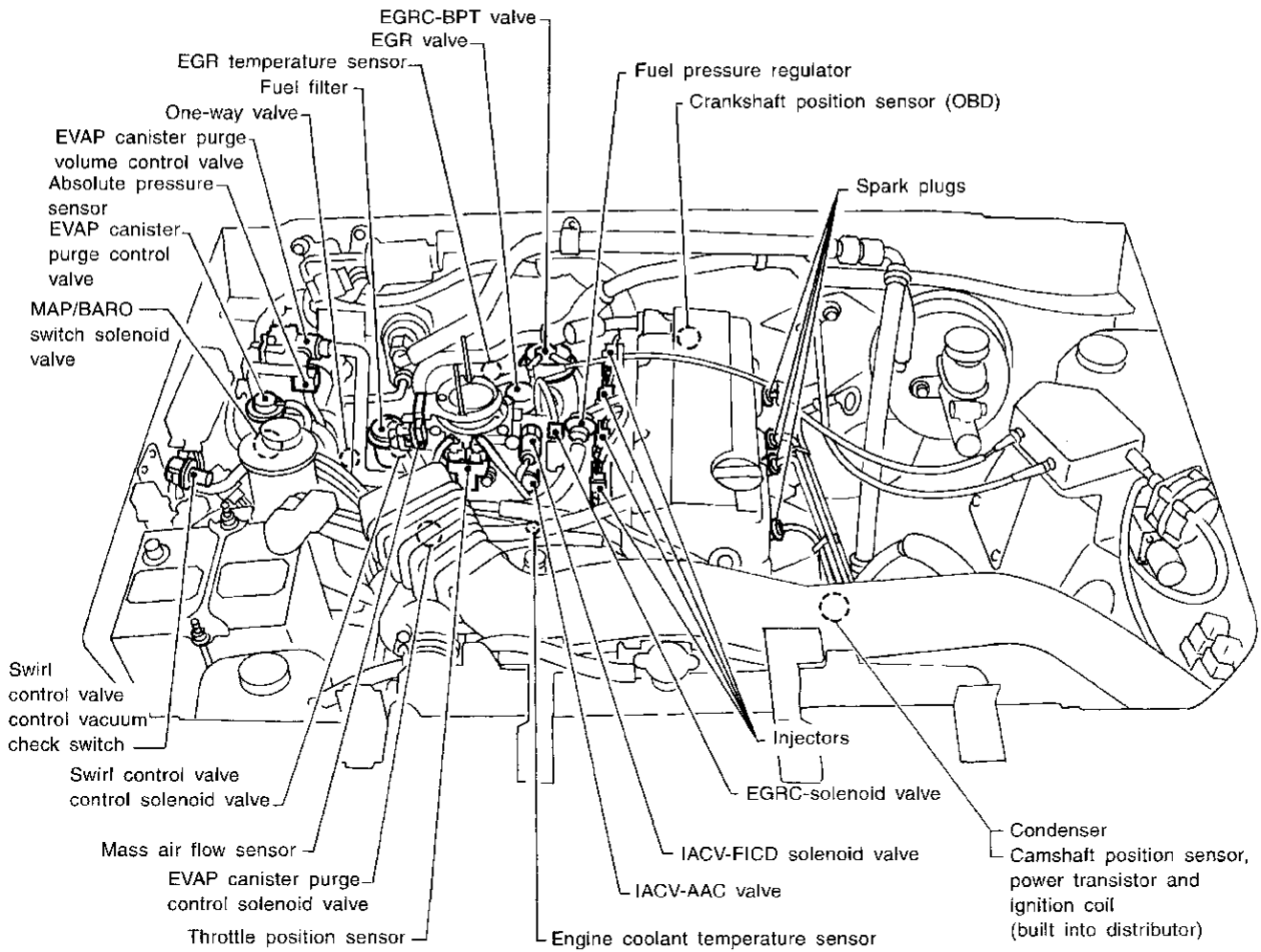
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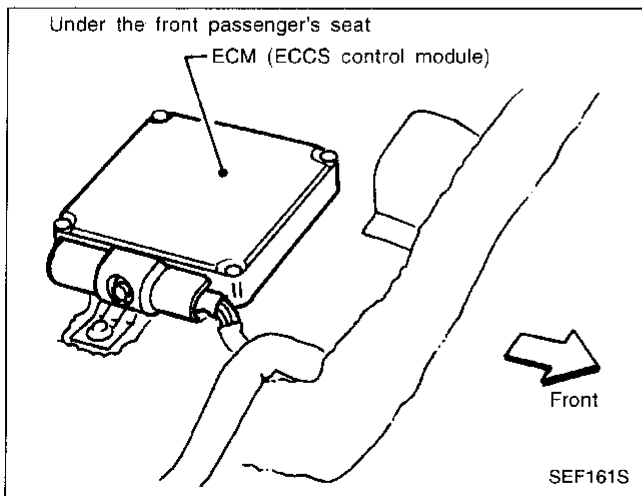
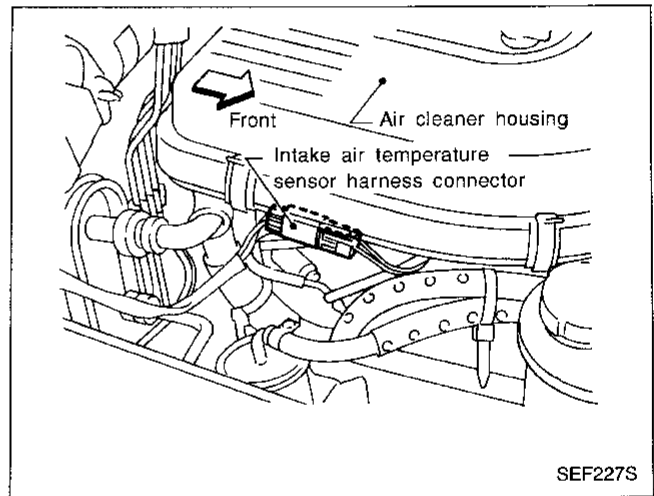
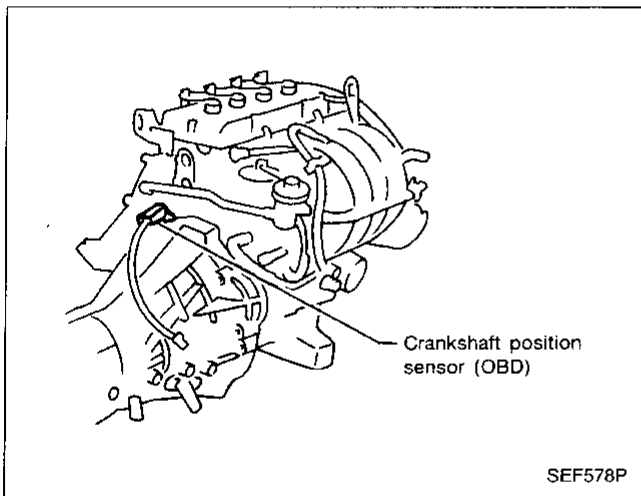
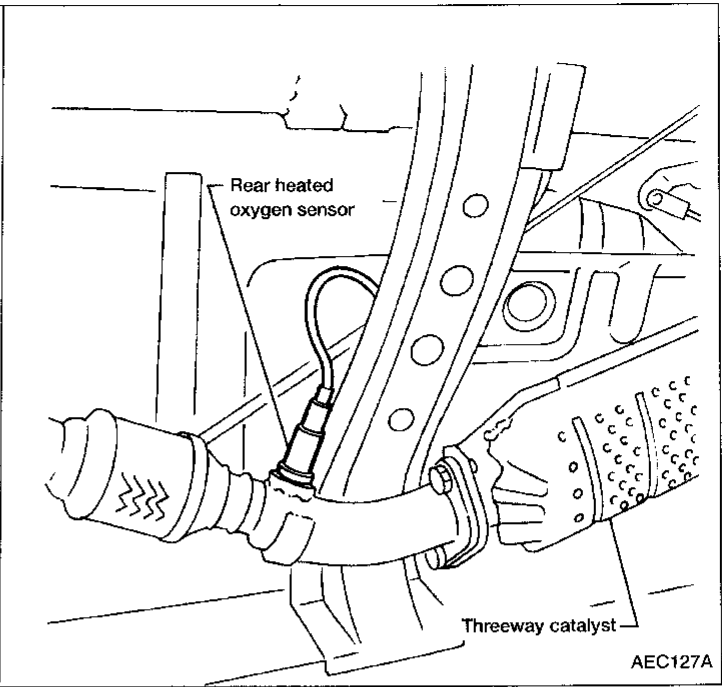
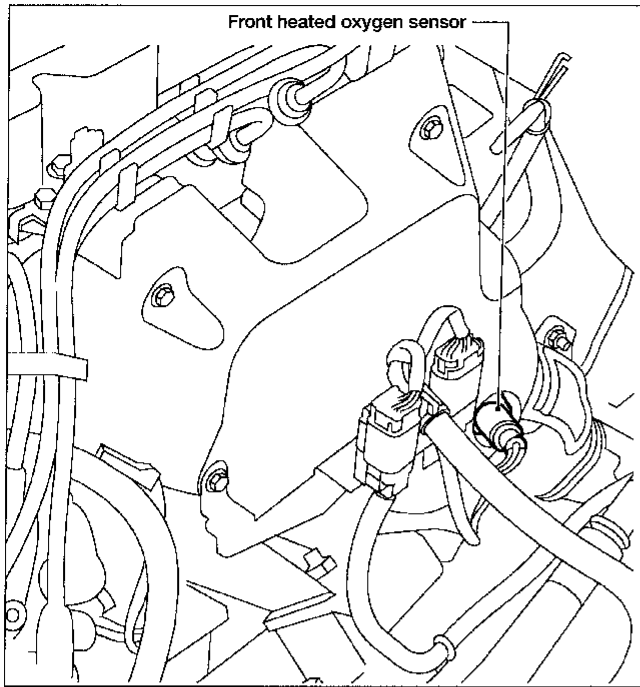
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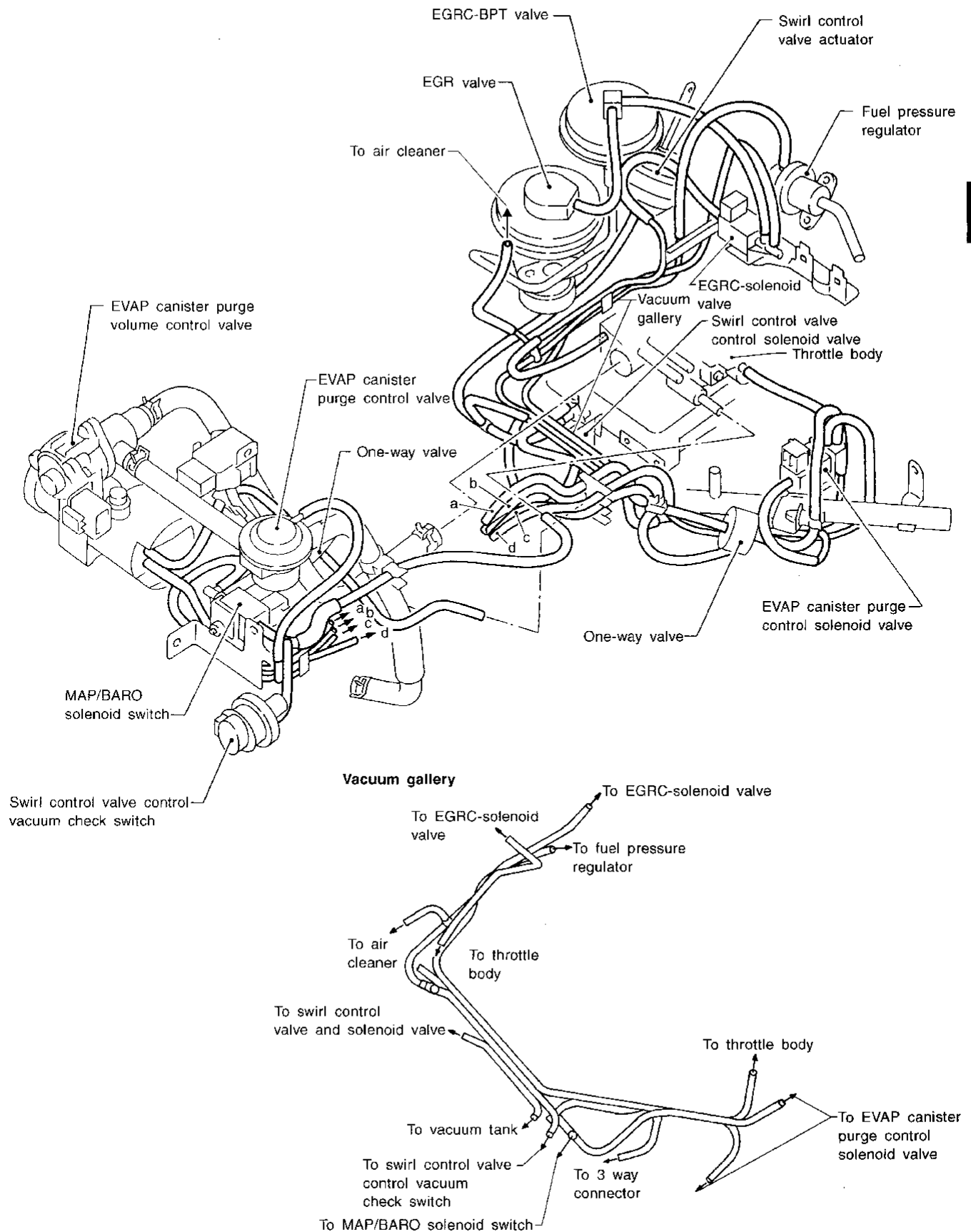
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# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

## ECCS Component Parts Location (Cont'd)



Vacuum Hose Drawing



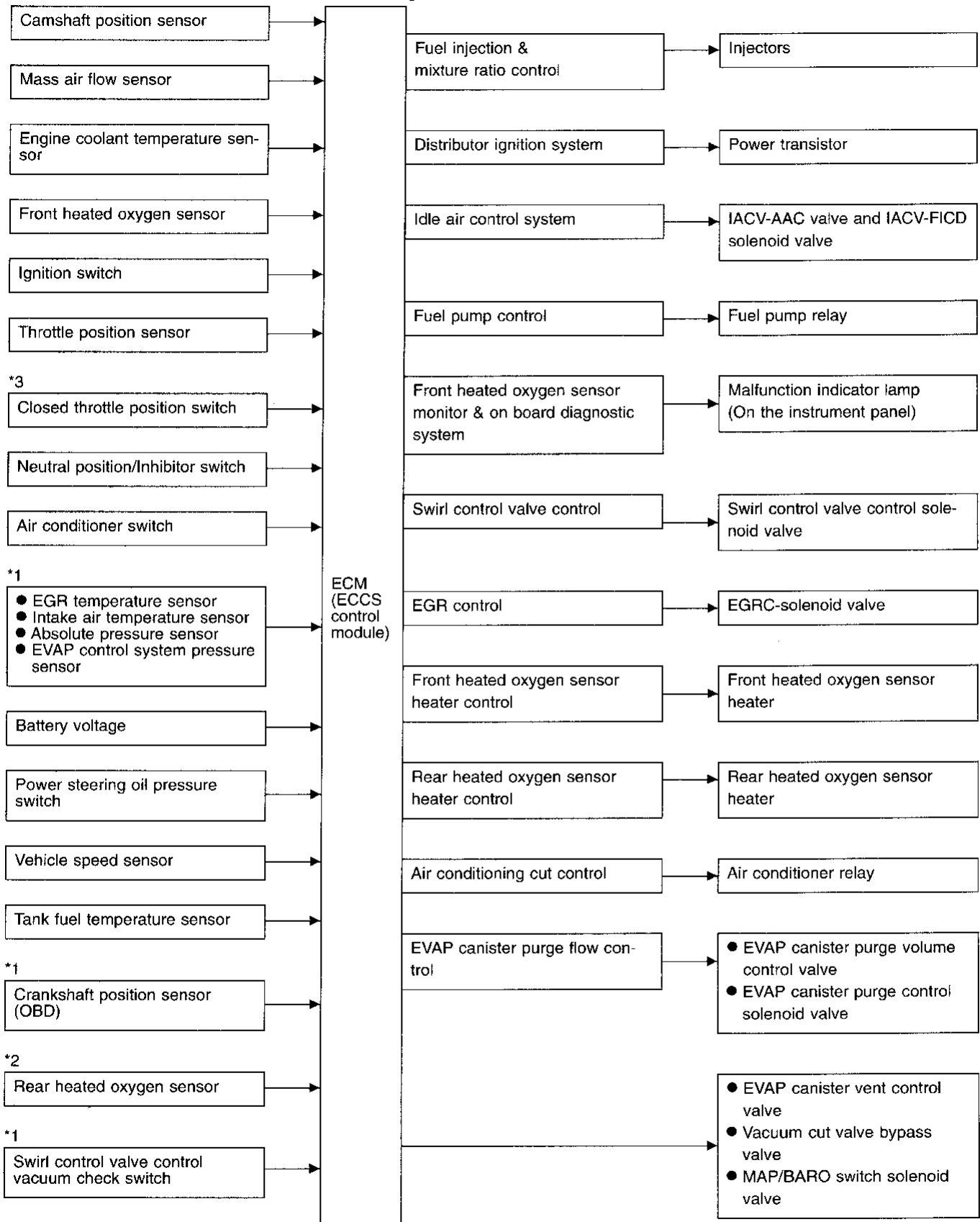
Refer to "System Diagram", EC-10 for vacuum control system.

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# ENGINE AND EMISSION CONTROL OVERALL SYSTEM

## System Chart



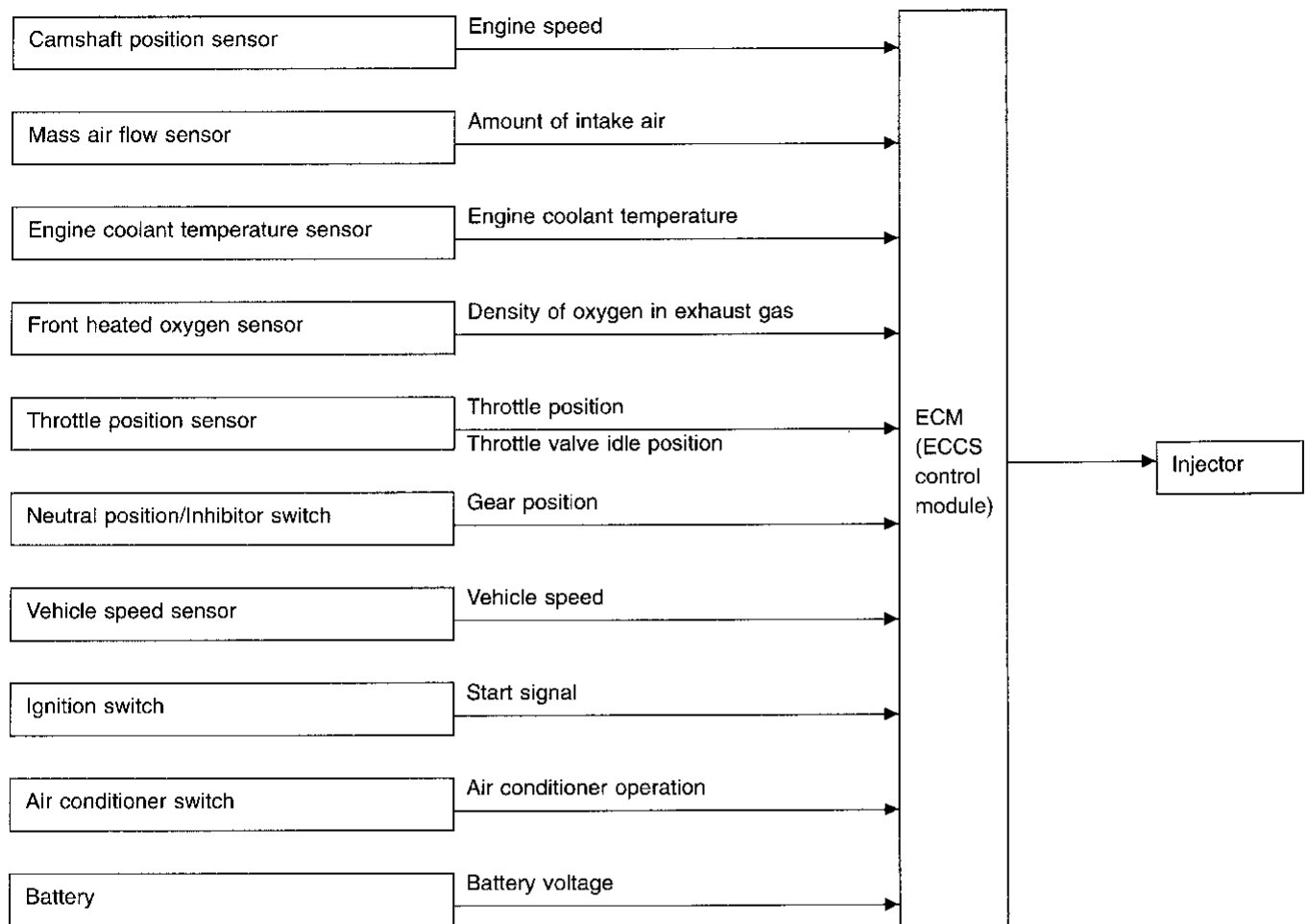
\*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.

\*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



### BASIC MULTIPOINT 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 air intake) from both the camshaft position sensor and the mass air flow sensor.

### VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injection is compensated for 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

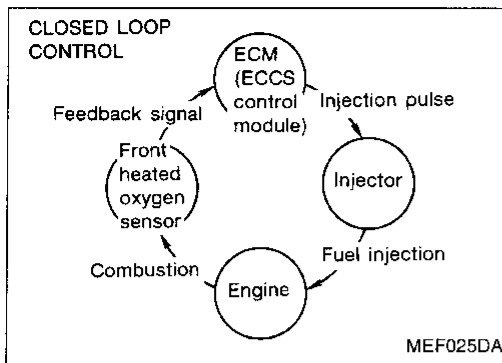
〈Fuel decrease〉

- During deceleration
- During high engine speed operation

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## ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION



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

#### MIXTURE RATIO FEEDBACK 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 is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about front heated oxygen sensor, refer to page EC-129. 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.

The 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
- Engine idling
- 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
- After shifting from "N" to "D"
- 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.

# ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION

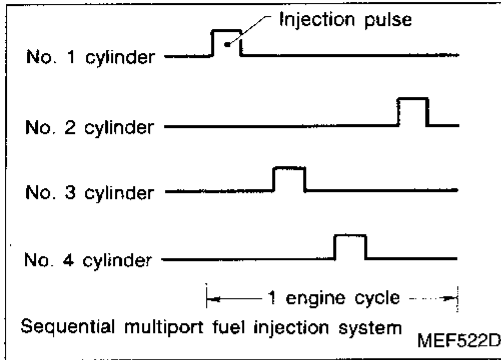
## Multiport Fuel Injection (MFI) System (Cont'd)

### 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.

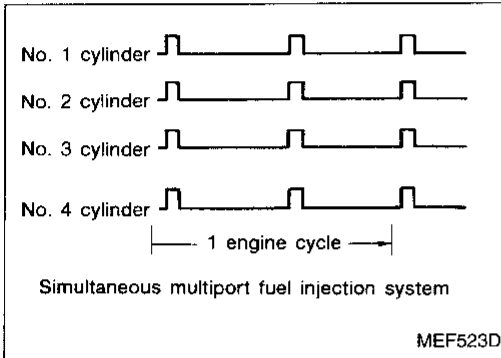


#### Simultaneous multiport fuel injection system

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

The four 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.

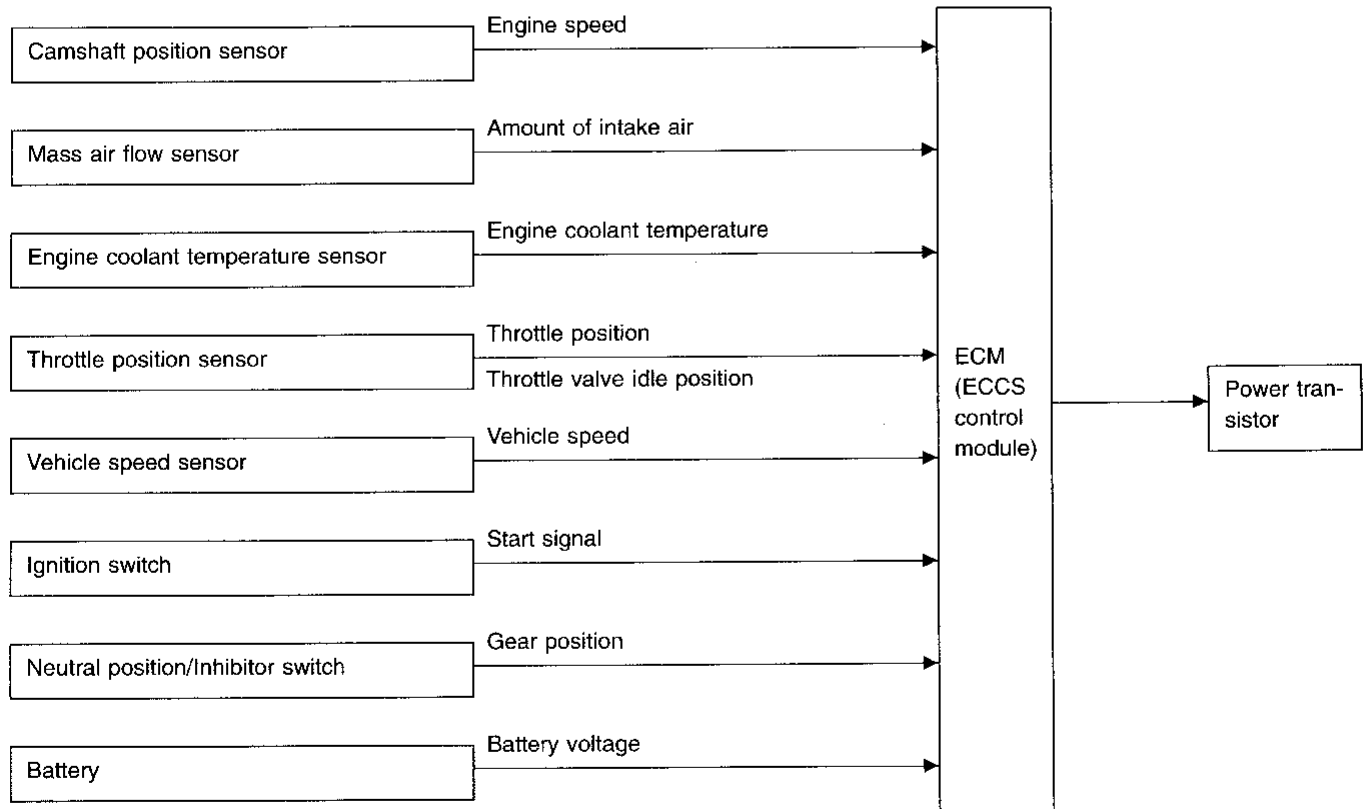


### FUEL SHUT-OFF

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



# ENGINE AND EMISSION BASIC CONTROL SYSTEM DESCRIPTION

## 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.

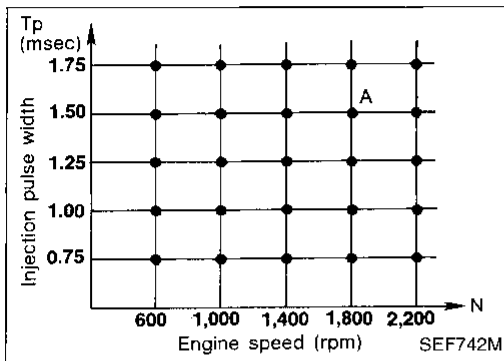
The ECM detects information such as the injection pulse width and camshaft position sensor signal. Responding to this information, ignition signals are transmitted to the power transistor.

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

A °BTDC

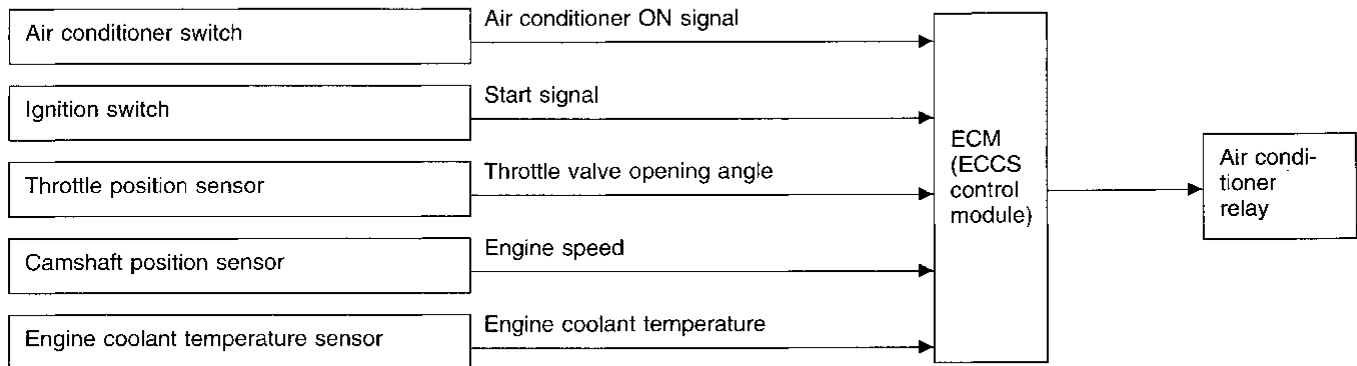
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

- At starting
- During warm-up
- At idle
- When swirl control valve operates
- Hot engine operation
- During acceleration



## Air Conditioning Cut Control

### INPUT/OUTPUT SIGNAL LINE



### SYSTEM DESCRIPTION

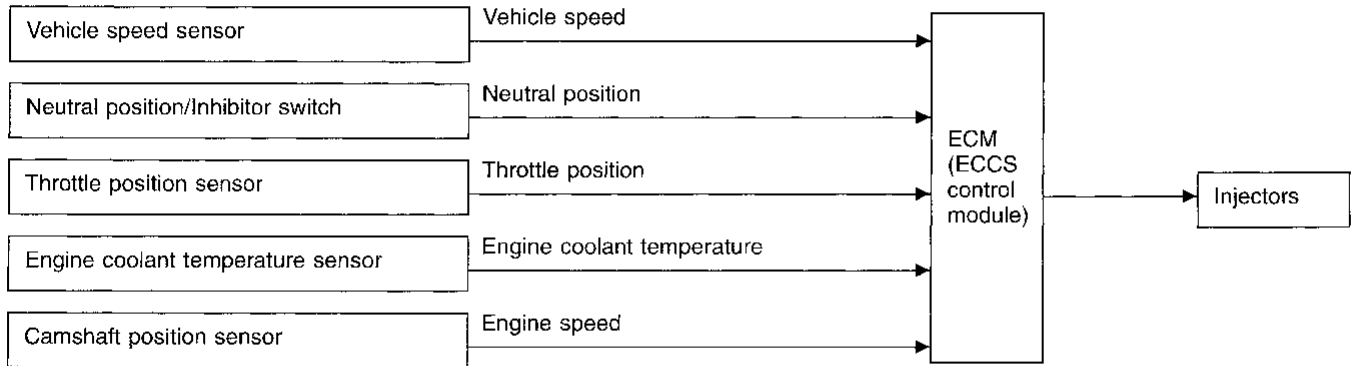
This system improves engine operation when the air conditioner is used.

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.

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

### INPUT/OUTPUT SIGNAL LINE



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

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

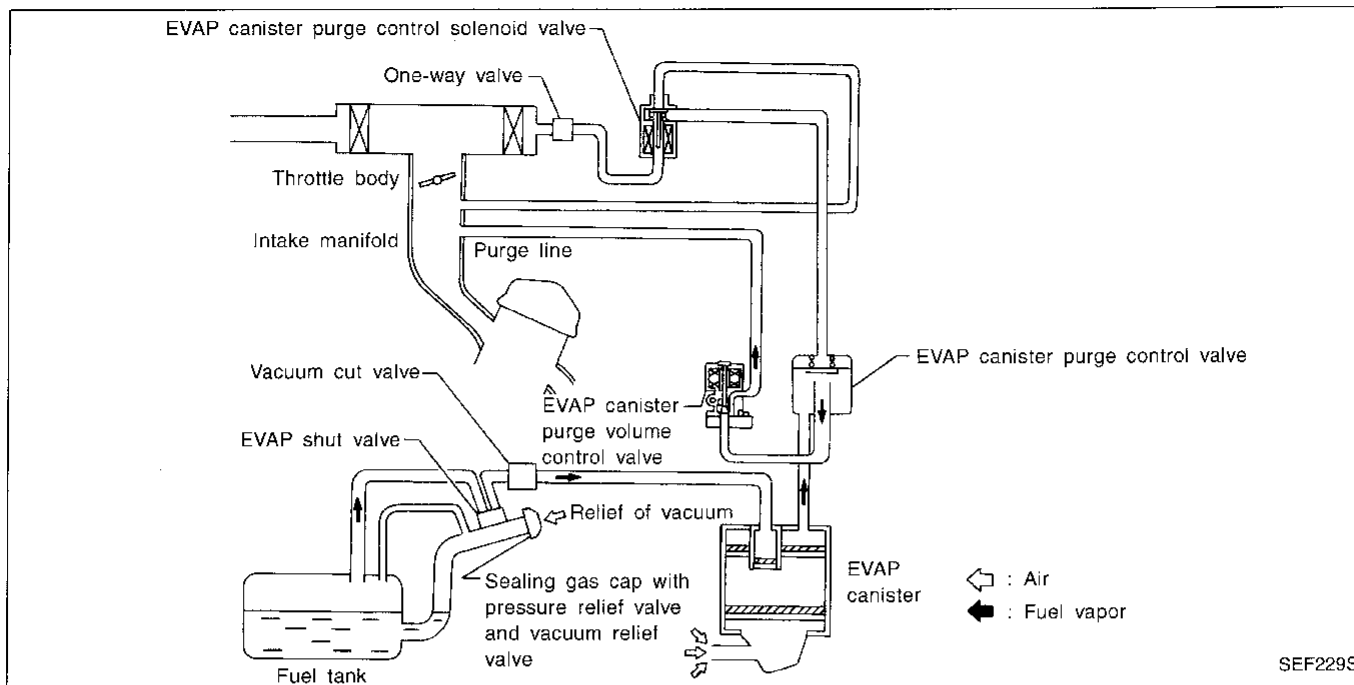
**NOTE:**

**This function is different than deceleration control listed under multiport fuel injection on EC-15.**

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# EVAPORATIVE EMISSION SYSTEM

## Description



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

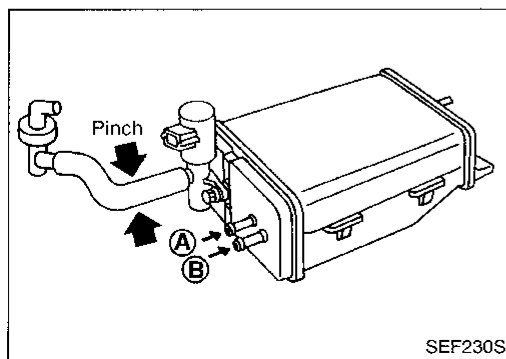
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating.

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 valve is controlled by engine control module. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control valve is proportionally regulated as the air flow increases.

EVAP canister purge control valve shuts off the vapor purge line during decelerating and idling, and under normal operating conditions the valve is usually open.

EVAP shut valve shuts off the vapor charge line when fuel is being supplied to the fuel tank.



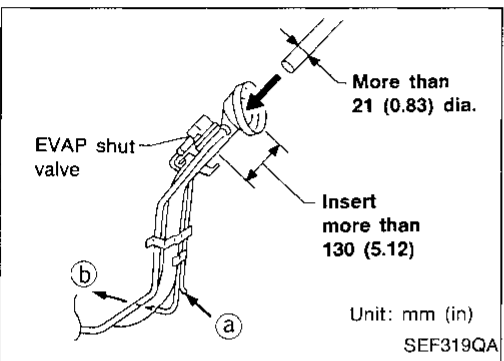
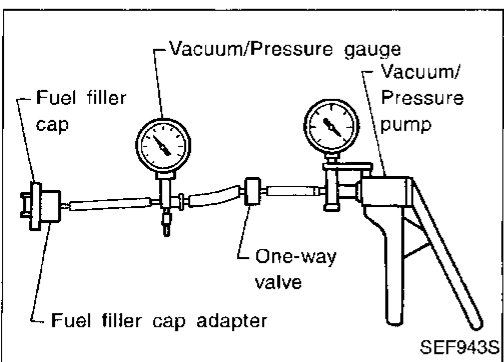
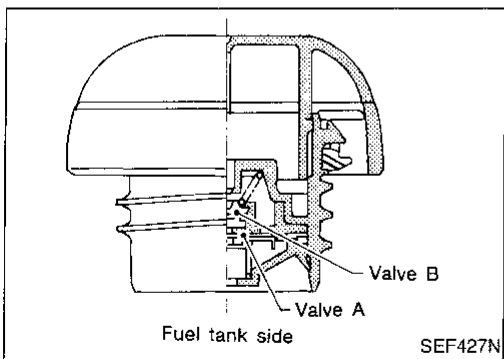
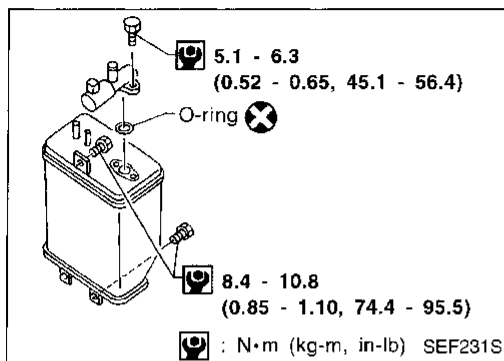
## Inspection

### EVAP CANISTER

Check EVAP canister as follows:

1. Pinch the fresh air vent hose.
2. Blow air in port (A) and check that it flows freely out of port (B).

# EVAPORATIVE EMISSION SYSTEM



## 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 canister 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:

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

#### Vacuum:

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

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

#### CAUTION:

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

### EVAPORATIVE EMISSION (EVAP) SHUT VALVE

- When pushing down the shutter inside the fuel filler opening, the EVAP shut valve is closed.
  - When releasing the shutter, the valve is open.
1. Blow air from one side of the EVAP shut valve tube (a) or (b) and check that there is air flow.
  2. Insert suitable steel tube as shown in the figure.
  3. Blow air from one side of the EVAP shut valve tube (a) or (b) and check that there is no air flow.

### EVAP CANISTER PURGE CONTROL VALVE

Refer to EC-199.

### VACUUM CUT VALVE

Refer to EC-280.

### EVAPORATIVE EMISSION (EVAP) CANISTER PURGE VOLUME CONTROL VALVE

Refer to EC-281.

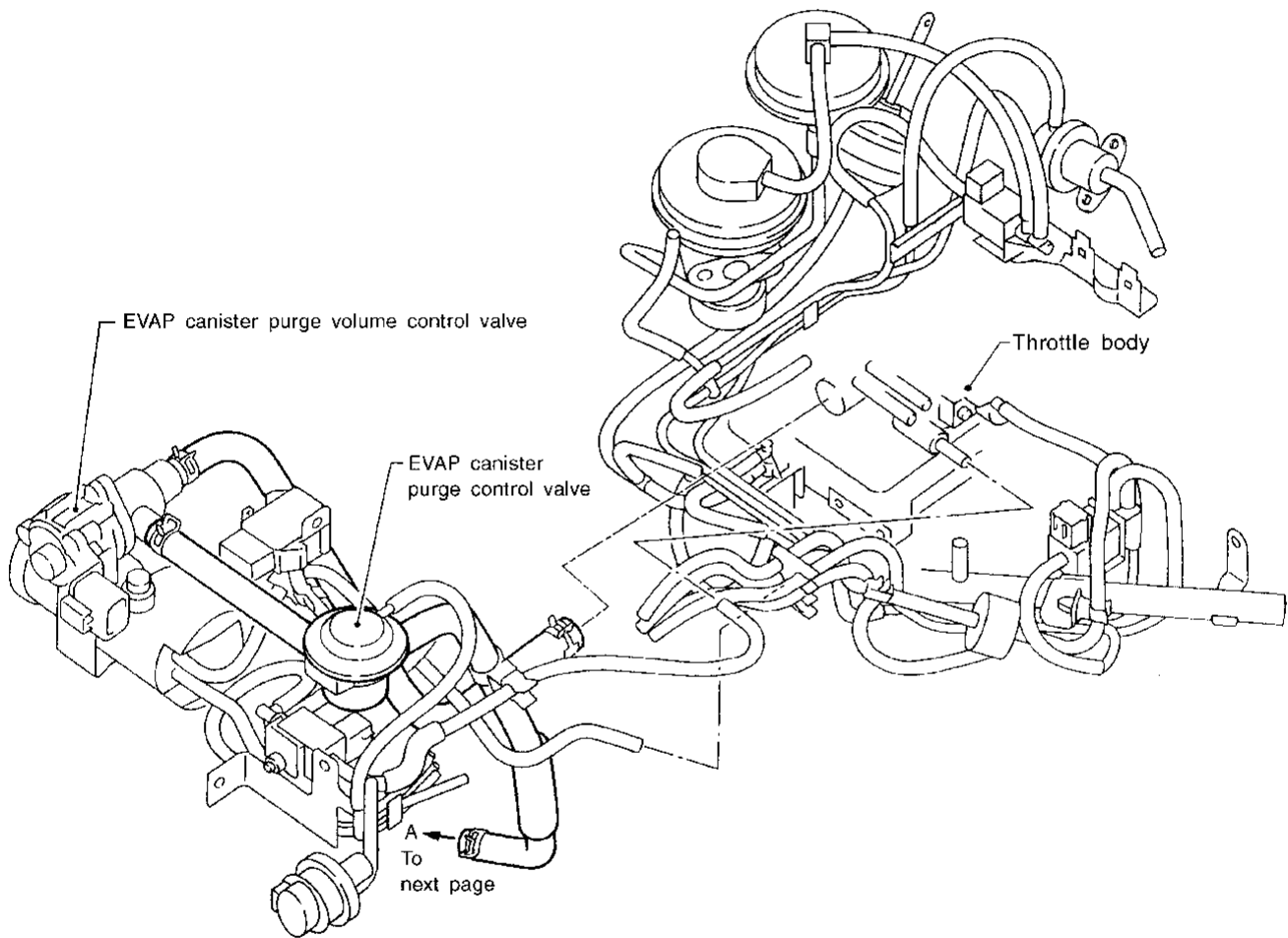
### EVAPORATIVE EMISSION (EVAP) CANISTER PURGE CONTROL SOLENOID VALVE

Refer to EC-199.

### TANK FUEL TEMPERATURE SENSOR

Refer to EC-158.

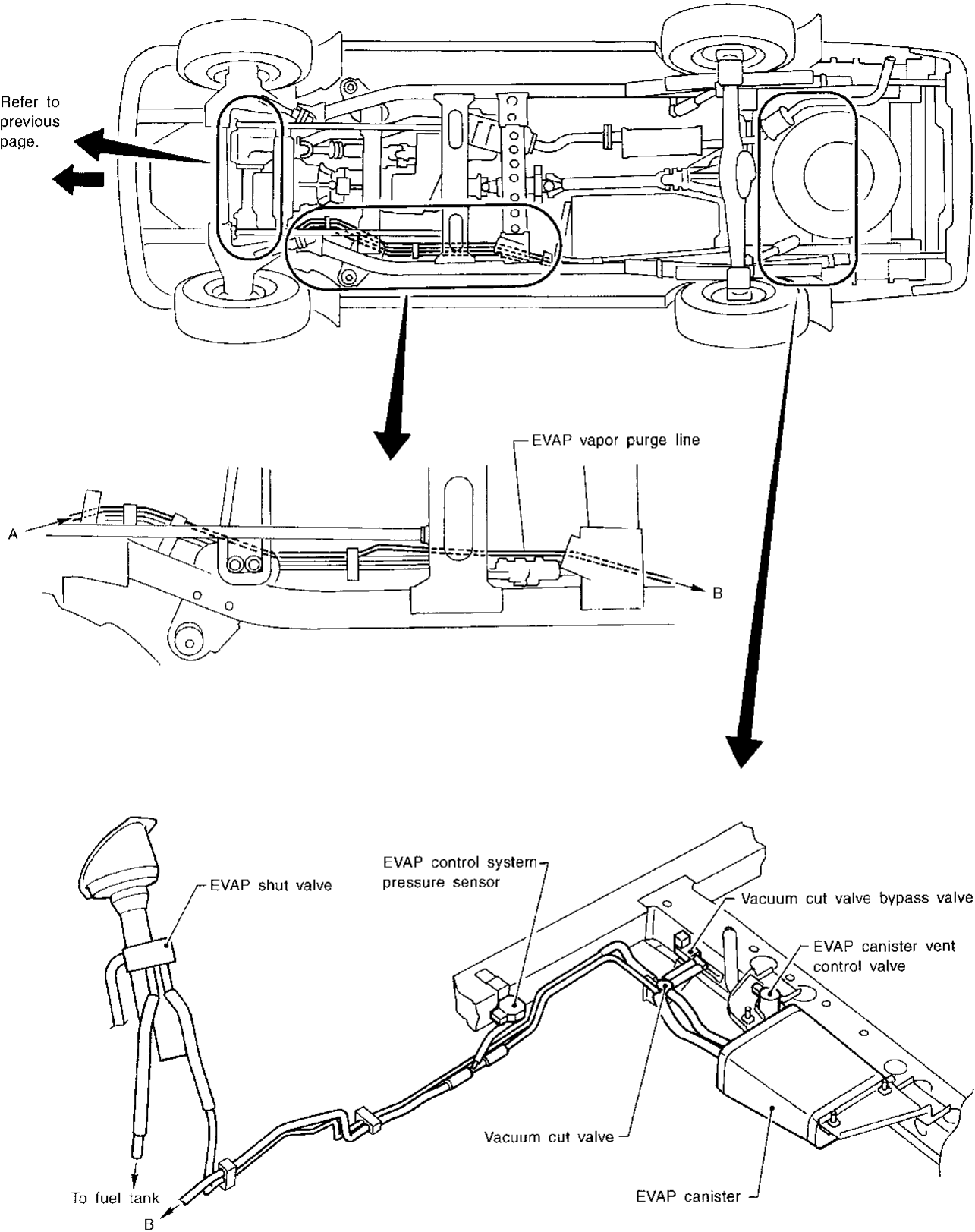
## Evaporative Emission Line Drawing



# EVAPORATIVE EMISSION SYSTEM

## Evaporative Emission Line Drawing (Cont'd)

Refer to  
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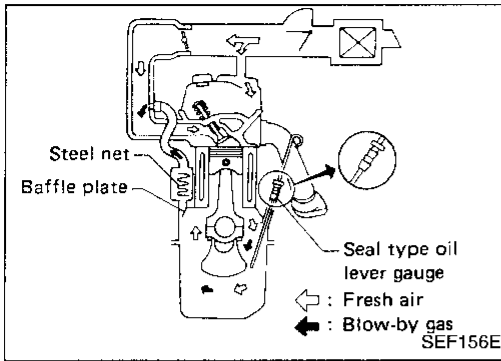
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# POSITIVE CRANKCASE VENTILATION



## Description

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

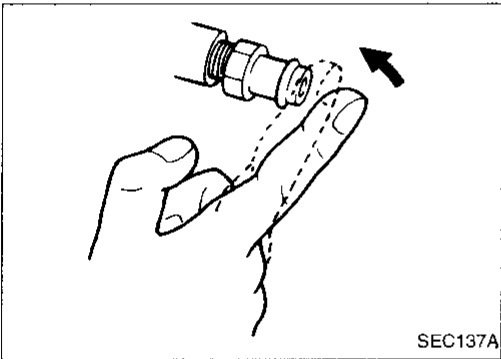
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

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 the 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.

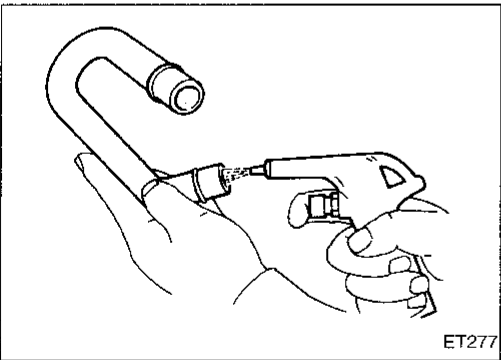
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the intake collector under all conditions.



## Inspection

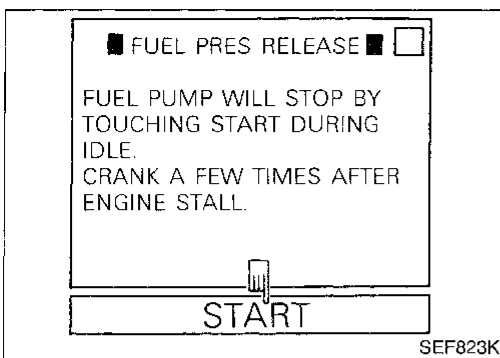
### PCV (Positive Crankcase Ventilation) VALVE

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.



### PCV HOSE

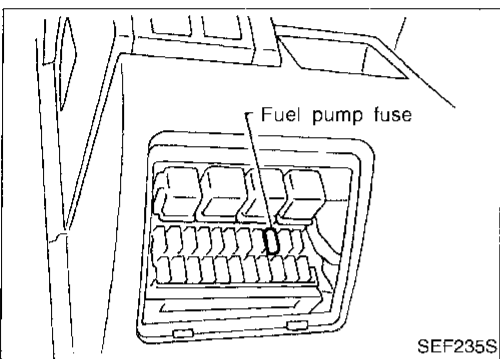
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



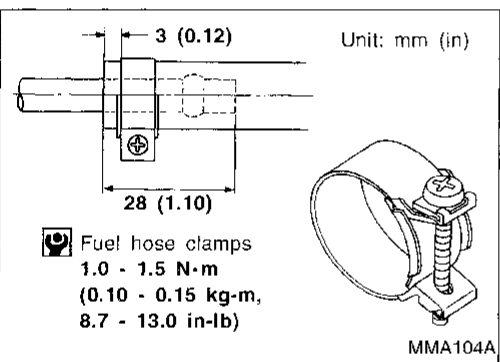
## Fuel Pressure Release

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.  
(Touch "START", and after engine stalls, crank it two or three times to release all fuel pressure.)
3. Turn ignition switch OFF.



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 reinstall fuel pump fuse.



## Fuel Pressure Check

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

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.

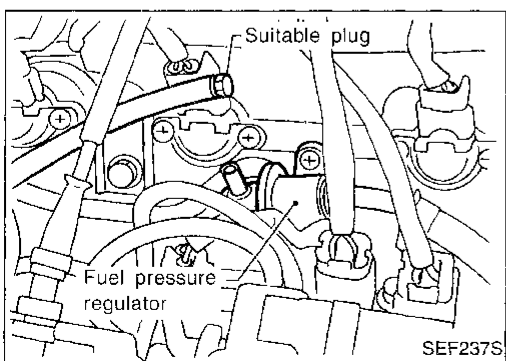
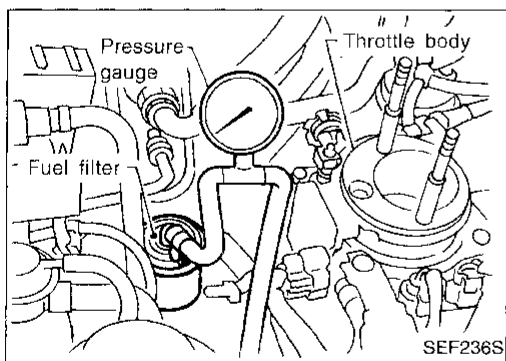
**At idling:**

**Approximately 235 kPa (2.4 kg/cm<sup>2</sup>, 34 psi)**

**A few seconds after ignition switch is turned OFF to ON:**

**Approximately 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)**

6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

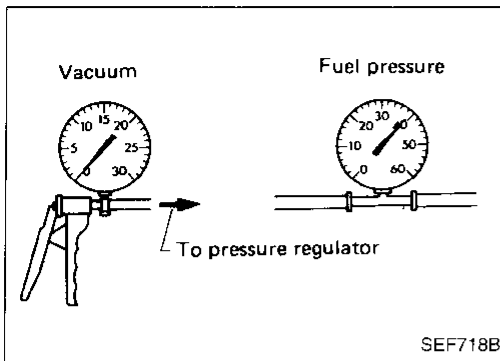


## BASIC SERVICE PROCEDURE

### Fuel Pressure Check (Cont'd)

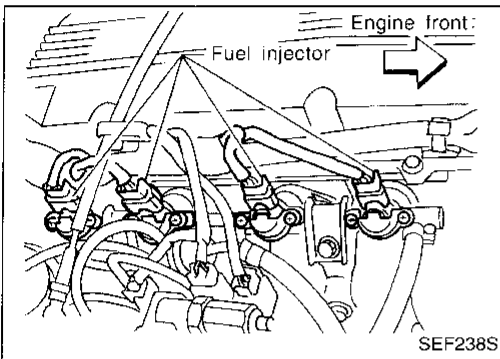
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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



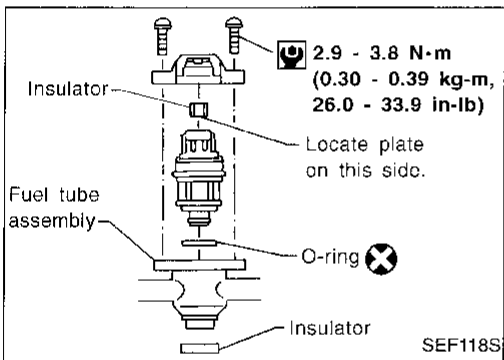
### Injector Removal and Installation

1. Release fuel pressure to zero.
2. 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.**



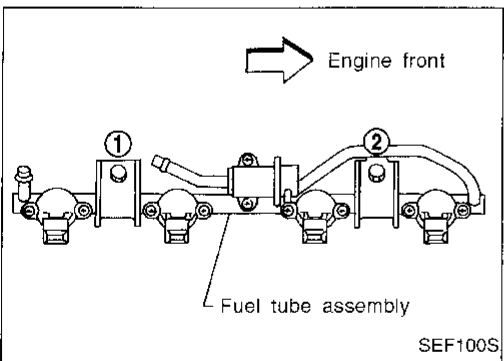
5. Install injectors with fuel tube assembly to intake manifold.

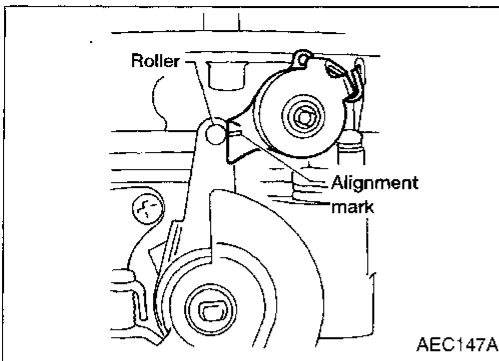
**Tighten in numerical order shown in the figure.**

- 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:**

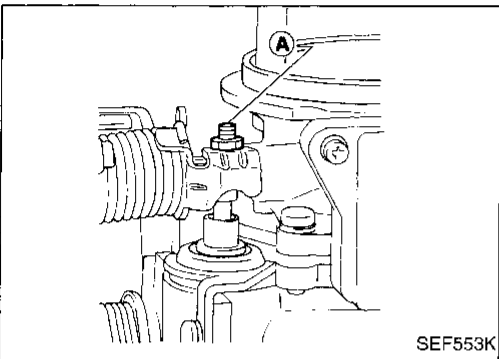
**After properly connecting injectors to fuel tube assembly, check connections for fuel leakage.**



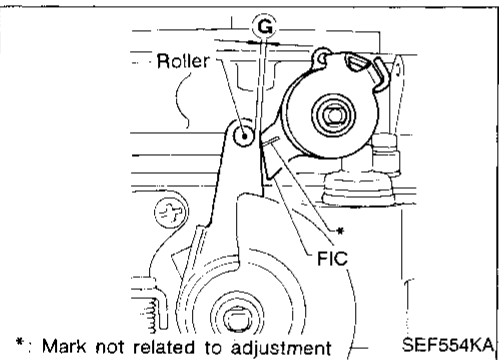


## Fast Idle Cam (FIC) Inspection and Adjustment

1. Remove air cleaner assembly.
2. Make sure the FIC alignment mark is centered on the lever roller as shown in the figure.
  - An alignment mark is stamped on the FIC so that the top of the cam will face in the correct direction.



- If necessary, adjust the FIC screw (A) until the alignment mark is centered on the lever roller.



3. Start engine and warm up to operating temperature.
4. Measure clearance (G) between the lever roller and the top of the FIC using a feeler gauge as shown in the figure.

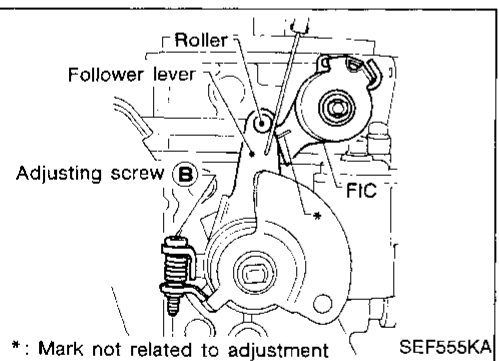
**Clearance (G):**

**M/T model**

2.0 - 2.6 mm (0.079 - 0.102 in)

**A/T model**

1.8 - 2.4 mm (0.071 - 0.094 in)



- If clearance (G) is out of specification, adjust clearance (G) using adjusting screw (B) to 2.3 mm (0.091 in) (M/T) or 2.1 mm (0.083 in) (A/T).

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

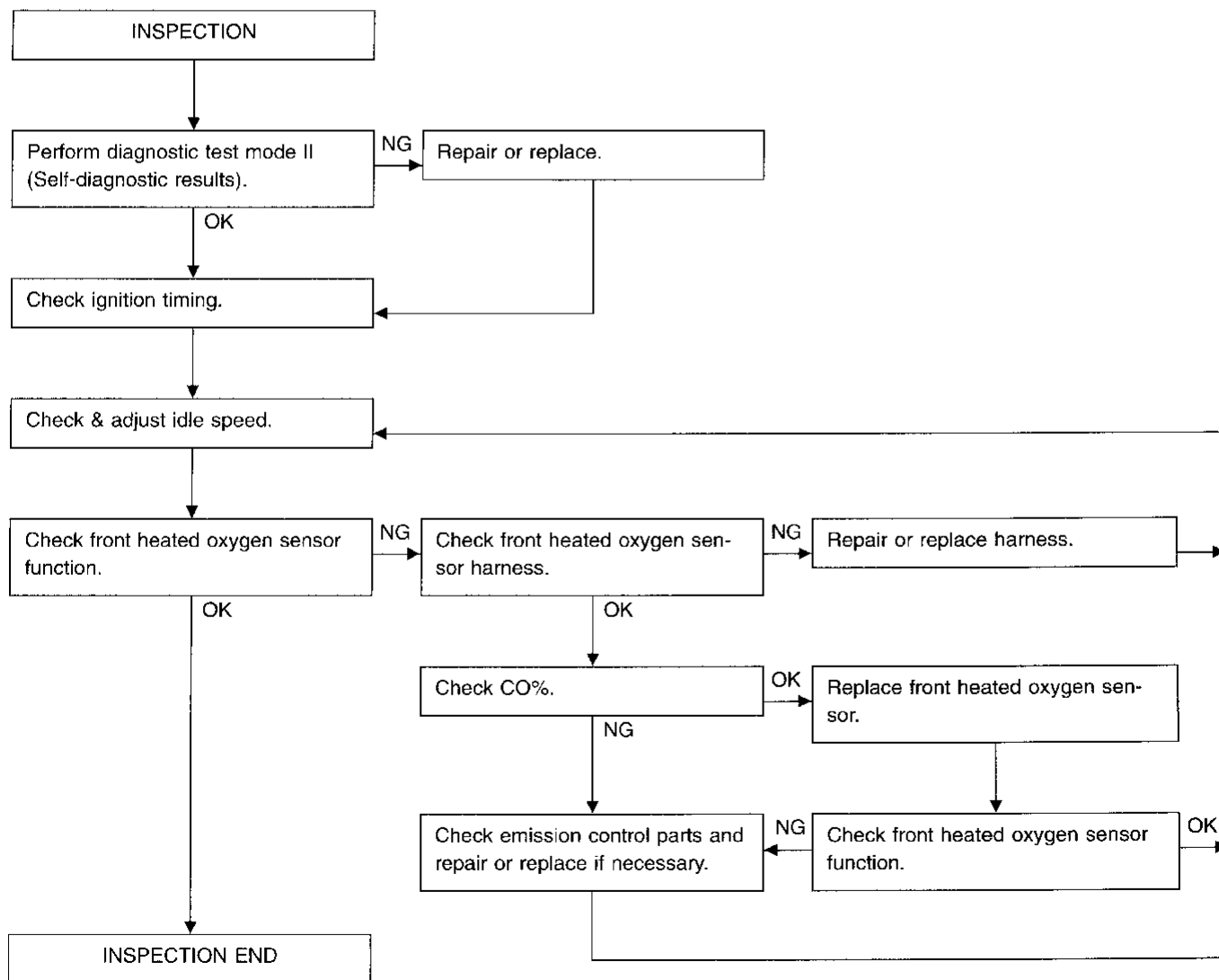
### PREPARATION

- 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) Evaporative emission (EVAP) canister purge control valve

- On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
- When checking idle speed, ignition timing and mixture ratio of A/T models, shift lever to "N" position.
- When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- Turn off headlamps, heater blower, rear window defogger.
- Keep front wheels pointed straight ahead.
- Make the check after the cooling fan has stopped.

### Overall inspection sequence



# BASIC SERVICE PROCEDURE

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

GI

MA

EM

LC

**EC**

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

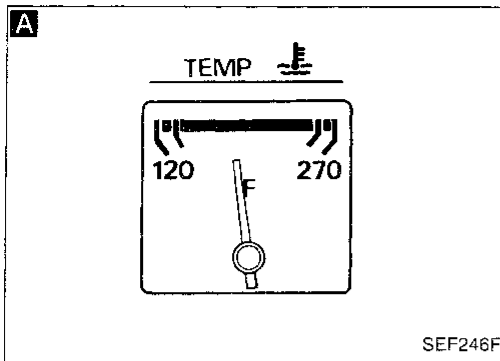
RS

BT

HA

EL

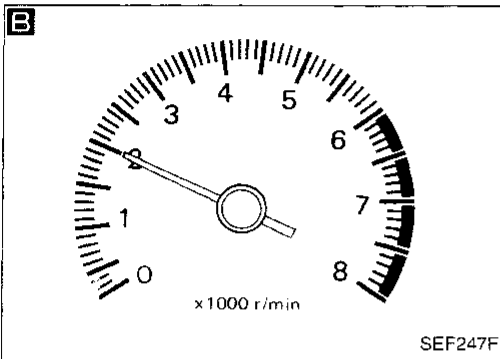
IDX



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.

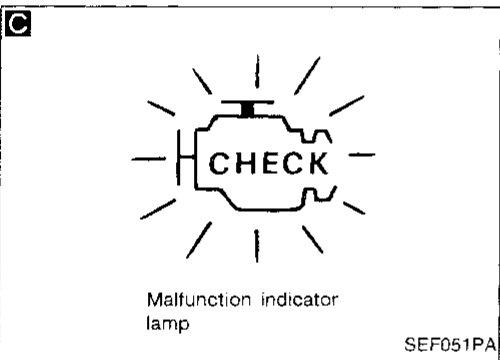
**B** Open engine hood and run engine at about 2,000 rpm for about 2 minutes under no-load.

**C** Perform the diagnostic test mode II (Self-diagnostic results).

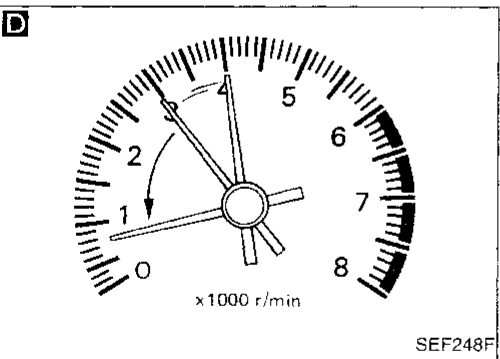
OK

NG

Repair or replace components as necessary.



**D** 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.

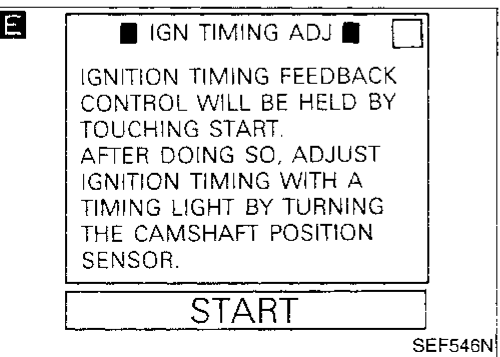


**E**

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

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.



**F** Check ignition timing with a timing light.

M/T:  $10^{\circ} \pm 2^{\circ}$  BTDC  
A/T:  $10^{\circ} \pm 2^{\circ}$  BTDC (in "N" position)

OK

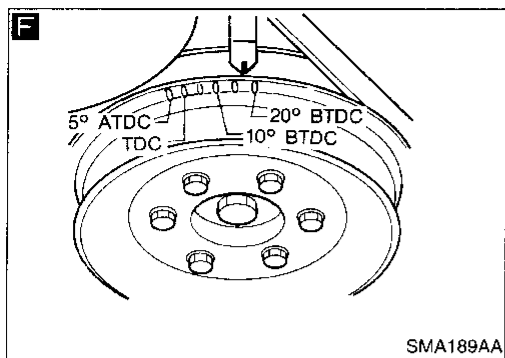
NG

**A** (Go to next page.)

**B** (Go to next page.)

# BASIC SERVICE PROCEDURE

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

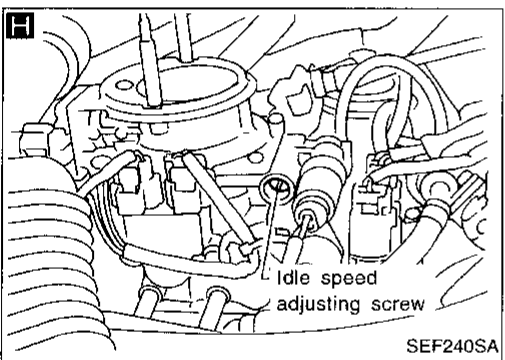


**■ IGN TIMING ADJ ■**

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**

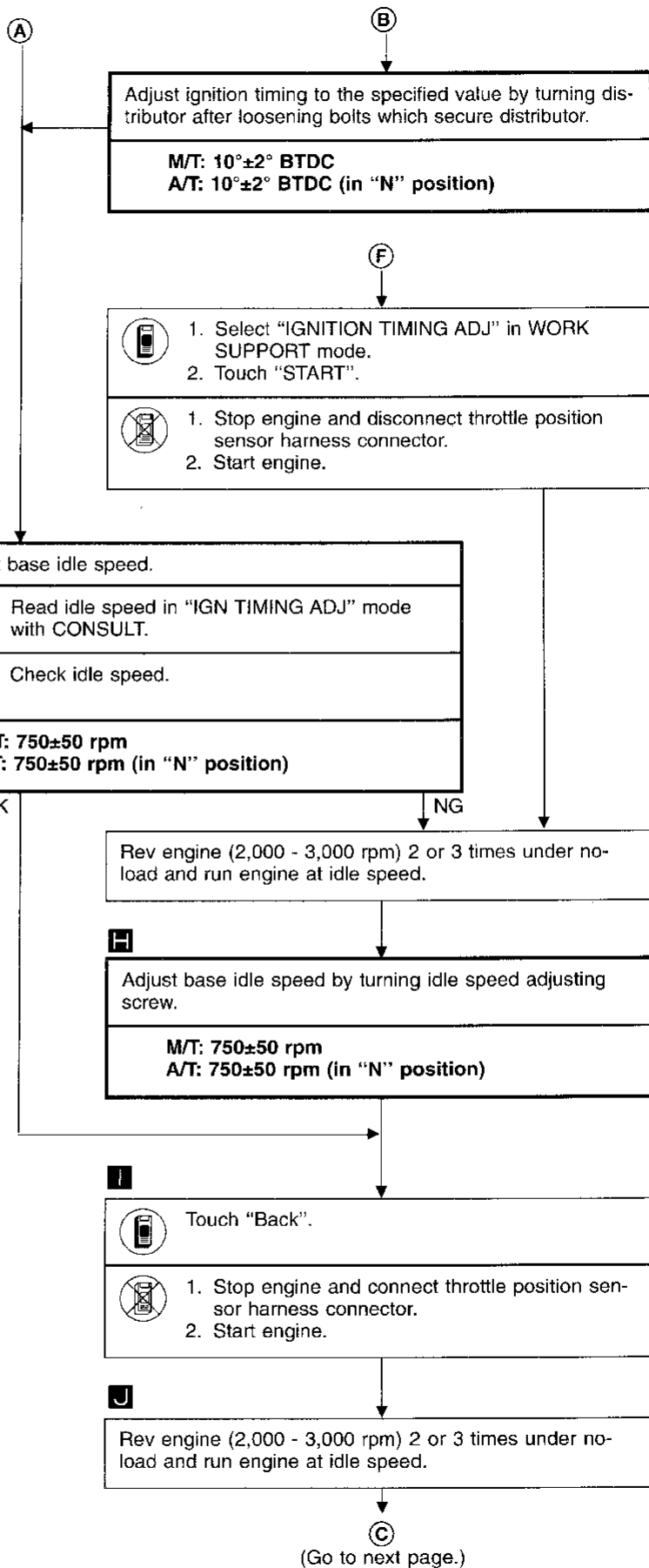
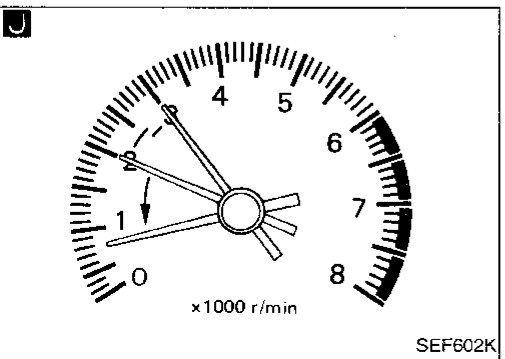
SEF546N



**I**

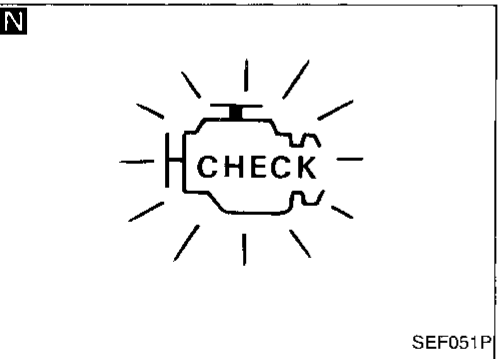
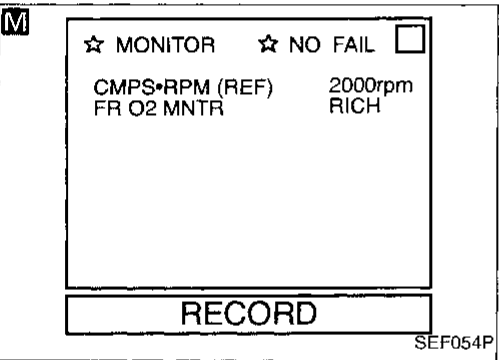
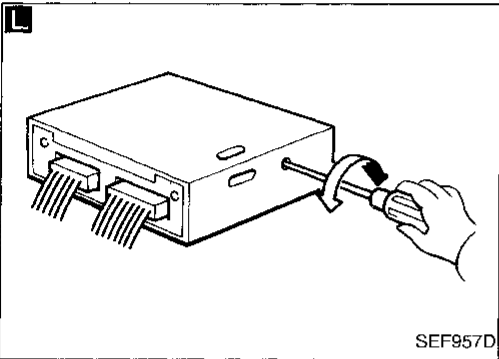
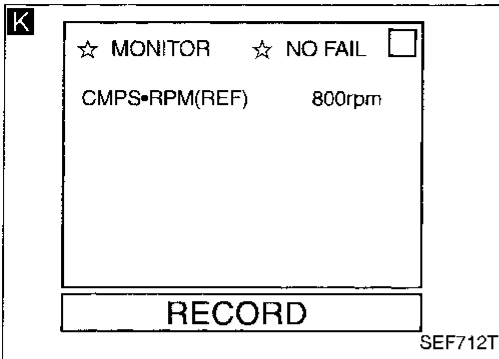
BACK	←	→	↑	↓	
MODE	LIGHT ON	LIGHT OFF	↑	↓	ENTER

SEF913J



# BASIC SERVICE PROCEDURE

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



ⓐ

**K**

Check target idle speed.

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

OR

Check idle speed.

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

OK

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.

**L**

Set the diagnostic test mode II (front heated oxygen sensor monitor).

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

**M N**

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 sufficiently), 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**

OR

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

NG → **D** (Go to next page.)

OK

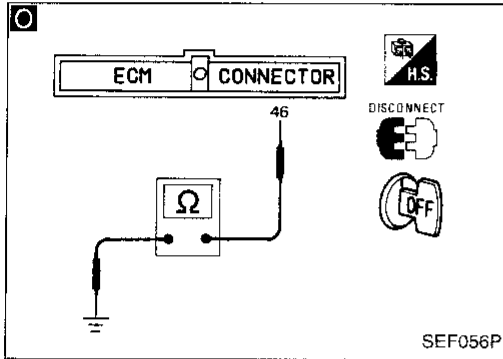
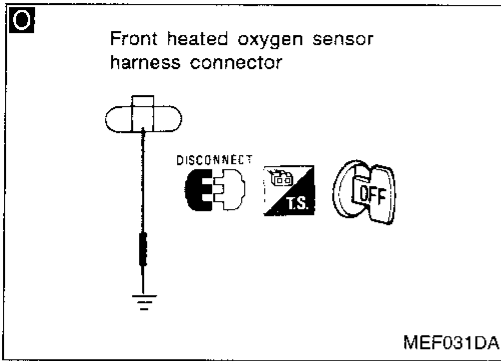
INSPECTION END

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



# BASIC SERVICE PROCEDURE

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



- ⓐ
- 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 (46) of ECM harness connector and ground metal on vehicle body.

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

Repair harness.

ⓕ  
(Go to EC-30.)

OK

Connect ECM harness connector to ECM.

- ⓑ
1. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
  2. Set "COOLANT TEMP" at 5°C (41°F).
- Disconnect engine coolant temperature sensor harness connector.
  - Connect a resistor (4.4 kΩ) between terminals of engine coolant temperature sensor harness connector.

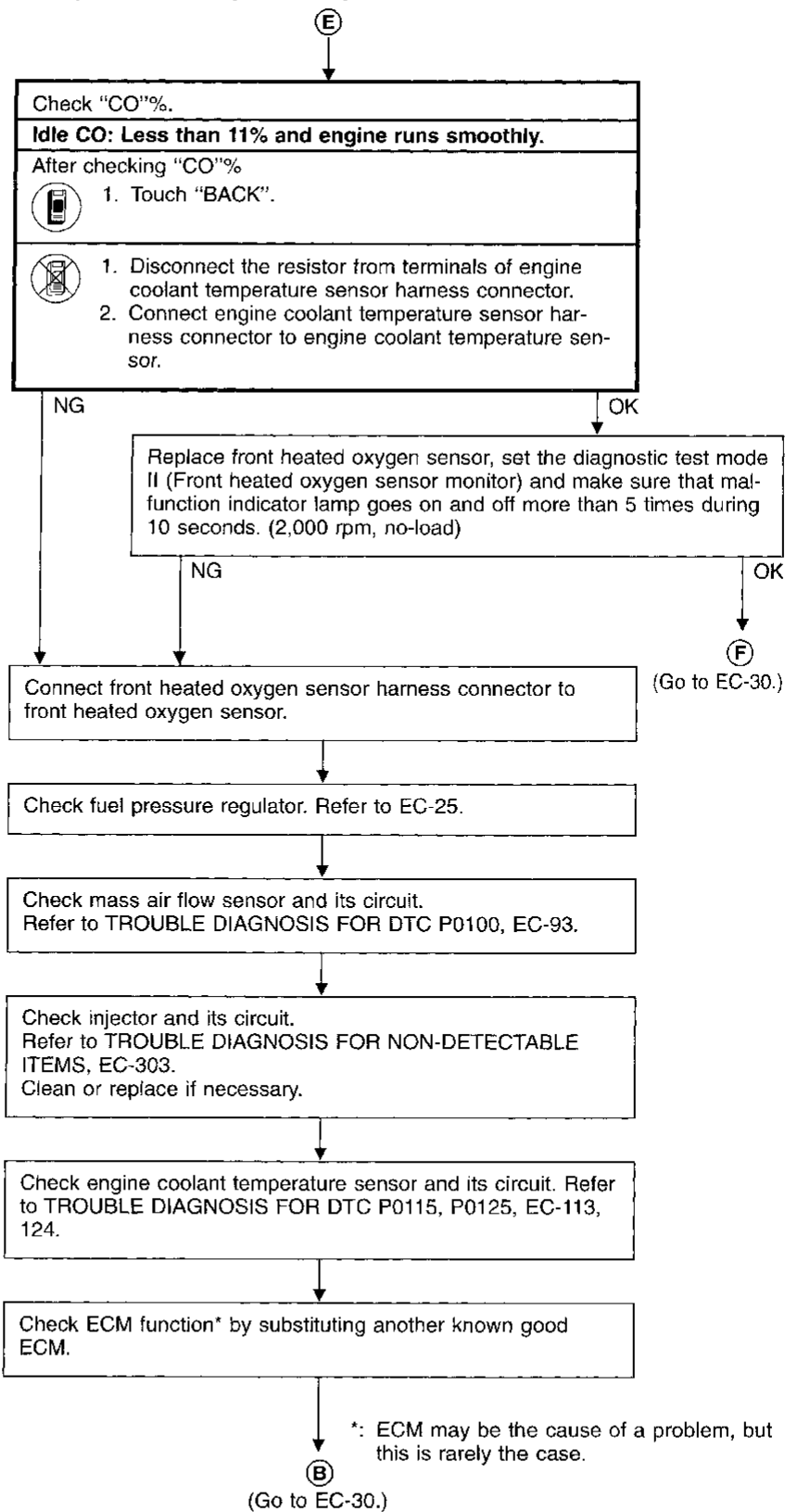
Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. (Be careful to start engine after setting "COOLANT TEMP" or installing a 4.4 kΩ resistor.)

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

ⓓ  
(Go to next page.)

# BASIC SERVICE PROCEDURE

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



- 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 (ECCS control module) has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information. Including:

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

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

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

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

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

The malfunction indicator lamp (MIL) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode (Refer to EC-76.).

## 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 lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up					
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) is being detected	X			X		X	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 (0701, 0605 - 0608) has been detected		X		X		X	
Closed loop control — DTC: P0130 (0307)		X		X		X	
Fail-safe items (Refer to EC-76.)		X		X*1		X*1	
Except above			X		X	X	X

\*1: Except "ECM".

## Emission-related Diagnostic Information

CI

MA

EM

IC

EC

FE

OL

MT

AT

TF

PD

FA

EA

BR

ST

RS

BT

HA

EL

IDX

### 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 (for example, driving pattern A, refer to EC-52) 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-43.




For malfunctions in which 1st trip DTCs are displayed, refer to EC-41. These items are required by legal regulation 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.

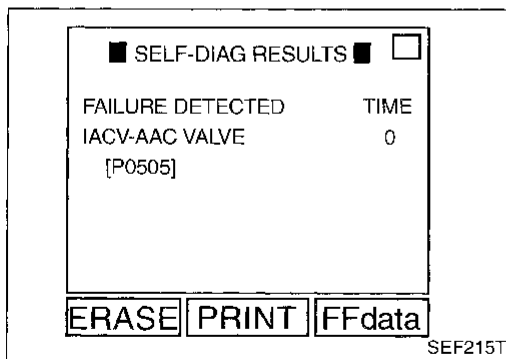
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to page EC-70. Then perform "DTC confirmation procedure" or "Overall function check" to try to duplicate the problem. If the malfunction is duplicated, the item requires repair.

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

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

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.  
 (CONSULT also displays the malfunctioning component or system.)

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

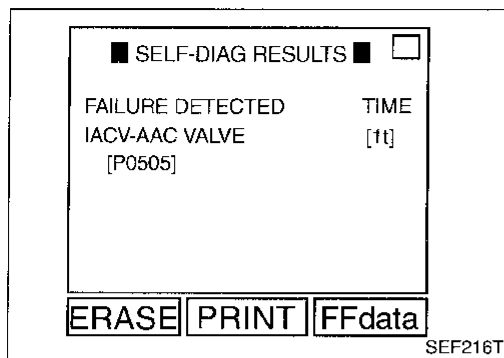


A sample of CONSULT display for DTC is shown at left. DTC or 1st trip DTC of a malfunction is displayed in SELF-DIAGNOSTIC RESULTS mode of CONSULT. Time data indicates how many times the vehicle was driven after the last detection of a DTC. If the DTC is being detected currently, the time data will be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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

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



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

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 and vehicle speed 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 are 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-56.

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 (Includes A/T related items)
3	1st trip freeze frame data	

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

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION". Refer to EC-43.

### 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 requirement 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 two 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 (9 test items) for the ECCS used in D21 models.


# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

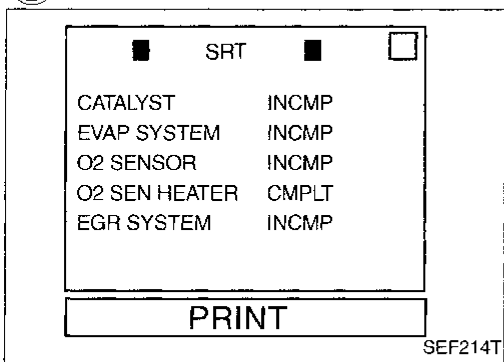
SRT items	Self-diagnostic test items
Catalyst monitoring	<ul style="list-style-type: none"> <li>● Three way catalyst function P0420 (0702)</li> </ul>
EVAP system monitoring	<ul style="list-style-type: none"> <li>● EVAP control system (Small Leak) P0440 (0705)</li> <li>● EVAP control system purge flow monitoring P1447 (0111)</li> </ul>
Oxygen sensor monitoring	<ul style="list-style-type: none"> <li>● Front heated oxygen sensor P0130 (0503)</li> <li>● Rear heated oxygen sensor P0136 (0707)</li> </ul>
Oxygen sensor heater monitoring	<ul style="list-style-type: none"> <li>● Front heated oxygen sensor heater P0135 (0901)</li> <li>● Rear heated oxygen sensor heater P0141 (0902)</li> </ul>
EGR system monitoring	<ul style="list-style-type: none"> <li>● EGR function P0400 (0302)</li> <li>● EGRC-BPT valve function P0402 (0306)</li> </ul>

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-43). In addition, after ECCS components/systems 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" in "SRT-OBD TEST VALUE" 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)



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

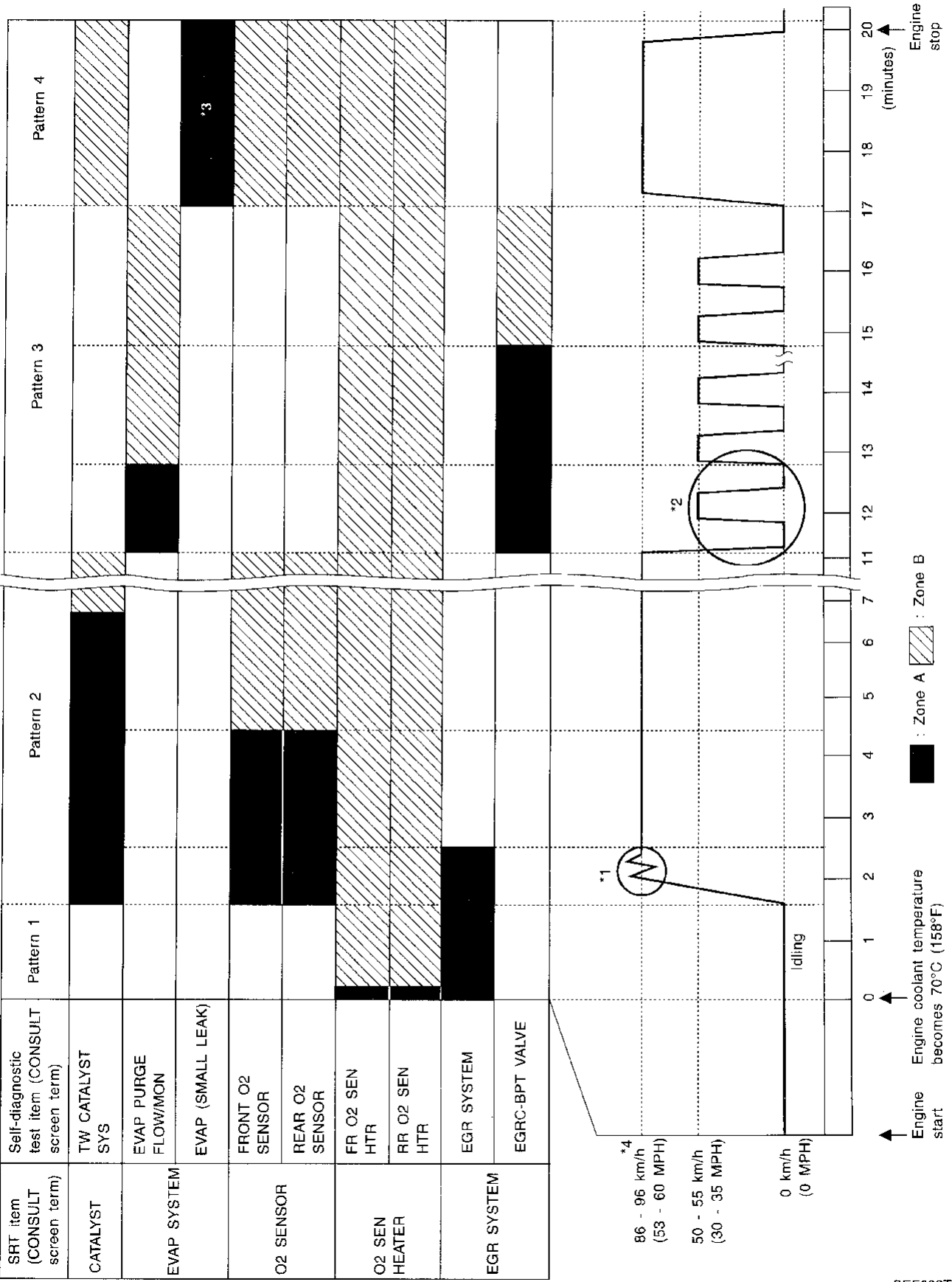
To set all SRT codes, self-diagnosis for the items indicated above must be performed two or more times. Each diagnosis may require a long period of actual driving under various conditions. The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

### 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.**



# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## 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:

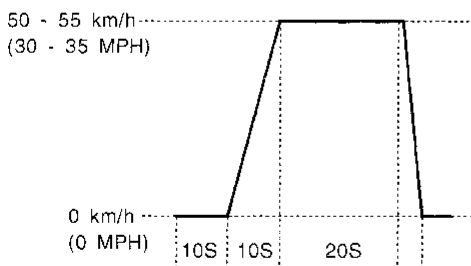
- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.

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 (51) 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 (51) and (43) is lower than 1.4V).**
- Pattern 2: • When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.
- 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 at right.
- Pattern 4: • Tests are performed after the engine has been operated for at least 12 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 THRTL 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.



SEF414S

\*3: The driving pattern may be omitted when EVAP (SMALL LEAK) checks are performed using the FUNCTION TEST mode of CONSULT.

\*4: Checking the vehicle speed with CONSULT or GST is advised.

### Suggested transmission gear position for A/T models

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

### Suggested upshift speeds for M/T models

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

For normal acceleration in low altitude areas [less than 1,219 m (4,000 ft)]:

Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)
1st to 2nd	24 (15)	23 (14)
2nd to 3rd	40 (25)	28 (17)
3rd to 4th	65 (40)	44 (27)
4th to 5th	75 (45)	61 (38)

For high altitude areas [over 1,219 m (4,000 ft)] and quick acceleration in low altitude areas:

Gear change	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.

Gear	km/h (MPH)	
	2WD models	4WD models (2H position)
1st	50 (30)	40 (25)
2nd	90 (55)	70 (43)
3rd	130 (80)	110 (68)
4th	—	—
5th	—	—



# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

### TEST VALUE AND TEST LIMIT

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 CONSULT screen or GST.

X: Applicable  
—: Not applicable

SRT item (CONSULT display)	Self-diagnostic test item	Test value			Test limit	Application
		GST display		CONSULT display		
		TID	CID			
CATALYST	Warm-up three way catalyst function	01H	01H	Parameter 1	Max.	X
EVAP SYSTEM	EVAP control system (Small leak)	05H	03H	Parameter 1	Max.	X
	EVAP control system purge flow monitoring	06H	83H	Parameter 2	Min.	X
O2 SENSOR	Front heated oxygen sensor	09H	04H	Parameter 1	Max.	X
		0AH	84H	Parameter 2	Min.	X
		0BH	04H	Parameter 3	Max.	X
		0CH	04H	Parameter 4	Max.	X
		0DH	04H	Parameter 5	Max.	X
	Rear heated oxygen sensor	19H	86H	Parameter 6	Min.	X
		1AH	86H	Parameter 7	Min.	X
		1BH	06H	Parameter 8	Max.	X
	1CH	06H	Parameter 9	Max.	X	
O2 SENSOR HEATER	Front heated oxygen sensor heater	29H	08H	Parameter 1	Max.	X
		2AH	88H	Parameter 1	Min.	X
	Rear heated oxygen sensor heater	2DH	0AH	Parameter 1	Max.	X
		2EH	8AH	Parameter 1	Min.	X
EGR SYSTEM	EGR function	31H	8CH	Parameter 1	Min.	X
		32H	8CH	Parameter 2	Min.	X
		33H	8CH	Parameter 3	Min.	X
		34H	8CH	Parameter 4	Min.	X
		35H	0CH	Parameter 5	Max.	X
	EGRC-BPT valve function	36H	0CH	Parameter 6	Max.	X
		37H	8CH	Parameter 7	Min.	X

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

### EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable  
—: Not applicable

Items (CONSULT screen terms)	DTC*3		SRT code	Test value/ Test limit	1st trip DTC	Reference page
	CONSULT GST*2	ECM*1				
<b>NO SELF DIAGNOSTIC FAILURE INDICATED</b>	<b>P0000</b>	<b>0505</b>	—	—	—	—
MASS AIR FLOW SEN	P0100	0102	—	—	X	EC-93
ABSOL PRESS SENSOR	P0105	0803	—	—	X	EC-100
INT AIR TEMP SEN	P0110	0401	—	—	X	EC-107
COOLANT TEMP SEN	P0115	0103	—	—	X	EC-113
THROTTLE POSI SEN	P0120	0403	—	—	X	EC-118
*COOLANT TEMP SEN	P0125	0908	—	—	X	EC-124
CLOSED LOOP	P0130	0307	—	—	X	EC-134
FRONT O2 SENSOR	P0130	0503	X	X	X*4	EC-129
FR O2 SEN HEATER	P0135	0901	X	X	X*4	EC-135
REAR O2 SENSOR	P0136	0707	X	X	X*4	EC-139
RR O2 SEN HEATER	P0141	0902	X	X	X*4	EC-143
FUEL SYS DIAG LEAN	P0171	0115	—	—	X	EC-148
FUEL SYS DIAG RICH	P0172	0114	—	—	X	EC-153
TANK FUEL TEMP SEN	P0180	0402	—	—	X	EC-158
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-162
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-162
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-162
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-162
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-162
CRANK POS SEN (OBD)	P0335	0802	—	—	X	EC-166
CAMSHAFT POSI SEN	P0340	0101	—	—	X	EC-171
EGR SYSTEM	P0400	0302	X	X	X*4	EC-176
EGRC-BPT VALVE	P0402	0306	X	X	X*4	EC-184
TW CATALYST SYS	P0420	0702	X	X	X*4	EC-186
EVAP (SMALL LEAK)	P0440	0705	X	X	X*4	EC-189
PURG CONT/V & S/V	P0443	0807	—	—	X	EC-199
VENT CONTROL VALVE	P0446	0903	—	—	X	EC-207
EVAP SYS PRES SEN	P0450	0704	—	—	X	EC-212

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

\*2: These numbers are prescribed by SAE J2012.

\*3: 1st trip DTC No. is the same as DTC No.

\*4: These are not displayed with GST.

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

X: Applicable  
—: Not applicable

Items (CONSULT screen terms)	DTC*3		SRT code	Test value/ Test limit	1st trip DTC	Reference page
	CONSULT GST*2	ECM*1				
VEHICLE SPEED SEN	P0500	0104	—	—	X	EC-217
IACV-AAC VALVE	P0505	0205	—	—	X	EC-221
CLOSED THRL POS SW	P0510	0203	—	—	X	EC-226
ECM	P0605	0301	—	—	X	EC-230
PARK/NEUT POSI SW	P0705	1003	—	—	X	EC-232
MAP/BARO SW SOL/V	P1105	1302	—	—	X	EC-237
SWIRL CONT S/V	P1130	1004	—	—	X	EC-243
SWIRL/V CONT VC SW	P1165	0112	—	—	X	EC-251
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-256
CRANK P/S (OBD) COG	P1336	0905	—	—	X	EC-262
EGRC SOLENOID/V	P1400	1005	—	—	X	EC-267
EGR TEMP SENSOR	P1401	0305	—	—	X	EC-271
VCV BYPASS/V	P1441	0801	—	—	X	EC-276
PURGE VOLUME CONT/V	P1445	1008	—	—	X	EC-281
EVAP PURGE FLOW/MON	P1447	0111	X	X	X*4	EC-288
TOR CONV CLUTCH S/V	P1550	0904	—	—	X	EC-295

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

\*2: These numbers are prescribed by SAE J2012.

\*3: 1st trip DTC No. is the same as DTC No.




\*4: These are not displayed with GST.

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

### HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

The emission-related diagnostic information can be erased by the following methods.

-  Selecting "ERASE" in the "SELF-DIAG RESULTS" mode with CONSULT
-  Selecting Mode 4 with GST (Generic Scan Tool)
-  Changing the diagnostic test mode from Diagnostic Test Mode II to Mode I by turning the mode selector on the ECM (Refer to EC-46.)
- **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.

### How to erase DTC (With CONSULT)

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

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 7 seconds and then turn it "ON" (engine stopped) again.
2. Turn CONSULT "ON" and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the A/T control unit will be erased.) Then touch "BACK" twice.
5. Touch "ENGINE".
6. Touch "SELF-DIAG RESULTS".
7. Touch "ERASE". (The DTC in the ECM will be erased.)
- If DTCs are displayed for both ECM and A/T control unit, they need to be erased individually from the ECM and A/T control unit.

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

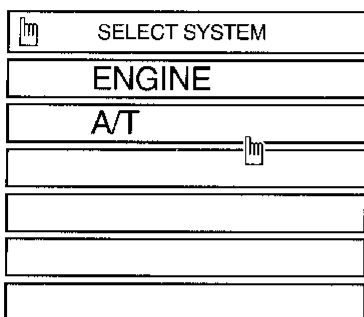
IDX

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

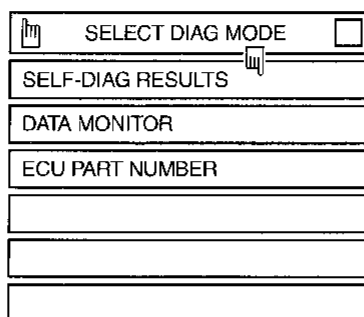
## Emission-related Diagnostic Information (Cont'd)

### How to erase DTC (With CONSULT)

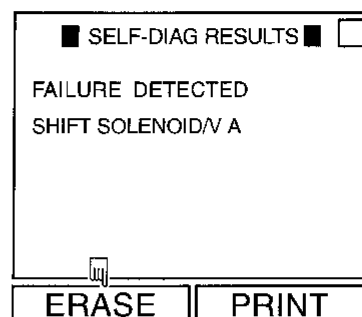
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 7 seconds and then turn it "ON" (engine stopped) again.



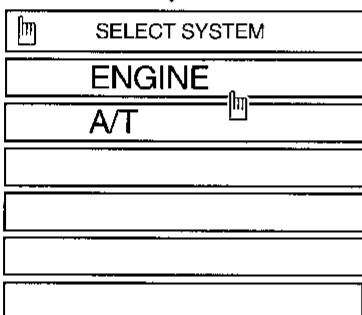
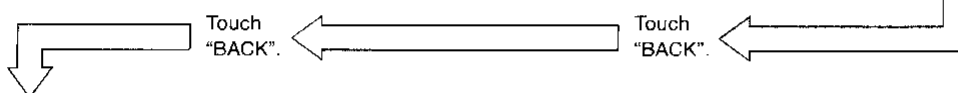
2. Turn CONSULT "ON", and touch "A/T".



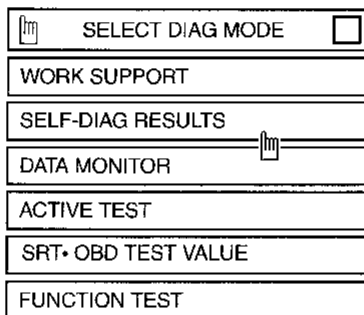
3. Touch "SELF-DIAG RESULTS".



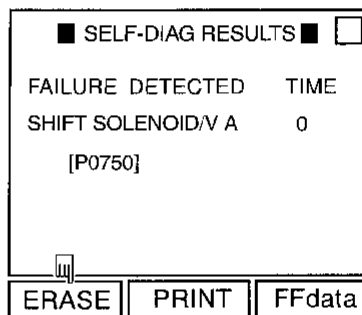
4. Touch "ERASE". (The DTC in the A/T control unit will be erased.)



5. Touch "ENGINE".



6. Touch "SELF-DIAG RESULTS".



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

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### How to erase DTC (With GST)

**Note: If the diagnostic trouble code is not for A/T related items (see EC-2), skip step 2.**

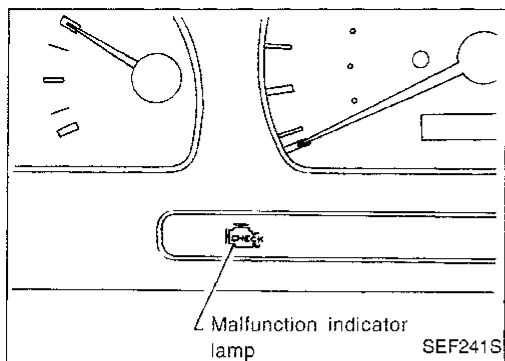
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 7 seconds and then turn it "ON" (engine stopped) again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

### How to erase DTC (No Tools)

**Note: If the diagnostic trouble code is not for A/T related items (see EC-2), skip step 2.**

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 7 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-46.)

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



## Malfunction Indicator Lamp (MIL)

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-321.
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 (two trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MIL in the 1st trip.
  - "Misfire (Possible three way catalyst damage)"
  - "Closed loop control"
  - Fail-safe mode

### 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

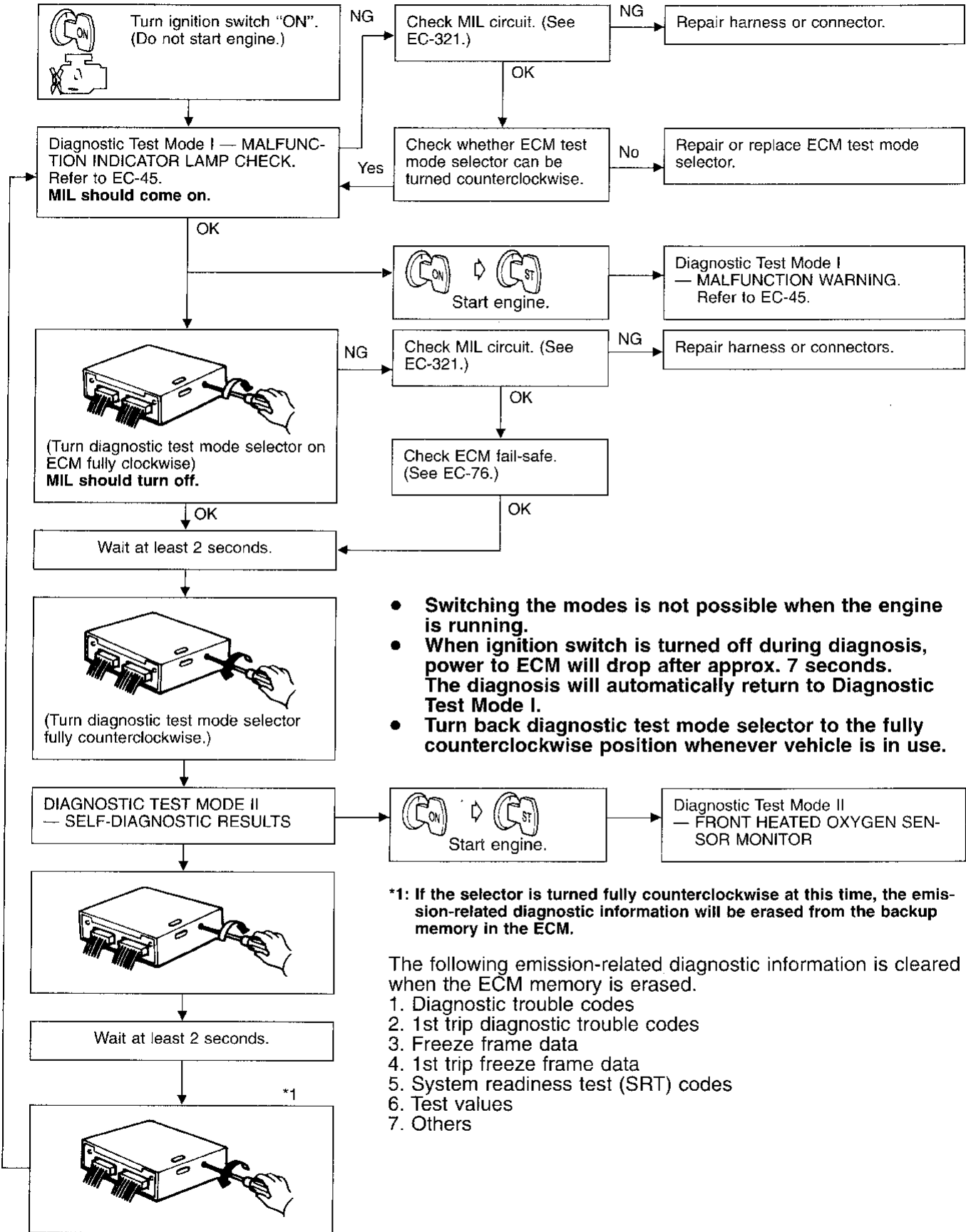
If the ECM is in Diagnostic Test Mode II, MIL may flash when engine is running. In this case, check ECM test mode selector following "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page. Refer to "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page.

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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## Malfunction Indicator Lamp (MIL) (Cont'd)

### HOW TO SWITCH DIAGNOSTIC TEST MODES



- 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. 7 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.

\*1: 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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## Malfunction Indicator Lamp (MIL) (Cont'd)

### 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-321.

### DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

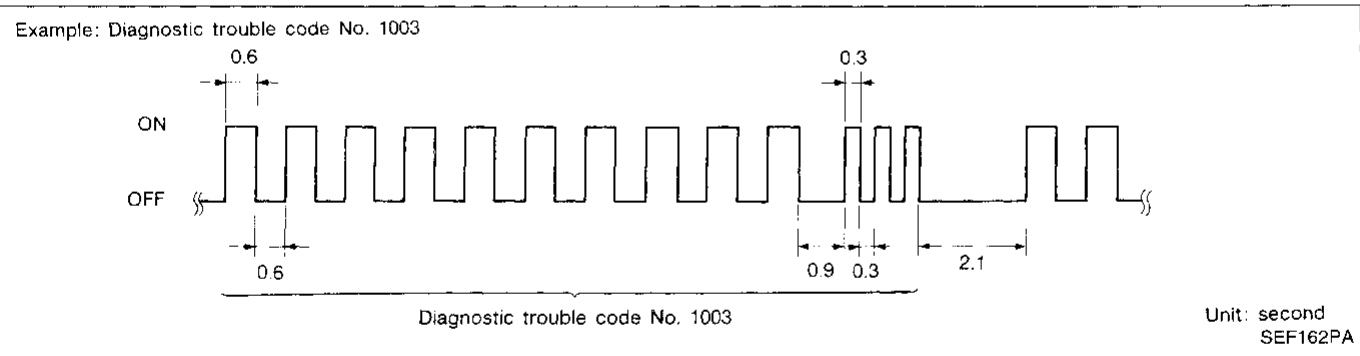
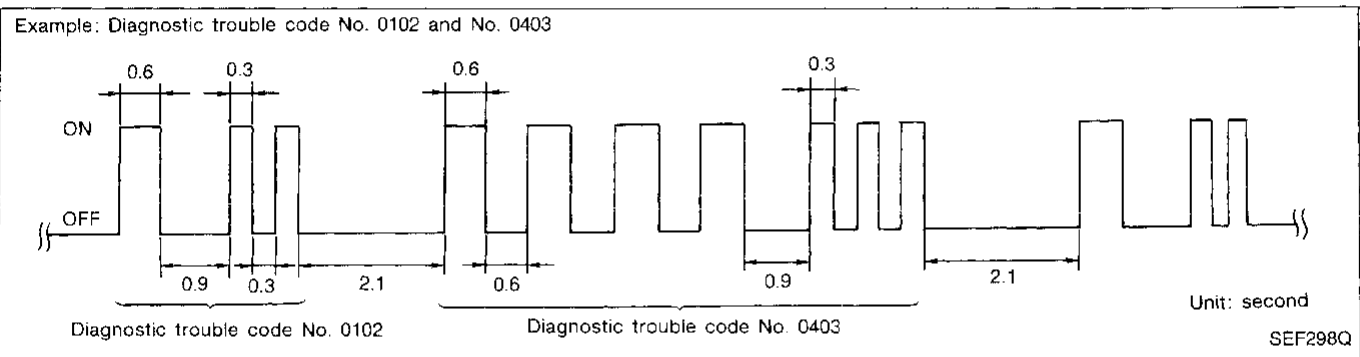
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

- 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 DTCs. 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 DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



Long (0.6 second) blinking indicates the number of ten digits, and short (0.3 second) blinking indicates the number of single digits. 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 park/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 INDEX, EC-2.)

### 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" on previous page.)

- 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.



## ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

### Malfunction Indicator Lamp (MIL) (Cont'd)

#### 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 Diagnostic Test Mode II. Then warm it up until engine coolant temperature indicator points to middle of gauge.

Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. 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-34.
- 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	Except the lefts
MIL (goes off)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2	1 (pattern B)

Details about patterns "A", "B", and "C" are on EC-50, 52.

\*1: Clear timing is at the moment OK is detected.

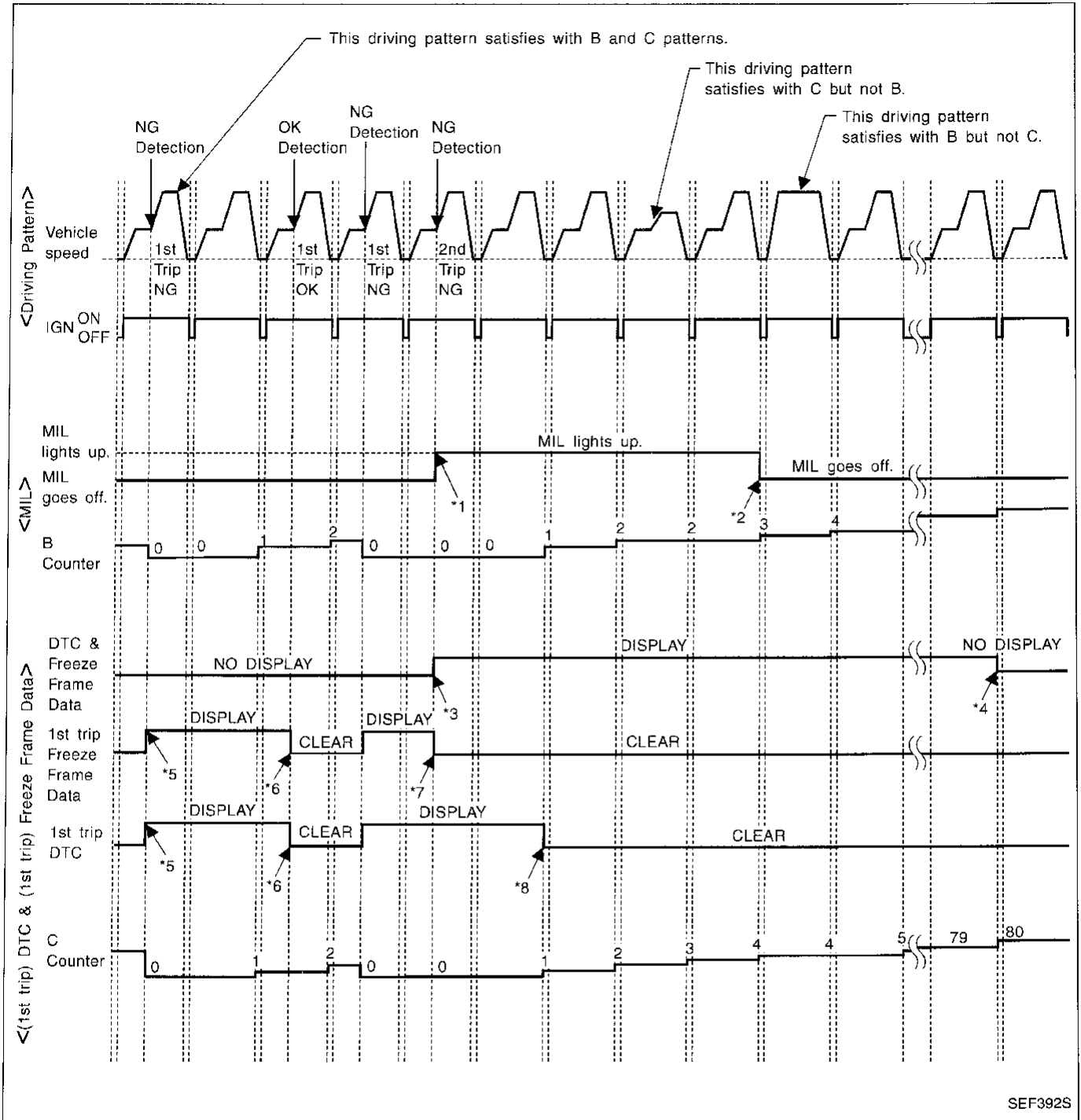
\*2: Clear timing is when the same malfunction is detected in the 2nd trip.

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## OBD System Operation Chart (Cont'd)

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

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



- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*2: MIL will go off after vehicle is driven three 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.

## ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

### OBD System Operation Chart (Cont'd)

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

##### <Driving pattern B>

Driving pattern B means the vehicle operation as follows:

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

- The B counter will reset 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 the 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)  $\pm 375$  rpm

Calculated load value: (Calculated load value in the freeze frame data)  $\times (1 \pm 0.1)$  [%]

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:

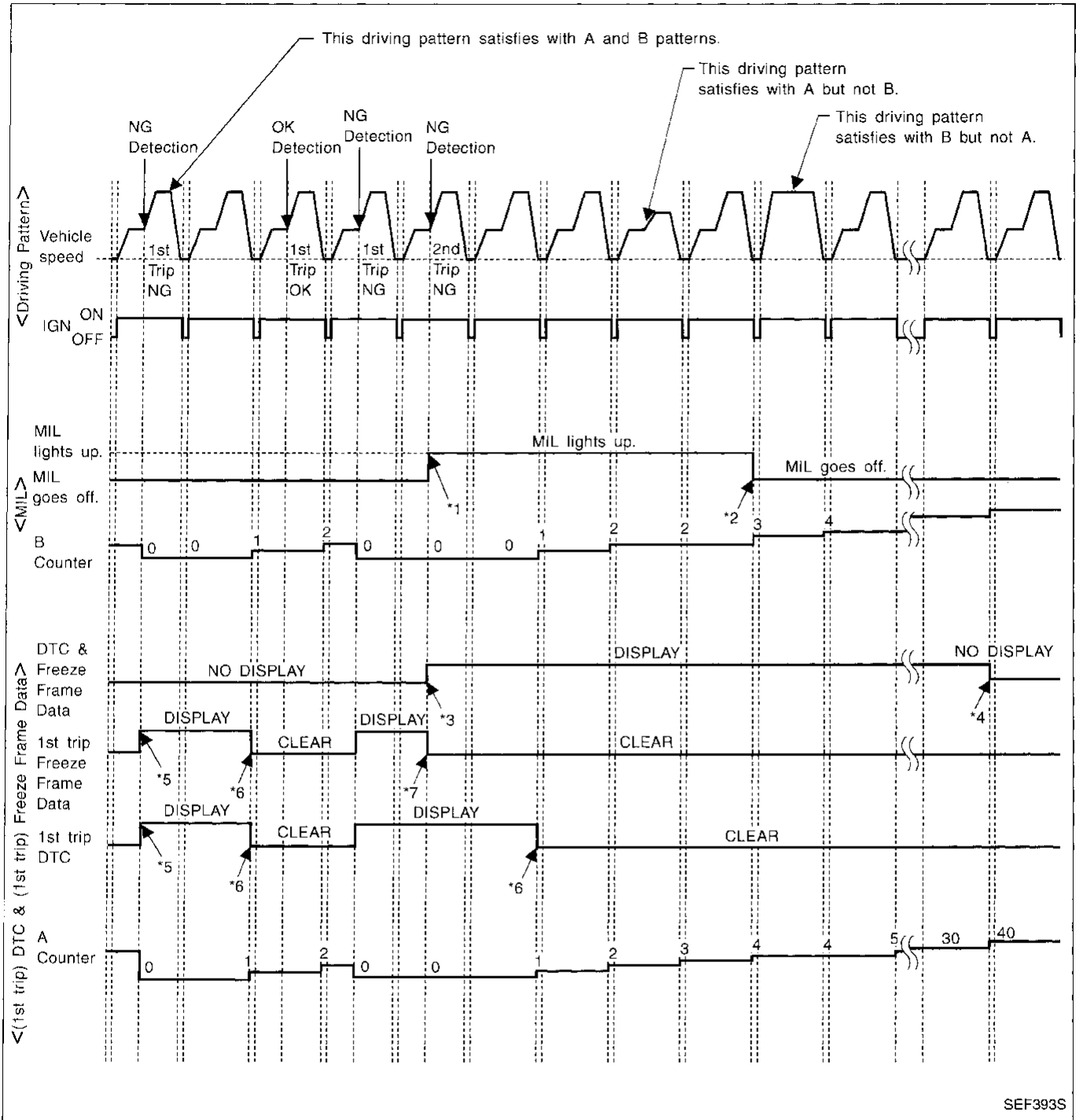
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than  $\geq 70^\circ\text{C}$  (158°F)

- 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.

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## 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"



- \*1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- \*2: MIL will go off after vehicle is driven three 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.)

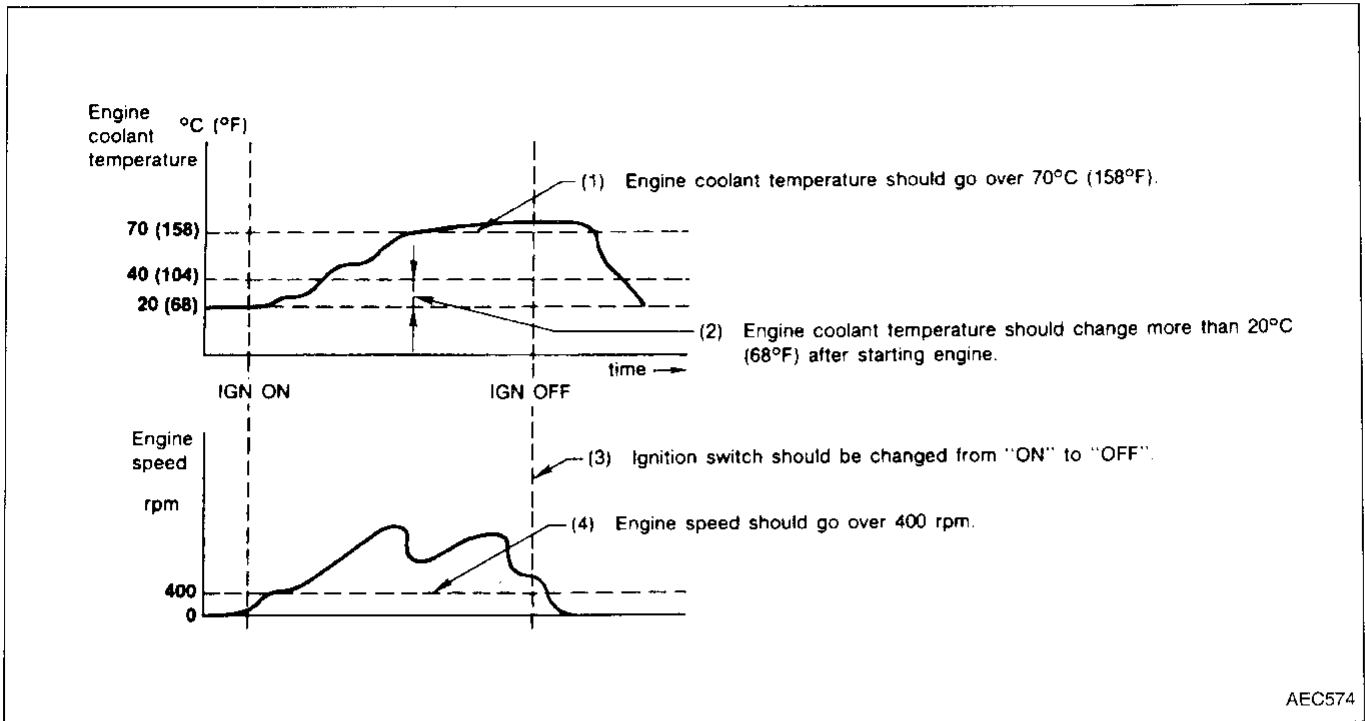
- \*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.
- \*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.
- \*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## 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.

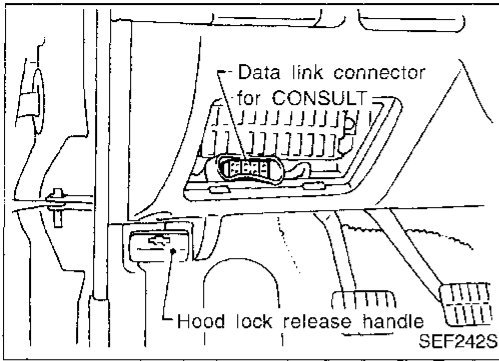
### <Driving pattern B>

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").

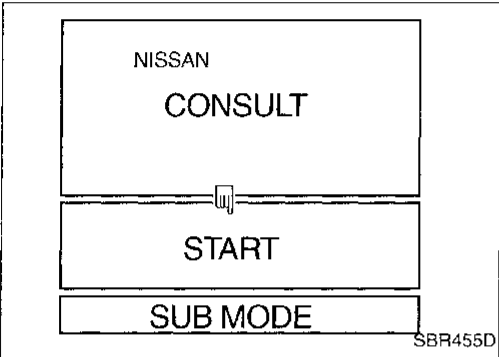
# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



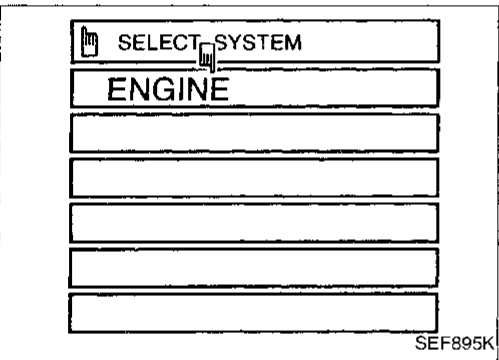
## CONSULT

### CONSULT INSPECTION PROCEDURE

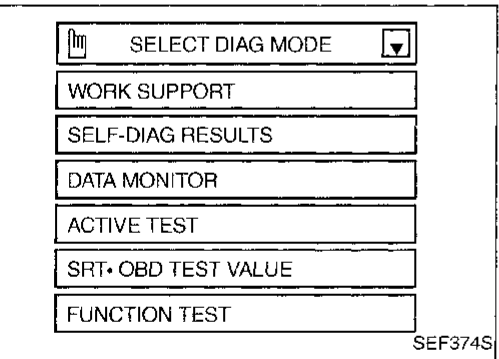
1. Turn ignition switch OFF.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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

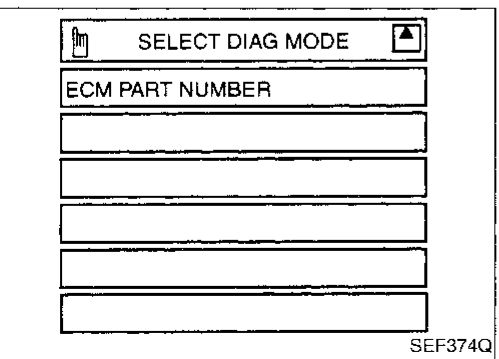


5. Touch "ENGINE".



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

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



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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

### ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item		DIAGNOSTIC TEST MODE						
		WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS*1		DATA MONITOR	ACTIVE TEST	FUNCTION TEST	SRT-OB D TEST VALUE
				FREEZE FRAME DATA*2				
ECCS COMPONENT PARTS	INPUT	Camshaft position sensor		X	X			
		Mass air flow sensor		X	X			
		Engine coolant temperature sensor		X	X	X	X	
		Front heated oxygen sensor		X		X		X
		Rear heated oxygen sensor		X		X		X
		Vehicle speed sensor		X	X	X		X
		Throttle position sensor	X	X		X		X
		Tank fuel temperature sensor		X		X		
		EVAP control system pressure sensor		X		X		
		Absolute pressure sensor		X		X		
		EGR temperature sensor		X		X		
		Intake air temperature sensor		X		X		
		Crankshaft position sensor (OBD)		X				
		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
		Swirl control valve control vacuum check switch		X		X		
	Battery voltage				X			
	OUTPUT	Injectors			X	X	X	
		Power transistor (Ignition timing)	X	X (Ignition signal)		X	X	X
		IACV-AAC valve	X	X		X	X	X
		EVAP canister purge volume control valve		X		X	X	
		Air conditioner relay				X		
		Fuel pump relay	X			X	X	X
		EGRC-solenoid valve		X		X	X	X
		Swirl control valve control 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		
		EVAP canister purge control solenoid valve		X		X	X	
EVAP canister vent control valve			X		X			
Vacuum cut valve bypass valve		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-36.

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## 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.
SRT-OBD test value	The status of system monitoring tests and the test values/test limits can be read.
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. <ul style="list-style-type: none"> <li>● IGN SW "ON"</li> <li>● ENG NOT RUNNING</li> <li>● ACC PEDAL NOT PRESSED</li> </ul>	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 VALVE ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. <ul style="list-style-type: none"> <li>● ENGINE WARMED UP</li> <li>● NO-LOAD</li> </ul>	
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



# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

### SELF-DIAGNOSTIC MODE

#### DTC and 1st trip DTC

Regarding items of "DTC and 1st trip DTC", refer to "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS" (See EC-41.)

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

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	<ul style="list-style-type: none"> <li>● ECCS component part/control system has a trouble code, it is displayed as "PXXXX". [Refer to "Alphabetical &amp; P No. Index for DTC (EC-2)."]</li> </ul>
FUEL SYS DATA	<ul style="list-style-type: none"> <li>● "Fuel injection system status" at the moment a malfunction is detected is displayed.</li> <li>● One mode in the following is displayed.                             <ul style="list-style-type: none"> <li>"MODE 2": Open loop due to detected system malfunction</li> <li>"MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment)</li> <li>"MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control</li> <li>"MODE 5": Open loop - has not yet satisfied condition to go to closed loop</li> </ul> </li> </ul>
CAL/LD VALUE [%]	<ul style="list-style-type: none"> <li>● The calculated load value at the moment a malfunction is detected is displayed.</li> </ul>
COOLANT TEMP [°C] or [°F]	<ul style="list-style-type: none"> <li>● The engine coolant temperature at the moment a malfunction is detected is displayed.</li> </ul>
S-FUEL TRIM [%]	<ul style="list-style-type: none"> <li>● "Short-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>● The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.</li> </ul>
L-FUEL TRIM [%]	<ul style="list-style-type: none"> <li>● "Long-term fuel trim" at the moment a malfunction is detected is displayed.</li> <li>● The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.</li> </ul>
ENGINE SPEED [rpm]	<ul style="list-style-type: none"> <li>● The engine speed at the moment a malfunction is detected is displayed.</li> </ul>
VHCL SPEED [km/h] or [mph]	<ul style="list-style-type: none"> <li>● The vehicle speed at the moment a malfunction is detected is displayed.</li> </ul>
ABSOL PRES [kPa] or [kg/cm <sup>2</sup> ] or [psi]	<ul style="list-style-type: none"> <li>● The intake manifold absolute pressure at the moment a malfunction is detected is displayed.</li> </ul>

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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

### DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS-RPM (POS) [rpm]	○	○	<ul style="list-style-type: none"> <li>Indicates the engine speed computed from the POS signal (1° signal) of the camshaft position sensor.</li> </ul>	
CMPS-RPM (REF) [rpm]	○		<ul style="list-style-type: none"> <li>Indicates the engine speed computed from the REF signal (180° signal) of the camshaft position sensor.</li> </ul>	<ul style="list-style-type: none"> <li>The accuracy of detection becomes poor if engine speed drops below the idle rpm.</li> <li>If the signal is interrupted while the engine is running, an abnormal value may be indicated.</li> </ul>
MAS AIR/FL SE [V]	○	○	<ul style="list-style-type: none"> <li>The signal voltage of the mass air flow sensor is displayed.</li> </ul>	<ul style="list-style-type: none"> <li>When the engine is stopped, a certain value is indicated.</li> </ul>
COOLAN TEMP/S [°C] or [°F]	○	○	<ul style="list-style-type: none"> <li>The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.</li> </ul>	<ul style="list-style-type: none"> <li>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.</li> </ul>
FR O2 SENSOR [V]	○	○	<ul style="list-style-type: none"> <li>The signal voltage of the front heated oxygen sensor is displayed.</li> </ul>	
RR O2 SENSOR [V]	○	○	<ul style="list-style-type: none"> <li>The signal voltage of the rear heated oxygen sensor is displayed.</li> </ul>	
FR O2 MNTR [RICH/LEAN]	○	○	<ul style="list-style-type: none"> <li>Display of front 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.</li> </ul>	<ul style="list-style-type: none"> <li>After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins.</li> <li>When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.</li> </ul>
RR O2 MNTR [RICH/LEAN]	○		<ul style="list-style-type: none"> <li>Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen downstream three way catalyst is relatively small. LEAN ... means the amount of oxygen downstream three way catalyst is relatively large.</li> </ul>	<ul style="list-style-type: none"> <li>When the engine is stopped, a certain value is indicated.</li> </ul>
VHCL SPEED SE [km/h] or [mph]	○	○	<ul style="list-style-type: none"> <li>The vehicle speed computed from the vehicle speed sensor signal is displayed.</li> </ul>	

**NOTE:**

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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
BATTERY VOLT [V]	○	○	<ul style="list-style-type: none"> <li>The power supply voltage of ECM is displayed.</li> </ul>	
THRTL POS SEN [V]	○	○	<ul style="list-style-type: none"> <li>The throttle position sensor signal voltage is displayed.</li> </ul>	
TANK F/TMP SE [°C] or [°F]	○		<ul style="list-style-type: none"> <li>The fuel temperature judged from the tank fuel temperature sensor signal voltage is displayed.</li> </ul>	
EGR TEMP SEN [V]	○		<ul style="list-style-type: none"> <li>The signal voltage of the EGR temperature sensor is displayed.</li> </ul>	
INT/A TEMP SE [°C] or [°F]	○		<ul style="list-style-type: none"> <li>The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.</li> </ul>	
START SIGNAL [ON/OFF]	○	○	<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition from the starter signal.</li> </ul>	<ul style="list-style-type: none"> <li>After starting the engine, [OFF] is displayed regardless of the starter signal.</li> </ul>
CLSD THL/P SW [ON/OFF]	○	○	<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition from the closed throttle position switch signal.</li> </ul>	
AIR COND SIG [ON/OFF]	○	○	<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.</li> </ul>	
P/N POSI SW [ON/OFF]	○	○	<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition from the park/neutral position switch signal.</li> </ul>	
PW/ST SIGNAL [ON/OFF]	○	○	<ul style="list-style-type: none"> <li>[ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated.</li> </ul>	
IGNITION SW [ON/OFF]	○		<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition from ignition switch.</li> </ul>	
SWL CON VC SW [ON/OFF]	○		<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition of swirl control valve control vacuum check switch determined by ECM according to the input signal.</li> <li>ON ... Atmospheric pressure</li> <li>OFF ... Vacuum pressure</li> </ul>	
INJ PULSE [msec]		○	<ul style="list-style-type: none"> <li>Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.</li> </ul>	<ul style="list-style-type: none"> <li>When the engine is stopped, a certain computed value is indicated.</li> </ul>
B/FUEL SCHDL [msec]		○	<ul style="list-style-type: none"> <li>"Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on-board correction.</li> </ul>	
IGN TIMING [BTDC]		○	<ul style="list-style-type: none"> <li>Indicates the ignition timing computed by ECM according to the input signals.</li> </ul>	

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
IACV-AAC/V [%]		○	<ul style="list-style-type: none"> <li>Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.</li> </ul>	
PURG VOL C/V [step]			<ul style="list-style-type: none"> <li>Indicates the EVAP canister purge volume control valve computed by the engine control module according to the input signals.</li> <li>The opening becomes larger as the value increases.</li> </ul>	
A/F ALPHA [%]			<ul style="list-style-type: none"> <li>The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.</li> </ul>	<ul style="list-style-type: none"> <li>When the engine is stopped, a certain value is indicated.</li> <li>This data also includes the data for the air-fuel ratio learning control.</li> </ul>
EVAP SYS PRES [V]		○	<ul style="list-style-type: none"> <li>The signal voltage of EVAP control system pressure sensor is displayed.</li> </ul>	
AIR COND RLY [ON/OFF]			<ul style="list-style-type: none"> <li>The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.</li> </ul>	
FUEL PUMP RLY [ON/OFF]			<ul style="list-style-type: none"> <li>Indicates the fuel pump relay control condition determined by ECM according to the input signals.</li> </ul>	
SWRL CONT S/V			<ul style="list-style-type: none"> <li>The control condition of the swirl control valve control solenoid valve (computed by the ECM according to the input signal) is indicated.</li> <li>ON ... Swirl control valve is closed</li> <li>OFF ... Swirl control valve is open</li> </ul>	
EGRC SOL/V [ON/OFF]			<ul style="list-style-type: none"> <li>The control condition of the EGRC-solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>ON ... EGR operation is cut-off</li> <li>OFF ... EGR is operational</li> </ul>	
TCC SOL/V			<ul style="list-style-type: none"> <li>The control condition of the torque converter clutch solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>ON ... Lock-up is cancelled</li> <li>OFF ... Lock-up is operational</li> </ul>	
VENT CONT/V [ON/OFF]			<ul style="list-style-type: none"> <li>The control condition of the EVAP canister vent control valve (determined by ECM according to the input signal) is indicated.</li> <li>ON ... Closed</li> <li>OFF ... Open</li> </ul>	
FR O2 HEATER			<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals.</li> </ul>	
VCV BYPASS/V [ON/OFF]			<ul style="list-style-type: none"> <li>The control condition of the vacuum cut valve bypass valve (determined by ECM according to the input signal) is indicated.</li> <li>ON ... Open</li> <li>OFF ... Closed</li> </ul>	

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
PURG CONT S/V [ON/OFF]			<ul style="list-style-type: none"> <li>The control condition of the EVAP canister purge control solenoid valve (computed by the engine control module according to the input signals) is indicated.</li> <li>ON ... Canister purge is operational</li> <li>OFF ... Canister purge operation is cut-off</li> </ul>	
RR O2 HEATER			<ul style="list-style-type: none"> <li>Indicates [ON/OFF] condition of front heated oxygen sensor heater determined by ECM according to the input signals.</li> </ul>	
CAL/LD VALUE [%]			<ul style="list-style-type: none"> <li>"Calculated load value" indicates the value of the current airflow divided by peak airflow.</li> </ul>	
ABSOL TH·P/S [%]			<ul style="list-style-type: none"> <li>"Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.</li> </ul>	
MASS AIRFLOW [g·m/s]			<ul style="list-style-type: none"> <li>Indicates the mass airflow computed by ECM according to the signal voltage of the mass airflow sensor.</li> </ul>	
MAP/BARO SW/V [MAP/BARO]			<ul style="list-style-type: none"> <li>The control condition of the MAP/BARO switch solenoid valve (determined by ECM according to the input signal) is indicated.</li> <li>MAP ... Intake manifold absolute pressure</li> <li>BARO ... Barometric pressure</li> </ul>	
ABSOL PRES/SE [V]			<ul style="list-style-type: none"> <li>The signal voltage of the absolute pressure sensor is displayed.</li> </ul>	
VOLTAGE [V]			<ul style="list-style-type: none"> <li>Voltage measured by the voltage probe.</li> </ul>	
PULSE [msec] or [Hz] or [%]			<ul style="list-style-type: none"> <li>Pulse width, frequency or duty cycle measured by the pulse probe.</li> </ul>	<ul style="list-style-type: none"> <li>Only "#" is displayed if item is unable to be measured.</li> <li>Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.</li> </ul>

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

### ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	<ul style="list-style-type: none"> <li>● Engine: Return to the original trouble condition</li> <li>● Change the amount of fuel injection using CONSULT.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Fuel injectors</li> <li>● Front heated oxygen sensor</li> </ul>
IACV-AAC/V OPENING	<ul style="list-style-type: none"> <li>● Engine: After warming up, idle the engine.</li> <li>● Change the IACV-AAC valve opening percent using CONSULT.</li> </ul>	Engine speed changes according to the opening percent.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● IACV-AAC valve</li> </ul>
ENG COOLANT TEMP	<ul style="list-style-type: none"> <li>● Engine: Return to the original trouble condition</li> <li>● Change the engine coolant temperature using CONSULT.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Engine coolant temperature sensor</li> <li>● Fuel injectors</li> </ul>
IGNITION TIMING	<ul style="list-style-type: none"> <li>● Engine: Return to the original trouble condition</li> <li>● Timing light: Set</li> <li>● Retard the ignition timing using CONSULT.</li> </ul>	If trouble symptom disappears, see CHECK ITEM.	<ul style="list-style-type: none"> <li>● Adjust initial ignition timing</li> </ul>
POWER BALANCE	<ul style="list-style-type: none"> <li>● Engine: After warming up, idle the engine.</li> <li>● Air conditioner switch "OFF"</li> <li>● Shift lever "N"</li> <li>● Cut off each injector signal one at a time using CONSULT.</li> </ul>	Engine runs rough or dies.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Compression</li> <li>● Injectors</li> <li>● Power transistor</li> <li>● Spark plugs</li> <li>● Ignition coils</li> </ul>
FUEL PUMP RELAY	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound.</li> </ul>	Fuel pump relay makes the operating sound.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Fuel pump relay</li> </ul>
EGRC SOLENOID VALVE	<ul style="list-style-type: none"> <li>● Ignition switch: ON</li> <li>● Turn solenoid valve "ON" and "OFF" with CONSULT and listen to operating sound.</li> </ul>	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Solenoid valve</li> </ul>
SWIRL CONT SOL VALVE	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Turn solenoid valve "ON" and "OFF" with CONSULT and listen to operating sound.</li> </ul>	Solenoid valve makes an operating sound.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Solenoid valve</li> <li>● Swirl control valve</li> <li>● Vacuum hose</li> </ul>
SELF-LEARNING CONT	<ul style="list-style-type: none"> <li>● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.</li> </ul>		
PURG VOL CONT/V	<ul style="list-style-type: none"> <li>● Engine: After warming up, run engine at 1,500 rpm.</li> <li>● Change the EVAP canister purge volume control valve opening step using CONSULT.</li> </ul>	Engine speed changes according to the opening step.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● EVAP canister purge volume control valve</li> </ul>
PURG CONT S/V	<ul style="list-style-type: none"> <li>● Start engine.</li> <li>● Turn the EVAP canister purge control solenoid valve "ON" and "OFF" using CONSULT and listen for operating sound.</li> </ul>	EVAP canister purge control solenoid valve makes an operating sound. Check vacuum signal for EVAP canister purge control valve. VC ON ... Vacuum exists. VC OFF ... Vacuum does not exist.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● EVAP canister purge control solenoid valve</li> <li>● Vacuum hose</li> </ul>
MAP/BARO SW/V	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Turn the MAP/BARO switch solenoid valve between "MAP" and "BARO" using CONSULT and listen for operating sound.</li> </ul>	MAP/BARO switch solenoid valve makes an operating sound.	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● MAP/BARO switch solenoid valve</li> </ul>
TANK F/TEMP SEN	<ul style="list-style-type: none"> <li>● Change the tank fuel temperature using CONSULT.</li> </ul>		

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

### FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Displays the results of on board diagnostic system.</li> </ul>	—		Objective system
CLOSED THROTTLE POSI (CLOSED THROTTLE POSITION SWITCH CIRCUIT)	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Closed throttle position switch 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.)</li> </ul>	Throttle valve: opened	OFF	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Throttle position sensor (Closed throttle position switch)</li> <li>● Throttle position sensor (Closed throttle position switch) adjustment</li> <li>● Throttle linkage</li> <li>● Verify operation in DATA MONITOR mode.</li> </ul>
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Throttle position sensor circuit is tested when throttle is opened and closed fully.</li> </ul>	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Throttle position sensor</li> <li>● Throttle position sensor adjustment</li> <li>● Throttle linkage</li> <li>● Verify operation in DATA MONITOR mode.</li> </ul>
PARK/NEUT POSI SW CKT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Inhibitor/Neutral position switch circuit is tested when shift lever is manipulated.</li> </ul>	OUT OF N/P-RANGE	OFF	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Neutral position switch/ Inhibitor switch</li> <li>● Linkage + Inhibitor switch adjustment</li> </ul>
		IN N/P-RANGE	ON	
FUEL PUMP CIRCUIT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.</li> </ul>	There is pressure pulsation on the fuel feed hose.		<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Fuel pump</li> <li>● Fuel pump relay</li> <li>● Fuel filter clogging</li> <li>● Fuel level</li> </ul>
EGRC SOL/V CIRCUIT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● EGRC-solenoid valve circuit is tested by checking solenoid valve operating noise.</li> </ul>	The solenoid valve makes an operating sound every 3 seconds.		<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● EGRC-solenoid valve</li> </ul>
START SIGNAL CIRCUIT	<ul style="list-style-type: none"> <li>● Ignition switch: ON → START</li> <li>● Start signal circuit is tested when engine is started by operating the starter. Battery voltage and engine coolant temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed.</li> </ul>	Start signal: OFF → ON		<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Ignition switch</li> </ul>

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
PW/ST SIGNAL CIRCUIT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine running)</li> <li>● Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.</li> </ul>	Locked position	ON	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Power steering oil pressure switch</li> <li>● Power steering oil pump</li> </ul>
		Neutral position	OFF	
SWRL CONT S/V CIRCUIT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> <li>● Swirl control valve control solenoid valve circuit is tested by checking solenoid valve operating sound.</li> </ul>	The solenoid valve makes an operating sound every 3 seconds.		<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Solenoid valve</li> <li>● Swirl control valve</li> <li>● Vacuum hose</li> </ul>
VEHICLE SPEED SEN CKT	<ul style="list-style-type: none"> <li>● Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher.</li> </ul>	Vehicle speed sensor input signal is greater than 4 km/h (2 MPH)		<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● Vehicle speed sensor</li> <li>● Speedometer</li> </ul>
IGN TIMING ADJ	<ul style="list-style-type: none"> <li>● After warming up, idle the engine.</li> <li>● Ignition timing adjustment is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.</li> </ul>	The timing light indicates the same value on the screen.		<ul style="list-style-type: none"> <li>● Adjust ignition timing (by moving camshaft position sensor or distributor)</li> <li>● Camshaft position sensor drive mechanism</li> </ul>
MIXTURE RATIO TEST	<ul style="list-style-type: none"> <li>● 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.</li> </ul>	Front heated oxygen sensor COUNT: More than 5 times during 10 seconds		<ul style="list-style-type: none"> <li>● INJECTION SYS (Injector, fuel pressure regulator, harness or connector)</li> <li>● IGNITION SYS (Spark plug, power transistor, ignition coil, harness or connector)</li> <li>● VACUUM SYS (Intake air leaks)</li> <li>● Front heated oxygen sensor circuit</li> <li>● Front heated oxygen sensor operation</li> <li>● Fuel pressure high or low</li> <li>● Mass air flow sensor</li> </ul>
POWER BALANCE	<ul style="list-style-type: none"> <li>● After warming up, idle the engine.</li> <li>● 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 multipoint fuel injection system is used.)</li> </ul>	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.		<ul style="list-style-type: none"> <li>● Injector circuit (Injector, harness or connector)</li> <li>● Ignition circuit (Spark plug, power transistor, ignition coil, harness or connector)</li> <li>● Compression</li> <li>● Valve timing</li> </ul>

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# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
IACV-AAC/V SYSTEM	<ul style="list-style-type: none"> <li>● After warming up, idle the engine.</li> <li>● IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 0%, 20% and 80%.</li> </ul>	<p>Difference in engine speed is greater than 150 rpm between when valve opening is at 80% and at 20%.</p>	<ul style="list-style-type: none"> <li>● Harness and connector</li> <li>● IACV-AAC valve</li> <li>● Air passage restriction between air inlet and IACV-AAC valve</li> <li>● IAS (Idle adjusting screw) adjustment</li> </ul>
★EVAP (SMALL LEAK)	<ul style="list-style-type: none"> <li>● After warming up, idle the engine etc.</li> <li>● EVAP system is tested by using the evaporative gas pressure in the fuel tank or engine intake manifold pressure.</li> </ul>	<ul style="list-style-type: none"> <li>● EVAP control system has no leak.</li> <li>● EVAP control system operates properly.</li> </ul>	<ul style="list-style-type: none"> <li>● Incorrect fuel tank vacuum relief valve</li> <li>● Incorrect fuel filler cap used</li> <li>● Fuel filler cap remains open or fails to close.</li> <li>● Foreign matter caught in fuel filler cap.</li> <li>● Leak is in line between intake manifold and EVAP canister purge control valve.</li> <li>● Foreign matter caught in EVAP canister vent control valve.</li> <li>● EVAP canister or fuel tank leaks</li> <li>● EVAP purge line tube leaks</li> <li>● EVAP purge line rubber tube bent.</li> <li>● Blocked or bent rubber tube to EVAP control system pressure sensor</li> <li>● EVAP canister purge control valve</li> <li>● EVAP canister purge volume control valve</li> <li>● EVAP canister purge control solenoid valve</li> <li>● Absolute pressure sensor</li> <li>● Tank fuel temperature sensor</li> <li>● MAP/BARO switch solenoid valve</li> <li>● Blocked or bent rubber tube to MAP/BARO switch solenoid valve</li> <li>● Loose or disconnected rubber tube</li> <li>● O-ring of EVAP canister vent control valve is missing or damaged</li> </ul>

★: Always select "SINGLE TEST" with CONSULT when performing the "FUNCTION TEST".

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

## CONSULT (Cont'd)

### REAL TIME DIAGNOSIS IN DATA MONITOR MODE

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

1. "AUTO TRIG" (Automatic trigger):

- The malfunction will be identified on the CONSULT screen in real time. In other words, DTC/1st trip DTC and malfunction item will be displayed at the moment the malfunction is detected by ECM. DATA MONITOR can be performed continuously until a malfunction is detected. However, DATA MONITOR cannot continue any longer after the malfunction detection.

2. "MANU TRIG" (Manual trigger):

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

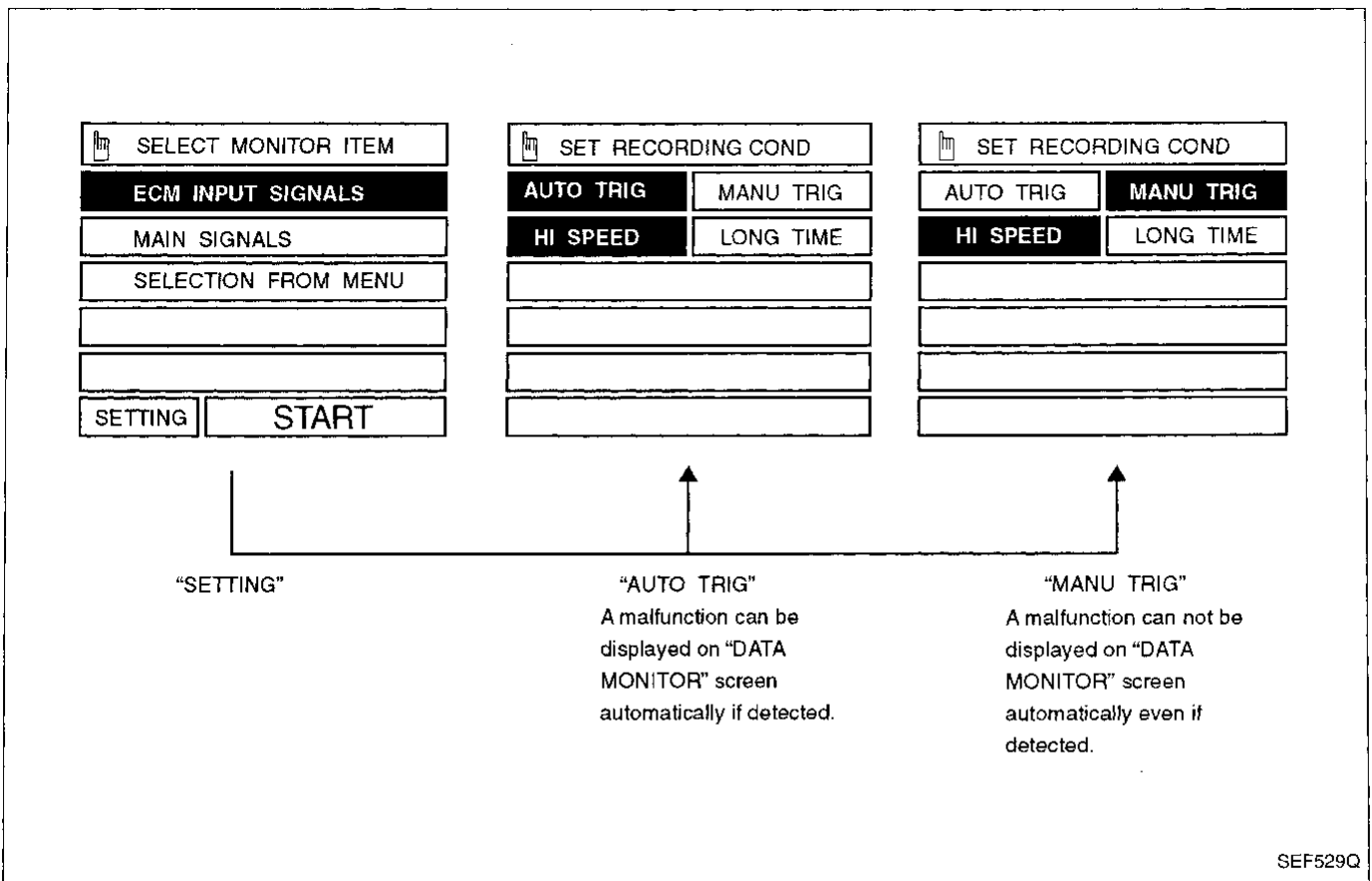
Use these triggers as follows:

1. "AUTO TRIG"

- While trying to detect the DTC/1st trip DTC by performing the "DTC CONFIRMATION PROCEDURE", be sure to select to "DATA MONITOR (AUTO TRIG)" mode. You can confirm the malfunction at the moment it is detected.
- While narrowing down the possible causes, CONSULT should be set in "DATA MONITOR (AUTO TRIG)" mode, especially in case the incident is intermittent. When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC CONFIRMATION PROCEDURE", the moment a malfunction is found the DTC will be displayed. (Refer to GI section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)

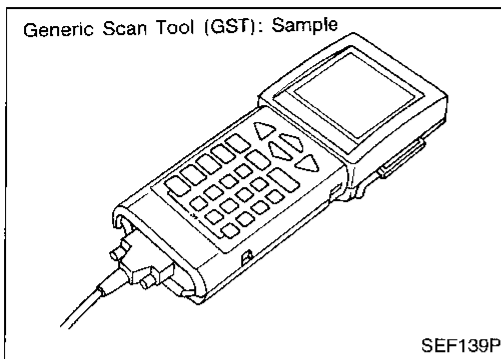
2. "MANU TRIG"

- 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.



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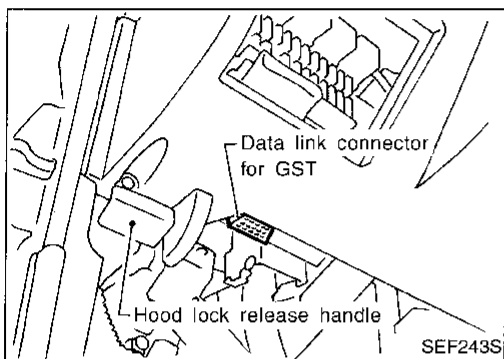
# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION



## Generic Scan Tool (GST)

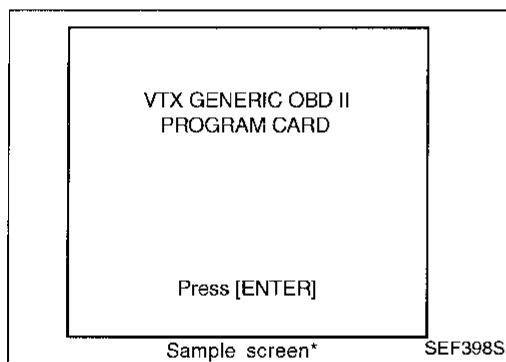
### DESCRIPTION

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.



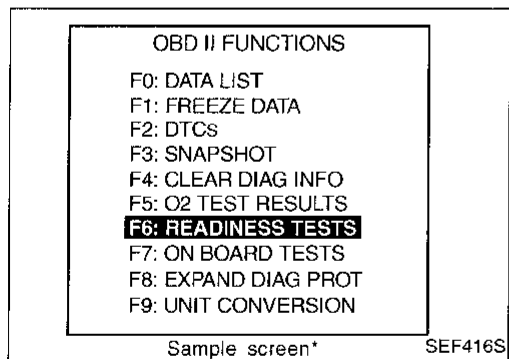
### GST INSPECTION PROCEDURE

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



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

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



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

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

# ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION

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

### 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 and 1st trip freeze frame data" (EC-56).]
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: <ul style="list-style-type: none"> <li>● Clear number of diagnostic trouble codes (MODE 1)</li> <li>● Clear diagnostic trouble codes (MODE 3)</li> <li>● Clear trouble code for freeze frame data (MODE 1)</li> <li>● Clear freeze frame data (MODE 2)</li> <li>● Clear heated oxygen sensor test data (MODE 5)</li> <li>● Reset status of system monitoring test (MODE 1)</li> <li>● Clear on board monitoring test results (MODE 6 and 7)</li> </ul>
MODE 5	(O2 TEST RESULTS)	This mode gains access to the on board heated oxygen sensor monitoring test results.
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.

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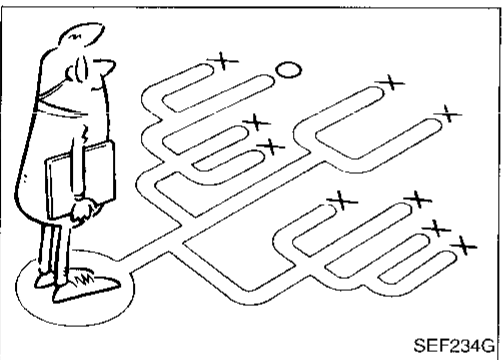
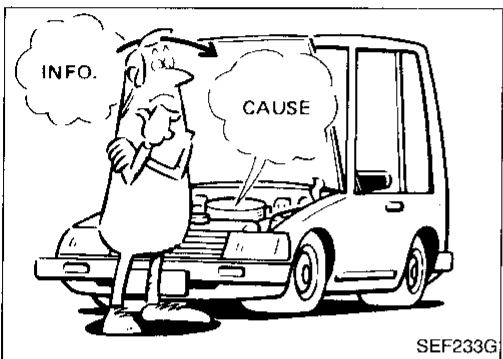
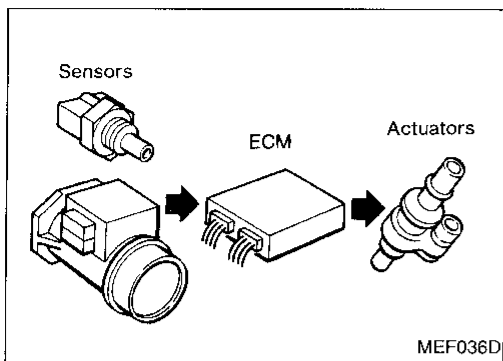
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KEY POINTS	
<b>WHAT</b>	..... Vehicle & engine model
<b>WHEN</b>	..... Date, Frequencies
<b>WHERE</b>	..... Road conditions
<b>HOW</b>	..... Operating conditions, Weather conditions, Symptoms

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## Introduction

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

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

A visual check only may not find the cause of the problems. A road test with CONSULT (or GST) or a circuit tester connected should be performed. Follow the "Work Flow" on EC-70.

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 the next page should be used.

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

## Diagnostic Worksheet

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting 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 next page in order to organize all the information for troubleshooting.

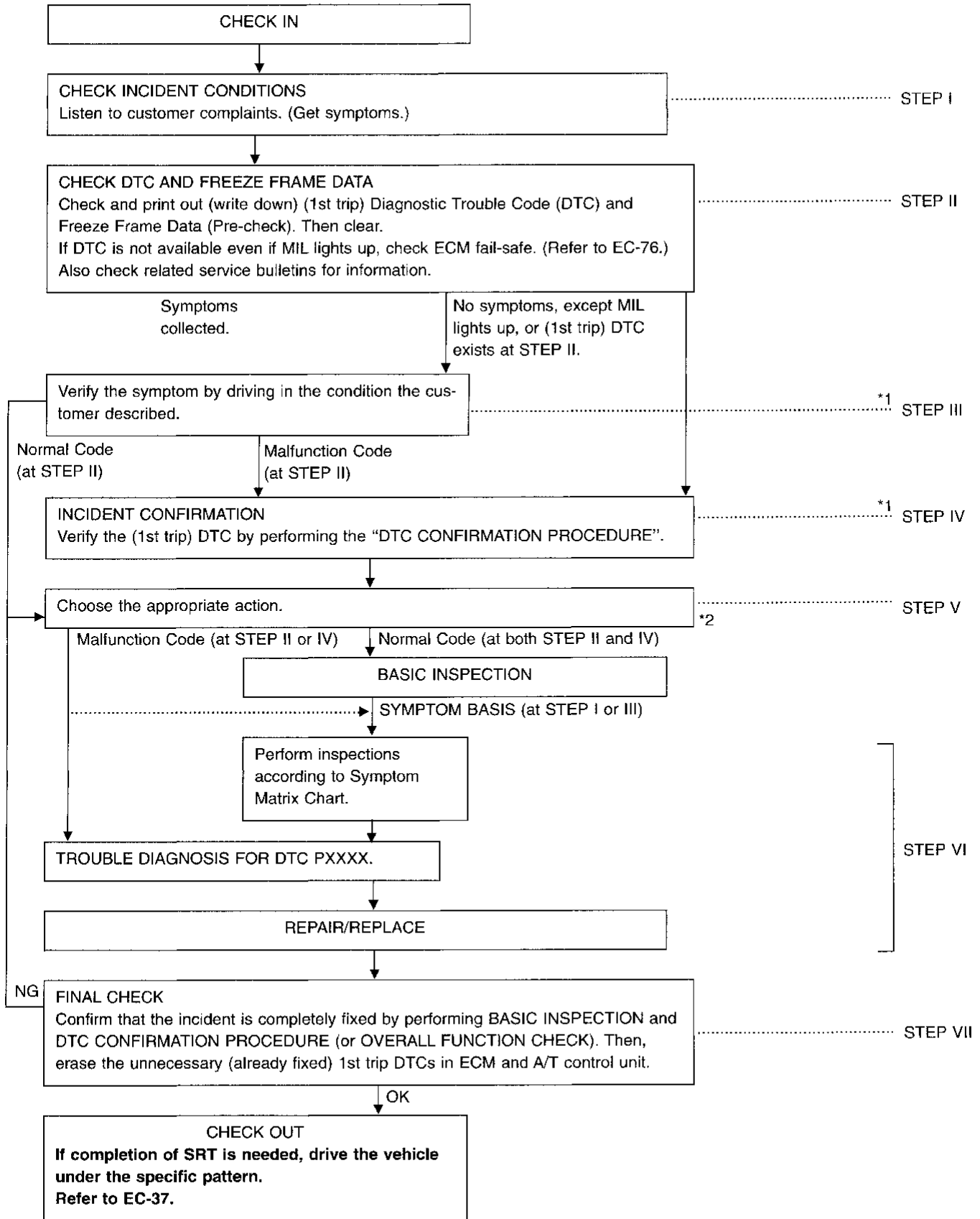
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

- 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 models with EVAP (SMALL LEAK) diagnosis].



# TROUBLE DIAGNOSIS — Work Flow

## Work Flow



\*1: If the incident cannot be duplicated, see "Incident Simulation Tests" of "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT" in GI section.

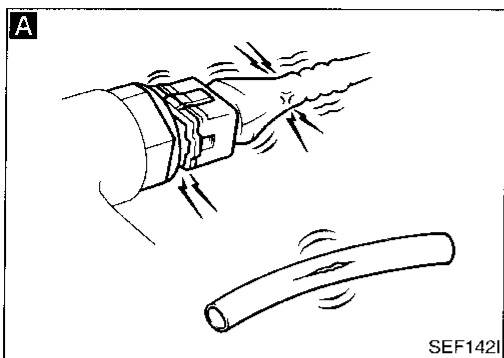
\*2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY EC-89).

# TROUBLE DIAGNOSIS — Work Flow

## 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-68.
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-43.) 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-77.) 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 "DTC 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 "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION on next page. Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-77.)
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-79, 83. 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 malfunctioning 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 "DTC 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 and A/T control unit. (Refer to EC-43.)



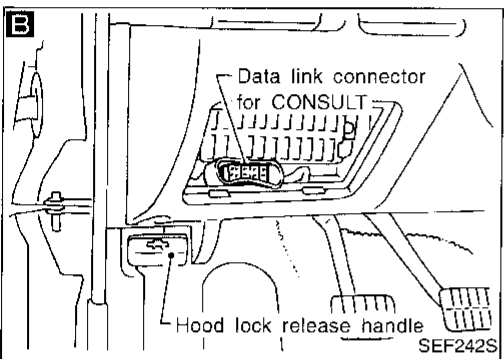


## Basic Inspection

### Precaution:

Perform Basic Inspection without electrical or mechanical loads applied;

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



**A**

**BEFORE STARTING**

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

**C**

■ 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

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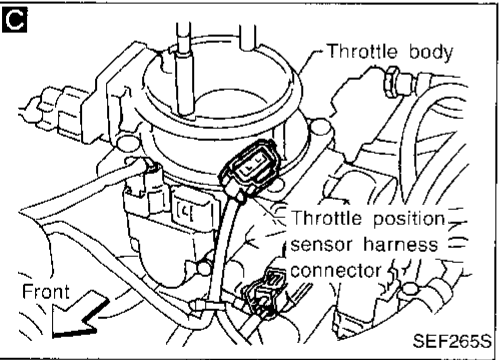
**B**

**CONNECT CONSULT TO THE VEHICLE.**  
Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-53.

**DOES ENGINE START?**

No → Go to **E**

Yes ↓



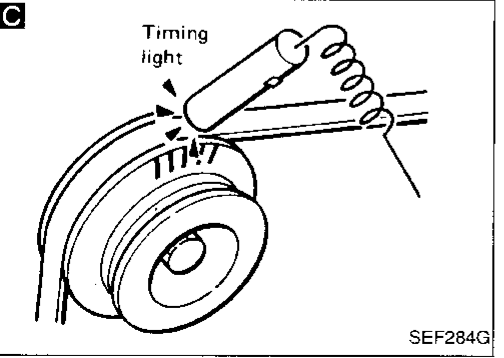
**C**

**CHECK IGNITION TIMING.**

1. Warm up engine sufficiently.
2. Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
3. Touch "START".
4. Check ignition timing at idle using timing light.

**Ignition timing:**  
M/T 10°±2° BTDC  
A/T 10°±2° BTDC (in "N" position)

NG → Adjust ignition timing by turning camshaft position sensor.



1. Warm up engine sufficiently.
2. Stop engine and disconnect throttle position sensor harness connector.
3. Start engine.
4. Check ignition timing at idle using timing light.

**Ignition timing:**  
M/T 10°±2° BTDC  
A/T 10°±2° BTDC (in "N" position)

OK ↓

(Go to next page.)

# TROUBLE DIAGNOSIS — Basic Inspection

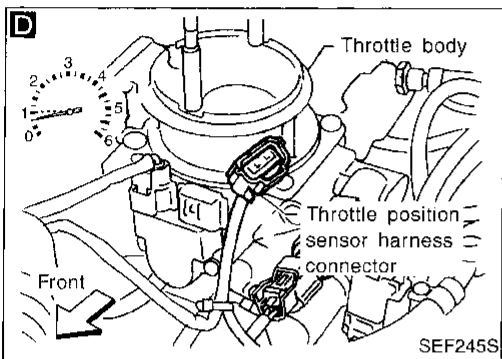
## Basic Inspection (Cont'd)

**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

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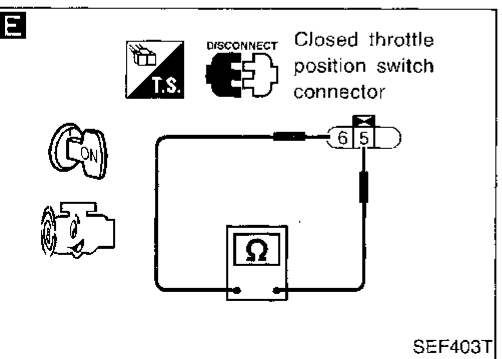
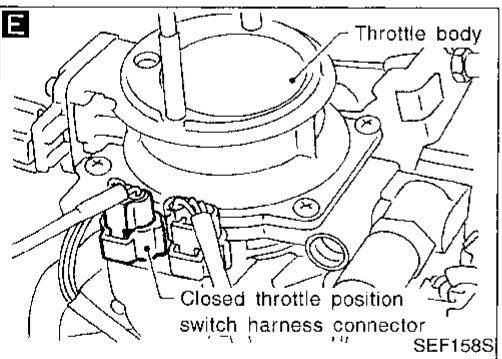
**E**

☆ MONITOR ☆ NO FAIL □

THRTL POS SEN	1.2V
ENGINE SPEED	1000rpm
CLOSED THL/SW	ON

RECORD

SEF814T



**D**

**CHECK IDLE SPEED ADJ. SCREW INITIAL SET RPM (BASE IDLE SPEED).**

- Select "IGN TIMING ADJ" in "WORK SUPPORT" mode.
- When touching "START", does engine speed fall to  $750 \pm 50$  rpm (A/T in "N" position)?

OR

When disconnecting throttle position sensor harness connector, does engine run at  $750 \pm 50$  rpm (A/T in "N" position)?

Adjust base idle speed by turning idle speed adjusting screw.

**E**

**CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION.**

- Select "A/T", then "DATA MONITOR" mode with CONSULT.
- Select "ENGINE SPEED" and "CLOSED THL/SW" from the menu.
- Read "CLOSED THL/SW" signal under the following condition:
  - Raise engine speed to 2,000 rpm.
  - Gradually lower engine speed.**"CLOSED THL/SW" signal should turn "ON" at  $1,000 \pm 150$  rpm with transaxle in "N" position.**

OR

- Disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
- Check continuity between closed throttle position switch terminals ⑤ and ⑥ under the following conditions.
  - Raise engine speed to 2,000 rpm.
  - Gradually lower engine speed.**Continuity should exist (closed throttle position switch closes) at  $1,000 \pm 150$  rpm with transaxle in "N" position.**

Adjust continuity signal by rotating throttle position sensor body.

**RESET IDLE POSITION MEMORY.**

- Warm up engine sufficiently.
- Select "CLSD THL/P SW" in "DATA MONITOR" mode (Manual trigger) with CONSULT, then stop engine.
- Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.
- Turn ignition switch "ON".
- Turn ignition switch "OFF" and wait at least 7 seconds.
- Repeat steps 4. and 5. until "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT changes to "ON". Repeat steps 4. and 5. 20 times.

Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.

(Go to next page.)

CI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

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BT

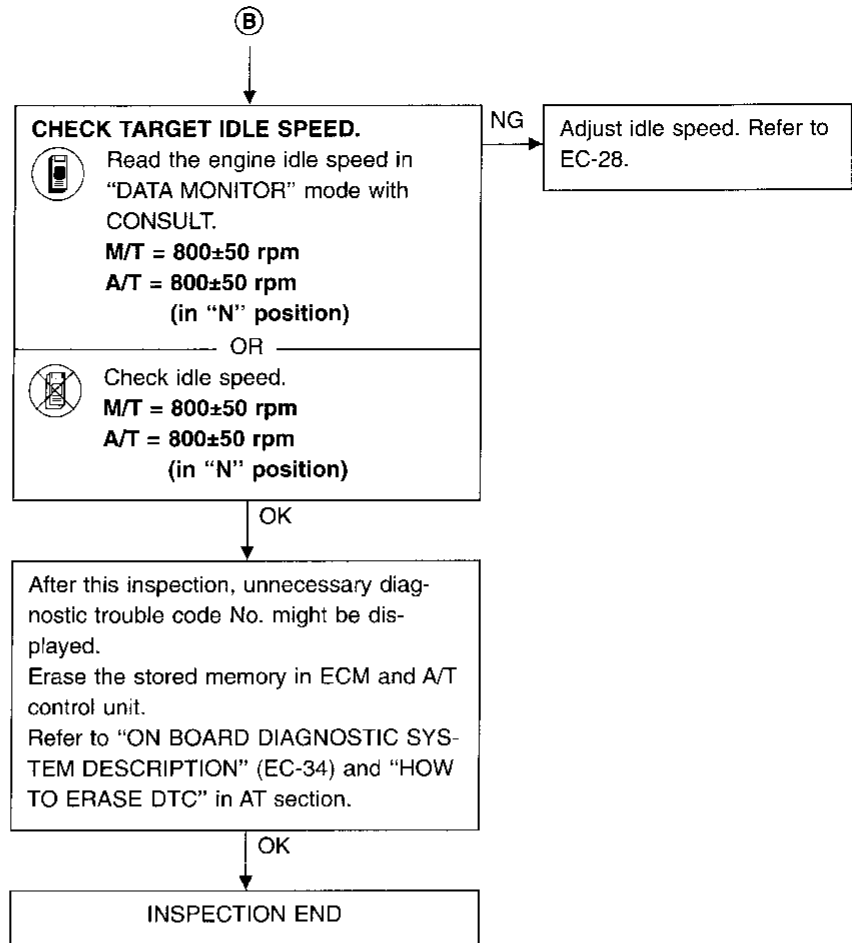
HA

EL

IDX

# TROUBLE DIAGNOSIS — Basic Inspection

## Basic Inspection (Cont'd)



# TROUBLE DIAGNOSIS — General Description

## 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	<ul style="list-style-type: none"> <li>● ECM (P0605, 0301)</li> <li>● Mass air flow sensor circuit (P0100, 0102)</li> <li>● Throttle position sensor circuit (P0120, 0403)</li> <li>● EGRC-solenoid valve circuit (P1400, 1005)</li> </ul>	<ul style="list-style-type: none"> <li>● Camshaft position sensor circuit (P0340, 0101)</li> <li>● Vehicle speed sensor circuit (P0500, 0104)</li> <li>● Intake air temperature sensor circuit (P0110, 0401)</li> <li>● Tank fuel temperature sensor (P0180, 0402)</li> </ul>	<ul style="list-style-type: none"> <li>● Engine coolant temperature sensor circuit (P0115, 0103) (P0125, 0908)</li> <li>● Ignition signal circuit (P1320, 0201)</li> <li>● Park/Neutral position switch circuit (P0705, 1003)</li> </ul>
2	<ul style="list-style-type: none"> <li>● EGR temperature sensor circuit (P1401, 0305)</li> <li>● Absolute pressure sensor circuit (P0105, 0803)</li> <li>● MAP/BARO switch solenoid valve circuit (P1105, 1302)</li> <li>● EVAP canister purge control valve/solenoid valve circuit (P0443, 0807)</li> <li>● Vacuum cut valve bypass valve (P1441, 0801)</li> <li>● Rear heated oxygen sensor heater circuit (P0141, 0902)</li> </ul>	<ul style="list-style-type: none"> <li>● Crankshaft position sensor circuit (P0335, 0802), (P1336, 0905)</li> <li>● Front heated oxygen sensor heater circuit (P0135, 0901)</li> <li>● EVAP control system pressure sensor circuit (P0450, 0704)</li> <li>● EVAP canister vent control valve circuit (P0446, 0903)</li> <li>● T/C clutch solenoid valve (P1550, 0904)</li> <li>● Swirl control valve control vacuum check switch (P1165, 0112)</li> </ul>	<ul style="list-style-type: none"> <li>● Front heated oxygen sensor circuit (P0130, 0303)</li> <li>● Rear heated oxygen sensor circuit (P0136, 0707)</li> <li>● EVAP canister purge volume control valve circuit (P1445, 1008)</li> <li>● EVAP control system purge flow monitoring (P1447, 0111)</li> <li>● Closed throttle position switch circuit (P0510, 0203)</li> </ul>
3	<ul style="list-style-type: none"> <li>● EGR function (P0400, 0302)</li> <li>● EGRC-BPT valve function (P0402, 0306)</li> <li>● IACV-AAC valve circuit (P0505, 0205)</li> <li>● Swirl control valve control solenoid valve (P1130, 1004)</li> </ul>	<ul style="list-style-type: none"> <li>● Misfire (P0300 - P0304, 0701 - 0605)</li> <li>● Closed loop control (P0130, 0307)</li> </ul>	<ul style="list-style-type: none"> <li>● Fuel injection system function (P0172, 0114), (P0171, 0115)</li> <li>● Three way catalyst function (P0420, 0702)</li> <li>● EVAP control system (small leak) (P0440, 0705)</li> </ul>

# TROUBLE DIAGNOSIS — General Description

## Fail-Safe Chart

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

DTC No.		Detected items	Engine operating condition in fail-safe mode												
CONSULT GST	ECM*														
P0100	0102	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.												
P0110	0401	Intake air temperature sensor circuit	The ECM controls on the assumption that the intake air temperature is 20°C (68°F).												
P0115	0103	Engine coolant temperature sensor circuit	<p>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.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Condition</th> <th style="text-align: center;">Engine coolant temperature decided (CONSULT display)</th> </tr> </thead> <tbody> <tr> <td>Just as ignition switch is turned ON or START</td> <td style="text-align: center;">20°C (68°F)</td> </tr> <tr> <td>More than approx. 6 minutes after ignition ON or START</td> <td style="text-align: center;">80°C (176°F)</td> </tr> <tr> <td>Except as shown above</td> <td style="text-align: center;">20 - 80°C (68 - 176°F) (Depends on the time)</td> </tr> </tbody> </table>	Condition	Engine coolant temperature decided (CONSULT display)	Just as ignition switch is turned ON or START	20°C (68°F)	More than approx. 6 minutes after ignition ON or START	80°C (176°F)	Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)				
Condition	Engine coolant temperature decided (CONSULT display)														
Just as ignition switch is turned ON or START	20°C (68°F)														
More than approx. 6 minutes after ignition ON or START	80°C (176°F)														
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)														
P0120	0403	Throttle position sensor circuit	<p>Throttle position will be determined based on the injected fuel amount and the engine speed. Therefore, acceleration will be poor.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Condition</th> <th style="text-align: center;">Driving condition</th> </tr> </thead> <tbody> <tr> <td>When engine is idling</td> <td style="text-align: center;">Normal</td> </tr> <tr> <td>When accelerating</td> <td style="text-align: center;">Poor acceleration</td> </tr> </tbody> </table>	Condition	Driving condition	When engine is idling	Normal	When accelerating	Poor acceleration						
Condition	Driving condition														
When engine is idling	Normal														
When accelerating	Poor acceleration														
Unable to access ECCS	Unable to access Diagnostic Test Mode II	ECM	<p><b>ECM fail-safe activating condition</b> 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 ECCS and DTC cannot be confirmed.</p> <p><b>Engine control with ECM fail-safe</b> When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation and IACV-AAC valve operation are controlled under certain limitations.</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center;">ECM fail-safe operation</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>Engine speed</b></td> <td style="text-align: center;"><b>Engine speed will not rise more than 3,000 rpm</b></td> </tr> <tr> <td>Fuel injection</td> <td style="text-align: center;">Simultaneous multipoint fuel injection system</td> </tr> <tr> <td>Ignition timing</td> <td style="text-align: center;">Ignition timing is fixed at the preset value</td> </tr> <tr> <td>Fuel pump</td> <td style="text-align: center;">Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td> </tr> <tr> <td>IACV-AAC valve</td> <td style="text-align: center;">Full open</td> </tr> </tbody> </table> <p>Replace ECM, if ECM fail-safe condition is confirmed.</p>	ECM fail-safe operation		<b>Engine speed</b>	<b>Engine speed will not rise more than 3,000 rpm</b>	Fuel injection	Simultaneous multipoint fuel injection system	Ignition timing	Ignition timing is fixed at the preset value	Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls	IACV-AAC valve	Full open
ECM fail-safe operation															
<b>Engine speed</b>	<b>Engine speed will not rise more than 3,000 rpm</b>														
Fuel injection	Simultaneous multipoint fuel injection system														
Ignition timing	Ignition timing is fixed at the preset value														
Fuel pump	Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls														
IACV-AAC valve	Full open														

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

# TROUBLE DIAGNOSIS — General Description

## Symptom Matrix Chart

		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)	OVERCOOLS		OVERCHARGING
Warranty Symptom Code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	1P	1X	
Basic engine control system	Fuel																
		Fuel pump circuit	●	●	●	○	●		●	○		○		○			EC-309
		Fuel pressure regulator system	●	●	●	○	●		●	●	○		●				EC-25
		Injector circuit	●	●	●	○	●		●	●			●				EC-303
		Evaporative emission system	○	○	○	○	●	○	○	○	○		○				EC-20
	Air	Positive crankcase ventilation system	○	○	○	○	●	○	○	○	○		○	○			EC-24
		Incorrect idle speed adjustment	○	○				○	○	○	○		○				EC-28
		Swirl control valve circuit		○	○					●							EC-243
		IACV-AAC valve circuit	●	●	○	○	●	●	●	●	●		○		○		EC-221
		IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○		○				EC-317
	Ignition	Incorrect ignition timing adjustment	○	○	●	●	●		●	●		●					EC-28
		Ignition circuit	●	●	●	●	●		●	●		●					EC-256
	EGR	EGRC-solenoid valve circuit		○	●	○	○						○				EC-267
		EGR system	●	●	●	●	●	●	●	●	○		●				EC-176
	Main power supply and ground circuit	●	●	●	○	○		○	○		○	○		○		EC-89	
	Air conditioner circuit	○	○	○	○	○	○	○	○	○		○		○		HA section	
ECCS system	ECCS																
		Camshaft position sensor circuit	●	●	●	●	●		○	○		○					EC-171
		Mass air flow sensor circuit	●	●	●	●	●		●	○		○					EC-93
		Front heated oxygen sensor circuit		●	●	○	●		●	○		●					EC-129
		Engine coolant temperature sensor circuit	●	●	●	○	●	●	●	○	○		●				EC-113, 124
		Throttle position sensor circuit		●	●		●	●	●	●	●		●				EC-118
		Incorrect throttle position sensor adjustment		●	○		○	●	○	○	●		○				EC-72
		Vehicle speed sensor circuit		○	○		○						○				EC-217
		ECM	○	○	○	○	○	○	○	○	○	○	○				EC-76, 230
		Start signal circuit	○														EC-306
		Park/Neutral position switch circuit			○		○		○	○			○				EC-232
	Power steering oil pressure switch circuit		○						○	○						EC-313	

● ; High Possibility Item  
○ ; Low Possibility Item

(continued on next page)

# TROUBLE DIAGNOSIS — General Description

## 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)	OVERCOOLS		OVERCHARGING	
Warranty Symptom Code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	1P	1X		
Fuel	Fuel tank	●	●														—	
	Fuel piping	●	●	○	○	●		○	○			○						
	Vapor lock		○															
	Valve deposit	○	○	○	○	○		○	○			○						
	Poor fuel (Heavy weight gasoline, Low octane)	○	○	○	○	○		○	○			○						
Air	Air duct		○	○		○		○	○			○					—	
	Air cleaner		○	●		●		●	○			○						
	Air leakage from air duct (Mass air flow sensor — throttle body)	○	○	○	○	○	○	○	○	○		○						
	Throttle body, Throttle wire	○	●	●		○	●	●	○	○		○						FE section
	Air leakage from intake manifold/Collector/Gasket	○	●	○	○	○	○	○	○	○		●						—
Cranking	Battery	○	○	○		○		○	○			○		○		○	—	
	Alternator circuit	○	○	○		○		○	○			○		○		○		EL section
	Starter circuit	●																—
	Flywheel/Drive plate	●																—
	Clutch interlock switch	●																CL section
	Inhibitor switch	●															AT section	
Engine	Cylinder head	●	○	●	○	○		●	○			○					—	
	Cylinder head gasket	○	○	○	○	○		●	○		●	○						
	Cylinder block	○	○	○	○	●		○	○			○	○					
	Piston	○	○	○	○	○		○	●			○	●					
	Piston ring	○	○	○	○	●		●	○			○	●					
	Connecting rod	●	○	○	○	○		○	○			○						
	Bearing	●	●	○	●	○		○	●			○						
	Crankshaft	○	○	○	○	○		○	○			○						
Valve mechanism	Timing chain	●	○	●	○	●		○	○			○					—	
	Camshaft	●	○	○	○	○		○	○			○						
	Intake valve	○	●	●	○	○		●	○			○	○					
	Exhaust valve	●	○	●	○	●		●	○			○	●					
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	○	●	●	●	●		●	○			●					—	
	Three way catalyst	○	○	○	○	○		○	○			○						
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	●	○	○	●	●		○	○			○	●				—	
	Oil level (Low)/Filthy oil	○	○	○	○	○		○	○			○	○					
Cooling	Radiator/Hose/Radiator filler cap	○	○	○	○	○		○	○		●	○					—	
	Thermostat	○	○	○	○	○	○	●	○	○	○	○			○			
	Water pump	●	○	○	○	○		○	○		●	○						
	Water gallery	○	○	○	○	○		○	○		○	○						
	Cooling fan	○	○	○	○	●	○	●	○	○	○	○				○		
	Coolant level (low)/Contaminated coolant	○	○	○	○	○		○	○	○		○	○					

● ; High Possibility Item  
○ ; Low Possibility Item

# TROUBLE DIAGNOSIS — General Description

## 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 (POS)	<ul style="list-style-type: none"> <li>● Tachometer: Connect</li> <li>● Run engine and compare tachometer indication with the CONSULT value.</li> </ul>		Almost the same speed as the CONSULT value.
CMPS-RPM (REF)			
MAS AIR/FL SE	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Idle	1.3 - 1.7V
		2,500 rpm	1.7 - 2.1V
COOLAN TEMP/S	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> </ul>		More than 70°C (158°F)
FR O2 SENSOR			0 - 0.3V ↔ Approx. 0.6 - 1.0V
FR O2 MNTR	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> </ul>	Maintaining engine speed at 2,000 rpm	LEAN ↔ RICH Changes more than 5 times during 10 seconds.
RR O2 SENSOR			0 - 0.3V ↔ Approx. 0.6 - 1.0V
RR O2 MNTR	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> </ul>	Maintaining engine speed at 2,000 rpm	LEAN ↔ RICH
VHCL SPEED SE	<ul style="list-style-type: none"> <li>● Turn drive wheels and compare speedometer indication with the CONSULT value</li> </ul>		Almost the same speed as the CONSULT value
BATTERY VOLT	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> </ul>		11 - 14V
THRTL POS SEN	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> </ul>	Throttle valve fully closed	0.3 - 0.7V
		Throttle valve fully opened	Approx. 4.0V
EGR TEMP SEN	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> </ul>		Less than 4.5V
START SIGNAL	<ul style="list-style-type: none"> <li>● Ignition switch: ON → START → ON</li> </ul>		OFF → ON → OFF
CLSD THL/P SW	<ul style="list-style-type: none"> <li>● Ignition switch: ON (Engine stopped)</li> </ul>	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	<ul style="list-style-type: none"> <li>● Engine: After warming up, idle the engine</li> </ul>	Air conditioner switch OFF	OFF
		Air conditioner switch ON (Compressor operates.)	ON
P/N POSI SW	<ul style="list-style-type: none"> <li>● Ignition switch: ON</li> </ul>	Shift lever "P" or "N"	ON
		Except above	OFF
PW/ST SIGNAL	<ul style="list-style-type: none"> <li>● Engine: After warming up, idle the engine</li> </ul>	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
IGNITION SW	<ul style="list-style-type: none"> <li>● Ignition switch ON → OFF → ON</li> </ul>		ON → OFF → ON
SWL CON VC SW	<ul style="list-style-type: none"> <li>● Engine is running at a speed of less than 3,600 rpm.</li> </ul>		OFF
	<ul style="list-style-type: none"> <li>● Except above</li> </ul>		ON
INJ PULSE	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Idle	2.4 - 3.2 msec.
		2,000 rpm	1.9 - 3.2 msec.



## TROUBLE DIAGNOSIS — General Description

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

MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL		Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec
IGN TIMING	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Idle	10° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V		Idle	20 - 40%
		2,000 rpm	—
PURG VOL C/V	Vehicle stopped	0 step	
	Vehicle running	—	
A/F ALPHA	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	52 - 159%
EVAP SYS PRES	● Ignition switch: ON		Approx. 3.4V
AIR COND RLY	● Air conditioner switch: OFF → ON		OFF → ON
FUEL PUMP RLY	<ul style="list-style-type: none"> <li>● Ignition switch is turned to ON (Operates for 5 seconds)</li> <li>● Engine running and cranking</li> <li>● When engine is stopped (Stops in 1.0 seconds)</li> </ul>		ON
	● Except as shown above		OFF
SWRL CONT S/V	● Engine is running at a speed of less than 3,600 rpm.		ON
	● Except above		OFF
EGRC SOL/V	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever: "N"</li> <li>● No-load</li> </ul>	Idle	ON
		Revsing up to 1,500 - 2,000 rpm	OFF
VENT CONT/V	● Ignition switch: ON		OFF
TCC SOL/V	<ul style="list-style-type: none"> <li>● Engine speed: Idle</li> <li>● Engine coolant temperature below 40°C (104°F)</li> </ul>		ON
	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Engine coolant temperature above 40°C (104°F)</li> </ul>	2,000 rpm	OFF
FR O2 HEATER	● Engine speed: Idle		ON
	● Engine speed: Above 3,000 rpm		OFF
VC/V BYPASS/V	● Ignition switch: ON		OFF
PURG CONT S/V	● Engine: After warming up	Idle	OFF
		2,000 rpm	ON
RR O2 HEATER	● Engine speed: Below 6,000 rpm		ON
	● Ignition switch: ON (Engine stopped)		OFF
CAL/LD VALUE	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Idle	16.8 - 34.7% (2WD models) 15.9 - 33.2% (4WD models)
		2,500 rpm	14.1 - 27.6 % (2WD models) 13.3 - 26.1 % (4WD models)
ABSOL TH-P/S	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.0%
		Throttle valve fully opened	Approx. 84%
MASS AIRFLOW	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Idle	1.8 - 6.5 g-m/s (2WD models) 2.1 - 6.0 g-m/s (4WD models)
		2,500 rpm	7.7 - 15.0 g-m/s (2WD models) 6.8 - 13.3 g-m/s (4WD models)
MAP/BARO SW/V	● Ignition switch: ON		BARO
	● Engine speed: Idle (More than 5 seconds after starting engine)		MAP
ABSOL PRES/SE	● Engine: After warming up	Engine is not running	Approx. 4.4V
		Idle (More than 5 seconds after starting engine)	Approx. 1.2V

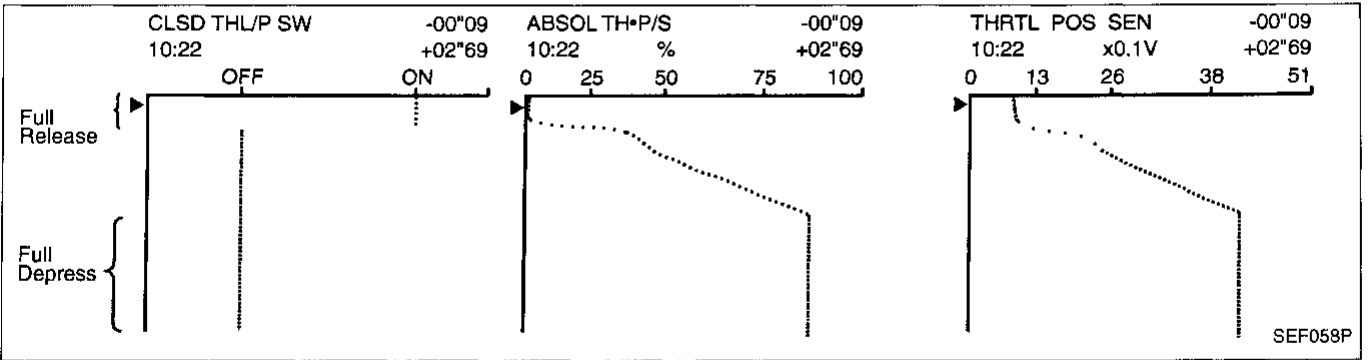
**Major Sensor Reference Graph in Data Monitor Mode**

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".

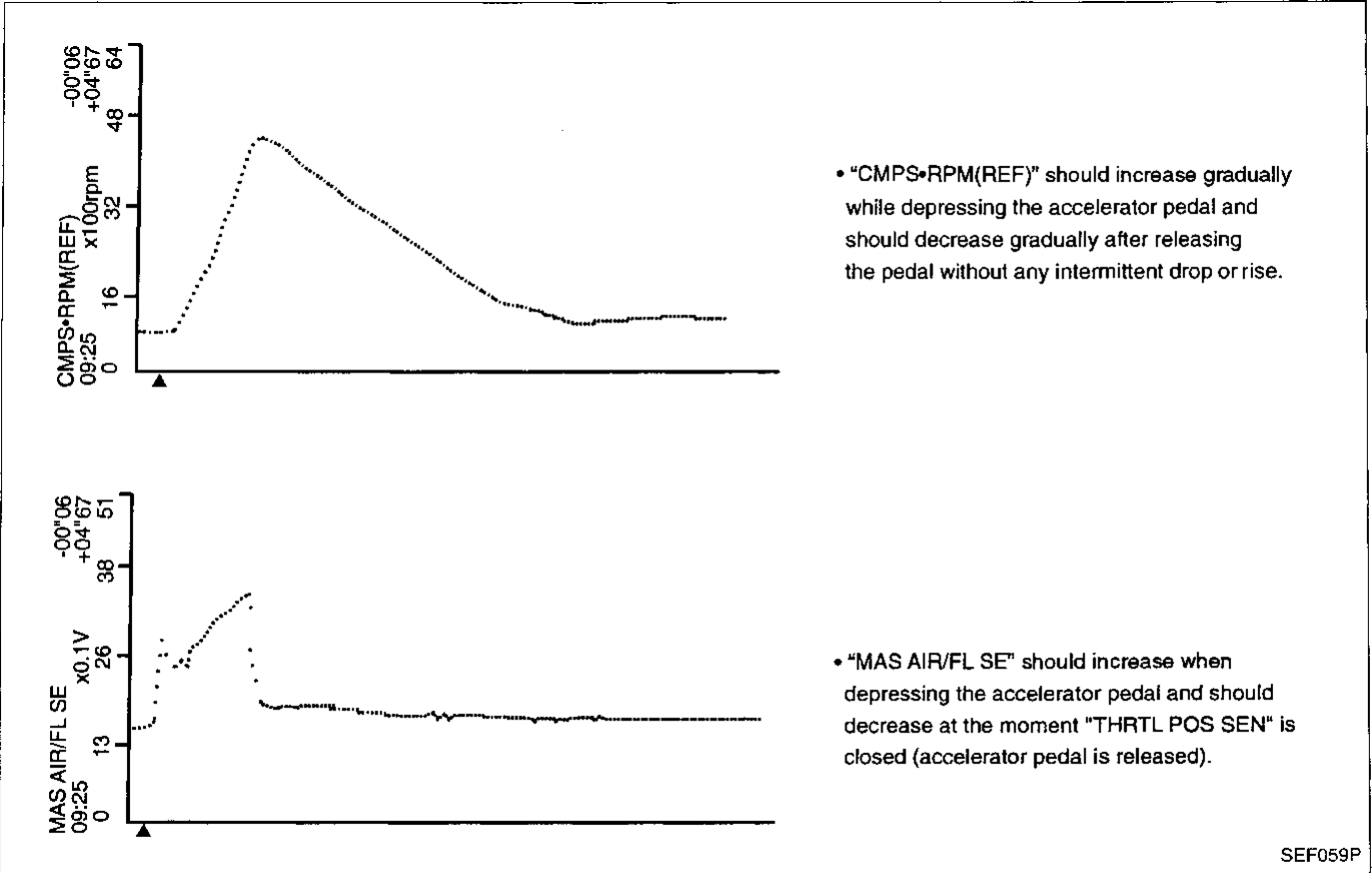
The signal of "THRTL POS SEN" and "ABSOL TH·P/S" should rise gradually without any intermittent drop or rise after "CLSD THL/P SW" is changed from "ON" to "OFF".



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

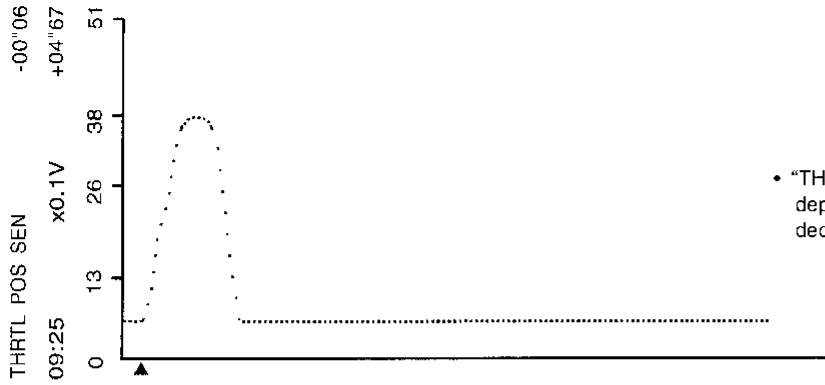
Below is the data for "CMPS·RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SENSOR", "FR O2 SENSOR" and "INJ PULSE" when revving quickly up to 4,800 rpm under no load after warming up engine sufficiently.

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

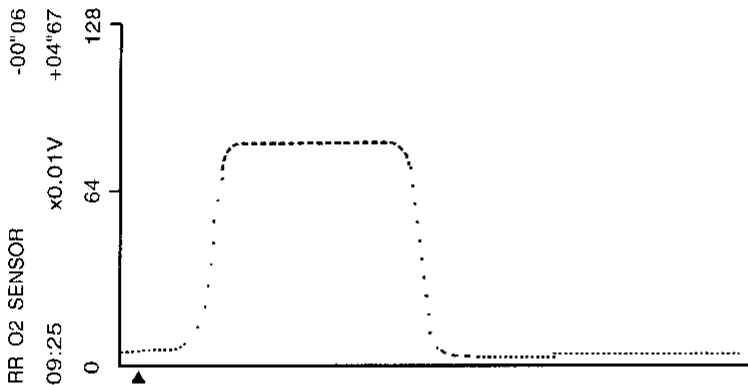


# TROUBLE DIAGNOSIS — General Description

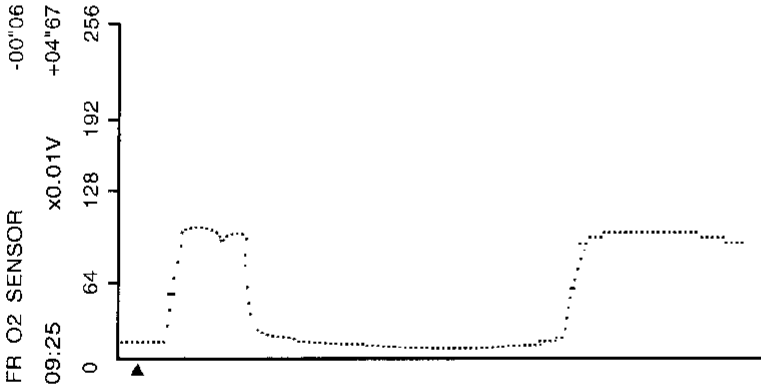
## Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



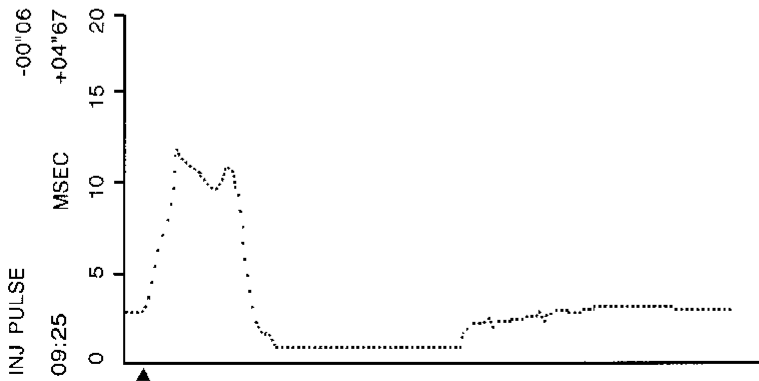
- "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



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

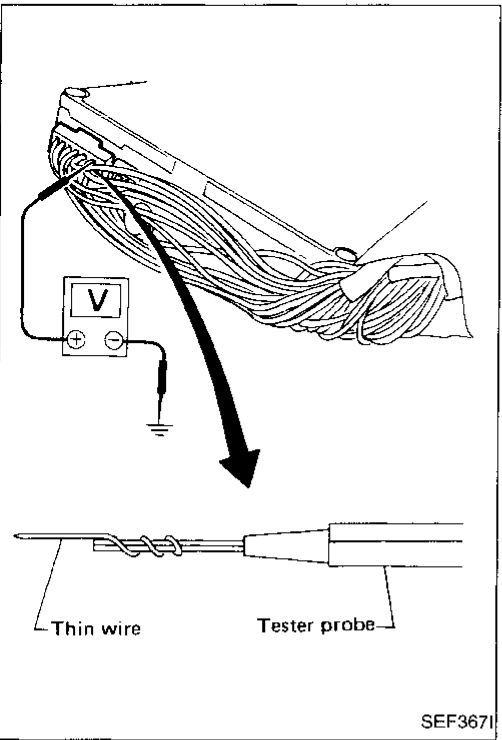
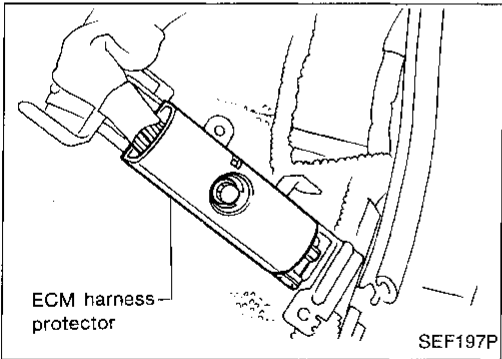
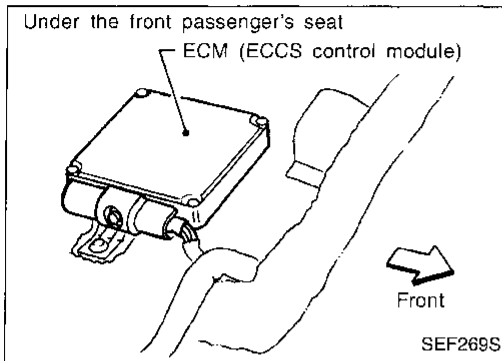


- "FR O2 SENSOR" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



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

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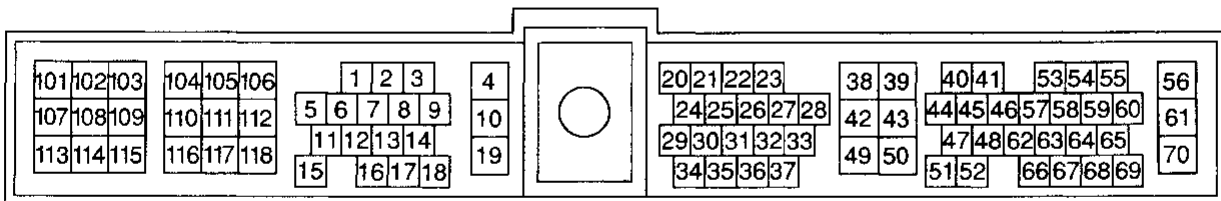


## ECM Terminals and Reference Value

### PREPARATION

1. ECM is located behind the front passenger seat side dash. For this inspection, remove the front passenger side dash.
2. Remove ECM harness protector.
3. Perform all voltage measurements with the connectors connected. Extend tester probe as shown to perform tests easily.

### ECM HARNESS CONNECTOR TERMINAL LAYOUT



SEF064P

## TROUBLE DIAGNOSIS — General Description

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

#### ECM INSPECTION TABLE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1	W	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.6V*
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.8V*
2	W/G	Ignition check	Engine is running. └ Idle speed	Approximately 12V*
3	W	Tachometer	Engine is running. └ Idle speed	Approximately 0.9V*
4	L/R	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ Less than 7 seconds after turning ignition switch "OFF".	0 - 1V
			Ignition switch "OFF" └ 7 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
5	R	EVAP canister purge volume control valve	Engine is running. └ Idle speed	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
6	L/G			
8	W/R	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON"	Approximately 1V
			Engine is running. Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
10	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
15	G/R	Air conditioner relay	Engine is running. └ Both air conditioner switch and blower switch are "ON".	Approximately 1V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
16	G	EVAP canister purge volume control valve	Engine is running. └ Idle speed	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
17	Y			
18	R/W	Malfunction indicator lamp	Ignition switch "ON"	0 - 1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)

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

## TROUBLE DIAGNOSIS — General Description

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
19	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
20	OR	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	G/R	Air conditioner 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	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" └ Gear position is "Neutral position" (M/T models) └ Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V
23	W	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.3 - 0.7V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
25	G	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0V
			Engine is running. └ Steering wheel is not being turned.	Approximately 5V
26	W/L	Vehicle speed sensor	Engine is running. └ Slowly rotating front wheels	Approximately 1.8 - 2.4V* (AC voltage)
27	Y	Throttle position switch (Closed position)	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V
28	Y/L	Intake air temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
32	R/Y	Swirl control valve control vacuum check switch	Engine is running. └ Engine speed is above 3,600 rpm.	0V
			Engine is running. └ Engine speed is less than 3,600 rpm.	Approximately 4.8V

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

## TROUBLE DIAGNOSIS — General Description

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
38	B/W	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
40 44	GY R	Camshaft position sensor (Reference signal)	Engine is running.	Approximately 0.3V*
41	G	Camshaft position sensor (Position signal)	Engine is running.	Approximately 2.5V*
42	W	Front heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,000 rpm.	Approximately 0V
			Engine is running. └ Engine speed is above 3,000 rpm.	BATTERY VOLTAGE (11 - 14V)
43	B	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
46	W	Front heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V (periodically changes)
47	B	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.3 - 1.7V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	1.7 - 2.1V
48	W	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	0.005 - 0.02V
49	P	Sensors' power supply	Ignition switch "ON"	Approximately 5V
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
51	LG/R	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
52	W	Rear heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V
53	R	Crankshaft position sensor (OBD)	Engine is running. (A/T: N range, M/T: Neutral) └ Idle speed (Air conditioner switch "OFF".)	More than 0.2V* (AC range)
56 61	G/R G/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

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

## TROUBLE DIAGNOSIS — General Description

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
57	L	Absolute pressure sensor	Ignition switch "ON" └ Engine is not running	Approximately 4.4V
			Engine is running. └ Idle speed (More than 5 seconds after starting engine)	Approximately 1.2V
58	R	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected.)	Approximately 9V
62	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 - 3.0V
63	L	Tank fuel temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with fuel temperature.
64	Y	Data link connector for CONSULT	Engine is running.	Approximately 0.1V
65	R		└ Idle speed (Connect CONSULT and select DATA MONITOR mode.)	Approximately 4 - 9V
68	G			Approximately 3.5V*
67	L	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V
70	R/G	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	W/G	IACV-AAC valve	Ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	0 - 7V
102	W/B	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
104	W/R	Injector No. 3		
107	W/L	Injector No. 2		
109	W/G	Injector No. 4		
103	W/L	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0 - 1V
105	W/R	EVAP canister purge control solenoid valve	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
106	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground

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



## TROUBLE DIAGNOSIS — General Description

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

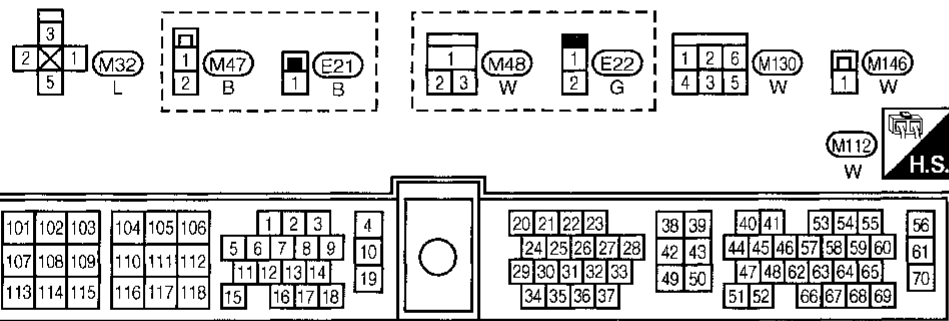
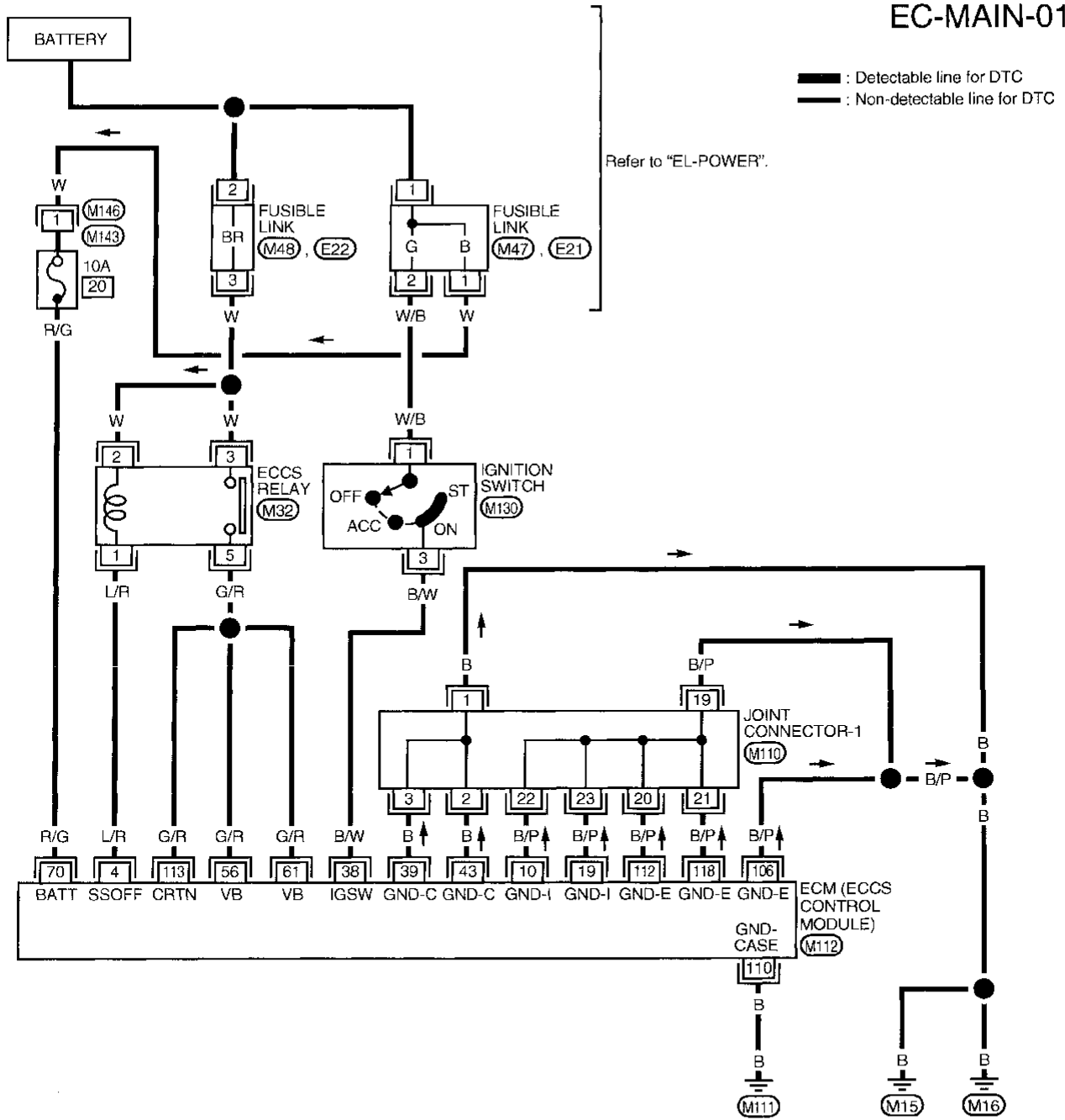
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
108	R	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
110	B	ECCS case ground	Engine is running. └ Idle speed	Approximately 0V
111	GY	Swirl control valve control solenoid valve	Engine is running. └ Idle speed	0 - 1V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
112	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
113	G/R	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
114	L/Y	Torque converter clutch solenoid valve	Engine is running. └ Idle speed └ Engine coolant temperature is below 40°C (104°F)	Approximately 0V
			Engine is running. └ After warming up └ Engine coolant temperature is above 40°C (104°F) └ Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)
115	R	Rear heated oxygen sensor heater	Engine is running. └ Engine speed is below 6,000 rpm.	Approximately 0V
			Ignition switch "ON" └ Engine is stopped.	BATTERY VOLTAGE (11 - 14V)
116	W/R	MAP/BARO switch solenoid valve	Ignition switch "ON"	0 - 1V
			Engine is running. └ Idle speed (More than 5 seconds after starting engine)	BATTERY VOLTAGE (11 - 14V)
117	Y	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
118	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground

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

# TROUBLE DIAGNOSIS FOR POWER SUPPLY

## Main Power Supply and Ground Circuit

EC-MAIN-01



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## TROUBLE DIAGNOSIS FOR POWER SUPPLY

### Main Power Supply and Ground Circuit (Cont'd)

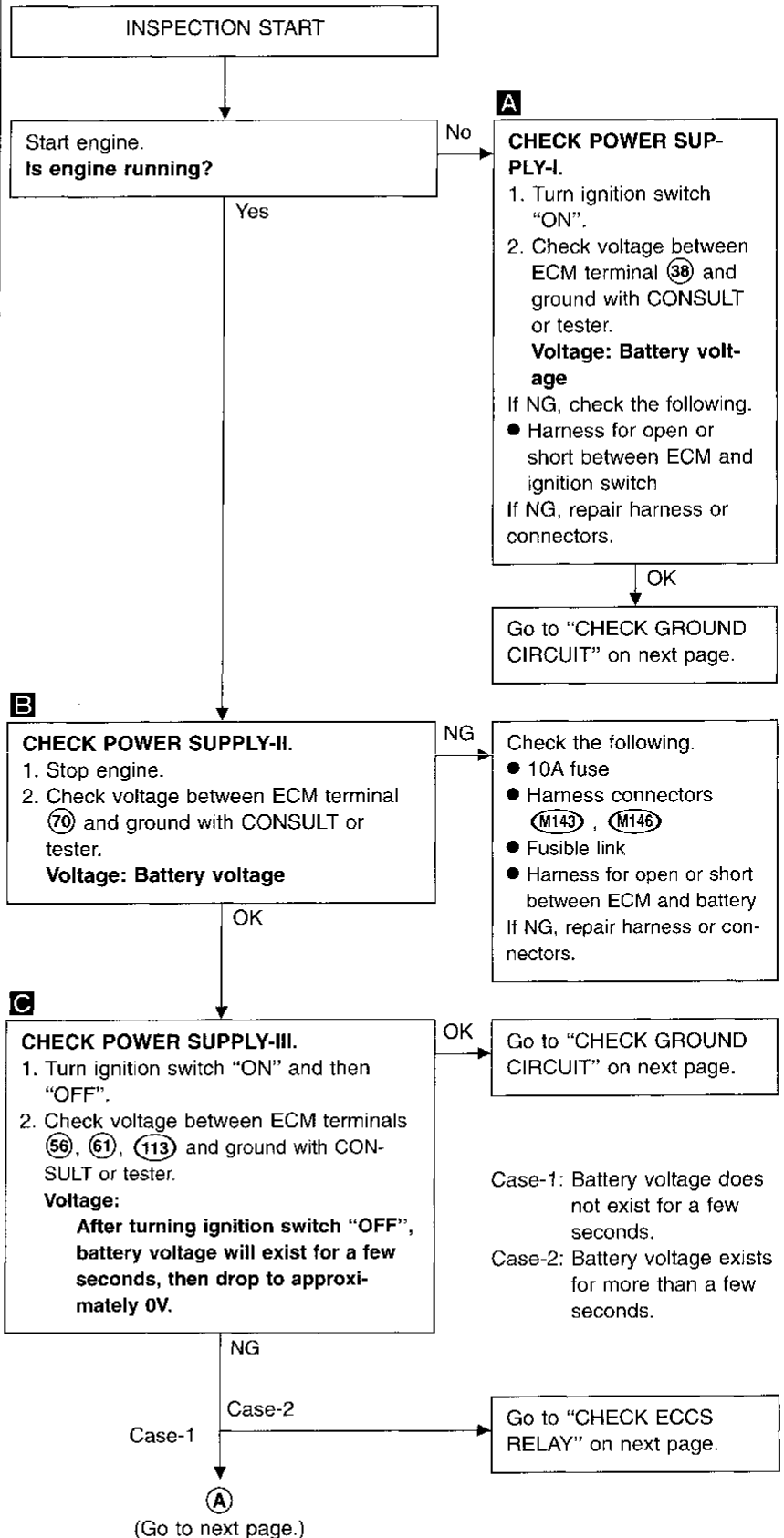
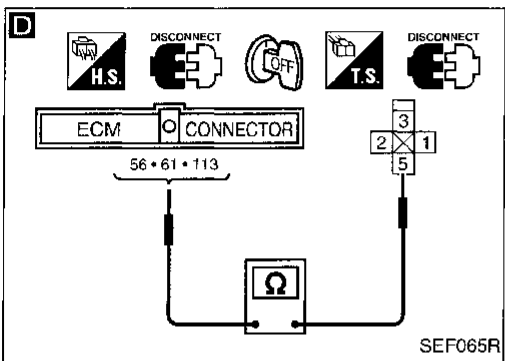
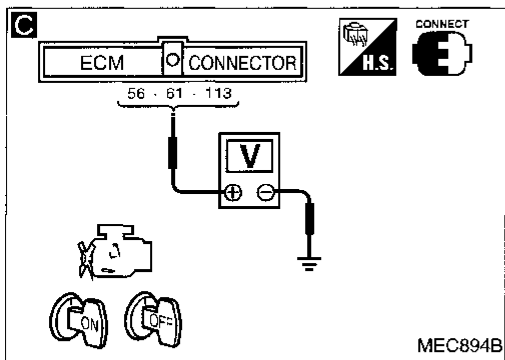
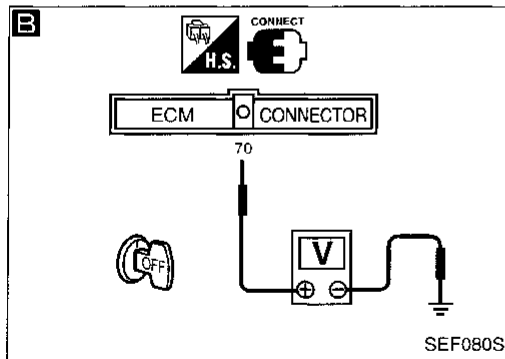
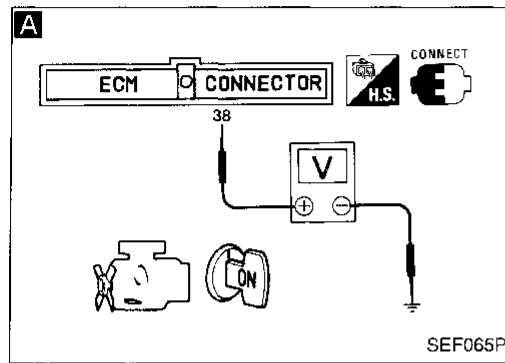
#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (43) (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
4	L/R	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ Less than 7 seconds after turning ignition switch "OFF".	0 - 1V
			Ignition switch "OFF" └ 7 seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
10	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
19	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
38	B/W	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
43	B	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
56 61	G/R G/R	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
70	R/G	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
106	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
110	B	ECCS case ground	Engine is running. └ Idle speed	Approximately 0V
112	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground
113	G/R	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
118	B/P	ECCS ground	Engine is running. └ Idle speed	Engine ground

# TROUBLE DIAGNOSIS FOR POWER SUPPLY

## Main Power Supply and Ground Circuit (Cont'd)

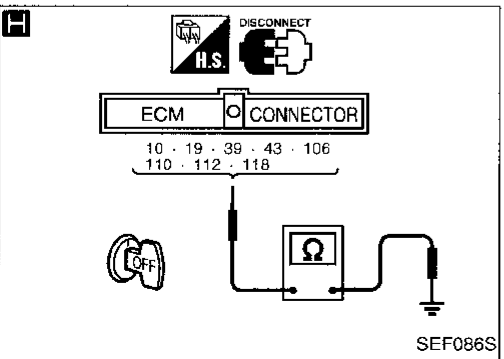
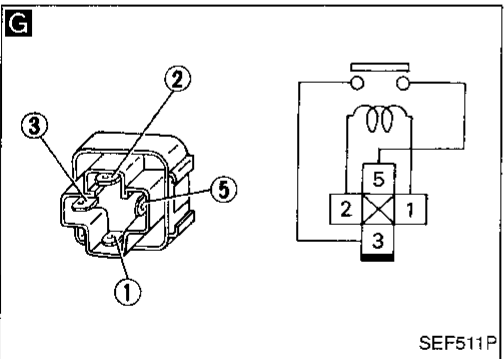
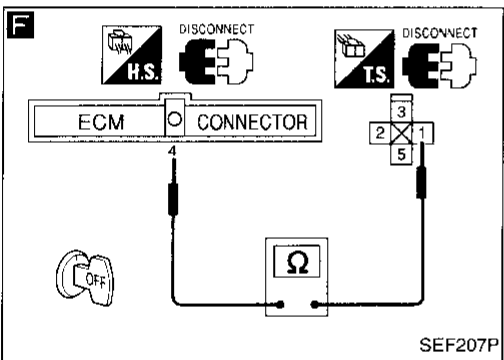
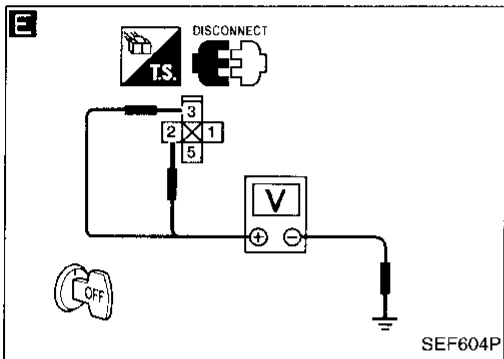
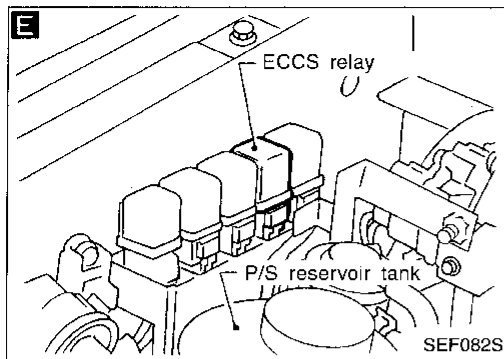


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# TROUBLE DIAGNOSIS FOR POWER SUPPLY

## Main Power Supply and Ground Circuit (Cont'd)



**A**

**D**

**CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.**

1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM terminals (56), (61), (113) and terminal (5).

**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

OK

**E**

**CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.**

Check voltage between terminals (2), (3) and ground with CONSULT or tester.

**Voltage: Battery voltage**

NG → Check the following.

- Fusible link (Brown)
- Harness for open or short between ECCS relay and battery

If NG, repair harness or connectors.

OK

**F**

**CHECK OUTPUT SIGNAL CIRCUIT.**

Check harness continuity between ECM terminal (4) and terminal (1).

**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

OK

**G**

**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

**H**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals (10), (19), (39), (43), (106), (110), (112), (118) and engine ground.

**Continuity should exist.**  
If OK, check harness for short.

NG → Check the following.

- Joint connector-1
- Harness for open or short between ECM and ground

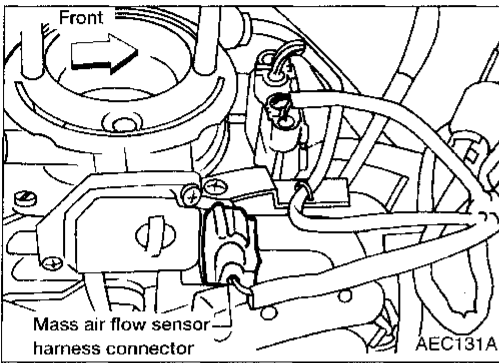
If NG, repair harness or connectors.

OK

Check ECM pin terminals for damage and check the connection of ECM harness connector.

INSPECTION END

# TROUBLE DIAGNOSIS FOR DTC P0100



## 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 the hot wire as air flow increases. This maintains the temperature of the hot wire. The ECM detects the air flow by means of this current change.

### ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
47	B	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.3 - 1.7V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	1.7 - 2.1V
48	W	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	0.005 - 0.02V

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
MAS AIR/FL SE	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul> Idle	1.3 - 1.7V
	2,500 rpm	1.7 - 2.1V
CAL/LD VALUE	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul> Idle	16.8 - 34.7% (2WD models) 15.9 - 33.2% (4WD models)
	2,500 rpm	14.1 - 27.6 % (2WD models) 13.3 - 26.1 % (4WD models)
MASS AIRFLOW	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul> Idle	1.8 - 6.5 g·m/s (2WD models) 2.1 - 6.0 g·m/s (4WD models)
	2,500 rpm	7.7- 15.0 g·m/s (2WD models) 6.8 - 13.3 g·m/s (4WD models)

## TROUBLE DIAGNOSIS FOR DTC P0100

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

#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Item (Possible Cause)
P0100 0102	A) An excessively high or low voltage from the sensor is sent to ECM.* ..... B)C) Rationally incorrect voltage is sent to ECM, compared with the calculated value by camshaft position sensor signal and throttle position sensor signal.	<ul style="list-style-type: none"> <li>● Harness or connectors (The sensor circuit is open or shorted.)</li> <li>● Mass air flow sensor</li> </ul>

\*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up. (Refer to EC-76.)

---

Engine operating condition in fail-safe mode

---

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

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# TROUBLE DIAGNOSIS FOR DTC P0100

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

### 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", "OVERALL FUNCTION CHECK".

#### Procedure for malfunction A

- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and wait at least 3 seconds.

OR

- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Start engine and wait at least 3 seconds.
- 3) Select "MODE 7" with GST.

OR

- 1) Turn ignition switch "ON" and wait at least 6 seconds.
- 2) Start engine and wait at least 3 seconds.
- 3) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

#### Procedure for malfunction B

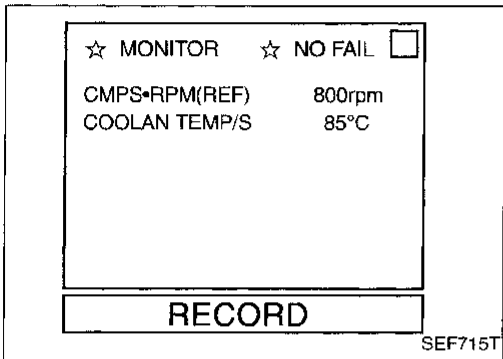
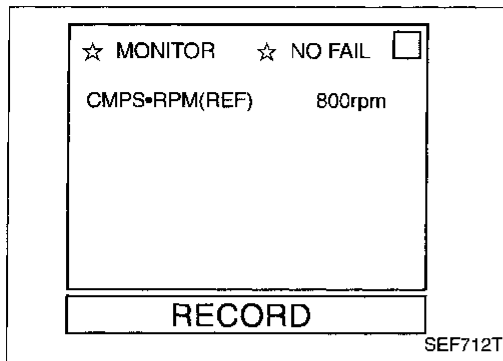
- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and warm it up sufficiently.
- 4) Run engine for at least 10 seconds at idle speed.

OR

- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Run engine for at least 10 seconds at idle speed.
- 4) Select "MODE 7" with GST.

OR

- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Run engine for at least 10 seconds at idle speed.
- 4) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



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# TROUBLE DIAGNOSIS FOR DTC P0100

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

### OVERALL FUNCTION CHECK

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

#### Procedure for malfunction C

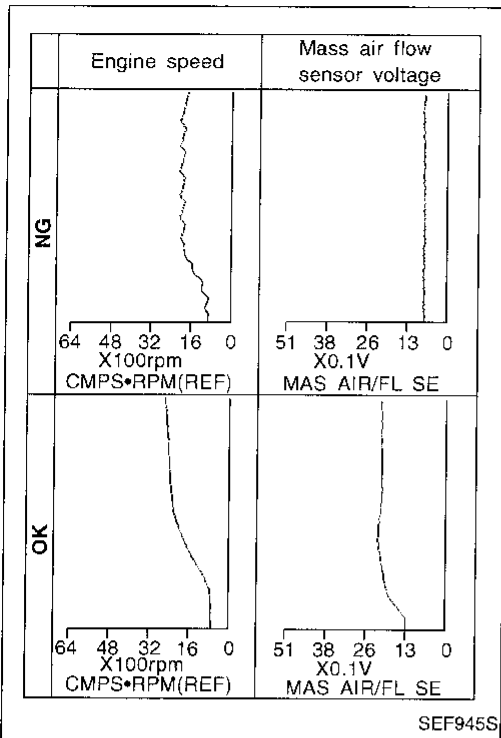
- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Select "DATA MONITOR" mode with CONSULT.
- 4) Check the voltage of mass air flow sensor with "DATA MONITOR".
- 5) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.



- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 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.

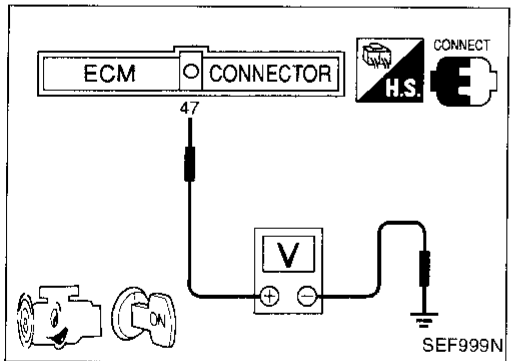


- 1) Turn ignition switch "ON".
- 2) Start engine and warm it up sufficiently.
- 3) Check the voltage between ECM terminal ④7 and ground.
- 4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.



FUEL SYS #1	OPEN
FUEL SYS #2	UNUSED
CALC LOAD	22%
COOLANT TEMP	30°C
SHORT FT #1	0%
LONG FT #1	2%
ENGINE SPD	1000RPM
VEHICLE SPD	0km/h
IGN ADVANCE	20.0°
INTAKE AIR	26°C
MAF	0.0gm/sec
THROTTLE POS	0%
O2S LOCATION	3
O2S B1,S1	0.680V
O2FT B1,S1	0%
O2S B1,S2	0.080V

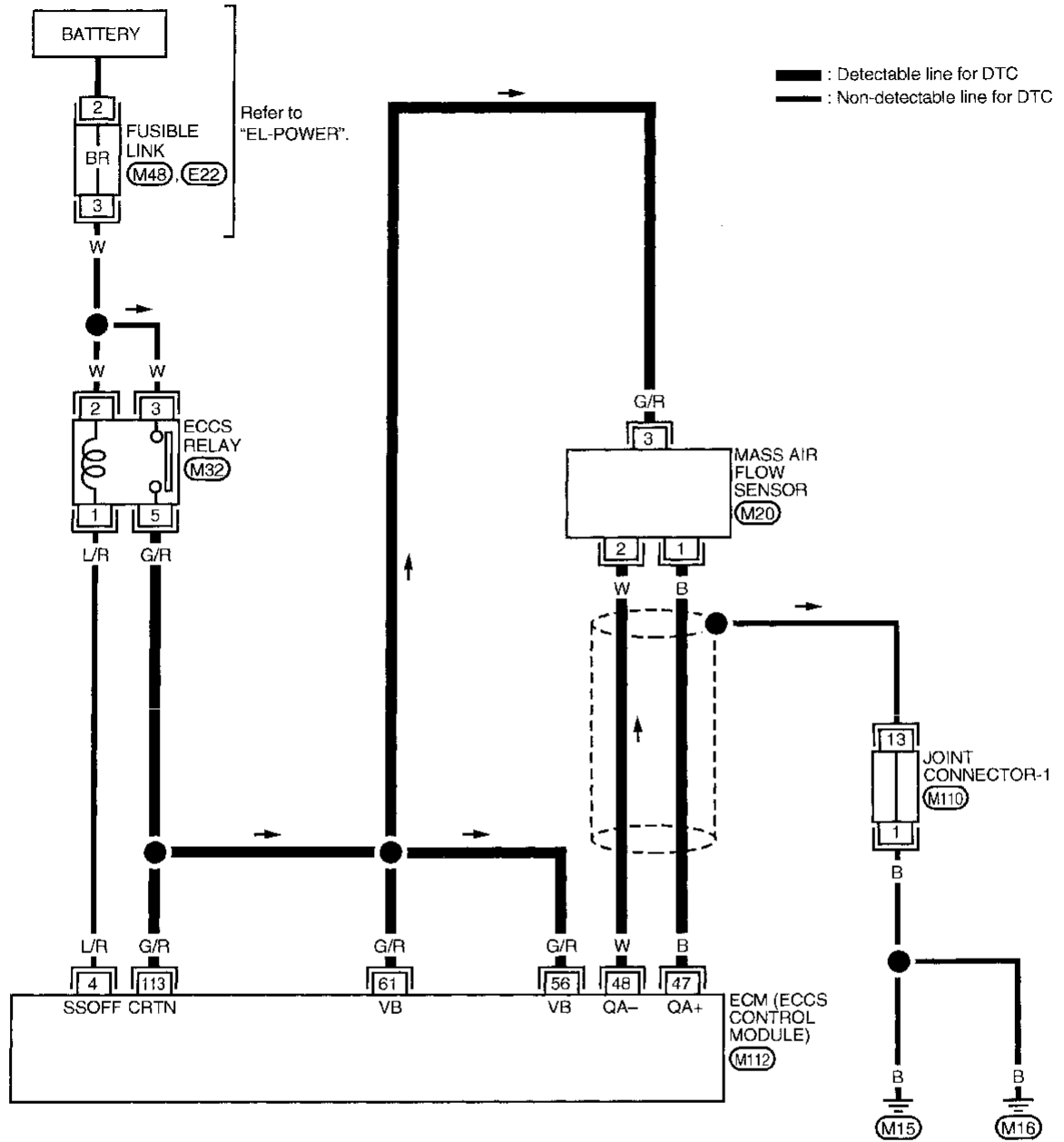
SEF003P



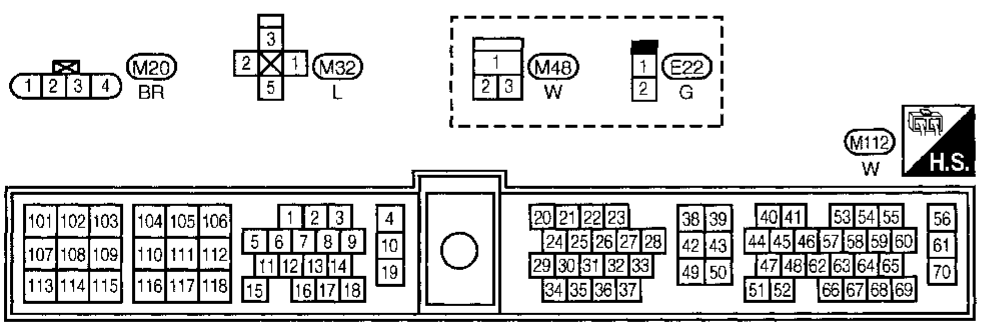
# TROUBLE DIAGNOSIS FOR DTC P0100

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

EC-MAFS-01



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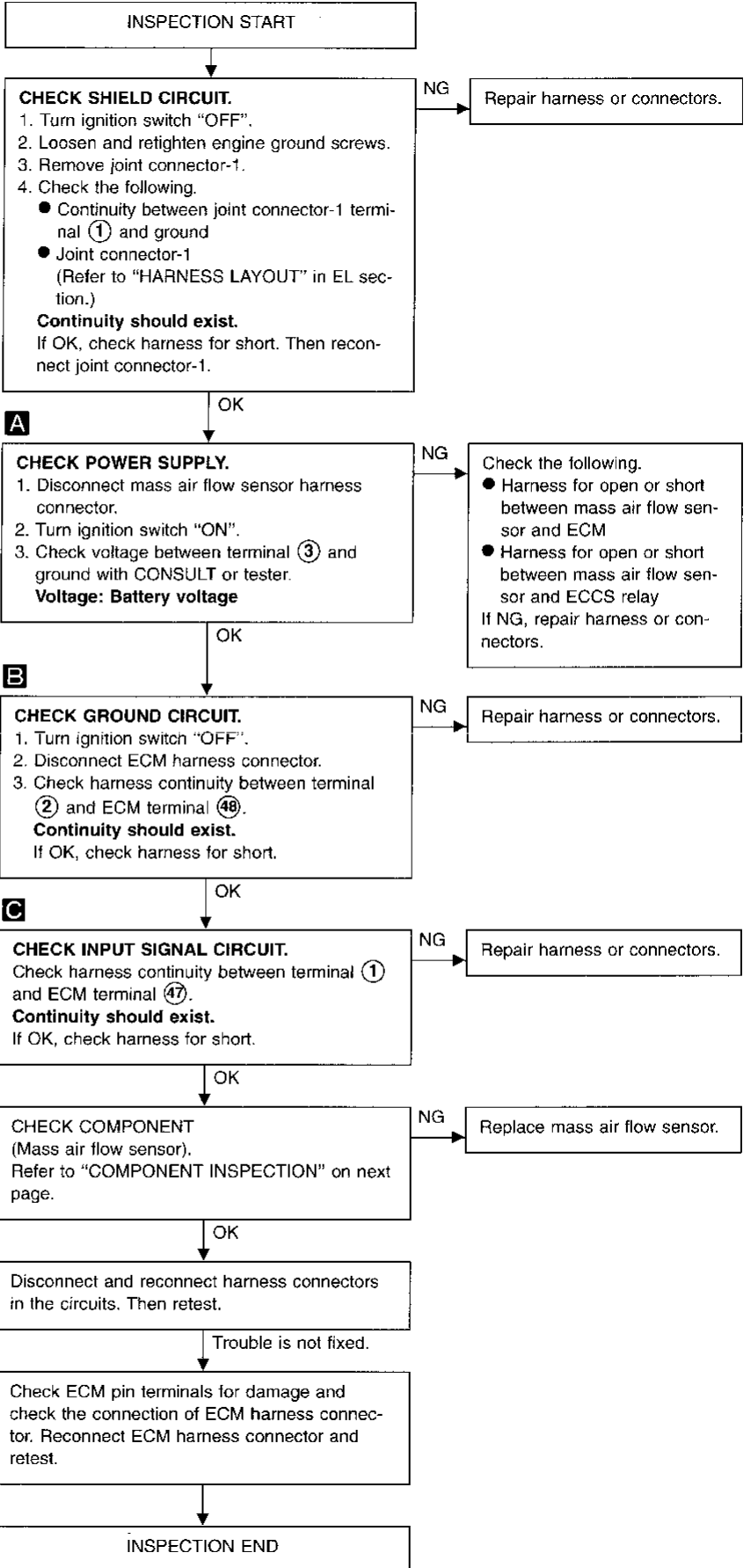
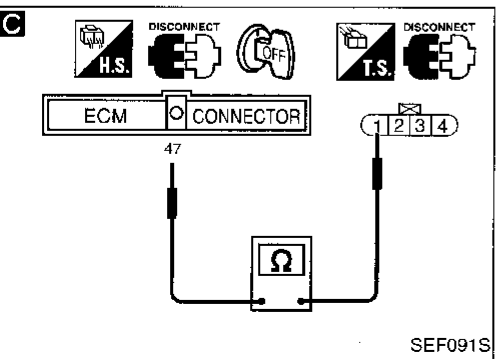
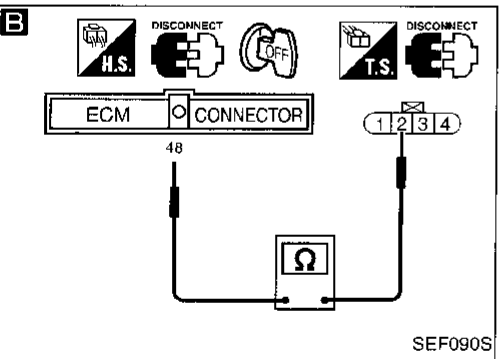
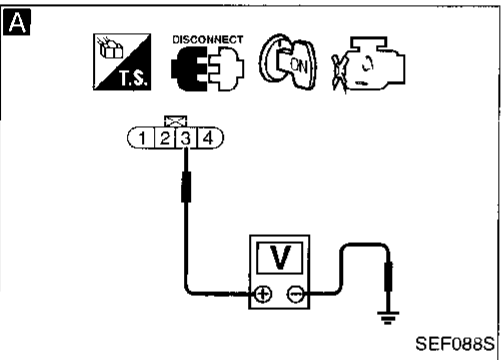
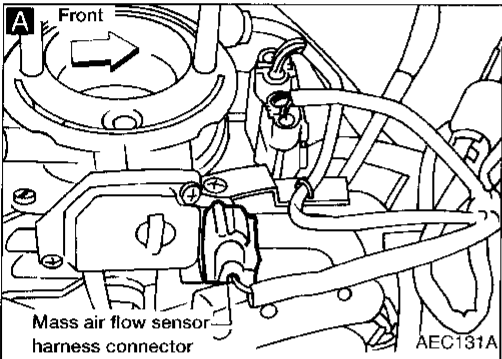
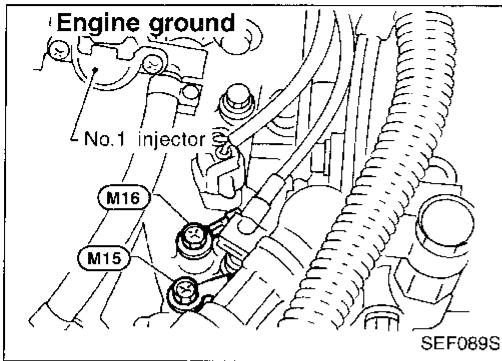


Refer to last page (Foldout page).  
 M110

# TROUBLE DIAGNOSIS FOR DTC P0100

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

### DIAGNOSTIC PROCEDURE



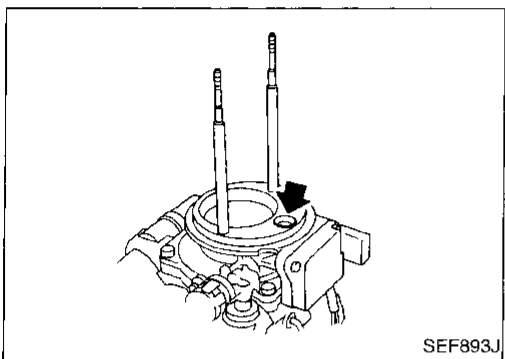
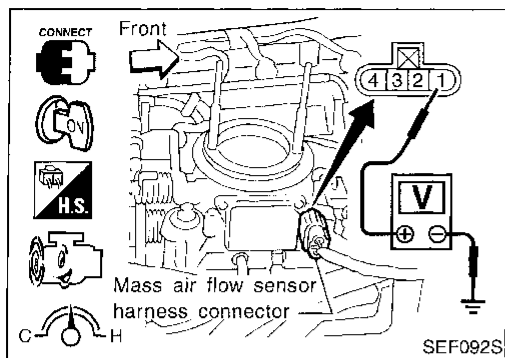
# TROUBLE DIAGNOSIS FOR DTC P0100

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

### COMPONENT INSPECTION

#### Mass air flow sensor

1. Turn ignition switch "ON".
2. Start engine and warm it up sufficiently.
3. Check voltage between terminal ① and ground.



Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	1.3 - 1.7
2,500 rpm	1.7 - 2.3
Idle to about 4,000 rpm*	1.3 - 1.7 to Approx. 4.0

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

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

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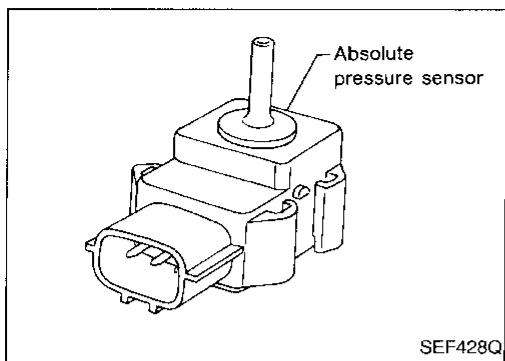
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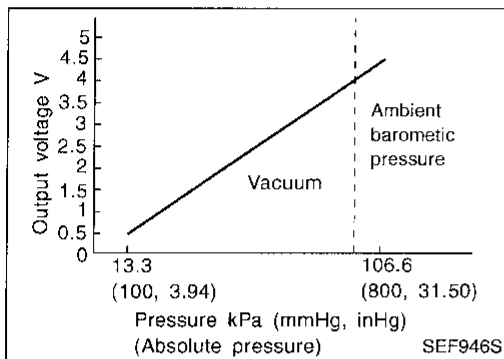
## TROUBLE DIAGNOSIS FOR DTC P0105



### 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. The absolute pressure sensor is not used to control the engine system. It is used only for on board diagnosis.



#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
49	P	Sensors' power supply	Ignition switch "ON"	Approximately 5V
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
57	L	Absolute pressure sensor	Ignition switch "ON" └ Engine is not running	Approximately 4.4V
			Engine is running. └ Idle speed (More than 5 seconds after starting engine)	Approximately 1.2V

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

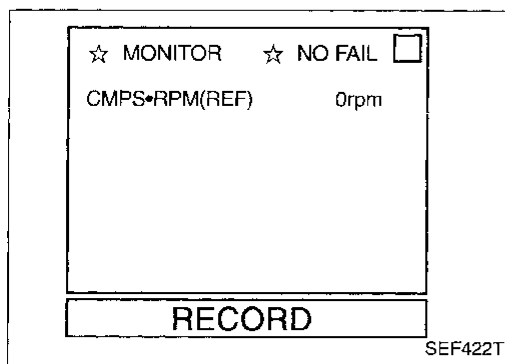
MONITOR ITEM	CONDITION	SPECIFICATION	
ABSOL PRES/SE	● Engine: After warming up	Engine is not running	Approx. 4.4V
		Idle (More than 5 seconds after starting engine)	Approx. 1.2V

# TROUBLE DIAGNOSIS FOR DTC P0105

## Absolute Pressure Sensor (Cont'd)

### 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.	<ul style="list-style-type: none"> <li>● Harness or connectors (Absolute pressure sensor circuit is open or shorted.)</li> <li>● Absolute pressure sensor</li> </ul>
	B) A low voltage from the sensor is sent to ECM under heavy load driving conditions.	<ul style="list-style-type: none"> <li>● Absolute pressure sensor</li> </ul>
	C) A high voltage from the sensor is sent to ECM under light load driving conditions.	<ul style="list-style-type: none"> <li>● Hoses (Hoses between the intake manifold and absolute pressure sensor are disconnected or clogged.)</li> <li>● Intake air leaks</li> <li>● Absolute pressure sensor</li> </ul>



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

#### Procedure for malfunction A

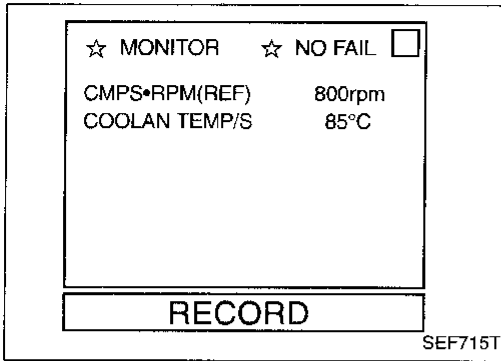
- 1) Turn ignition switch "ON".
  - 2) Select "DATA MONITOR" mode with CONSULT.
  - 3) Wait at least 6 seconds.
- OR
- 1) Turn ignition switch "ON" and wait at least 6 seconds.
  - 2) Select "MODE 7" with GST.
- OR
- 1) Turn ignition switch "ON" and wait at least 6 seconds.
  - 2) Turn ignition switch "OFF" and wait at least 7 seconds.
  - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B", "OVERALL FUNCTION CHECK" on next page.

# TROUBLE DIAGNOSIS FOR DTC P0105

## Absolute Pressure Sensor (Cont'd)

### Procedure for malfunction C



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and let it idle.
- 5) Wait at least 20 seconds.

OR

- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 20 seconds.
- 5) Select "MODE 7" with GST.

OR

- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine.
- 4) Let engine idle and wait at least 20 seconds.
- 5) Turn ignition switch "OFF".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

### OVERALL FUNCTION CHECK

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

### Procedure for malfunction B

- 1) Turn ignition switch "ON".
- 2) Select "ABSOL PRES/SE" in "DATA MONITOR" mode with CONSULT.
- 3) Make sure that the voltage of "ABSOL PRES/SE" is more than 1.74 [V].

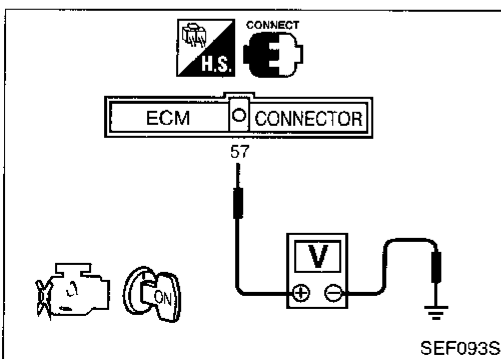
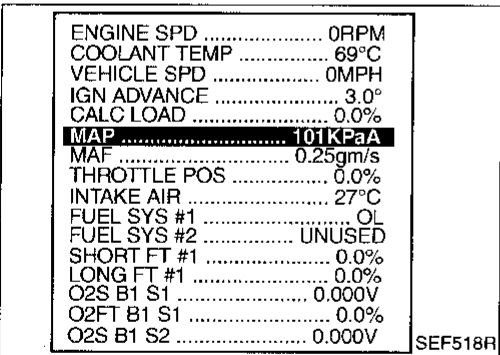
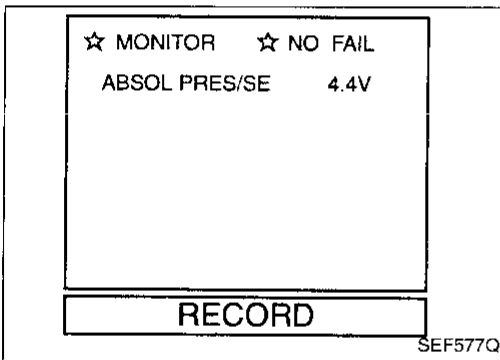
OR

- 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<sup>2</sup>, 6.7 psi).

OR

- 1) Turn ignition switch "ON".
- 2) Make sure that the voltage between ECM terminal ⑤7 and ground is more than 1.74 [V].

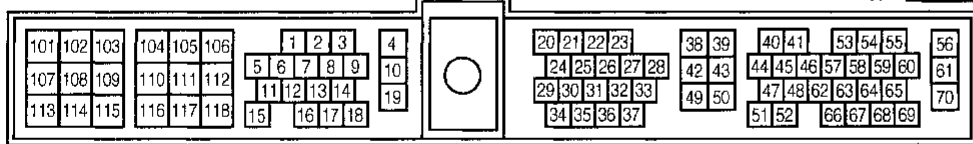
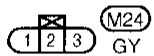
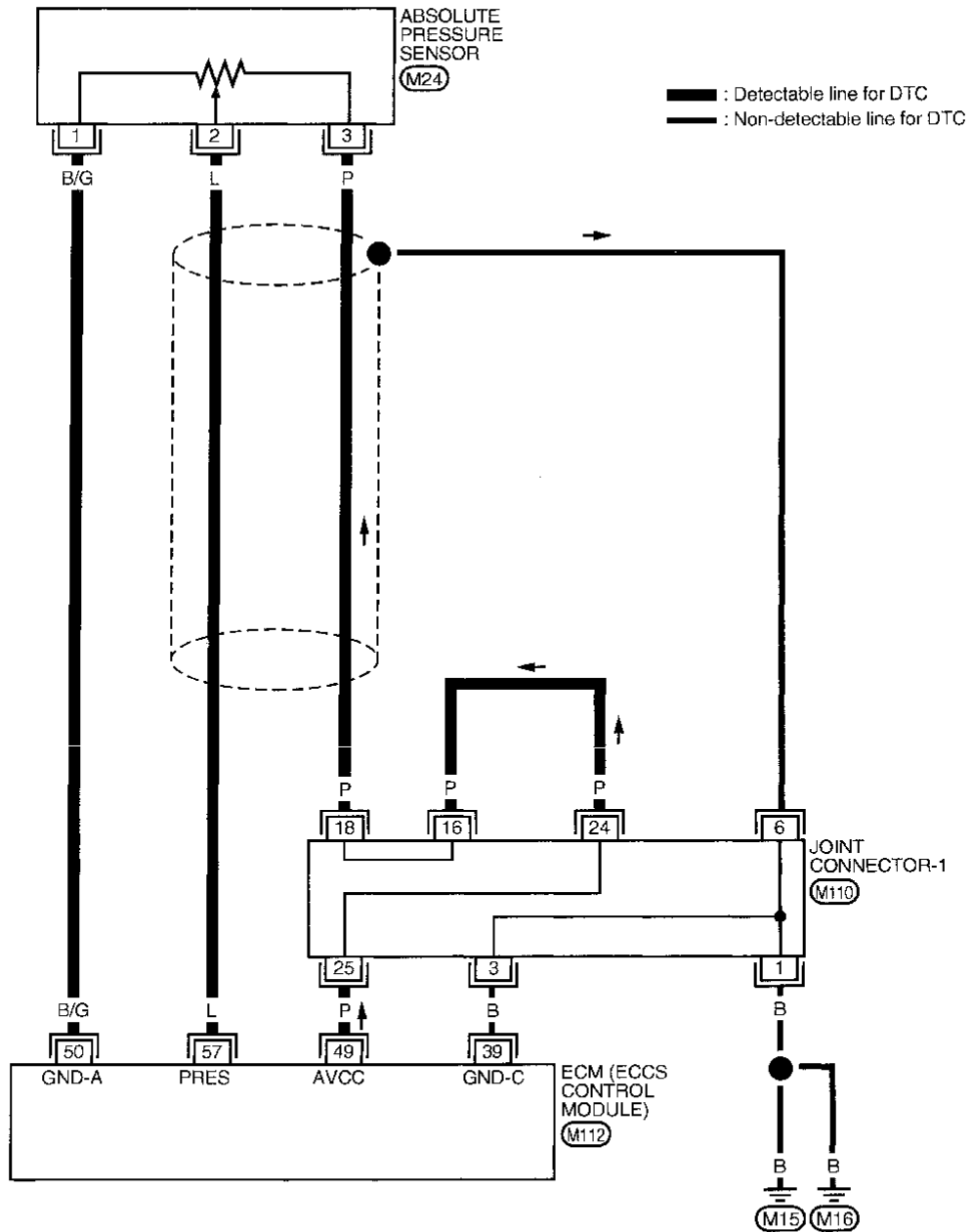
If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction C" above.



# TROUBLE DIAGNOSIS FOR DTC P0105

## Absolute Pressure Sensor (Cont'd)

EC-AP/SEN-01



Refer to last page (Foldout page).

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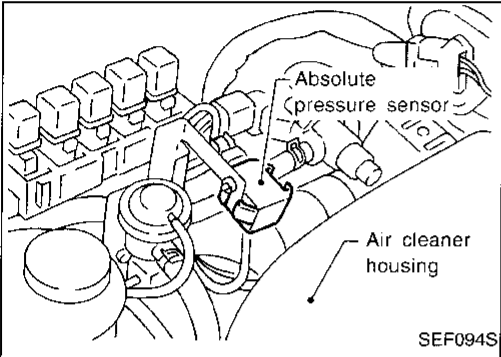
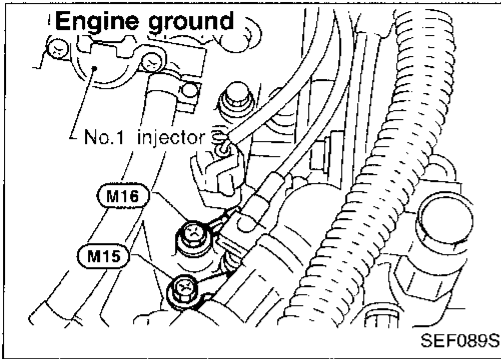
# TROUBLE DIAGNOSIS FOR DTC P0105

## Absolute Pressure Sensor (Cont'd)

### DIAGNOSTIC PROCEDURE

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

#### Procedure A



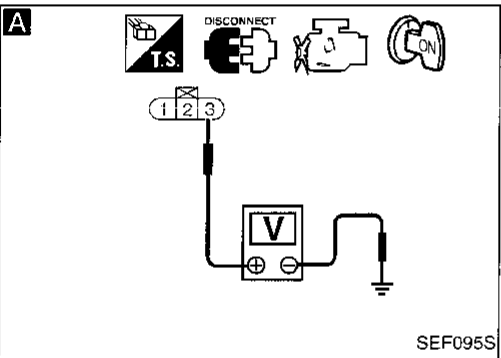
INSPECTION START

**CHECK SHIELD CIRCUIT.**  
1. Turn ignition switch "OFF".  
2. Loosen and retighten engine ground screws.  
3. Remove joint connector-1.  
4. Check the following.  
● Continuity between joint connector-1 terminal ① and ground  
● Joint connector-1  
(Refer to "HARNES LAYOUT" in EL section.)  
**Continuity should exist.**  
If OK, check harness for short. Then reconnect joint connector-1.

NG → Repair harness or connectors.

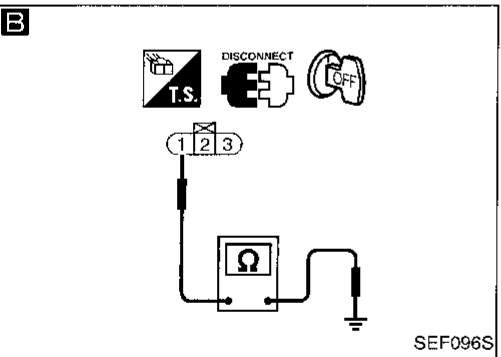
**A**  
**CHECK POWER SUPPLY.**  
1. Disconnect absolute pressure sensor harness connector.  
2. Turn ignition switch "ON".  
3. Check voltage between terminal ③ and engine ground with CONSULT or tester.  
**Voltage: Approximately 5V**

NG → Check the following.  
● Joint connector-1  
● Harness for open or short between absolute pressure sensor and ECM  
If NG, repair harness or connectors.



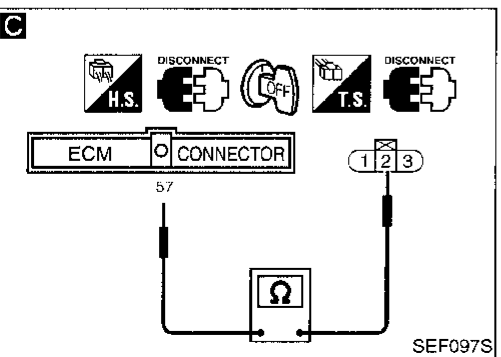
**B**  
**CHECK GROUND CIRCUIT.**  
1. Turn ignition switch "OFF".  
2. Check harness continuity between terminal ① and engine ground.  
**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.



**C**  
**CHECK INPUT SIGNAL CIRCUIT.**  
1. Disconnect ECM harness connector.  
2. Check harness continuity between ECM terminal ⑤7 and terminal ②.  
**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.



**CHECK COMPONENT**  
(Absolute pressure sensor).  
Refer to "COMPONENT INSPECTION", EC-106.

NG → Replace absolute pressure sensor.

Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

Ⓐ  
(Go to next page.)

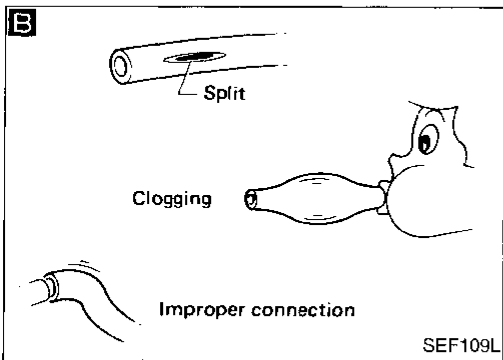
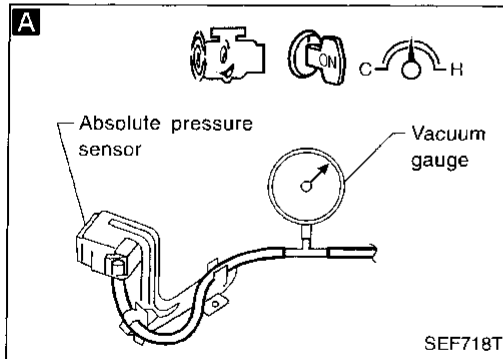
# TROUBLE DIAGNOSIS FOR DTC P0105

## Absolute Pressure Sensor (Cont'd)

(A)

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



### Procedure B

INSPECTION START

**A**  
**CHECK VACUUM SOURCE TO ABSOLUTE PRESSURE SENSOR.**  
 1. Start engine and warm it up sufficiently.  
 2. Stop engine.  
 3. Disconnect vacuum hose between absolute pressure sensor and MAP/BARO switch solenoid valve.  
 4. Install vacuum gauge between absolute pressure sensor and MAP/BARO switch solenoid valve.  
 5. Restart engine and let it idle.  
 6. Read the indication of vacuum gauge at idle speed.  
**Vacuum pressure:**  
**Approx. -66.7 kPa**  
**(-500 mmHg, -19.69 inHg, -9.67 psi)**

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

OK → **CHECK INTAKE SYSTEM.**  
 Check intake system for air leaks.

**B**  
**CHECK HOSE BETWEEN ABSOLUTE PRESSURE SENSOR AND MAP/BARO SWITCH SOLENOID VALVE.**  
 1. Turn ignition switch "OFF".  
 2. Check hose for clogging, cracks or improper connection.

NG → Repair or reconnect hose.

**CHECK COMPONENT**  
 (Absolute pressure sensor). Refer to "COMPONENT INSPECTION" on next page.

NG → Replace absolute pressure sensor.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.  
 Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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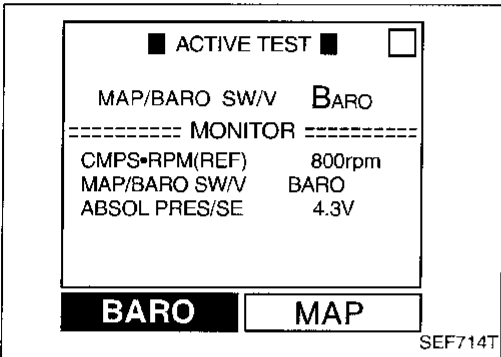
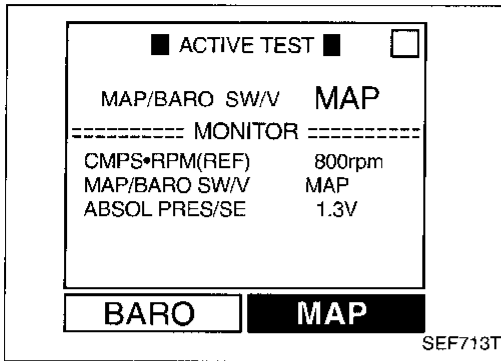
# TROUBLE DIAGNOSIS FOR DTC P0105

## Absolute Pressure Sensor (Cont'd)

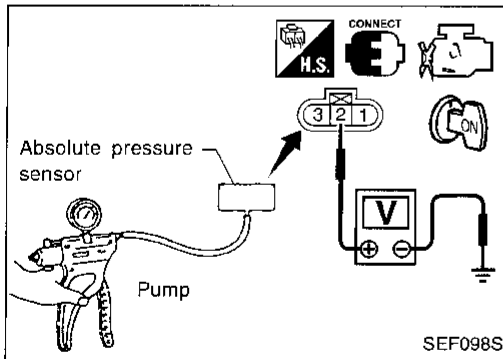
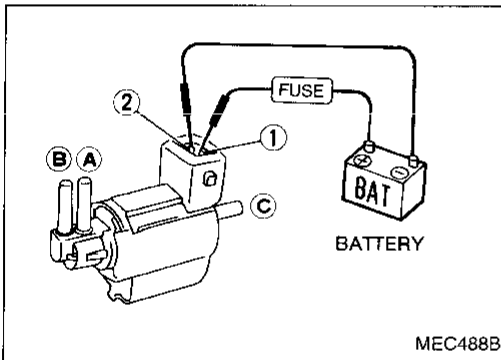
### COMPONENT INSPECTION

#### Absolute pressure sensor

1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
  - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
  - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
4. If NG, check MAP/BARO switch solenoid valve.
  - (1) Turn ignition switch "OFF".
  - (2) Remove MAP/BARO switch solenoid valve.
  - (3) Check air passage continuity.



Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals (1) and (2)	Yes	No
No supply	No	Yes



5. Remove absolute pressure sensor with its harness connector connected.
6. Remove hose from absolute pressure sensor.
7. Turn ignition switch "ON" and check output voltage between terminal (2) and engine ground.  
**The voltage should be 3.2 to 4.8 V.**
8. Use pump to apply vacuum of -26.7 kPa (-200 mmHg, -7.87 inHg, -3.87 psi) 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.**

9. If NG, replace absolute pressure sensor.

# TROUBLE DIAGNOSIS FOR DTC P0110

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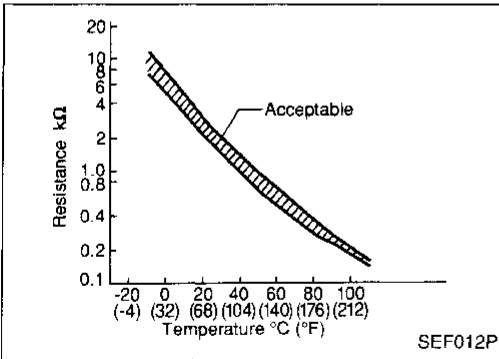
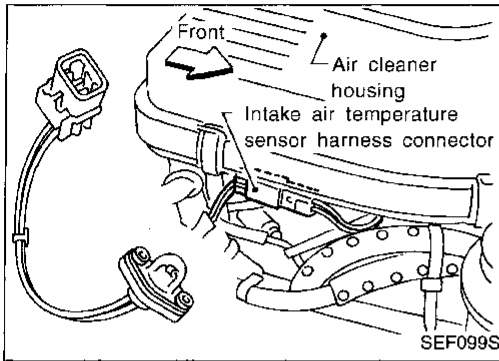
## Intake Air Temperature Sensor

### COMPONENT DESCRIPTION

The intake air temperature sensor is mounted to the air duct. 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.

This sensor is not used to control the engine system. It is used only for the on board diagnosis.



### ⟨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 28 (Intake air temperature sensor) and ECM terminal 43 (ECCS 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.	<ul style="list-style-type: none"> <li>● Harness or connectors (The sensor circuit is open or shorted.)</li> <li>● Intake air temperature sensor</li> </ul>

\*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up. (Refer to EC-76.)


#### Engine operating condition in fail-safe mode

The ECM controls on the assumption that the intake air temperature is 20°C (68°F).


## TROUBLE DIAGNOSIS FOR DTC P0110

### Intake Air Temperature Sensor (Cont'd) DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE


#### Procedure for malfunction A

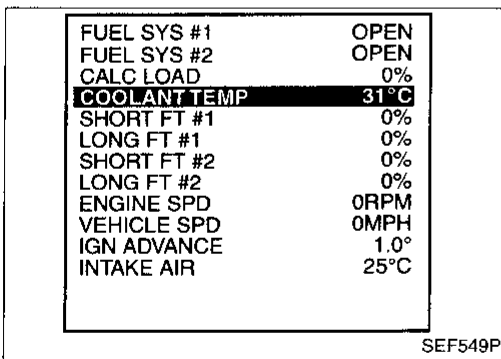
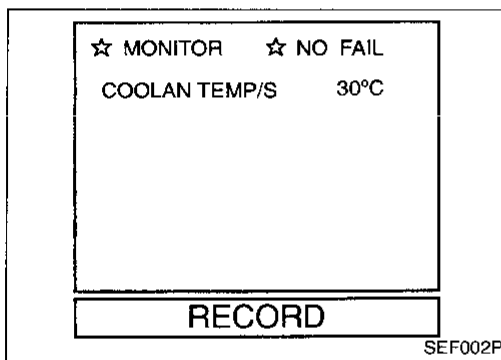
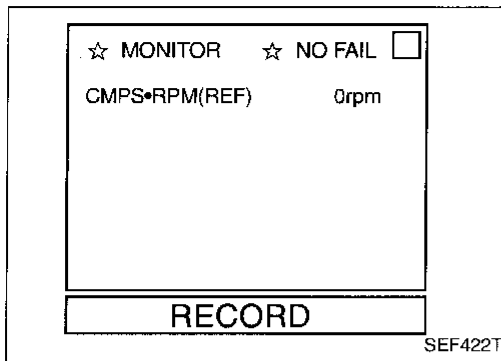
-  1) Turn ignition switch "ON".  
2) Select "DATA MONITOR" mode with CONSULT.  
3) Wait at least 5 seconds.

OR


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

OR

-  1) Turn ignition switch "ON" and wait at least 5 seconds.  
2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".  
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.




#### Procedure for malfunction B

-  1) Lift up vehicle and open engine hood.  
2) Wait until engine coolant temperature is less than 90°C (194°F).  
(a) Turn ignition switch "ON".  
(b) Select "DATA MONITOR" mode with CONSULT.  
(c) Check the engine coolant temperature.  
(d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.

- Perform the following steps before engine coolant temperature is above 90°C (194°F).

- 3) Turn ignition switch "ON".  
4) Select "DATA MONITOR" mode with CONSULT.  
5) Start engine.  
6) Shift selector lever to "D" position.  
7) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.

OR

-  1) Lift up vehicle and open engine hood.  
2) Wait until engine coolant temperature is less than 90°C (194°F).

- (a) Turn ignition switch "ON".  
(b) Select MODE 1 with GST.  
(c) Check the engine coolant temperature.  
(d) If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch "OFF" and cool down engine.

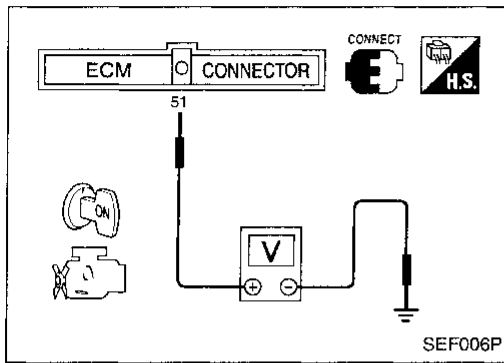
- Perform the following steps before engine coolant temperature is above 90°C (194°F).

- 3) Start engine.  
4) Shift selector lever to "D" position.  
5) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.  
6) Select MODE 7 with GST.

OR

# TROUBLE DIAGNOSIS FOR DTC P0110

## Intake Air Temperature Sensor (Cont'd)



NO TOOLS

- 1) Lift up vehicle and open engine hood.
- 2) Wait until engine coolant temperature is less than 90°C (194°F).
  - (a) Turn ignition switch "ON".
  - (b) Check voltage between ECM terminal 51 and ground.  
**Voltage: More than 1.0 (V)**
  - (c) If the voltage is not more than 1.0 (V), turn ignition switch "OFF" and cool down engine.
- Perform the following steps before the voltage is below 1.0V.
- 3) Start engine.
- 4) Shift selector lever to "D" position.
- 5) Hold vehicle speed at 70 to 80 km/h (43 to 50 MPH) for 2 minutes.
- 6) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 7) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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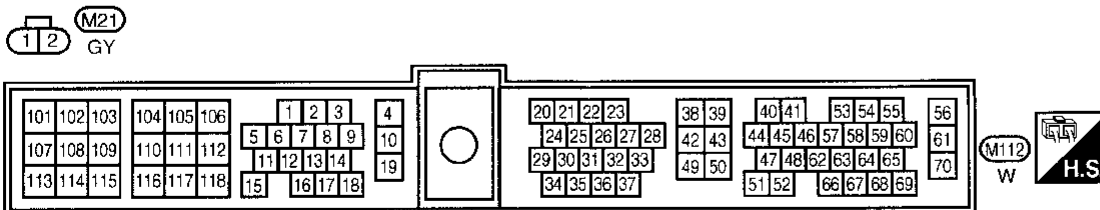
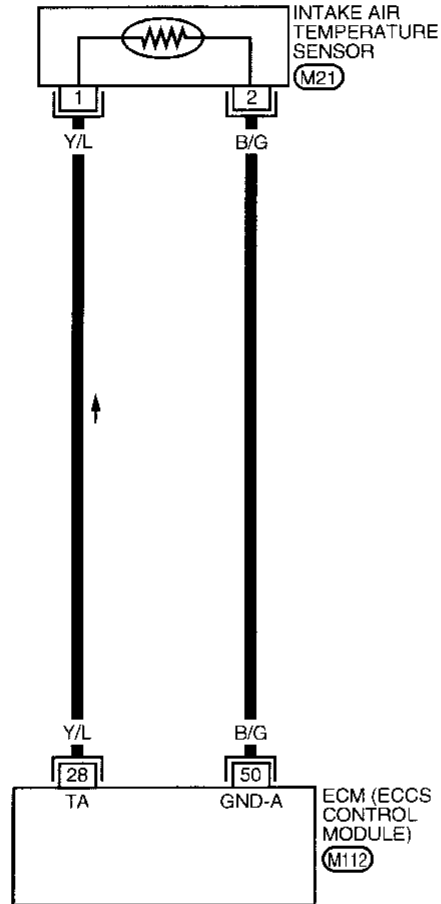
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# TROUBLE DIAGNOSIS FOR DTC P0110

## Intake Air Temperature Sensor (Cont'd)

EC-IATS-01

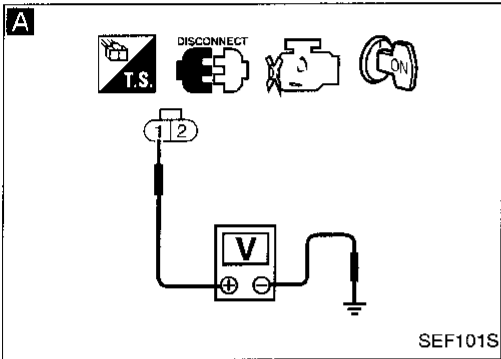
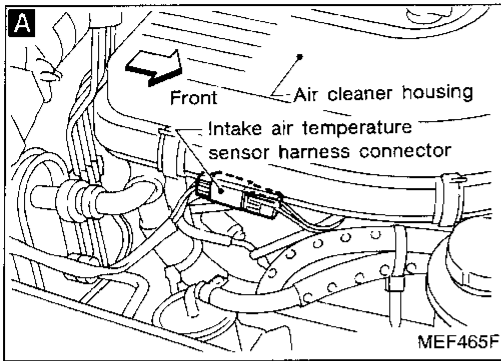
— : Detectable line for DTC  
 - - - : Non-detectable line for DTC



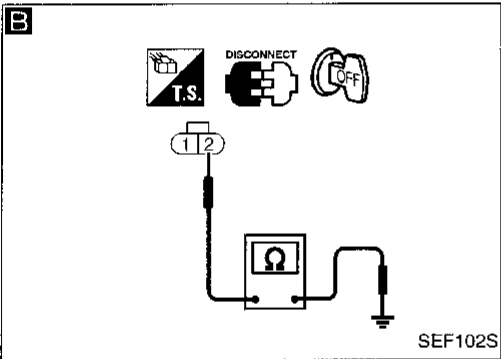
# TROUBLE DIAGNOSIS FOR DTC P0110

## Intake Air Temperature Sensor (Cont'd)

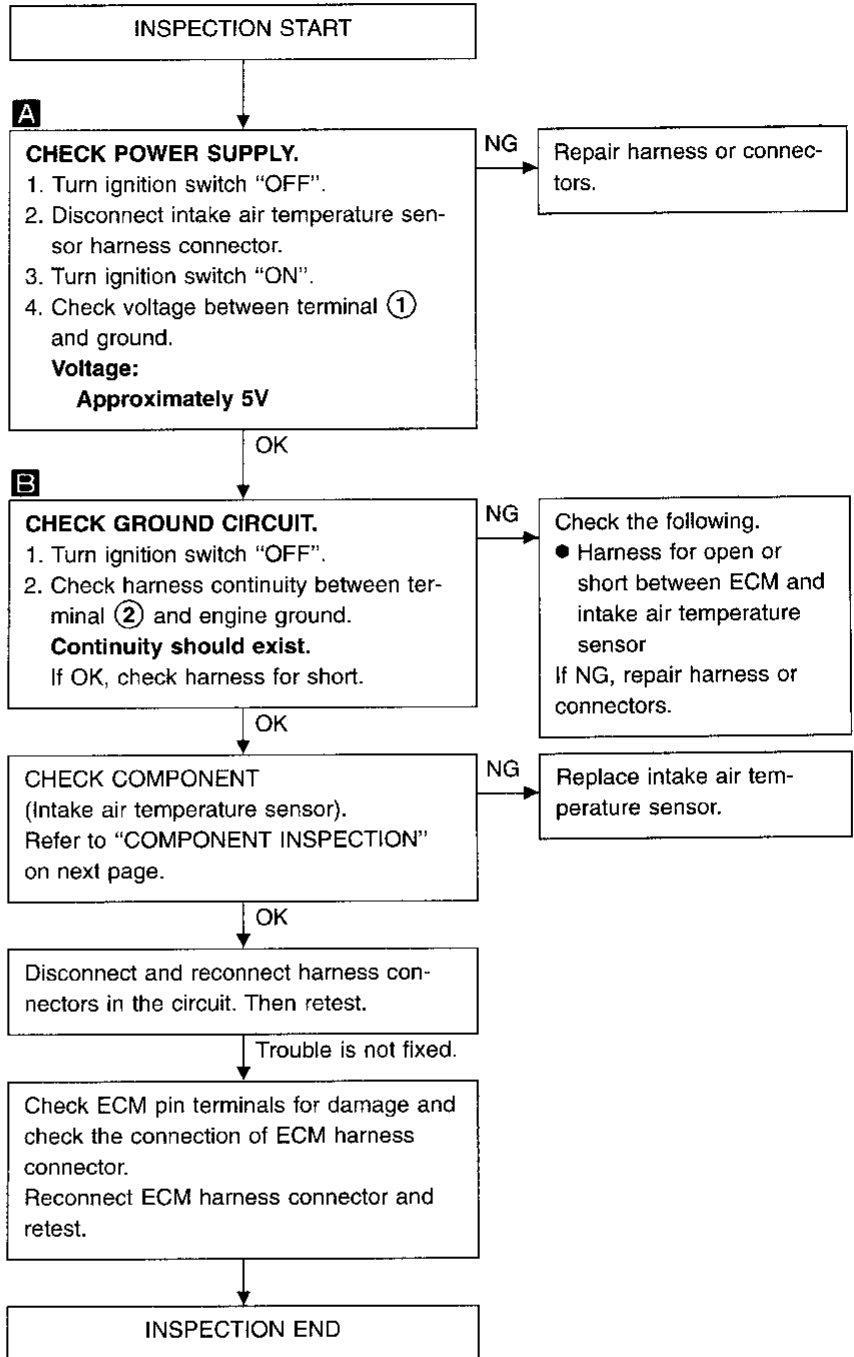
### DIAGNOSTIC PROCEDURE



SEF101S



SEF102S



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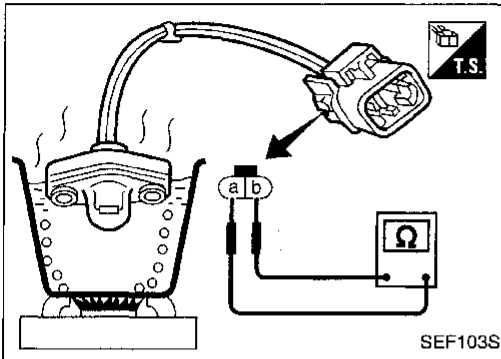


## TROUBLE DIAGNOSIS FOR DTC P0110

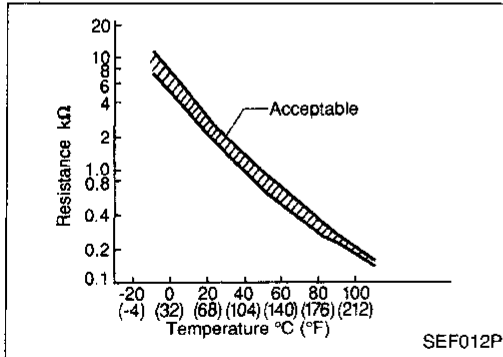
### Intake Air Temperature Sensor (Cont'd) COMPONENT INSPECTION

#### Intake air temperature sensor

Check resistance as shown in the figure.



SEF103S



SEF012P

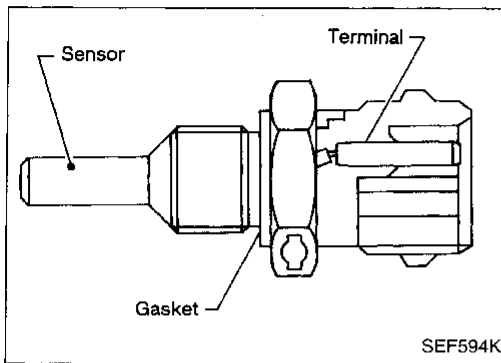
#### <Reference data>

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.

# TROUBLE DIAGNOSIS FOR DTC P0115

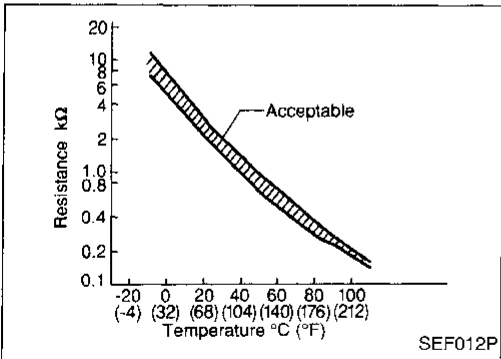
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## Engine Coolant Temperature Sensor (ECTS)

### 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 measured between ECM terminal (51) (Engine coolant temperature sensor) and ECM terminal (43) (ECCS ground).

## ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0115 0103	<ul style="list-style-type: none"> <li>An excessively high or low voltage from the sensor is sent to ECM.*</li> </ul>	<ul style="list-style-type: none"> <li>Harness or connectors (The sensor circuit is open or shorted.)</li> <li>Engine coolant temperature sensor</li> </ul>

\*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up. (Refer to EC-76.)

### Engine operating condition in fail-safe mode

Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".

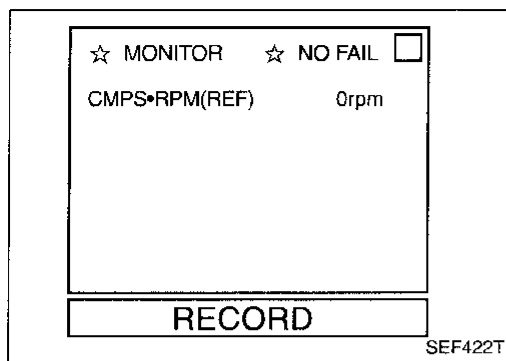
CONSULT displays the engine coolant temperature decided by ECM.

Condition	Engine coolant temperature decided (CONSULT display)
Just as ignition switch is turned ON or START	20°C (68°F)
More than approx. 6 minutes after ignition ON or START	80°C (176°F)
Except as shown above	20 - 80°C (68 - 176°F) (Depends on the time)

## TROUBLE DIAGNOSIS FOR DTC P0115

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

#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



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

OR



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

OR





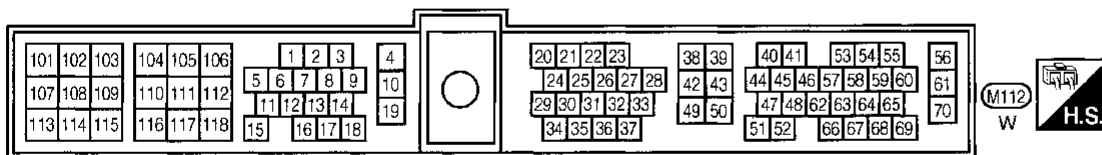
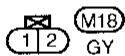
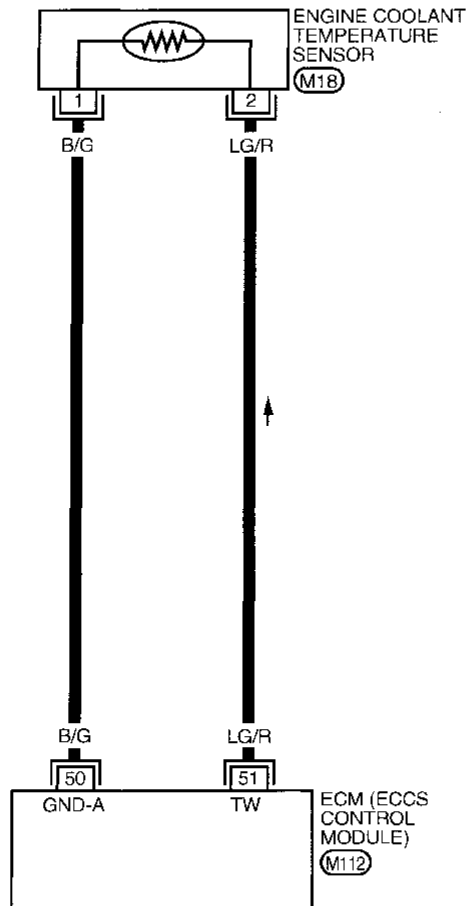
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P0115

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

EC-ECTS-01

 : Detectable line for DTC  
 : Non-detectable line for DTC



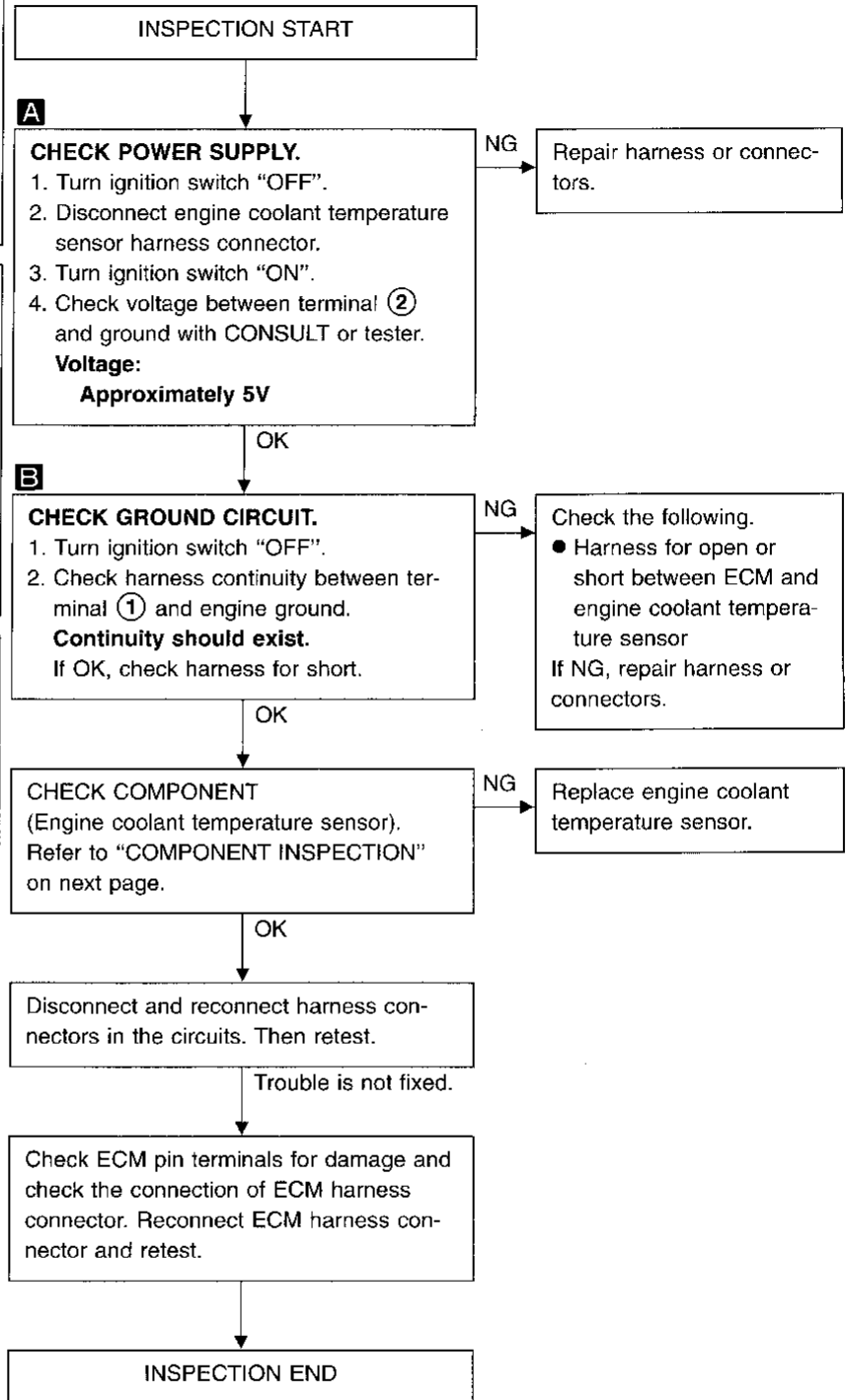
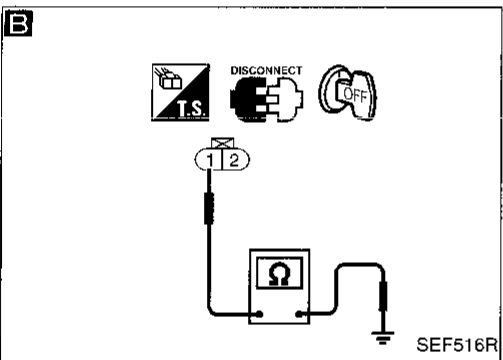
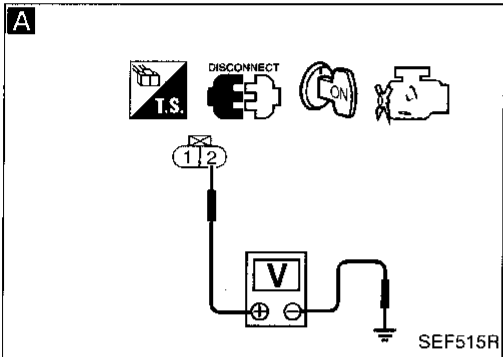
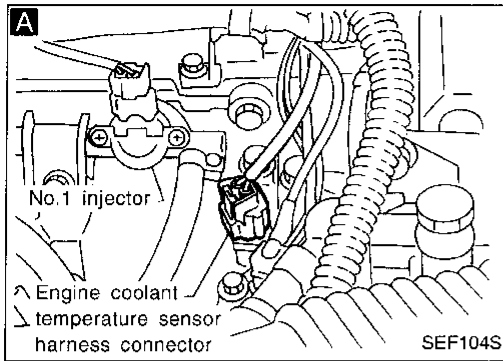
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# TROUBLE DIAGNOSIS FOR DTC P0115

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

### DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P0115

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

### COMPONENT INSPECTION

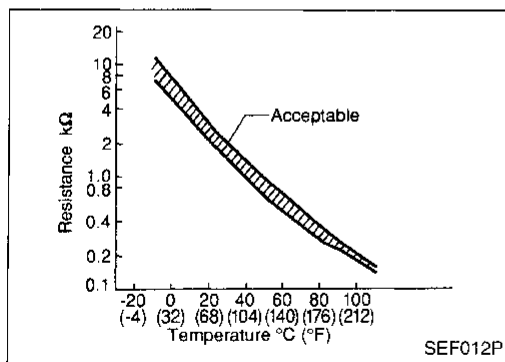
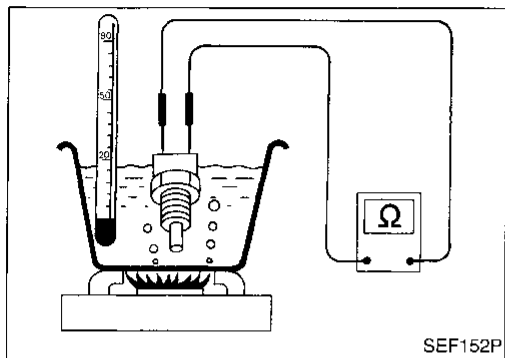
#### Engine coolant temperature sensor

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.



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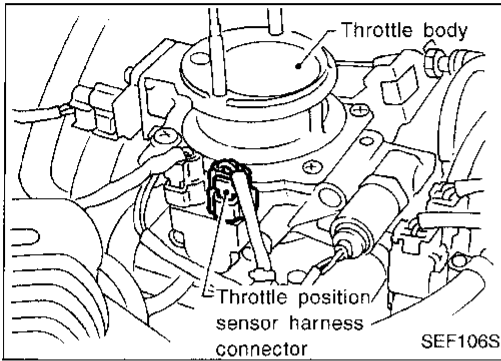
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# TROUBLE DIAGNOSIS FOR DTC P0120

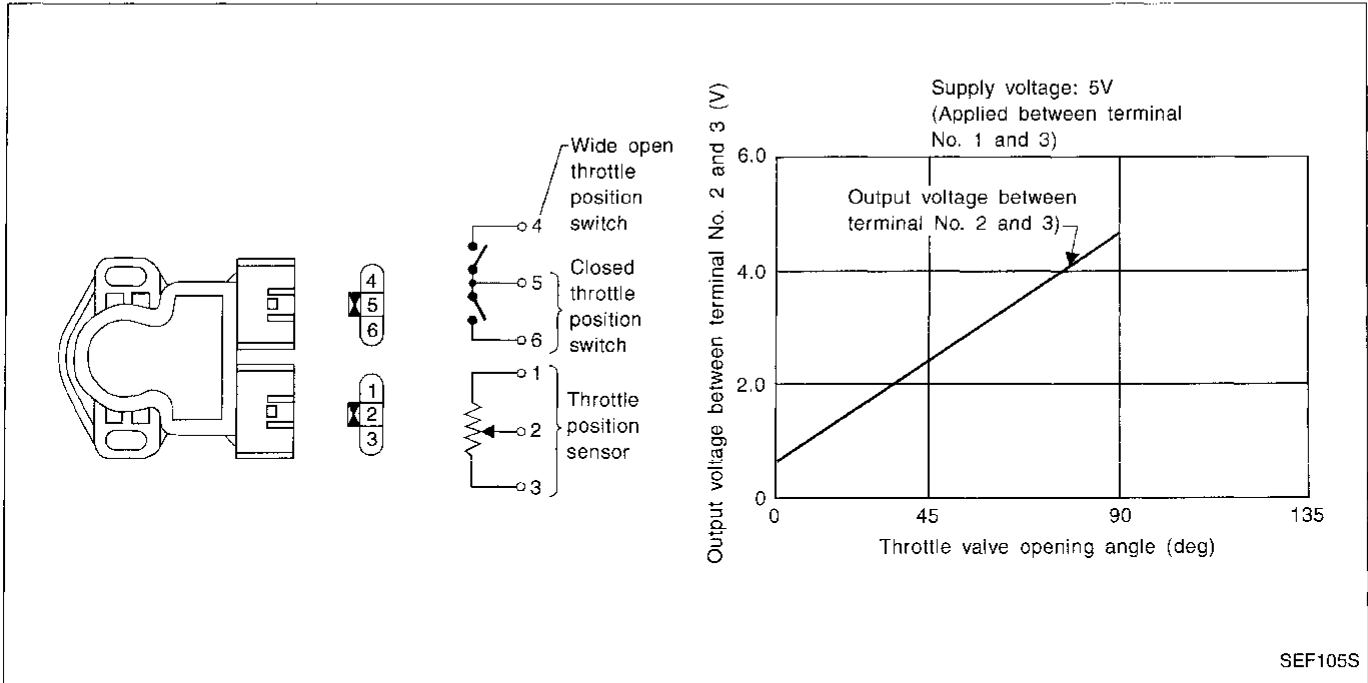


## Throttle Position Sensor

### 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 controls engine operation such as fuel cut. The throttle position sensor unit contains a built-in "Wide open and closed throttle position switch".



### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
23	W	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.3 - 0.7V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
49	P	Sensors' power supply	Ignition switch "ON"	Approximately 5V
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V

# TROUBLE DIAGNOSIS FOR DTC P0120

## Throttle Position Sensor (Cont'd)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed 0.3 - 0.7V
		Throttle valve fully opened Approx. 4.0V
ABSOL TH-P/S	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed 0.0%
		Throttle valve fully opened Approx. 84%

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	<ul style="list-style-type: none"> <li>● An excessively low or high voltage from the sensor is sent to ECM.*</li> <li>● Voltage sent to ECM is not practical when compared with mass air flow sensor and camshaft position sensor signals.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (The sensor circuit is open or shorted.)</li> <li>● Throttle position sensor</li> </ul>

\*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up. (Refer to EC-76.)

#### Engine operating condition in fail-safe mode

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



# TROUBLE DIAGNOSIS FOR DTC P0120

## Throttle Position Sensor (Cont'd)

### OVERALL FUNCTION CHECK

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



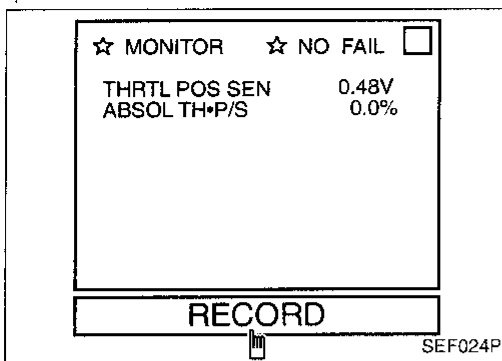
- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
- 5) Select "THRTL POS SEN" and "ABSOL TH-P/S" in "DATA MONITOR" mode with CONSULT.
- 6) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
- 7) Print out the recorded data and check the following:

- The voltage when accelerator pedal fully released is 0.3 - 0.7V.
- The voltage rise is linear in response to accelerator pedal depression.
- The voltage when accelerator pedal fully depressed is approximately 4V.

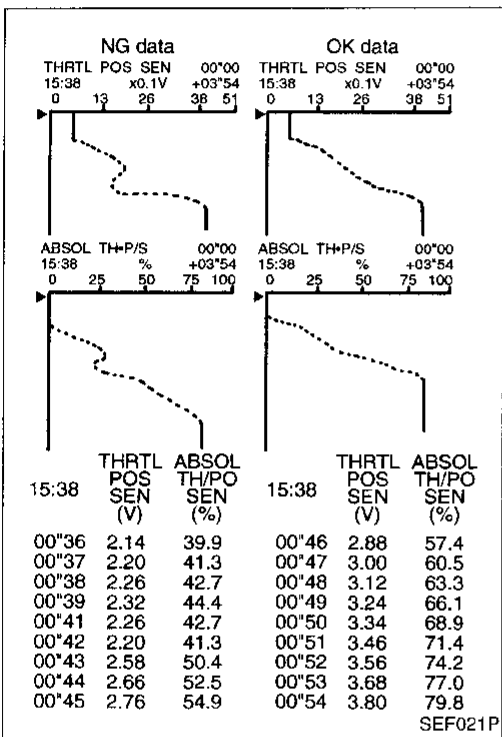
OR



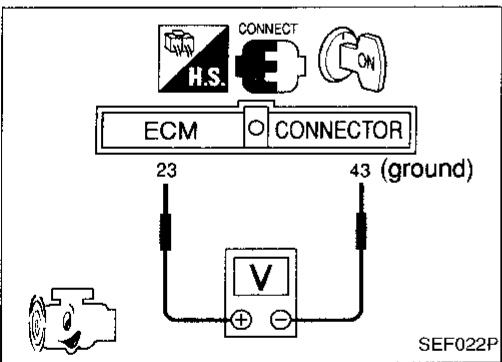
- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON".
- 4) Check the voltage between ECM terminal ②③ and ④③ (ground) and check the following:
  - The voltage when accelerator pedal fully released is 0.3 - 0.7V.
  - The voltage rise is linear in response to accelerator pedal depression.
  - The voltage when accelerator pedal fully depressed is approximately 4V.



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SEF021P

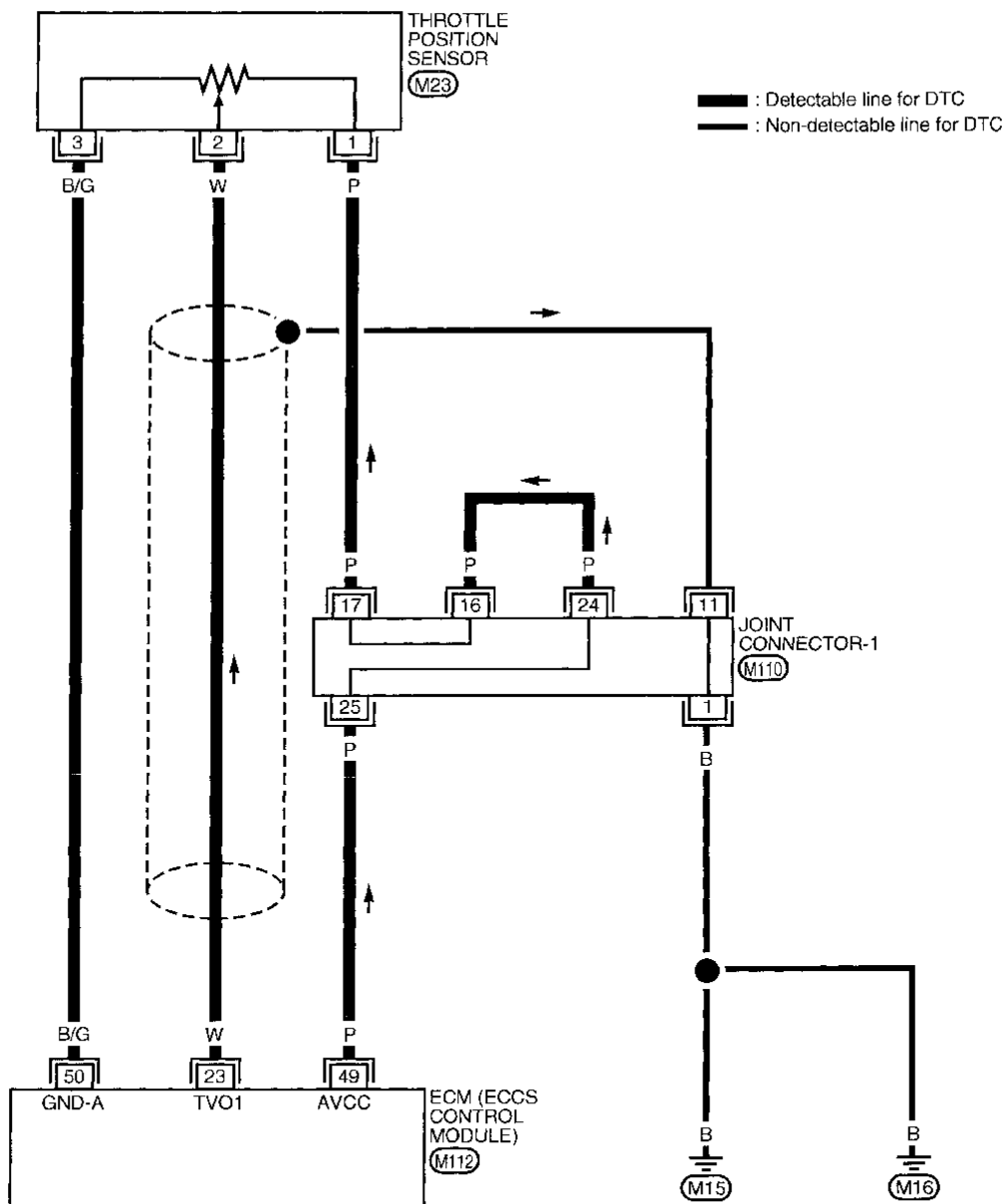


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# TROUBLE DIAGNOSIS FOR DTC P0120

## Throttle Position Sensor (Cont'd)

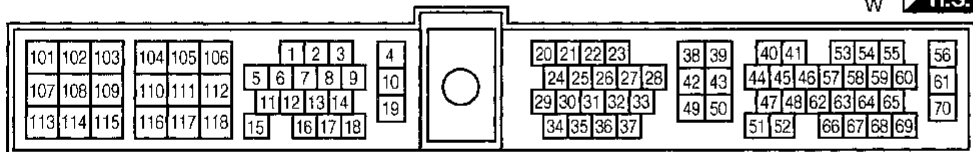
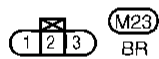
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Refer to last page (Foldout page).

(M110)

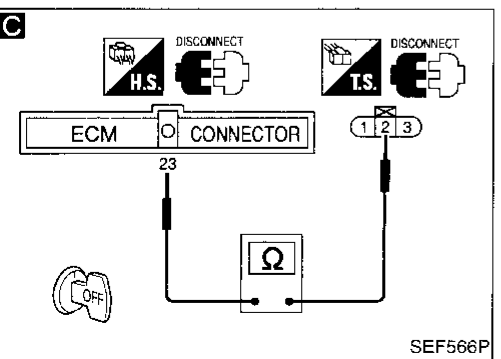
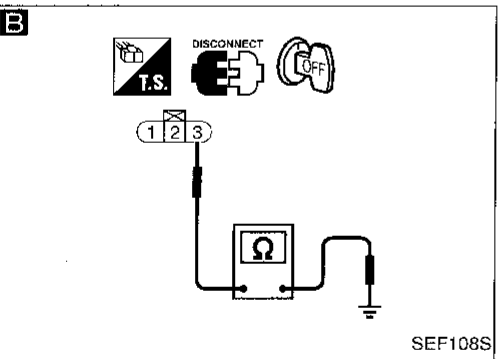
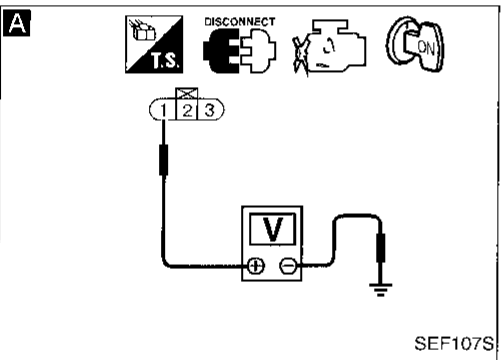
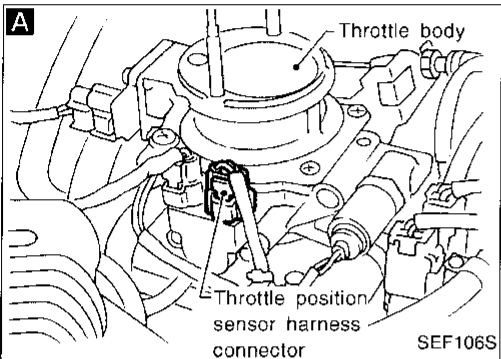
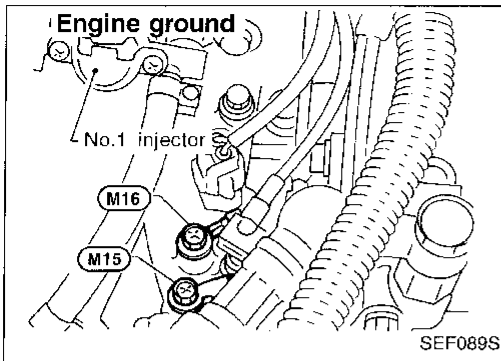


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# TROUBLE DIAGNOSIS FOR DTC P0120

## Throttle Position Sensor (Cont'd)

### DIAGNOSTIC PROCEDURE



INSPECTION START

ADJUST THROTTLE POSITION SENSOR.  
Perform BASIC INSPECTION, EC-72.

OK

**CHECK SHIELD CIRCUIT.**  
1. Turn ignition switch "OFF".  
2. Loosen and retighten engine ground screws.  
3. Remove joint connector-1.  
4. Check the following.  
● Continuity between joint connector-1 terminal ① and ground  
● Joint connector-1 (Refer to "HARNES LAYOUT" in EL section.)  
**Continuity should exist.**  
If OK, check harness for short. Then reconnect joint connector-1.

NG → Repair harness or connectors.

OK

**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 → Check the following.  
● Joint connector-1  
● Harness for open or short between throttle position sensor and ECM  
If NG, repair harness or connectors.

OK

**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.

NG → Repair harness or connectors.

OK

**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.

NG → Repair harness or connectors.

OK

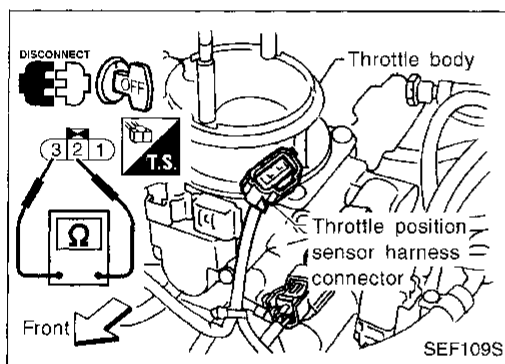
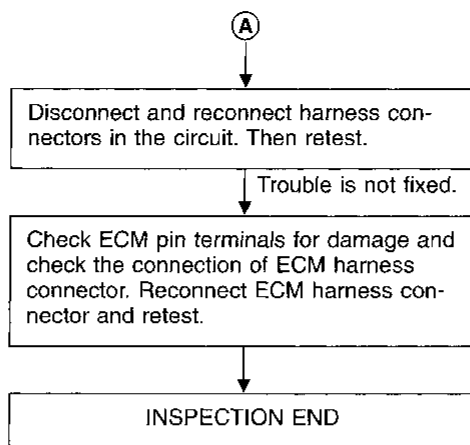
**CHECK COMPONENT** (Throttle position sensor).  
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace throttle position sensor. To adjust it, perform BASIC INSPECTION, EC-72.

OK  
A  
(Go to next page.)

# TROUBLE DIAGNOSIS FOR DTC P0120

## Throttle Position Sensor (Cont'd)



### COMPONENT INSPECTION

#### Throttle position sensor

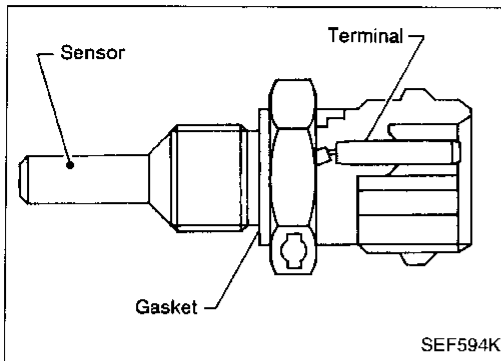
1. Start engine and warm it up sufficiently.
2. Turn ignition switch "OFF".
3. Disconnect throttle position sensor harness connector.
4. Check resistance between terminals ② and ③ while opening throttle valve manually.

Throttle valve conditions	Resistance at 25°C (77°F)
Completely closed	Approximately 0.5 kΩ
Partially open	0.5 - 4.0 kΩ
Completely open	Approximately 4.0 kΩ

If NG, replace throttle position sensor.  
 To adjust throttle position sensor, perform "BASIC INSPECTION", EC-72.

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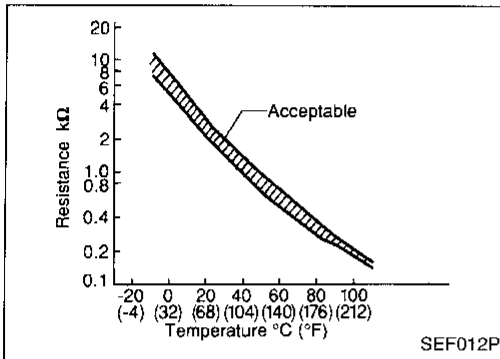
## TROUBLE DIAGNOSIS FOR DTC P0125



### 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

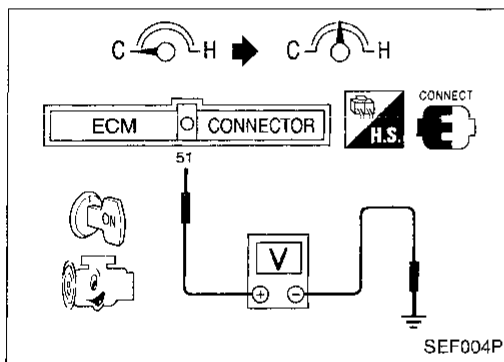
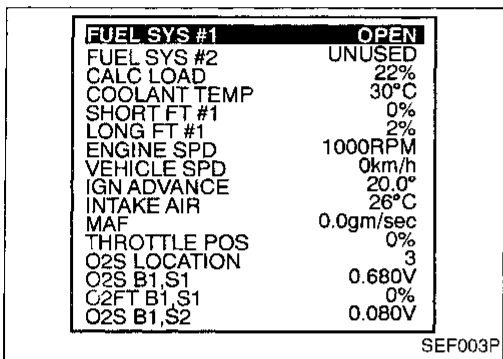
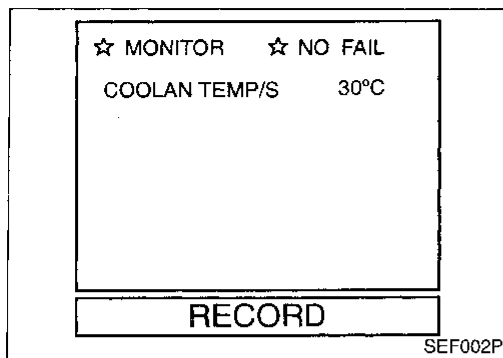
\*: These data are reference values and measured between ECM terminal (51) (Engine coolant temperature sensor) and ECM terminal (43) (ECCS ground).

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0125 0908	<ul style="list-style-type: none"> <li>● Rationally incorrect voltage from the sensor is sent to ECM, even when some time has passed after starting the engine.</li> <li>● Engine coolant temperature is insufficient for closed loop fuel control.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (High resistance in the circuit)</li> <li>● Engine coolant temperature sensor</li> <li>● Thermostat</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P0125

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



### OVERALL FUNCTION CHECK

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

**Note:** If both DTC P0115 (0103) and P0125 (0908) are displayed, first perform TROUBLE DIAGNOSIS FOR DTC P0115. (See EC-113.)

- 1) Turn ignition switch "ON".
- 2) Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
- 3) Start engine and run it at idle speed.
- 4) Check that the engine coolant temperature rises to 20°C (68°F) or more within 13 minutes. (Be careful not to overheat engine.)

- OR
- 1) Turn ignition switch "ON".
  - 2) Select "MODE 1" with GST.
  - 3) Start engine and run it at idle speed.
  - 4) Check that the engine coolant temperature rises to 20°C (68°F) or more within 13 minutes. (Be careful not to overheat engine.)

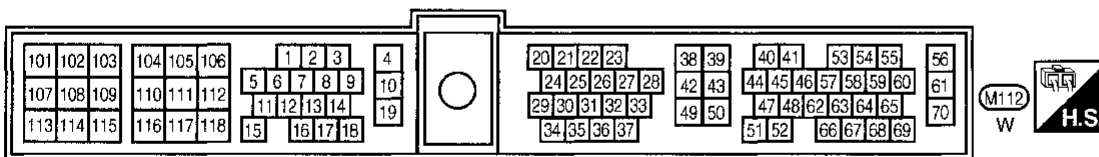
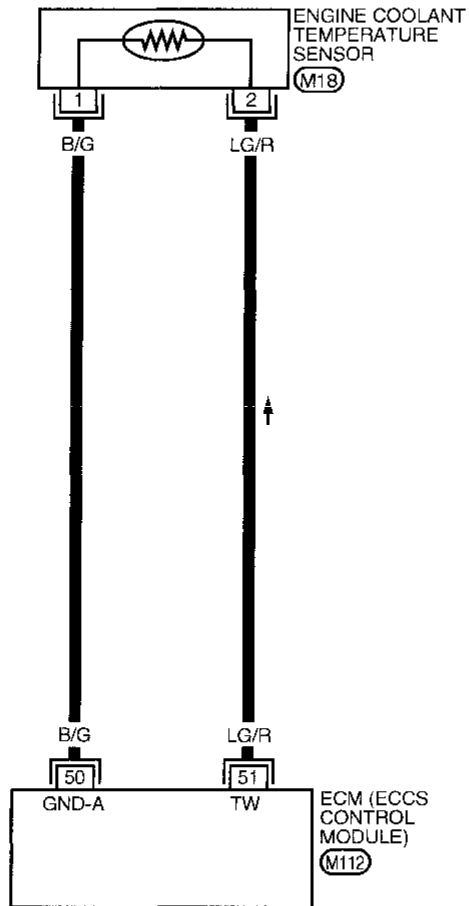
- OR
- 1) Turn ignition switch "ON".
  - 2) Probe voltage meter between ECM terminal 51 and ground.
  - 3) Start engine and run it at idle speed.
  - 4) Check that voltage of engine coolant temperature changes to less than 3.5 (V) within 13 minutes. (Be careful not to overheat engine.)

# TROUBLE DIAGNOSIS FOR DTC P0125

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

EC-ECTS-01

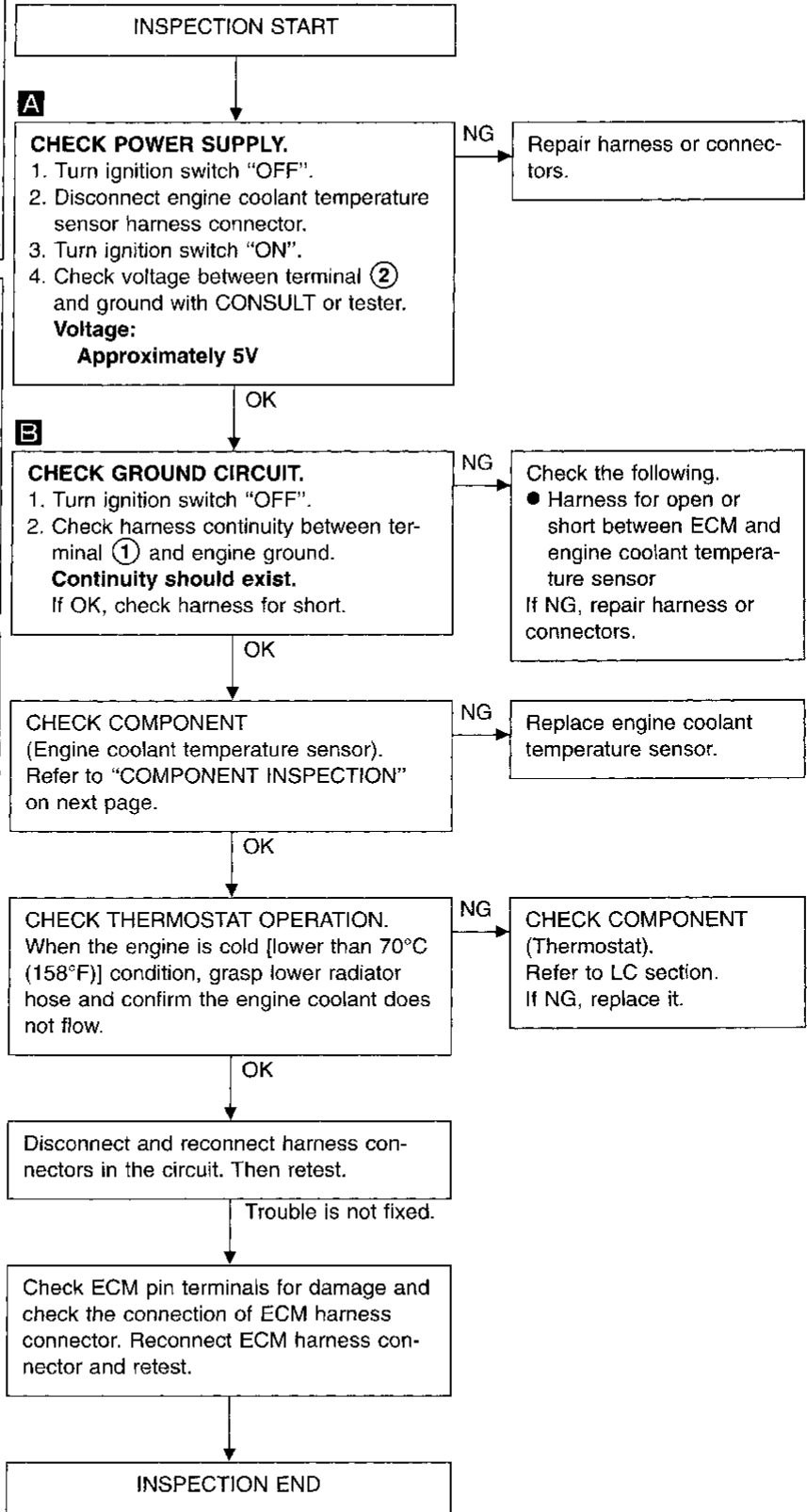
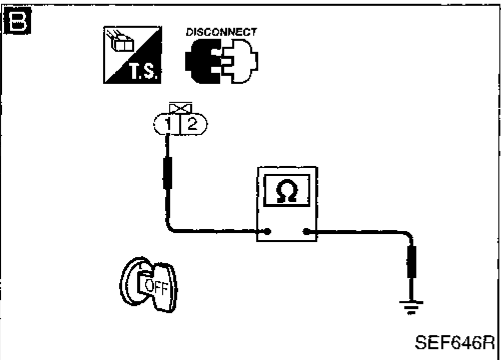
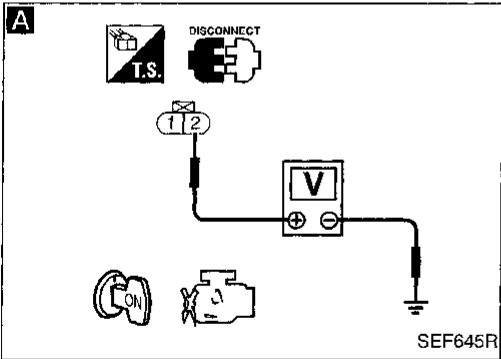
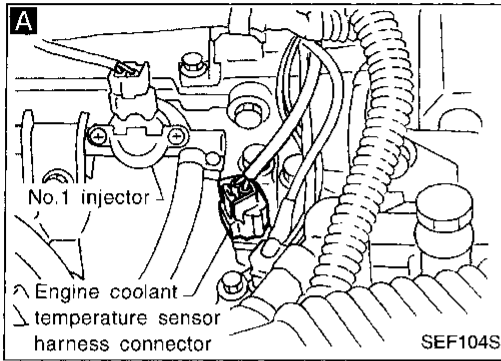
: Detectable line for DTC  
 : Non-detectable line for DTC



# TROUBLE DIAGNOSIS FOR DTC P0125

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

### DIAGNOSTIC PROCEDURE



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



## TROUBLE DIAGNOSIS FOR DTC P0125

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

#### COMPONENT INSPECTION

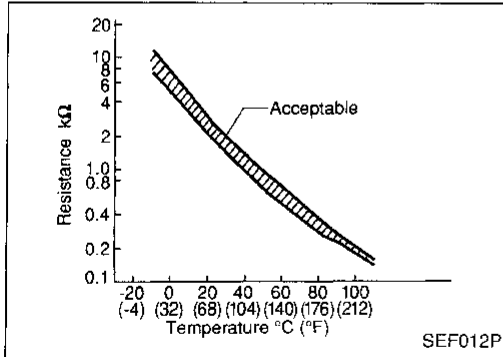
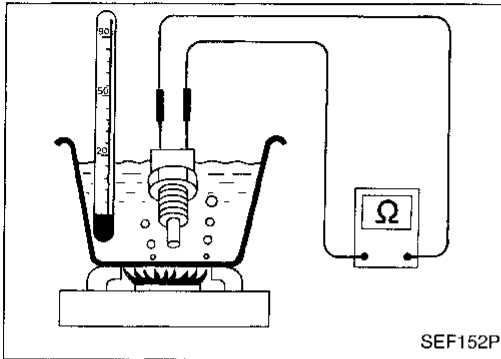
#### Engine coolant temperature sensor

Check resistance as shown in the figure.

⟨Reference data⟩

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

If NG, replace engine coolant temperature sensor.



GI

MA

EM

LC

EC

FE

CL

MT

AT

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FA

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BR

ST

RS

BT

HA

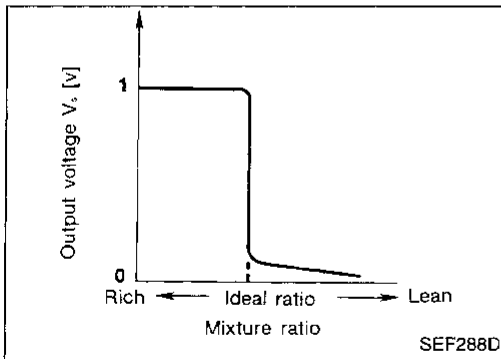
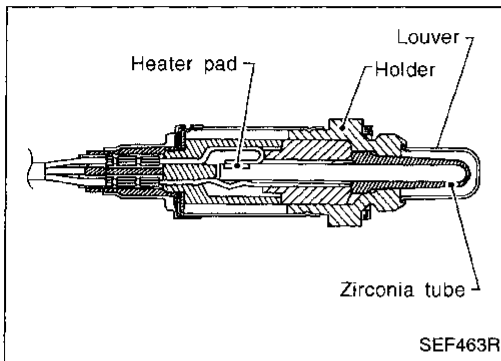
EL

IDX

## Front Heated Oxygen Sensor (Front HO2S)

### COMPONENT DESCRIPTION

The front HO2S is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The 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 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.



### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④9 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
46	W	Front heated oxygen sensor	Engine is running. After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V (periodically change)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

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

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0303	<ul style="list-style-type: none"> <li>● An excessively high voltage from the sensor is sent to ECM.</li> <li>● The voltage from the sensor is constantly approx. 0.3V.</li> <li>● The maximum and minimum voltages from the sensor do not reach the specified voltages.</li> <li>● The sensor does not respond between rich and lean within the specified time.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (The sensor circuit is open or shorted.)</li> <li>● Front heated oxygen sensor</li> <li>● Fuel pressure</li> <li>● Injectors</li> <li>● Intake air leaks</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P0130

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

### OVERALL FUNCTION CHECK

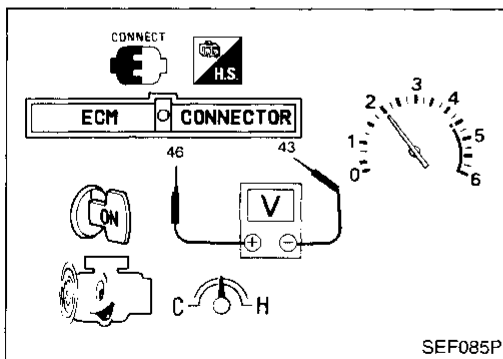
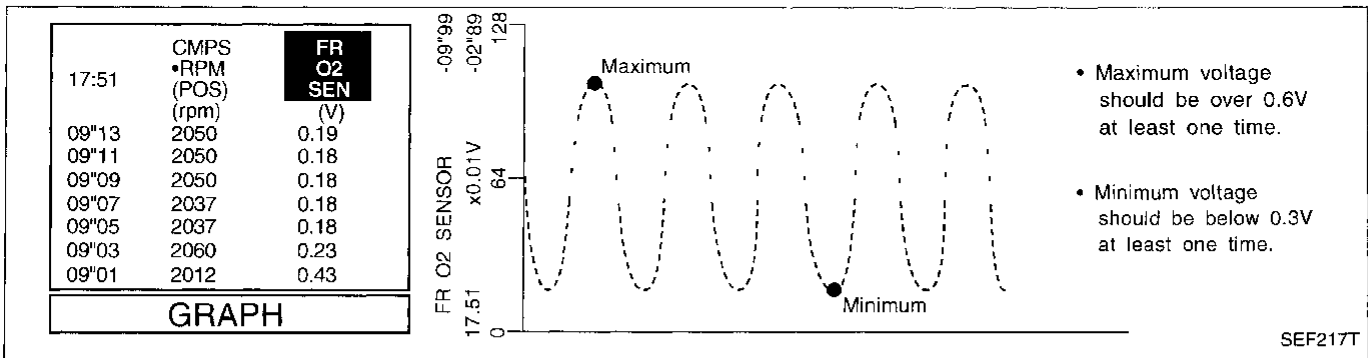
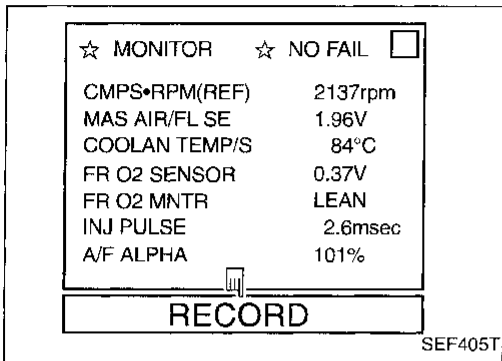
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Start engine and warm it up sufficiently.
  - 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

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 0.3V at least once.



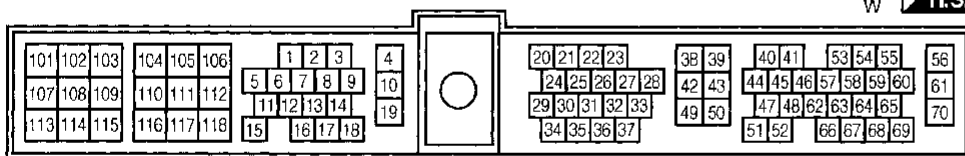
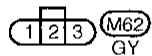
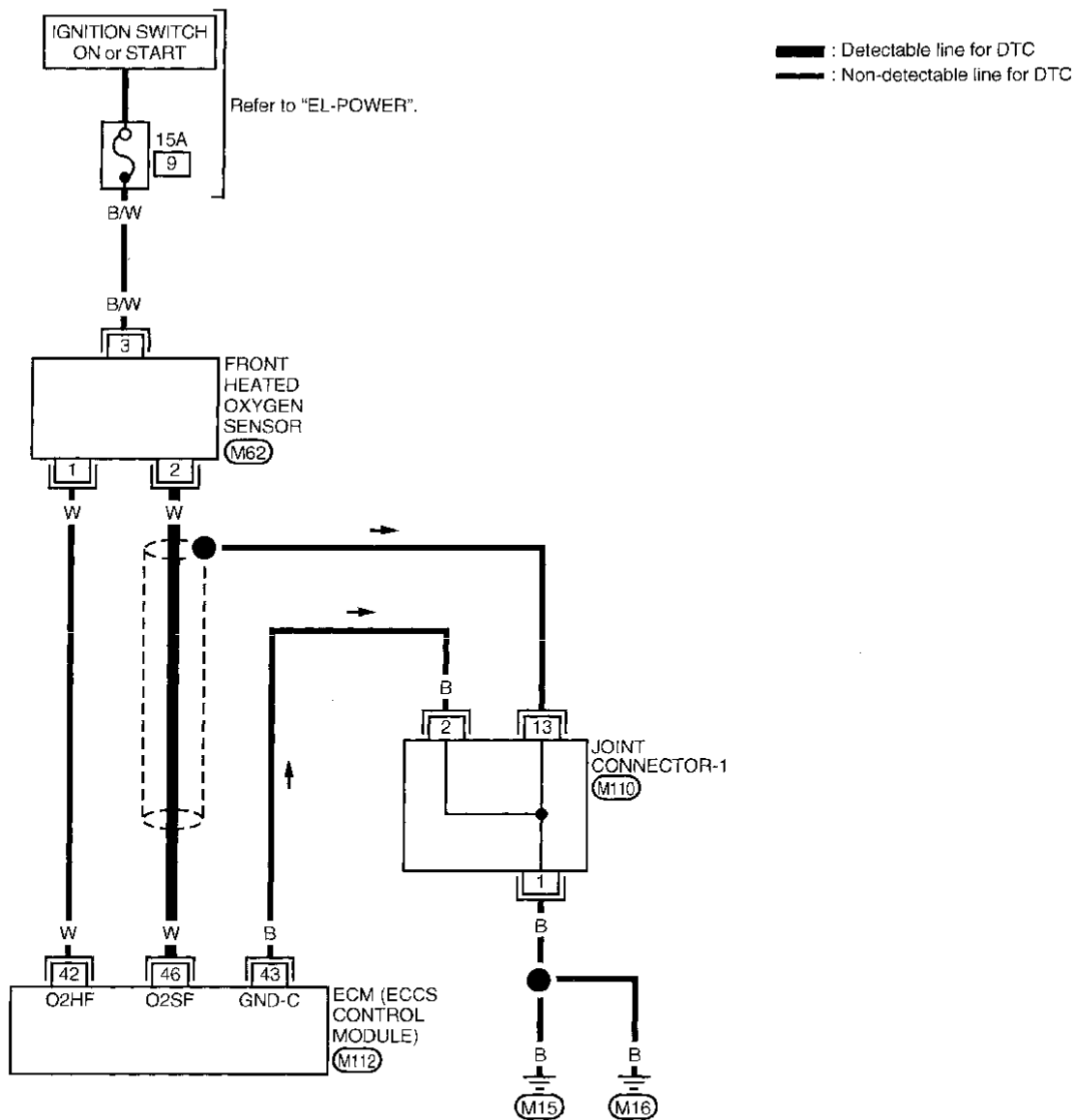
OR

- 1) Start engine and warm it up sufficiently.
- 2) Set voltmeter probes between ECM terminal ④⑥ (sensor signal) and ④③ (engine 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 0.3V at least one time.

# TROUBLE DIAGNOSIS FOR DTC P0130

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

EC-FRO2-01



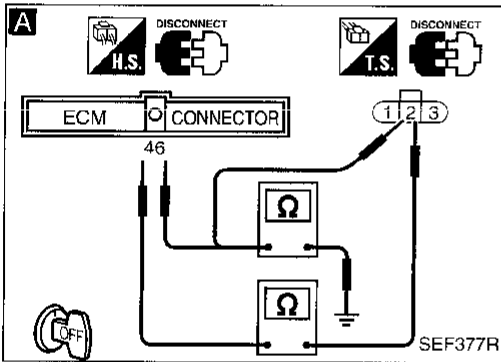
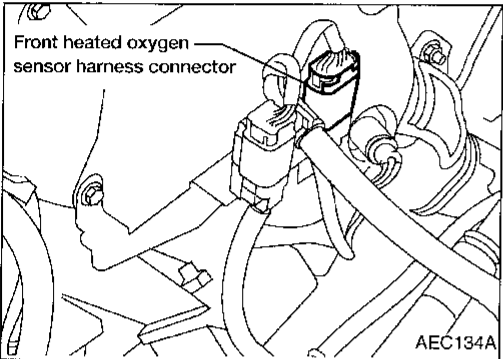
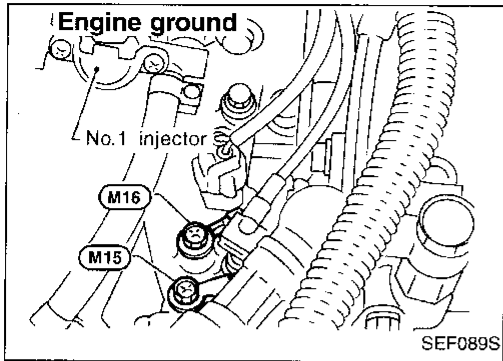
Refer to last page (Foldout page).

(M110)

# TROUBLE DIAGNOSIS FOR DTC P0130

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

### DIAGNOSTIC PROCEDURE



INSPECTION START

#### CHECK SHIELD CIRCUIT.

1. Turn ignition switch "OFF".
  2. Loosen and retighten engine ground screws.
  3. Remove joint connector-1.
  4. 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. Then reconnect joint connector-1.

NG

Repair harness or connectors.

OK

A

#### CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect front heated oxygen sensor harness connector and ECM harness connector.
2. Check harness continuity between ECM terminal ④⑥ and terminal ②.  
**Continuity should exist.**
3. Check harness continuity between ECM terminal ④⑥ (or terminal ②) and ground.  
**Continuity should not exist.**  
If OK, check harness for short.

NG

Repair harness or connectors.

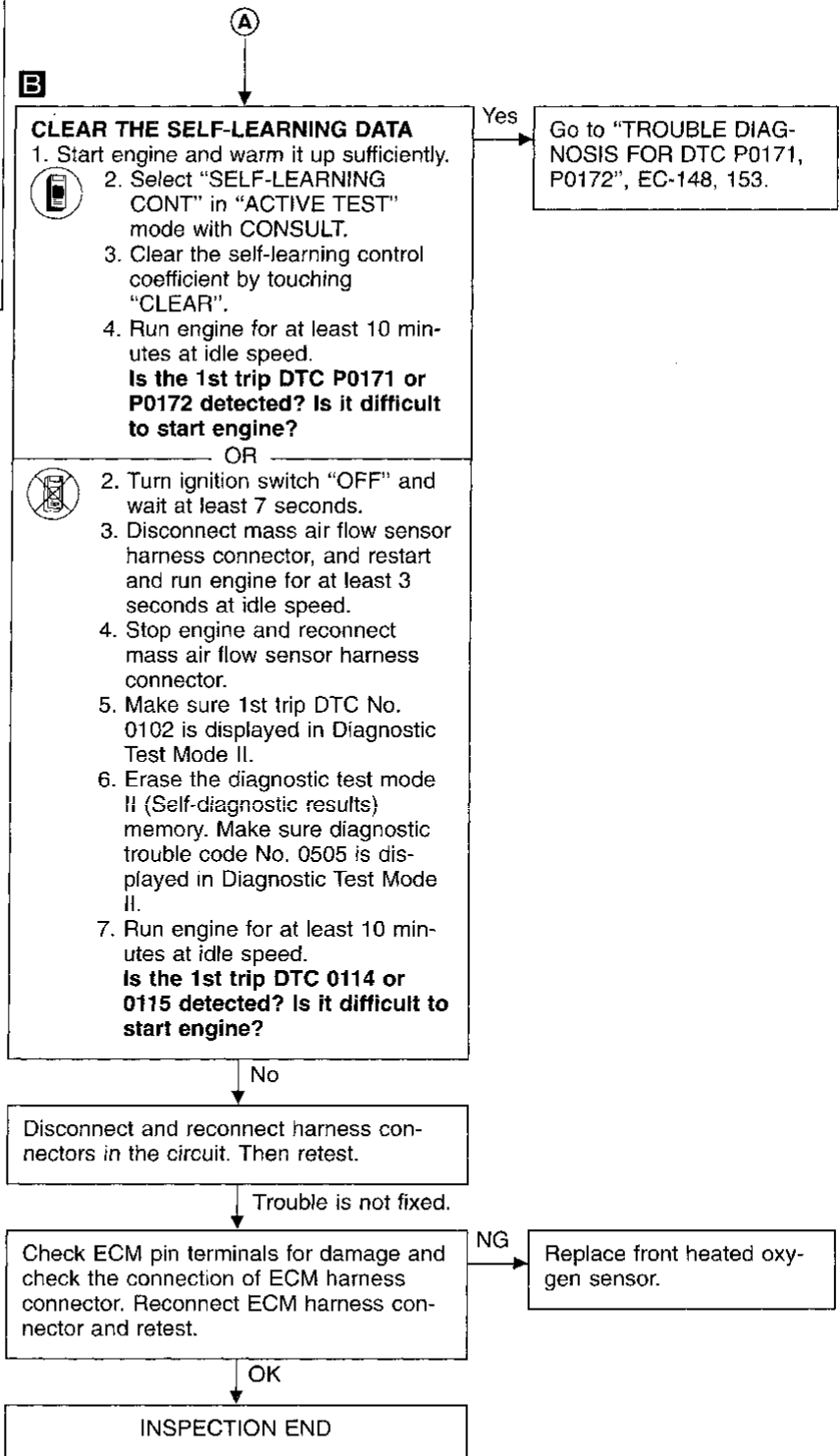
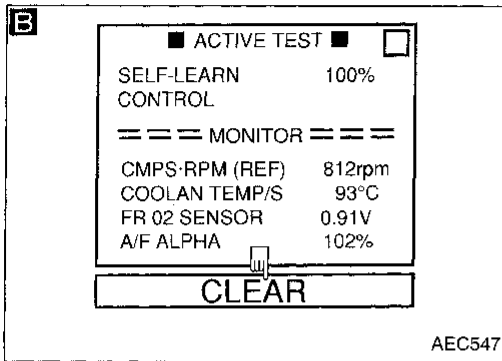
OK

A

(Go to next page.)

# TROUBLE DIAGNOSIS FOR DTC P0130

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



GI

MA

EM

LC

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FE

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MT

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TF

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EL

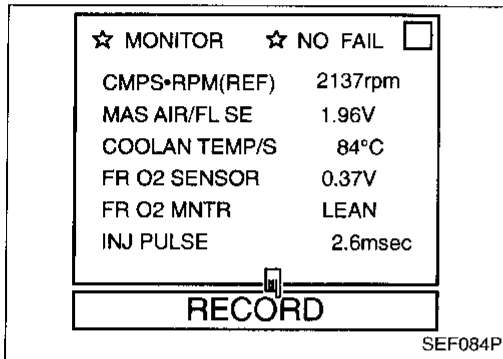
IDX

# TROUBLE DIAGNOSIS FOR DTC P0130

## Closed Loop Control

- The closed loop control has one trip detection logic.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0307	<ul style="list-style-type: none"> <li>• The closed loop control function does not operate even when vehicle is driving in the specified condition.</li> </ul>	<ul style="list-style-type: none"> <li>• The front heated oxygen sensor circuit is open or shorted.</li> <li>• Front heated oxygen sensor</li> <li>• Front heated oxygen sensor heater</li> </ul>



## 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 sufficiently.
  - 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

R = "FR O2 MNTR", "RICH"  
L = "FR O2 MNTR", "LEAN"

- 1) Start engine and warm it up sufficiently.
- 2) Check that malfunction indicator lamp goes on more than 5 times in 10 seconds while keeping at 2,000 rpm in Diagnostic Test Mode II (FRONT HEATED OXYGEN SENSOR MONITOR).

## DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0130, EC-129.

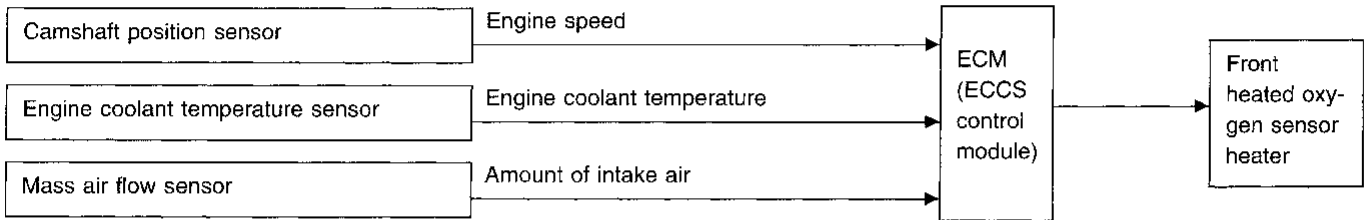
Refer to TROUBLE DIAGNOSIS FOR DTC P0135, EC-135.

# TROUBLE DIAGNOSIS FOR DTC P0135

## Front Heated Oxygen Sensor Heater

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

### SYSTEM DESCRIPTION



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

Engine speed (rpm)	Engine condition	Front heated oxygen sensor heater
Above 3,000	—	OFF
Below 3,000	Heavy load after warm-up	OFF
	Except above	ON

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
42	W	Front heated oxygen sensor heater	Engine is running. └ Engine speed is below 3,000 rpm.	Approximately 0V
			Engine is running. └ Engine speed is above 3,000 rpm.	BATTERY VOLTAGE (11 - 14V)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 HEATER	● Engine speed: Idle	ON
	● Engine speed: Above 3,000 rpm	OFF

### ON BOARD DIAGNOSIS LOGIC

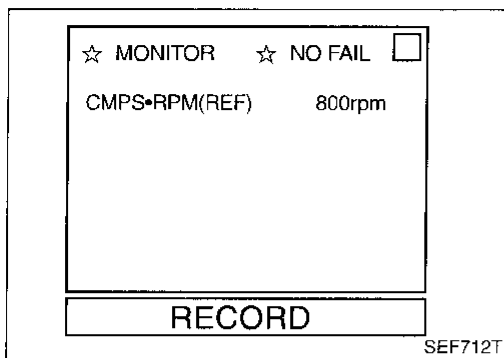
Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P0135 0901	● The current amperage in the front heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the front heated oxygen sensor heater.)	● Harness or connectors (The front heated oxygen sensor heater circuit is open or shorted.) ● Front heated oxygen sensor heater



## TROUBLE DIAGNOSIS FOR DTC P0135

### Front Heated Oxygen Sensor Heater (Cont'd)

#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 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.

OR



- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine and run it for at least 6 seconds at idle speed.
- 4) Select "MODE 3" with GST.

OR



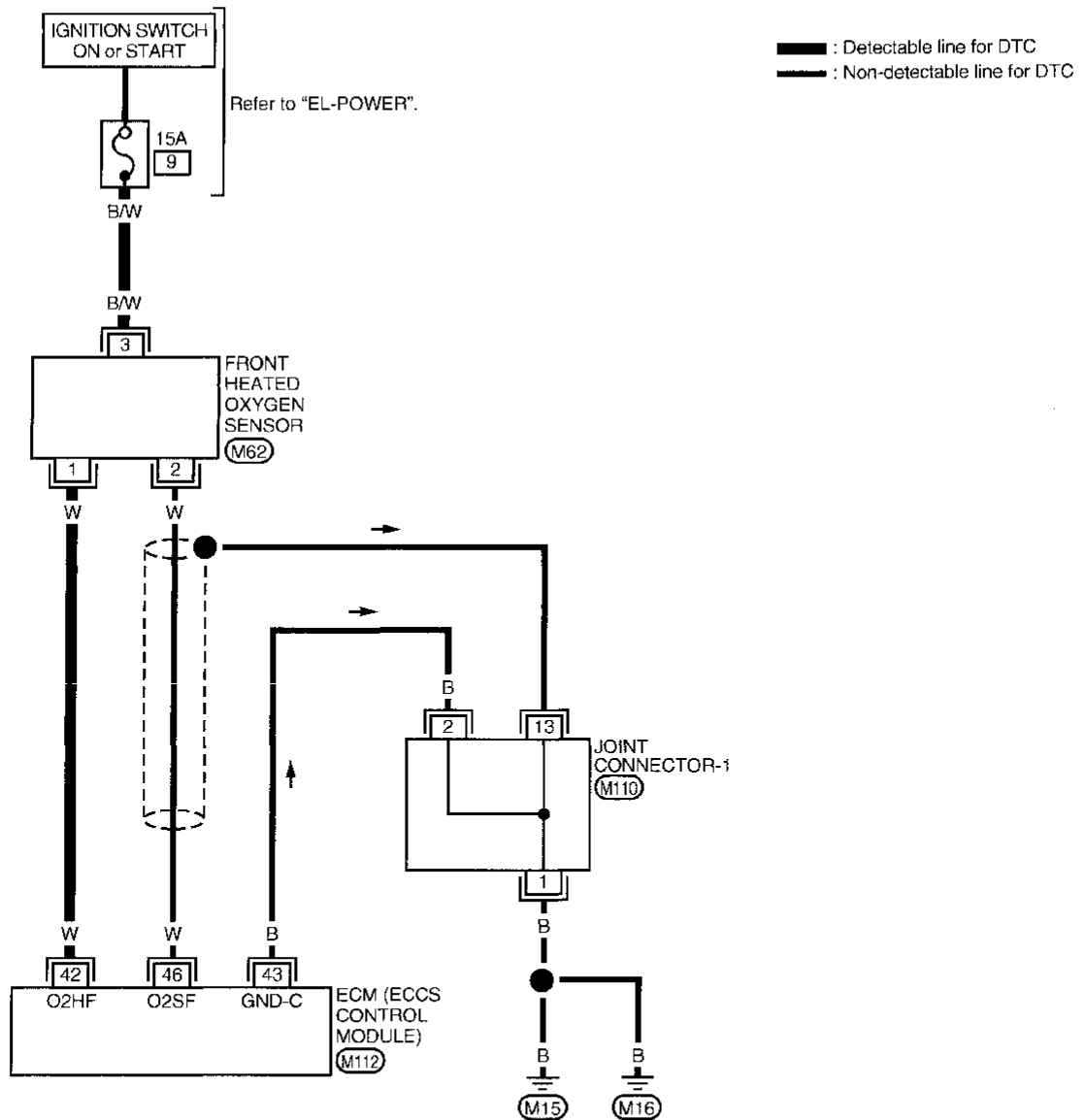
- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

- 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.

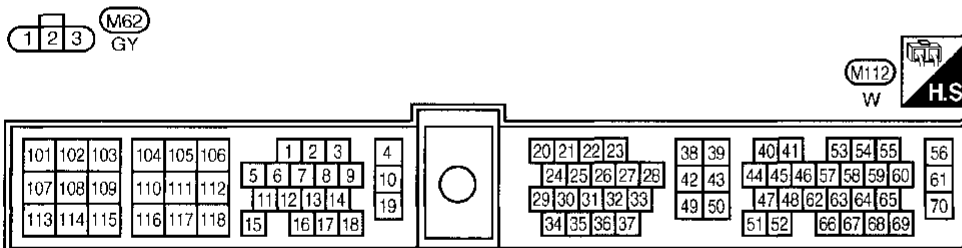
# TROUBLE DIAGNOSIS FOR DTC P0135

## Front Heated Oxygen Sensor Heater (Cont'd)

EC-FRO2/H-01



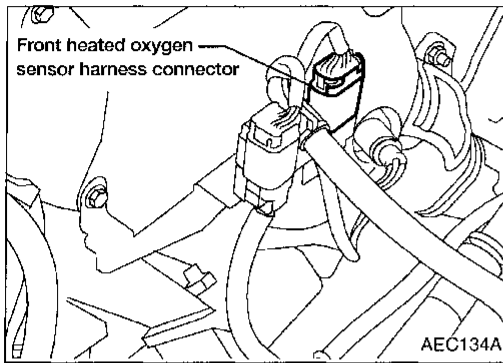
Refer to last page (Foldout page).



# TROUBLE DIAGNOSIS FOR DTC P0135

## Front Heated Oxygen Sensor Heater (Cont'd)

### DIAGNOSTIC PROCEDURE



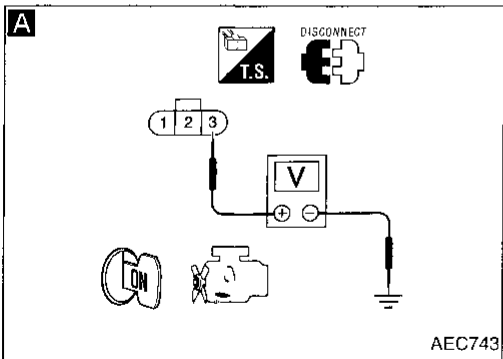
INSPECTION START

**A**  
**CHECK POWER SUPPLY.**  
 1. Disconnect front heated oxygen sensor harness connector.  
 2. Turn ignition switch "ON".  
 3. Check voltage between terminal ③ and ground.  
**Voltage: Battery voltage**

NG → Check the following.  
 ● 15A fuse  
 ● Harness for open or short between front heated oxygen sensor and 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 ① and ECM terminal ④2.  
**Continuity should exist.**  
 If OK, check harness for short.

NG → Repair harness or connectors.



OK  
**CHECK COMPONENT**  
 (Front heated oxygen sensor heater).  
 Refer to "COMPONENT INSPECTION" below.

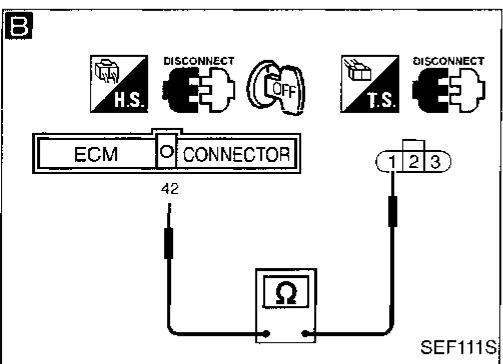
NG → Replace front heated oxygen sensor.

OK  
 Disconnect and reconnect harness connectors in the circuit, and retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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)**

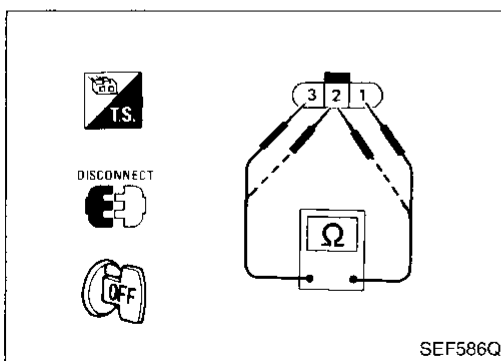
Check continuity between terminals ② and ①, ③ and ②.

**Continuity should not exist.**

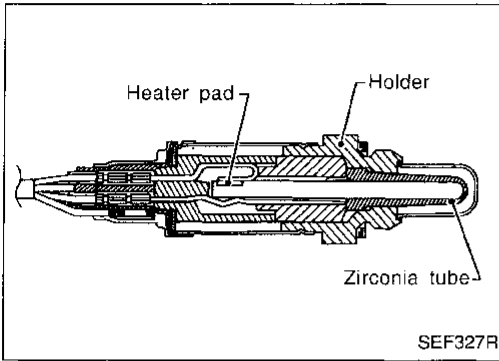
If NG, replace the front heated oxygen sensor.

#### 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.



# TROUBLE DIAGNOSIS FOR DTC P0136



## Rear Heated Oxygen Sensor (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.

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
52	W	Rear heated oxygen sensor	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 SENSOR	● Engine: After warming up Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ Approx. 0.6 - 1.0V
RR O2 MNTR		LEAN ↔ RICH

### 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 of the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors the sensor's voltage value and the switching response during the various driving condition such as fuel-cut.

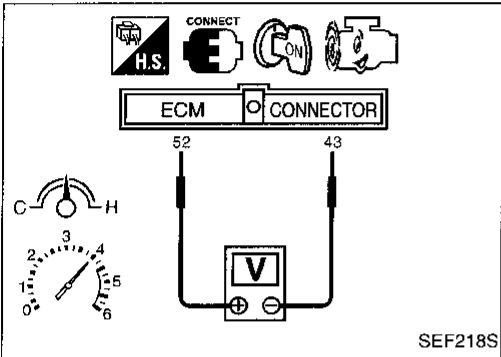
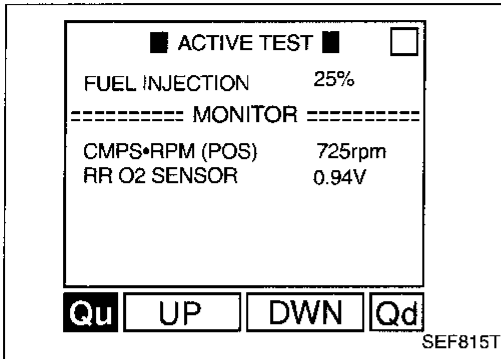
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0136 0707	<ul style="list-style-type: none"> <li>● An excessively high voltage from the sensor is sent to ECM.</li> <li>● The maximum and minimum voltages from the sensor are not reached to the specified voltages.</li> <li>● It takes more time for the sensor to respond between rich and lean than the specified time.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (The sensor circuit is open or shorted.)</li> <li>● Rear heated oxygen sensor</li> <li>● Fuel pressure</li> <li>● Injectors</li> <li>● Intake air leaks</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P0136

## Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

### 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 warm it up sufficiently.
- 2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR" as the monitor item with CONSULT.
- 3) Check "RR O2 SENSOR" at idle speed when adjusting "FUEL INJECTION" to  $\pm 25\%$ .  
**"RR O2 SENSOR" should be above 0.48V at least once when the "FUEL INJECTION" is +25%.**  
**"RR O2 SENSOR" should be below 0.43V at least once when the "FUEL INJECTION" is -25%.**

OR

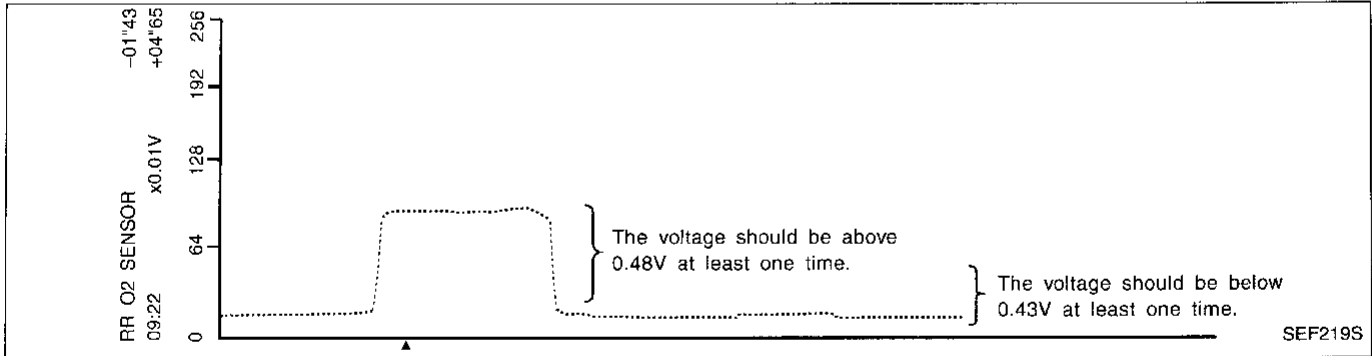
- 1) Start engine and warm it up sufficiently.
- 2) Set voltmeter probes between ECM terminals ⑤② (sensor signal) and ④③ (engine ground).
- 3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.  
(depress and release accelerator pedal as soon as possible)

**The voltage should be above 0.48V and below 0.43V at least once during this procedure.**

**If the voltage can be confirmed in step 3, step 4 is not necessary.**

- 4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.

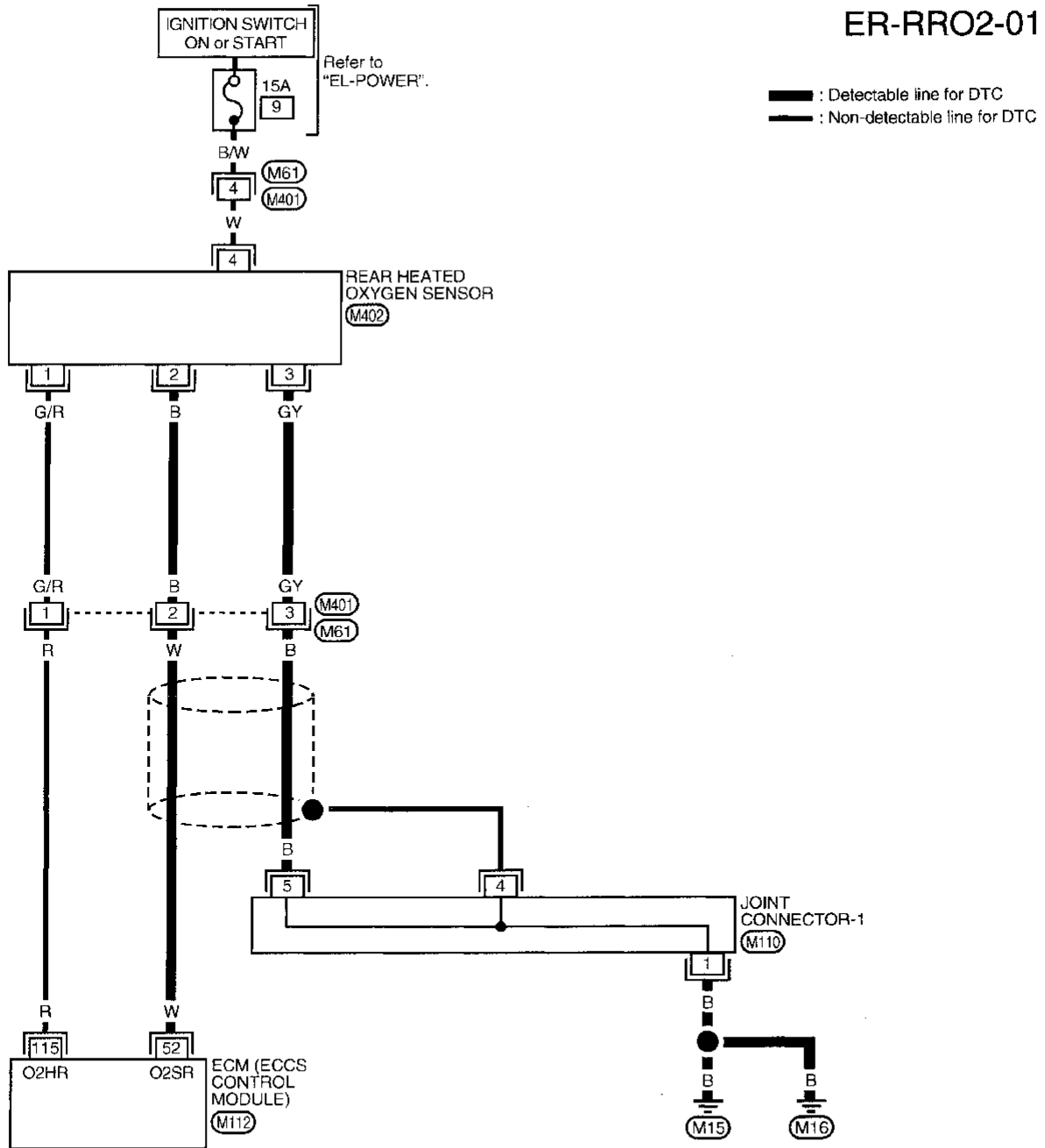
**The voltage should be above 0.48V and below 0.43V at least once during this procedure.**



# TROUBLE DIAGNOSIS FOR DTC P0136

## Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

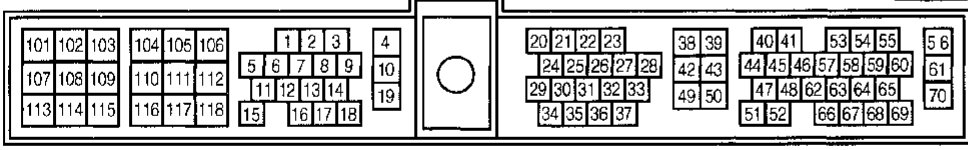
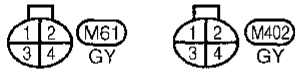
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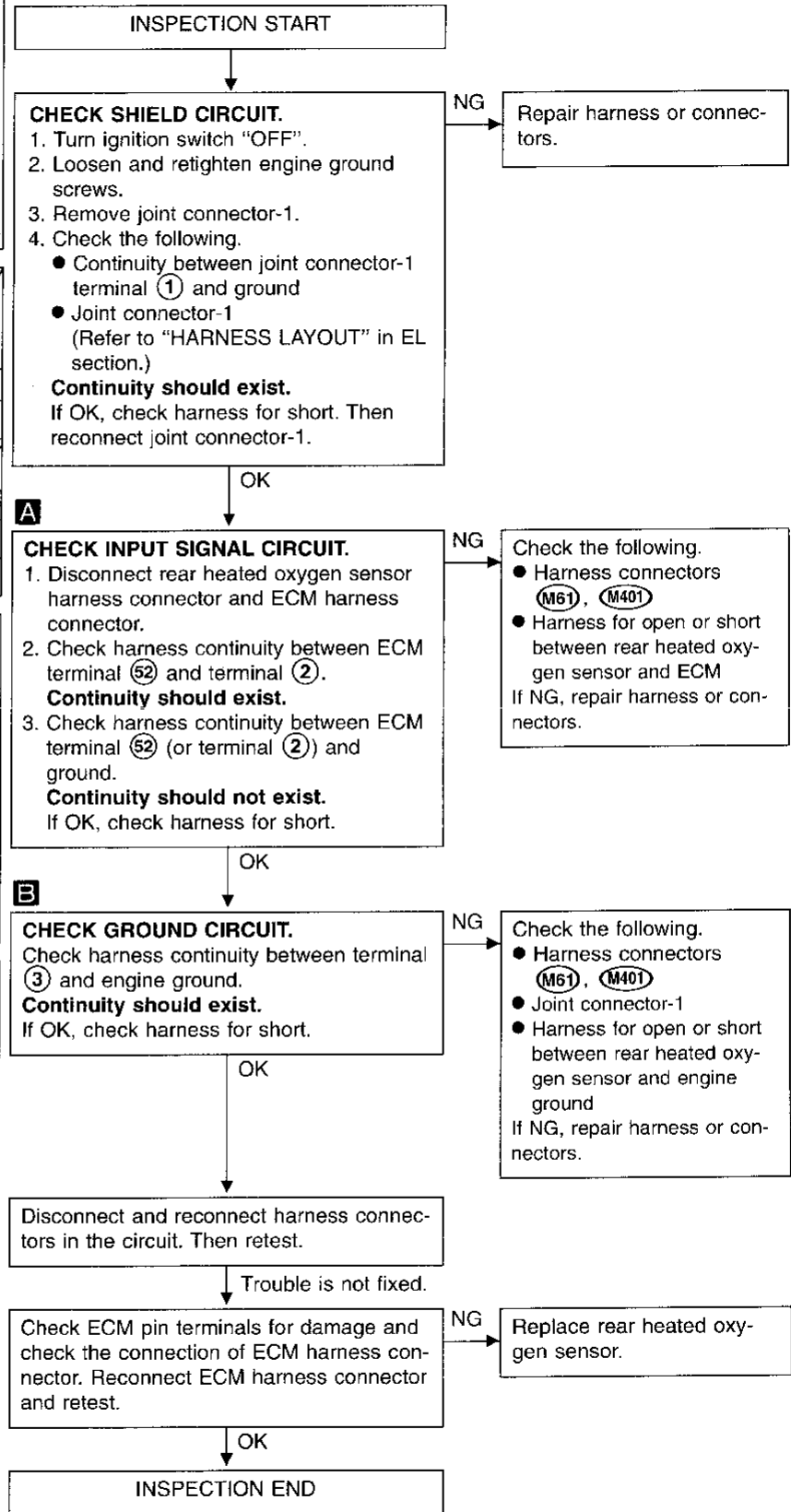
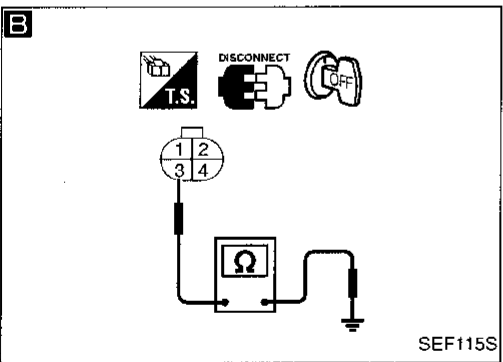
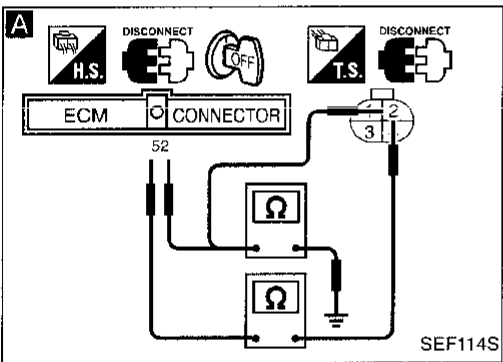
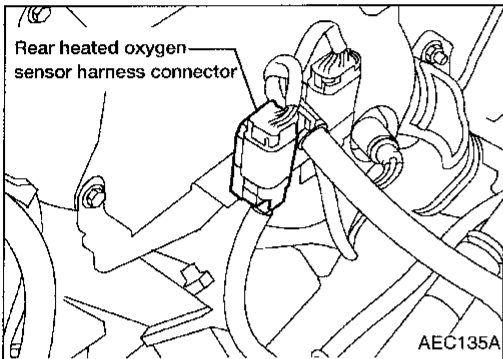
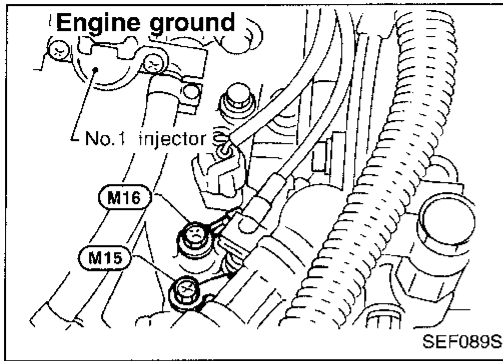
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# TROUBLE DIAGNOSIS FOR DTC P0136

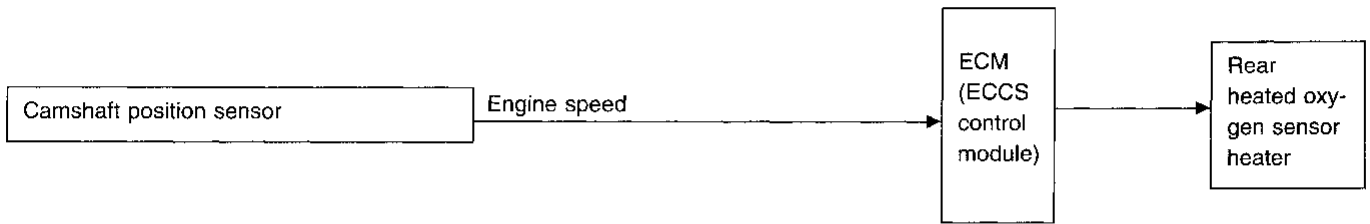
## Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

### DIAGNOSTIC PROCEDURE



**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
Above 6,000	OFF
Below 6,000	ON

**ECM TERMINALS AND REFERENCE VALUE**

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
115	R	Rear heated oxygen sensor heater	Engine is running. └ Engine speed is below 6,000 rpm.	Approximately 0V
			Ignition switch "ON" └ Engine is stopped.	BATTERY VOLTAGE (11 - 14V)

**CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 HEATER	● Engine speed: Below 6,000 rpm	ON
	● Ignition switch: ON (Engine stopped)	OFF

**ON BOARD DIAGNOSIS LOGIC**

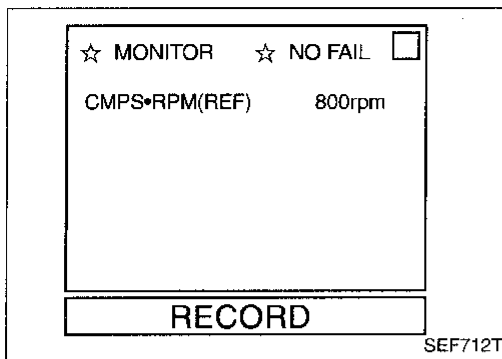
Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P0141 0902	<ul style="list-style-type: none"> <li>The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.)</li> </ul>	<ul style="list-style-type: none"> <li>Harness or connectors (The rear heated oxygen sensor heater circuit is open or shorted.)</li> <li>Rear heated oxygen sensor heater</li> </ul>



## TROUBLE DIAGNOSIS FOR DTC P0141

### Rear Heated Oxygen Sensor Heater (Cont'd)

#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 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.

OR



- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine and run it for at least 6 seconds at idle speed.
- 4) Select "MODE 3" with GST.

OR



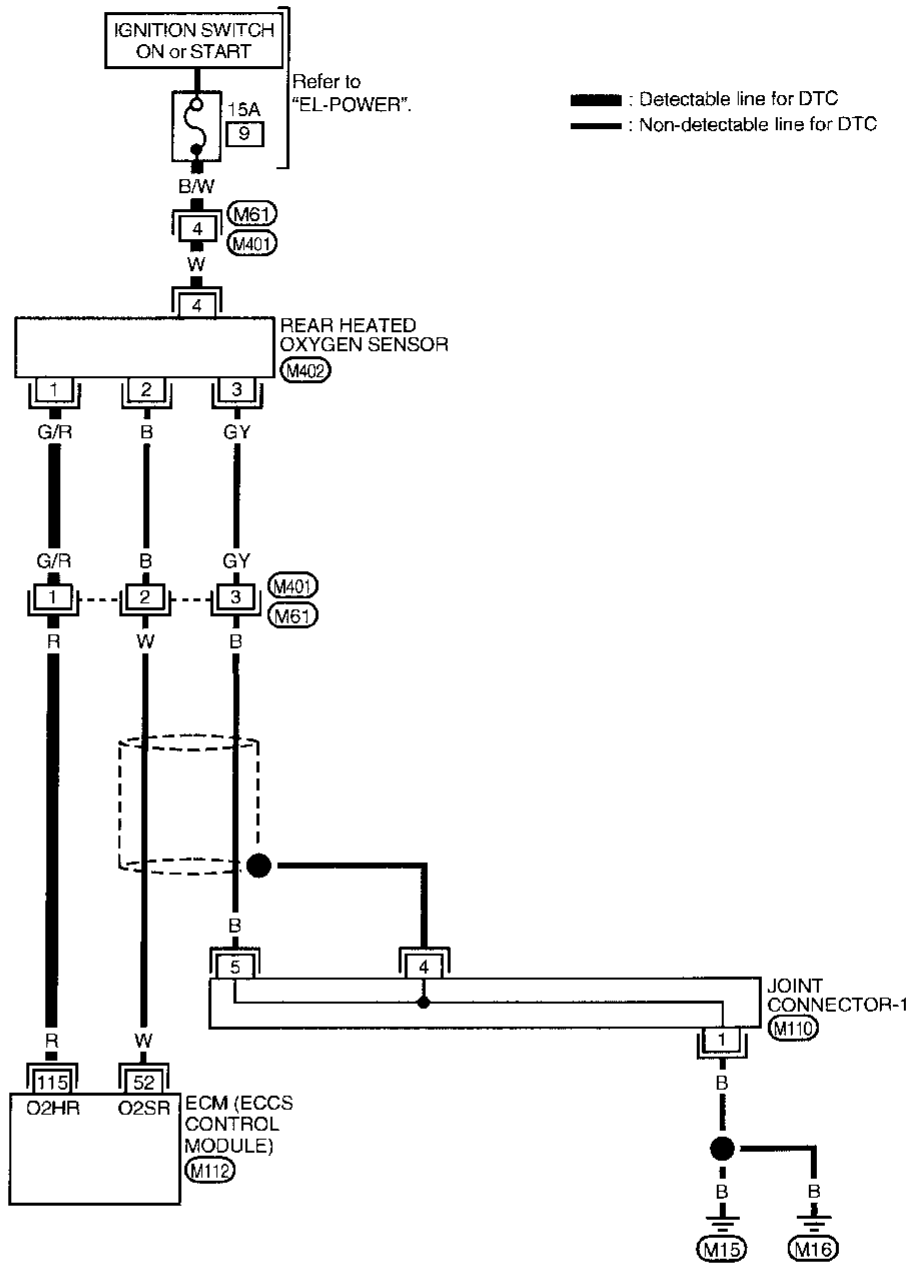
- 1) Start engine and run it for at least 6 seconds at idle speed.
- 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

- 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.

# TROUBLE DIAGNOSIS FOR DTC P0141

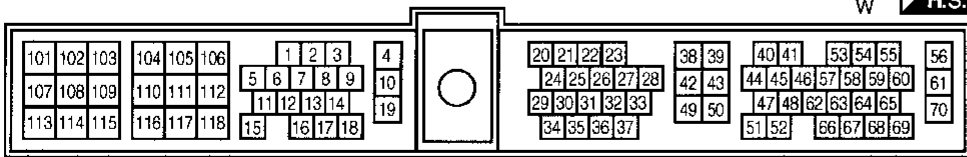
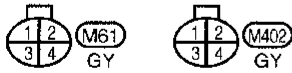
## Rear Heated Oxygen Sensor Heater (Cont'd)

EC-RRO2/H-01



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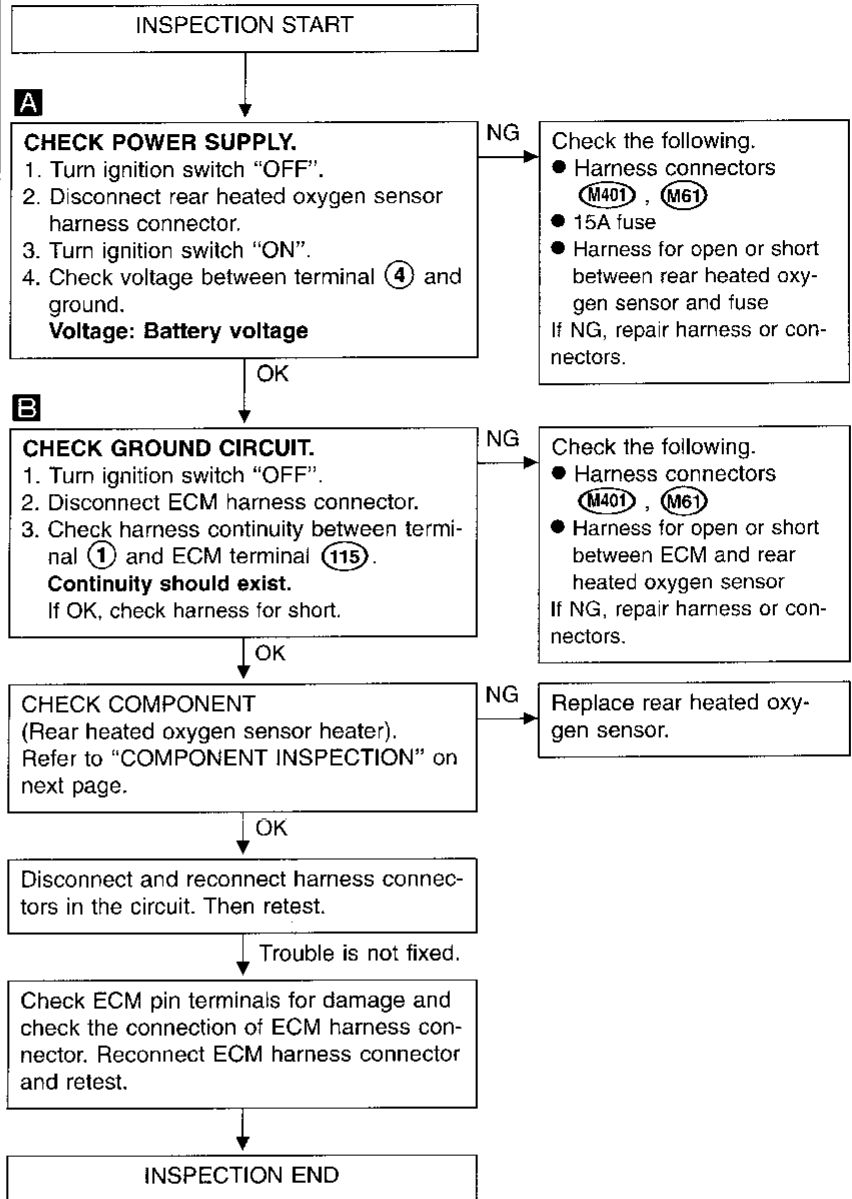
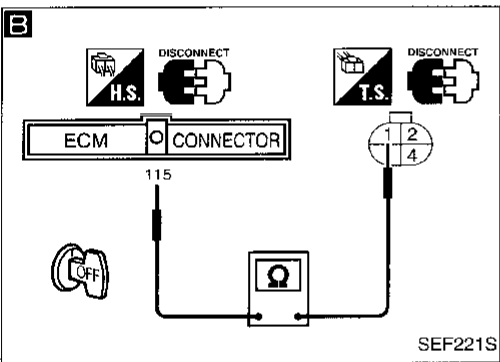
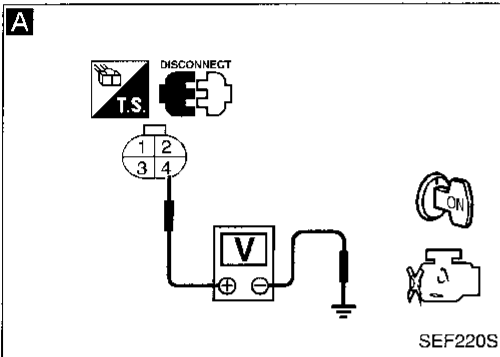
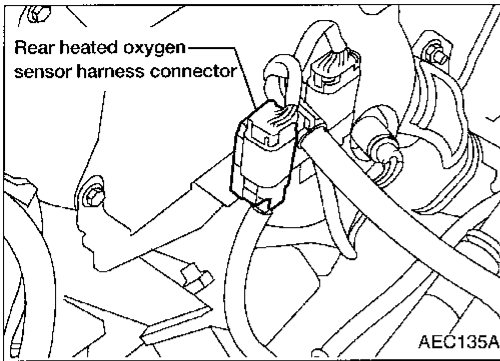
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# TROUBLE DIAGNOSIS FOR DTC P0141

## Rear Heated Oxygen Sensor Heater (Cont'd) DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P0141

## Rear Heated Oxygen Sensor Heater (Cont'd) COMPONENT INSPECTION

### Rear heated oxygen sensor heater

Check the following.

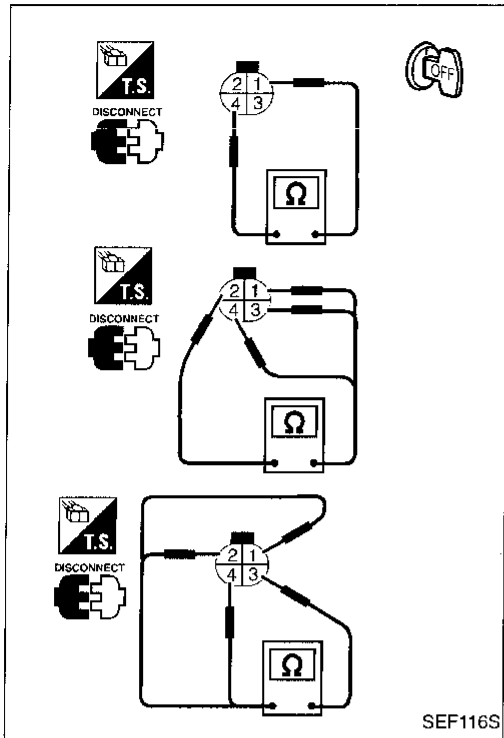
1. Check resistance between terminals ④ and ①.  
**Resistance: 11.4 - 17.4Ω at 25°C (77°F)**
2. Check continuity.

Terminal No.	Continuity
② and ①, ③, ④	No
③ and ①, ②, ④	

If NG, replace the rear heated oxygen sensor.

#### CAUTION:

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



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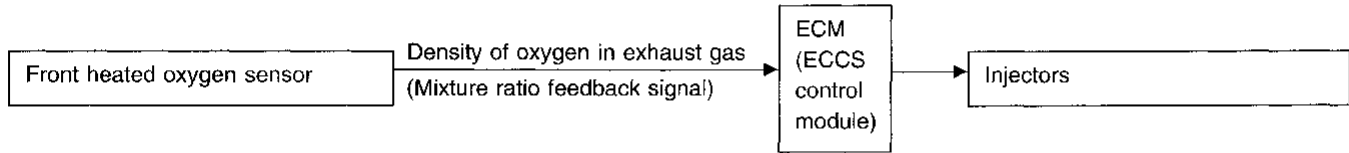
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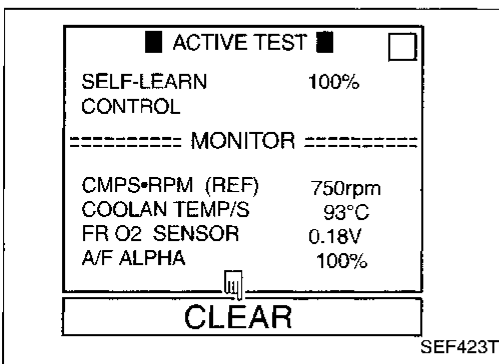
## Fuel Injection System Function (Lean side)

### ON BOARD DIAGNOSIS LOGIC

With Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as a fuel 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	<ul style="list-style-type: none"> <li>● Fuel injection system does not operate properly.</li> <li>● The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)</li> </ul>	<ul style="list-style-type: none"> <li>● Intake air leak</li> <li>● Front heated oxygen sensor</li> <li>● Injectors</li> <li>● Exhaust gas leak</li> <li>● Incorrect fuel pressure</li> <li>● Lack of fuel</li> <li>● Mass air flow sensor</li> </ul>



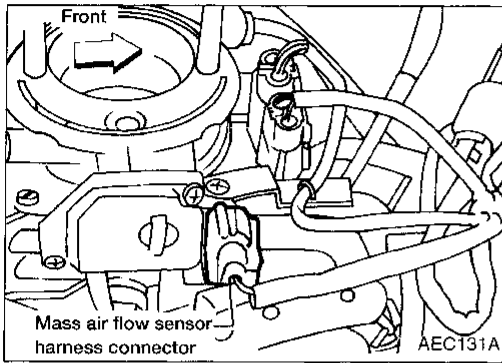
### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 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 run it for at least 10 minutes at idle speed.  
The 1st trip DTC should be detected at this stage, if a malfunction exists.
- 7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.  
Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-151. If engine does not start, check exhaust and intake air leak visually.

OR

# TROUBLE DIAGNOSIS FOR DTC P0171

## Fuel Injection System Function (Lean side) (Cont'd)



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 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 8, the fuel injection system has a malfunction.

Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-151. If engine does not start, check exhaust and intake air leak visually.

OR



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Disconnect mass air flow sensor harness connector.
- 4) Start engine and run it for at least 3 seconds at idle speed.
- 5) Stop engine and reconnect mass air flow sensor harness connector.
- 6) Turn ignition switch "ON".
- 7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
- 8) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 9) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
- 10) 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.

- 11) If it is difficult to start engine at step 10, the fuel injection system also has a malfunction. Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-151. If engine does not start, check exhaust and intake air leak visually.

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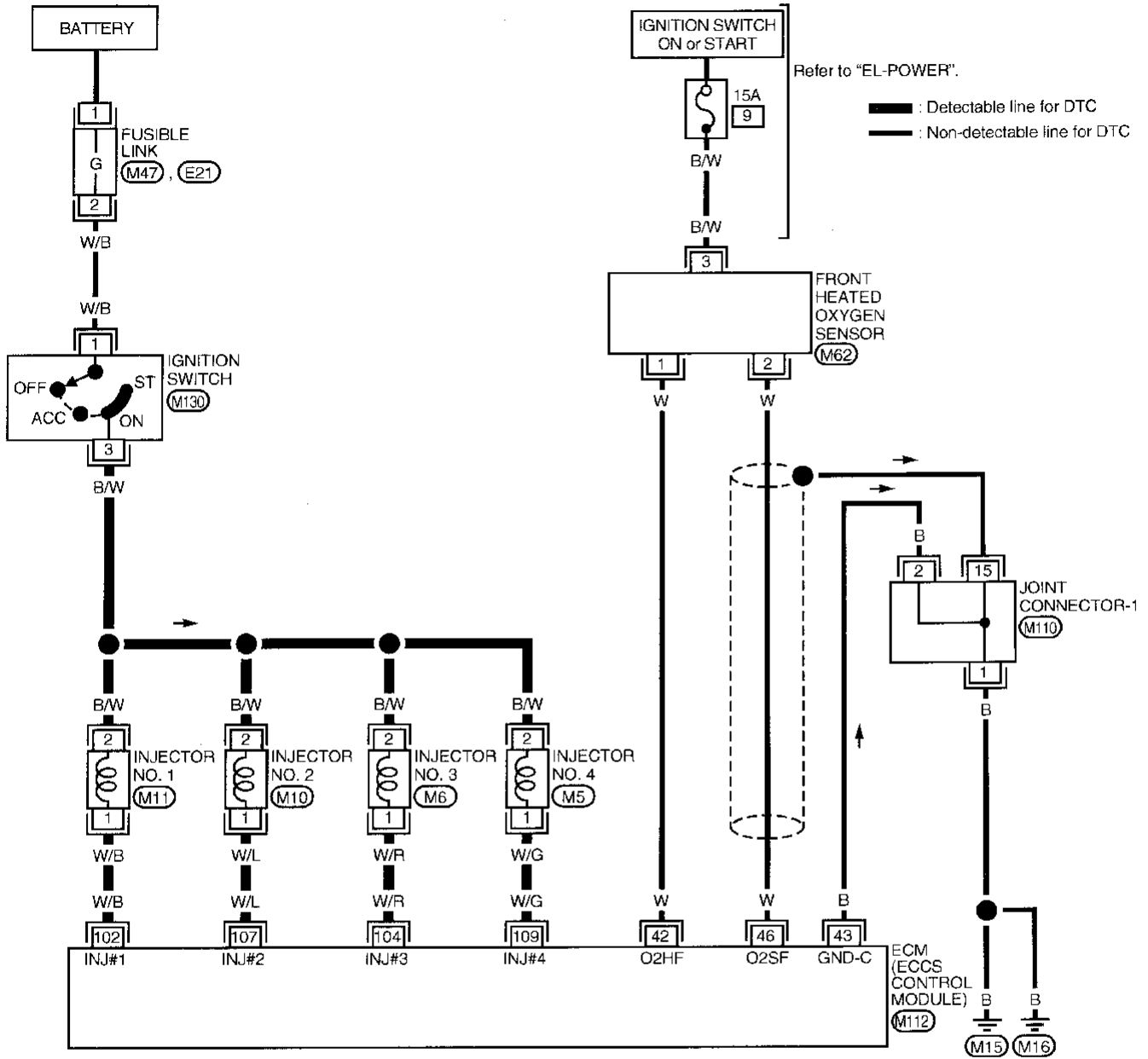
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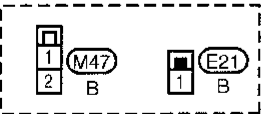
# TROUBLE DIAGNOSIS FOR DTC P0171

## Fuel Injection System Function (Lean side) (Cont'd)

EC-FUEL-01

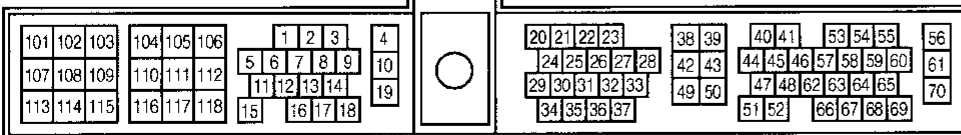


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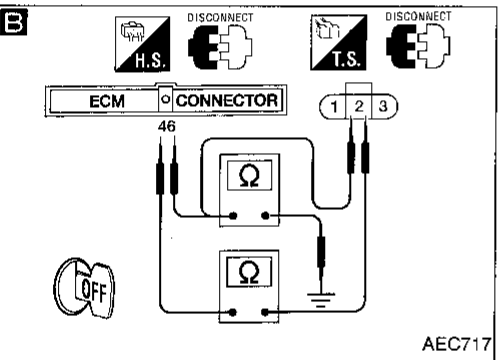
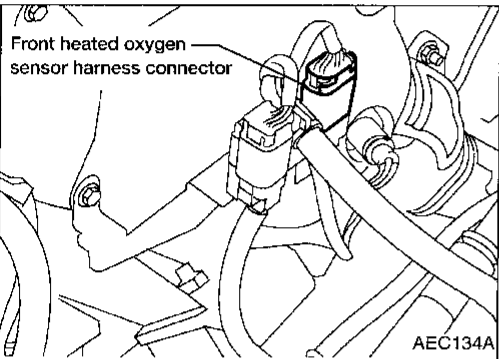
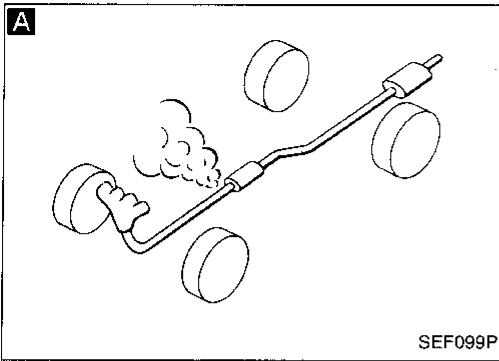
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# TROUBLE DIAGNOSIS FOR DTC P0171

## Fuel Injection System Function (Lean side) (Cont'd)

### DIAGNOSTIC PROCEDURE



INSPECTION START

**A** **CHECK EXHAUST AIR LEAK.**  
Start engine and run it at idle. Listen for an exhaust air leak before the three way catalyst.

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 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 (46) and terminal (2).  
**Continuity should exist.**
4. Check harness continuity between ECM terminal (46) (or terminal (2)) and ground.  
**Continuity should not exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

**CHECK FUEL PRESSURE.**

1. Release fuel pressure to zero. Refer to page EC-25.
2. Install fuel pressure gauge and check fuel pressure.

**At idle:**  
Approx. 235 kPa (2.4 kg/cm<sup>2</sup>, 34 psi)

**A few seconds after ignition switch is turned OFF to ON:**  
Approx. 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)

NG → Check fuel pump and circuit. Refer to EC-309.

OK ↓

**CHECK MASS AIR FLOW SENSOR.**

Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.

1.8 - 6.5 g-m/sec: at idling (2WD)  
2.1 - 6.0 g-m/sec: at idling (4WD)  
7.7 - 15.0 g-m/sec: at 2,500 rpm (2WD)  
6.8 - 13.3 g-m/sec: at 2,500 rpm (4WD)

OR

Check "mass air flow" in MODE 1 with GST.

1.8 - 6.5 g-m/sec: at idling (2WD)  
2.1 - 6.0 g-m/sec: at idling (4WD)  
7.7 - 15.0 g-m/sec: at 2,500 rpm (2WD)  
6.8 - 13.3 g-m/sec: at 2,500 rpm (4WD)

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-93.

OK ↓

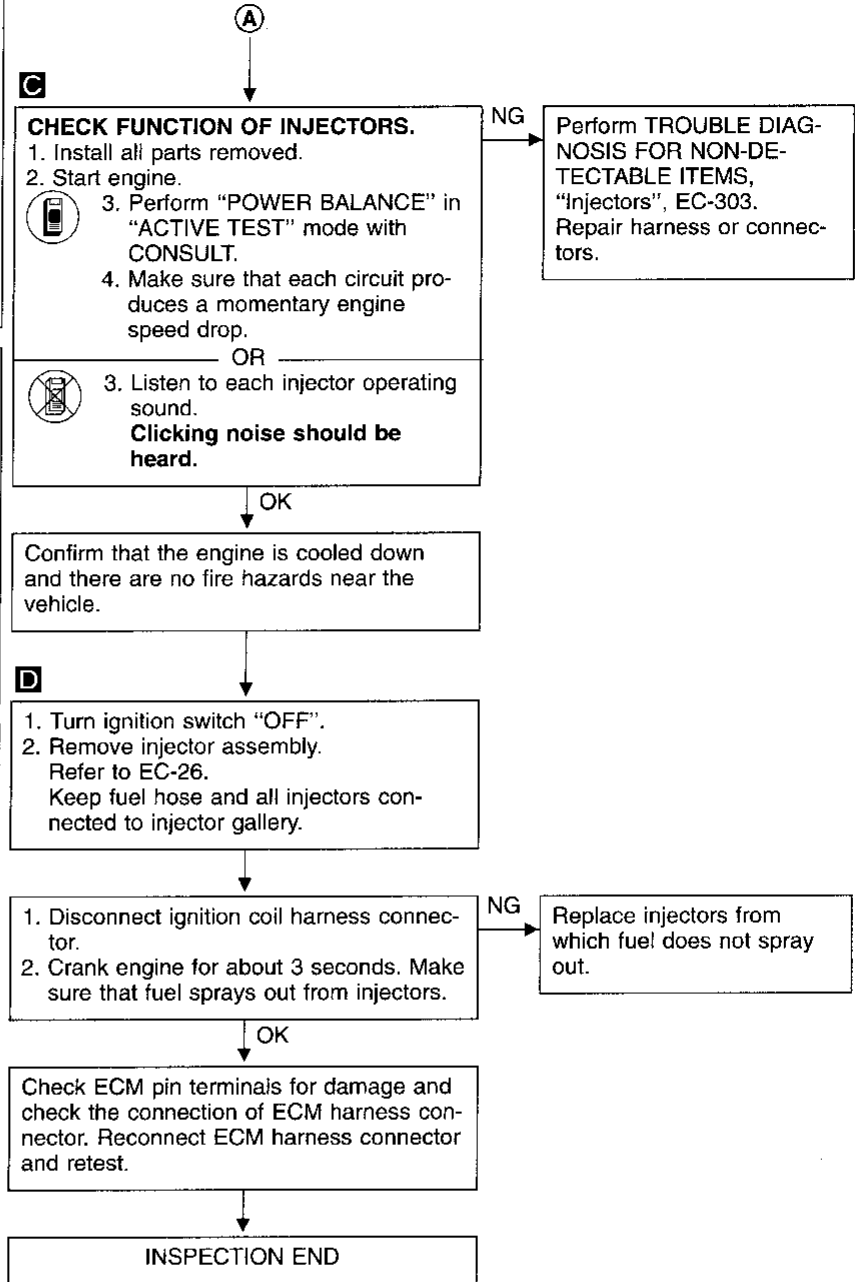
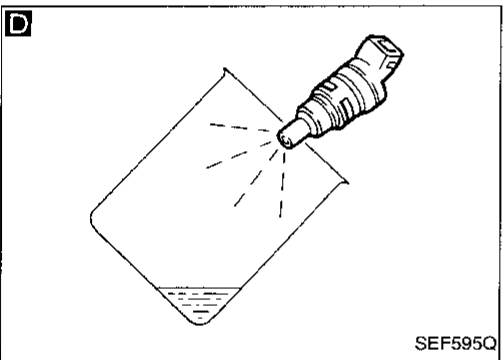
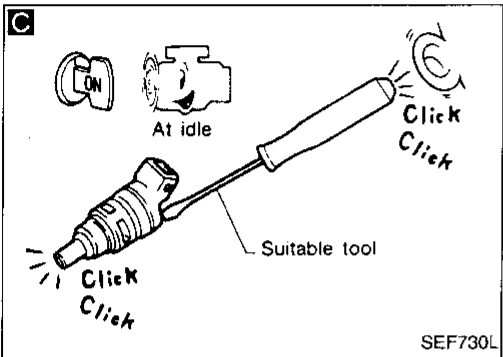
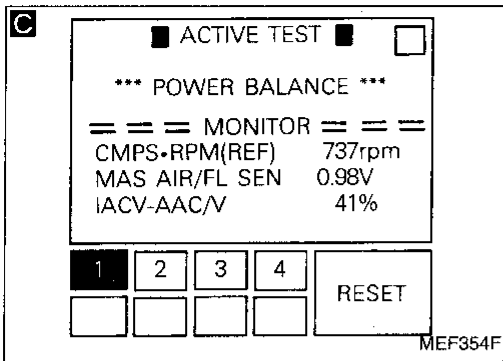
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# TROUBLE DIAGNOSIS FOR DTC P0171

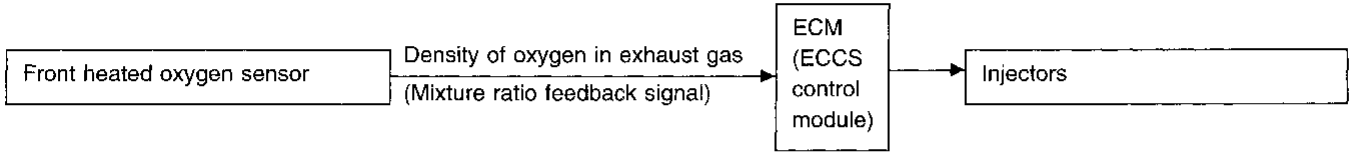
## Fuel Injection System Function (Lean side) (Cont'd)



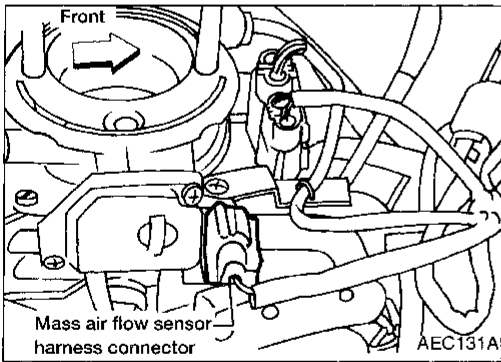
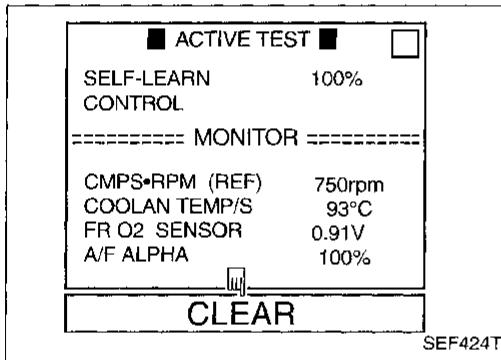
## Fuel Injection System Function (Rich side)

### ON BOARD DIAGNOSIS LOGIC

With Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensor. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios. In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as a fuel 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	<ul style="list-style-type: none"> <li>Fuel injection system does not operate properly.</li> <li>The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)</li> </ul>	<ul style="list-style-type: none"> <li>Front heated oxygen sensor</li> <li>Injectors</li> <li>Exhaust gas leak</li> <li>Incorrect fuel pressure</li> <li>Mass air flow sensor</li> </ul>



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 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 run it for at least 10 minutes at idle speed.  
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, too.  
Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-156. If engine does not start, remove ignition plugs and check for fouling, etc.

OR

- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 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 P0172 should be detected at this stage, if a malfunction exists.

## TROUBLE DIAGNOSIS FOR DTC P0172

### Fuel Injection System Function (Rich side) (Cont'd)

- 9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.  
Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-156. If engine does not start, remove ignition plugs and check for fouling, etc.

OR



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Disconnect mass air flow sensor harness connector.
- 4) Start engine and run it for at least 3 seconds at idle speed.
- 5) Stop engine and reconnect mass air flow sensor harness connector.
- 6) Turn ignition switch "ON".
- 7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
- 8) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
- 9) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
- 10) 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.
- 11) If it is difficult to start engine at step 10, the fuel injection system also has a malfunction.  
Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-156. If engine does not start, remove ignition plugs and check for fouling, etc.

# TROUBLE DIAGNOSIS FOR DTC P0172

## Fuel Injection System Function (Rich side) (Cont'd)

EC-FUEL-01

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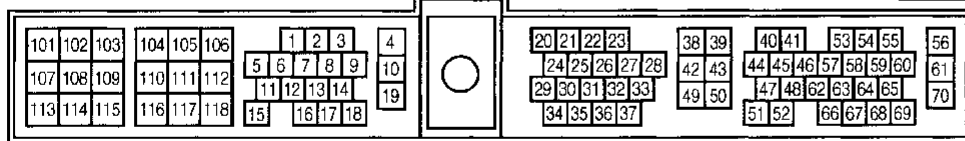
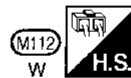
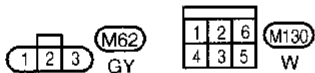
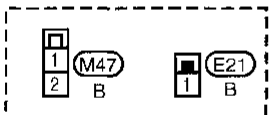
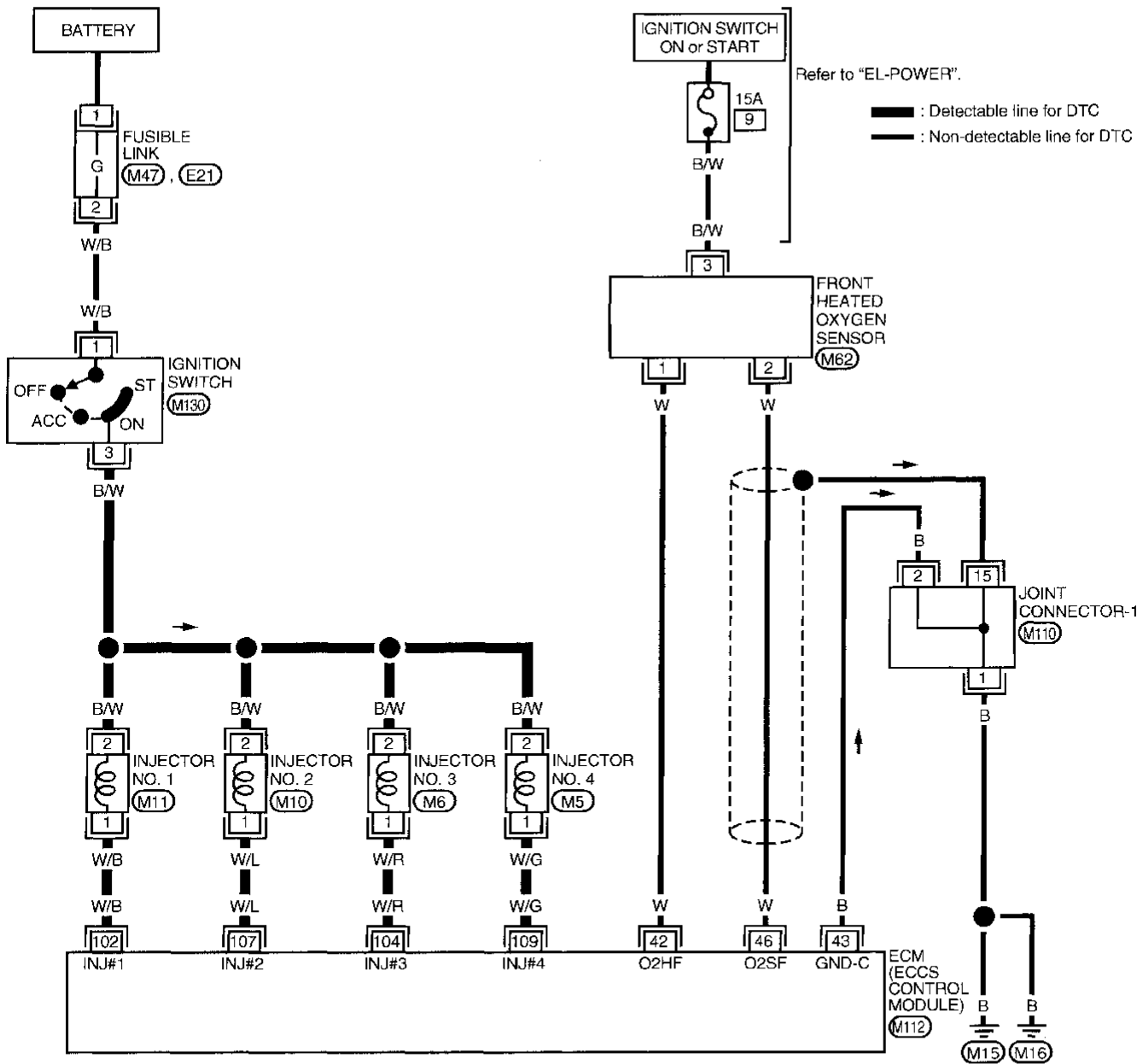
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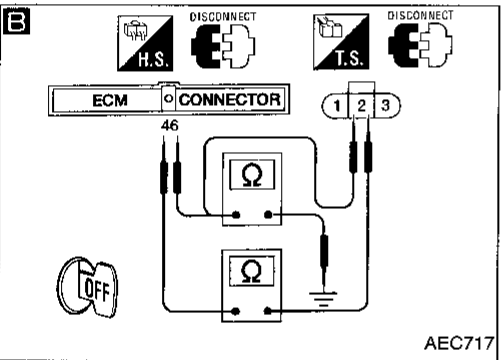
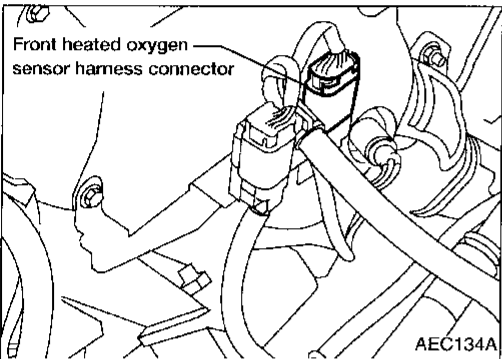
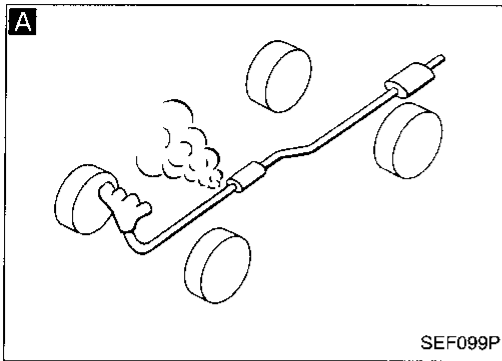
Refer to last page (Foldout page).

M110

# TROUBLE DIAGNOSIS FOR DTC P0172

## Fuel Injection System Function (Rich side) (Cont'd)

### 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.

**CHECK INTAKE AIR LEAK.**  
Start engine and run it at idle. Listen for an intake air leak after mass air flow sensor.

NG → Repair or replace.

**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 ④⑥ and terminal ②. **Continuity should exist.**  
4. Check harness continuity between ECM terminal ④⑥ (or terminal ②) and ground. **Continuity should not exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

**CHECK FUEL PRESSURE.**  
1. Release fuel pressure to zero. Refer to page EC-25.  
2. Install fuel pressure gauge and check fuel pressure.  
**At idle:**  
**Approx. 235 kPa (2.4 kg/cm<sup>2</sup>, 34 psi)**  
**A few seconds after ignition switch is turned OFF to ON:**  
**Approx. 294 kPa (3.0 kg/cm<sup>2</sup>, 43 psi)**

NG → Check fuel pump and circuit. Refer to EC-309.

**CHECK MASS AIR FLOW SENSOR.**  
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.  
**1.8 - 6.5 g-m/sec: at idling (2WD)**  
**2.1 - 6.0 g-m/sec: at idling (4WD)**  
**7.7 - 15.0 g-m/sec: at 2,500 rpm (2WD)**  
**6.8 - 13.3 g-m/sec: at 2,500 rpm (4WD)**

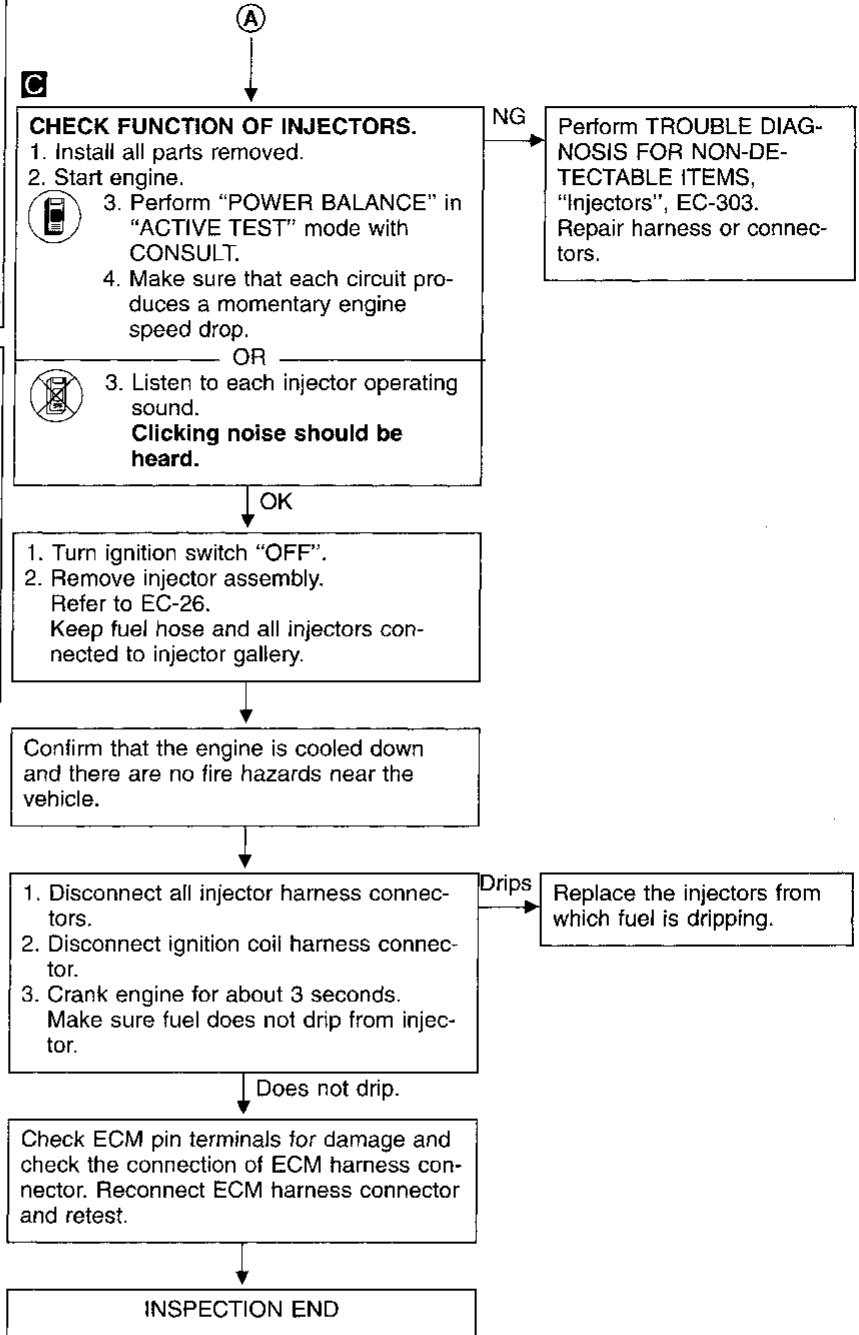
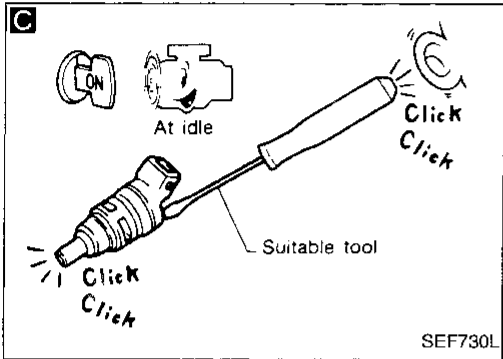
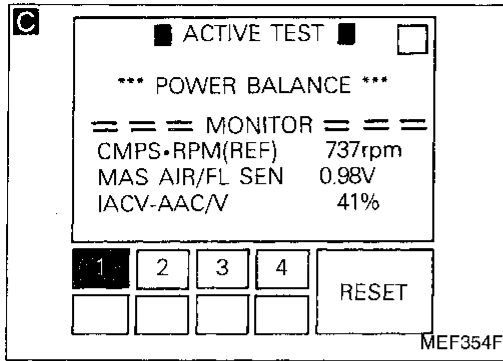
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-93.

OR  
Check "mass air flow" in MODE 1 with GST.  
**1.8 - 6.5 g-m/sec: at idling (2WD)**  
**2.1 - 6.0 g-m/sec: at idling (4WD)**  
**7.7 - 15.0 g-m/sec: at 2,500 rpm (2WD)**  
**6.8 - 13.3 g-m/sec: at 2,500 rpm (4WD)**

OK  
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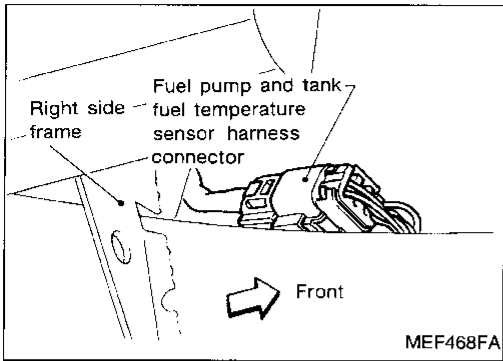
# TROUBLE DIAGNOSIS FOR DTC P0172

## Fuel Injection System Function (Rich side) (Cont'd)



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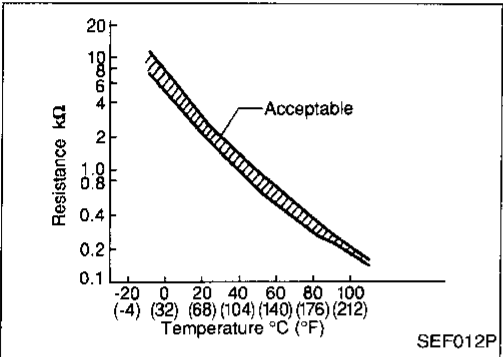
# TROUBLE DIAGNOSIS FOR DTC P0180



## 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.



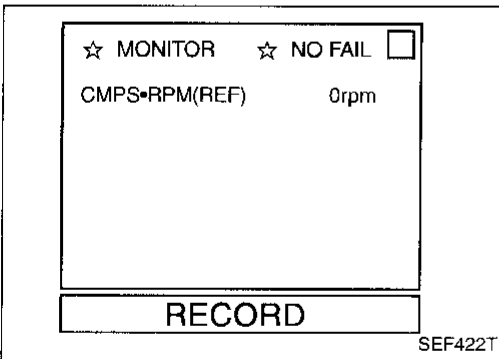
### (Reference data)

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 measured between ECM terminal 63 (Tank fuel temperature sensor) and ECM terminal 43 (ECCS ground).

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Causes)
P0180 0402	<ul style="list-style-type: none"> <li>● An excessively high or low voltage is sent to ECM.</li> <li>● Rationally incorrect voltage is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (The sensor circuit is open or shorted.)</li> <li>● Tank fuel temperature sensor</li> </ul>



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

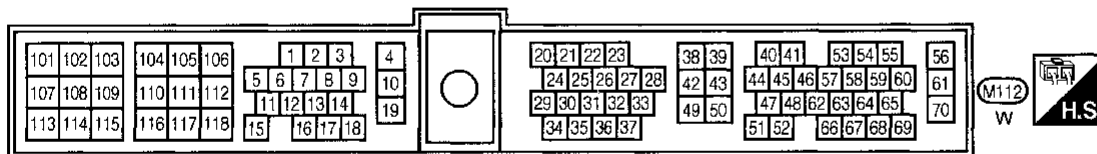
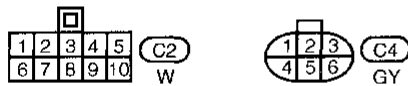
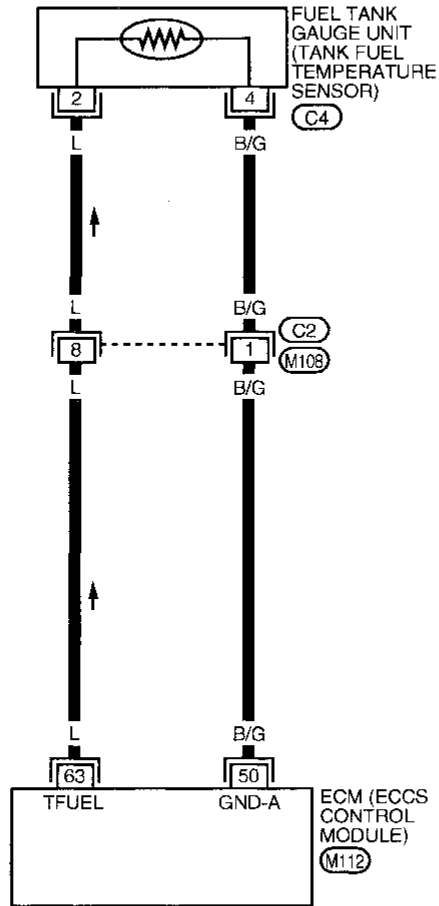
- 1) Turn ignition switch "ON".
  - 2) Select "DATA MONITOR" mode with CONSULT.
  - 3) Wait at least 12 seconds.
- OR
- 1) Turn ignition switch "ON" and wait at least 12 seconds.
  - 2) Select "MODE 7" with GST.
- OR
- 1) Turn ignition switch "ON" and wait at least 12 seconds.
  - 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
  - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P0180

## Tank Fuel Temperature Sensor (Cont'd)

EC-TFTS-01

: Detectable line for DTC  
 : Non-detectable line for DTC

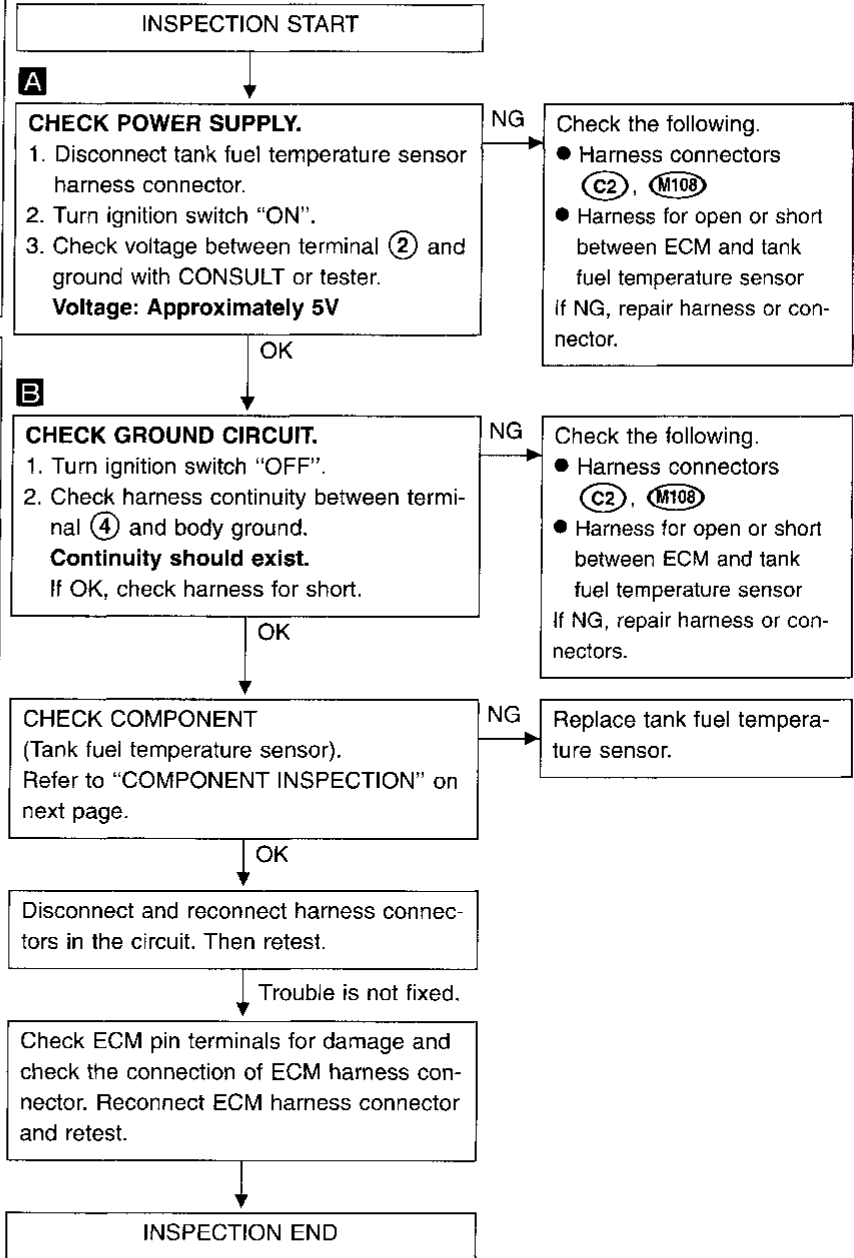
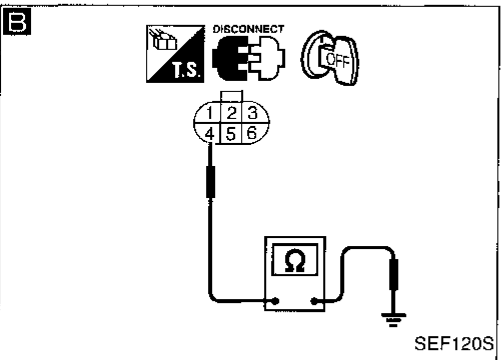
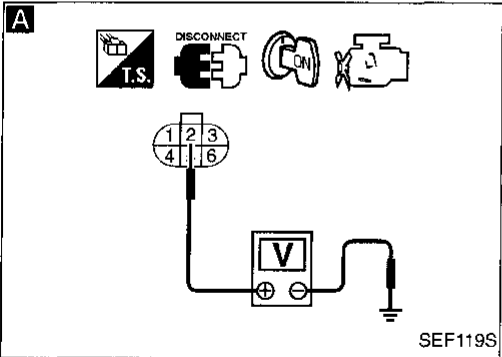
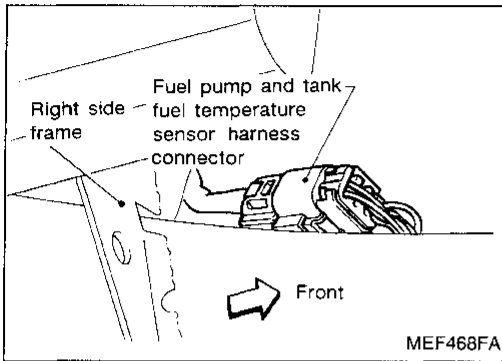


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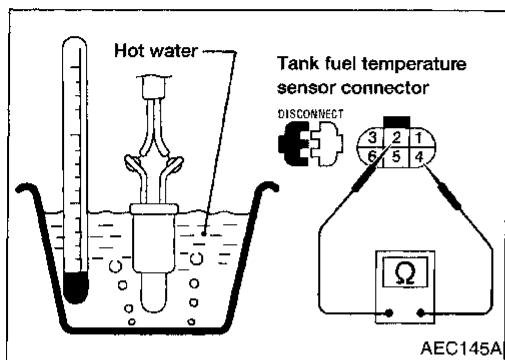
# TROUBLE DIAGNOSIS FOR DTC P0180

## Tank Fuel Temperature Sensor (Cont'd) DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P0180

## Tank Fuel Temperature Sensor (Cont'd) COMPONENT INSPECTION

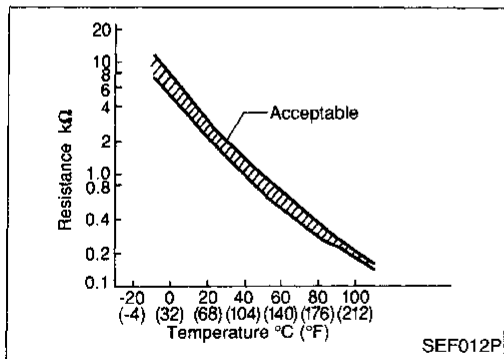


### Tank fuel temperature sensor

Check resistance by heating with hot water or heat gun as shown in the figure.

(Reference data)

Temperature °C (°F)	Resistance kΩ
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



If NG, replace tank fuel temperature sensor.

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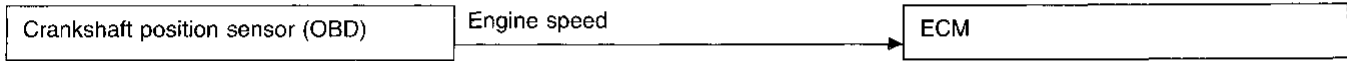
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## No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire

### ON BOARD DIAGNOSIS LOGIC

If a misfire occurs, the engine speed will fluctuate. If the fluctuation is detected by the crankshaft position sensor (OBD), the misfire is diagnosed.

The misfire detection logic consists of the following two conditions.



**1. One Trip Detection Logic (Three Way Catalyst Damage)**

When a misfire is detected which will overheat and damage the three way catalyst, the malfunction indicator lamp (MIL) will start blinking; even during the first trip. In this condition, ECM monitors the misfire every 200 revolutions.

If the misfire frequency decreases to a level that will not damage the three way catalyst, the MIL will change from blinking to lighting up.


(After the first trip detection, the MIL will light up from engine starting. If a misfire is detected that will cause three way catalyst damage, the MIL will start blinking.)

**2. Two Trip Detection Logic (Exhaust quality deterioration)**

When a misfire that will not damage the three way catalyst (but will affect exhaust emission) occurs, the malfunction indicator lamp will light up based on the second consecutive trip detection logic. In this condition, ECM monitors the misfire for every 1,000 revolutions of the engine.


Diagnostic Trouble Code Nos.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 (0701)	● Multiple cylinders misfire.	● Improper spark plug ● Insufficient compression
P0301 (0608)	● No. 1 cylinder misfires.	● Incorrect fuel pressure ● EGR valve
P0302 (0607)	● No. 2 cylinder misfires.	● The injector circuit is open or shorted ● Injectors
P0303 (0606)	● No. 3 cylinder misfires.	● Intake air leak ● The ignition secondary circuit is open or shorted
P0304 (0605)	● No. 4 cylinder misfires.	● Lack of fuel ● Magnetized flywheel (drive plate)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

-  1) Turn ignition switch "ON", and select "DATA MONITOR" mode with CONSULT.  
 2) Start engine and warm it up sufficiently.  
 3) Turn ignition switch "OFF" and wait at least 3 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 during driving.


**Note: Refer to the freeze frame data for the test driving condition.**

OR

-  1) Start engine and warm it up sufficiently.  
 2) Turn ignition switch "OFF" and wait at least 3 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 during driving.  
 4) Select "MODE 7" with GST.

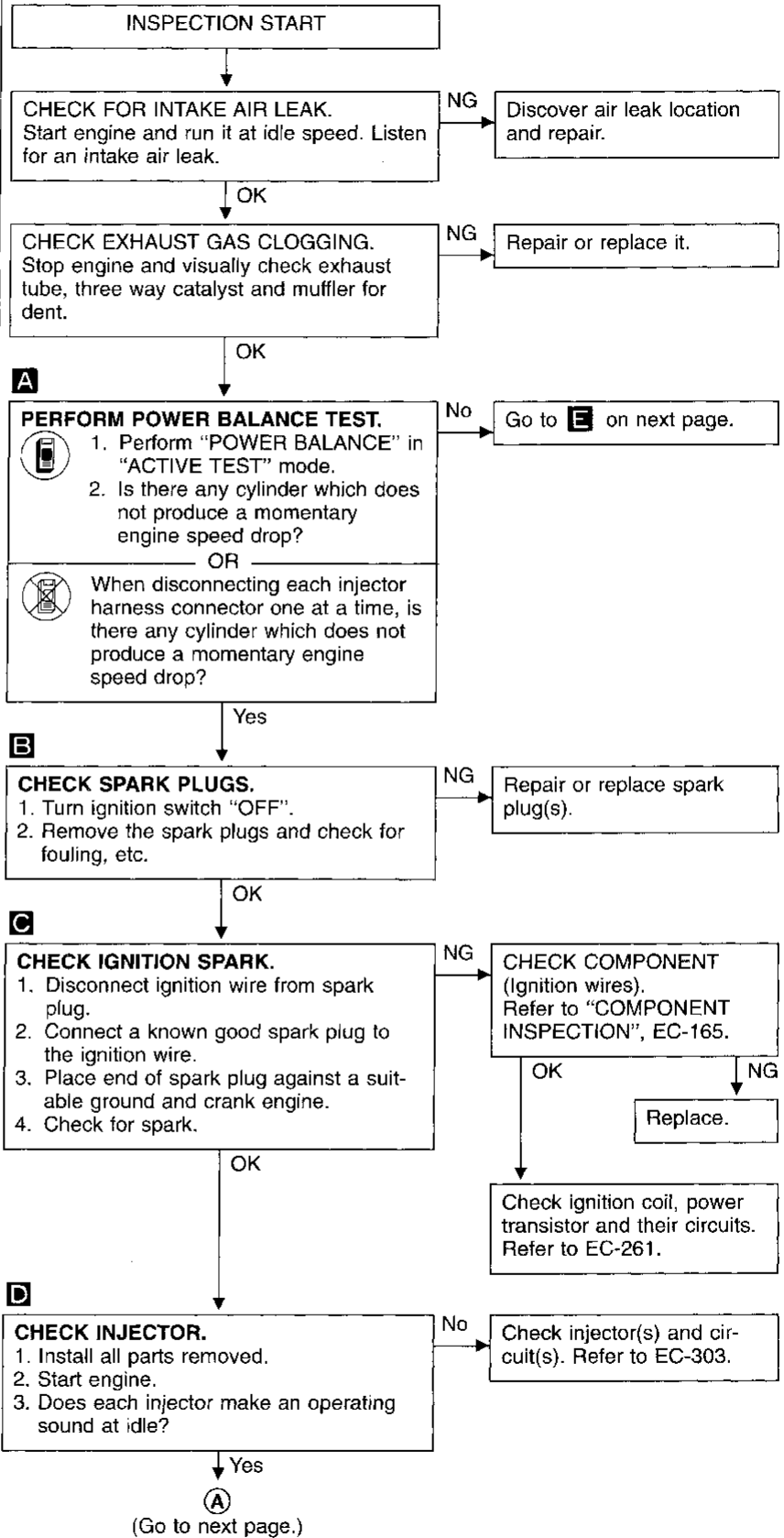
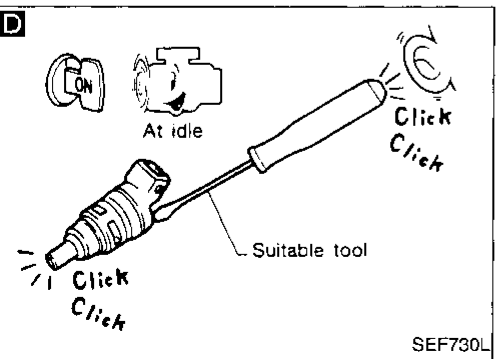
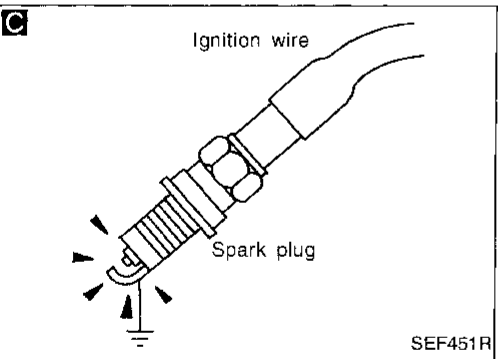
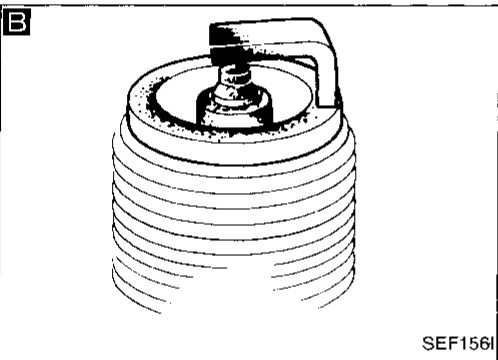
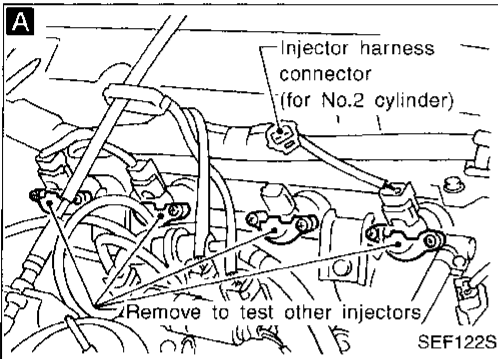
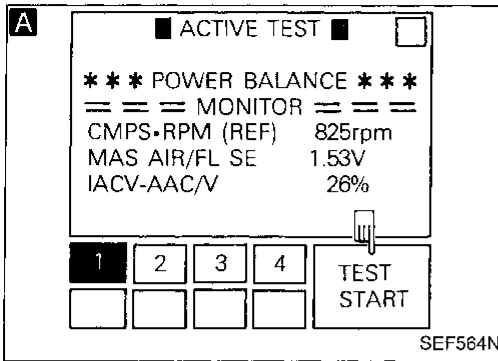
**Note: Refer to the freeze frame data for the test driving condition.**

OR

-  1) Start engine and warm it up sufficiently.  
 2) Turn ignition switch "OFF" and wait at least 3 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 during driving.  
 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

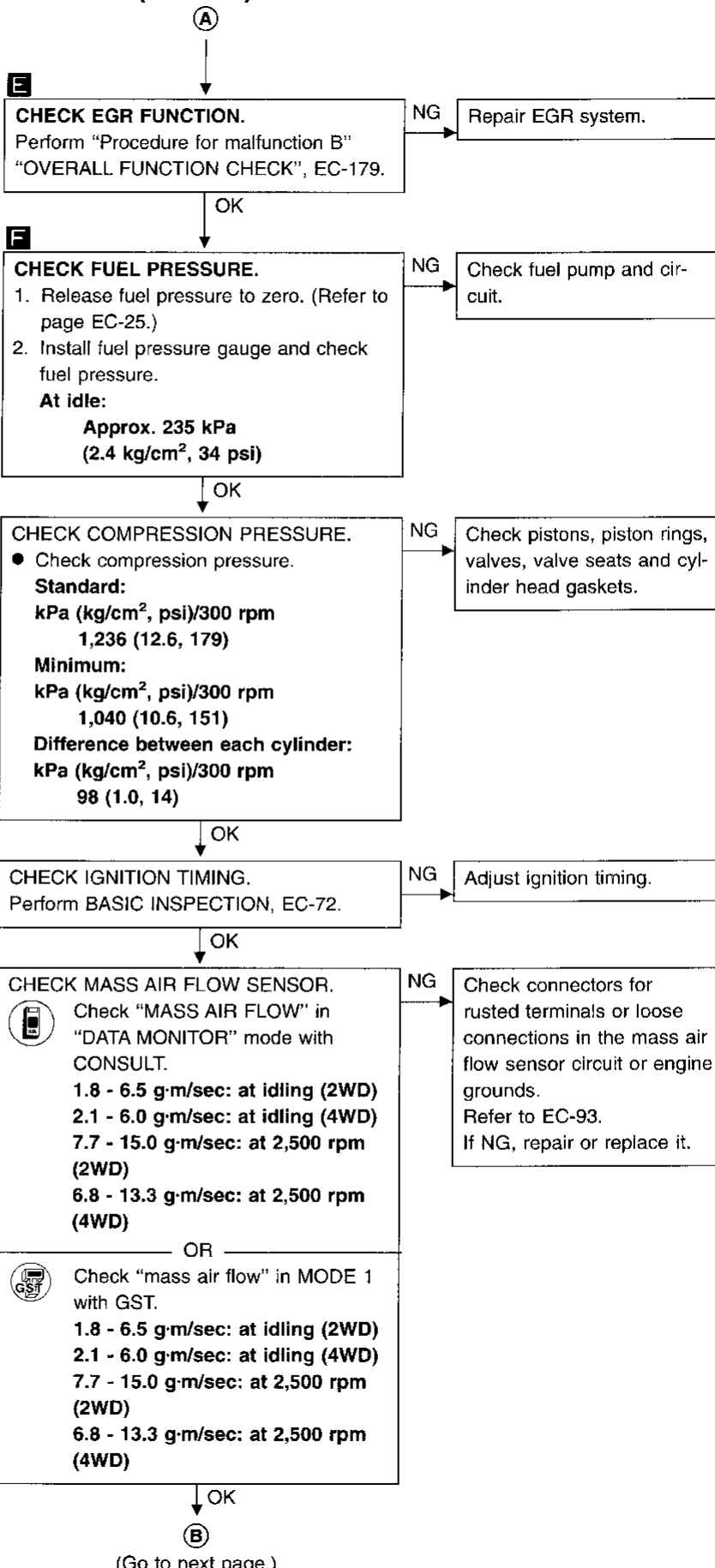
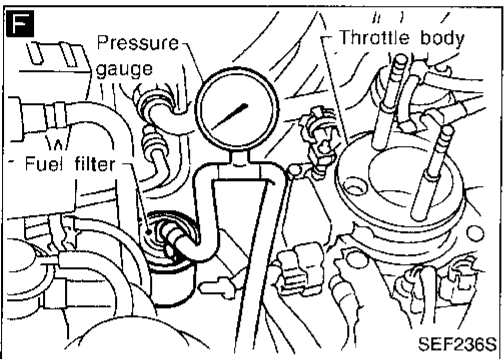
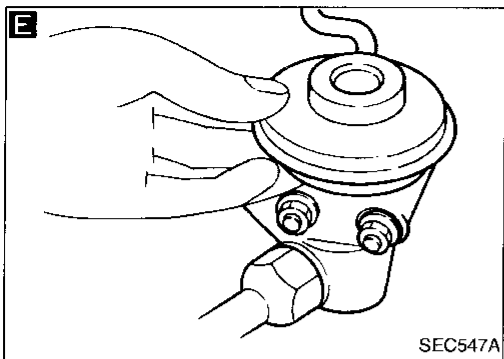
No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

DIAGNOSTIC PROCEDURE



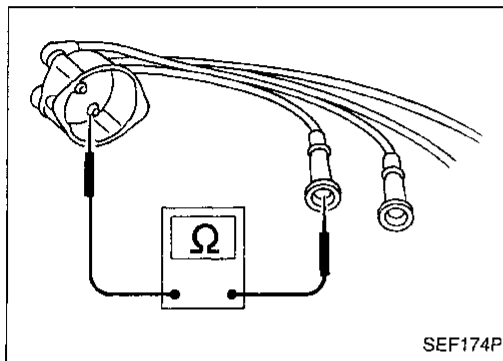
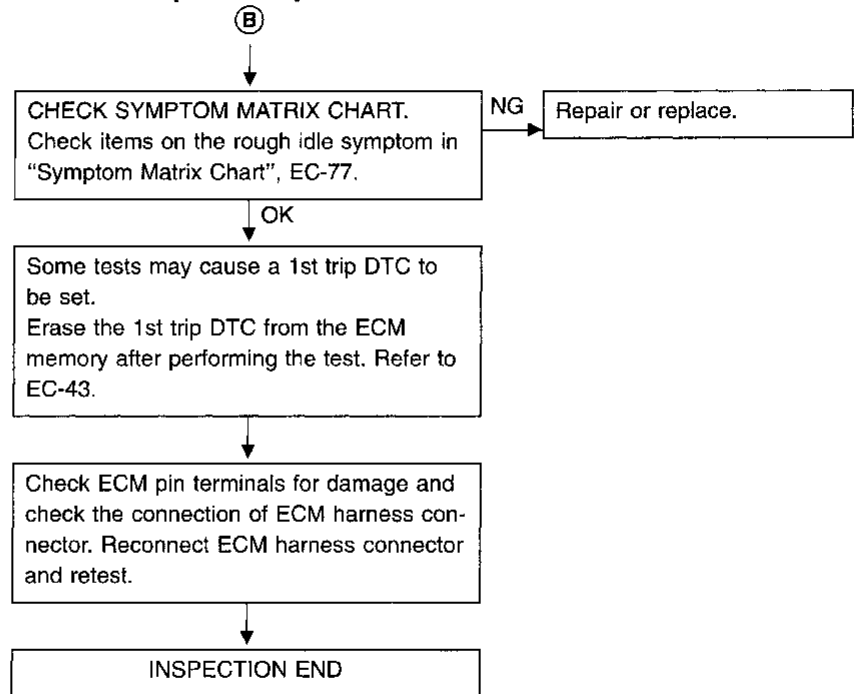
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No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)



(Go to next page.)

No. 4 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)



**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.

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# TROUBLE DIAGNOSIS FOR DTC P0335

## Crankshaft Position Sensor (CKPS) (OBD)

### COMPONENT DESCRIPTION

The crankshaft position sensor (OBD) is located on the transmission housing facing the gear teeth (cogs) of the flywheel or drive plate. It detects the fluctuation of the engine revolution.

The sensor consists of a permanent magnet, core and coil.

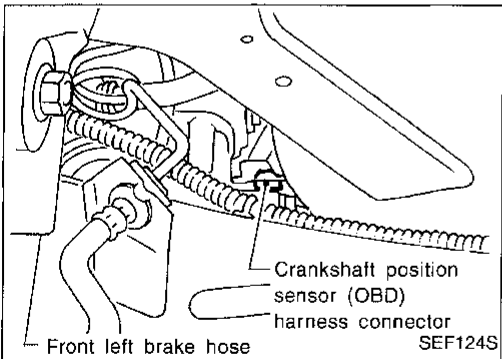
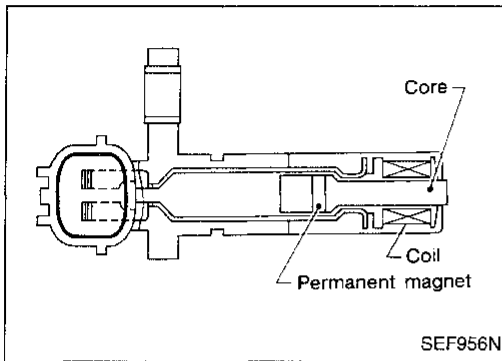
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

The changing gap causes the magnetic field near the sensor to change.

Due to the changing magnetic field, the voltage from the sensor changes.

The ECM receives the voltage signal and detects the fluctuation of the engine revolution.

This sensor is not used to control the engine system. It is used only for the on board diagnosis of misfire.



### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
53	R	Crankshaft position sensor (OBD)	Engine is running. (A/T: N range, M/T: Neutral) └ Idle speed (Air conditioner switch "OFF".)	More than 0.2V* (AC range)

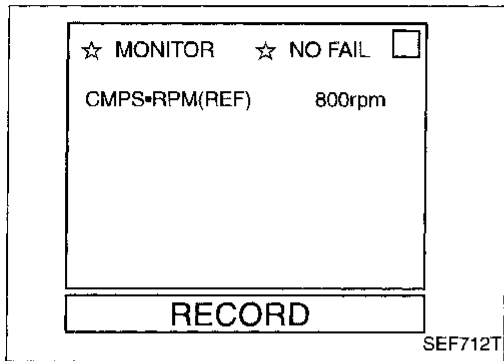
\*: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

### ON BOARD DIAGNOSIS LOGIC


Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P0335 0802	<ul style="list-style-type: none"> <li>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.</li> </ul>	<ul style="list-style-type: none"> <li>Harness or connectors (The crankshaft position sensor (OBD) circuit is open.)</li> <li>Crankshaft position sensor (OBD)</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P0335


## Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)




### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

-  1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.  
2) Start engine and run it for at least 10 seconds at idle speed.

OR

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

OR

-  1) Start engine and run it for at least 10 seconds at idle speed.  
2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".  
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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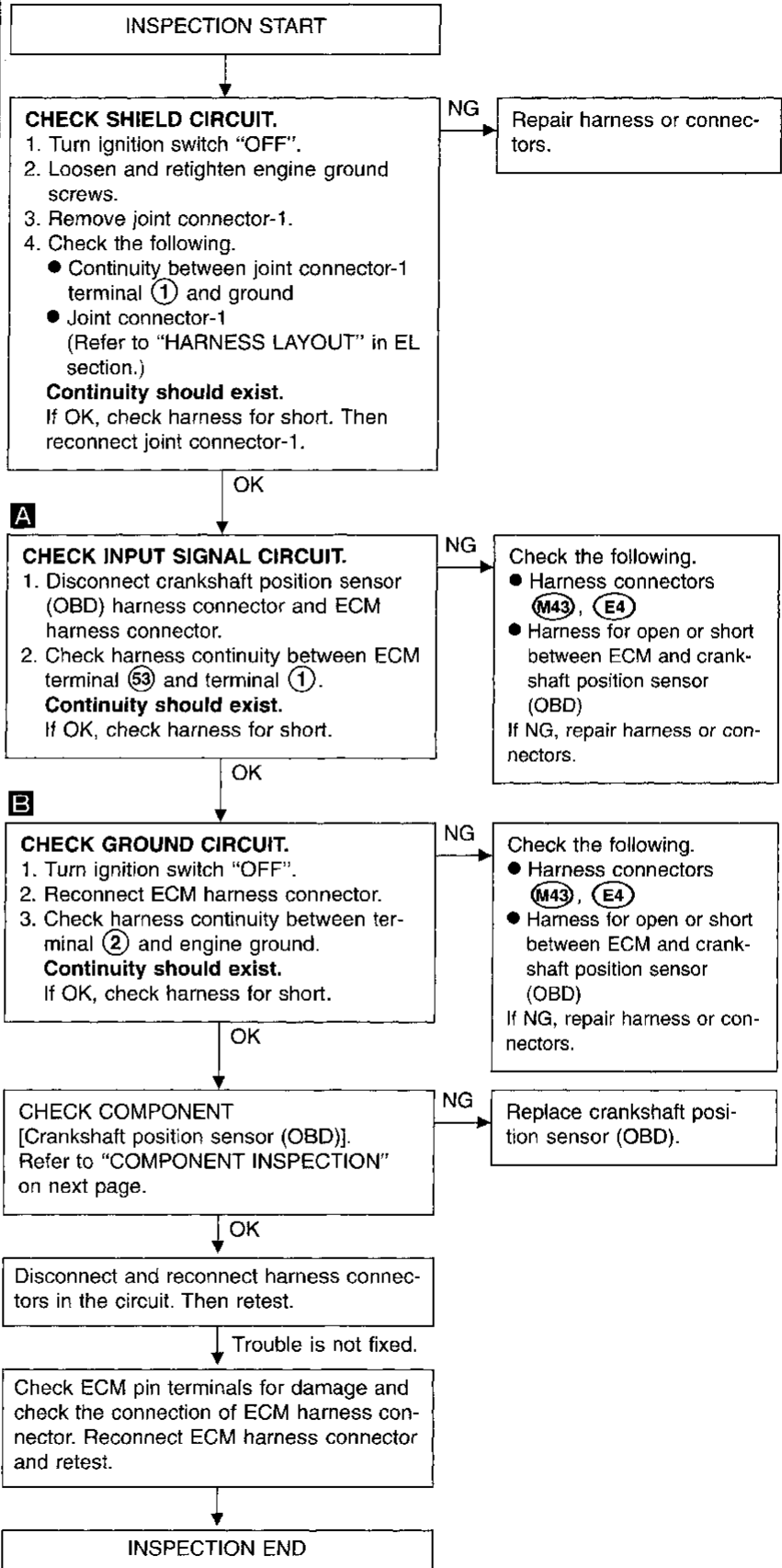
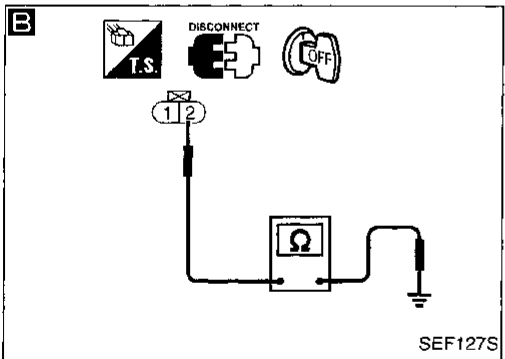
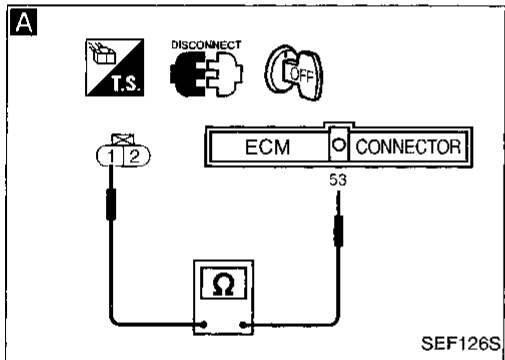
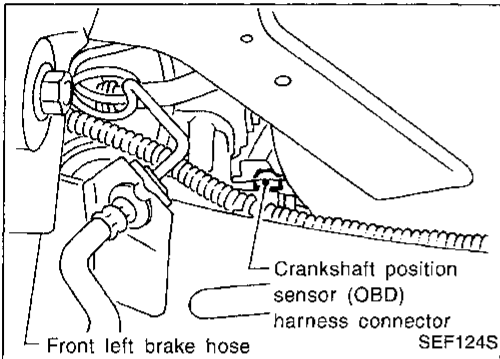
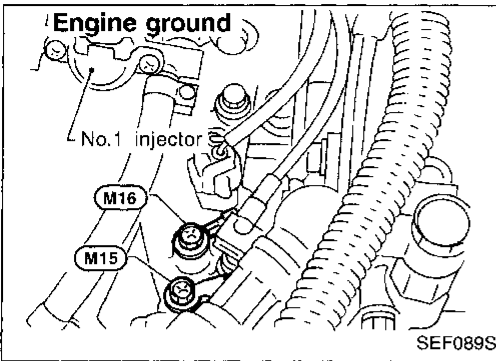




# TROUBLE DIAGNOSIS FOR DTC P0335

## Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

### DIAGNOSTIC PROCEDURE



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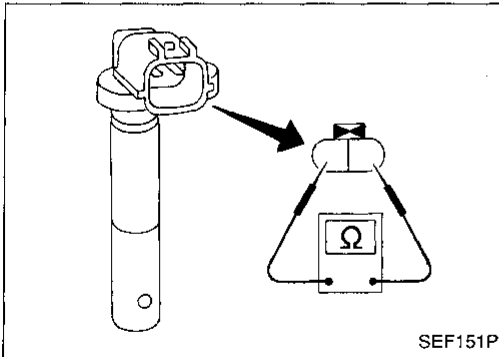
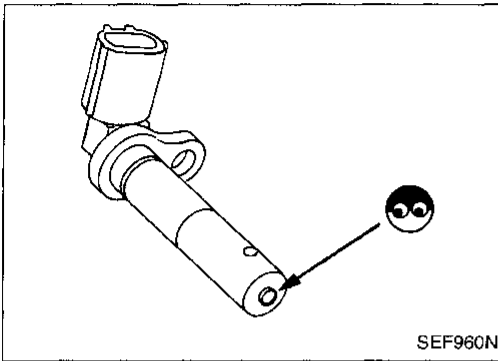
## TROUBLE DIAGNOSIS FOR DTC P0335

### Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

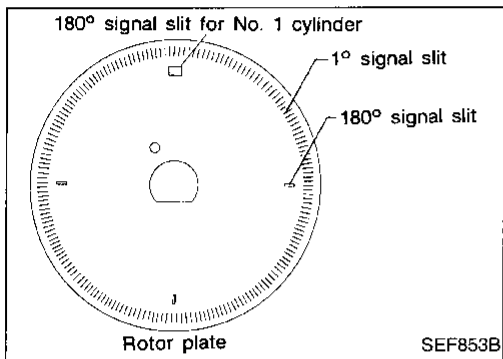
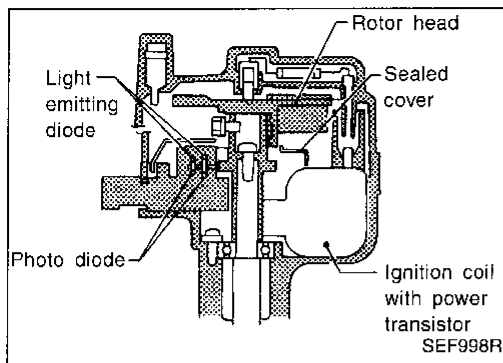
#### COMPONENT INSPECTION

#### 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.
5. Check resistance as shown in the figure.  
**Resistance: Approximately 166.5 - 203.5 $\Omega$  at 20°C (68°F)**



# TROUBLE DIAGNOSIS FOR DTC P0340



## Camshaft Position Sensor (CMPS)

### COMPONENT DESCRIPTION

The camshaft position sensor is a basic component of the ECCS. It monitors engine speed and piston position. These input signals to the ECM are used to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for a 1° signal and 4 slits for a 180° signal. The wave-forming circuit consists of Light Emitting Diodes (LED) and photo diodes.

The rotor plate is positioned between the LED and the photo diode. The LED transmits light to the photo diode. As the rotor plate turns, the slits cut the light to generate rough-shaped pulses. These pulses are converted into on-off signals by the wave-forming circuit and sent to the ECM.

The distributor is not repairable and must be replaced as an assembly, except distributor cap.

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
40 44	GY R	Camshaft position sensor (Reference signal)	Engine is running.	Approximately 0.3V*
41	G	Camshaft position sensor (Position signal)	Engine is running.	Approximately 2.5V*

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

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check items (Possible cause)
P0340 0101	<ul style="list-style-type: none"> <li>Either 1° or 180° signal is not sent to ECM for the first few seconds during engine cranking.</li> <li>Either 1° or 180° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed.</li> <li>The relation between 1° and 180° signal is not in the normal range during the specified engine speed.</li> </ul>	<ul style="list-style-type: none"> <li>Harness or connectors (The camshaft position sensor circuit is open or shorted.)</li> <li>Camshaft position sensor</li> <li>Starter motor (Refer to EL section.)</li> <li>Starting system circuit (Refer to EL section.)</li> <li>Dead (Weak) battery</li> </ul>

## TROUBLE DIAGNOSIS FOR DTC P0340

### Camshaft Position Sensor (CMPS) (Cont'd)

#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

**Note:** Before performing the following procedure, confirm that battery voltage is more than 10.5V.

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM(REF)	800rpm	
<b>RECORD</b>		

SEF712T



- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Start engine and run it for 2 seconds. (If engine does not run, crank engine for at least 2 seconds.)

OR



- 1) Start engine and run it for 2 seconds. (If engine does not run, crank engine for at least 2 seconds.)
- 2) Select "MODE 7" with GST.

OR

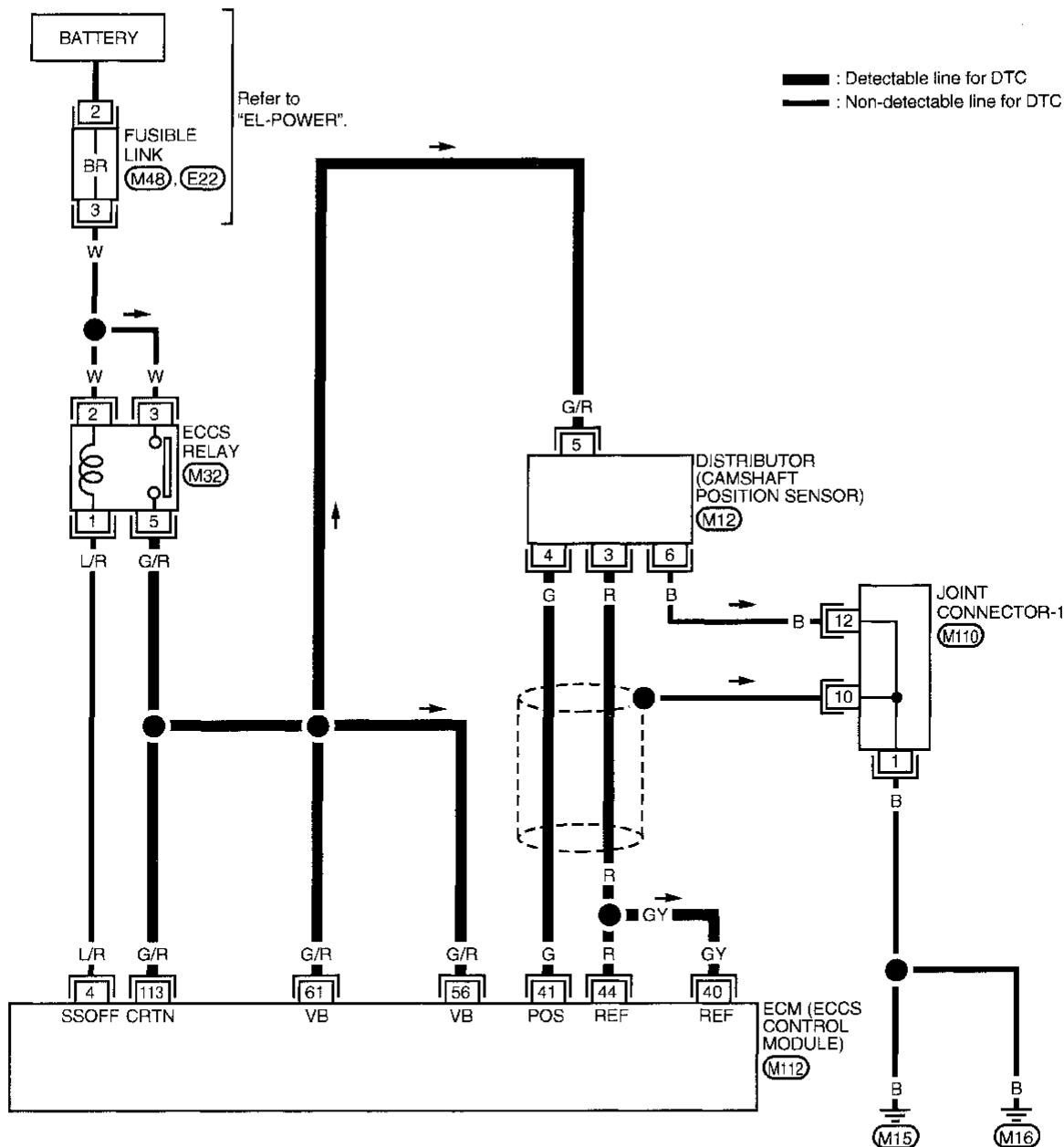


- 1) Start engine and run it for 2 seconds. (If engine does not run, crank engine for at least 2 seconds.)
- 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

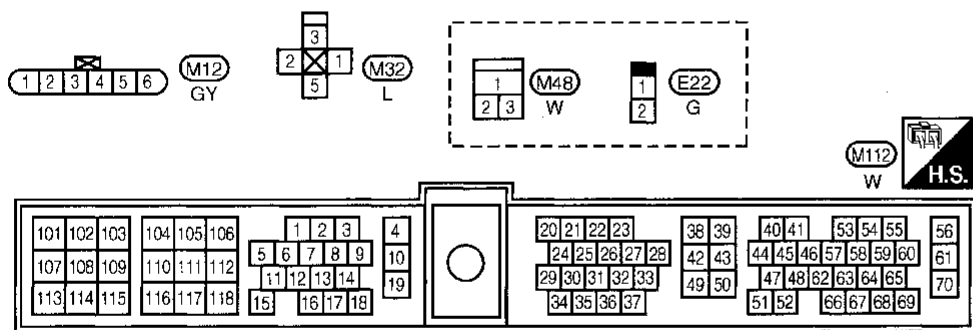
# TROUBLE DIAGNOSIS FOR DTC P0340

## Camshaft Position Sensor (CMPS) (Cont'd)

EC-CMPS-01

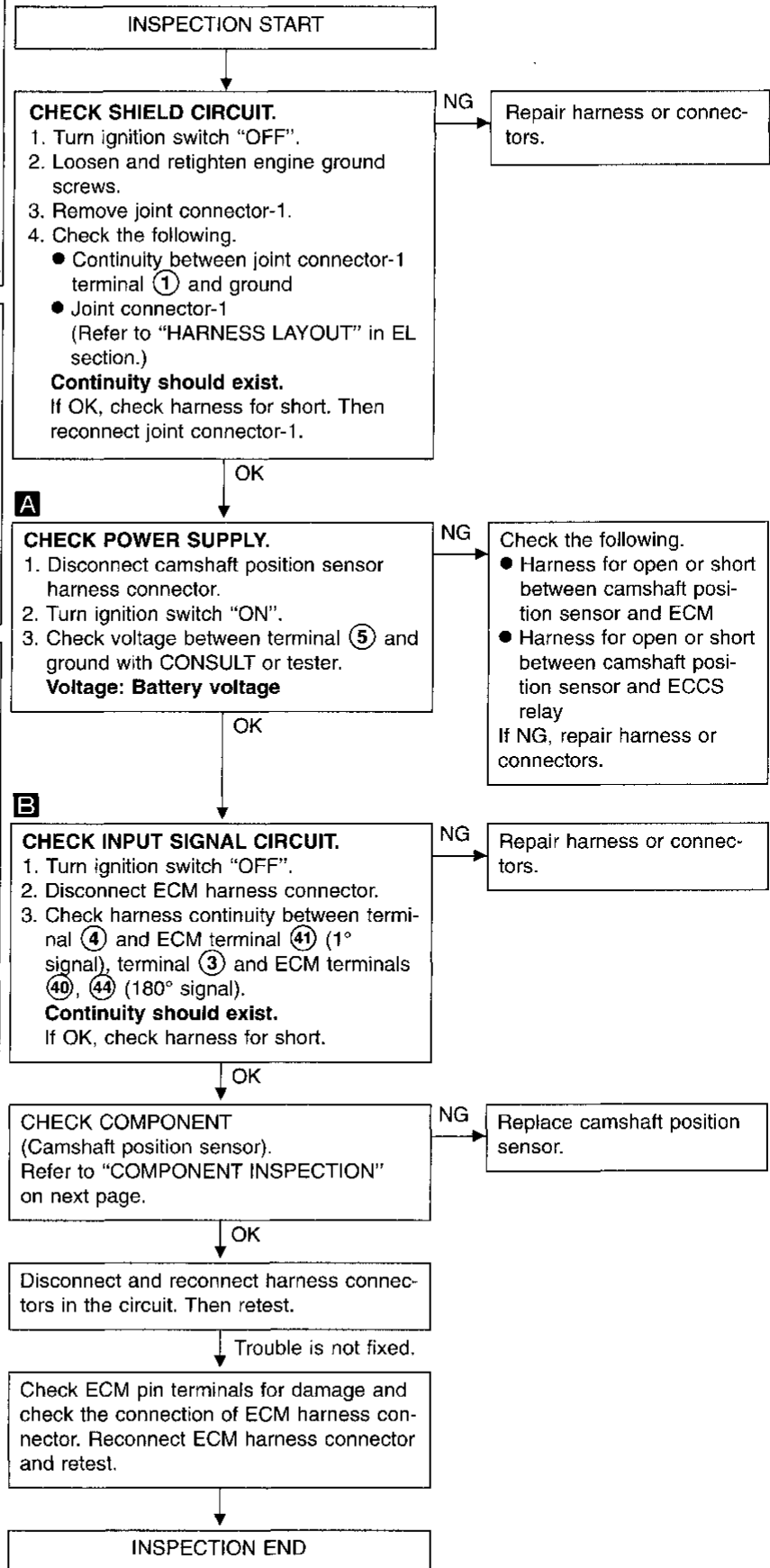
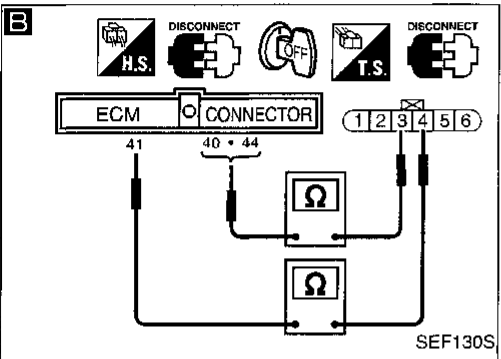
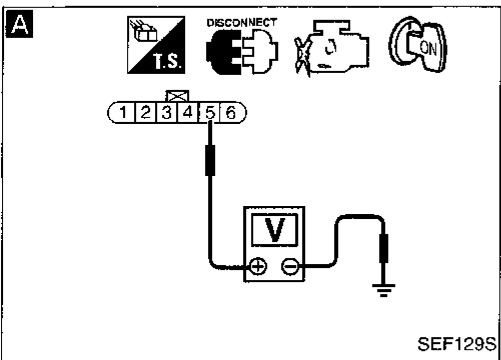
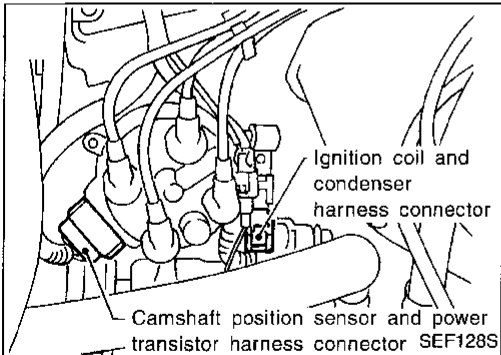
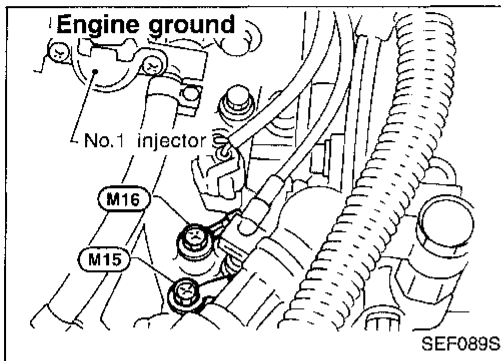


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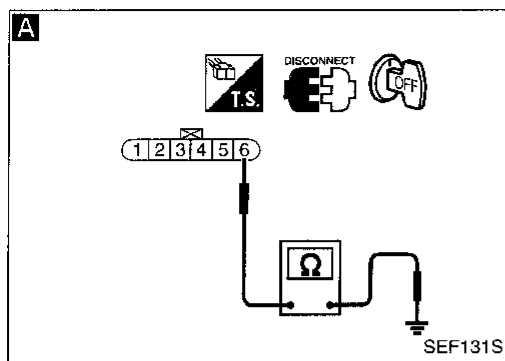
# TROUBLE DIAGNOSIS FOR DTC P0340

## Camshaft Position Sensor (CMPS) (Cont'd) DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)

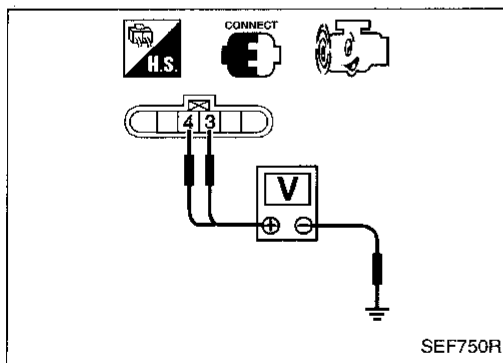
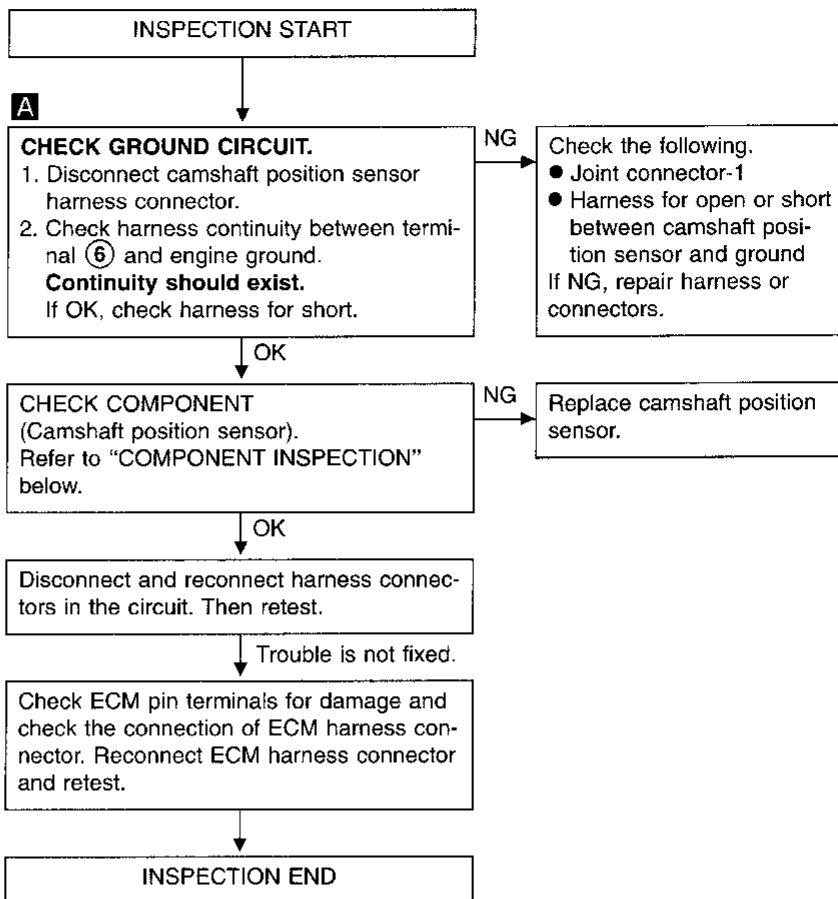


# TROUBLE DIAGNOSIS FOR DTC P0340

## Camshaft Position Sensor (CMPS) (Cont'd) DIAGNOSTIC PROCEDURE (NON-DETECTABLE CIRCUIT)



SEF131S



SEF750R

### COMPONENT INSPECTION

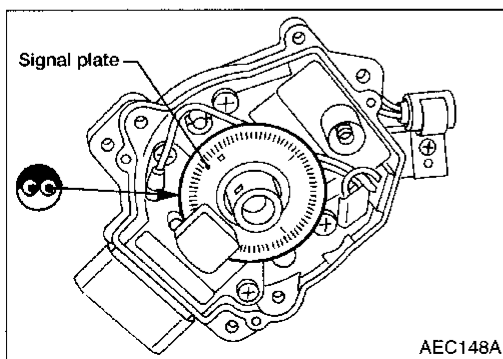
#### Camshaft position sensor

1. Start engine.
2. Check voltage between terminals ③, ④ and ground with DC range.

Condition	Terminals	Voltage
Engine running at idle	③ and ground	Approximately 0.3V*
	④ and ground	Approximately 2.5V*

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

3. Visually check signal plate for damage or dust.



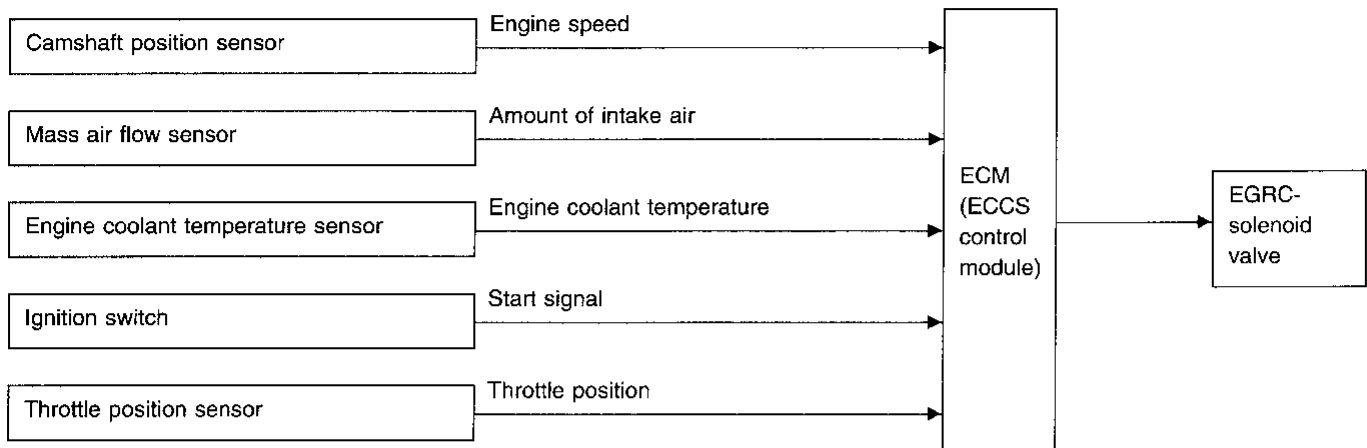
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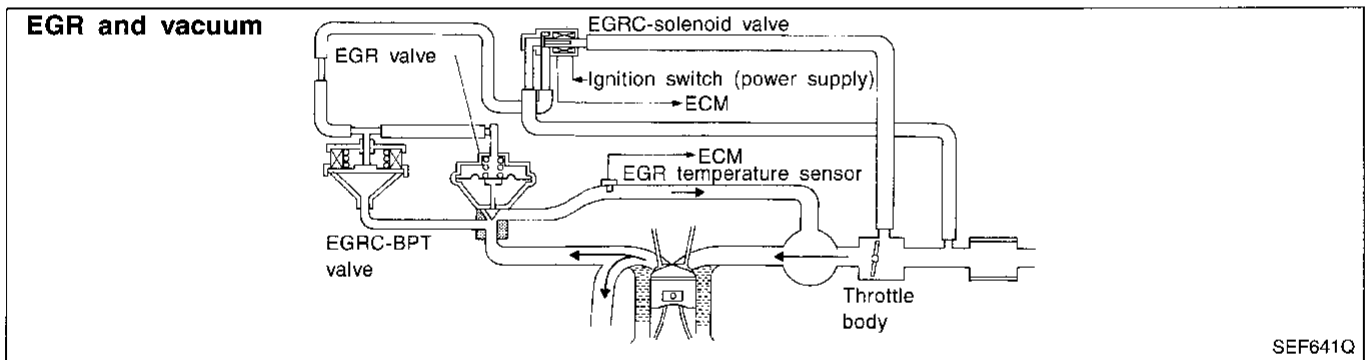
## EGR Function

### 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 and the EGR valve remains closed.

- Low engine coolant temperature
- Engine starting
- Engine stopped
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction



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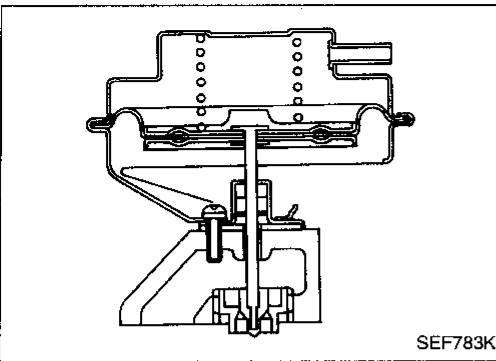
### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and (43) (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
62	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 - 3.0V
103	W/L	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0 - 1V

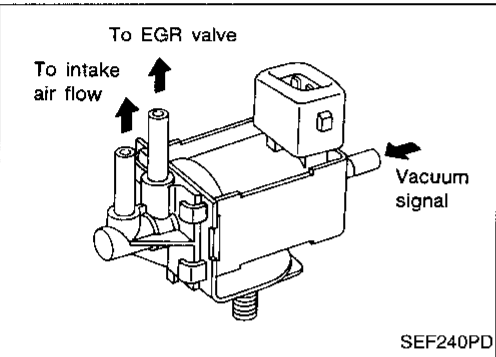
# TROUBLE DIAGNOSIS FOR DTC P0400

## EGR Function (Cont'd) COMPONENT DESCRIPTION



### Exhaust gas recirculation (EGR) valve

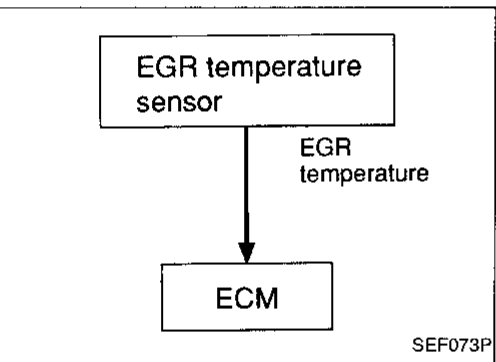
The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.



### 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.



### 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.

If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0302	A) The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition.	<ul style="list-style-type: none"> <li>● EGR valve stuck closed</li> <li>● EGRC-BPT valve leaking</li> <li>● Passage blocked</li> <li>● EGRC-solenoid valve</li> <li>● Tube leaking for EGR valve</li> <li>● EGR temperature sensor</li> </ul>
	B) The exhaust gas recirculation (EGR) flow is excessively high during the specified driving condition.	<ul style="list-style-type: none"> <li>● EGRC-solenoid valve</li> <li>● EGR valve leaking or stuck open</li> <li>● EGR temperature sensor</li> </ul>

### OVERALL FUNCTION CHECK

Use this procedure to check the overall EGR function. During this check, a 1st trip DTC might not be confirmed.

Before starting with the following procedure, check the engine coolant temperature of the freeze frame data with CONSULT or Generic Scan Tool.

If the engine coolant temperature is higher than or equal to 55°C (131°F), perform only "Procedure for malfunction A".

If the engine coolant temperature is lower than 55°C (131°F), perform both "Procedure for malfunction A" and "Procedure for malfunction B". In this case, check DTCs in the ECM and perform inspections one by one based on "INSPECTION PRIORITY", refer to EC-75.

# TROUBLE DIAGNOSIS FOR DTC P0400

## EGR Function (Cont'd)

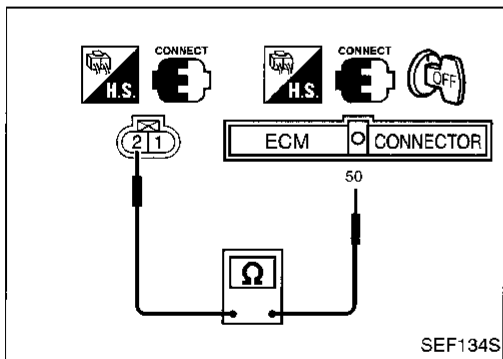
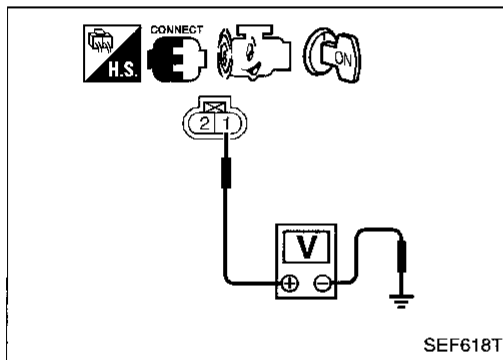
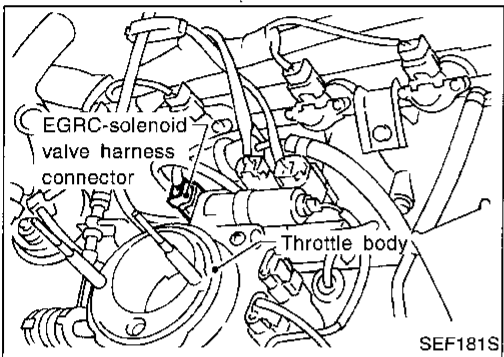
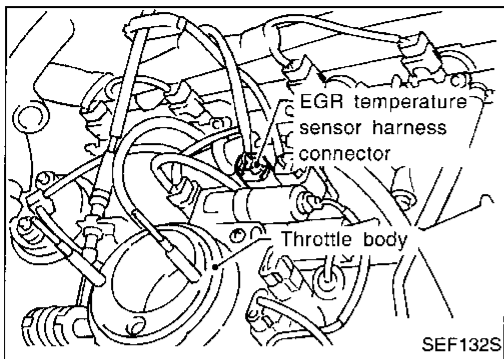
### Procedure for malfunction A

- 1) Start engine and warm it up sufficiently.
- 2) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.

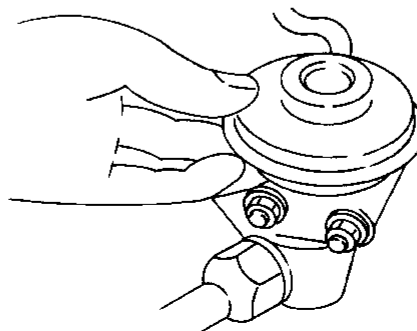
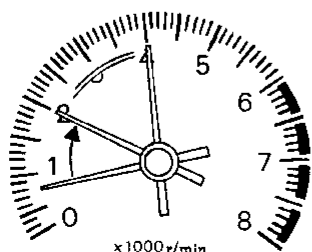
**EGR valve should lift up and down without sticking.**

If EGR valve does not lift up and down, try again with either of the following methods:

- 🔌
    - Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
  - 🕒
    - Disconnect EGRC-solenoid valve harness connector. (The 1st trip DTC for EGRC-solenoid valve will be displayed, however, ignore it.)
- 3) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.  
**Less than 4.5V should exist.**
  - 4) Turn ignition switch "OFF".  
Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ⑤0.  
**Continuity should exist.**
  - 5) Perform "COMPONENT INSPECTION", "EGR temperature sensor", EC-183.



### Overall function check



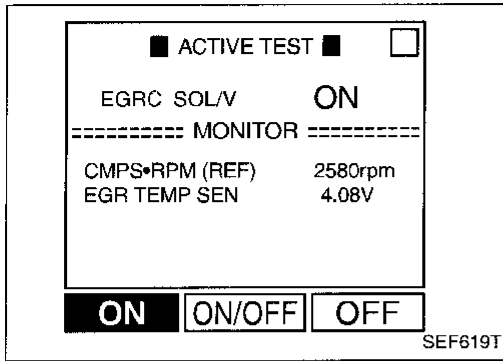
Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

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# TROUBLE DIAGNOSIS FOR DTC P0400

## EGR Function (Cont'd)

### Procedure for malfunction B



- 1) Start engine.
- 2) Turn EGRC-solenoid valve "ON" in "ACTIVE TEST" mode with CONSULT.
- 3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.  
**EGR valve should be closed and should not lift up.**

OR

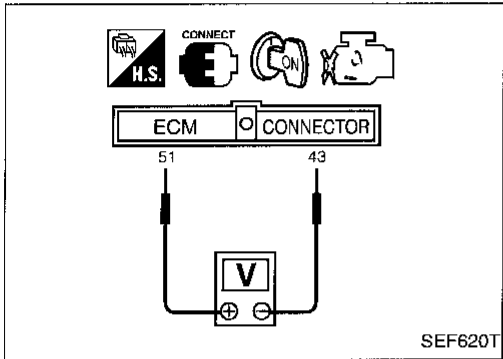
- 1) Confirm the engine coolant temperature is lower than 55°C (131°F) in "Mode 1" with generic scan tool. Perform the following steps before its temperature becomes higher than 55°C (131°F).

- 2) Start engine.
- 3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.  
**EGR valve should be closed and should not lift up.**

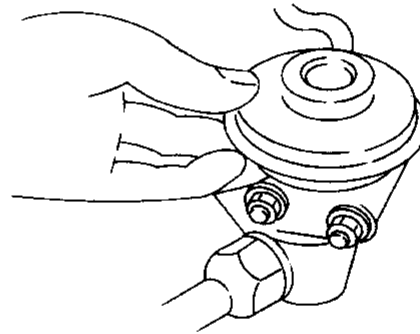
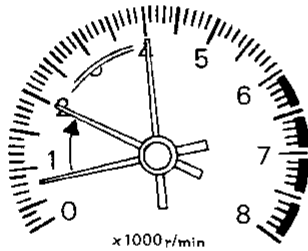
OR

- 1) Confirm the voltage between ECM terminals (51) and (43) is higher than 2.08V. Perform the following steps before the voltage becomes lower than 2.08V.

- 2) Start engine.
- 3) Check for the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load.  
**EGR valve should be closed and should not lift up.**



### Overall function check



Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

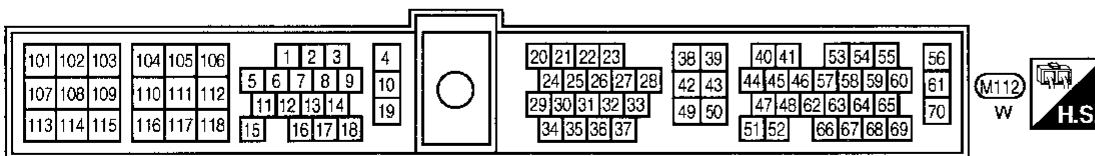
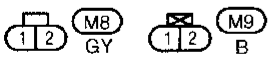
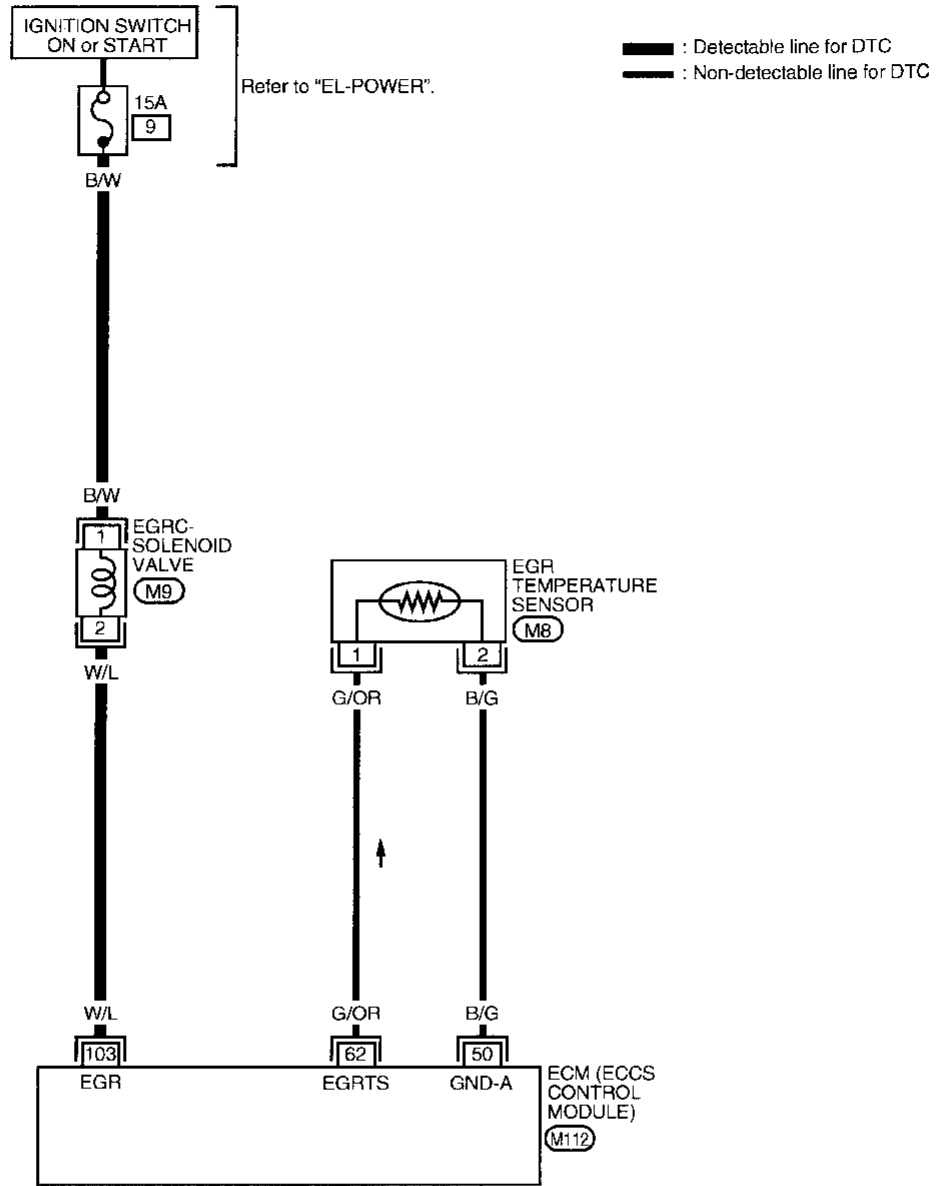
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# TROUBLE DIAGNOSIS FOR DTC P0400

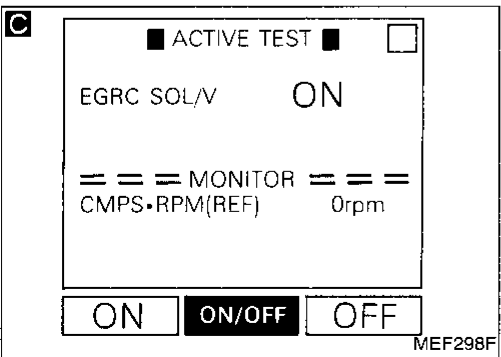
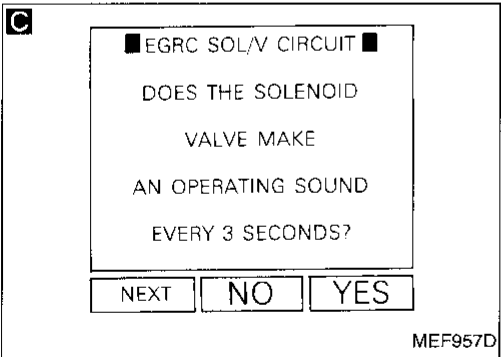
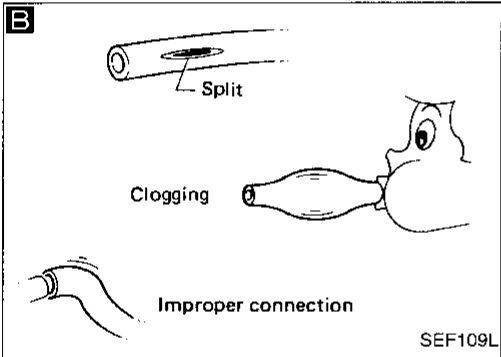
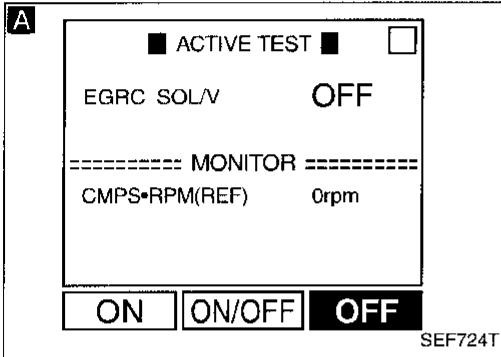
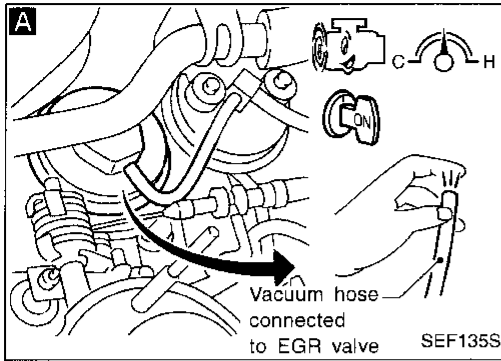
## EGR Function (Cont'd)

EC-EGRC1-01



# TROUBLE DIAGNOSIS FOR DTC P0400

## EGR Function (Cont'd) DIAGNOSTIC PROCEDURE



INSPECTION START

**A**

**CHECK VACUUM SOURCE TO EGR VALVE.**

1. Start engine and warm it up sufficiently.
2. Disconnect vacuum hose to EGR valve.
3. Check for vacuum existence.  
**Vacuum should not exist at idle.**
4. Check for vacuum existence when revving from 2,000 rpm up to 4,000 rpm with the following methods.
  - Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
  - OR
  - Disconnect EGRC-solenoid valve harness connector. (The 1st trip DTC for EGRC-solenoid valve will be displayed, however, ignore it.)**Vacuum should exist when revving engine.**

OK → **CHECK COMPONENTS** (EGR valve, and EGRC-BPT valve). Refer to "COMPONENT INSPECTION" on next page.

NG → **Replace malfunctioning component(s).**

**B**

**CHECK VACUUM HOSE.**  
Check vacuum hose for clogging, cracks or improper connection.

NG → **Replace EGRC-solenoid valve.**

**C**

**CHECK COMPONENT** (EGRC-solenoid valve).

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

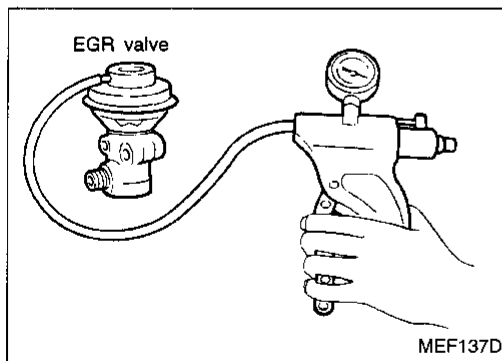
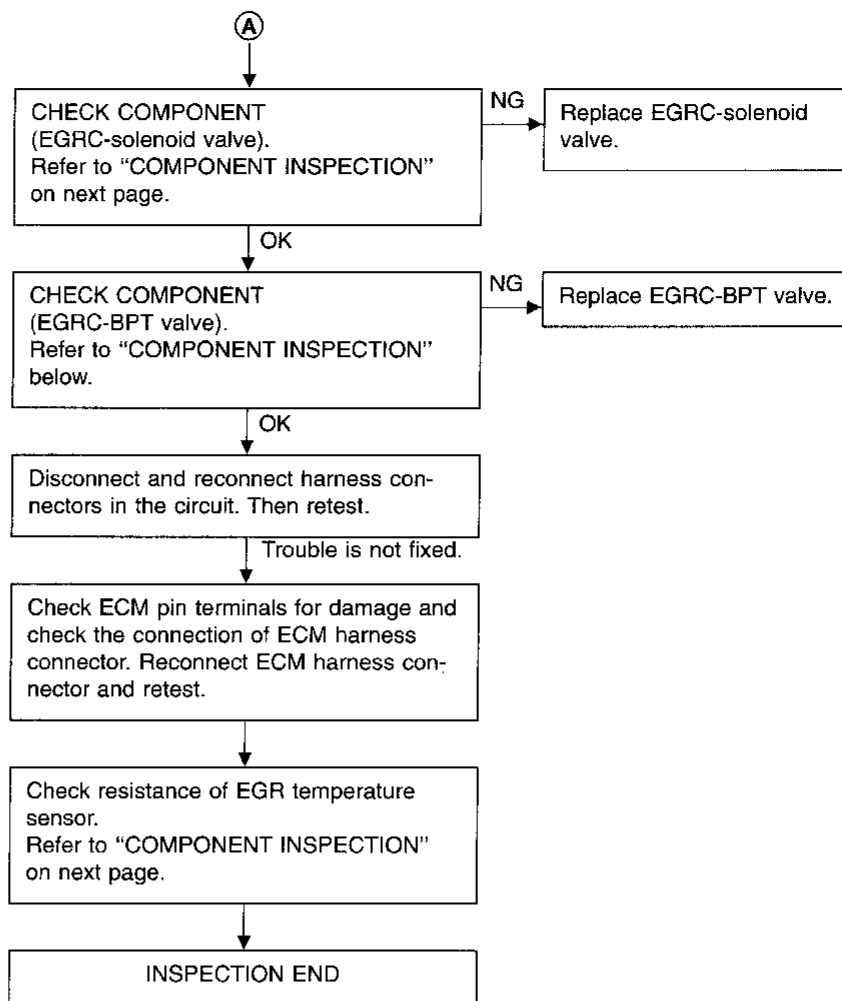
1. Turn ignition switch "ON".
2. Check operating sound of the solenoid valve when disconnecting and connecting EGRC-solenoid valve harness connector. (The DTC or 1st trip DTC for the EGRC-solenoid valve will be displayed, however, ignore it.)

OK → **(A)**  
(Go to next page.)

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# TROUBLE DIAGNOSIS FOR DTC P0400

## EGR Function (Cont'd)



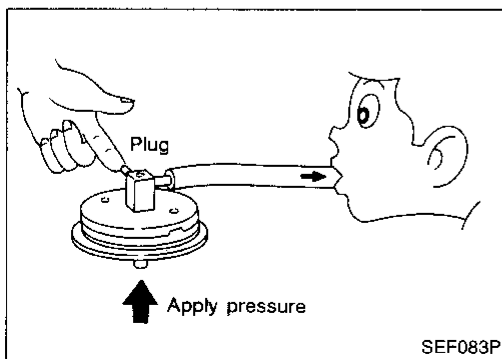
### COMPONENT INSPECTION

#### EGR valve

Apply vacuum to EGR valve vacuum port with a hand vacuum pump.

#### EGR valve spring should lift.

If NG, replace EGR valve.



#### EGRC-BPT valve

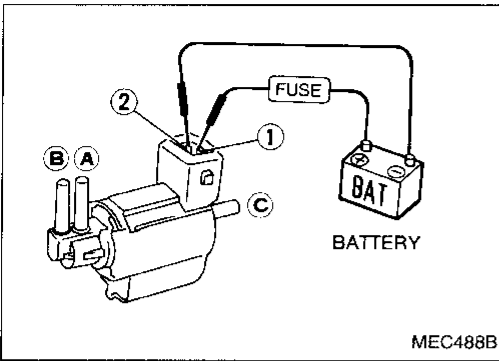
1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH<sub>2</sub>O, 3.94 inH<sub>2</sub>O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

# TROUBLE DIAGNOSIS FOR DTC P0400

## EGR Function (Cont'd)

### EGRC-solenoid valve

Check solenoid valve, following the table as shown below:

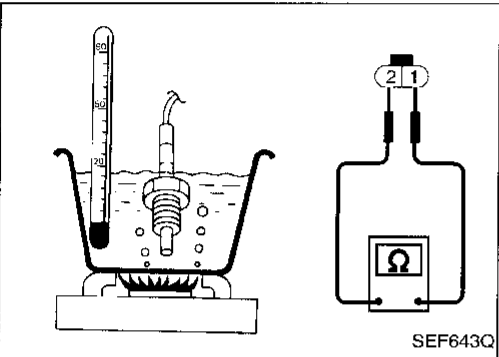


Conditions	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals (1) and (2)	Yes	No
No supply	No	Yes

If NG, replace the solenoid valve.

### EGR temperature sensor

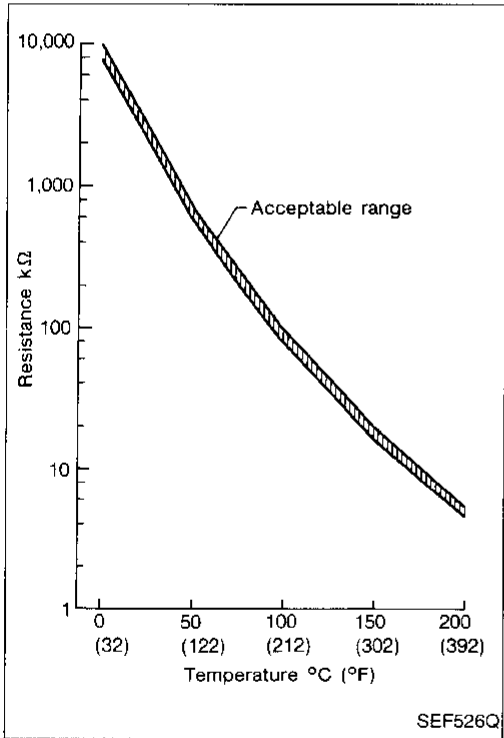
Check resistance change and resistance value.



<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

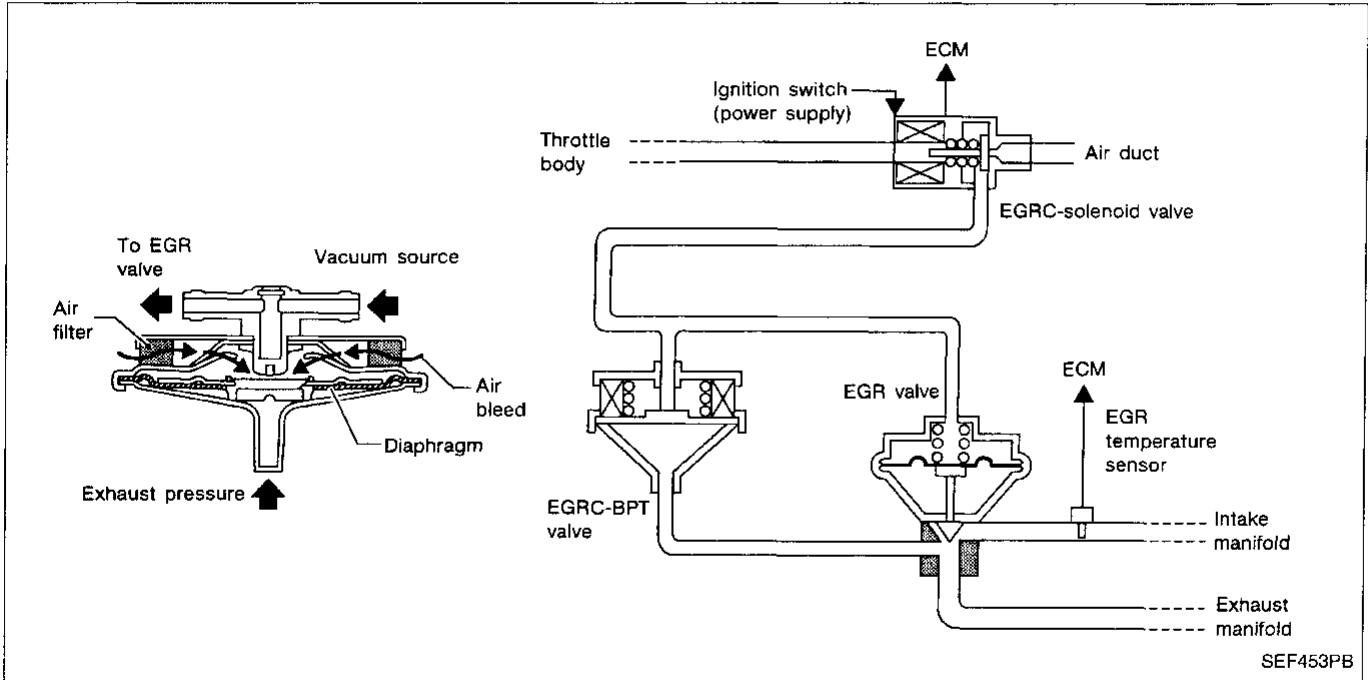
If NG, replace EGR temperature sensor.



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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	<ul style="list-style-type: none"> <li>● The EGRC-BPT valve does not operate properly.</li> </ul>	<ul style="list-style-type: none"> <li>● EGRC-BPT valve</li> <li>● Misconnected rubber tube</li> <li>● Blocked rubber tube</li> <li>● Intake manifold EGR passage</li> </ul>

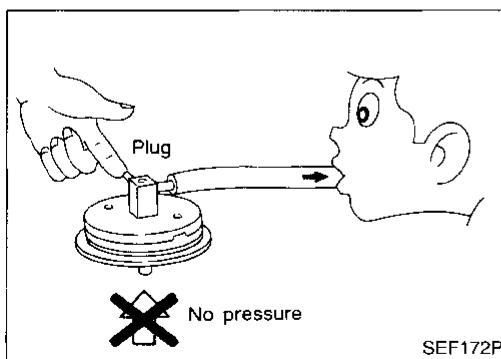
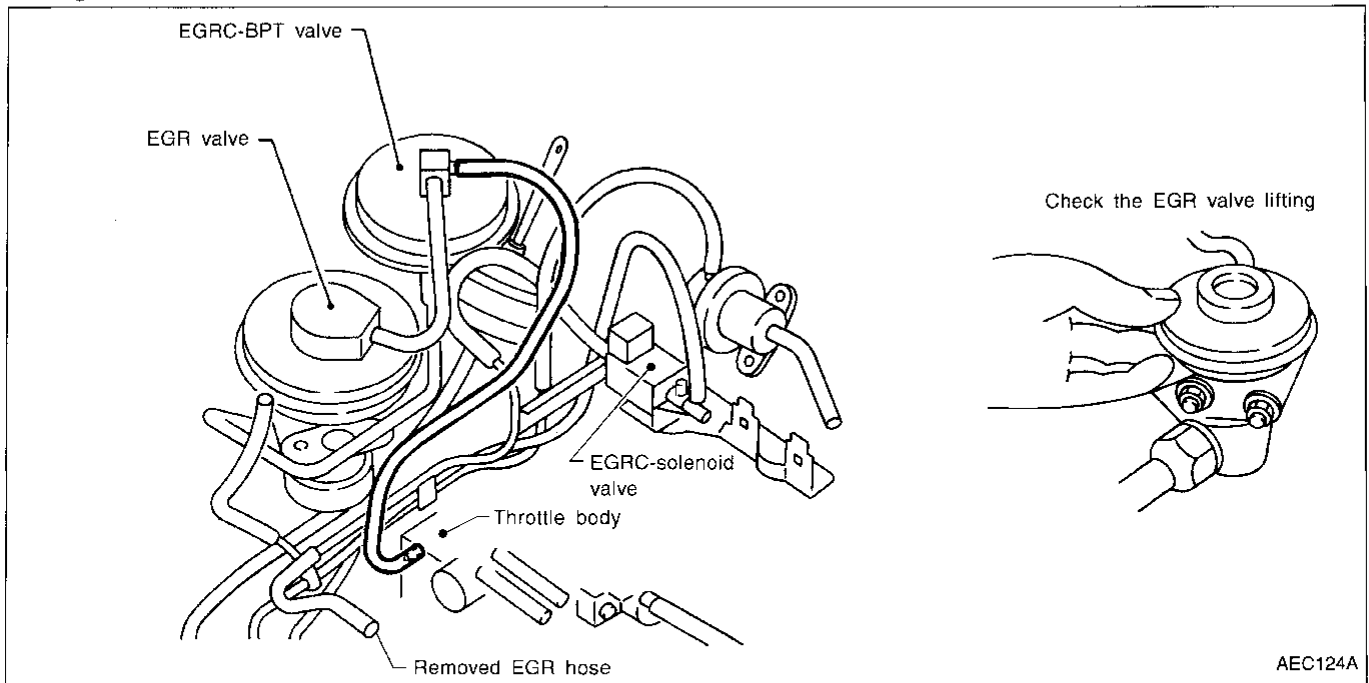
# TROUBLE DIAGNOSIS FOR DTC P0402

## EGRC-BPT Valve Function (Cont'd)

### 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. Disconnect the rubber tube to the EGRC-solenoid valve at the intake manifold.
2. Disconnect the rubber tube to the EGRC-solenoid valve at the EGRC-BPT valve. Connect the intake manifold and the EGRC-BPT valve. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
3. Start engine.
4. Check for the EGR valve lifting with engine at less than 1,500 rpm under no load.  
**EGR valve should remain closed.**
5. Check the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm 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.



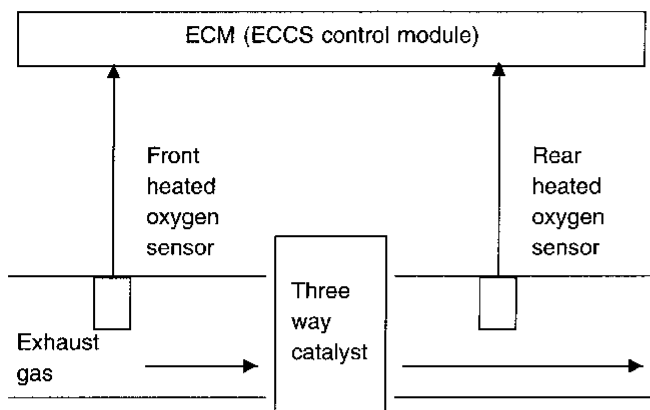
### COMPONENT INSPECTION

#### 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.**

## Three Way Catalyst Function

### ON BOARD DIAGNOSIS LOGIC



The ECM monitors the switching frequency ratio of front heated oxygen sensor and rear heated oxygen sensor.

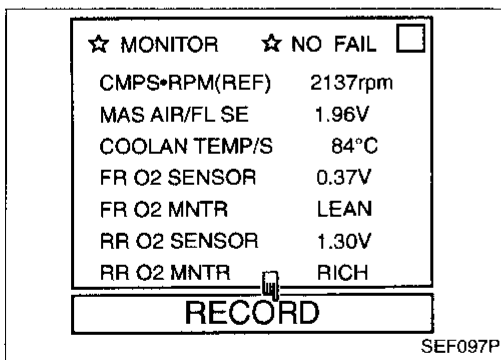
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.

When the frequency ratio of front heated oxygen sensor and rear heated oxygen sensor approaches a specified limit value, the three way catalyst malfunction is diagnosed.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0420 0702	<ul style="list-style-type: none"> <li>● Three way catalyst does not operate properly.</li> <li>● Three way catalyst does not have enough oxygen storage capacity.</li> </ul>	<ul style="list-style-type: none"> <li>● Three way catalyst</li> <li>● Exhaust tube</li> <li>● Intake air leak</li> <li>● Injectors</li> <li>● Injector leak</li> </ul>

### 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 warm it up sufficiently.
- 2) 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.
- 3) Touch "RECORD" on CONSULT screen with engine speed held at 2,000 rpm constant under no load.
- 4) Make sure that the switching frequency between "RICH" and "LEAN" of "RR O2 MNTR" is much less than that of "FR O2 MNTR".

**Switching frequency ratio =**

**Rear heated oxygen sensor switching frequency**

**Front heated oxygen sensor switching frequency**

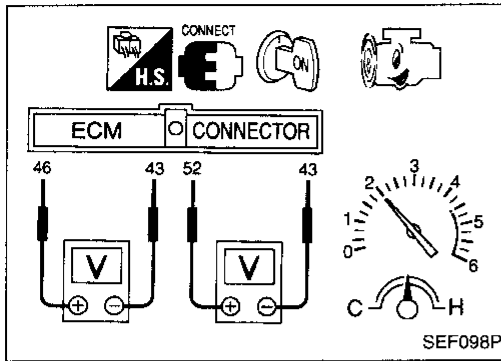
**This ratio should be less than 0.6 (2WD models) and 0.8 (4WD models).**

If the ratio is greater than above, the three way catalyst is not operating properly.

OR

## TROUBLE DIAGNOSIS FOR DTC P0420

### Three Way Catalyst Function (Cont'd)



- 1) Start engine and warm it up sufficiently.
- 2) Set voltmeter probes between ECM terminals ④⑥ (front heated oxygen sensor signal) and ④③ (engine ground), and ECM terminals ⑤② (rear heated oxygen sensor signal) and ④③ (engine ground).
- 3) Keep engine speed at 2,000 rpm constant under no load.
- 4) Make sure that the voltage switching frequency (high & low) between ECM terminals ⑤② and ④③ is much less than that of ECM terminals ④⑥ and ④③.

**Switching frequency ratio =**

**Rear heated oxygen sensor voltage switching frequency**

**Front heated oxygen sensor voltage switching frequency**

**This ratio should be less than 0.6 (2WD models) and 0.8 (4WD models).**

If the ratio is greater than above, it means three way catalyst does not operate properly.

Note: If the voltage at terminal ④⑥ does not switch periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC P0130 (Front heated oxygen sensor) first. (See page EC-129.)

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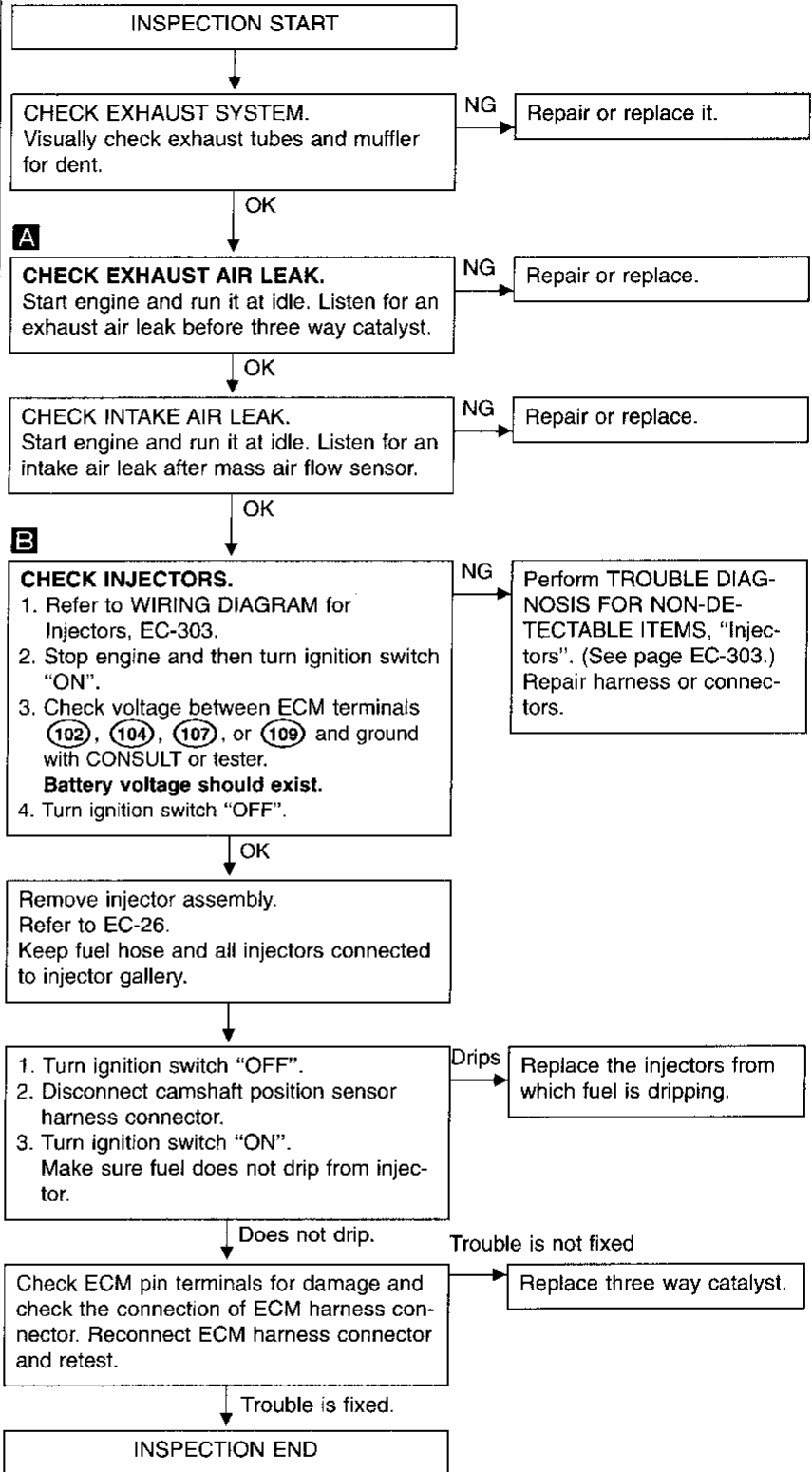
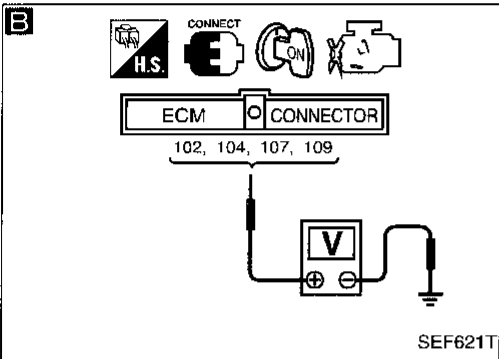
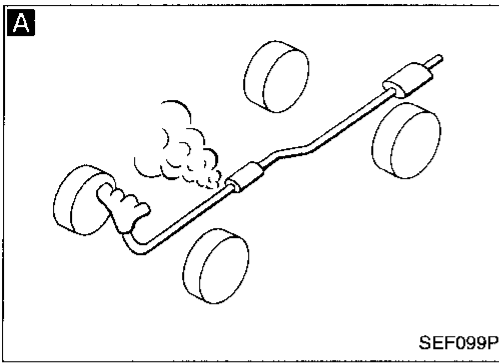
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# TROUBLE DIAGNOSIS FOR DTC P0420

## Three Way Catalyst Function (Cont'd)

### DIAGNOSTIC PROCEDURE



## Evaporative Emission (EVAP) Control System (Small Leak)

**Note:** If both DTC P0440 and P0446 are displayed, perform TROUBLE DIAGNOSIS FOR P0446 first. (See EC-207.)

### ON BOARD DIAGNOSIS LOGIC

This diagnosis uses two methods to detect leaks in the EVAP purge line.

The first method, the pressure test, makes use of vapor pressure in the fuel tank. The second method, the vacuum test, makes use of engine intake manifold vacuum.

#### Pressure test

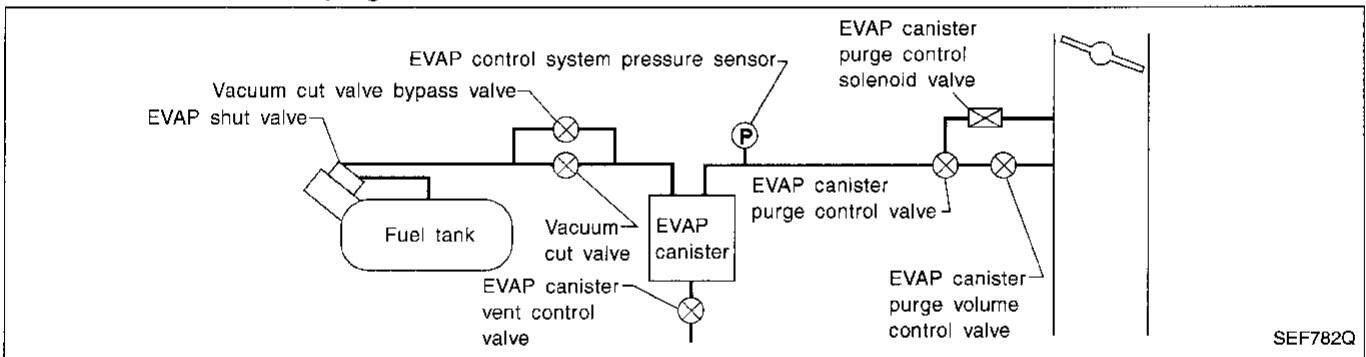
The EVAP canister vent control valve is closed to shut the EVAP purge line. The vacuum cut valve bypass valve will then be opened to clear the line between the fuel tank and the EVAP canister purge control valve. The EVAP control system pressure sensor can now monitor the pressure inside the fuel tank.

If pressure increases, the ECM will check for leaks in the line between the vacuum cut valve and EVAP canister purge control valve. If no pressure does not increase, the ECM will perform the "Vacuum test".

#### Vacuum test

If pressure does not increase in the "Pressure test", the ECM will check for leaks in the line between the fuel tank and EVAP canister purge control 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 control valve. The EVAP canister vent control valve will then be closed to shut the EVAP purge line off. The EVAP canister purge volume control valve and EVAP canister purge control valve are opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge control valve and EVAP canister purge volume control valve will be closed.



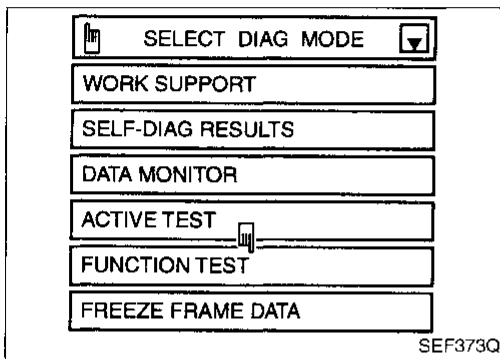
## TROUBLE DIAGNOSIS FOR DTC P0440

### Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P0440 0705	<ul style="list-style-type: none"> <li>● EVAP control system has a leak.</li> <li>● EVAP control system does not operate properly.</li> </ul>	<ul style="list-style-type: none"> <li>● Incorrect fuel tank vacuum relief valve</li> <li>● Incorrect fuel filler cap used</li> <li>● Fuel filler cap remains open or fails to close</li> <li>● Foreign matter caught in fuel filler cap</li> <li>● Leak is in line between intake manifold and EVAP canister purge control valve.</li> <li>● Foreign matter caught in EVAP canister vent control valve.</li> <li>● EVAP canister or fuel tank leaks</li> <li>● EVAP purge line (pipe and rubber tube) leaks</li> <li>● EVAP purge line rubber tube bent</li> <li>● Blocked or bent rubber tube to EVAP control system pressure sensor</li> <li>● Loose or disconnected rubber tube</li> <li>● EVAP canister purge control valve</li> <li>● EVAP canister purge volume control valve</li> <li>● EVAP canister purge control solenoid valve</li> <li>● Absolute pressure sensor</li> <li>● Tank fuel temperature sensor</li> <li>● MAP/BARO switch solenoid valve</li> <li>● Blocked or bent rubber tube to MAP/BARO switch solenoid valve</li> <li>● O-ring of EVAP canister vent control valve is missing or damaged</li> </ul>

#### CAUTION:

- Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may come on.
- If the fuel filler cap is not tightened properly, the MIL may come on.
- Use only a genuine rubber tube as a replacement.



#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

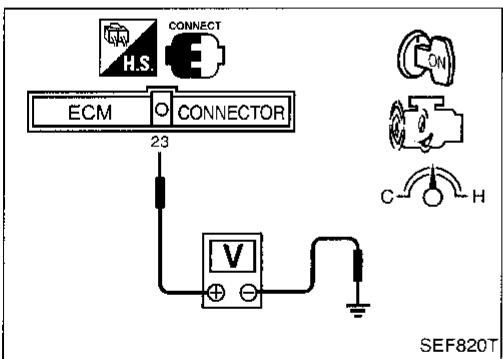
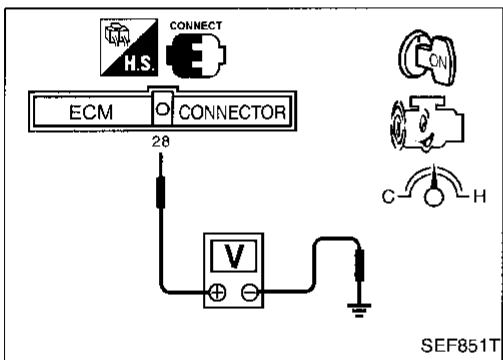
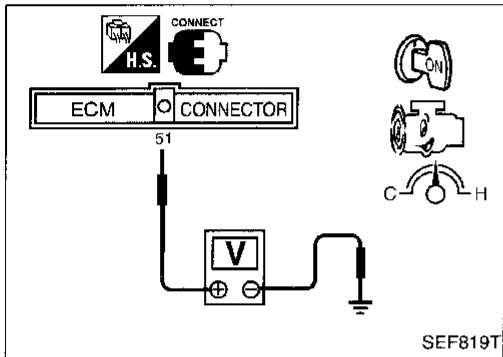
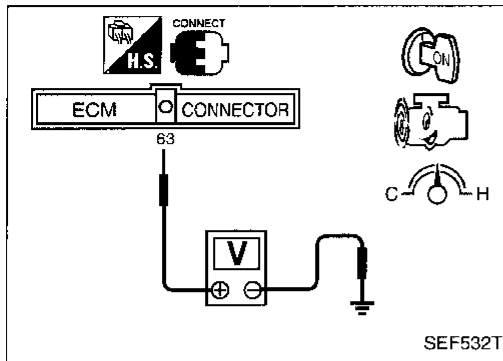


##### CAUTION:

- Always select "SINGLE TEST" with CONSULT when performing the "FUNCTION TEST".
  - Perform "FUNCTION TEST" when the fuel level is less than 3/4 full. If not, inspect fuel filler cap and fuel tank separately. Refer to EC-193.
- 1) Select "EVAP (SMALL LEAK)" in "FUNCTION TEST" mode with CONSULT.
  - 2) Make sure that "OK" is displayed with "EVAP (SMALL LEAK)". (If "NG" is displayed, refer to "DIAGNOSTIC PROCEDURE".)
  - 3) Check fuel filler cap and fuel tank when the fuel tank is more than 3/4 full.  
Refer to "DIAGNOSTIC PROCEDURE", EC-193.

## TROUBLE DIAGNOSIS FOR DTC P0440

### Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)



- 1) Start engine and warm it up sufficiently.
- 2) Check voltage between ECM terminal ⑥③ and ground (**Voltage 1**).  
**Voltage: 1.9 - 4.2V**
- 3) Check voltage between ECM terminal ⑤① and ground.  
**Voltage: 0.8 - 1.5V**  
**Perform the following procedure before the voltage drops below 0.8V. If the voltage drops below 0.8V, cool down the engine and perform the entire procedure over again.**
- 4) Check voltage between ECM terminal ②⑧ and ground.  
**Voltage: 1.9 - 4.1V**
- 5) Turn ignition switch "OFF" and wait at least 7 seconds.
- 6) Turn ignition switch "ON" and wait at least 12 seconds.
- 7) Restart engine and let it idle for at least 70 seconds.
- 8) Maintain the following conditions for at least 40 seconds consecutively.  
**Gear position: Suitable gear position**  
**Vehicle speed: 50 - 70 km/h (31 - 43 MPH)**  
**Engine speed: 1,500 - 2,500 rpm**
- 9) Decelerate the vehicle to 0 km/h and let engine idle.
- 10) Maintain the following conditions for at least 5 seconds consecutively.  
**Gear position: "1" or "2" position**  
**Vehicle speed: 40 - 60 km/h (25 - 37 MPH)**  
**Engine speed: 1,500 - 2,500 rpm**
- 11) Perform steps 9, 10 more than 10 times.
- 12) Decelerate the vehicle to 0 km/h and let engine idle.
- 13) Maintain the following condition for at least continuous 10 seconds.  
**Gear position: Suitable gear position**  
**Vehicle speed: 40 - 80 km/h (25 - 50 MPH)**  
**Engine speed: 1,000 - 3,000 rpm**
- 14) Decelerate the vehicle to 0 km/h and let engine idle, then wait at least 11 minutes.
- 15) Check voltage between ECM terminal ⑥③ and ground (**Voltage 2**).  
**Voltage: 1.9 - 4.2V**
- 16) Check voltage decrease between **voltage 1 and 2**.  
**Voltage 1 - Voltage 2 ≥ 0.1V**
- 17) Check voltage between ECM terminal ②③ and ground (**Voltage 3**).  
**Voltage: 0.3 - 0.7V**
- 18) Maintain the following conditions for 9 minutes measuring voltage between ECM terminal ②③ and ground (**Voltage 4**) after 12 minutes have passed from restarting engine in step 7.  
**Gear position: Suitable gear position**  
**Vehicle speed: 20 - 80 km/h (12 - 50 MPH)**  
**Engine speed: 800 - 2,200 rpm (A/T models)**  
**800 - 3,000 rpm (M/T models)**  
**Voltage 4 - Voltage 3 ≤ 0.5V (2WD M/T)**  
**0.7V (2WD A/T)**  
**0.8V (4WD)**
- 19) Stop the vehicle, turn ignition switch "OFF", wait at least 7 seconds, and then turn "ON".
- 20) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



## **TROUBLE DIAGNOSIS FOR DTC P0440**

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### **Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)**

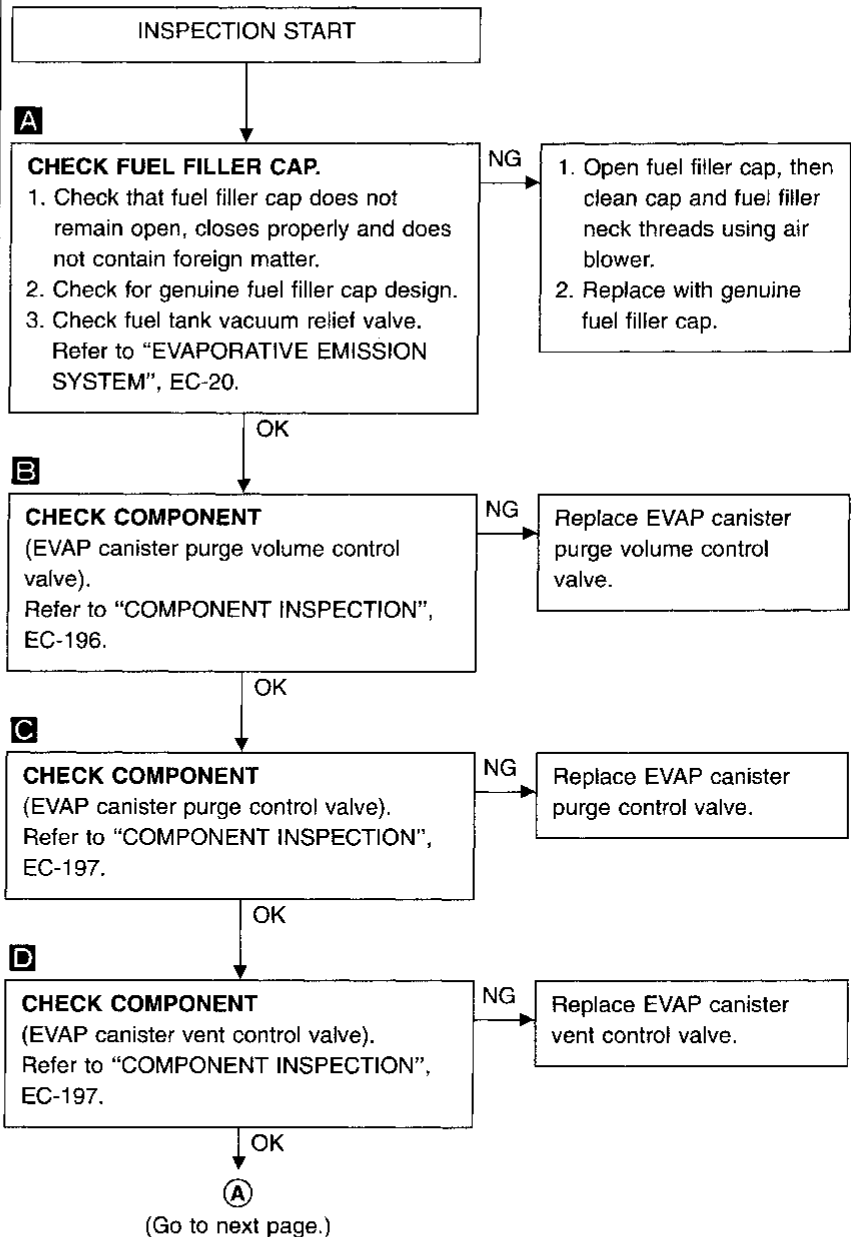
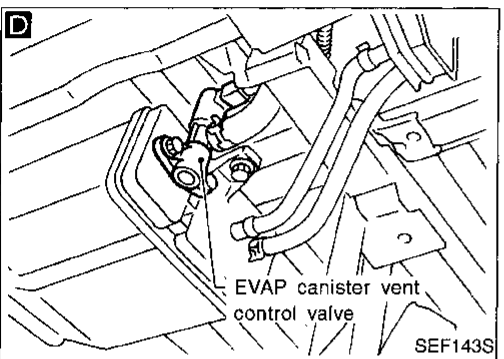
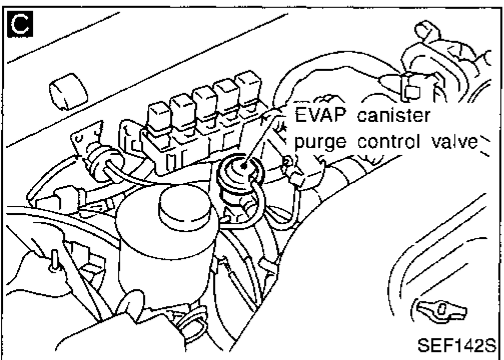
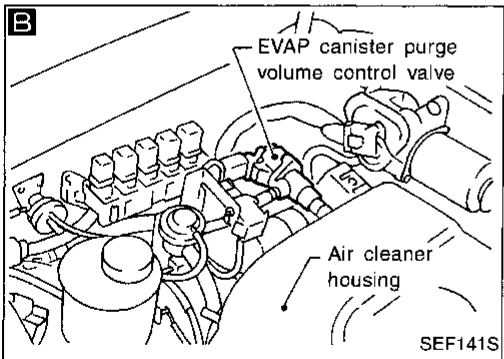
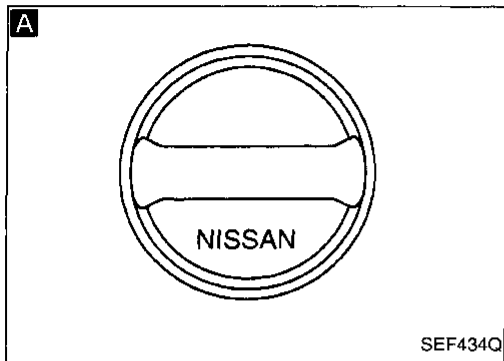
**NOTE:**

- Hold the accelerator pedal as steady as possible during driving in steps 8, 10, 13 and 18.
- If the driving conditions do not conform to those specified in steps 8, 10, 13 and 18, the procedure must be performed again under the specified conditions.
- It is better that the fuel level is low.
- While warming up the engine or idling it for more than 30 seconds, keep the engine hood open. Close the engine hood before driving the vehicle.

# TROUBLE DIAGNOSIS FOR DTC P0440

## Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

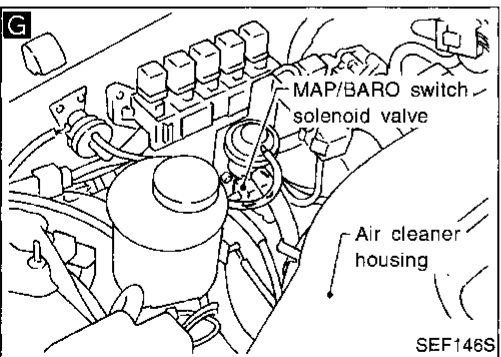
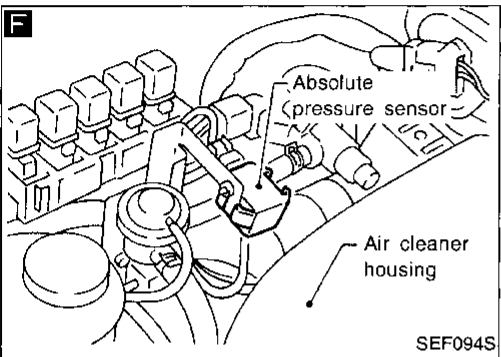
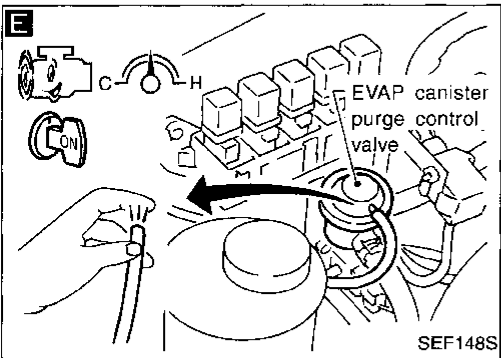
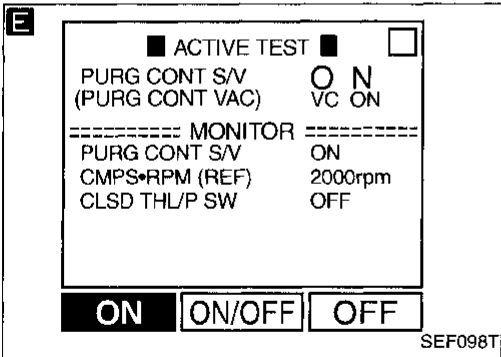
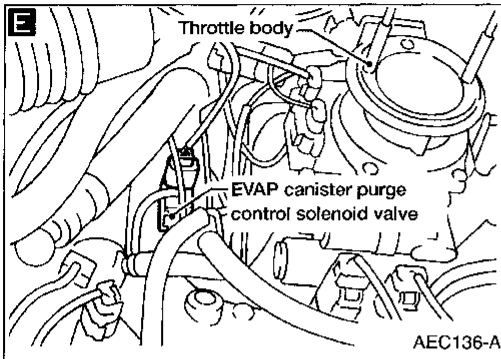
### DIAGNOSTIC PROCEDURE



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# TROUBLE DIAGNOSIS FOR DTC P0440

## Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)



(A)

**E**

**CHECK COMPONENT** (EVAP canister purge control solenoid valve).

1. Disconnect vacuum hose to EVAP canister purge control valve.
2. Start engine.
3. Perform "PURG CONT S/V" in "ACTIVE TEST" mode.
4. Select "ON" on CONSULT screen to turn on "PURG CONT S/V".
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 sufficiently.
2. Stop engine.
3. Lift up the vehicle.
4. Disconnect vacuum hose to EVAP canister purge control valve.
5. Start engine.
6. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

**Vacuum should exist.**

NG

Check the following.

- EVAP canister purge control solenoid valve  
Refer to "COMPONENTS INSPECTION", EC-197.
- Vacuum hoses for clogging or disconnection  
Refer to "Vacuum Hose Drawing", EC-22.

**F**

**CHECK COMPONENT** (Absolute pressure sensor).  
Refer to "COMPONENT INSPECTION", EC-197.

NG

Replace absolute pressure sensor.

**G**

**CHECK COMPONENT** (MAP/BARO switch solenoid valve).  
Refer to "COMPONENT INSPECTION", EC-198.

NG

Replace MAP/BARO switch solenoid valve.

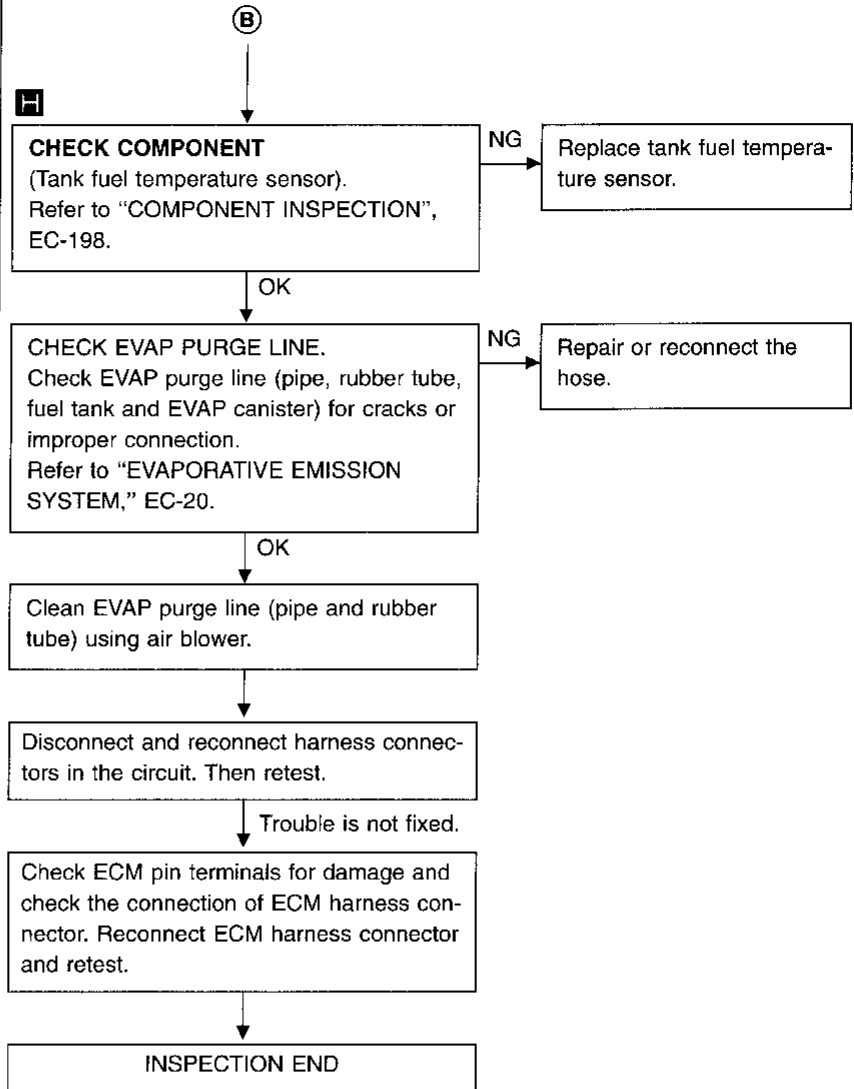
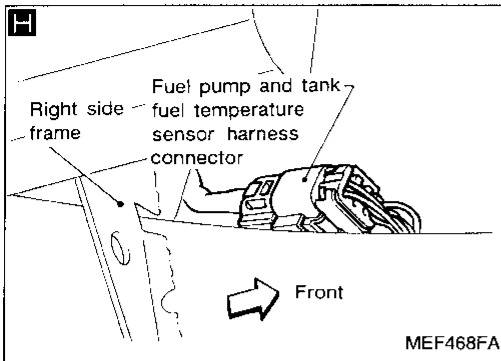
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# TROUBLE DIAGNOSIS FOR DTC P0440

## Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)



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# TROUBLE DIAGNOSIS FOR DTC P0440

## Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

### COMPONENT INSPECTION

#### EVAP canister purge volume control valve

1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.  
terminal ② and terminals ①, ③  
terminal ⑤ and terminals ④, ⑥

**Resistance:**

**Approximately 30Ω [At 25°C (77°F)]**

3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.  
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON".
6. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the valve opening.  
If NG, replace the EVAP canister purge volume control valve.

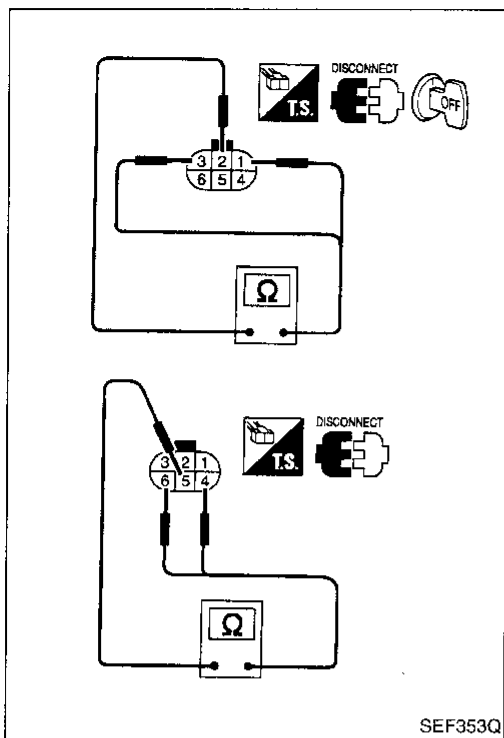
OR

1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.  
terminal ② and terminals ①, ③  
terminal ⑤ and terminals ④, ⑥

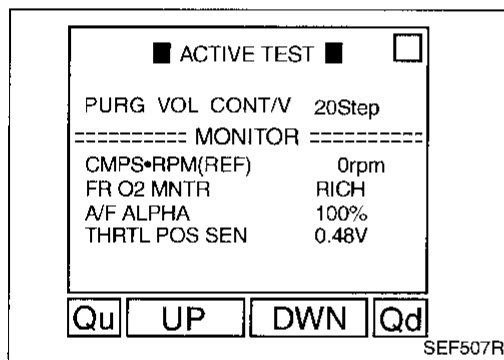
**Resistance:**

**Approximately 30Ω [At 25°C (77°F)]**

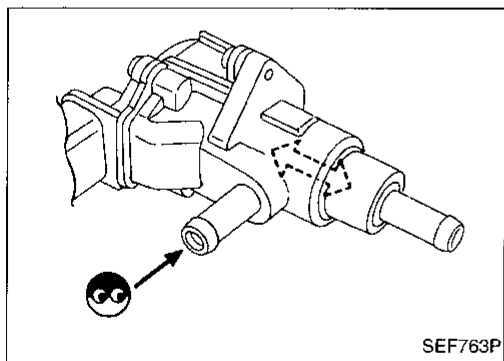
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.  
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON" and "OFF". Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the ignition switch position.  
If NG, replace the EVAP canister purge volume control valve.



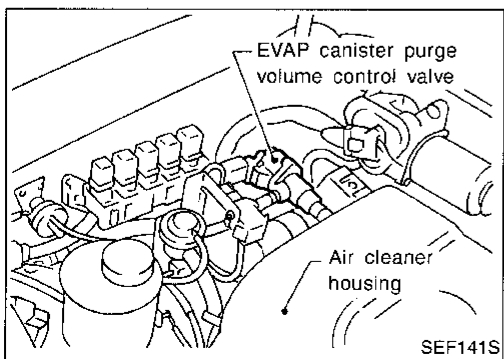
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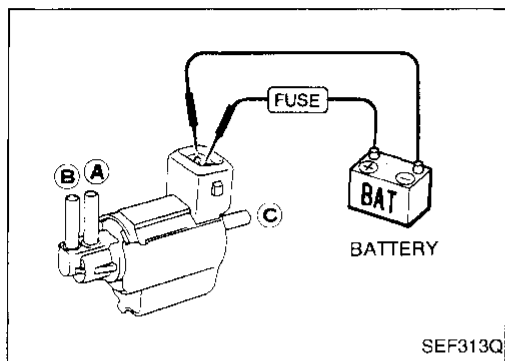
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# TROUBLE DIAGNOSIS FOR DTC P0440

## Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

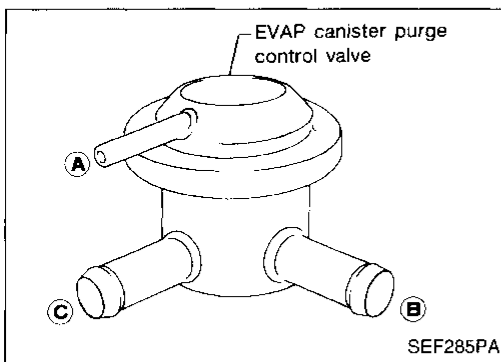
### EVAP canister purge control solenoid valve

Check air passage continuity.



Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals	Yes	No
No supply	No	Yes

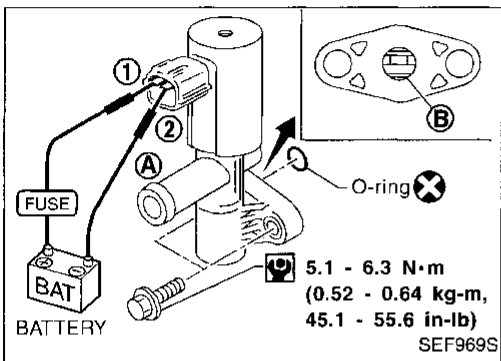
If NG, replace solenoid valve.



### EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Plug the port (B).
2. Apply pressure [80.0 kPa (600 mmHg, 23.62 inHg, 11.60 psi)] to port (A). Then keep it for 15 seconds, and check there is no leakage.
3. Repeat step 2 for port (C).

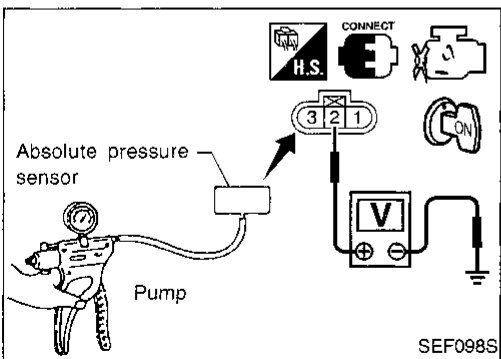


### EVAP canister vent control valve

Check air passage continuity.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals (1) and (2)	No
No supply	Yes

If NG, clean valve using air blower or replace as necessary. Make sure new O-ring is installed properly.



### Absolute pressure sensor

1. Remove absolute pressure sensor from bracket with its harness connector connected.
2. Remove hose from absolute pressure sensor.
3. Turn ignition switch "ON" and check output voltage between terminal (2) 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, -3.87 psi) 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.**

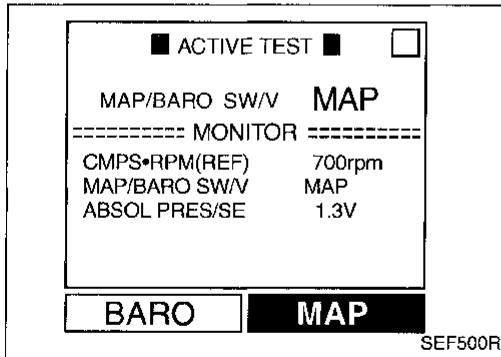
## TROUBLE DIAGNOSIS FOR DTC P0440

### Evaporative Emission (EVAP) Control System (Small Leak) (Cont'd)

#### CAUTION:

Always calibrate the vacuum pump gauge when using it.

- If NG, replace absolute pressure sensor.

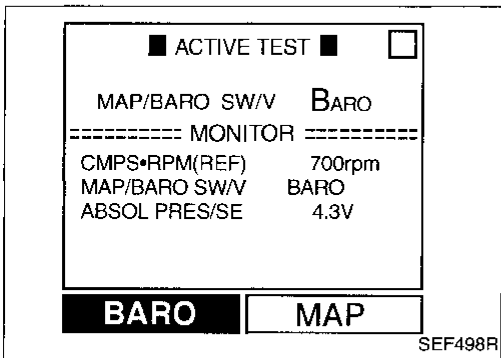


#### MAP/BARO switch solenoid valve

- Start engine and warm it up sufficiently.
- Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
- Check the following.
  - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
  - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
- If NG, replace solenoid valve.

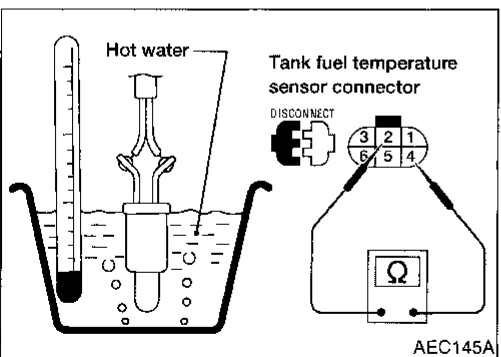
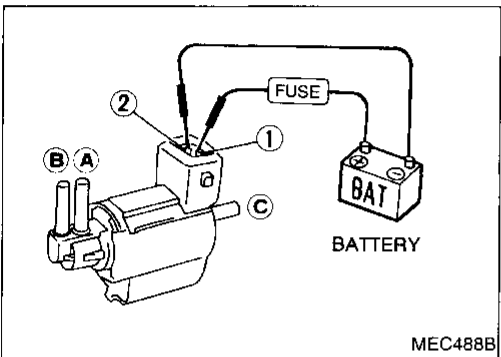
OR

- Remove MAP/BARO switch solenoid valve.
- Check air passage continuity.



Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

- If NG, replace solenoid valve.



#### Tank fuel temperature sensor

Check resistance by heating with hot water or heat gun as shown in the figure.

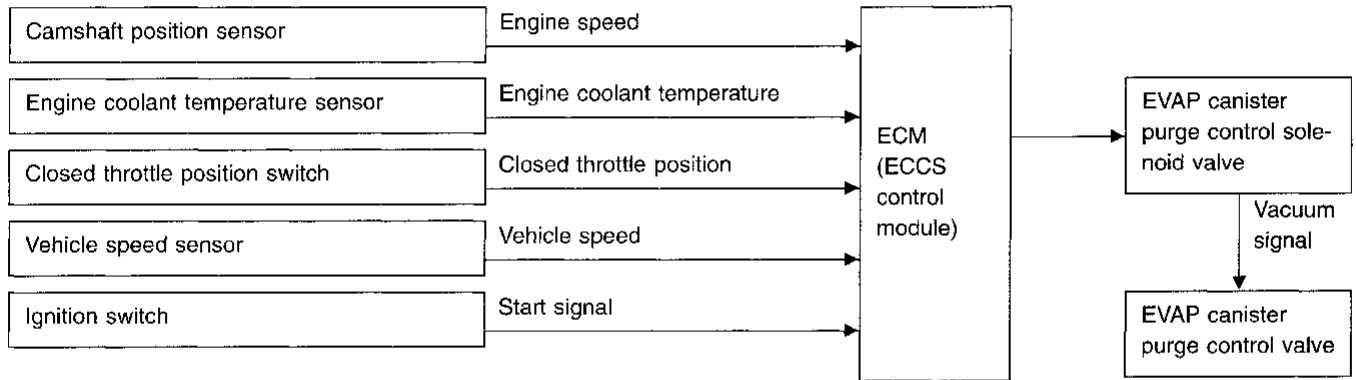
<Reference data>

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 Control Valve/Solenoid Valve

### SYSTEM DESCRIPTION



This system controls the vacuum signal applied to the EVAP canister purge control valve. When the ECM detects any of the following conditions, current does not flow through the EVAP canister purge control solenoid valve. The solenoid valve cuts the vacuum signal so that the EVAP canister purge control valve remains closed.

- Ignition switch "START"
- Closed throttle position
- Low or high engine coolant temperature
- During deceleration
- Engine stopped
- Low vehicle speed (M/T models)

### ECM TERMINALS AND REFERENCE VALUE

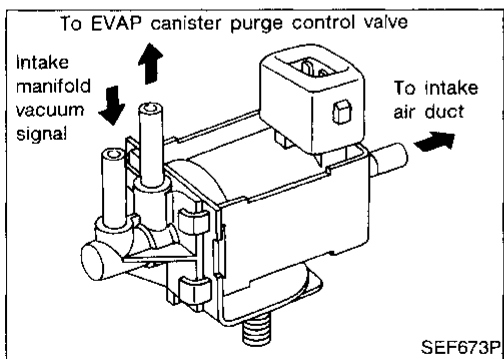
Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
105	W/R	EVAP canister purge control solenoid valve	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Idle speed	BATTERY VOLTAGE (11 - 14V)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
PURG CONT S/V	● Engine: After warming up	Idle
		2,000 rpm
		OFF
		ON



### COMPONENT DESCRIPTION

#### EVAP canister purge control solenoid valve

The EVAP canister purge control solenoid valve responds to signals from the ECM. When the ECM sends an OFF signal, the vacuum signal (from the intake manifold to the EVAP canister purge control valve) is cut. When the ECM sends an ON (ground) signal, the vacuum signal passes through the EVAP canister purge control solenoid valve. The signal then opens the EVAP canister purge control valve.

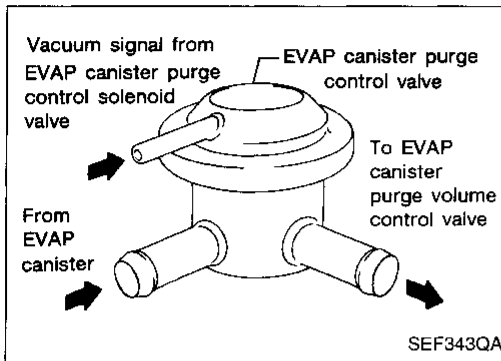


## TROUBLE DIAGNOSIS FOR DTC P0443

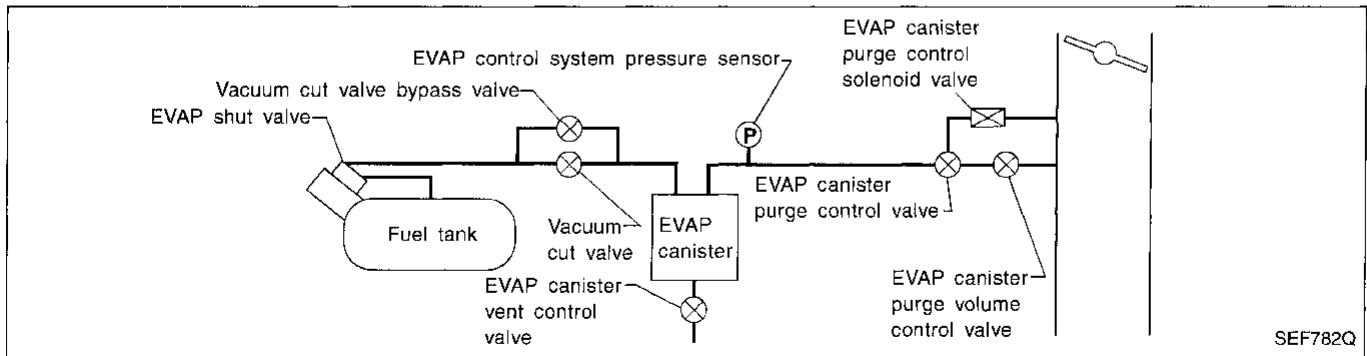
### Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

#### EVAP canister purge control valve

When the vacuum signal is cut by EVAP canister purge control solenoid valve, EVAP canister purge control valve closes.



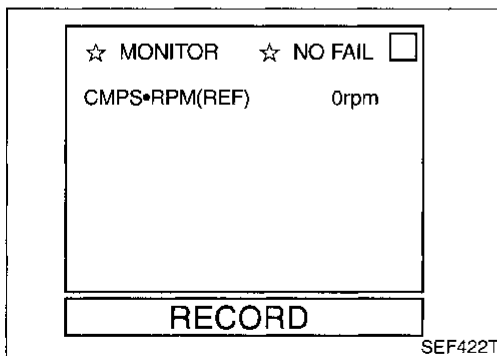
### EVAPORATIVE EMISSION SYSTEM DIAGRAM



Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P0443 0807	A) An improper voltage signal is sent to ECM through EVAP canister purge control solenoid valve.  B) EVAP canister purge control valve does not operate properly (stuck open).	<ul style="list-style-type: none"> <li>● Harness or connectors (The EVAP canister purge control solenoid valve circuit is open or shorted.)</li> <li>● EVAP canister purge control solenoid valve</li> <li>● EVAP canister purge control valve</li> <li>● EVAP canister purge control solenoid valve</li> <li>● Vacuum hoses for clogging or disconnection</li> <li>● EVAP control system pressure sensor</li> </ul>

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B" on next page.



#### Procedure for malfunction A

- 1) Turn ignition switch "ON".
  - 2) Select "DATA MONITOR" mode with CONSULT.
  - 3) Wait at least 5 seconds.
- OR
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
  - 2) Select "MODE 7" with GST.
- OR
- 1) Turn ignition switch "ON" and wait at least 5 seconds.
  - 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
  - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P0443

## Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

☆ MONITOR	☆ NO FAIL
CMPS•RPM (POS)	2000rpm
COOLAN TEMP/S	80°C
VHCL SPEED SE	65km/h
TANK F/TMP SE	22°C
<b>RECORD</b>	

SEF816T

### Procedure for malfunction B

- 1) Lift up vehicle.
- 2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and warm it up sufficiently.
- 4) Check that tank fuel temperature is above 0°C (32°F).
- 5) Turn ignition switch "OFF" and wait at least 7 seconds.
- 6) Turn ignition switch "ON" and wait at least 12 seconds.
- 7) Start engine and let it idle for at least 70 seconds.
- 8) Maintain the following conditions for at least 10 seconds.

#### Gear position:

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

#### Vehicle speed:

50 - 80 km/h (31 - 50 MPH)

#### Engine speed:

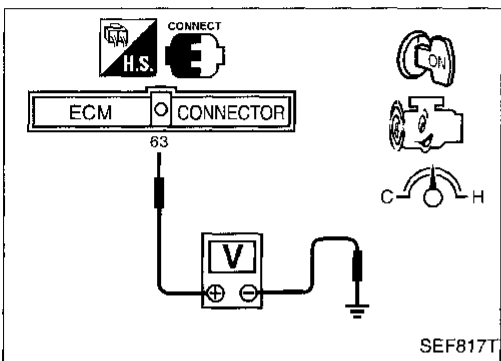
1,500 - 2,500 rpm

#### Coolant temperature:

Less than 100°C (212°F)

ENGINE SPD	825RPM
<b>COOLANT TEMP</b>	<b>69°C</b>
VEHICLE SPD	0MPH
IGN ADVANCE	8.0°
CALC LOAD	28.2%
MAP	36KPaA
MAF	5.20gm/s
THROTTLE POS	0.0%
INTAKE AIR	27°C
FUEL SYS #1	OLDRIVE
FUEL SYS #2	UNUSED
SHORT FT #1	0.8%
LONG FT #1	0.0%
O2S B1 S1	0.200V
O2FT B1 S1	0.8%
O2S B1 S2	0.010V

SEF519R



OR

- 1) Lift up vehicle.
- 2) Turn ignition switch "ON" and select "MODE 1" with GST.
- 3) Start engine and warm it up sufficiently.
- 4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
- 5) Turn ignition switch "OFF" and wait at least 7 seconds.
- 6) Turn ignition switch "ON" and wait at least 12 seconds.
- 7) Start engine and let it idle for at least 70 seconds.
- 8) Maintain the following conditions for at least 10 seconds.

#### Gear position:

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

#### Vehicle speed:

50 - 80 km/h (31 - 50 MPH)

#### Engine speed:

1,500 - 2,500 rpm

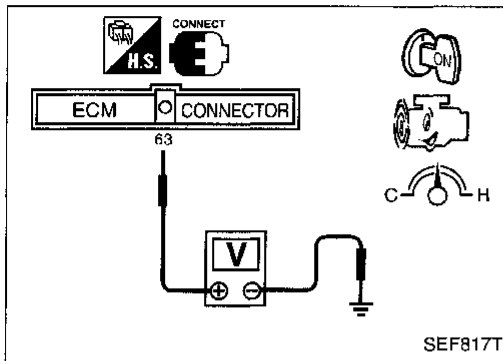
#### Coolant temperature:

Less than 100°C (212°F)

- 9) Select "MODE 7" with GST.

## TROUBLE DIAGNOSIS FOR DTC P0443

### Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)



OR

NO TOOLS

- 1) Lift up vehicle.
- 2) Start engine and warm it up sufficiently.
- 3) Check that voltage between ECM terminal ⑥③ and ground is less than 4.2V.
- 4) Turn ignition switch "OFF" and wait at least 7 seconds.
- 5) Turn ignition switch "ON" and wait at least 12 seconds.
- 6) Start engine and let it idle for at least 70 seconds.
- 7) Maintain the following conditions for at least 10 seconds.

#### Gear position:

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

#### Vehicle speed:

50 - 80 km/h (31 - 50 MPH)

#### Engine speed:

1,500 - 2,500 rpm

#### Voltage between ECM terminal ⑤① and ground:

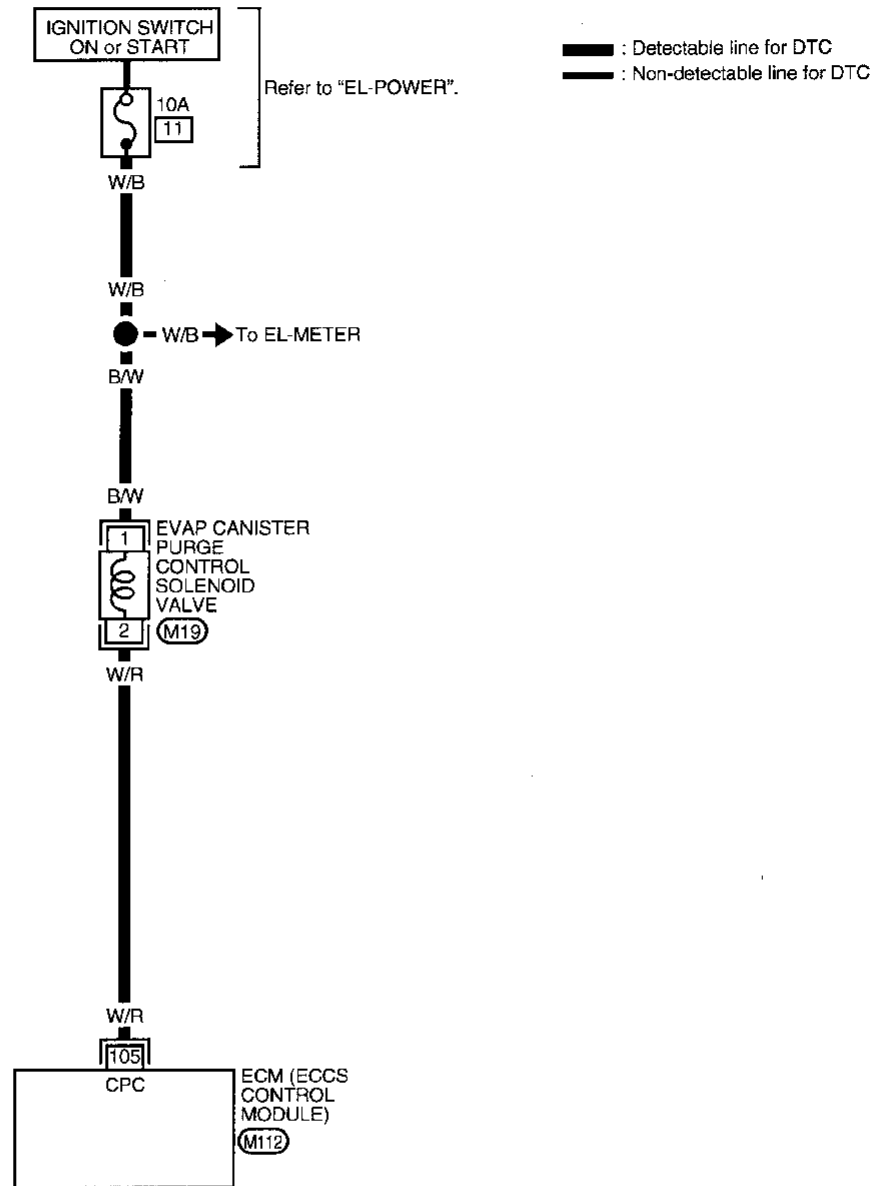
More than 0.8V

- 8) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

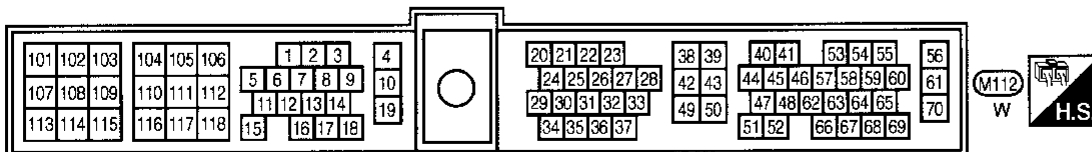
# TROUBLE DIAGNOSIS FOR DTC P0443

## Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

EC-CANI/V-01



GI  
MA  
EM  
LC  
**EC**  
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AT  
TF  
PD  
FA  
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ST  
RS  
BT  
HA  
EL  
IDX

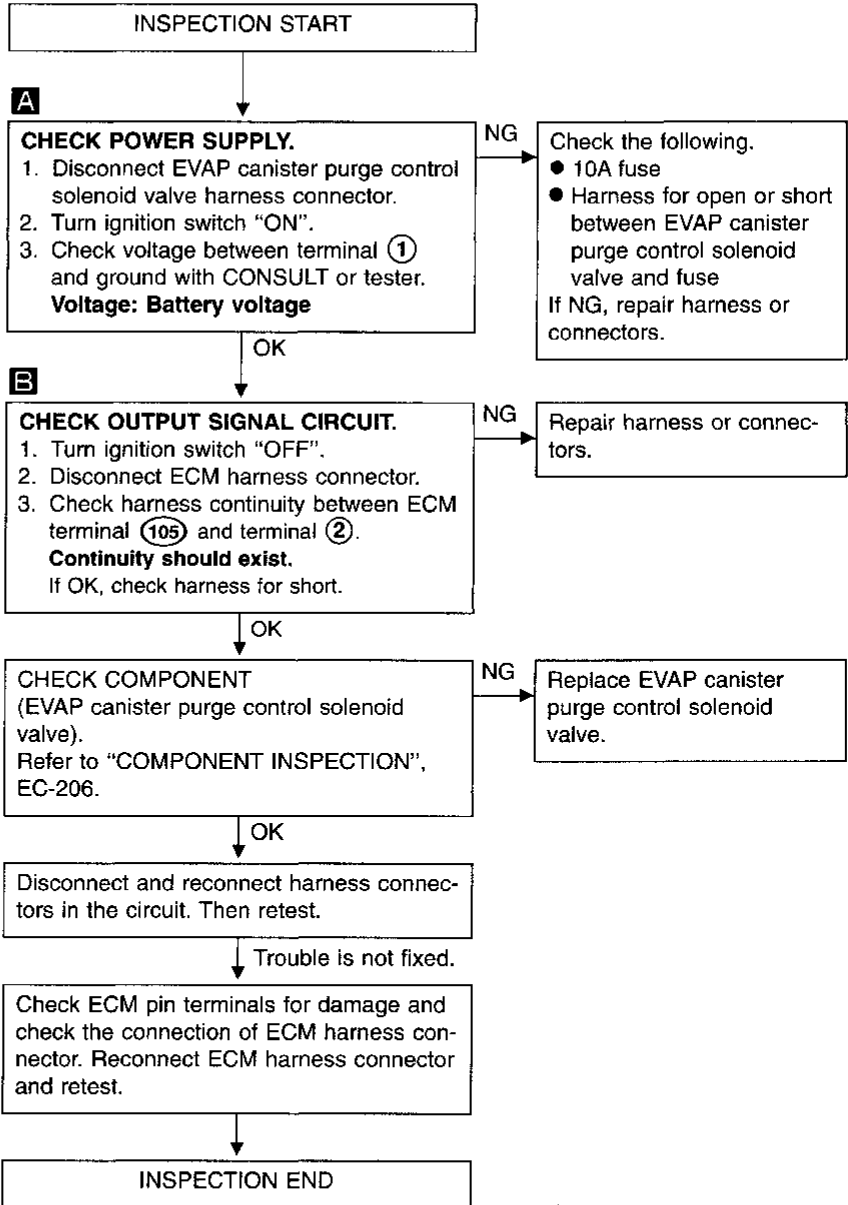
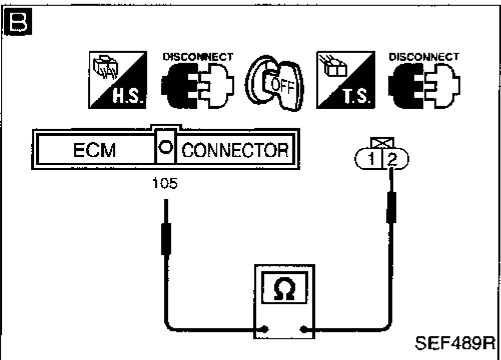
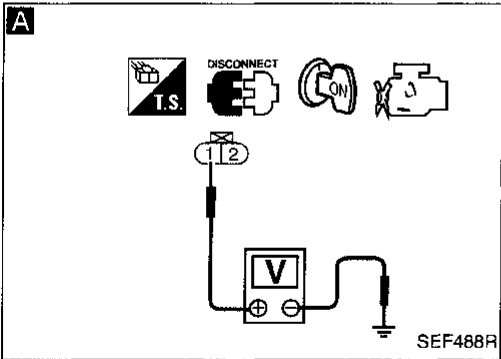
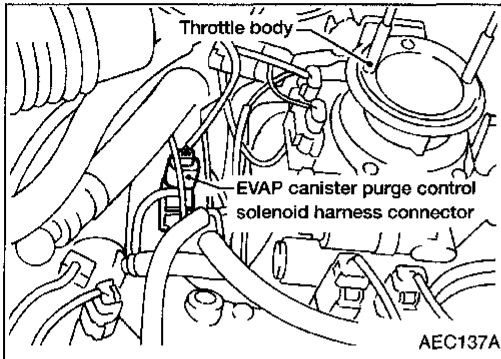


# TROUBLE DIAGNOSIS FOR DTC P0443

## Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE

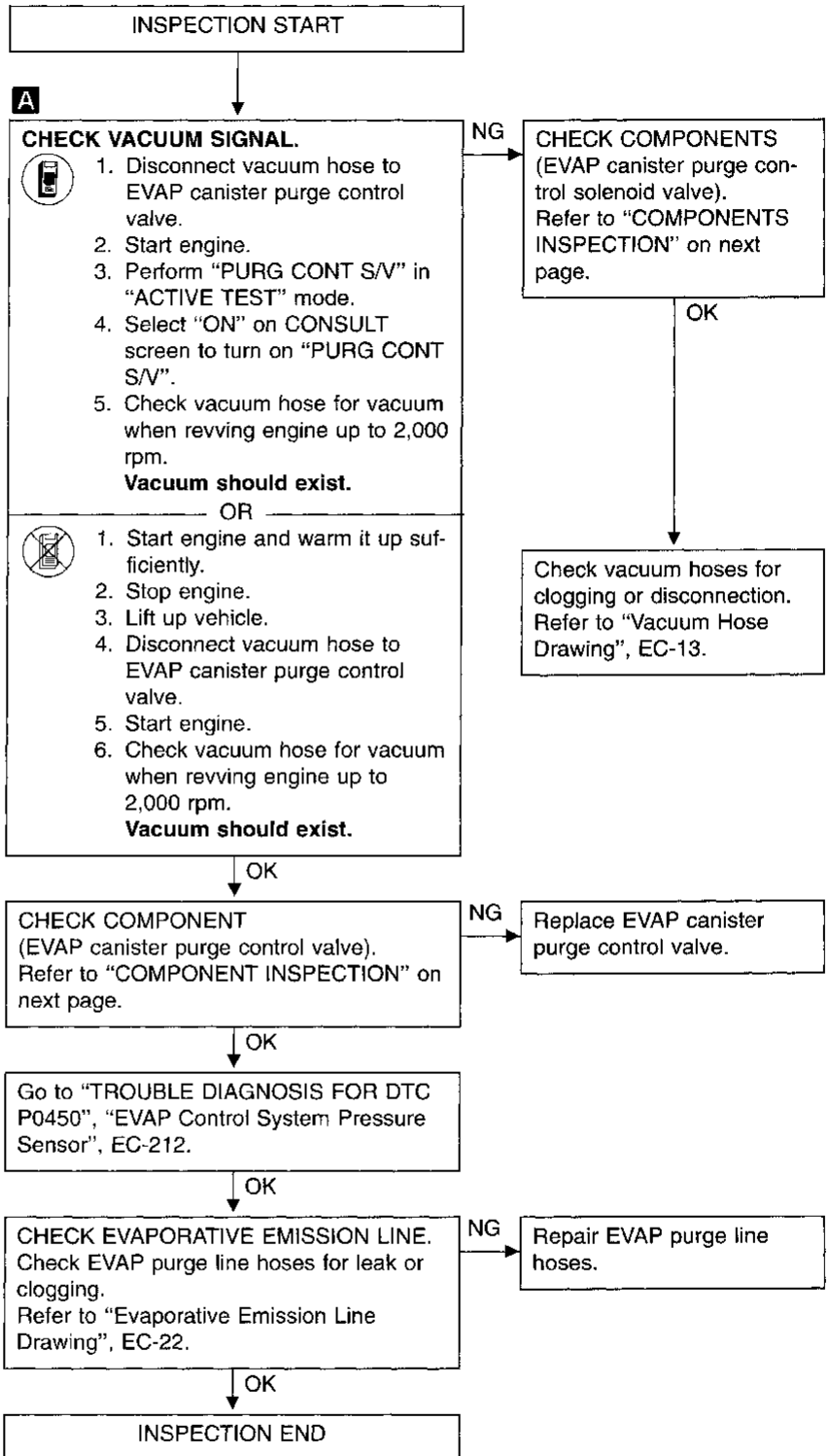
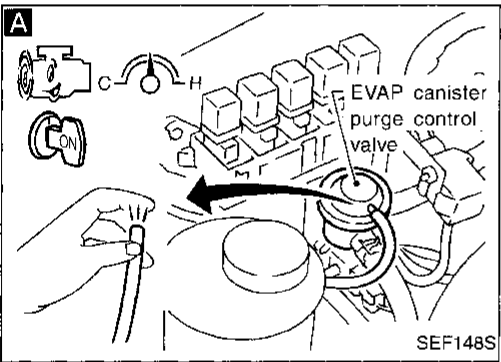
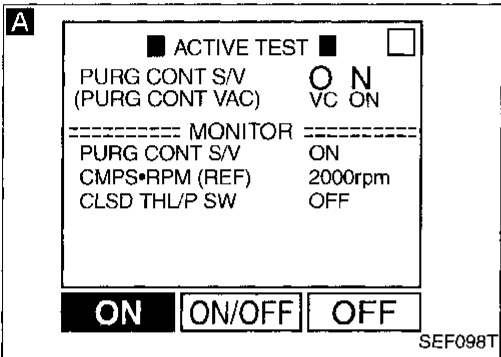
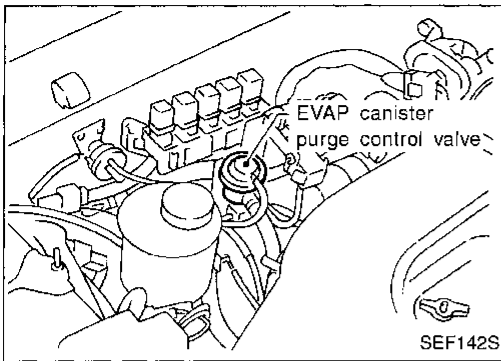
#### Procedure for malfunction A



# TROUBLE DIAGNOSIS FOR DTC P0443

## Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

### Procedure for malfunction B



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

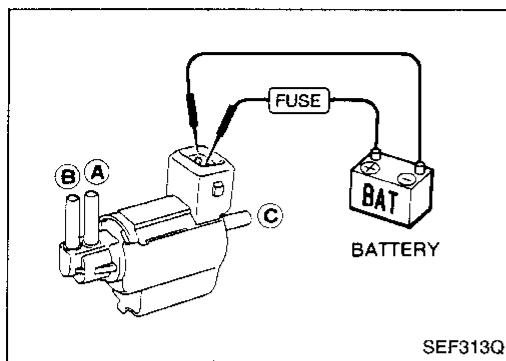
## TROUBLE DIAGNOSIS FOR DTC P0443

### Evaporative Emission (EVAP) Canister Purge Control Valve/Solenoid Valve (Cont'd)

#### COMPONENT INSPECTION

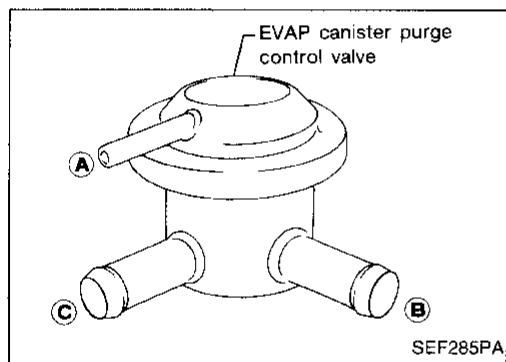
#### EVAP canister purge control solenoid valve

Check air passage continuity.



Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

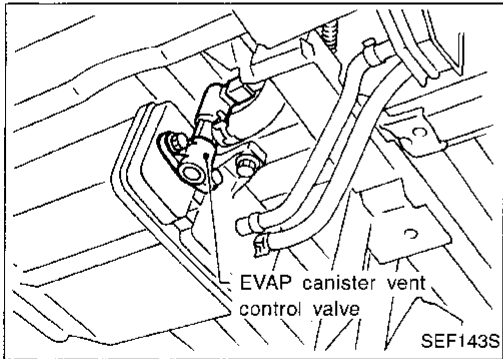
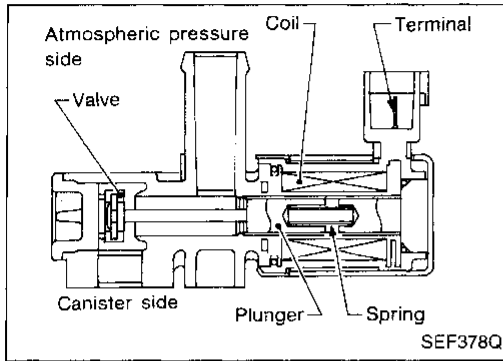


#### EVAP canister purge control valve

Check EVAP canister purge control valve as follows.

1. Plug the port (B).
2. Apply pressure [80.0 kPa (600 mmHg, 23.62 inHg, 11.60 psi)] to port (A). Then keep it for 15 seconds, and check there is no leakage.
3. Repeat step 2 for port (C).

# TROUBLE DIAGNOSIS FOR DTC P0446



## Evaporative Emission (EVAP) Canister Vent Control Valve

**Note:** If both DTC P0440 and P0446 are displayed, perform TROUBLE DIAGNOSIS FOR P0446 first.

### 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 loss 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 loss system is depressurized and allows "EVAP Control System (Small Leak)" diagnosis.

### ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
108	R	EVAP canister vent control valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	● Ignition switch: ON	OFF

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P0446 0903	A) 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.)
	B) EVAP canister vent control valve does not operate properly.	● EVAP canister vent control valve ● EVAP control system pressure sensor ● Blocked rubber tube to EVAP canister vent control valve

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




## TROUBLE DIAGNOSIS FOR DTC P0446

### Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)


#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A". If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B" on next page.


##### Procedure for malfunction A

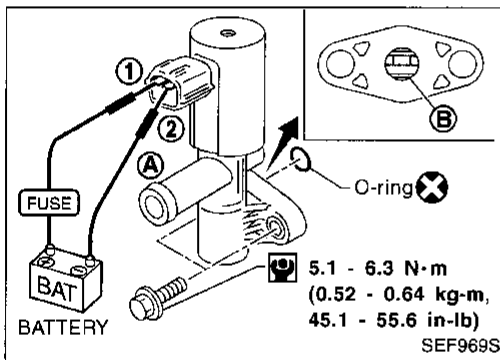
-  1) Turn ignition switch "ON".  
2) Select "DATA MONITOR" mode with CONSULT.  
3) Start engine and wait at least 5 seconds.

OR

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

OR

-  1) Start engine and wait at least 5 seconds.  
2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".  
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



#### OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EVAP canister vent control valve circuit. During this check, a 1st trip DTC might not be confirmed.

##### Procedure for malfunction B

- Remove EVAP canister vent control valve from EVAP canister and disconnect hoses from the valve.
- Check air passage continuity.

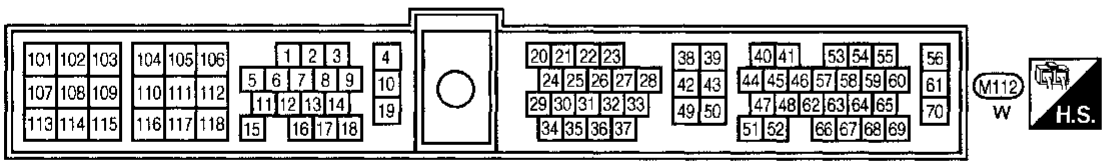
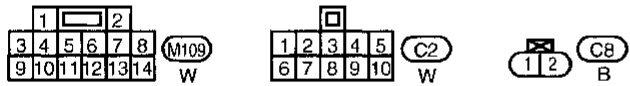
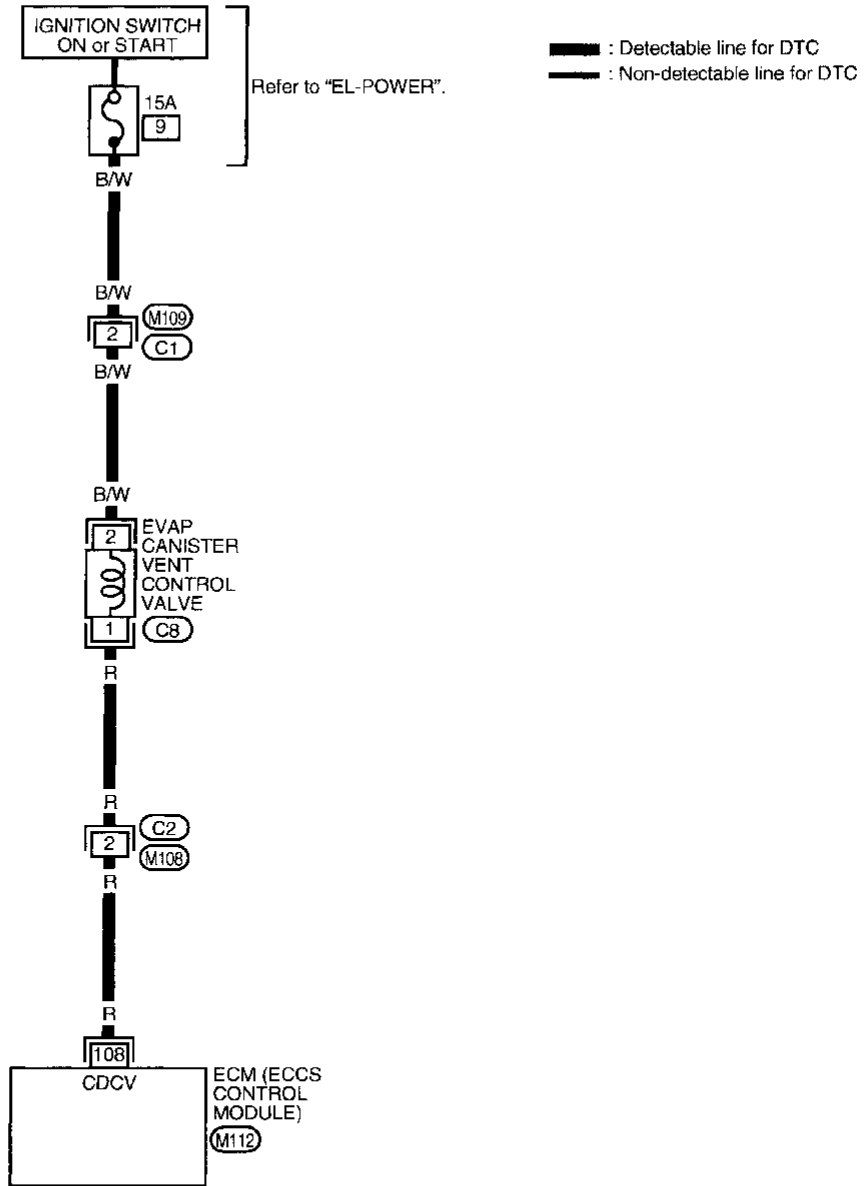
Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals (1) and (2)	No
No supply	Yes

Make sure new O-ring is installed properly.

# TROUBLE DIAGNOSIS FOR DTC P0446

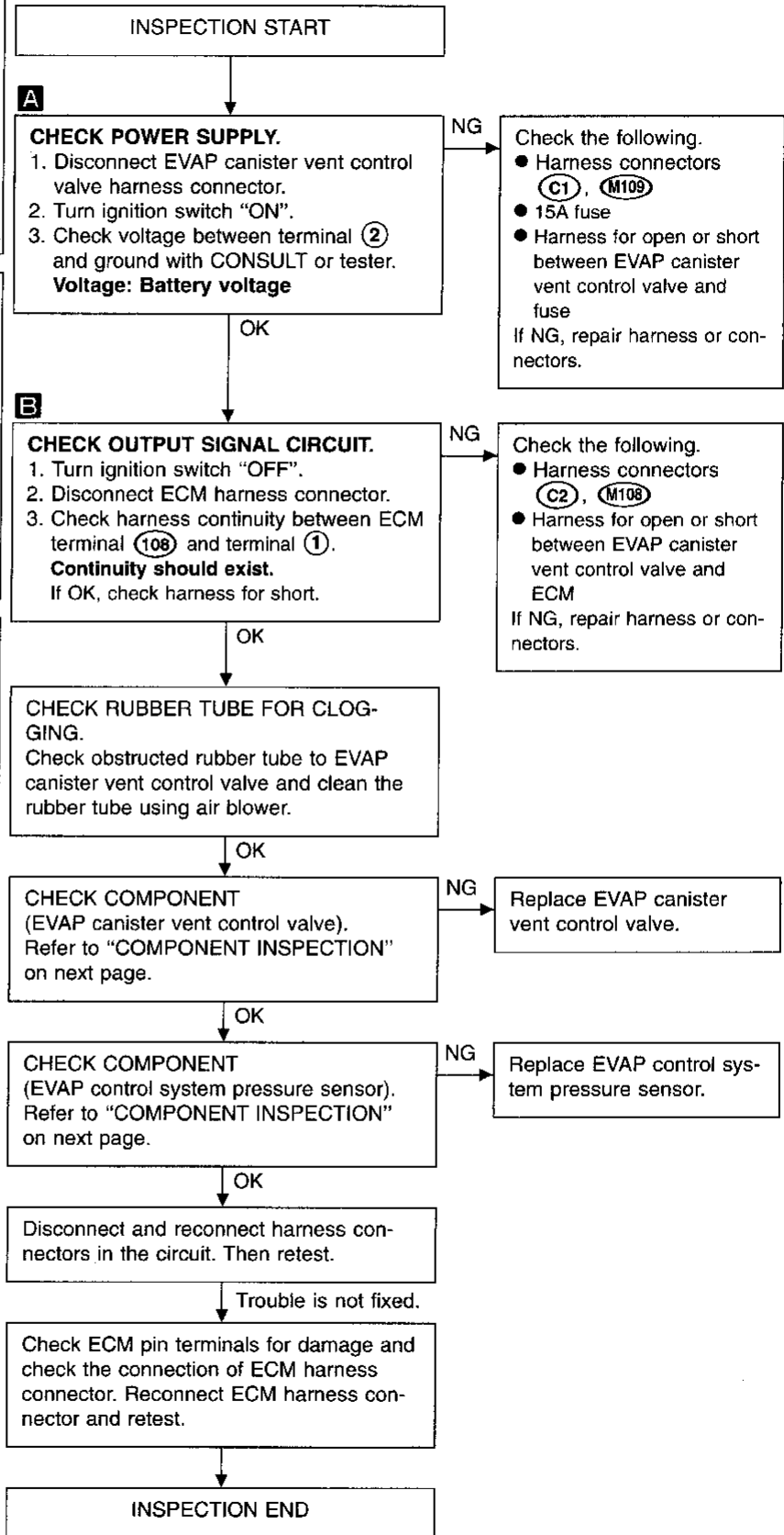
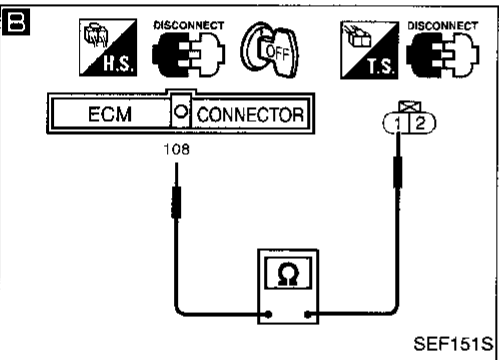
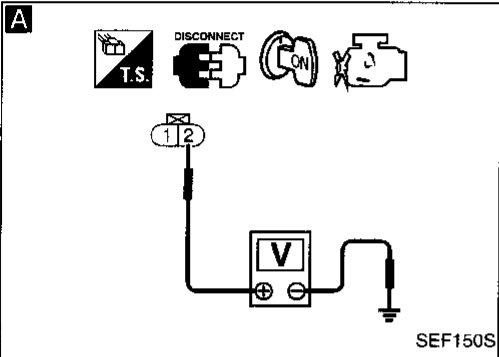
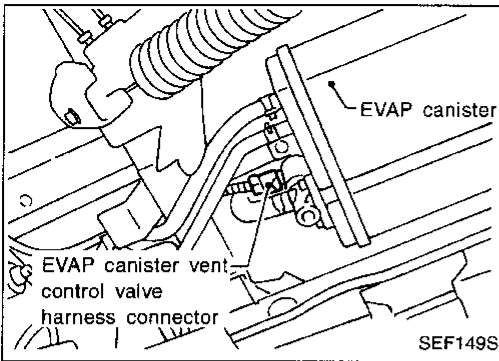
## Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

EC-VENT/V-01



# TROUBLE DIAGNOSIS FOR DTC P0446

## Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd) DIAGNOSTIC PROCEDURE



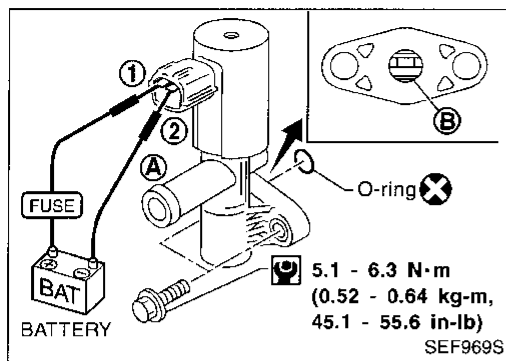
## TROUBLE DIAGNOSIS FOR DTC P0446

### Evaporative Emission (EVAP) Canister Vent Control Valve (Cont'd)

#### COMPONENT INSPECTION

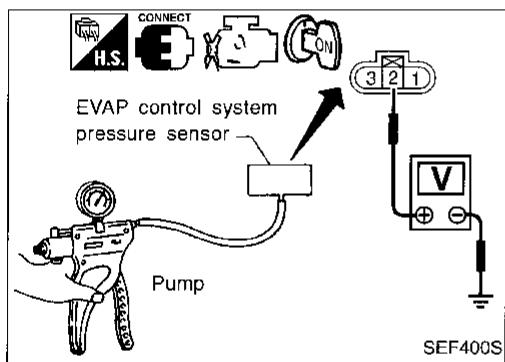
#### EVAP canister vent control valve

Check air passage continuity.



Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals ① and ②	No
No supply	Yes

If NG, clean valve using air blower or replace as necessary. 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 terminal ② and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg, 0 psi)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg, -1.35 psi)	0.4 - 0.6

#### CAUTION:

**Always calibrate the vacuum pump gauge when using it.**

5. If NG, replace EVAP control system pressure sensor.

GI

MA

EM

LC

EC

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TF

PD

FA

RA

BR

ST

RS

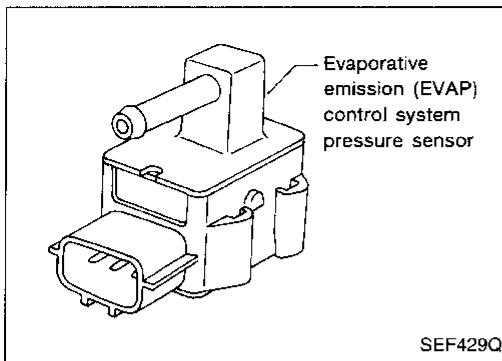
BT

HA

EL

IDX

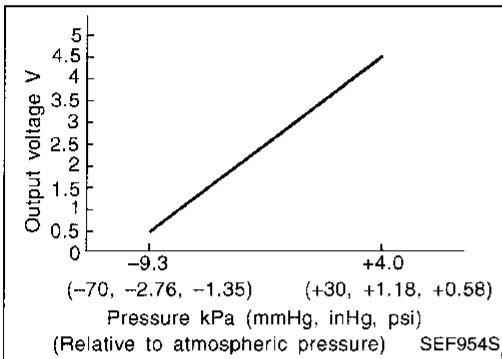
## TROUBLE DIAGNOSIS FOR DTC P0450



### 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.



#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④③ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
49	P	Sensors' power supply	Ignition switch "ON"	Approximately 5V
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
67	L	EVAP control system pressure sensor	Ignition switch "ON"	Approximately 3.4V

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values

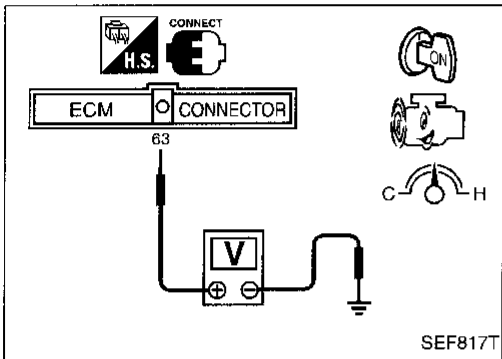
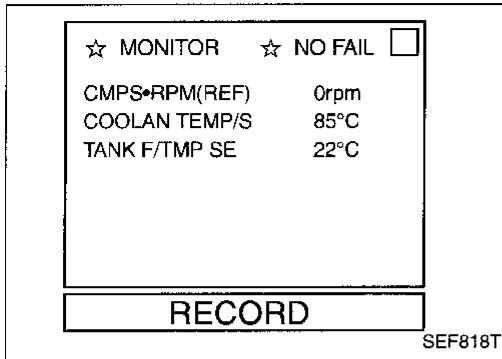
MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	● Ignition switch: ON	Approx. 3.4V

#### 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.	<ul style="list-style-type: none"> <li>● Harness or connectors (The EVAP control system pressure sensor circuit is open or shorted.)</li> <li>● EVAP control system pressure sensor</li> <li>● EVAP canister vent control valve (The valve is stuck open.)</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P0450

## Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

- 1) Start engine and warm it up sufficiently.  
 2) Check that tank fuel temperature is above 0°C (32°F).  
 3) Turn ignition switch "OFF" and wait at least 7 seconds.  
 4) Turn ignition switch "ON".  
 5) Select "DATA MONITOR" mode with CONSULT.  
 6) Wait at least 5 seconds.

OR

- 1) Start engine and warm it up sufficiently.  
 2) Check that voltage between ECM terminal ⑥3 and ground is less than 4.2V.  
 3) Turn ignition switch "OFF" and wait at least 7 seconds.  
 4) Turn ignition switch "ON" and wait at least 5 seconds.  
 5) Select "MODE 7" with GST.

OR

- 1) Start engine and warm it up sufficiently.  
 2) Check that voltage between ECM terminal ⑥3 and ground is less than 4.2V.  
 3) Turn ignition switch "OFF" and wait at least 7 seconds.  
 4) Turn ignition switch "ON" and wait at least 5 seconds.  
 5) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".  
 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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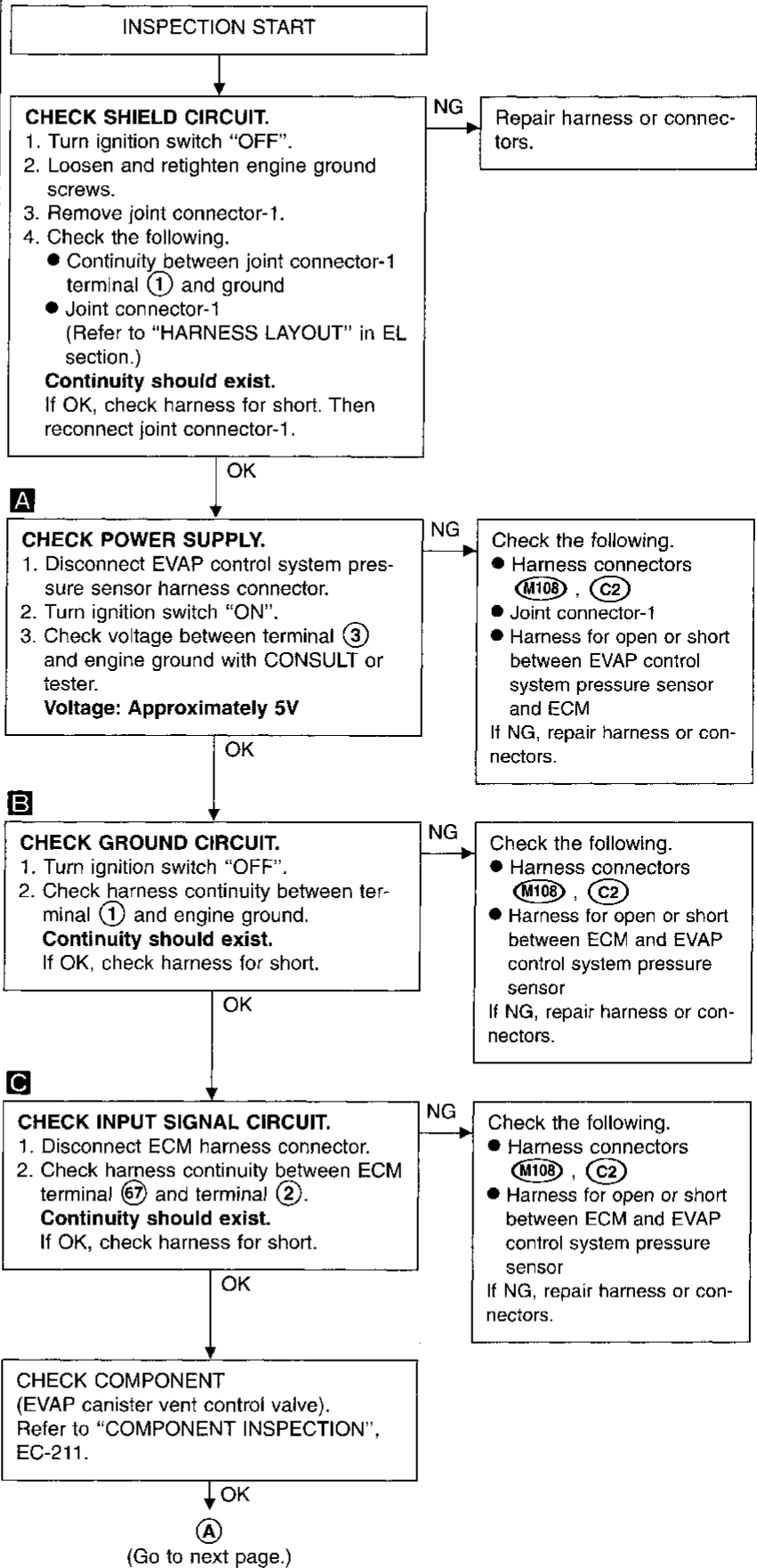
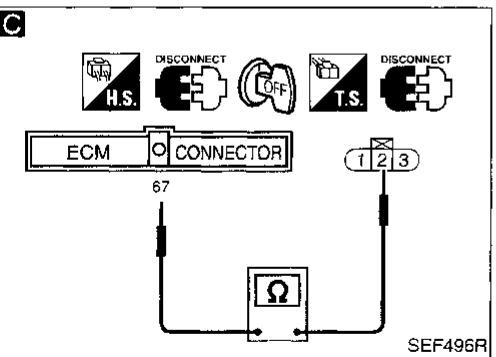
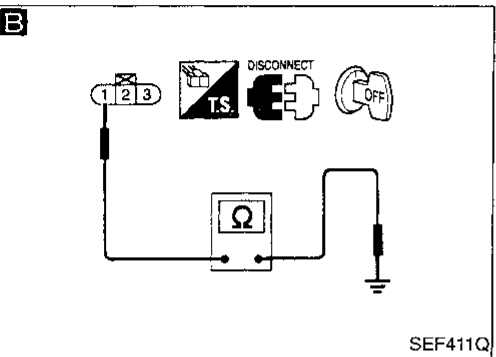
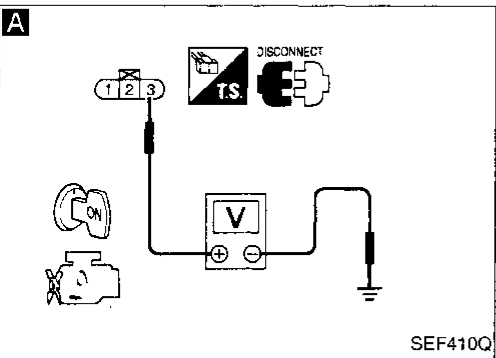
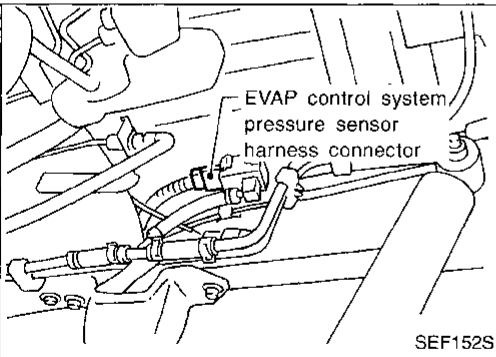
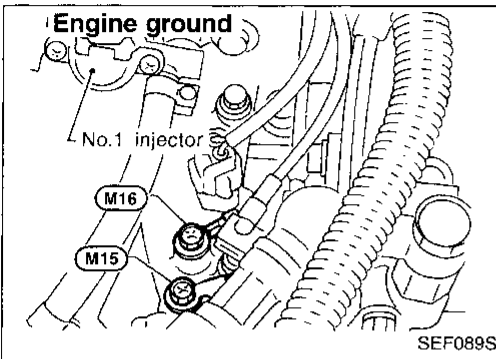
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# TROUBLE DIAGNOSIS FOR DTC P0450

## Evaporative Emission (EVAP) Control System Pressure Sensor (Cont'd)

### DIAGNOSTIC PROCEDURE

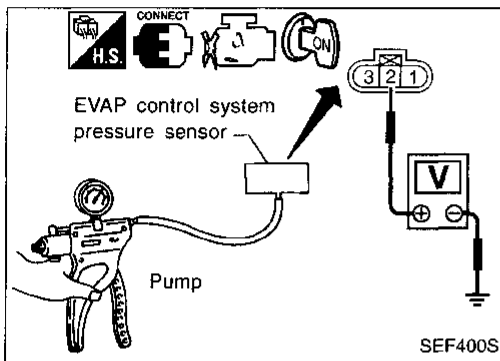
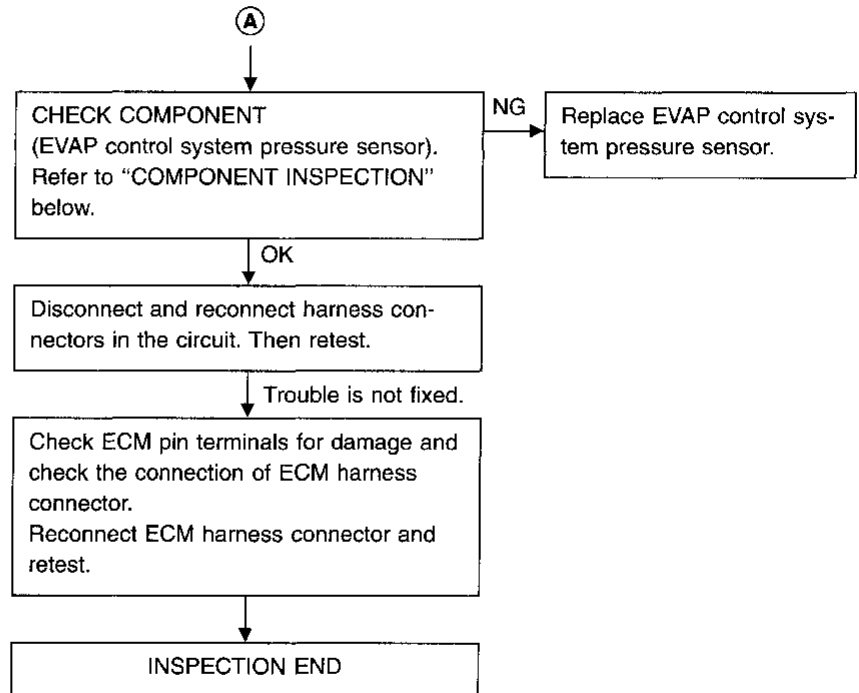


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## TROUBLE DIAGNOSIS FOR DTC P0450

### Evaporative Emission (EVAP) Control System Pressure Sensor (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 terminal ② and engine ground.

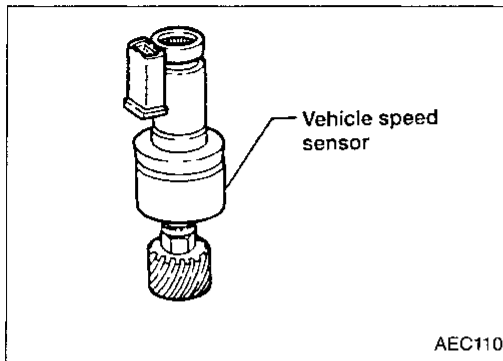
Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg, 0 psi)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg, -1.35 psi)	0.4 - 0.6

#### CAUTION:

**Always calibrate the vacuum pump gauge when using it.**

5. If NG, replace EVAP control system pressure sensor.

# TROUBLE DIAGNOSIS FOR DTC P0500



## Vehicle Speed Sensor (VSS)

### COMPONENT DESCRIPTION

The vehicle speed sensor is installed in the transmission. 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 ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
26	W/L	Vehicle speed sensor	<div style="border: 1px solid black; padding: 2px; display: inline-block;">Engine is running.</div> Slowly rotating front wheels	Approximately 1.8 - 2.4V* (AC voltage)

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

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check items (Possible cause)
P0500 0104	<ul style="list-style-type: none"> <li>The almost 0 km/h (0 MPH) signal from the vehicle speed sensor is sent to ECM even when the vehicle is driving.</li> </ul>	<ul style="list-style-type: none"> <li>Harness or connector (The vehicle speed sensor circuit is open or shorted.)</li> <li>Vehicle speed sensor</li> </ul>

## TROUBLE DIAGNOSIS FOR DTC P0500

### Vehicle Speed Sensor (VSS) (Cont'd)

#### OVERALL FUNCTION CHECK

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

- 1) Jack up drive wheels.
- 2) Start engine.
- 3) Perform "VEHICLE SPEED SEN CKT" in "FUNCTION TEST" mode with CONSULT.

OR

- 2) Start engine.
- 3) Read vehicle speed sensor signal in "DATA MONITOR" mode with CONSULT.

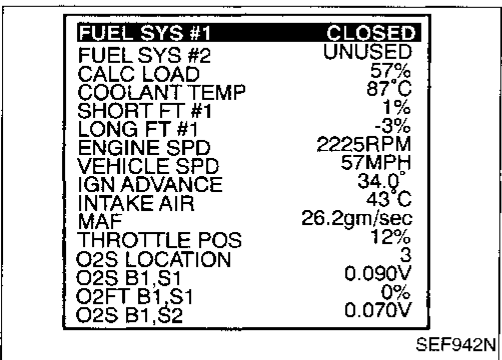
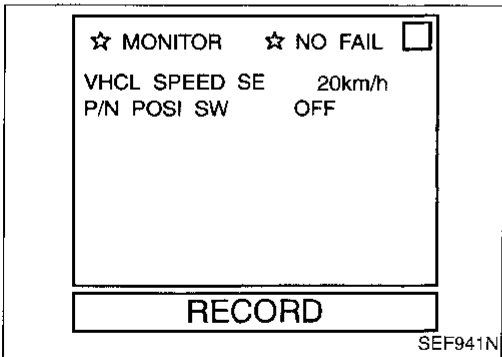
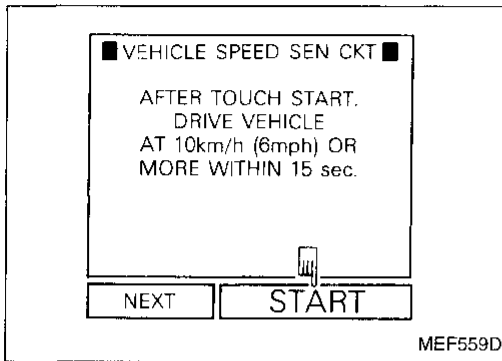
**The vehicle speed on CONSULT should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.**

OR

- 1) Jack up drive wheels.
- 2) Start engine.
- 3) Read vehicle speed sensor signal in "MODE 1" with GST.

**The vehicle speed on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.**

OR



#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

- 1) Start engine and warm it up sufficiently.
- 2) Perform test drive for at least 10 seconds continuously in the following recommended condition.

Engine speed : 1,400 - 2,500 rpm (A/T models)  
1,700 - 2,600 rpm (2WD M/T models)  
1,850 - 2,850 rpm (4WD M/T models)

Intake manifold vacuum : (A/T models) -53.3 to -33.3 kPa  
(-400 to -250 mmHg, -15.75 to -9.84 inHg, -7.73 to -4.83 psi)  
(M/T models) -46.7 to -32.0 kPa  
(-350 to -240 mmHg, -13.78 to -9.45 inHg, -6.77 to -4.64 psi)

Gear position : Suitable position (except "N" or "P" position)

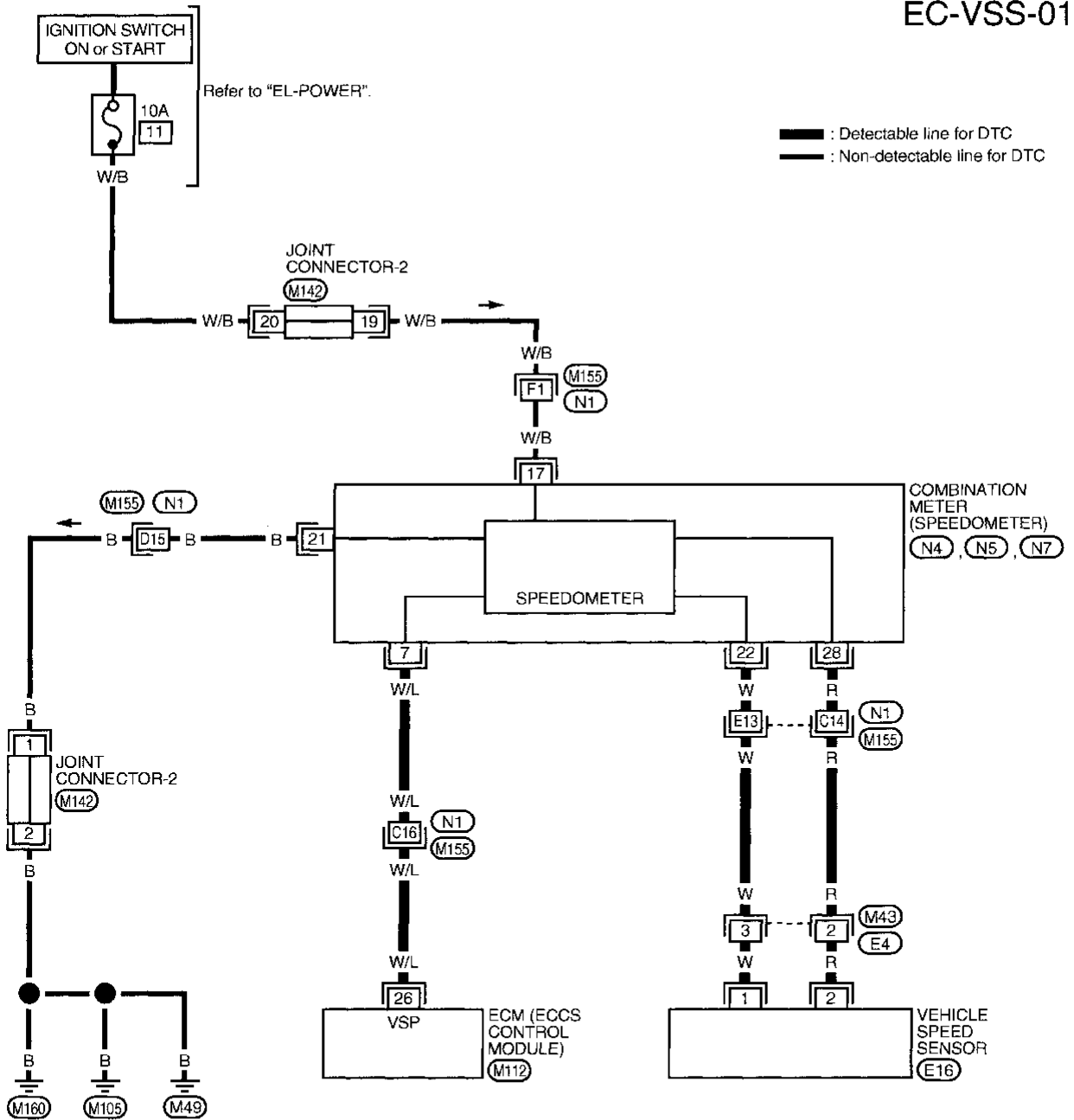
- 3) Stop the vehicle, turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

**Even though 1st trip DTC is not detected, perform the above test drive at least one more time.**

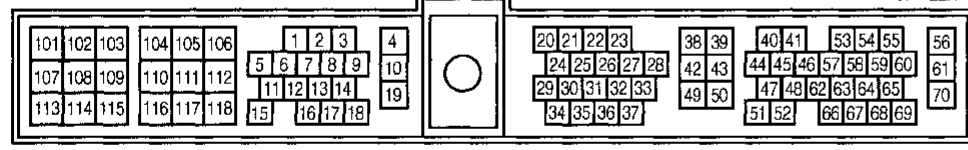
# TROUBLE DIAGNOSIS FOR DTC P0500

## Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01



— : Detectable line for DTC  
 - - - : Non-detectable line for DTC



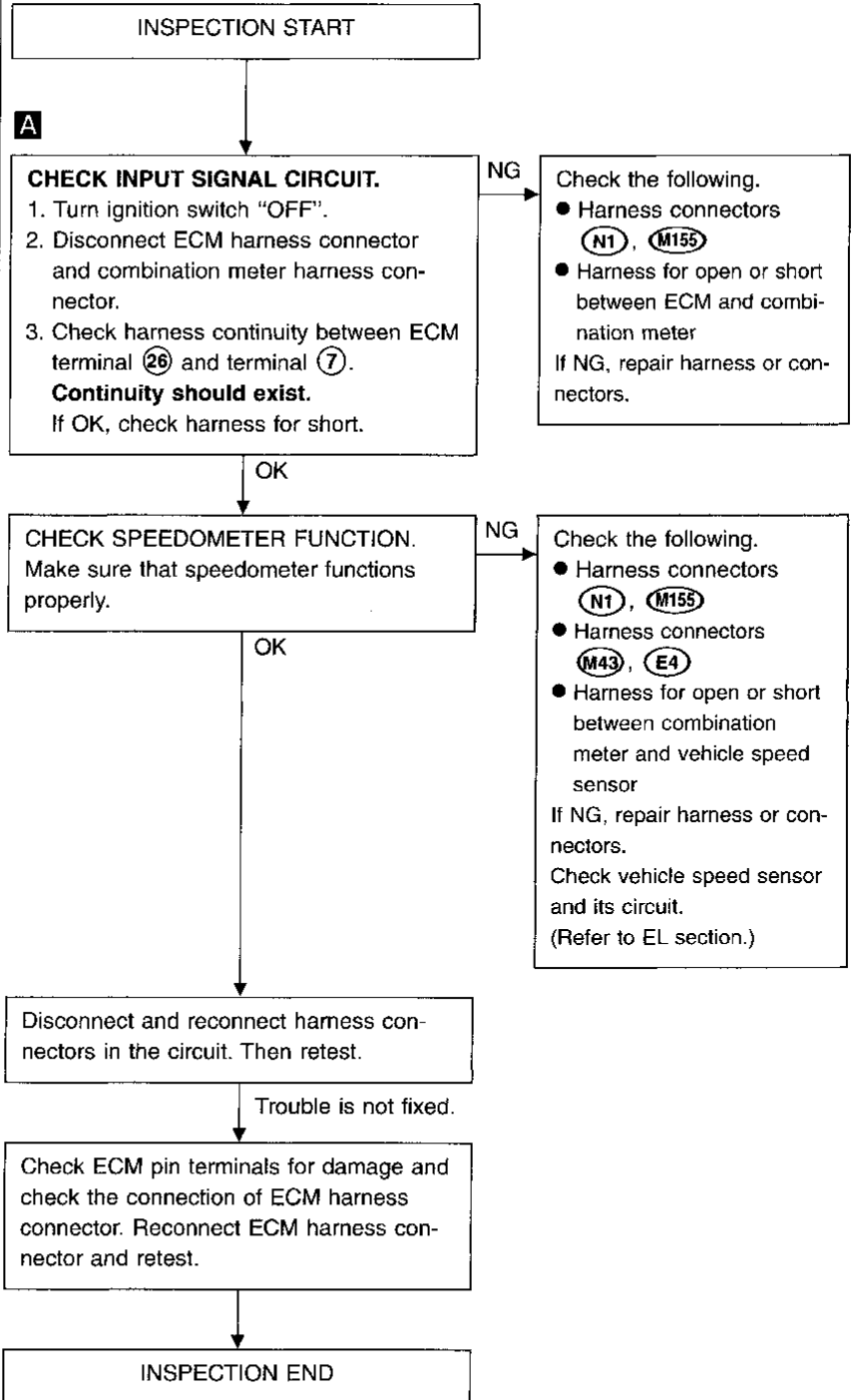
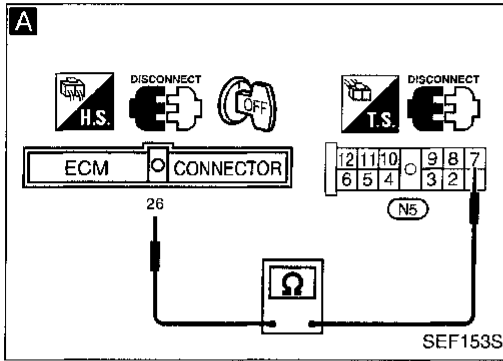
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 M142 (W)  
 M155 (W), N1 (W)

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# TROUBLE DIAGNOSIS FOR DTC P0500

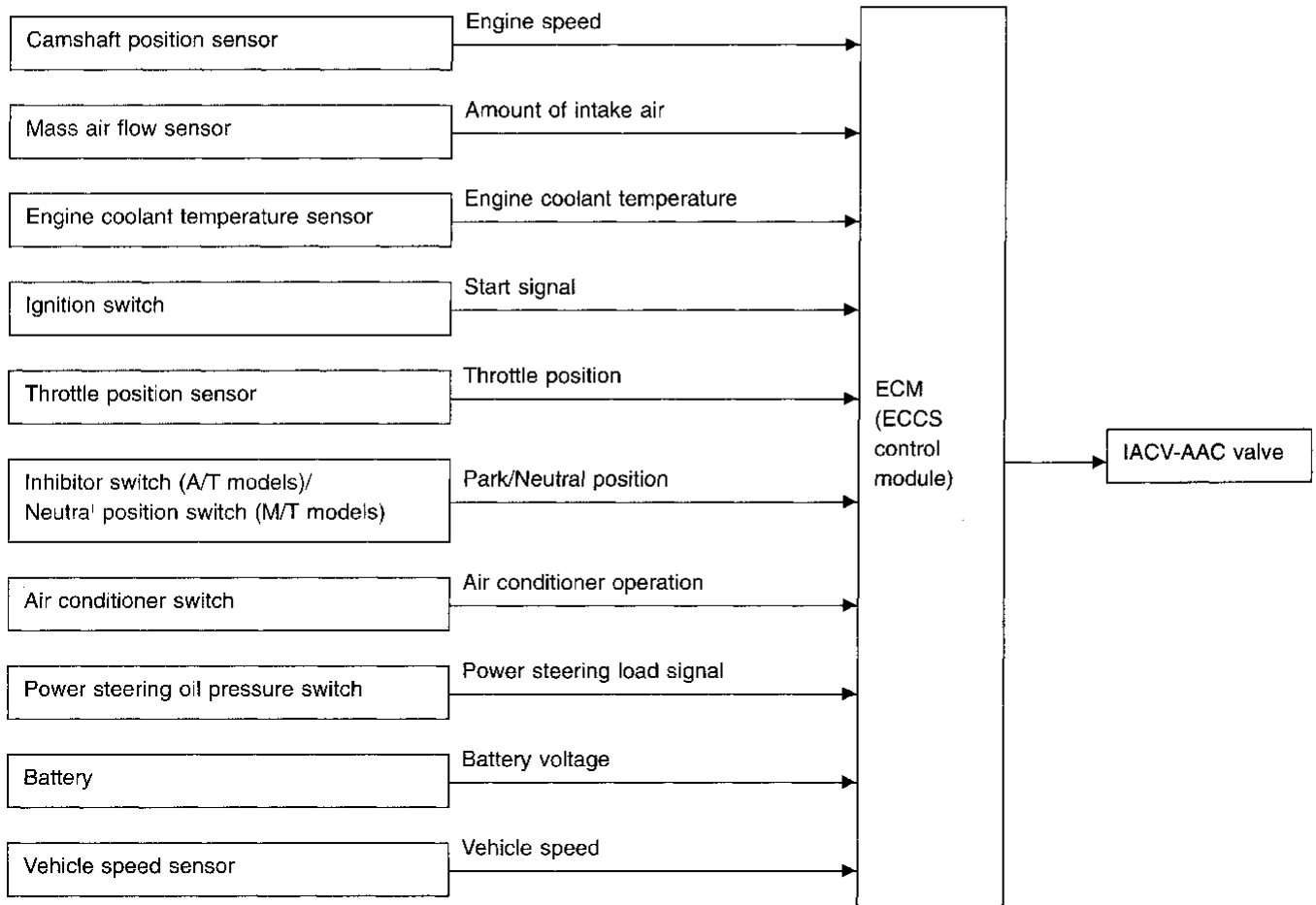
## Vehicle Speed Sensor (VSS) (Cont'd)

### DIAGNOSTIC PROCEDURE



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 by-passes 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 operation).

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
101	W/G	IACV-AAC valve	Ignition switch "ON".	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm	0 - 7V

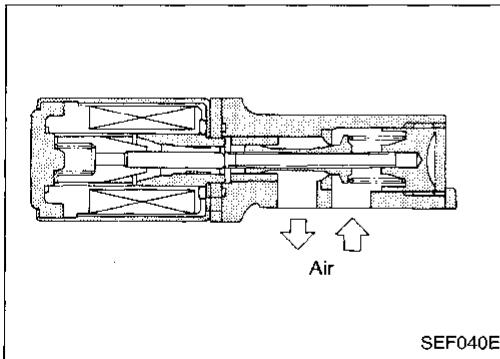
# TROUBLE DIAGNOSIS FOR DTC P0505

## Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
IACV-AAC/V	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Idle
		2,000 rpm
		20 - 40%
		—



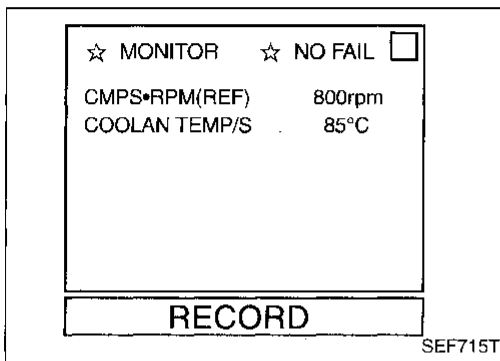
### COMPONENT DESCRIPTION

#### 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.

### 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.	<ul style="list-style-type: none"> <li>● Harness or connectors (The IACV-AAC valve circuit is open.)</li> <li>● IACV-AAC valve</li> </ul>
	B) The IACV-AAC valve does not operate properly.	<ul style="list-style-type: none"> <li>● Harness or connectors (The IACV-AAC valve circuit is shorted.)</li> <li>● IACV-AAC valve</li> </ul>



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B".

#### Procedure for malfunction A

- 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.

OR

- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Select "MODE 7" with GST.

OR

- 1) Start engine and run it for at least 2 seconds at idle speed.
- 2) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.


# TROUBLE DIAGNOSIS FOR DTC P0505

## Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)


☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS-RPM(REF)	800rpm	
COOLAN TEMP/S	85°C	
<b>RECORD</b>		

SEF715T


### Procedure for malfunction B

-  1) Start engine and warm it up sufficiently.  
2) Turn ignition switch "OFF" and wait at least 7 seconds.  
3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.  
4) Start engine and run it for at least 1 minute at idle speed.

OR

-  1) Start engine and warm it up sufficiently.  
2) Turn ignition switch "OFF" and wait at least 7 seconds.  
3) Start engine again and run it for at least 1 minute at idle speed.  
4) Select "MODE 7" with GST.

OR

-  1) Start engine and warm it up sufficiently.  
2) Turn ignition switch "OFF" and wait at least 7 seconds.  
3) Start engine again and run it for at least 1 minute at idle speed.  
4) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".  
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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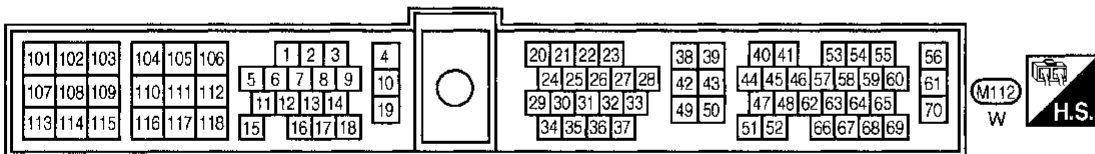
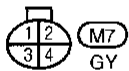
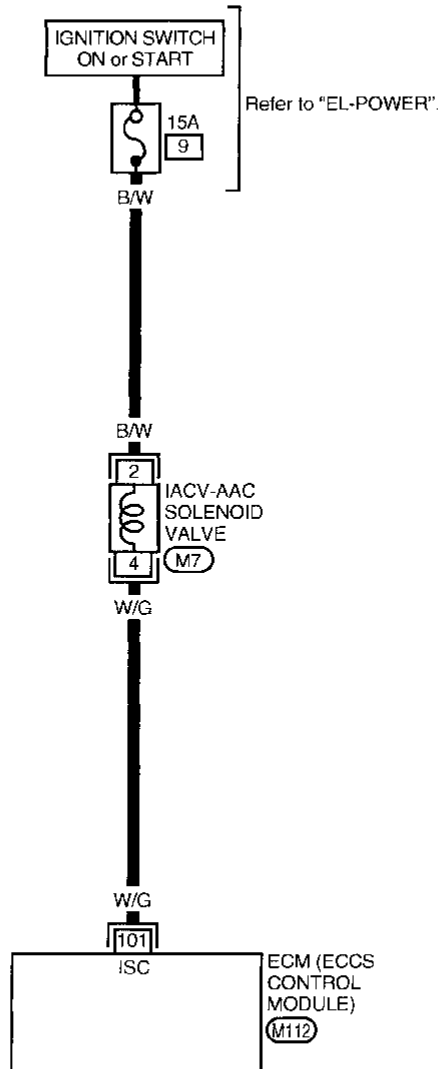


# TROUBLE DIAGNOSIS FOR DTC P0505

## Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

EC-AAC/V-01

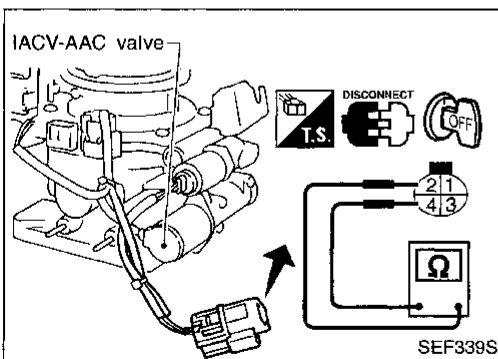
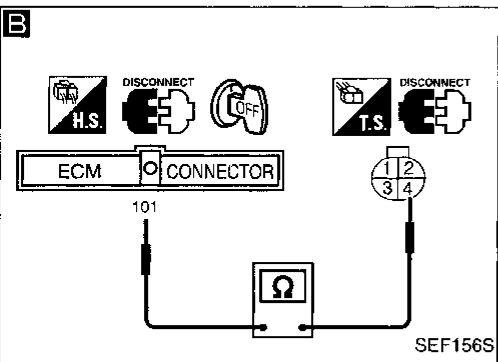
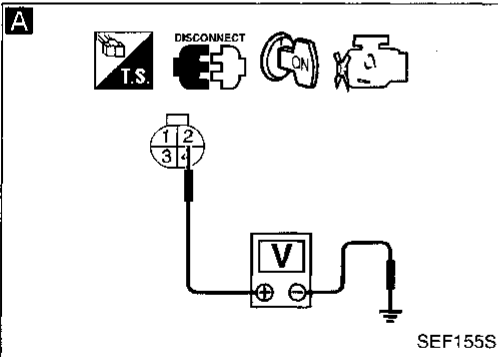
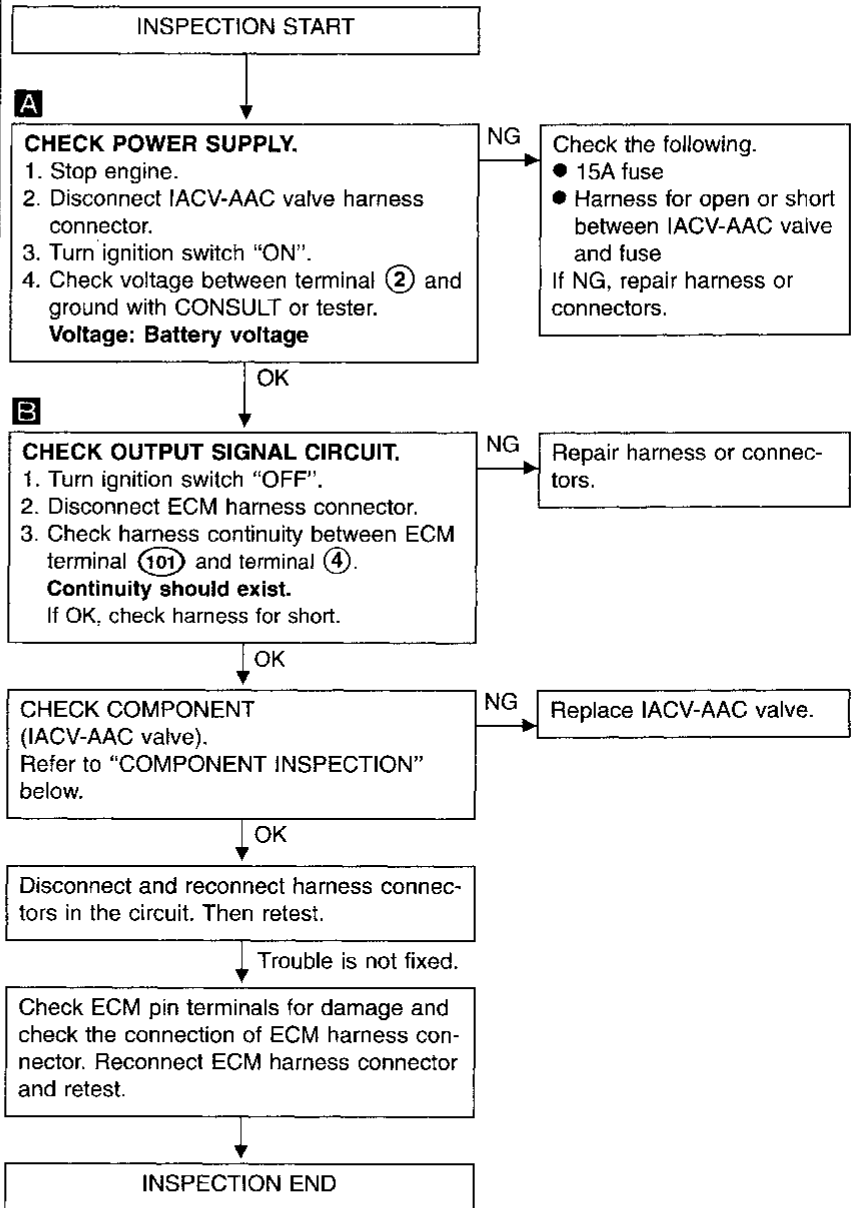
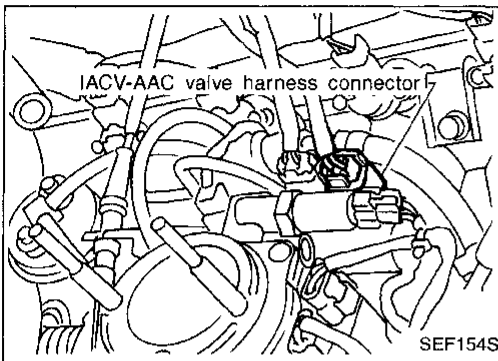
— : Detectable line for DTC  
 — : Non-detectable line for DTC



# TROUBLE DIAGNOSIS FOR DTC P0505

## Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

### DIAGNOSTIC PROCEDURE



### COMPONENT INSPECTION

#### IACV-AAC valve

Disconnect IACV-AAC valve harness connector.

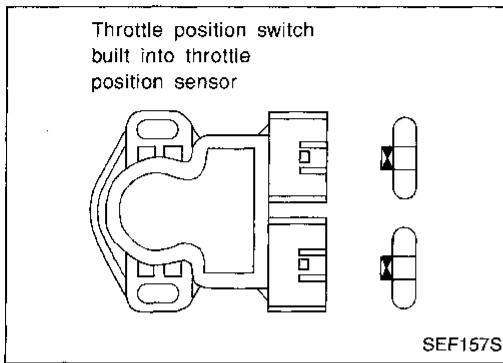
- Check IACV-AAC valve resistance.

#### Resistance:

**Approximately 10Ω at 25°C (77°F)**

- Check plunger for seizing or sticking.
- Check for broken spring.

# TROUBLE DIAGNOSIS FOR DTC P0510



## 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. The wide open throttle position switch is used only for A/T control.

When the throttle valve is in the closed position, the closed throttle position switch sends a voltage signal to the ECM. The ECM only uses this signal to open or close the EVAP canister purge control 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 (43) (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
27	Y	Throttle position switch (Closed position)	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	BATTERY VOLTAGE (11 - 14V)
			Ignition switch "ON" └ Accelerator pedal depressed	Approximately 0V

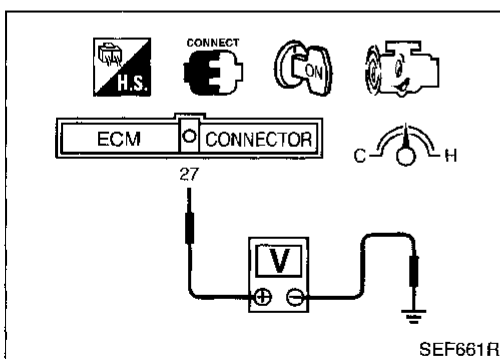
### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION	
CLSD THL/P SW	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF

### 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.



### 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.

- 1) Start engine and warm it up sufficiently.
- 2) Check the voltage between ECM terminal (27) and ground under the following conditions.

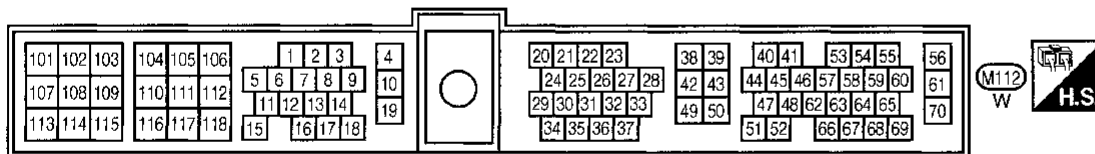
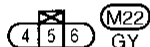
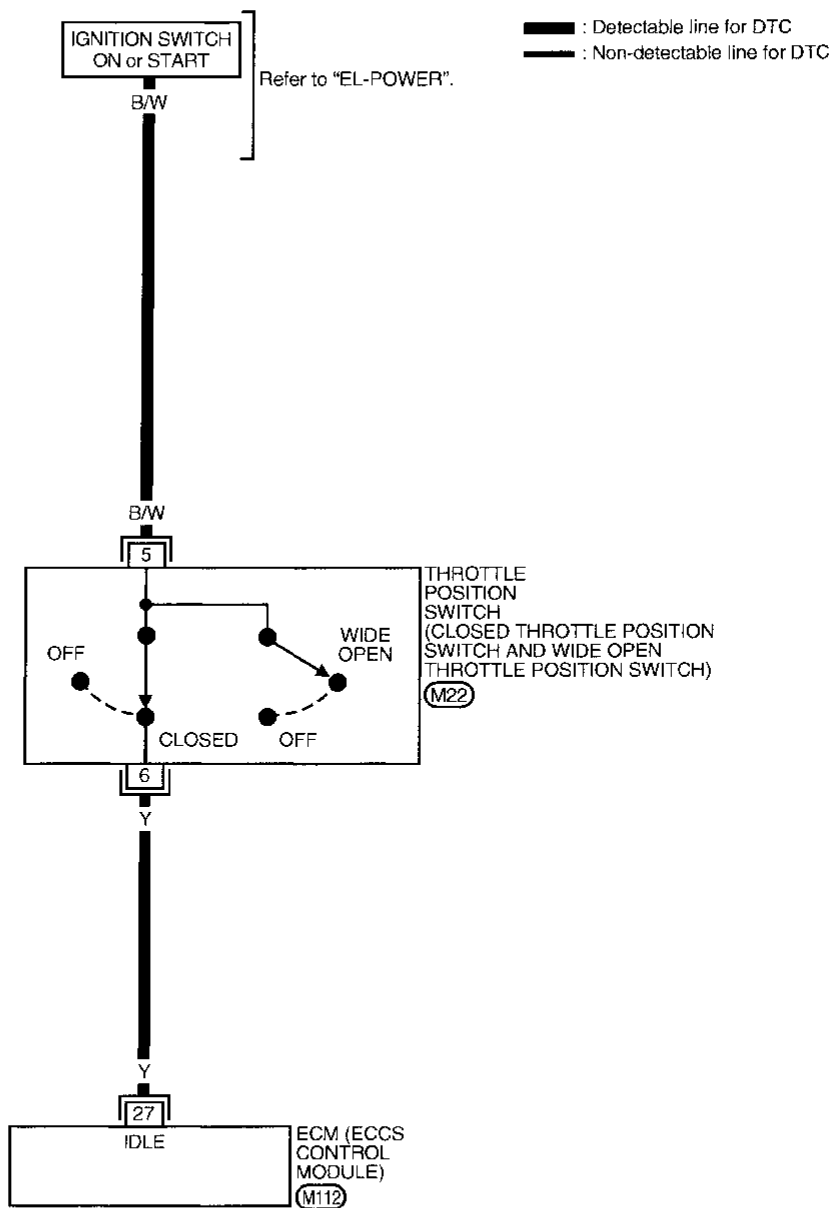
**At idle: Battery voltage**

**At 2,000 rpm: Approximately 0V**

# TROUBLE DIAGNOSIS FOR DTC P0510

## Closed Throttle Position Switch (Cont'd)

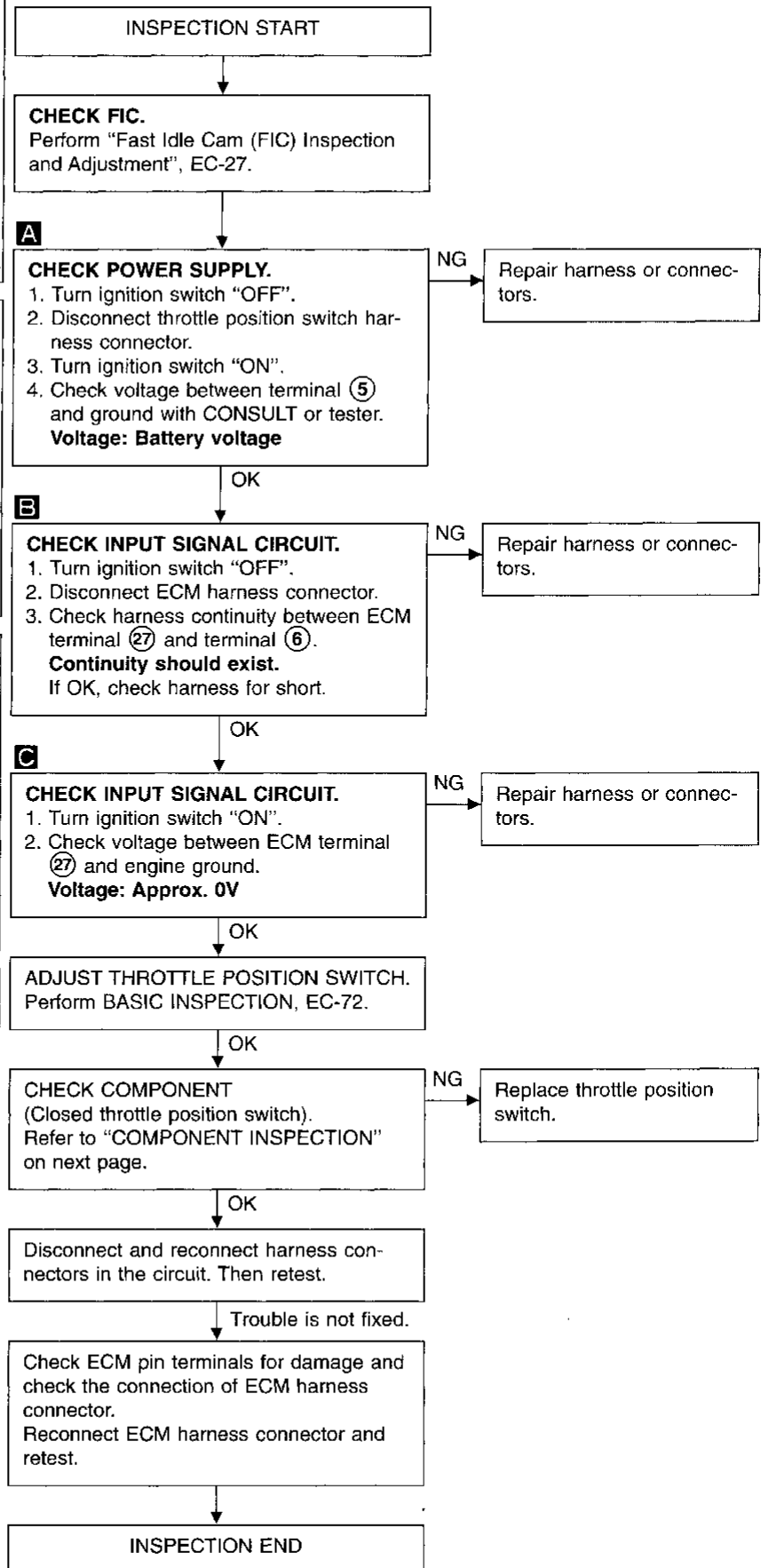
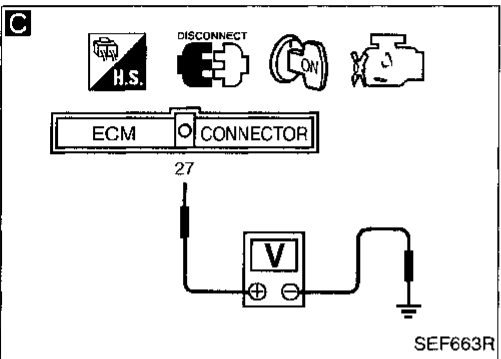
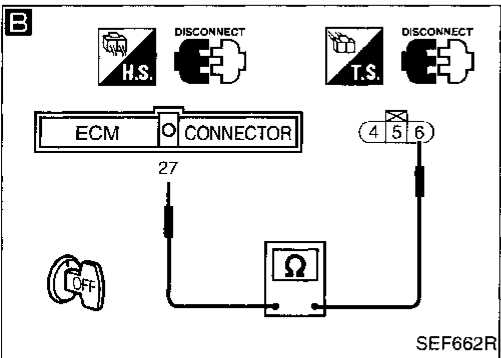
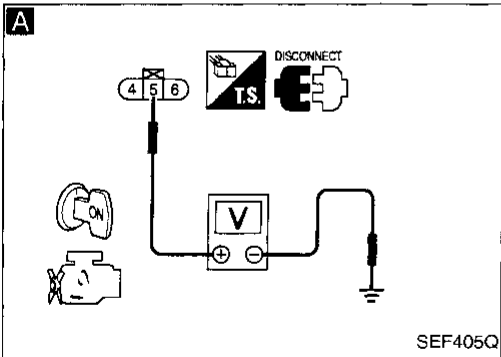
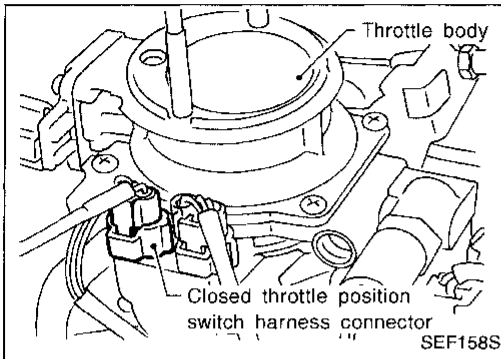
EC-TP/SW-01



# TROUBLE DIAGNOSIS FOR DTC P0510

## Closed Throttle Position Switch (Cont'd)

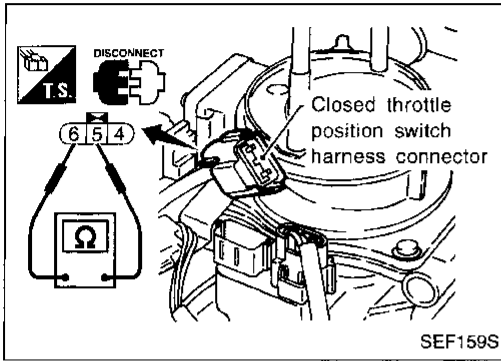
### DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P0510

## Closed Throttle Position Switch (Cont'd)

### COMPONENT INSPECTION



### Closed throttle position switch

1. Start engine and warm it up sufficiently.
2. Turn ignition switch "OFF".
3. Disconnect throttle position switch harness connector.
4. Check continuity between terminals ⑤ and ⑥ while opening throttle valve manually.

Throttle valve conditions	Continuity
Completely closed	Yes
Partially open or completely open	No

If NG, replace throttle position switch.

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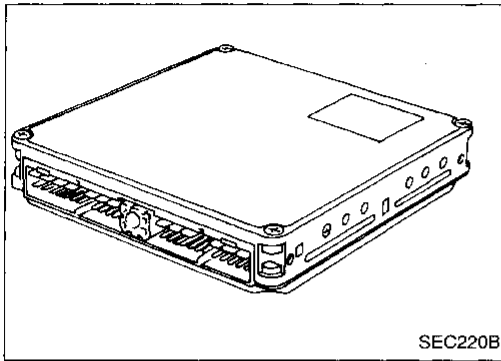
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# TROUBLE DIAGNOSIS FOR DTC P0605



## Engine Control Module (ECM)-ECCS Control Module

### 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.

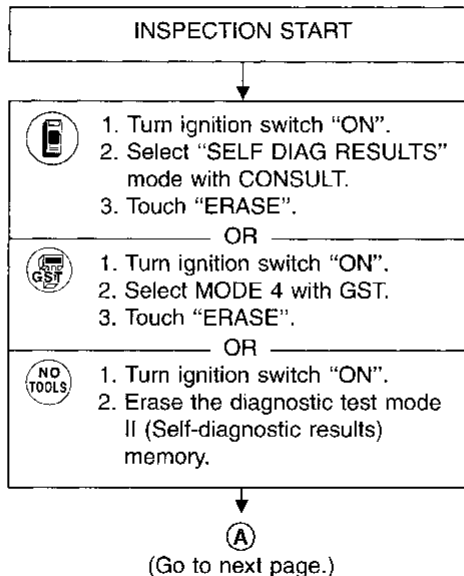
### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Item (Possible Cause)
P0605 0301	● ECM calculation function is malfunctioning.	● ECM (ECCS control module)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

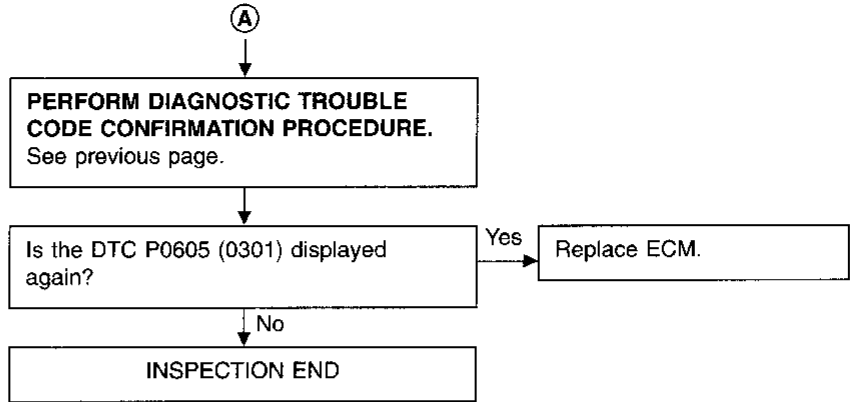
- 1) Turn ignition switch "ON".
  - 2) Select "DATA MONITOR" mode with CONSULT.
  - 3) Start engine.
  - 4) Run engine for at least 2 seconds at idle speed.
- OR
- 1) Turn ignition switch "ON".
  - 2) Start engine.
  - 3) Run engine for at least 2 seconds at idle speed.
  - 4) Select "Mode 7" with GST.
- OR
- 1) Turn ignition switch "ON".
  - 2) Start engine and wait at least 2 seconds.
  - 3) Turn ignition switch "OFF" and wait at least 7 seconds.
  - 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

### DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P0605

## Engine Control Module (ECM)-ECCS Control Module (Cont'd)



GI

MA

EM

LC

**EC**

FE

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MT

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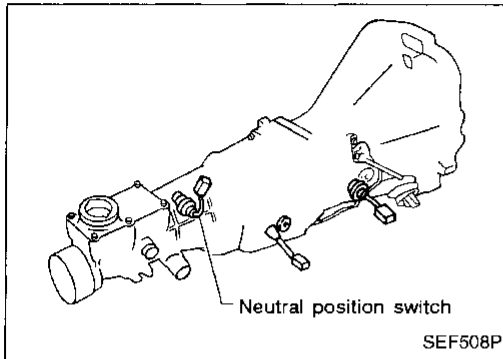
HA

EL

IDX



## TROUBLE DIAGNOSIS FOR DTC P0705



### Park/Neutral Position Switch

#### COMPONENT DESCRIPTION

When the gear position is "P" (A/T models only) or "N", park/neutral position is "ON".

ECM detects the position because the continuity of the line (the "ON" signal) exists.

#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
22	L/B	Neutral position switch (M/T models) Inhibitor switch (A/T models)	Ignition switch "ON" └ Gear position is "Neutral position" (M/T models) └ Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V

#### 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

#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible cause)
P0705 1003	● The signal of the park/neutral position switch is not changed in the process of engine starting and driving.	<ul style="list-style-type: none"> <li>● Harness or connectors (The neutral position switch or inhibitor switch circuit is open or shorted.)</li> <li>● Neutral position switch (M/T models)</li> <li>● Inhibitor switch (A/T models)</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P0705

## Park/Neutral Position Switch (Cont'd)

### OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

- 1) Turn ignition switch "ON".
- 2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

OR

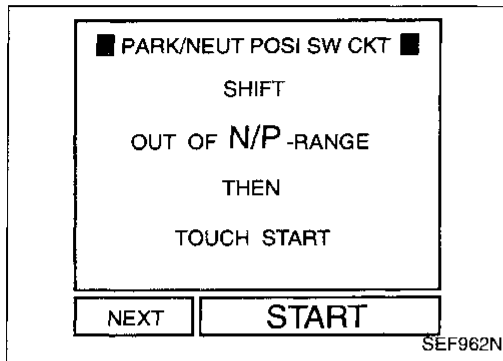
- 2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.
- 3) Check the "P/N POSI SW" signal under the following conditions.

Condition (Gear position)	Known good signal
"N" and "P" (A/T only) position	ON
Except the above position	OFF

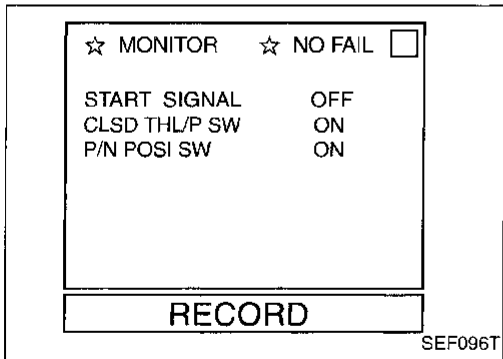
OR

- 1) Turn ignition switch "ON".
- 2) Check voltage between ECM terminal ②② and body ground under the following conditions.

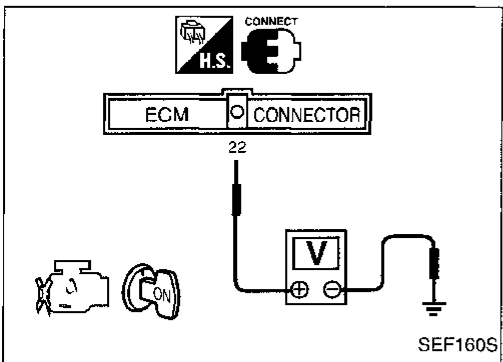
Condition (Gear position)	Voltage (V) (Known good data)
"N" and "P" (A/T only) position	Approx. 0
Except the above position	Approx. 5



SEF0962N



SEF096T



SEF160S

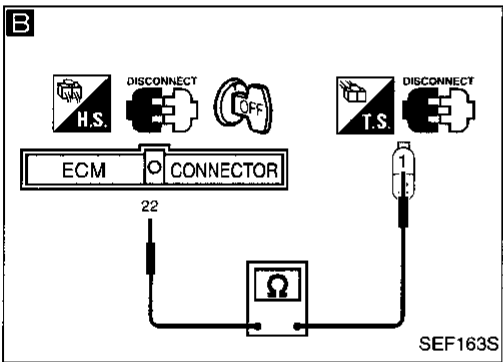
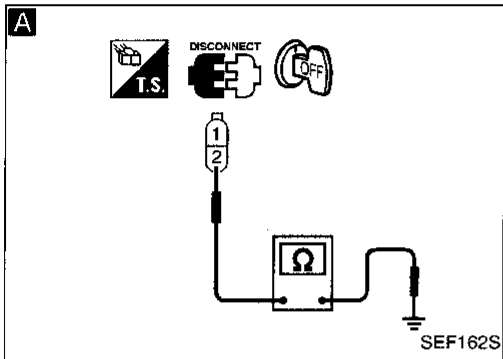
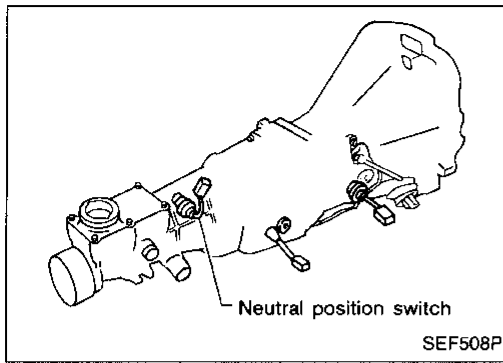
GI  
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BT  
HA  
EL  
DX



# TROUBLE DIAGNOSIS FOR DTC P0705

## Park/Neutral Position Switch (Cont'd)

### DIAGNOSTIC PROCEDURE



Neutral position switch

INSPECTION START

**A**

**CHECK GROUND CIRCUIT.**  
 1. Disconnect neutral position switch harness connector.  
 2. Check harness continuity between terminal ② and body ground.  
**Continuity should exist.**  
 If OK, check harness for short.

NG → Repair harness or connectors.

**B**

**CHECK INPUT SIGNAL CIRCUIT.**  
 1. Disconnect ECM harness connector.  
 2. Check harness continuity between ECM terminal ②② and terminal ①①.  
**Continuity should exist.**  
 If OK, check harness for short.

NG → Check the following.  
 ● Harness connectors  
 ● (E1), (M44)  
 ● Harness for open or short between ECM and neutral position switch  
 If NG, repair harness or connectors.

**CHECK COMPONENT**  
 (Neutral position switch).  
 Refer to MT section

NG → Replace neutral position switch.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

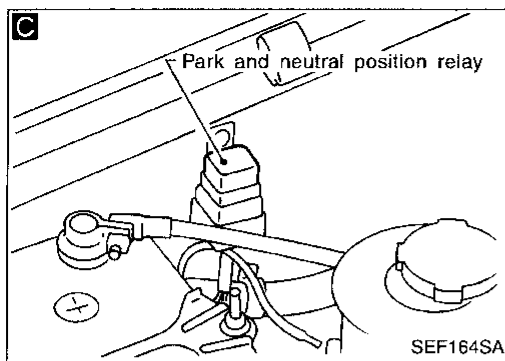
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

GI  
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**EC**  
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 AT  
 TF  
 PD  
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 BR  
 ST  
 RS  
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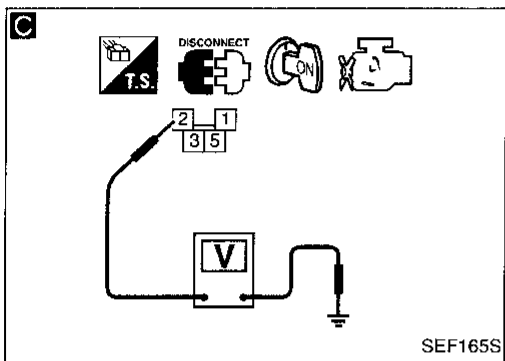
# TROUBLE DIAGNOSIS FOR DTC P0705

## Park/Neutral Position Switch (Cont'd)



### Inhibitor switch (A/T models)

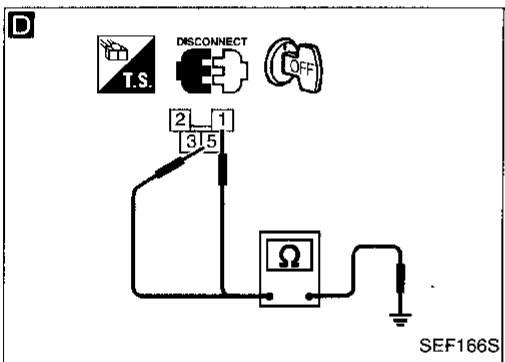
INSPECTION START



**C**  
**CHECK POWER SUPPLY.**  
1. Turn ignition switch "OFF".  
2. Disconnect park and neutral position relay.  
3. Make sure that selector lever is in "P" or "N" position.  
4. Turn ignition switch "ON".  
5. 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 inhibitor switch and fuse  
● Harness for open or short between inhibitor switch and park and neutral position relay  
If NG, repair harness or connector.

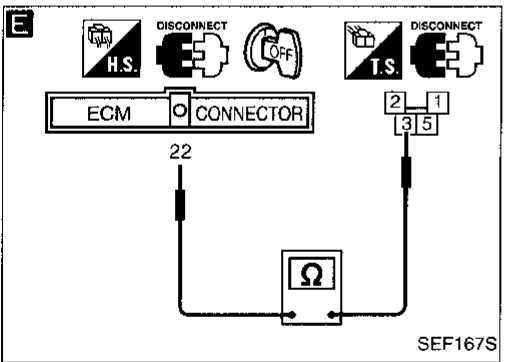
OK → CHECK COMPONENT (INHIBITOR SWITCH). Refer to AT section.



**D**  
**CHECK GROUND CIRCUIT.**  
1. Turn ignition switch "OFF".  
2. Check harness continuity between relay terminals ①, ⑤ and engine ground.  
**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

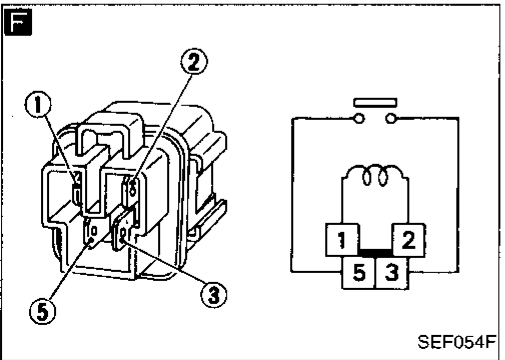
OK →



**E**  
**CHECK INPUT SIGNAL CIRCUIT.**  
1. Disconnect ECM harness connector.  
2. Check harness continuity between ECM terminal ②② and relay terminal ③.  
**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

OK →



**F**  
**PARK AND NEUTRAL POSITION 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 park and neutral position relay.

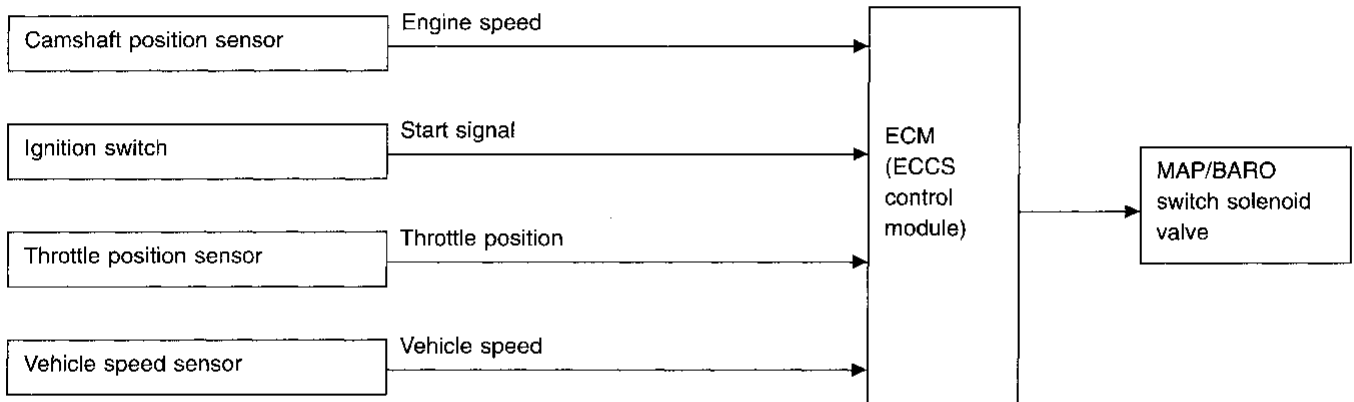
OK → Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.  
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

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	<ul style="list-style-type: none"> <li>● Ignition switch is "ON". (Engine is not running.)</li> <li>● For 5 seconds after starting engine or</li> <li>● More than 5 minutes after the solenoid valve shuts OFF.</li> <li style="text-align: center;">and</li> <li>● Throttle valve is shut or almost fully shut for more than 5 seconds and</li> <li>● Vehicle speed is less than 100 km/h (62 MPH).</li> </ul>

**ECM TERMINALS AND REFERENCE VALUE**

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
116	W/R	MAP/BARO switch solenoid valve	Ignition switch "ON"	0 - 1V
			Engine is running. └ Idle speed (More than 5 seconds after starting engine)	BATTERY VOLTAGE (11 - 14V)

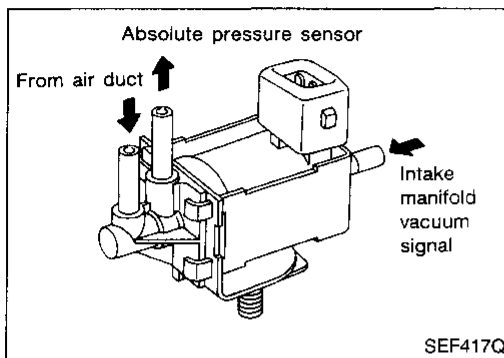
**CONSULT REFERENCE VALUE IN DATA MONITOR MODE**

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
MAP/BARO SW/V	● Ignition switch: ON	BARO
	● Engine speed: Idle (More than 5 seconds after starting engine)	MAP

## TROUBLE DIAGNOSIS FOR DTC P1105

### Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

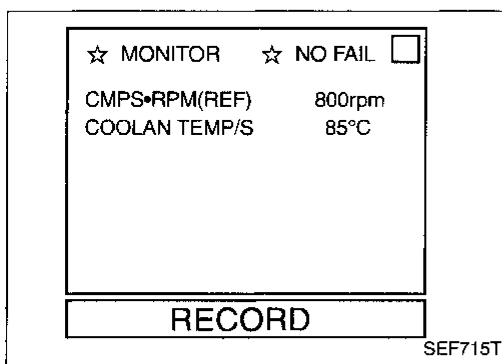


#### COMPONENT DESCRIPTION

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.

#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P1105 1302	<ul style="list-style-type: none"> <li>● MAP/BARO switch solenoid valve receives the voltage supplied though ECM does not supply the voltage to the valve.</li> <li>● There is little difference between MAP/BARO switch solenoid valve input voltage at ambient barometric pressure and voltage at intake manifold pressure.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (MAP/BARO switch solenoid valve circuit is open or shorted.)</li> <li>● Hoses (Hoses are clogged or disconnected.)</li> <li>● Absolute pressure sensor</li> <li>● MAP/BARO switch solenoid valve</li> </ul>



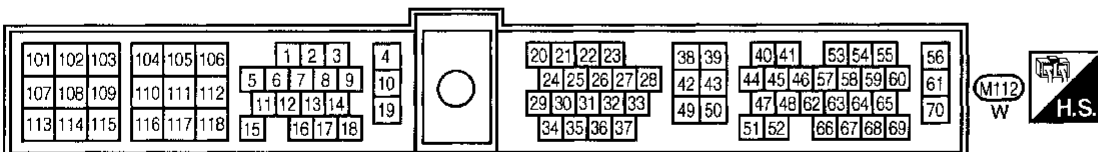
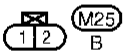
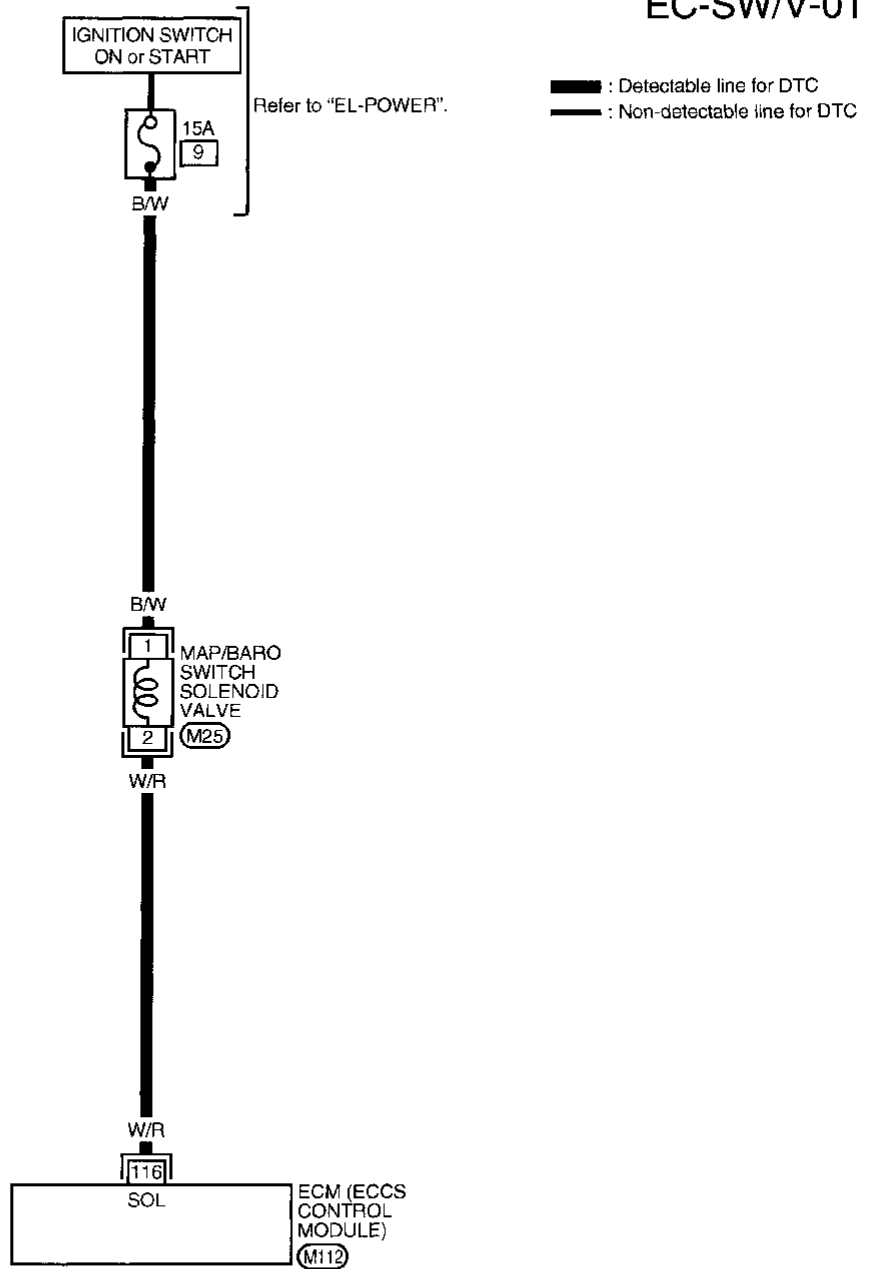
#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

- 1) Start engine and warm it up sufficiently.
  - 2) Turn ignition switch "OFF" and wait at least 7 seconds.
  - 3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
  - 4) Start engine and let it idle.
  - 5) Wait at least 15 seconds.
- OR
- 1) Start engine and warm it up sufficiently.
  - 2) Turn ignition switch "OFF" and wait at least 7 seconds.
  - 3) Start engine and let it idle.
  - 4) Wait at least 15 seconds.
  - 5) Select "MODE 7" with GST.
- OR
- 1) Start engine and warm it up sufficiently.
  - 2) Turn ignition switch "OFF" and wait at least 7 seconds.
  - 3) Start engine and let it idle.
  - 4) Wait at least 15 seconds.
  - 5) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
  - 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P1105

## Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

EC-SW/V-01



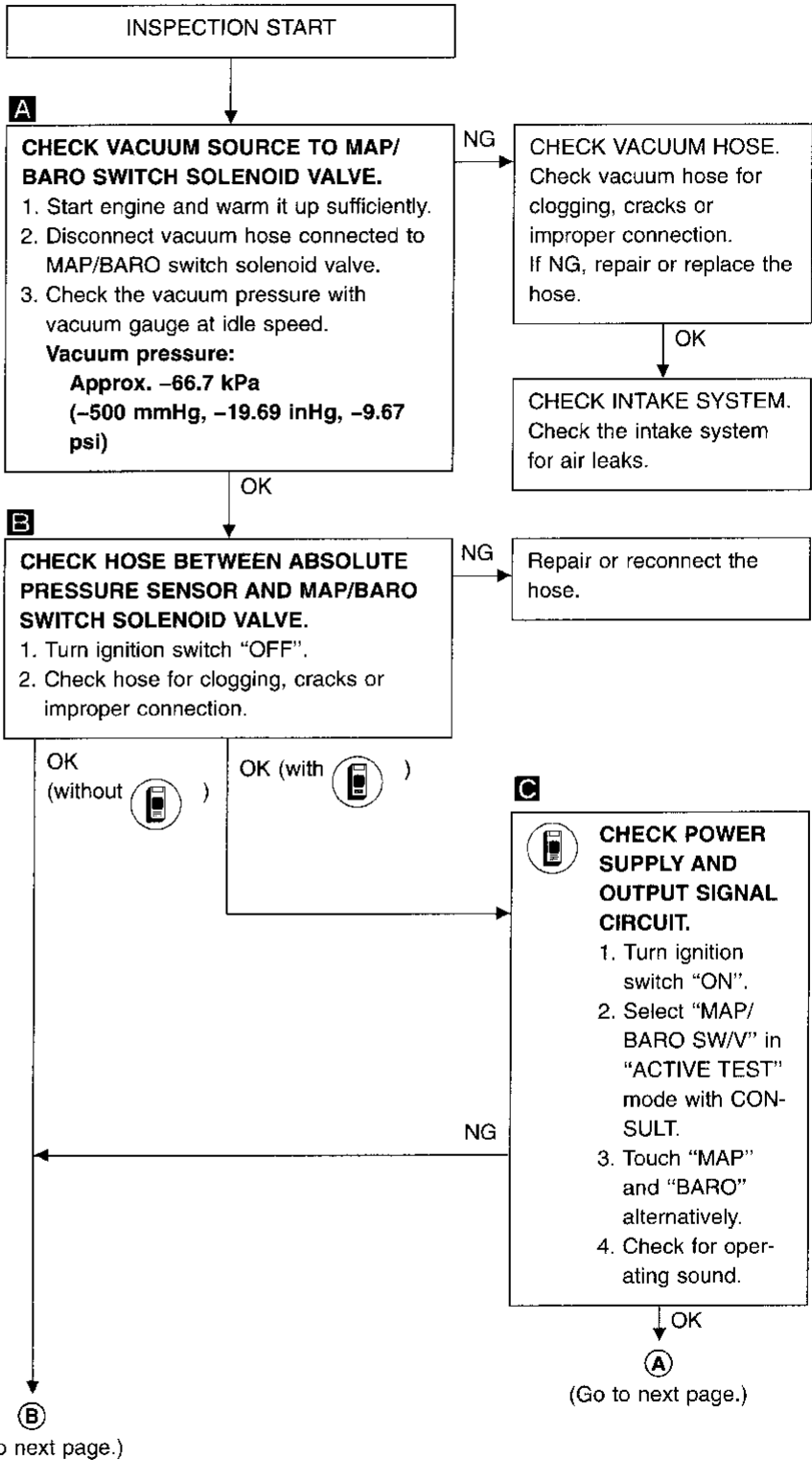
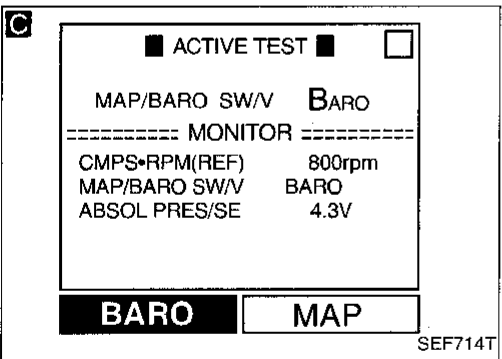
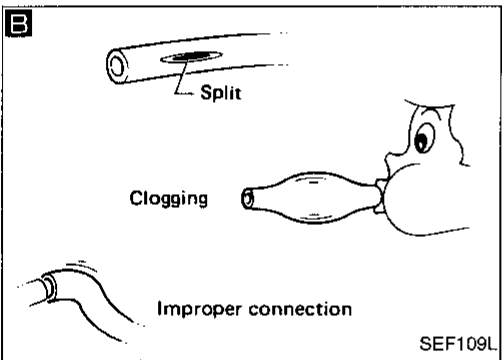
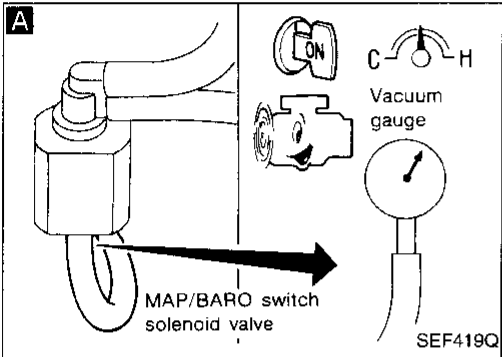
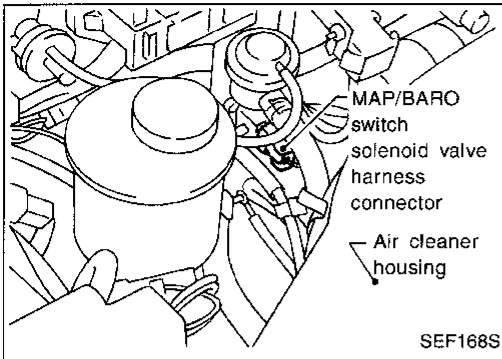
AEC314A



# TROUBLE DIAGNOSIS FOR DTC P1105

## Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE

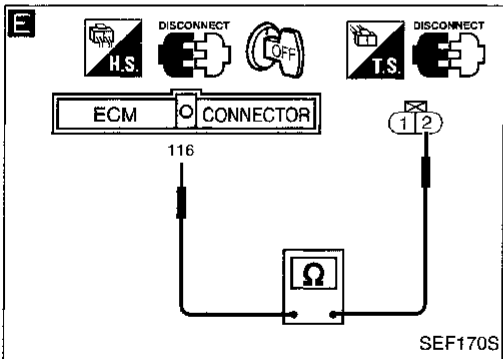
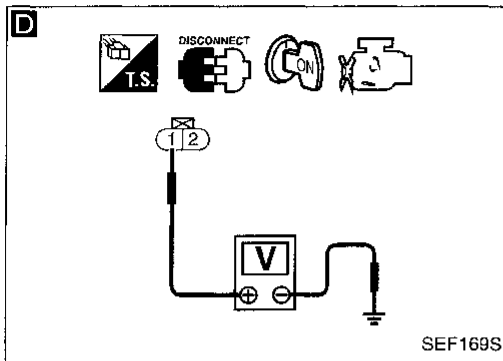


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# TROUBLE DIAGNOSIS FOR DTC P1105

## Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)



**D**

**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 ① and ground with CONSULT or tester.

**Voltage: Battery voltage**  
If OK, check harness for short.

NG → Check the following.  
 ● 15A fuse  
 ● Harness for open or short between MAP/BARO switch solenoid valve and fuse  
 If NG, repair harness or connectors.

OK

**E**

**CHECK OUTPUT SIGNAL CIRCUIT.**

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ①①⑥ and terminal ②.

**Continuity should exist.**  
If OK, check harness for short.

NG → Repair harness or connectors.

OK

**A**

**CHECK COMPONENT**  
(Absolute pressure sensor).  
Refer to "COMPONENT INSPECTION" of "TROUBLE DIAGNOSIS FOR DTC P0105", EC-106.

NG → Replace absolute pressure sensor.

OK

**CHECK COMPONENT**  
(MAP/BARO switch solenoid valve).  
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace MAP/BARO switch solenoid valve.

OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

GI  
MA  
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LC  
EC  
FE  
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MT  
AT  
TF  
PD  
FA  
RA  
BR  
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## TROUBLE DIAGNOSIS FOR DTC P1105

### Manifold Absolute Pressure (MAP)/Barometric Pressure (BARO) Switch Solenoid Valve (Cont'd)

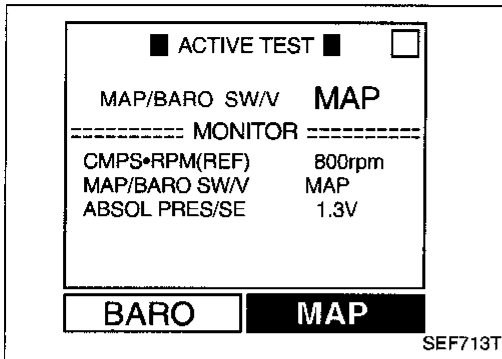
#### COMPONENT INSPECTION

##### MAP/BARO switch solenoid valve

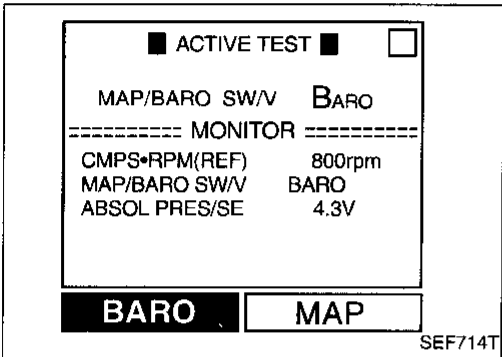
1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
  - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
  - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
4. If NG, replace solenoid valve.

OR

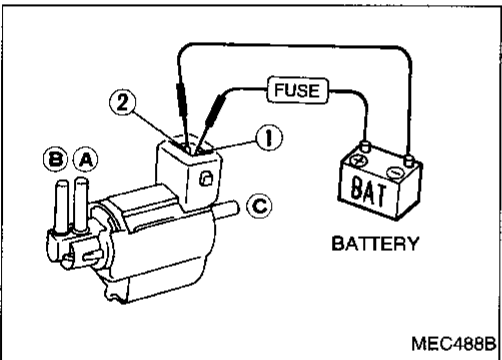
1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.



SEF713T



SEF714T



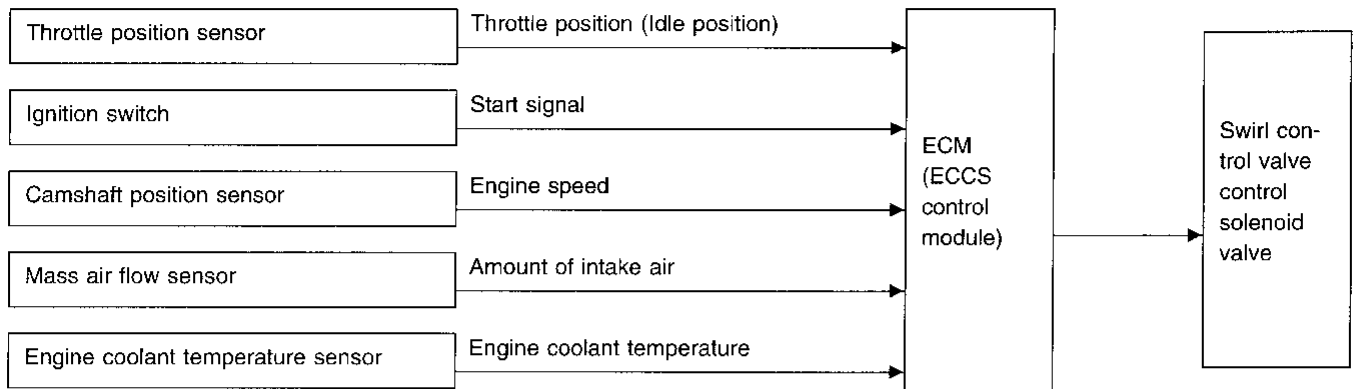
MEC488B

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

3. If NG, replace solenoid valve.

## Swirl Control Valve Control Solenoid Valve

### SYSTEM DESCRIPTION



This system has a swirl control valve in the intake passage of each cylinder.

While idling and during low engine speed operation, the swirl control valve closes. Thus the velocity of the air in the intake passage increases, promoting the vaporization of the fuel and producing a swirl in the combustion chamber.

Because of this operation, this system tends to increase the burning speed of the gas mixture, improve fuel consumption, and increase the stability in running conditions.

Also, except when idling and during low engine speed operation, this system opens the swirl control valve. In this condition, this system tends to increase power by improving intake efficiency via reduction of intake flow resistance, intake flow.

The solenoid valve controls swirl control valve's shut/open condition. This solenoid valve is operated by the ECM.

Throttle position switch (Idle position)	Engine speed	Swirl control valve control solenoid valve	Swirl control valve
ON	Below 3,600 rpm	ON	Closed
OFF	Less than 3,200 rpm	ON	Closed
	More than 4,000 rpm	OFF	Open

When engine coolant temperature is below 0°C (32°F) swirl control valve is kept open.

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
111	GY	Swirl control valve control solenoid valve	Engine is running. └ Idle speed	0 - 1V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
SWRL CONT S/V	● Engine is running at a speed of less than 3,600 rpm.	ON
	● Except above	OFF

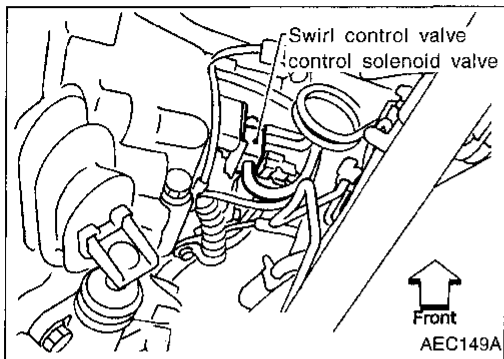
## TROUBLE DIAGNOSIS FOR DTC P1130

### Swirl Control Valve Control Solenoid Valve (Cont'd)

#### COMPONENT DESCRIPTION

##### Swirl control valve control solenoid valve

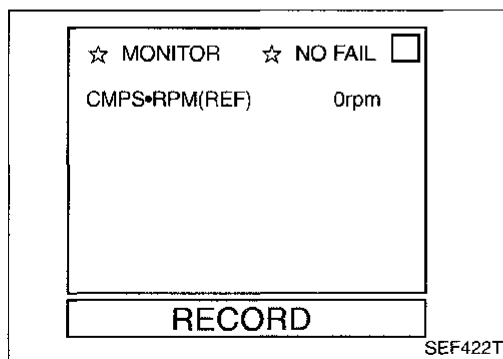
The swirl control valve control solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the solenoid valve is bypassed to apply intake manifold vacuum to the swirl control valve actuator. This operation closes the swirl control valve. When the ECM sends an OFF signal, the vacuum signal is cut and the swirl control valve opens.



#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1130 1004	A) An improper voltage signal is sent to ECM through swirl control valve control solenoid valve.	<ul style="list-style-type: none"> <li>● Harness or connectors (The swirl control valve control solenoid valve circuit is open or shorted.)</li> </ul>
	B) The vacuum signal is not sent to swirl control valve under specified driving conditions, even though swirl control valve control solenoid valve is ON.	<ul style="list-style-type: none"> <li>● Harness or connector (The swirl control valve control solenoid valve circuit is open.)</li> <li>● Swirl control valve control solenoid valve</li> <li>● Intake system (Intake air leaks)</li> <li>● Hoses</li> <li>● Swirl control valve</li> <li>● Swirl control valve control vacuum check switch</li> <li>● One-way valve</li> <li>● Vacuum tank</li> </ul>
	C) The vacuum signal is sent to swirl control valve even though swirl control valve control solenoid valve is OFF.	<ul style="list-style-type: none"> <li>● Harness or connector (The swirl control valve control solenoid valve circuit is shorted.)</li> <li>● Blocked vacuum pipe or hose</li> <li>● Swirl control valve control solenoid valve</li> </ul>

**Note:** If DTC P1130 (1004) and P1165 (0112) are displayed, first perform TROUBLE DIAGNOSIS FOR DTC P1165 (0112). (See EC-251.)



#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B and C".

##### Procedure for malfunction A

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

OR

# TROUBLE DIAGNOSIS FOR DTC P1130

## Swirl Control Valve Control Solenoid Valve (Cont'd)

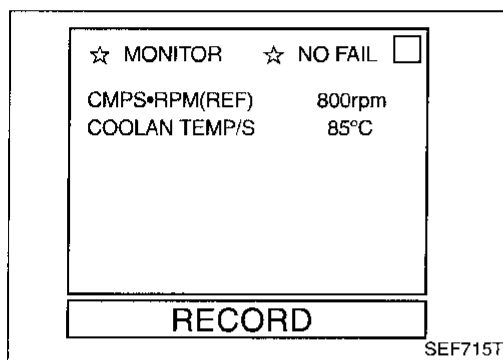


- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Select "MODE 7" with GST.

OR



- 1) Turn ignition switch "ON" and wait at least 5 seconds.
- 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



### Procedure for malfunction B



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and run it for at least 20 seconds at idle speed.

OR

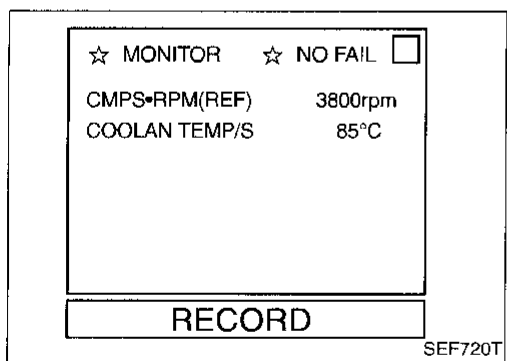


- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine again and run it for at least 20 seconds at idle speed.
- 4) Select "MODE 7" with GST.

OR



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine and run it for at least 20 seconds at idle speed.
- 4) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



### Procedure for malfunction C



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
- 4) Start engine and run it for at least 20 seconds at 3,800 rpm under no load.

OR



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine and run it for at least 20 seconds at 3,800 rpm under no load.
- 4) Select "MODE 7" with GST.

OR

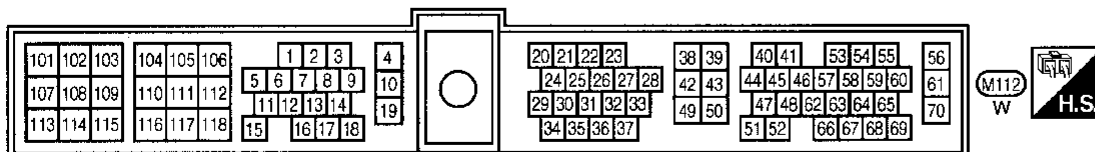
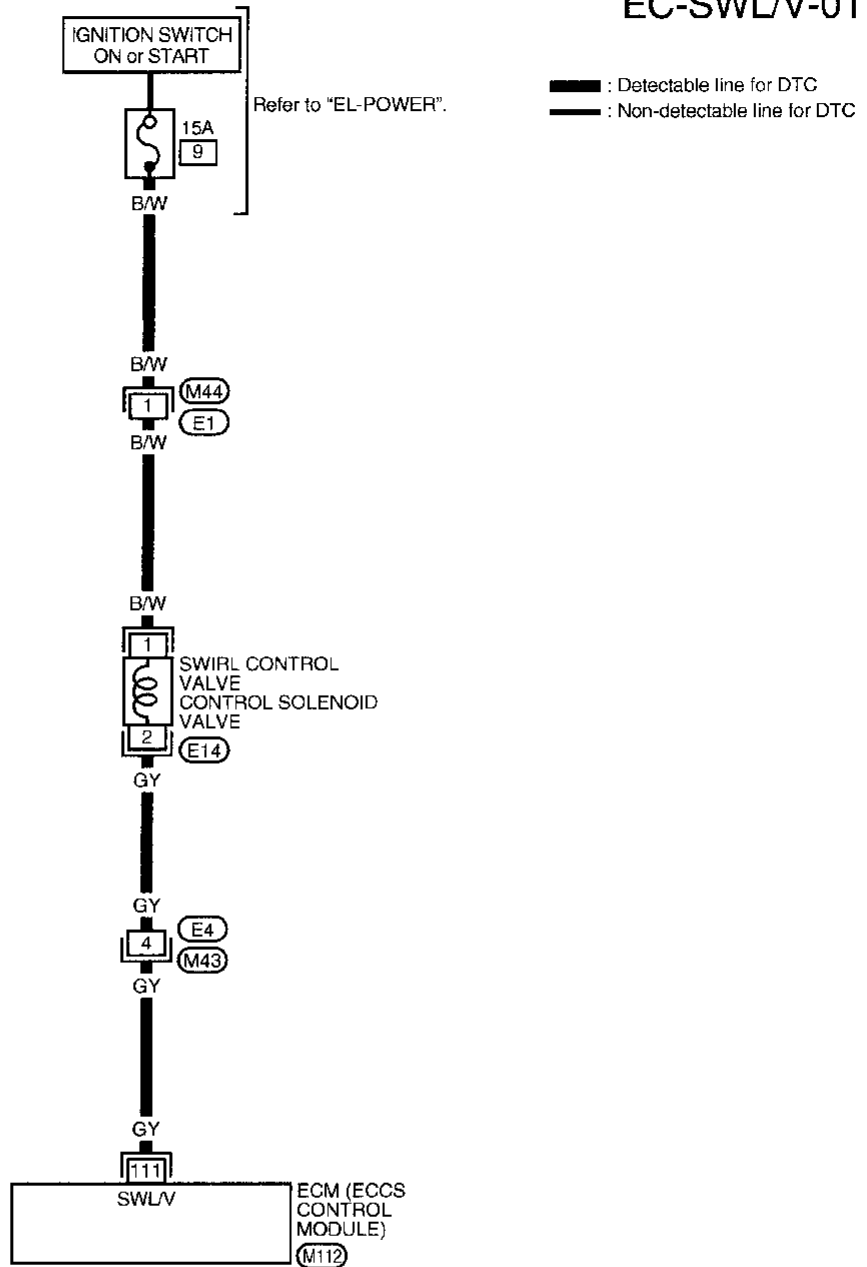


- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine and run it for at least 20 seconds at 3,800 rpm under no load.
- 4) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P1130

## Swirl Control Valve Control Solenoid Valve (Cont'd)

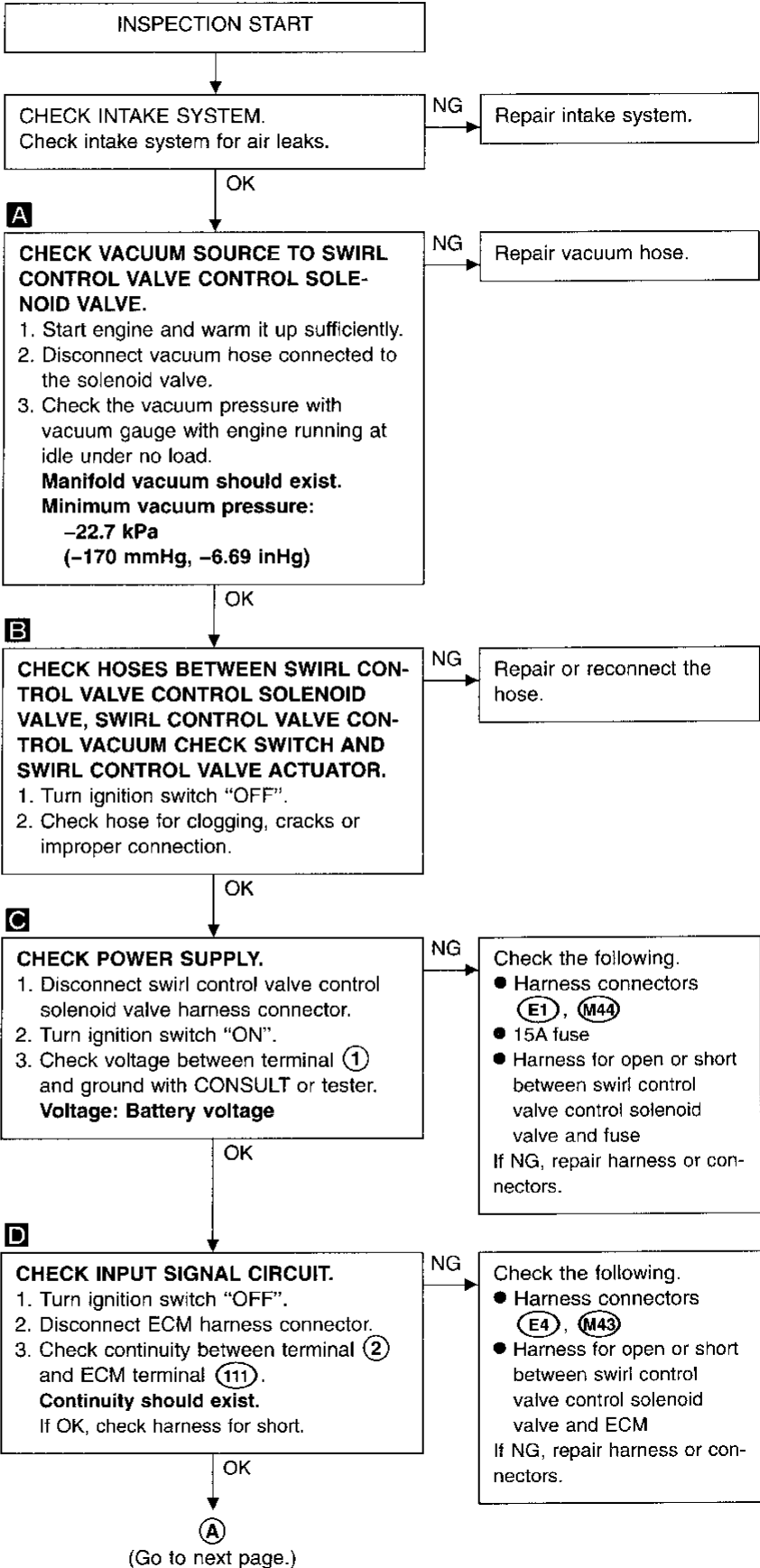
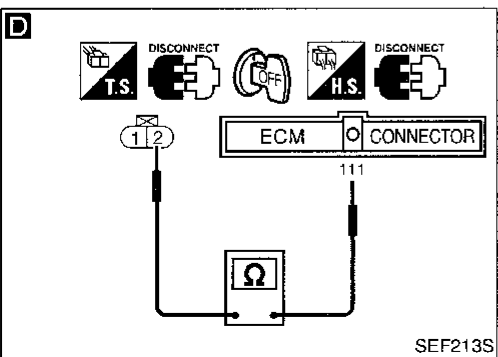
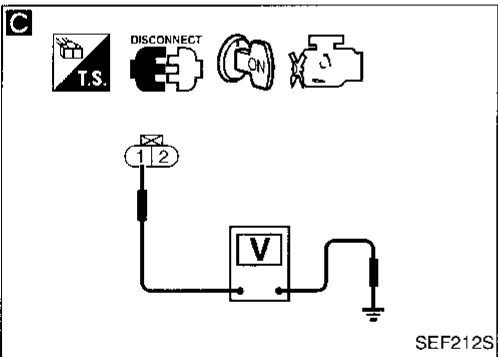
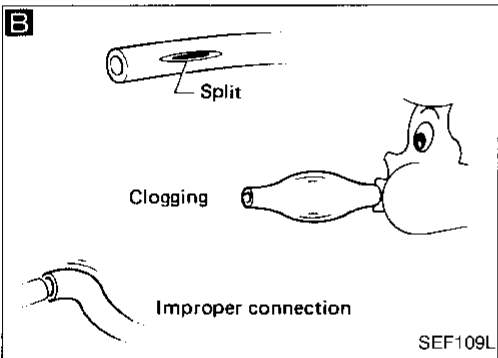
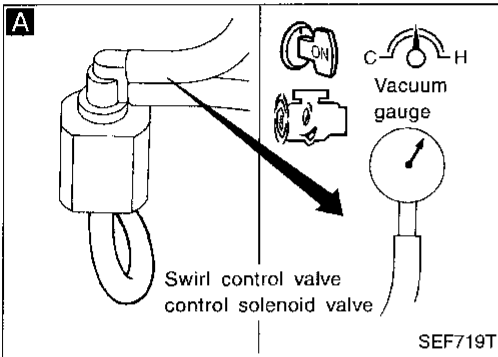
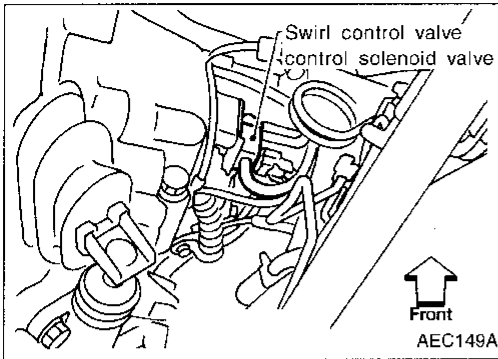
EC-SWL/V-01



# TROUBLE DIAGNOSIS FOR DTC P1130

## Swirl Control Valve Control Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE

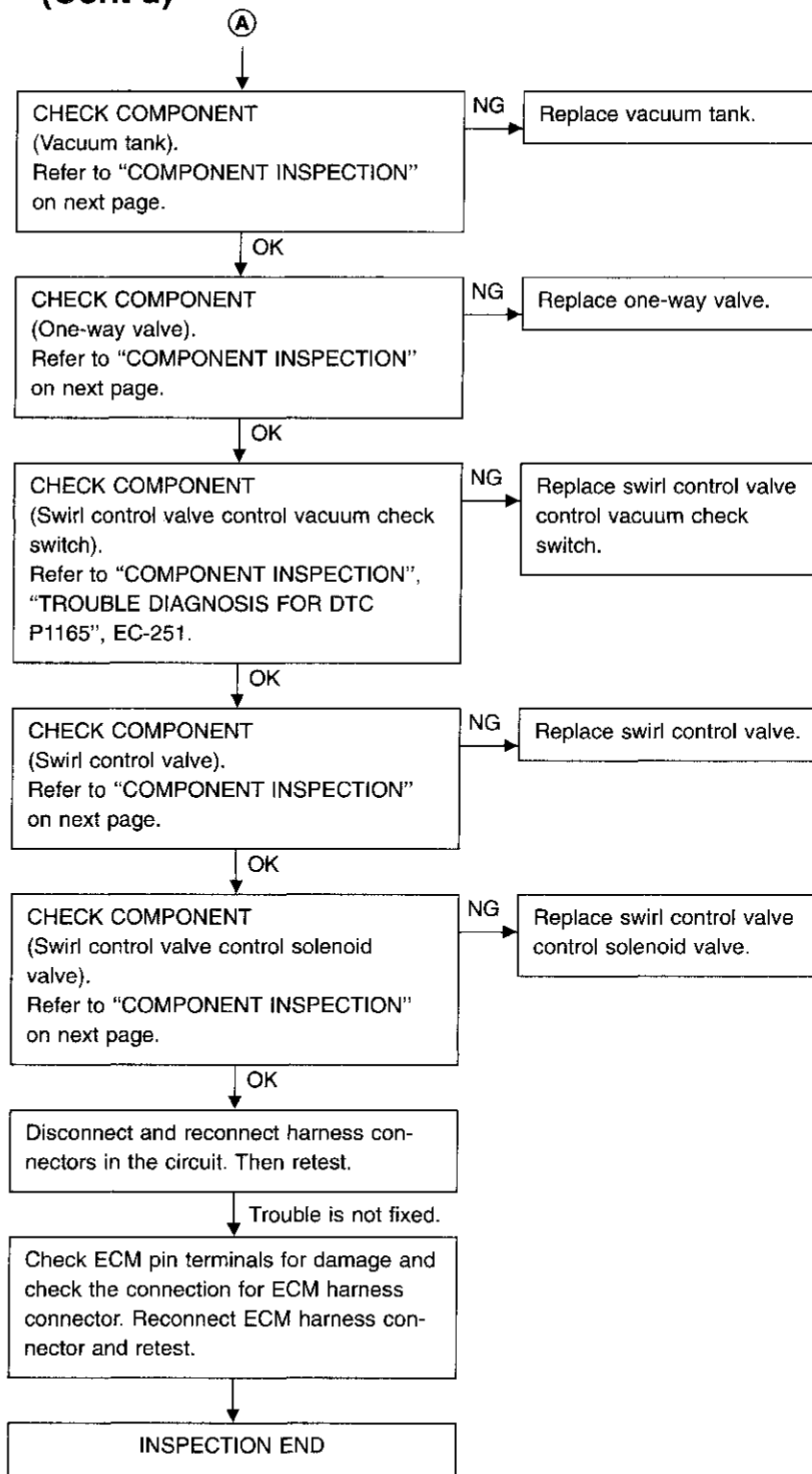


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# TROUBLE DIAGNOSIS FOR DTC P1130

## Swirl Control Valve Control Solenoid Valve (Cont'd)



# TROUBLE DIAGNOSIS FOR DTC P1130

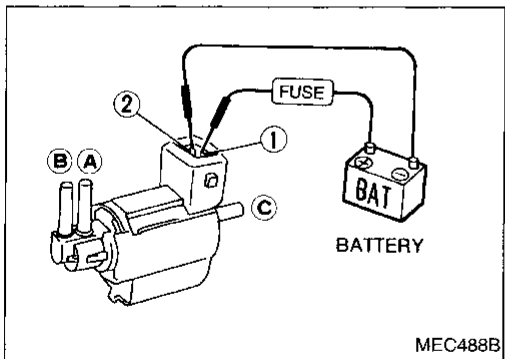
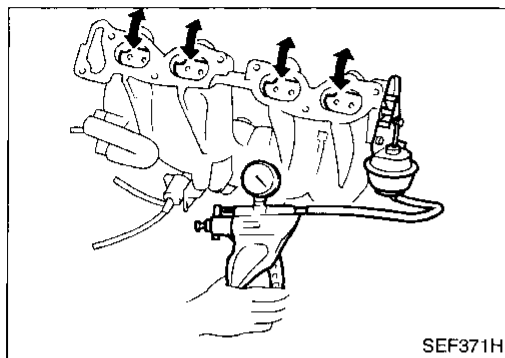
## Swirl Control Valve Control Solenoid Valve (Cont'd)

### COMPONENT INSPECTION

#### Swirl control valve

Supply vacuum to actuator and check swirl control valve operation.

Condition	Swirl control valve
Supply vacuum to actuator	Close
No supply	Open

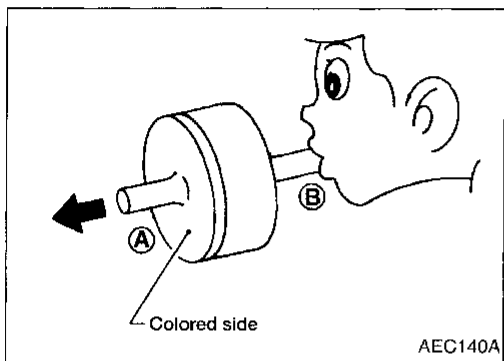


#### Swirl control valve control solenoid valve

Check solenoid valve air passage continuity.

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

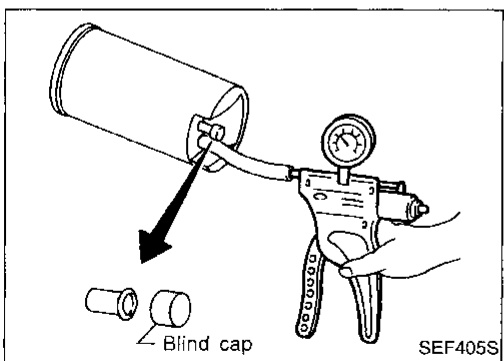


#### One-way valve

Check one-way valve air passage continuity.

Condition	Air passage continuity
Blow air from side B to A	Yes
Blow air from side A to B	No

If NG, replace one-way valve.



#### Vacuum tank

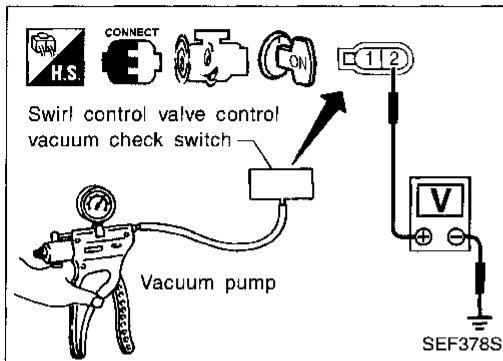
Check vacuum tank leakage.

Apply vacuum  $-80.0$  kPa ( $-600$  mmHg,  $-23.62$  inHg,  $-11.60$  psi). Then keep it for 10 seconds and check there is no leakage.

## TROUBLE DIAGNOSIS FOR DTC P1130

### Swirl Control Valve Control Solenoid Valve (Cont'd)

#### Swirl control valve control vacuum check switch

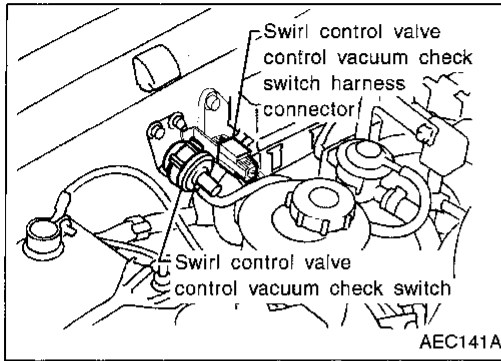


1. Disconnect swirl control valve control vacuum check switch harness connector.
2. Use vacuum pump to apply vacuum to swirl control valve control vacuum check switch as shown in figure.
3. Start engine.
4. Check voltage between terminal ② and engine ground with CONSULT or tester.

Pressure	Voltage (V)
More than $-18.7$ kPa ( $-140$ mmHg, $-5.51$ inHg)	Engine ground
$-18.7$ to $-22.7$ kPa ( $-140$ to $-170$ mmHg, $-5.51$ to $-6.69$ inHg)	Engine ground or Approx. 4.8
Less than $-22.7$ kPa ( $-170$ mmHg, $-6.69$ inHg)	Approx. 4.8

5. If NG, replace swirl control valve control vacuum check switch.

# TROUBLE DIAGNOSIS FOR DTC P1165



## Swirl Control Valve Control Vacuum Check Switch

### COMPONENT DESCRIPTION

The swirl control valve control vacuum check switch detects vacuum signal to the swirl control valve, and sends "ON" or "OFF" signal to the ECM.

When vacuum is supplied to the valve, the swirl control valve control vacuum check switch sends "OFF" signal to the ECM.

The swirl control valve control vacuum check switch is not used to control the engine system, it is used for on board diagnosis.

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
32	R/Y	Swirl control valve control vacuum check switch	Engine is running. └ Engine speed is above 3,600 rpm.	0V
			Engine is running. └ Engine speed is less than 3,600 rpm.	Approximately 4.8V

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible cause)
P1165 0112	The swirl control valve control vacuum check switch remains "OFF" under specified engine conditions.	<ul style="list-style-type: none"> <li>● Harness or connectors (Swirl control valve control vacuum check switch circuit is open.)</li> <li>● Hoses (Hoses are connected incorrectly.)</li> <li>● Swirl control valve control solenoid valve</li> <li>● Swirl control valve control vacuum check switch</li> </ul>

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
SWL CON VC SW	● Engine is running at a speed of less than 3,600 rpm.	OFF
	● Except above	ON

## TROUBLE DIAGNOSIS FOR DTC P1165

### Swirl Control Valve Control Vacuum Check Switch (Cont'd)

#### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

☆ MONITOR	☆ NO FAIL	<input type="checkbox"/>
CMPS•RPM(REF)	3800rpm	
COOLAN TEMP/S	85°C	
<b>RECORD</b>		

SEF720T



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON".
- 4) Select "DATA MONITOR" mode with CONSULT.
- 5) Start engine and run it for at least 5 seconds at 3,800 rpm under no load.

OR



- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Start engine and run it for at least 5 seconds at 3,800 rpm under no load.
- 4) Select "MODE 7" with GST.

OR

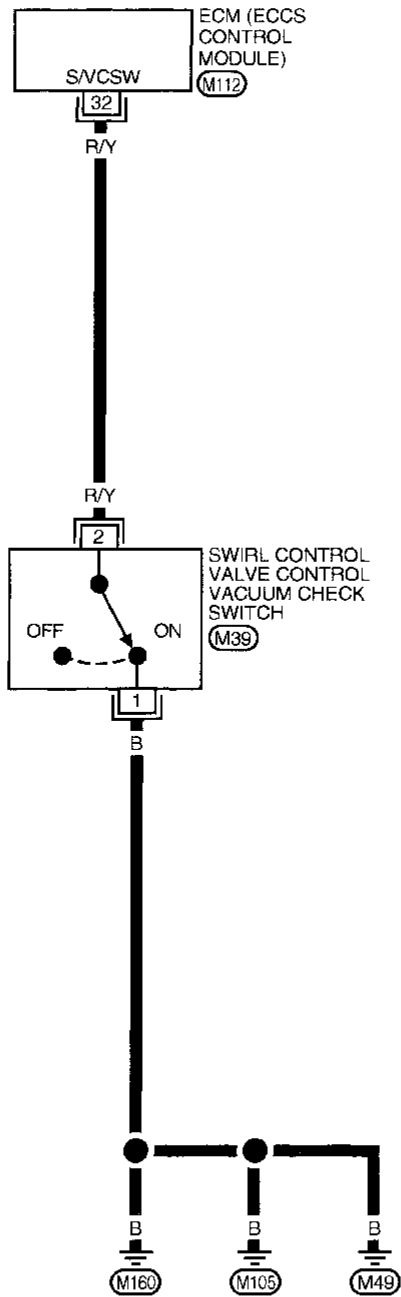


- 1) Start engine and warm it up sufficiently.
- 2) Turn ignition switch "OFF" and wait at least 7 seconds.
- 3) Turn ignition switch "ON".
- 4) Start engine and run it for at least 5 seconds at 3,800 rpm under no load.
- 5) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P1165

## Swirl Control Valve Control Vacuum Check Switch (Cont'd)

EC-S/VCSW-01



— : Detectable line for DTC  
 — : Non-detectable line for DTC

GI

MA

EM

LC

**EC**

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TF

PD

FA

RA

BR

ST

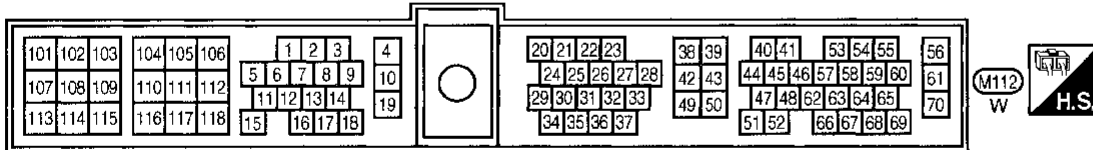
RS

BT

HA

EL

IDX

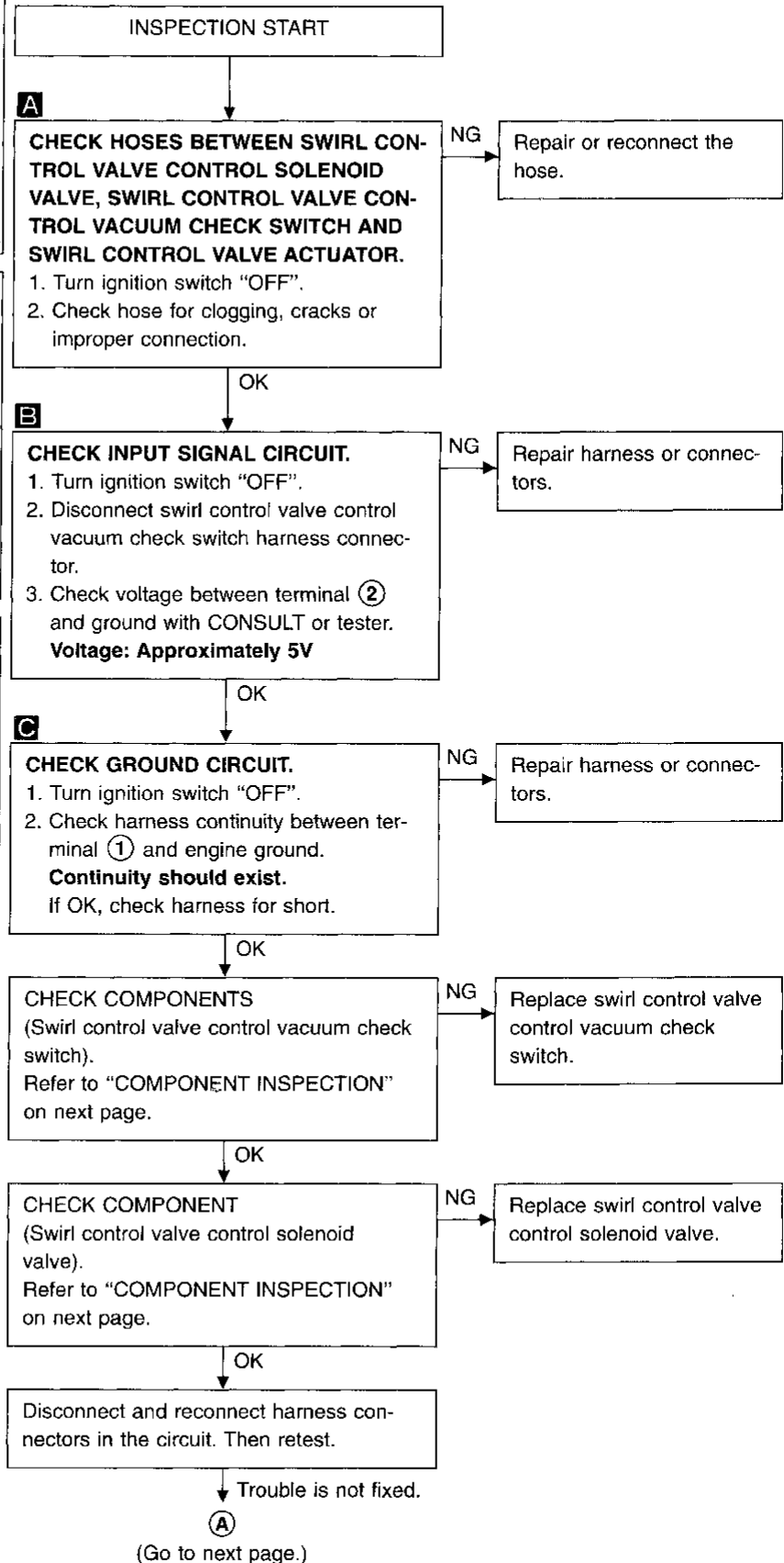
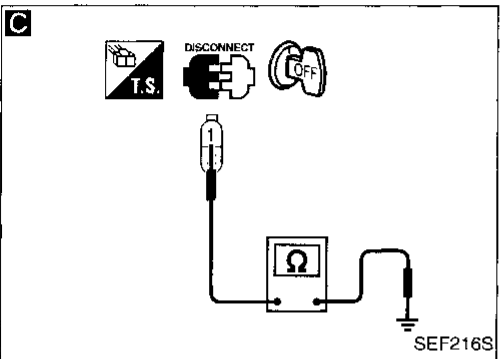
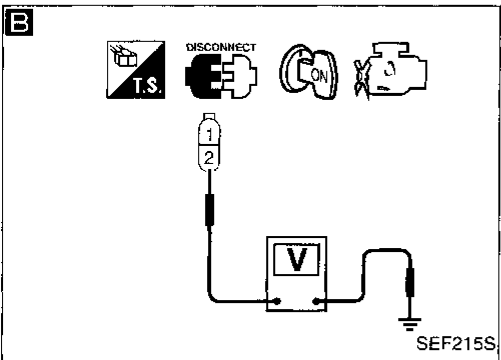
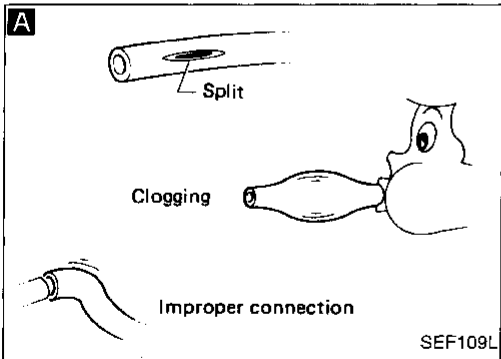
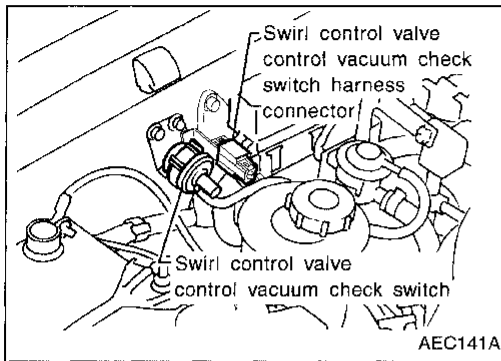


AEC061A

# TROUBLE DIAGNOSIS FOR DTC P1165

## Swirl Control Valve Control Vacuum Check Switch (Cont'd)

### DIAGNOSTIC PROCEDURE



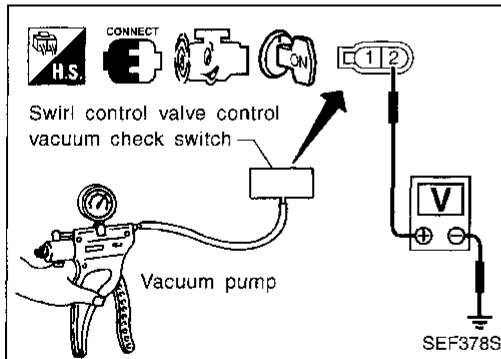
# TROUBLE DIAGNOSIS FOR DTC P1165

## Swirl Control Valve Control Vacuum Check Switch (Cont'd)

(A)

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END



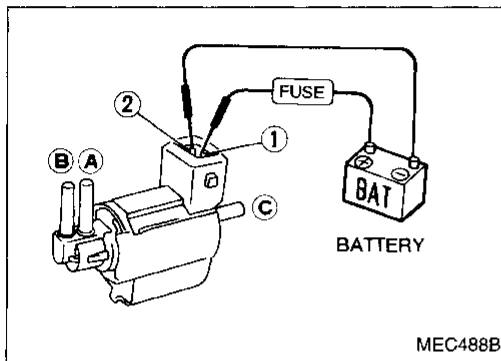
### COMPONENT INSPECTION

#### Swirl control valve control vacuum check switch

1. Use vacuum pump to apply vacuum to swirl control valve control vacuum check switch as shown in figure.
2. Start engine.
3. Check voltage between terminal ② and engine ground with CONSULT or tester.

Pressure	Voltage (V)
More than -18.7 kPa (-140 mmHg, -5.51 inHg)	Engine ground
-18.7 to -22.7 kPa (-140 to -170 mmHg, -5.51 to -6.69 inHg)	Engine ground or Approx. 4.8
Less than -22.7 kPa (-170 mmHg, -6.69 inHg)	Approx. 4.8

4. If NG, replace swirl control valve control vacuum check switch.



#### Swirl control valve control solenoid valve

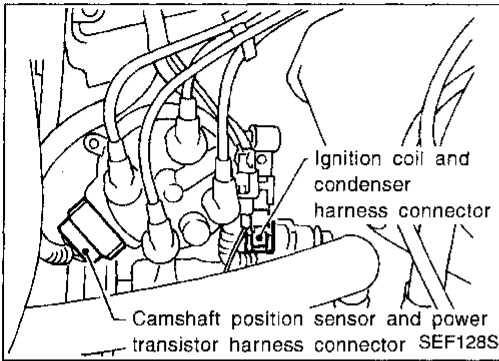
Check solenoid valve air passage continuity.

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.



## TROUBLE DIAGNOSIS FOR DTC P1320



### Ignition Signal

#### COMPONENT DESCRIPTION

#### Ignition coil & power transistor (Built into distributor)

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

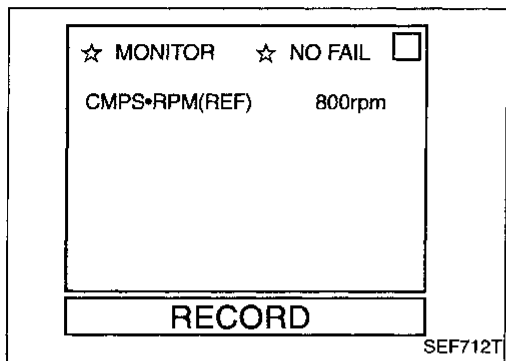
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1	W	Ignition signal	Engine is running. └ Idle speed	0.3 - 0.6V*
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.8V*
2	W/G	Ignition check	Engine is running. └ Idle speed	Approximately 12V*
3	W	Tachometer	Engine is running. └ Idle speed	Approximately 0.9V*

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

#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1320 0201	<ul style="list-style-type: none"> <li>The ignition signal in the primary circuit is not sent during engine cranking or running.</li> </ul>	<ul style="list-style-type: none"> <li>Harness or connectors (The ignition primary circuit is open or shorted.)</li> <li>Power transistor</li> <li>Resistor</li> <li>Camshaft position sensor</li> <li>Camshaft position sensor circuit</li> </ul>




# TROUBLE DIAGNOSIS FOR DTC P1320



## Ignition Signal (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

**Note:** If both DTC P0340 (0101) and P1320 (0201) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340 first. (See EC-171.)

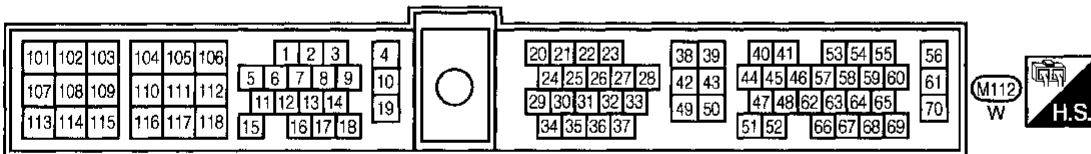
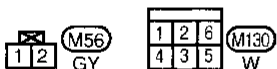
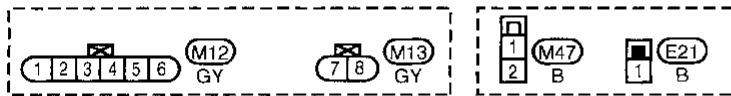
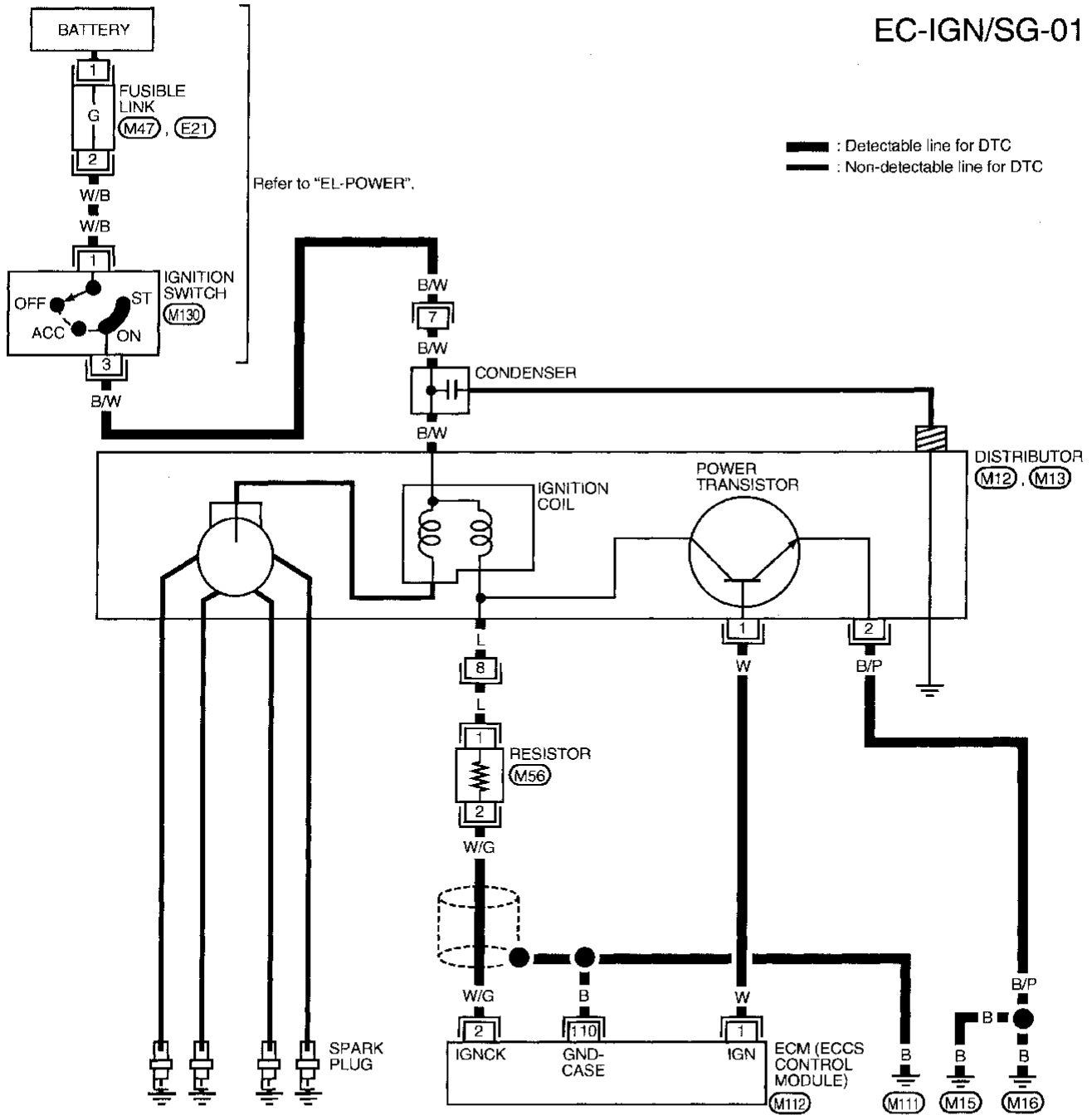
- |   |   |  |
|---|---|--|
|  | <ol style="list-style-type: none"> <li>1) Turn ignition switch "ON".</li> <li>2) Select "DATA MONITOR" mode with CONSULT.</li> <li>3) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)</li> </ol>  | GI<br>MA<br>EM<br>LC   |
| _____ OR _____  |   |  |
|  | <ol style="list-style-type: none"> <li>1) Turn ignition switch "ON".</li> <li>2) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)</li> <li>3) Select MODE 7 with GST.</li> </ol>   | <div style="background-color: black; color: white; padding: 2px 5px; display: inline-block;"><b>EC</b></div> |
| _____ OR _____  |   |  |
|  | <ol style="list-style-type: none"> <li>1) Turn ignition switch "ON".</li> <li>2) Start engine. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)</li> <li>3) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".</li> <li>4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.</li> </ol> | FE<br>CL<br>MT   |

GI  
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# TROUBLE DIAGNOSIS FOR DTC P1320

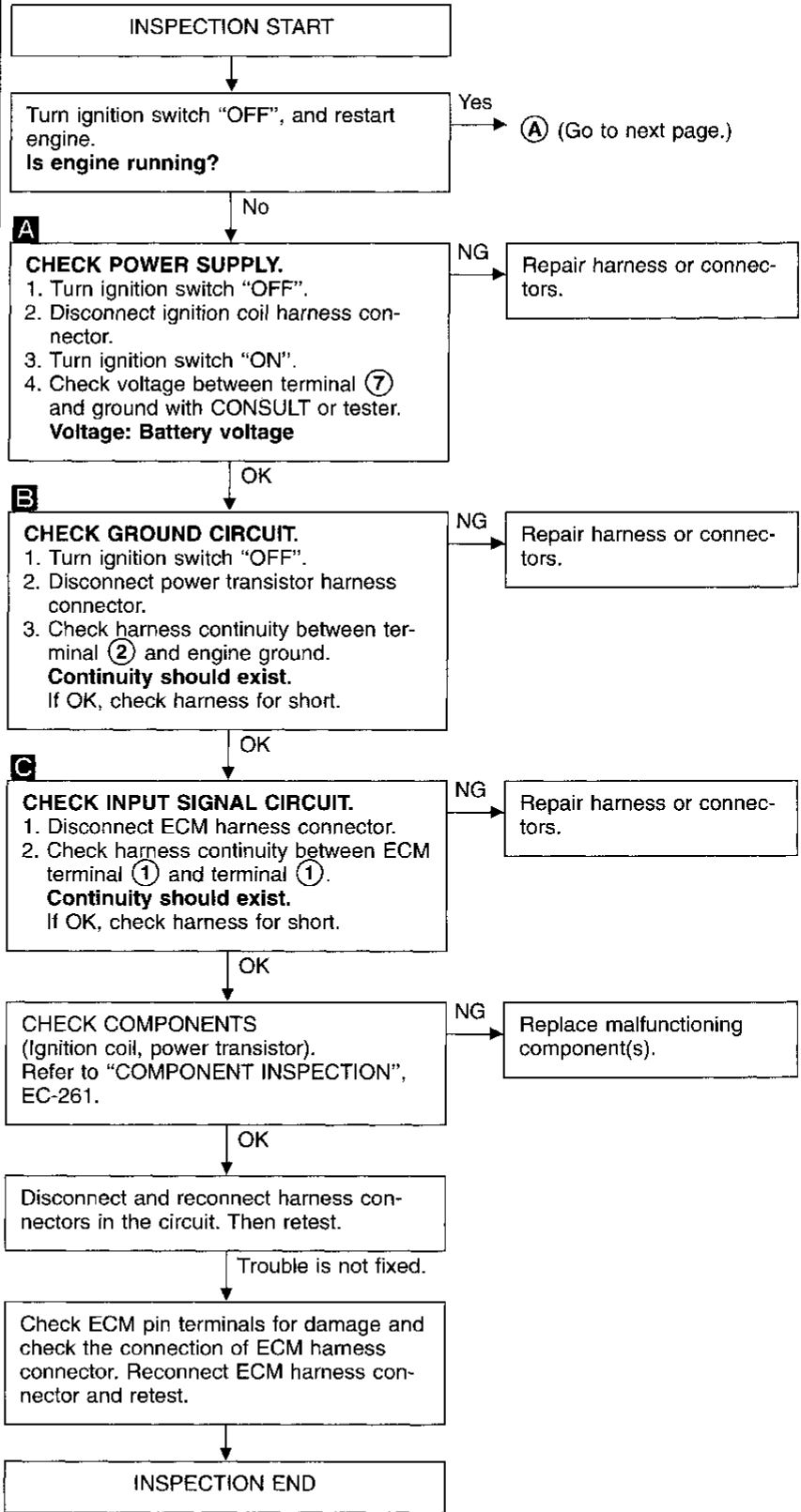
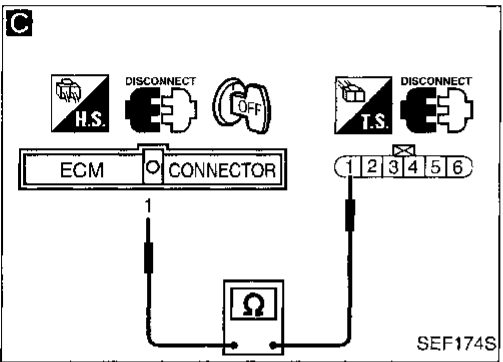
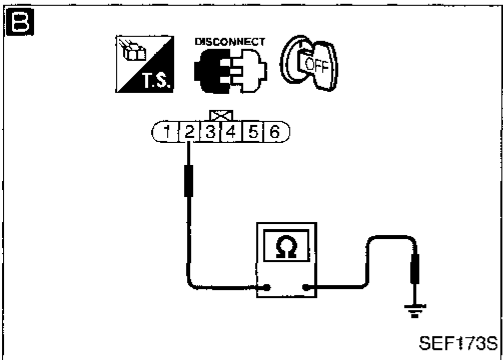
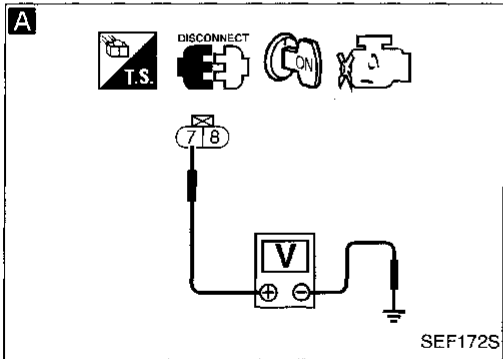
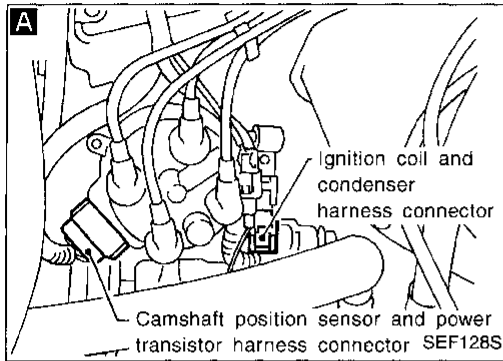
## Ignition Signal (Cont'd)

EC-IGN/SG-01



# TROUBLE DIAGNOSIS FOR DTC P1320

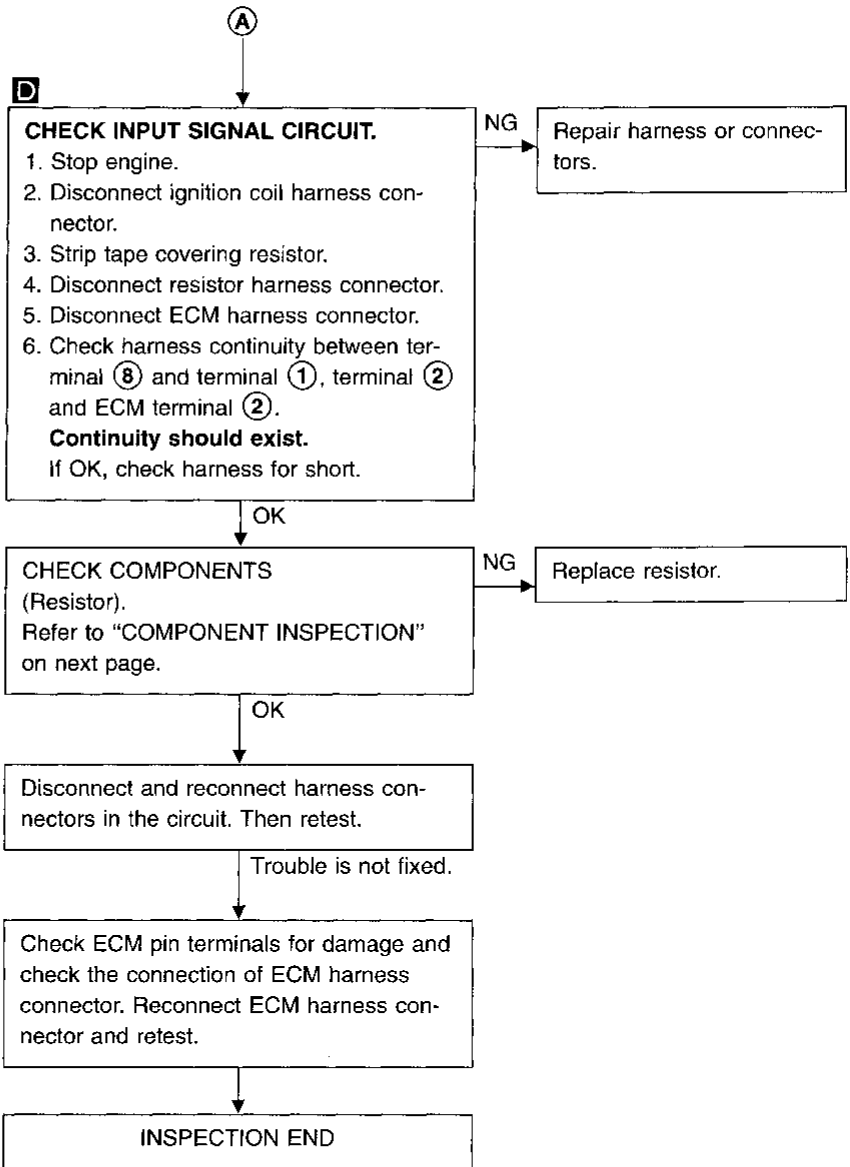
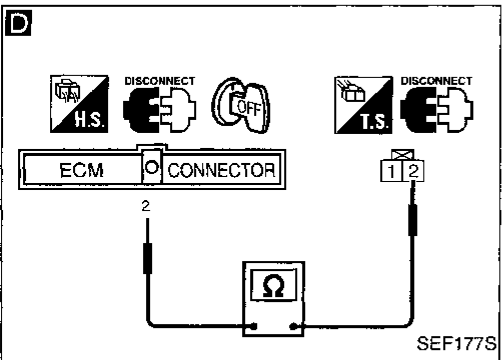
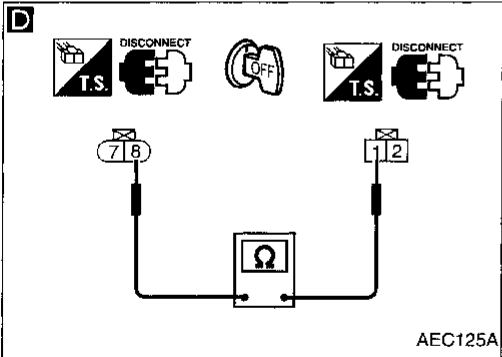
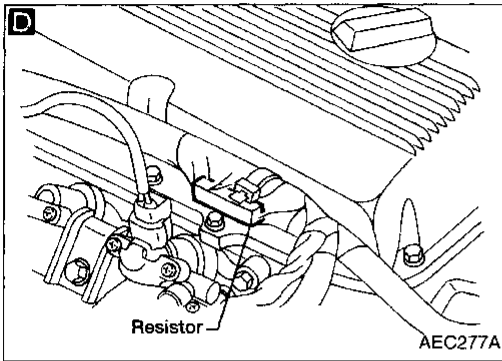
## Ignition Signal (Cont'd) DIAGNOSTIC PROCEDURE



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

# TROUBLE DIAGNOSIS FOR DTC P1320

## Ignition Signal (Cont'd)



# TROUBLE DIAGNOSIS FOR DTC P1320

## Ignition Signal (Cont'd) COMPONENT INSPECTION

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

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FA

RA

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BT

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EL

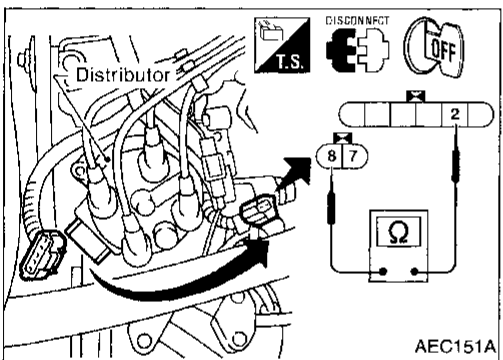
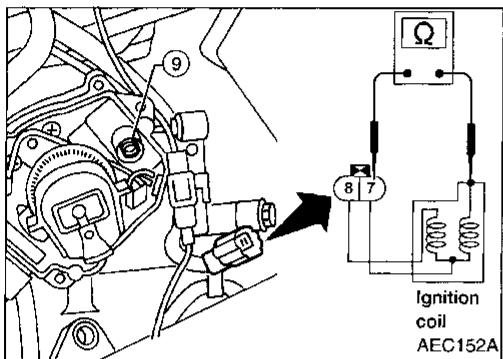
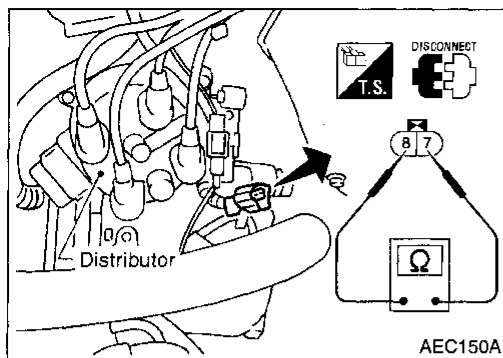
IDX

### 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.

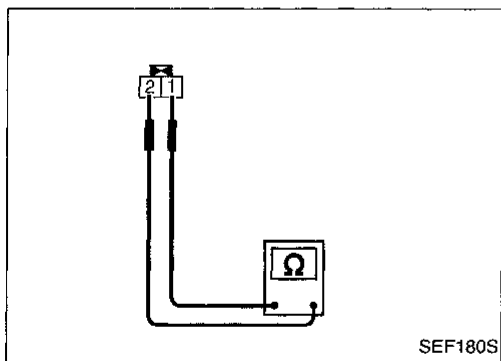


### Power transistor

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

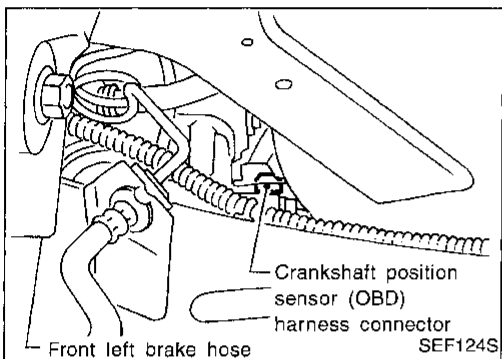
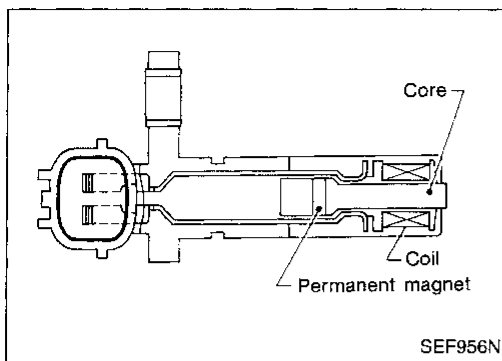
If NG, replace distributor assembly.



### Resistor

1. Disconnect resistor harness connector.
  2. Check resistance between terminals ① and ②.  
**Resistance: Approximately 2.2 kΩ**
- If NG, replace resistor.

## TROUBLE DIAGNOSIS FOR DTC P1336



### 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 used to control the engine system.

It is used only for the on board diagnosis of misfire.

#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
50	B/G	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	0.001 - 0.02V
53	R	Crankshaft position sensor (OBD)	Engine is running. (A/T: N range, M/T: Neutral) └ Idle speed (Air conditioner switch "OFF".)	More than 0.2V* (AC range)

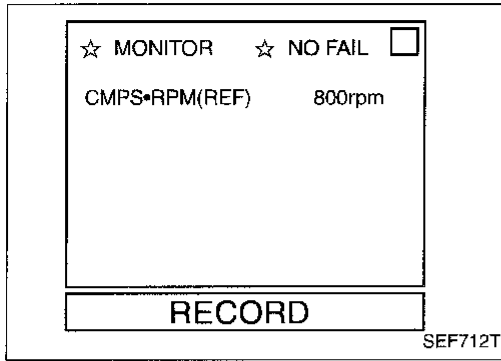
\*: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P1336 0905	<ul style="list-style-type: none"> <li>● A chipping of the flywheel or drive plate gear tooth (cog) is detected by the ECM.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors</li> <li>● Crankshaft position sensor (OBD)</li> <li>● Flywheel (Drive plate)</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P1336

## Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)



### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

- 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.

OR

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

OR

- 1) Start engine and run it for at least 2 minutes at idle speed.
- 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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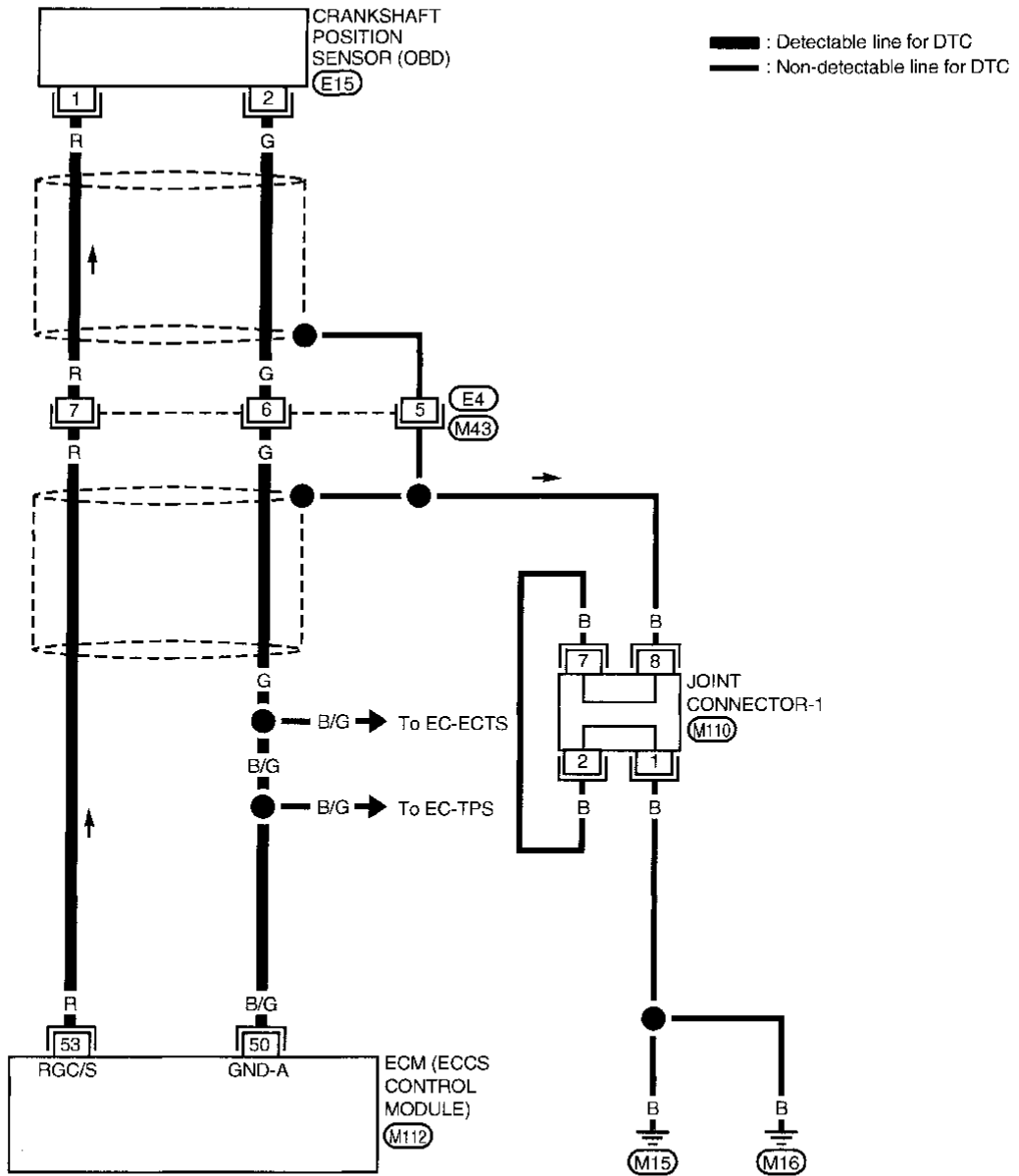
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# TROUBLE DIAGNOSIS FOR DTC P1336

## Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

EC-CKPS-01

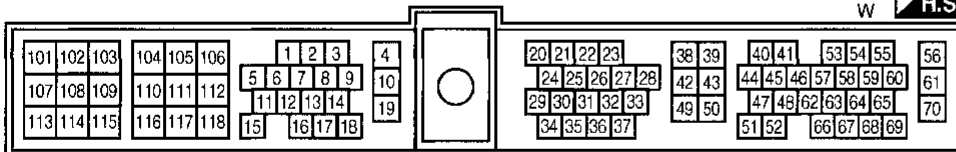


Refer to last page (Foldout page).

(M110)



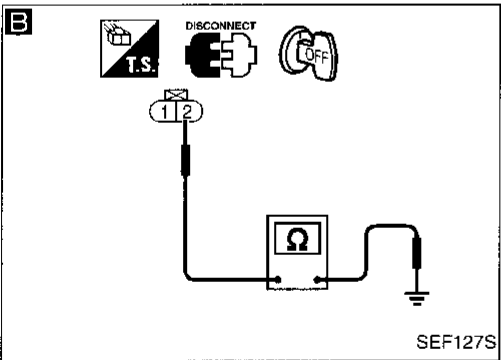
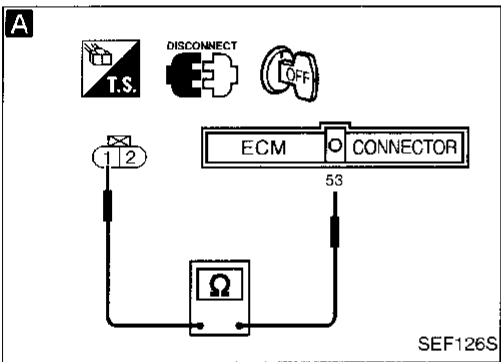
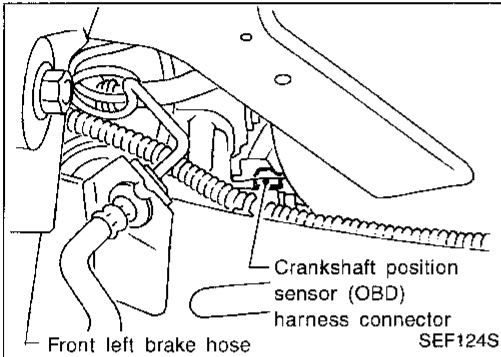
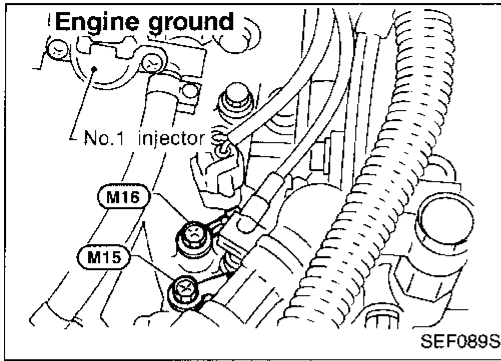
(M112) W H.S.



# TROUBLE DIAGNOSIS FOR DTC P1336

## Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

### DIAGNOSTIC PROCEDURE



INSPECTION START

**CHECK SHIELD CIRCUIT.**

1. Turn ignition switch "OFF".
2. Loosen and retighten engine ground screws.
3. Remove joint connector-1.
4. Check the following.
  - Continuity between joint connector-1 terminal and ground
  - Joint connector-1 (Refer to "HARNESS LAYOUT" in EL section.)

**Continuity should exist.**  
If OK, check harness for short. Then reconnect joint connector-1.

NG → Repair harness or connectors.

OK

**A**

**CHECK INPUT SIGNAL CIRCUIT.**

1. Disconnect crankshaft position sensor (OBD) harness connector and ECM harness connector.
2. Check continuity between ECM terminal 53 and terminal 1.

**Continuity should exist.**  
If OK, check harness for short.

NG → Check the following.

- Harness connectors (M43), (E4)
- Harness for open or short between crankshaft position sensor (OBD) and ECM

If NG, repair harness or connectors.

OK

**B**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch "OFF".
2. Reconnect ECM harness connector.
3. Check harness continuity between terminal 2 and engine ground.

**Continuity should exist.**  
If OK, check harness for short.

NG → Check the following.

- Harness connectors (M43), (E4)
- Harness for open or short between crankshaft position sensor (OBD) and ECM

If NG, repair harness or connectors.

OK

Loosen and retighten the fixing bolt of the crankshaft position sensor (OBD). Then retest.

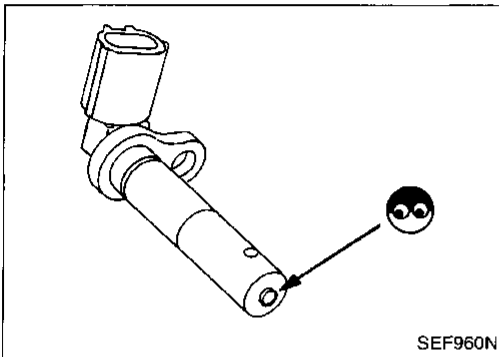
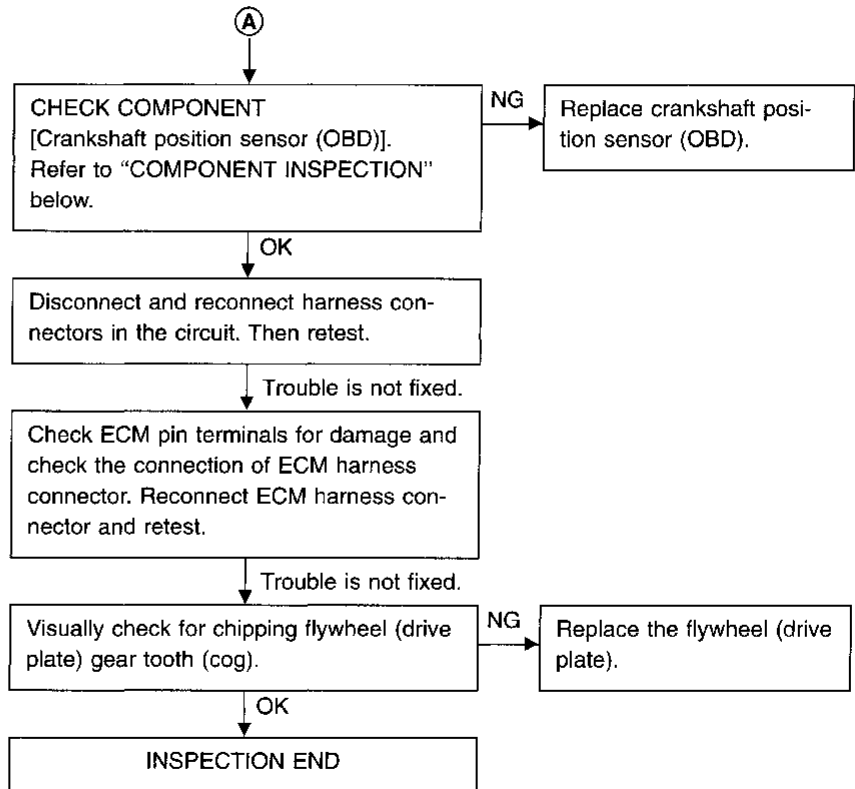
↓ Trouble is not fixed.

Ⓐ (Go to next page.)

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## TROUBLE DIAGNOSIS FOR DTC P1336

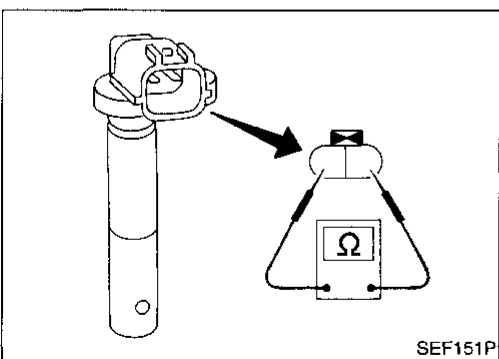
### Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)



#### COMPONENT INSPECTION

##### Crankshaft position sensor (OBD)

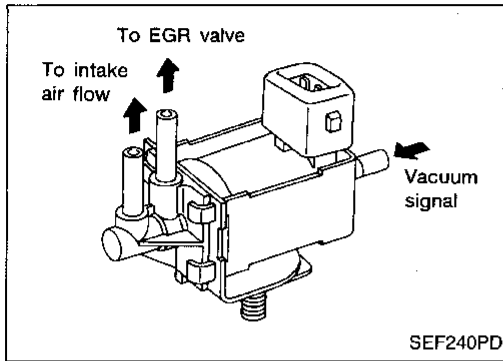
1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

**Resistance: Approximately 166.5 - 203.5Ω at 20°C  
(68°F)**

# TROUBLE DIAGNOSIS FOR DTC P1400



## EGRC-Solenoid Valve

### COMPONENT DESCRIPTION

The EGRC-solenoid valve responds to signals from the ECM. When the ECM sends an ON (ground) signal, the coil in the solenoid valve is energized. 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.

### ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
103	W/L	EGRC-solenoid valve	Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0 - 1V

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EGRC SOLV	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever: "N"</li> <li>● No-load</li> </ul> Idle	ON
	Racing up to 1,500 - 2,000 rpm	OFF

### ON BOARD DIAGNOSIS LOGIC


Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P1400 1005	<ul style="list-style-type: none"> <li>● An improper voltage signal is sent to ECM through EGRC-solenoid valve.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (The EGRC-solenoid valve circuit is open or shorted.)</li> <li>● EGRC-solenoid valve</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P1400


## EGRC-Solenoid Valve (Cont'd)

### OVERALL FUNCTION CHECK


Use this procedure to check the overall function of the EGRC-solenoid valve circuit. During this check, a 1st trip DTC might not be confirmed.

-  1) Turn ignition switch "ON".  
2) Perform "EGRC SOL/V CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

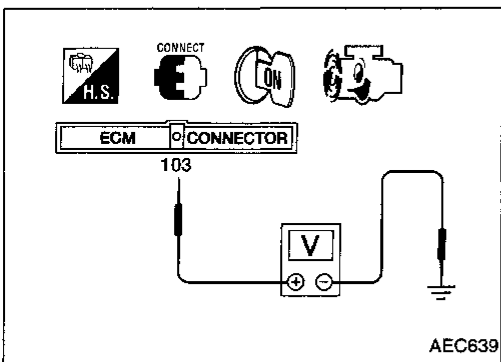
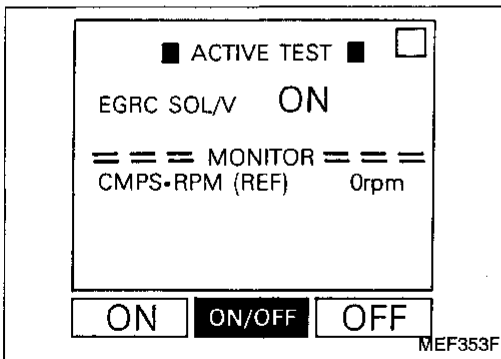
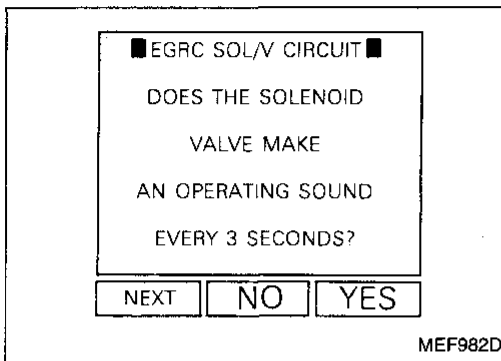
-  1) Turn ignition switch "ON".  
2) Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and check the operating sound, according to ON/OFF switching.

OR

-  1) Start engine and warm it up sufficiently.  
2) Turn ignition switch "OFF" and wait at least 7 seconds.  
3) Start engine again.  
4) Check the voltage between ECM terminal **103** and ground at idle speed.

**Voltage: 0.04 - 0.08V**

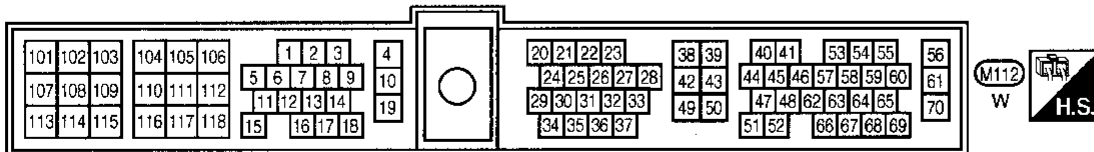
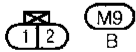
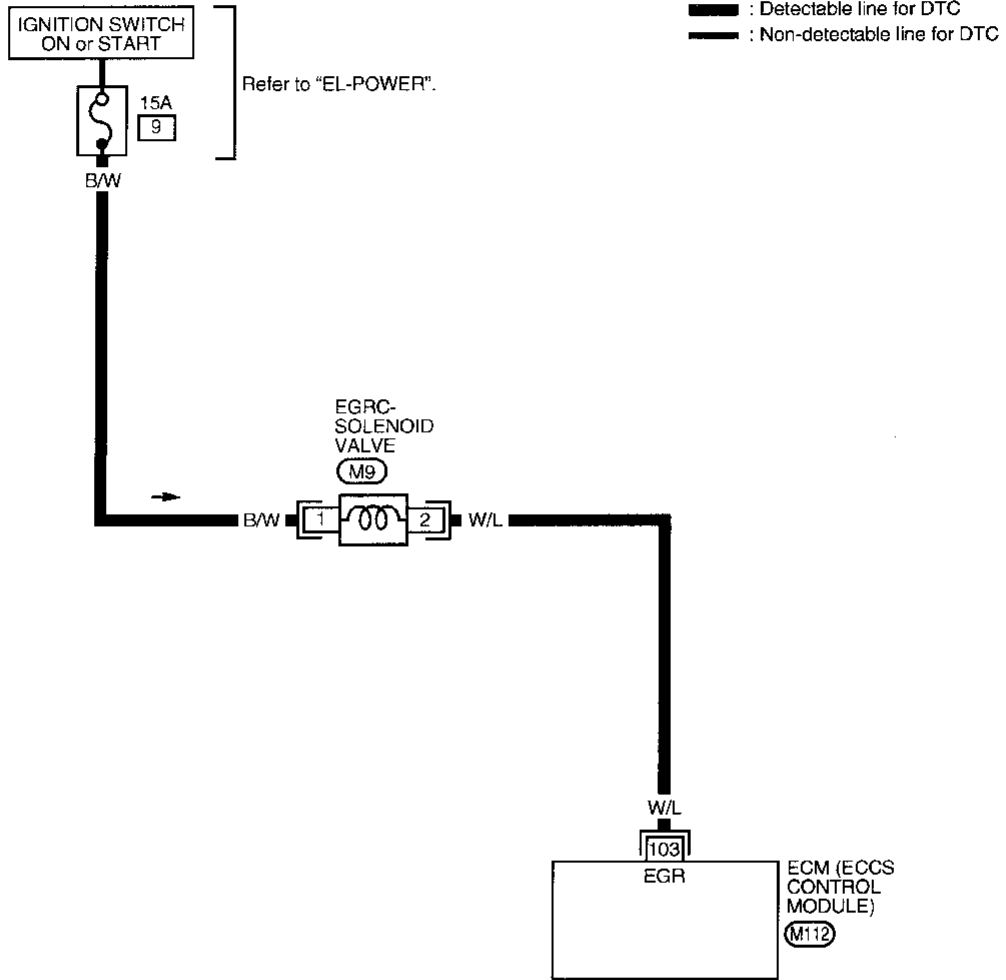
- 5) Check that the voltage changes to battery voltage and returns to 0.04 - 0.08V when the engine speed increases to about 2,500 rpm.



# TROUBLE DIAGNOSIS FOR DTC P1400

## EGRC-Solenoid Valve (Cont'd)

EC-EGRC/V-01

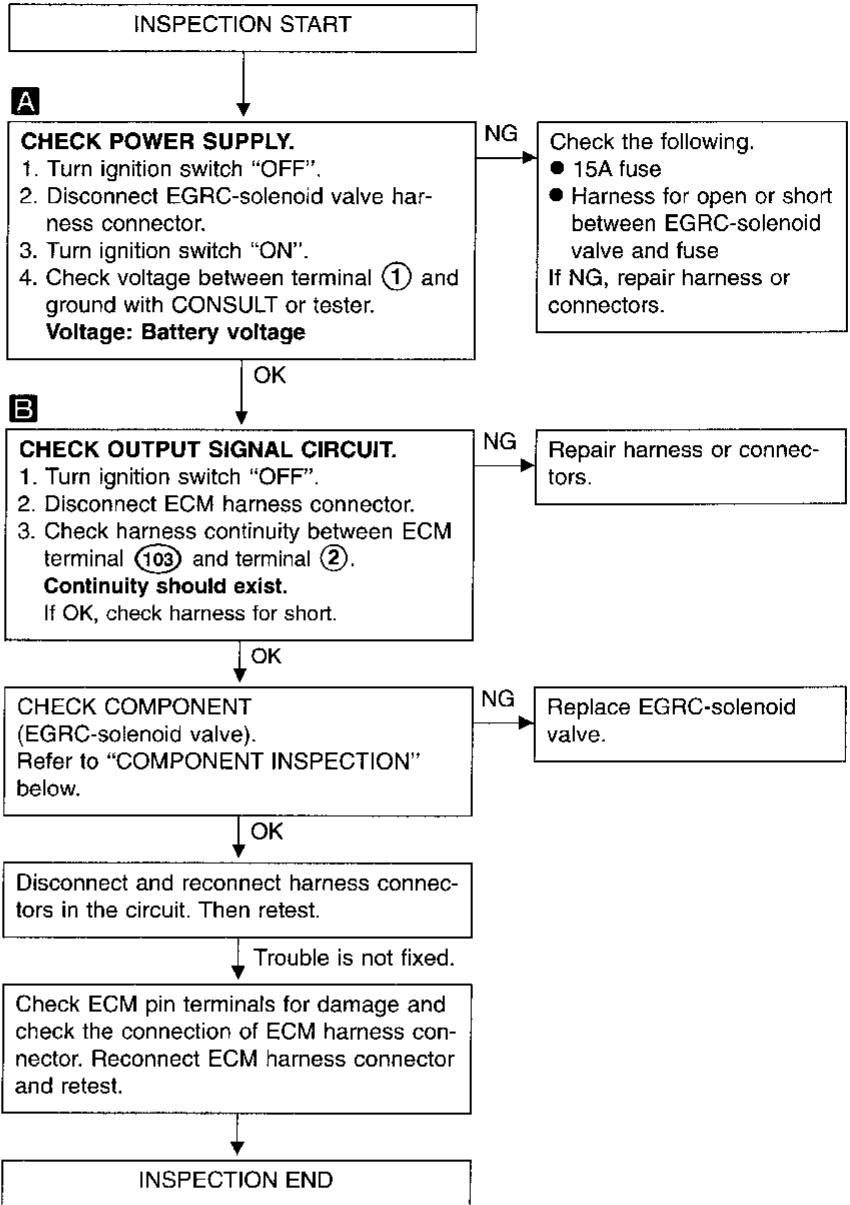
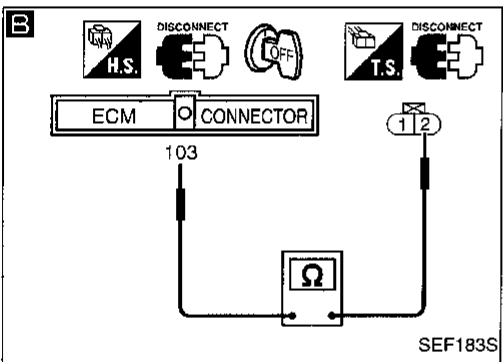
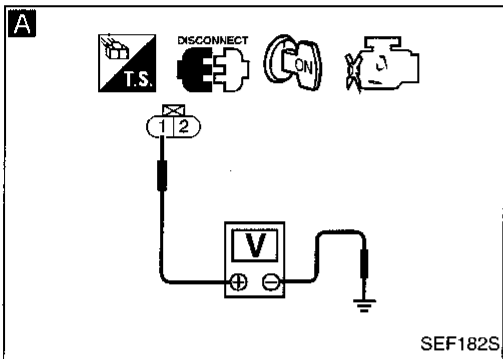
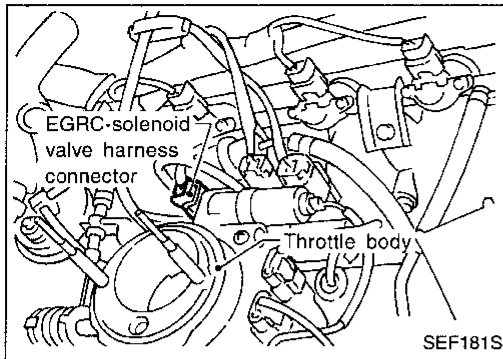


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# TROUBLE DIAGNOSIS FOR DTC P1400

## EGRC-Solenoid Valve (Cont'd)

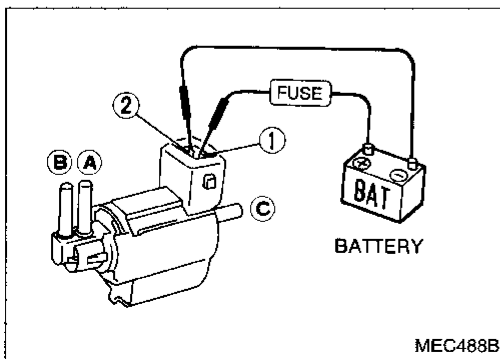
### DIAGNOSTIC PROCEDURE



### COMPONENT INSPECTION

#### EGRC-solenoid valve

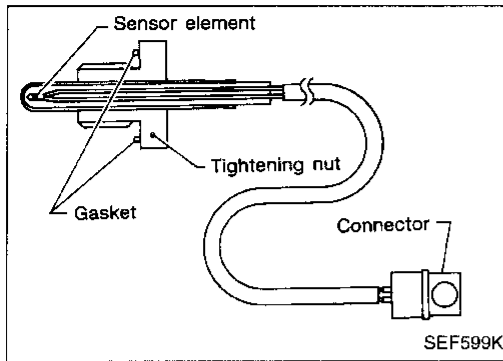
Check air passage continuity.



Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.

# TROUBLE DIAGNOSIS FOR DTC P1401



## EGR Temperature Sensor

### COMPONENT DESCRIPTION

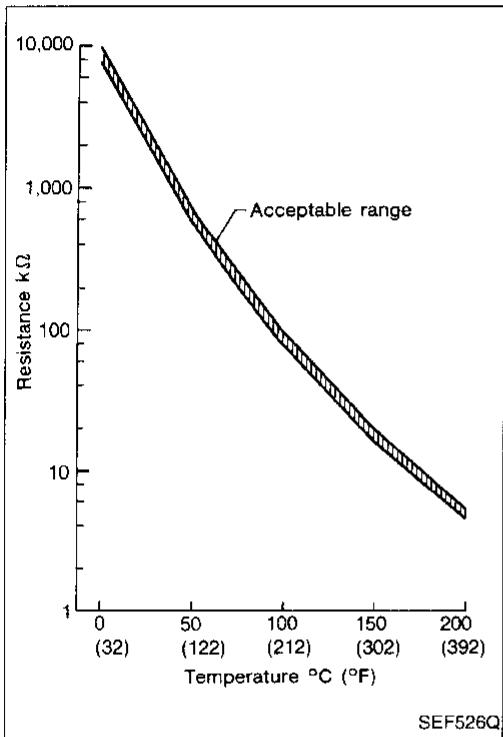
The EGR temperature sensor detects temperature changes in the EGR passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passageway changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases.

This sensor is not used to control the engine system. It is used only for the on board diagnosis.

<Reference data>

EGR temperature °C (°F)	Voltage* (V)	Resistance (MΩ)
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

\*: These data are reference values and measured between ECM terminal ⑥2 (EGR temperature sensor) and ECM terminal ④3 (ECCS ground).



### 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.	<ul style="list-style-type: none"> <li>● Harness or connectors (The EGR temperature sensor circuit is shorted.)</li> <li>● EGR temperature sensor</li> <li>● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve</li> </ul>
	B) An excessively high voltage from the EGR temperature sensor is sent to ECM, even when engine coolant temperature is high.	<ul style="list-style-type: none"> <li>● Harness or connectors (The EGR temperature sensor circuit is open.)</li> <li>● EGR temperature sensor</li> <li>● Malfunction of EGR function, EGRC-BPT valve or EGRC-solenoid valve</li> </ul>



# TROUBLE DIAGNOSIS FOR DTC P1401

## EGR Temperature Sensor (Cont'd)

### OVERALL FUNCTION CHECK

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

#### Procedure for malfunctions A and B

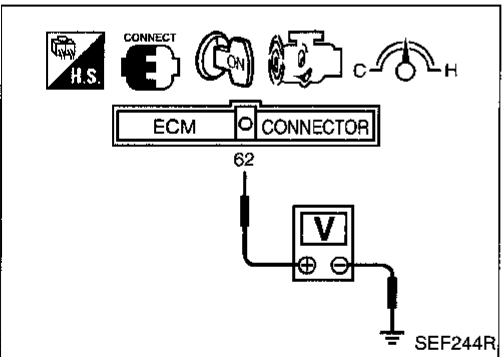
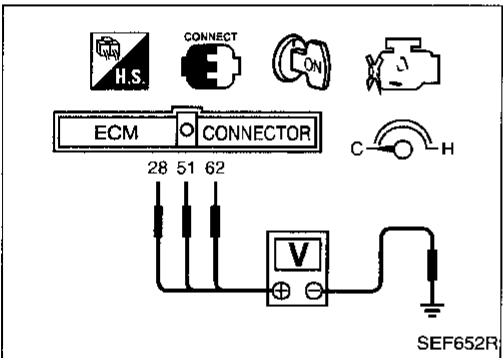
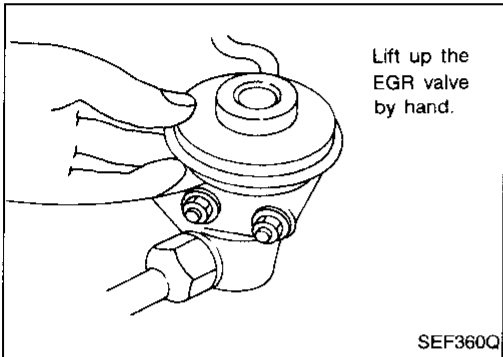
- 1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 2) Confirm that engine coolant temperature and intake air temperature are lower than 40°C (104°F). (If necessary, wait until the temperatures equal atmospheric temperature.)
- 3) Confirm that "EGR TEMP SEN" reading is between 3.45V and 5.0V.
- 4) Start engine and warm it up sufficiently.
- 5) Run engine at idle for at least 2 minutes.
- 6) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P0400 and P0402. (See pages EC-176 and 184.)
- 7) Read "EGR TEMP SEN" at about 1,500 rpm with EGR valve lifted up to the full position by hand.  
**Voltage should decrease to less than 1.0V.**
- 8) If step 7 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400, P0402 and P1400. (See pages EC-176, 184 and 267.)

OR

- 1) Turn ignition switch "ON".
- 2) Confirm that voltage between ECM terminals ⑤1, ②8 and ground are more than 2.72V. (If necessary, wait until engine coolant temperature and intake air temperature equal atmospheric temperature.)
- 3) Confirm that voltage between ECM terminal ⑥2 and ground is between 3.45V and 5.0V.
- 4) Start engine and warm it up sufficiently.
- 5) Run engine at idle for at least 2 minutes.
- 6) Confirm that EGR valve is not lifting. If NG, go to TROUBLE DIAGNOSES FOR DTC P0400 and P0402. (See pages EC-176 and 184.)
- 7) Check voltage between ECM terminal ⑥2 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.**
- 8) If step 7 is OK, perform TROUBLE DIAGNOSES FOR DTC P0400, P0402 and P1400. (See pages EC-176, 184 and 267.)

★ MONITOR	★ NO FAIL	<input type="checkbox"/>
CMPS•RPM (REF)	0rpm	
COOLAN TEMP/S	20°C	
EGR TEMP SEN	4.3V	
INT/A TEMP SE	22°C	

SEF651R

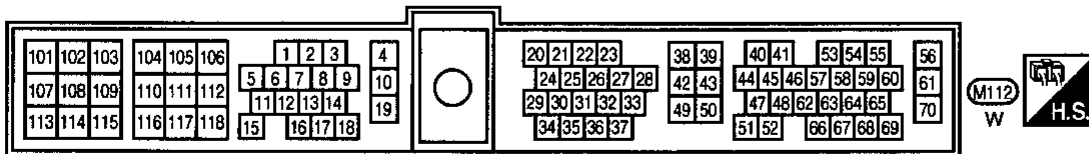
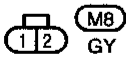
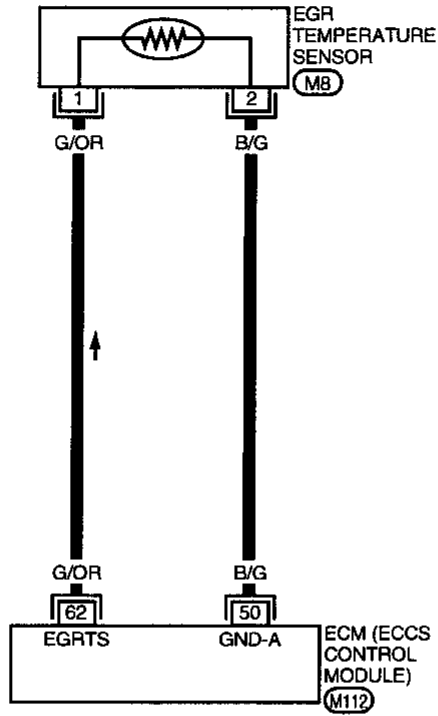


# TROUBLE DIAGNOSIS FOR DTC P1401

## EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01

: Detectable line for DTC  
 : Non-detectable line for DTC



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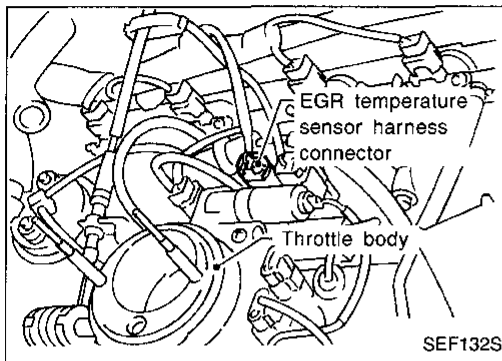
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# TROUBLE DIAGNOSIS FOR DTC P1401

## EGR Temperature Sensor (Cont'd)

### DIAGNOSTIC PROCEDURE



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

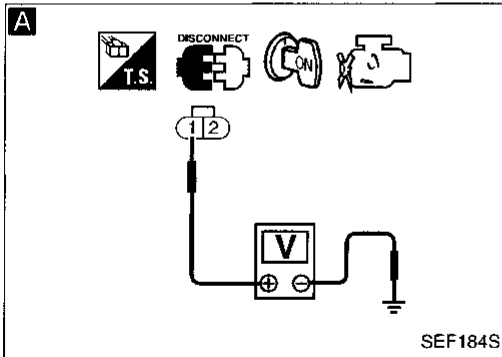
**B**

**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.

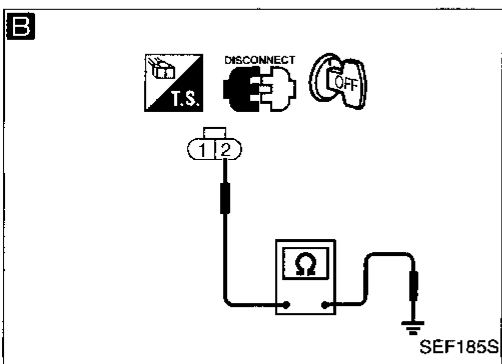
NG → Check the following.  
● Harness continuity between ECM and EGR temperature sensor  
If NG, repair harness or connector.



OK

**CHECK COMPONENT**  
(EGR temperature sensor).  
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR temperature sensor.



OK

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

# TROUBLE DIAGNOSIS FOR DTC P1401

## EGR Temperature Sensor (Cont'd) COMPONENT INSPECTION

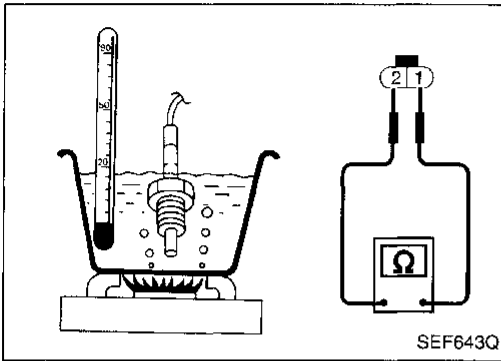
### EGR temperature sensor

Check resistance change and resistance value.

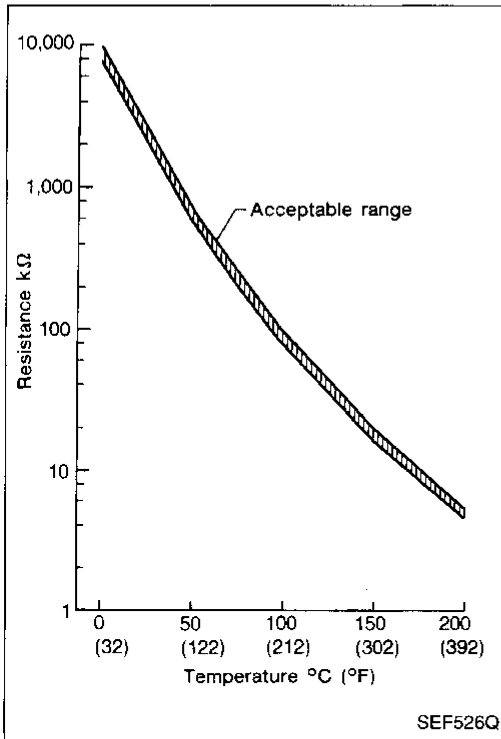
<Reference data>

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.



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SEF526Q

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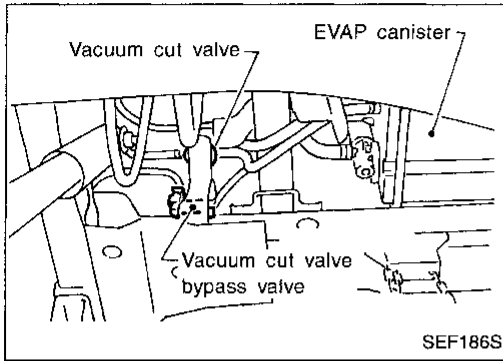
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# TROUBLE DIAGNOSIS FOR DTC P1441



## 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.

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

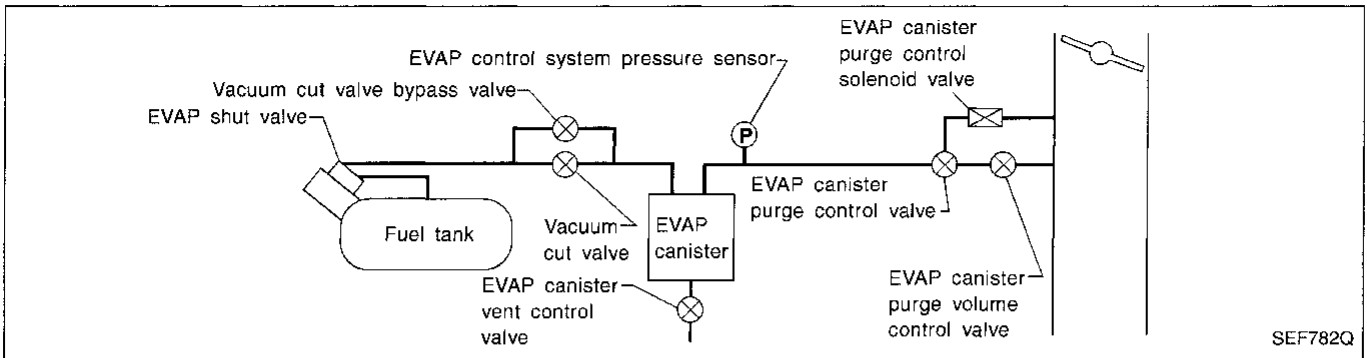
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
117	Y	Vacuum cut valve bypass valve	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VC/V BYPASS/V	● Ignition switch: ON	OFF

### EVAPORATIVE EMISSION SYSTEM DIAGRAM



### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P1441 0801	A) An improper voltage signal is sent to ECM through vacuum cut valve bypass valve.  B) Vacuum cut valve bypass valve does not operate properly.	<ul style="list-style-type: none"> <li>● Harness or connectors (The vacuum cut valve bypass valve circuit is open or shorted.)</li> <li>● Vacuum cut valve bypass valve</li> <li>● Vacuum cut valve bypass valve</li> <li>● Vacuum cut valve</li> <li>● Bypass hoses for clogging</li> <li>● EVAP shut valve</li> <li>● EVAP control system pressure sensor</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P1441

## Vacuum Cut Valve Bypass Valve (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If 1st trip DTC cannot be confirmed, perform "OVERALL FUNCTION CHECK", "Procedure for malfunction B".

GI

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EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

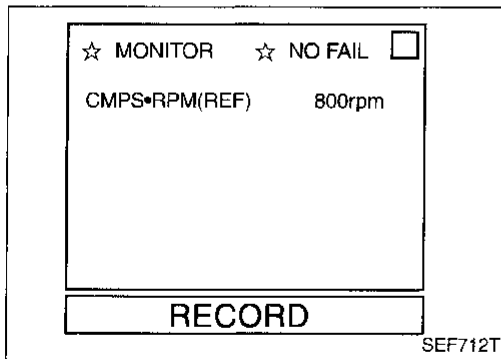
RS

BT

HA

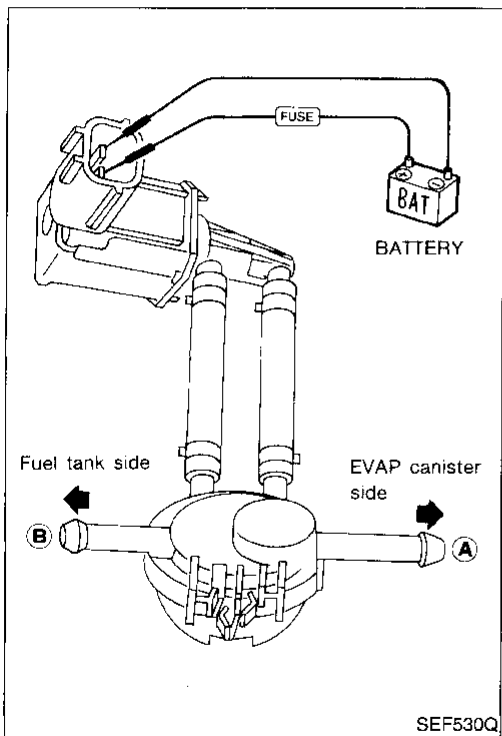
EL

IDX



### Procedure for malfunction A

- 1) Turn ignition switch "ON".
  - 2) Select "DATA MONITOR" mode with CONSULT.
  - 3) Start engine and wait at least 5 seconds.
- OR
- 1) Start engine and wait at least 5 seconds.
  - 2) Select "MODE 7" with GST.
- OR
- 1) Start engine and wait at least 5 seconds.
  - 2) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
  - 3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.



### OVERALL FUNCTION CHECK

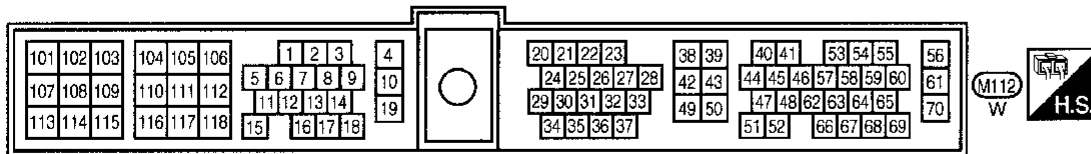
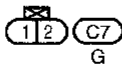
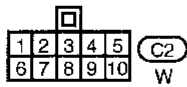
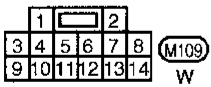
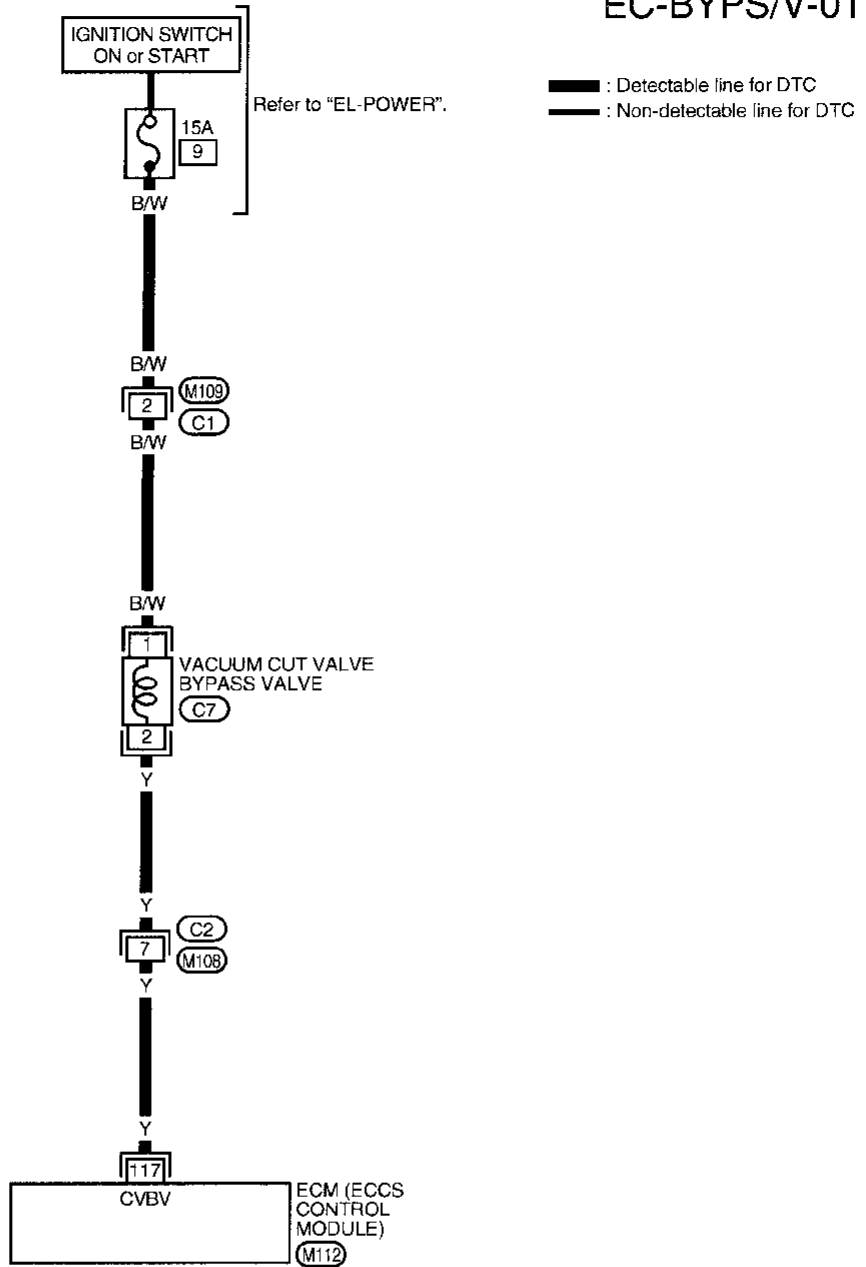
#### Procedure for malfunction B

- 1) Remove vacuum cut valve and vacuum cut valve bypass valve as an assembly.
- 2) Apply vacuum to port (A) and check that there is no suction from port (B).
- 3) Apply vacuum to port (B) and check that there is suction from port (A).
- 4) Blow air in port (B) and check that there is a resistance to flow out of port (A).
- 5) Supply battery voltage to the terminal.
- 6) Blow air in port (A) and check that air flows freely out of port (B).
- 7) Blow air in port (B) and check that air flows freely out of port (A).

# TROUBLE DIAGNOSIS FOR DTC P1441

## Vacuum Cut Valve Bypass Valve (Cont'd)

EC-BYPS/V-01

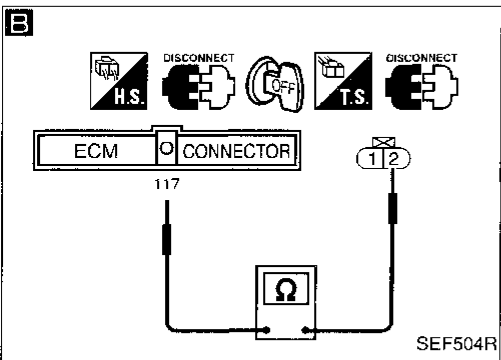
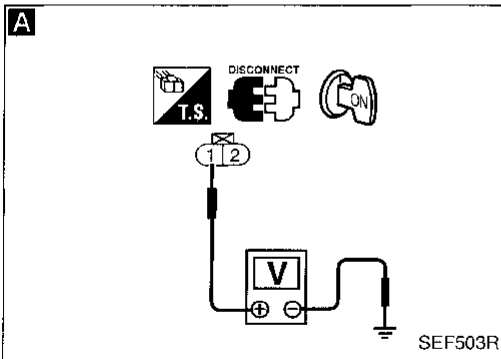
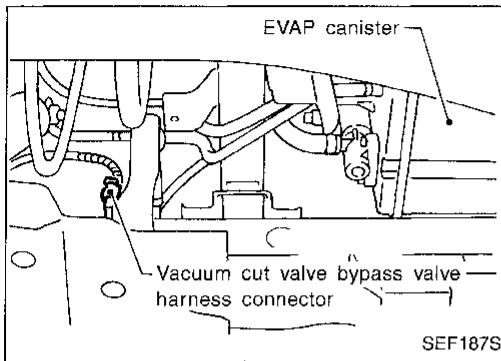


# TROUBLE DIAGNOSIS FOR DTC P1441

## Vacuum Cut Valve Bypass Valve (Cont'd)

### DIAGNOSTIC PROCEDURE

#### Procedure for malfunction A



INSPECTION START

**A**

**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 ① and ground with CONSULT or tester.

**Voltage: Battery voltage**

NG → Check the following.

- Harness connectors (C1, M109)
- 15A fuse
- Harness for open or short between vacuum cut valve bypass valve and fuse

If NG, repair harness or connectors.

**B**

**CHECK OUTPUT SIGNAL CIRCUIT.**

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal ①①⑦ and terminal ②.

**Continuity should exist.**

If OK, check harness for short.

NG → Check the following.

- Harness connectors (C2, M108)
- Harness for open or short between vacuum cut valve bypass valve and ECM

If NG, repair harness or connectors.

**CHECK COMPONENT** (Vacuum cut valve bypass valve). Refer to "COMPONENT INSPECTION" on next page.

NG → Replace vacuum cut valve bypass valve.

Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed.

Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

GI  
MA  
EM  
LC  
EC  
FE  
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TF  
PD  
FA  
RA  
BR  
ST  
RS  
BT  
HA  
EL  
DX

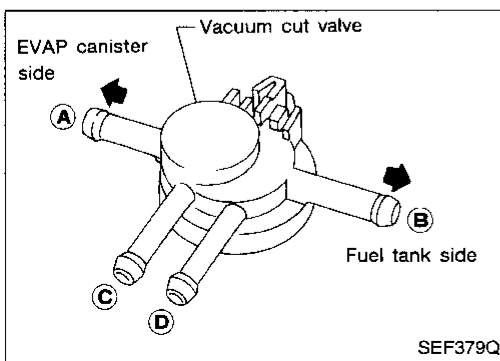
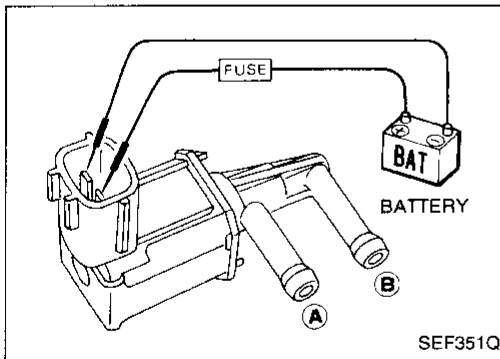
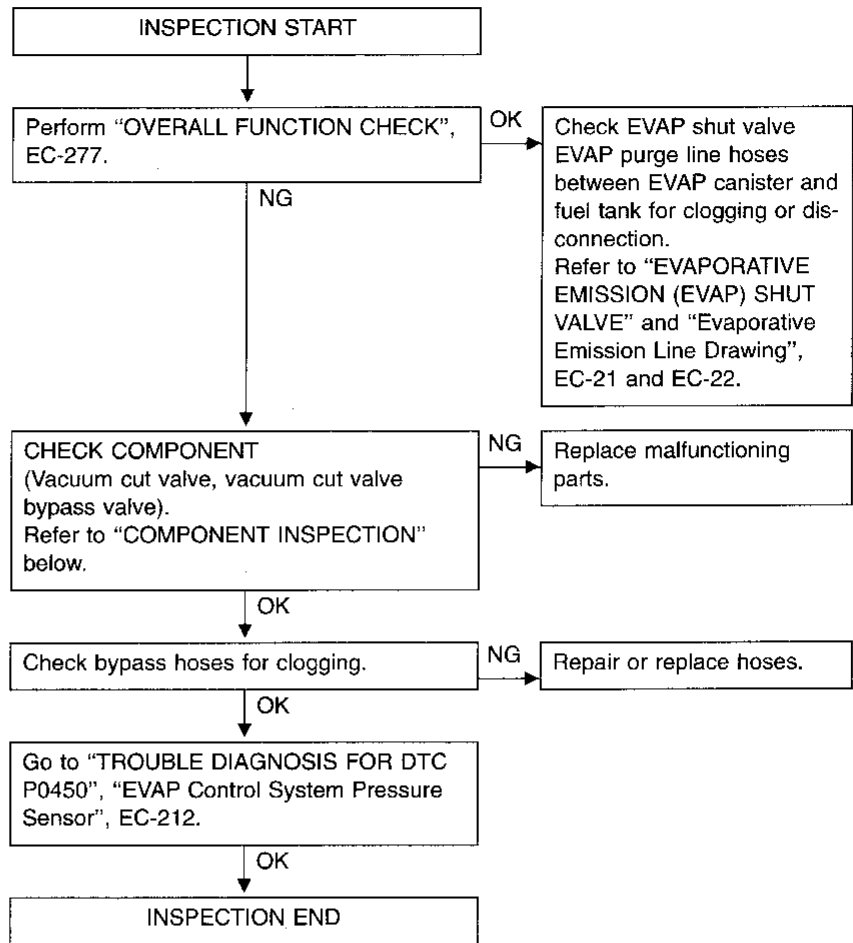


# TROUBLE DIAGNOSIS FOR DTC P1441

## Vacuum Cut Valve Bypass Valve (Cont'd)

### DIAGNOSTIC PROCEDURE

#### Procedure for malfunction B



### COMPONENT INSPECTION

#### Vacuum cut valve bypass valve

Check air passage continuity.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals	Yes
No supply	No

If NG, replace vacuum cut valve bypass valve.

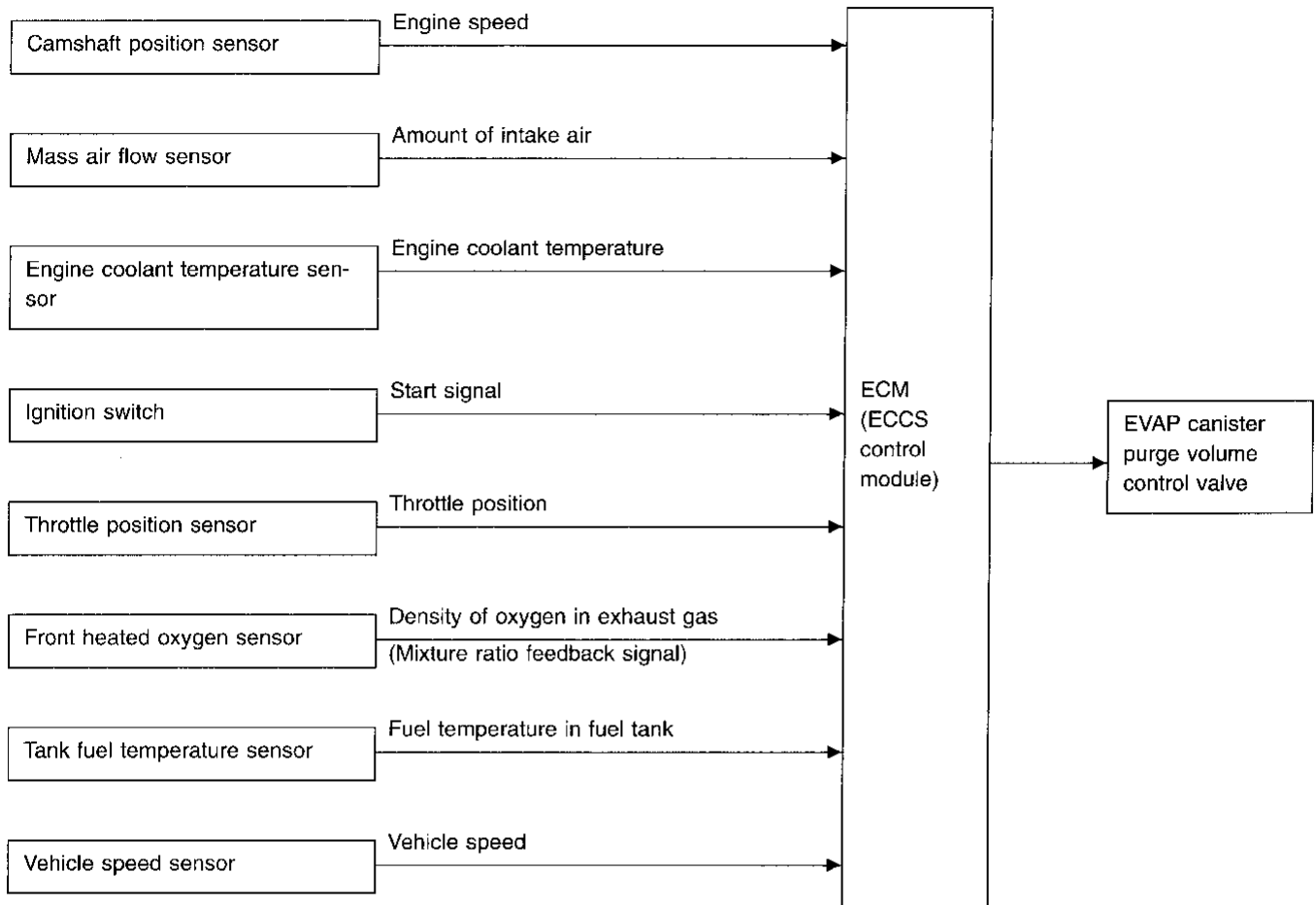
#### Vacuum cut valve

Check vacuum cut valve as follows:

1. Plug port (C) and (D) with fingers.
2. Apply vacuum to port (A) and check that there is no suction from port (B).
3. Apply vacuum to port (B) and check that there is suction from port (A).
4. Blow air in port (B) and check that there is a resistance to flow out of port (A).
5. Open port (C) and (D).
6. Blow air in port (A) check that air flows freely out of port (C).
7. Blow air in port (B) check that air flows freely out of port (D).

Evaporative Emission (EVAP) Canister Purge Volume Control 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 valve changes to control the flow rate. A built-in step motor moves the valve in steps corresponding to the ECM output pulses. 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.

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
5	R	EVAP canister purge volume control valve	<div style="border: 1px solid black; padding: 2px;">Engine is running.</div> Idle speed	0 - 0.4V or BATTERY VOLTAGE (11 - 14V)
6	L/G			
16	G			
17	Y			

GI  
MA  
EM  
LC  
EC  
FE  
CL  
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AT  
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EL  
IDX

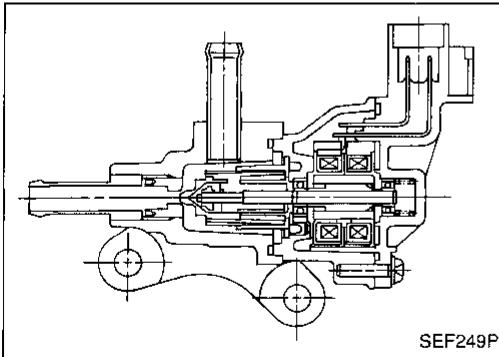
## TROUBLE DIAGNOSIS FOR DTC P1445

### Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	<ul style="list-style-type: none"> <li>● Engine: After warming up</li> <li>● Air conditioner switch: OFF</li> <li>● Shift lever "N"</li> <li>● No-load</li> </ul>	Vehicle stopped	0 step
		Vehicle running	—



#### COMPONENT DESCRIPTION

The EVAP canister purge volume control valve uses a step motor to control the flow rate of fuel vapor from the EVAP canister. This motor has four winding phases. It operates according to the output pulse signal of the ECM. Two windings are turned ON and OFF in sequence. Each time an ON pulse is issued, the valve opens or closes, changing the flow rate. When no change in the flow rate is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

#### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P1445 1008	A) An improper voltage signal is sent to ECM through the valve.	<ul style="list-style-type: none"> <li>● Harness or connectors (The valve circuit is open or shorted.)</li> <li>● EVAP canister purge volume control valve</li> </ul>
	B) The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control valve is completely closed.	<ul style="list-style-type: none"> <li>● EVAP control system pressure sensor</li> <li>● EVAP canister purge volume control valve (The valve is stuck open.)</li> <li>● EVAP canister purge control valve</li> <li>● Hoses (Hoses are connected incorrectly.)</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P1445

## Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If the 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B".

#### Procedure for malfunction A

- 1) Lift up vehicle.
- 2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and let it idle for at least 90 seconds.
- 4) Move selector/gearshift lever to "1" range (A/T) or "1st" gear (M/T).
- 5) Rev engine from idle to 2,000 to 3,000 rpm more than 10 times.

OR

- 1) Lift up vehicle.
- 2) Start engine and let it idle for at least 90 seconds.
- 3) Move selector/gearshift lever to "1" range (A/T) or "1st" gear (M/T).
- 4) Rev engine from idle to 2,000 to 3,000 rpm more than 10 times.
- 5) Select "MODE 3" with GST.

OR

- 1) Lift up vehicle.
- 2) Start engine and let it idle for at least 90 seconds.
- 3) Move selector/gearshift lever to "1" range (A/T) or "1st" gear (M/T).
- 4) Rev engine from idle to 2,000 to 3,000 rpm more than 10 times.
- 5) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

#### Procedure for malfunction B

- 1) Lift up vehicle.
- 2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and warm it up sufficiently.
- 4) Check that tank fuel temperature is above 0°C (32°F).
- 5) Turn ignition switch "OFF" and wait at least 7 seconds.
- 6) Turn ignition switch "ON" and wait at least 12 seconds.
- 7) Start engine and let it idle for at least 70 seconds.
- 8) Maintain the following conditions for at least 25 seconds.

##### Gear position:

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

##### Vehicle speed:

50 - 70 km/h (31 - 43 MPH)

##### Engine speed:

1,500 - 2,500 rpm

##### Coolant temperature:

Less than 100°C (212°F)

☆ MONITOR	☆ NO FAIL
CMPS•RPM (POS)	2000rpm
COOLAN TEMP/S	80°C
VHCL SPEED SE	65km/h
TANK F/TMP SE	22°C
RECORD	

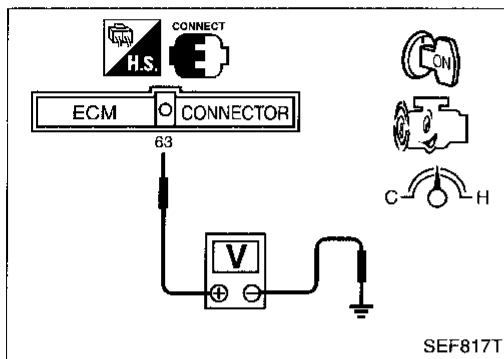
SEF816T

## TROUBLE DIAGNOSIS FOR DTC P1445

### Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

ENGINE SPD	825RPM
<b>COOLANT TEMP</b>	<b>69°C</b>
VEHICLE SPD	0MPH
IGN ADVANCE	8.0°
CALC LOAD	28.2%
MAP	36KPaA
MAF	5.20gm/s
THROTTLE POS	0.0%
INTAKE AIR	27°C
FUEL SYS #1	OLDRIVE
FUEL SYS #2	UNUSED
SHORT FT #1	0.8%
LONG FT #1	0.0%
O2S B1 S1	0.200V
O2FT B1 S1	0.8%
O2S B1 S2	0.010V

SEF519R



SEF817T

OR



- 1) Lift up vehicle.
- 2) Turn ignition switch "ON" and select "MODE 1" mode with GST.
- 3) Start engine and warm it up sufficiently.
- 4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
- 5) Turn ignition switch "OFF" and wait at least 7 seconds.
- 6) Turn ignition switch "ON" and wait at least 12 seconds.
- 7) Start engine and let it idle for at least 70 seconds.
- 8) Maintain the following conditions for at least 25 seconds.

**Gear position:**

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

**Vehicle speed:**

50 - 70 km/h (31 - 43 MPH)

**Engine speed:**

1,500 - 2,500 rpm

**Coolant temperature:**

Less than 100°C (212°F)

- 9) Select "MODE 3" with GST.

OR



- 1) Lift up vehicle.
- 2) Turn ignition switch "ON".
- 3) Start engine and warm it up sufficiently.
- 4) Check that voltage between ECM terminal 63 and ground is less than 4.2V.
- 5) Turn ignition switch "OFF" and wait at least 7 seconds.
- 6) Turn ignition switch "ON" and wait at least 12 seconds.
- 7) Start engine and let it idle for at least 70 seconds.
- 8) Maintain the following conditions for at least 25 seconds.

**Gear position:**

"2" or "D" range (A/T)

"3rd" or "4th" gear (M/T)

**Vehicle speed:**

50 - 70 km/h (31 - 43 MPH)

**Engine speed:**

1,500 - 2,500 rpm

**Voltage between ECM terminal 51 and ground:**

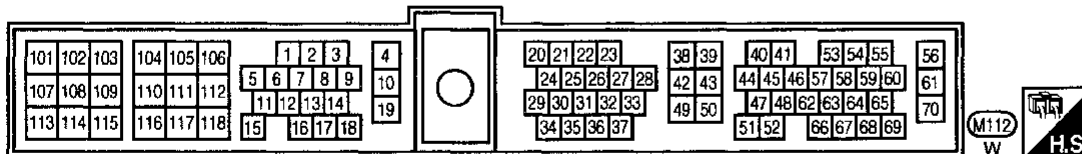
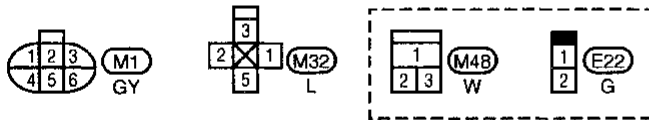
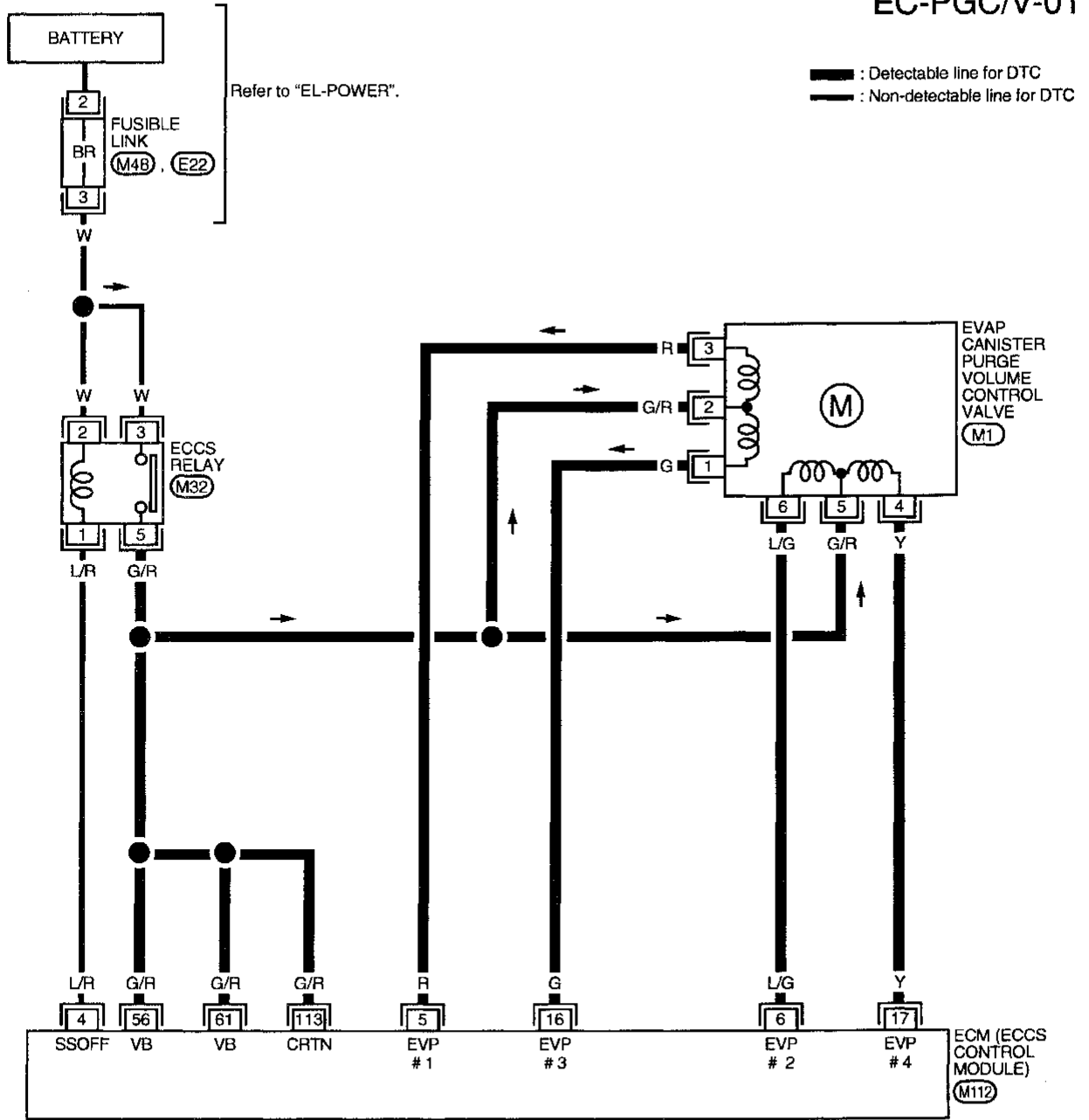
More than 0.8V

- 9) Turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 10) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P1445

## Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

EC-PGC/V-01



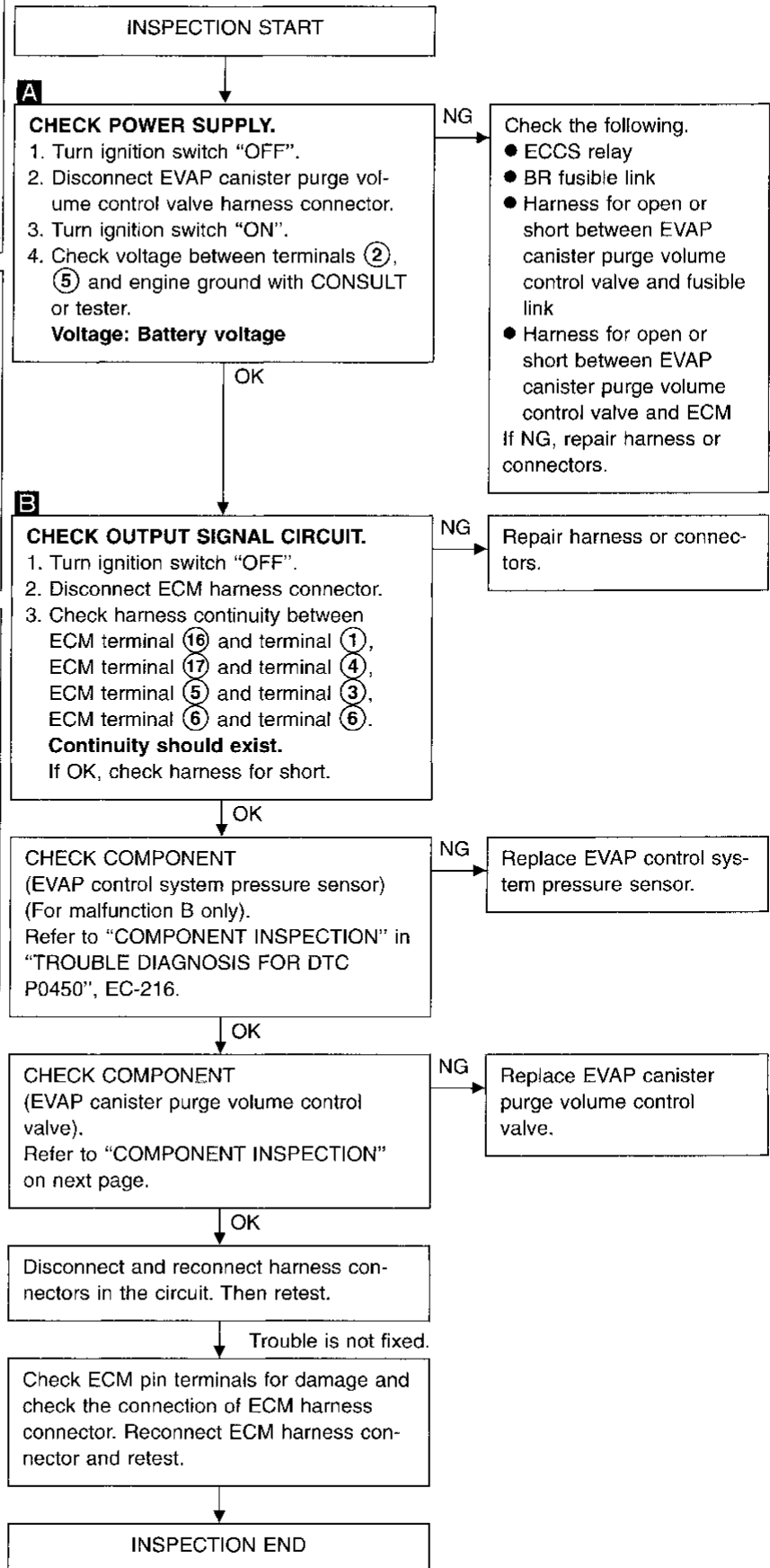
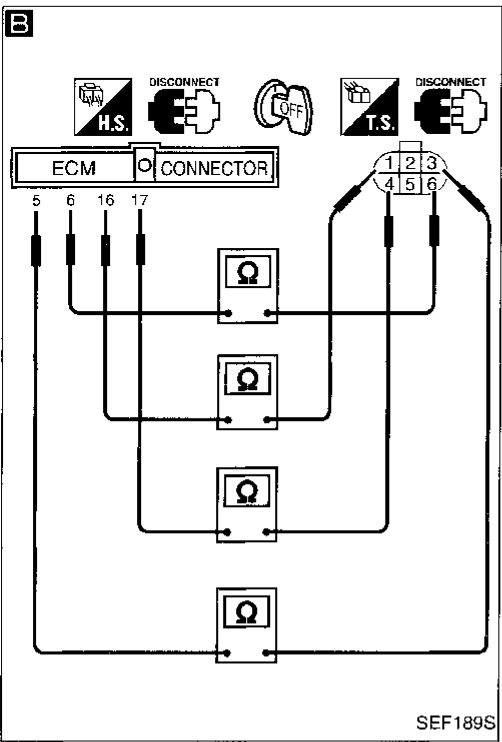
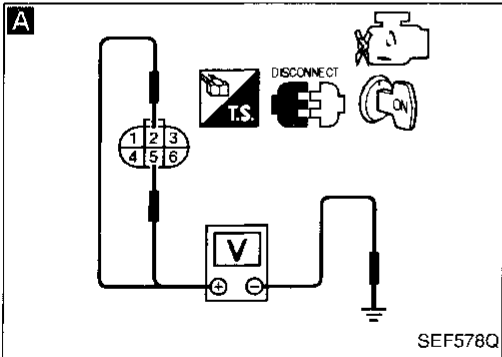
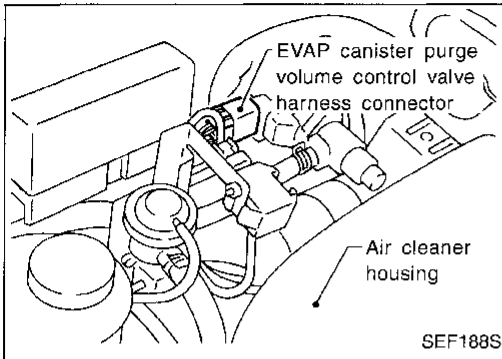
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# TROUBLE DIAGNOSIS FOR DTC P1445

## Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

### DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P1445

## Evaporative Emission (EVAP) Canister Purge Volume Control Valve (Cont'd)

### COMPONENT INSPECTION

#### EVAP canister purge volume control valve

1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.  
terminal ② and terminals ①, ③  
terminal ⑤ and terminals ④, ⑥

#### Resistance:

**Approximately 30Ω [At 25°C (77°F)]**

3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.  
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON".
6. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the valve opening.  
If NG, replace the EVAP canister purge volume control valve.

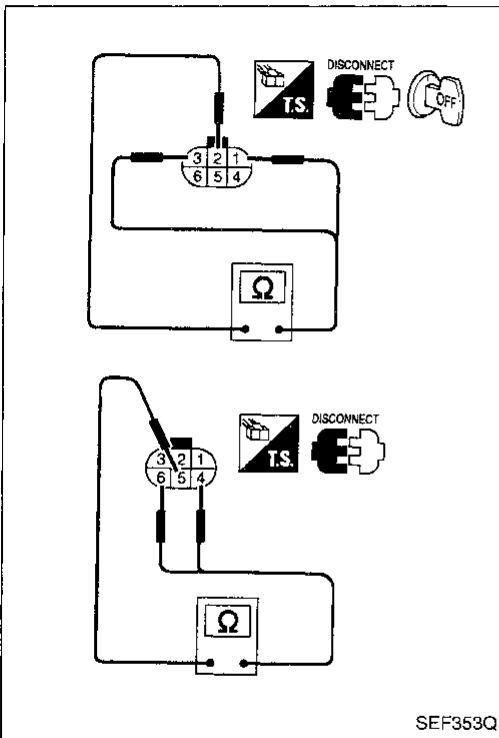
OR

1. Disconnect EVAP canister purge volume control valve harness connector.
2. Check resistance between the following terminals.  
terminal ② and terminals ①, ③  
terminal ⑤ and terminals ④, ⑥

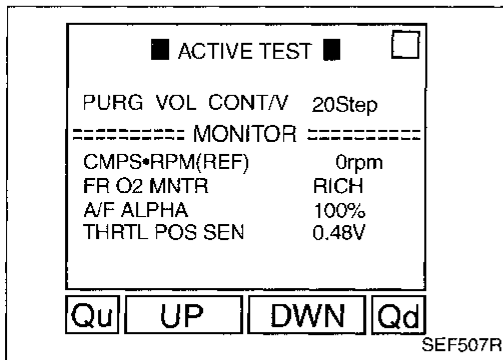
#### Resistance:

**Approximately 30Ω [At 25°C (77°F)]**

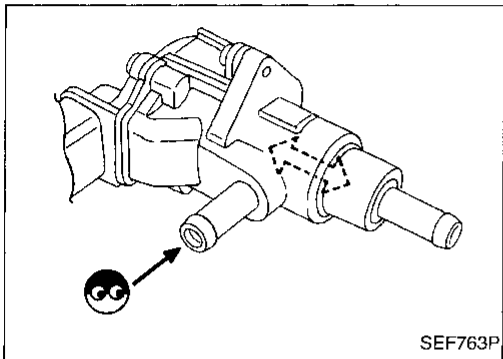
3. Reconnect EVAP canister purge volume control valve harness connector.
4. Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.  
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
5. Turn ignition switch "ON" and "OFF". Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the ignition switch position.  
If NG, replace the EVAP canister purge volume control valve.



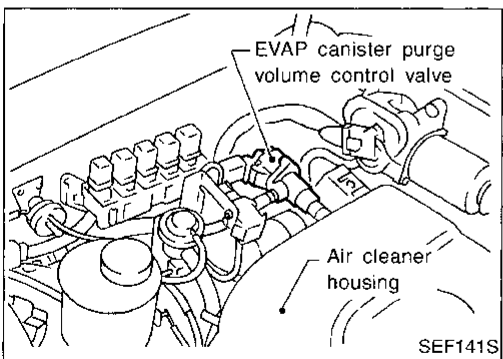
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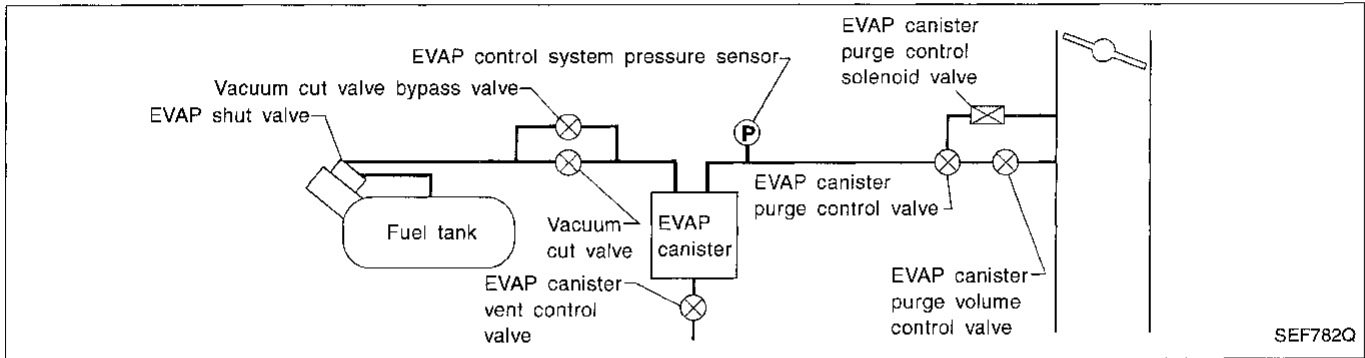
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**Evaporative Emission (EVAP) Control System  
Purge Flow Monitoring**



**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 valve and EVAP canister purge control valve are open. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

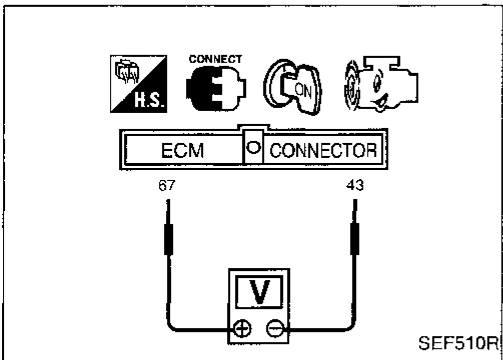
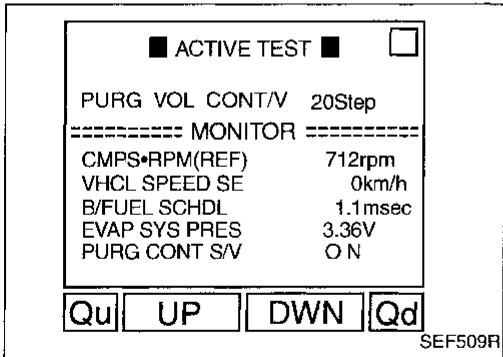
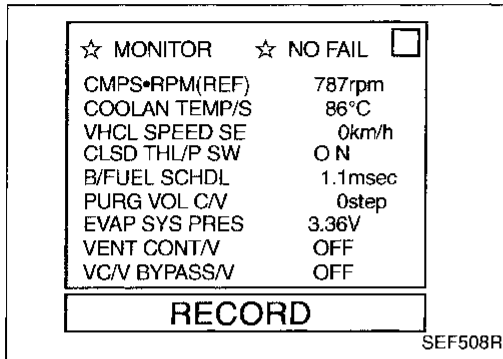
**ON BOARD DIAGNOSIS LOGIC**

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	<ul style="list-style-type: none"> <li>● EVAP control system does not operate properly.</li> <li>● EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.</li> </ul>	<ul style="list-style-type: none"> <li>● EVAP canister purge volume control valve stuck closed</li> <li>● EVAP canister purge control valve stuck closed</li> <li>● EVAP control system pressure sensor</li> <li>● Loose or disconnected rubber tube</li> <li>● Blocked rubber tube</li> <li>● EVAP canister purge control solenoid valve</li> <li>● Blocked or bent rubber tube to MAP/BARO switch solenoid valve</li> <li>● Cracked EVAP canister</li> <li>● Absolute pressure sensor</li> <li>● MAP/BARO switch solenoid valve</li> </ul>

# TROUBLE DIAGNOSIS FOR DTC P1447

## Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



### 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 vehicle.
- 2) Start engine.
- 3) Select "EVAP SYS PRES" in "DATA MONITOR" mode with CONSULT.
- 4) Check EVAP control system pressure sensor value at idle speed.
- 5) Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT and set "PURG VOL CONT/V" to 20 steps by touching "UP" or "Qu".
- 6) Maintain the following conditions for at least 30 seconds. Verify that EVAP control system pressure sensor value ("EVAP SYS PRES") stays 0.1V less than the value at idle speed for at least 2 seconds.

#### Engine speed:

Approx. 2,000 rpm

#### Gear position (for M/T models):

Any position other than "Neutral" or "Reverse"

#### CAUTION:

Do not run vehicle at speeds greater than 80 km/h (50 MPH).

OR

- 1) Lift up vehicle.
- 2) Start engine and warm it up sufficiently.
- 3) Turn ignition switch "OFF", wait at least 7 seconds.
- 4) Start engine and wait at least 70 seconds.
- 5) Set voltmeter probes to ECM terminals ⑥7 (EVAP control system pressure sensor signal) and ④9 (ground).
- 6) Check EVAP control system pressure sensor value at idle speed.
- 7) Establish and maintain the following conditions for at least 30 seconds.

#### Air conditioner switch: ON

Steering wheel: Fully turned

Headlamp switch: ON

Engine speed: Approx. 3,500 rpm

#### Intake manifold vacuum:

-73.3 to -60.0 kPa (-550 to -450 mmHg,

-21.65 to -17.72 inHg, -10.63 to -8.70 psi)

#### Gear position:

M/T models

Any position other than "Neutral" or "Reverse"

A/T models

Any position other than "P", "N" or "R".

Return all conditions to normal. Repeat this procedure at least 5 times.

Verify that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed for at least 2 seconds.

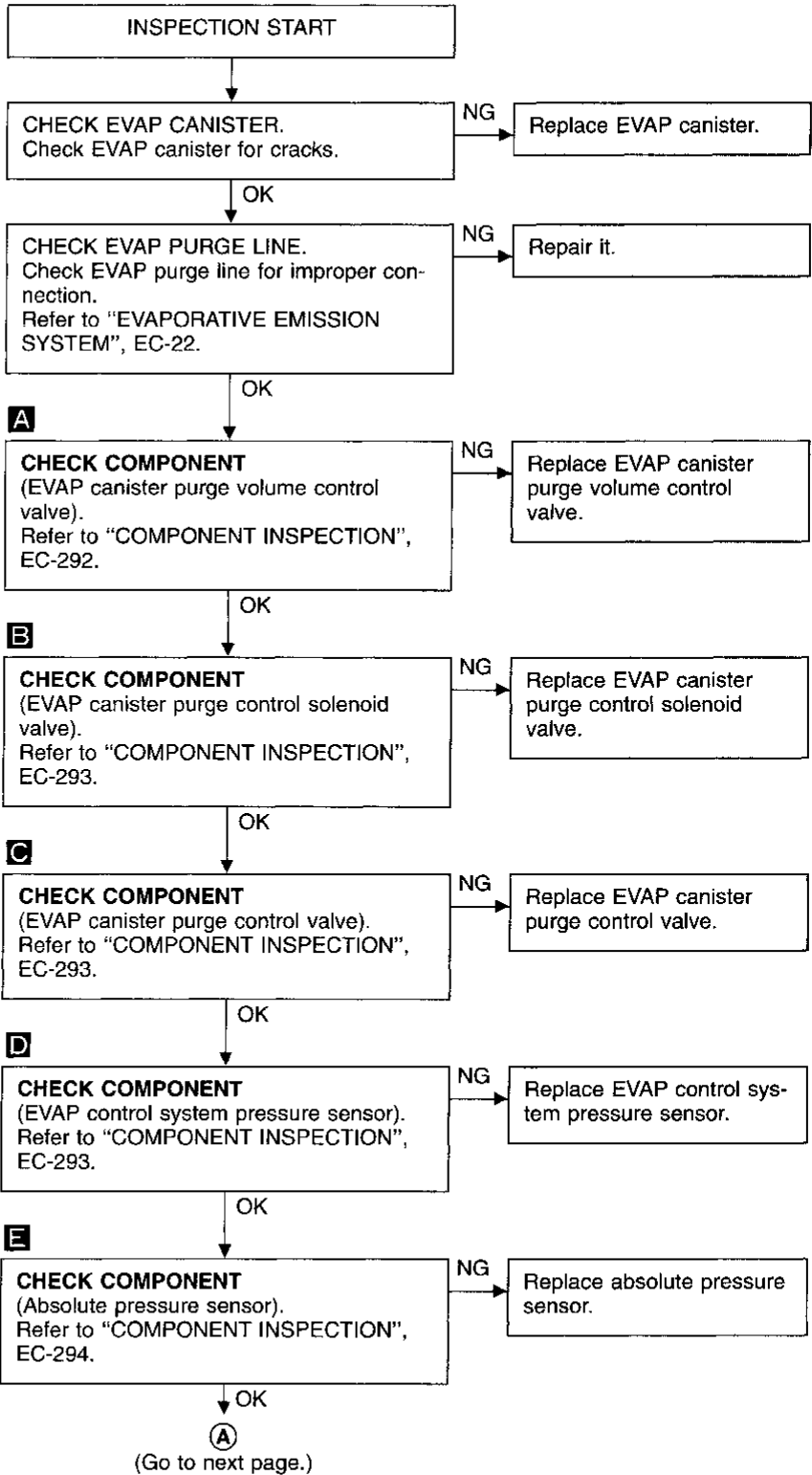
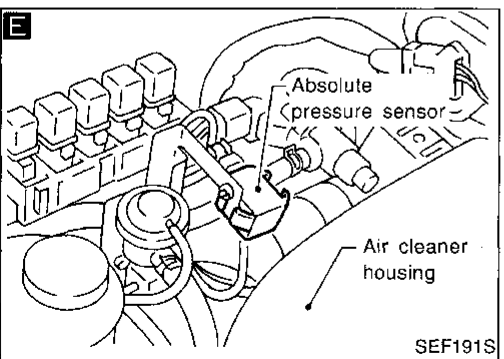
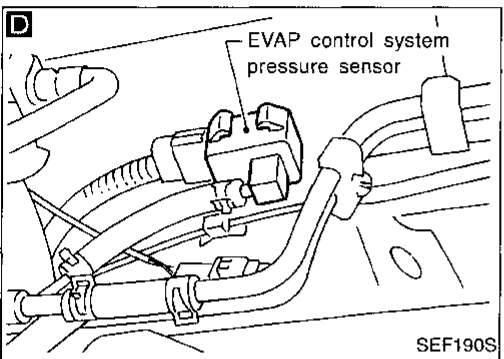
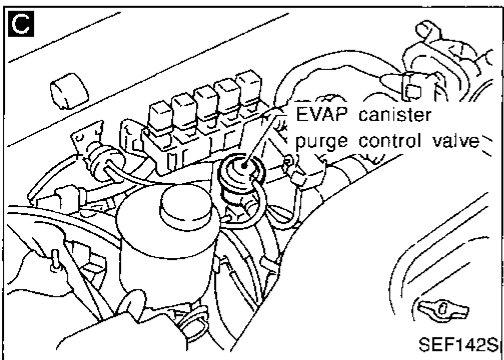
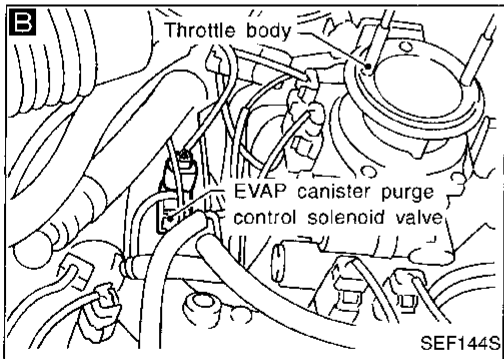
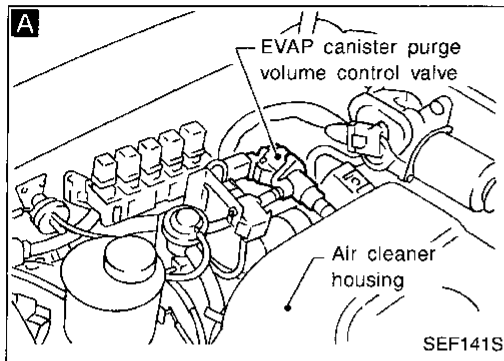
#### CAUTION:

Do not run vehicle at speeds greater than 80 km/h (50 MPH).

# TROUBLE DIAGNOSIS FOR DTC P1447

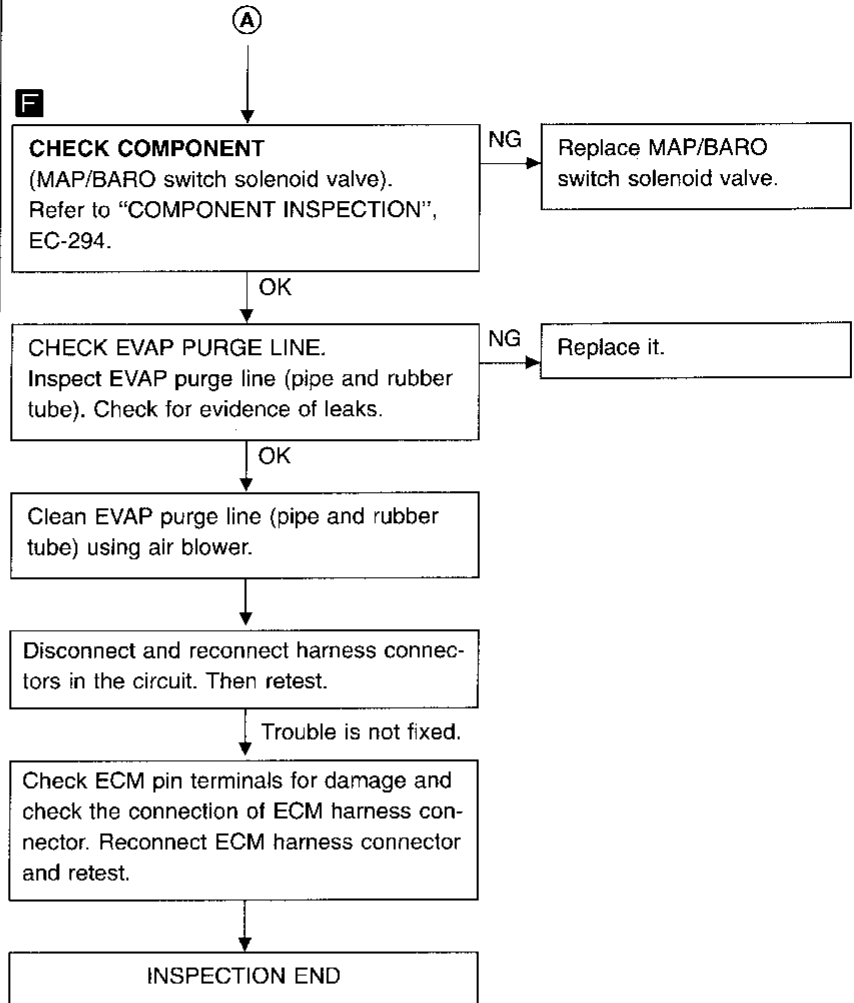
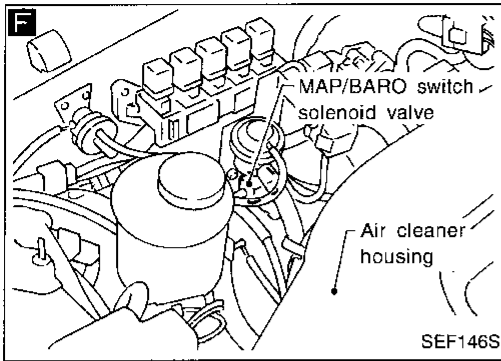
## Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

### DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR DTC P1447

## Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)



GI

MA

EM

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IDX

## TROUBLE DIAGNOSIS FOR DTC P1447

### Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

#### COMPONENT INSPECTION

##### EVAP canister purge volume control valve

- 1) Disconnect EVAP canister purge volume control valve harness connector.
- 2) Check resistance between the following terminals.  
terminal ② and terminals ①, ③  
terminal ⑤ and terminals ④, ⑥

##### Resistance:

**Approximately 30Ω [At 25°C (77°F)]**

- 3) Reconnect EVAP canister purge volume control valve harness connector.
- 4) Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.  
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
- 5) Turn ignition switch "ON".
- 6) Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT. Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the valve opening.  
If NG, replace the EVAP canister purge volume control valve.

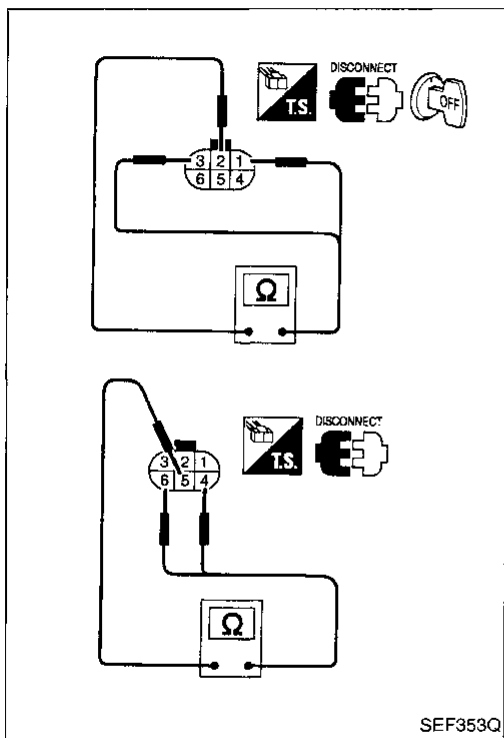
OR

- 1) Disconnect EVAP canister purge volume control valve harness connector.
- 2) Check resistance between the following terminals.  
terminal ② and terminals ①, ③  
terminal ⑤ and terminals ④, ⑥

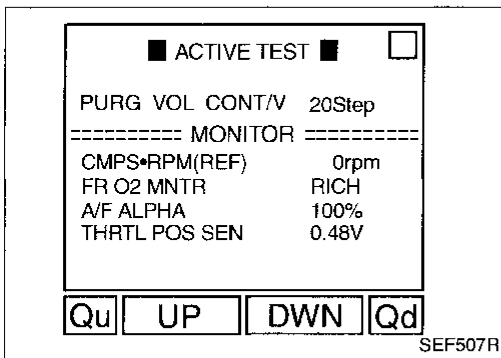
##### Resistance:

**Approximately 30Ω [At 25°C (77°F)]**

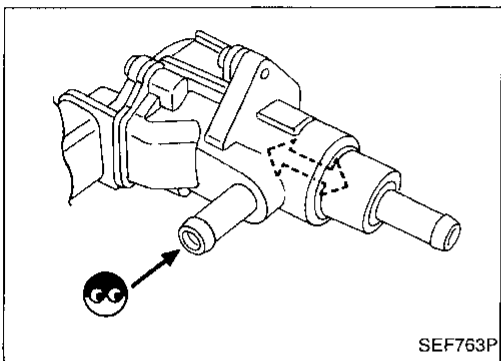
- 3) Reconnect EVAP canister purge volume control valve harness connector.
- 4) Remove EVAP canister purge volume control valve from intake manifold collector and disconnect hoses from the valve.  
(Plug the purge hoses. The EVAP canister purge volume control valve harness connector should remain connected.)
- 5) Turn ignition switch "ON" and "OFF". Check that EVAP canister purge volume control valve shaft moves smoothly forward and backward according to the ignition switch position.  
If NG, replace the EVAP canister purge volume control valve.



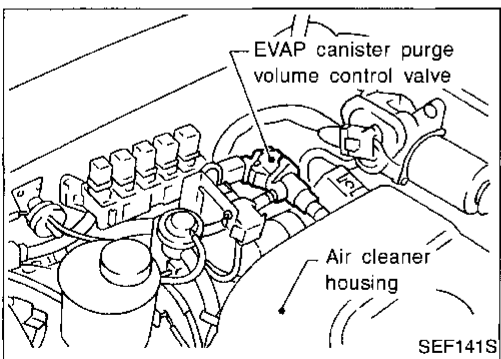
SEF353Q



SEF507R



SEF763P



SEF141S

# TROUBLE DIAGNOSIS FOR DTC P1447

## Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

G1

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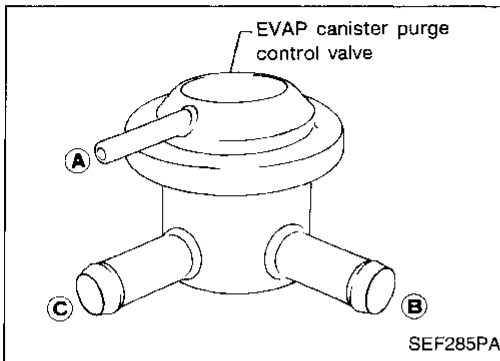
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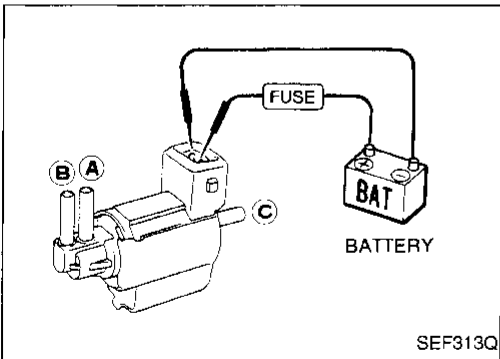
IDX



### EVAP canister purge control valve

Check EVAP canister purge control valve as follows:

1. Plug the port (B).
2. Apply pressure [80.0 kPa (600 mmHg, 23.62 inHg, 11.60 psi)] to port (A). Then keep it for 15 seconds, and check there is no leakage.
3. Repeat step 2 for port (C).

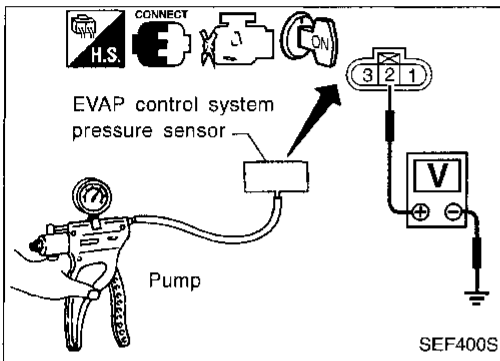


### EVAP canister purge control solenoid valve

Check air passage continuity.

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals	Yes	No
No supply	No	Yes

If NG, replace solenoid valve.



### 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 terminal (2) and engine ground.

Pressure (Relative to atmospheric pressure)	Voltage (V)
0 kPa (0 mmHg, 0 inHg, 0 psi)	3.0 - 3.6
-9.3 kPa (-70 mmHg, -2.76 inHg, -1.35 psi)	0.4 - 0.6

### CAUTION:

**Always calibrate the vacuum pump gauge when using it.**

5. If NG, replace EVAP control system pressure sensor.

## TROUBLE DIAGNOSIS FOR DTC P1447

### Evaporative Emission (EVAP) Control System Purge Flow Monitoring (Cont'd)

#### 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 terminal ② and engine ground.

**The voltage should be 3.2 to 4.8 V.**

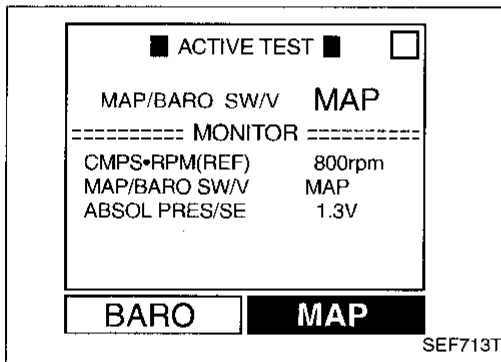
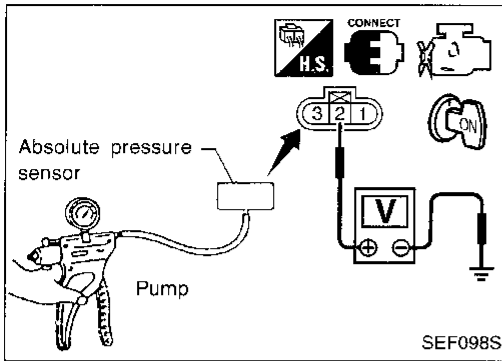
4. Use pump to apply vacuum of  $-26.7$  kPa ( $-200$  mmHg,  $-7.87$  inHg,  $-3.87$  psi) to absolute pressure sensor as shown in figure and check the output voltage.

**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.**

5. If NG, replace absolute pressure sensor.



#### MAP/BARO switch solenoid valve

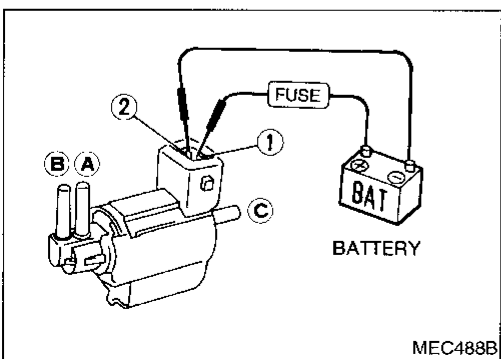
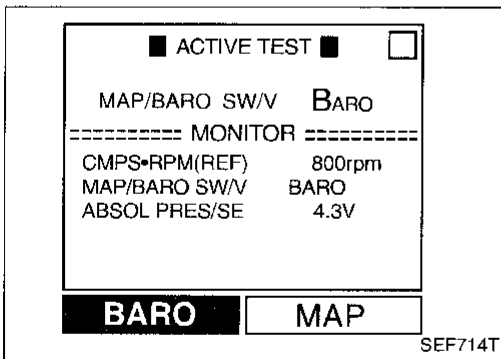
1. Start engine and warm it up sufficiently.
2. Perform "MAP/BARO SW/V" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
  - When "MAP" is selected, "ABSOL PRES/SE" indicates approximately 1.3V.
  - When "BARO" is selected, "ABSOL PRES/SE" indicates approximately 4.3V.
4. If NG, replace solenoid valve.

OR

1. Remove MAP/BARO switch solenoid valve.
2. Check air passage continuity.

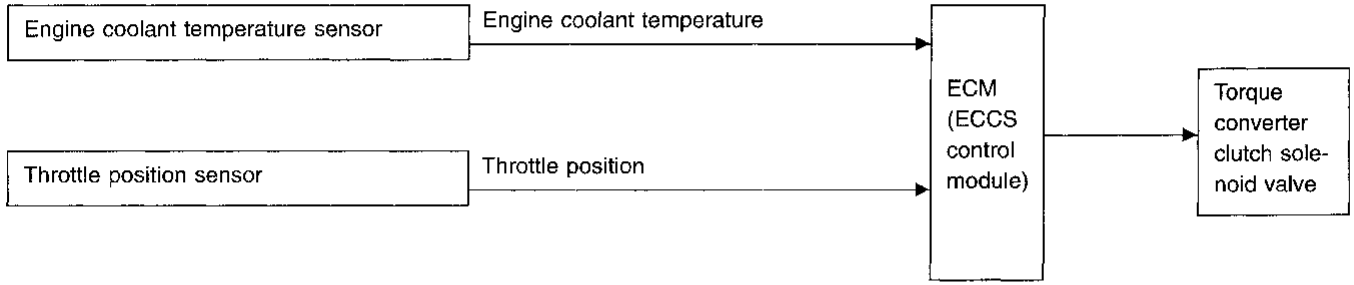
Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals ① and ②	Yes	No
No supply	No	Yes

3. If NG, replace 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:

- Throttle valve is fully closed (idling or deceleration)
- Engine coolant temperature is below 40°C (104°F)

ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
114	L/Y	Torque converter clutch solenoid valve	Engine is running. — Idle speed — Engine coolant temperature is below 40°C (104°F)	Approximately 0V
			Engine is running. — After warming up — Engine coolant temperature is above 40°C (104°F) — Engine speed is 2,000 rpm	BATTERY VOLTAGE (11 - 14V)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
TCC SOL/V	<ul style="list-style-type: none"> <li>• Engine speed: Idle</li> <li>• Engine coolant temperature below 40°C (104°F)</li> </ul>	ON
	<ul style="list-style-type: none"> <li>• Engine: After warming up</li> <li>• Engine coolant temperature above 40°C (104°F)</li> </ul> 2,000 rpm	OFF

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IDX



# TROUBLE DIAGNOSIS FOR DTC P1550

## Torque Converter Clutch Solenoid Valve (Cont'd)

### ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ....	Check Items (Possible Cause)
P1550 0904	<ul style="list-style-type: none"> <li>● An excessively low voltage from the solenoid is sent to ECM.</li> <li>● A/T torque converter slip is occurred in lock-up condition.</li> </ul>	<ul style="list-style-type: none"> <li>● Harness or connectors (The circuit is open or shorted.)</li> <li>● Torque converter clutch solenoid valve</li> <li>● A/T hydraulic control system</li> <li>● Torque converter</li> </ul>

### DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE



- 1) Turn ignition switch "ON".
- 2) Select "DATA MONITOR" mode with CONSULT.
- 3) Start engine and warm it up sufficiently.
- 4) Perform test drive in "D" position for at least 20 seconds continuously under the following conditions.

**Engine speed: 2,000 - 2,700 rpm**

**Vehicle speed: 75 - 95 km/h (45 - 60 MPH)**

OR



- 1) Start engine and warm it up sufficiently.
- 2) Perform test drive in "D" position for at least 20 seconds continuously under the following conditions.

**Engine speed: 2,000 - 2,700 rpm**

**Vehicle speed: 75 - 95 km/h (45 - 60 MPH)**

- 3) Select MODE 7 with GST.

OR



- 1) Start engine and warm it up sufficiently.
- 2) Perform test drive in "D" position for at least 20 seconds continuously under the following conditions.

**Engine speed: 2,000 - 2,700 rpm**

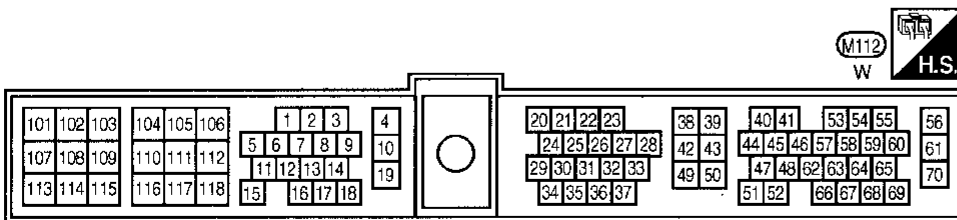
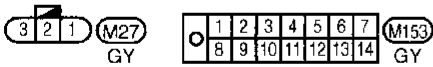
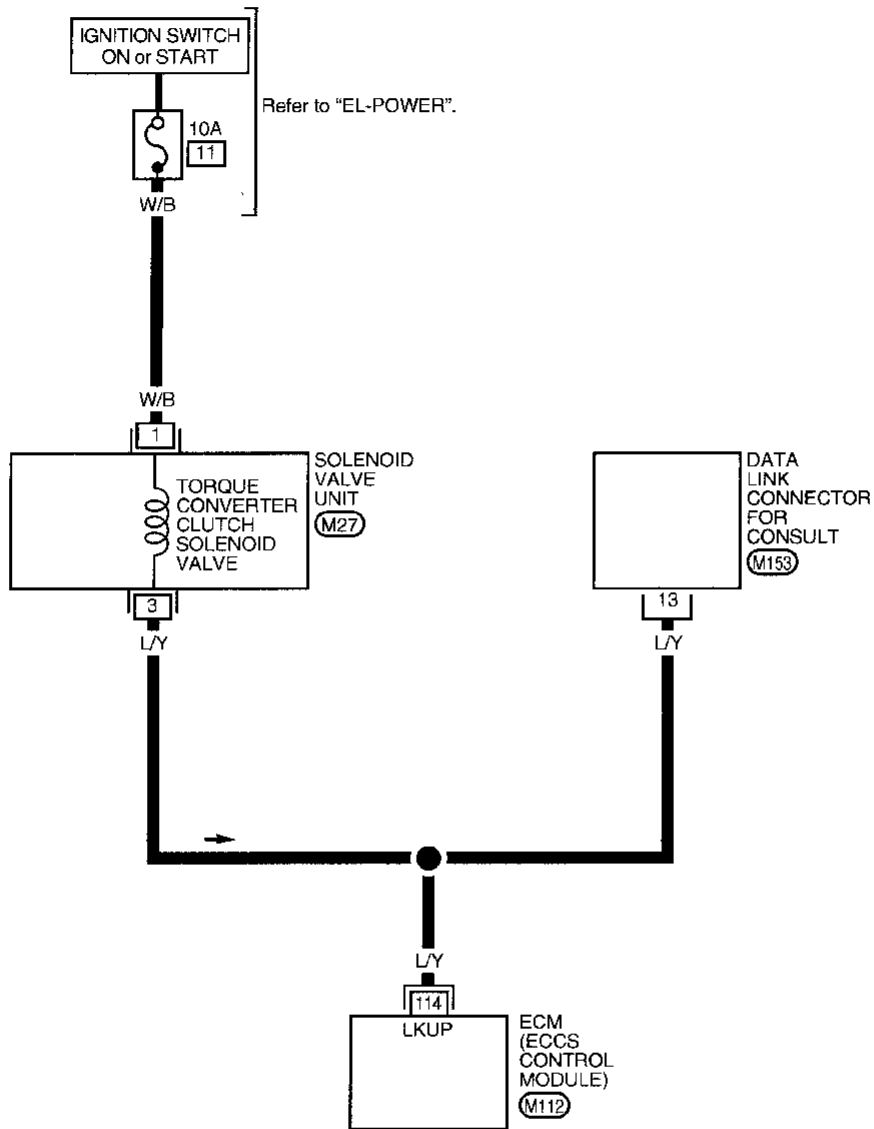
**Vehicle speed: 75 - 95 km/h (45 - 60 MPH)**

- 3) Stop the vehicle, turn ignition switch "OFF", wait at least 7 seconds and then turn "ON".
- 4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

# TROUBLE DIAGNOSIS FOR DTC P1550

## Torque Converter Clutch Solenoid Valve (Cont'd)

EC-TCV-01

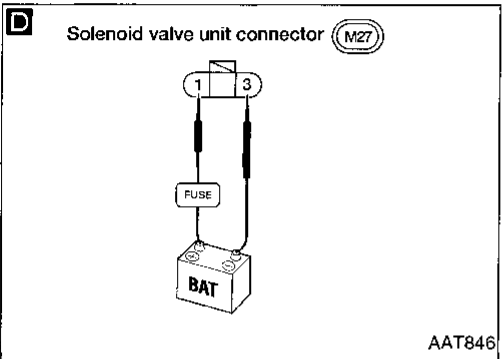
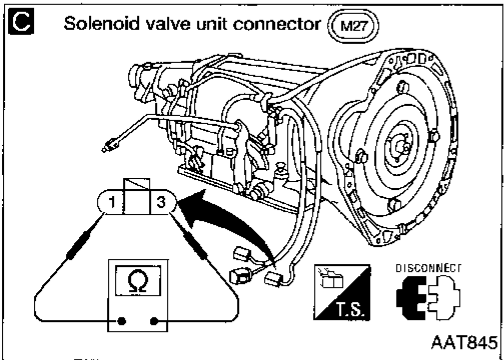
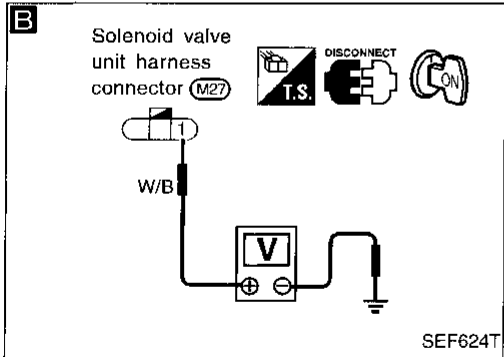
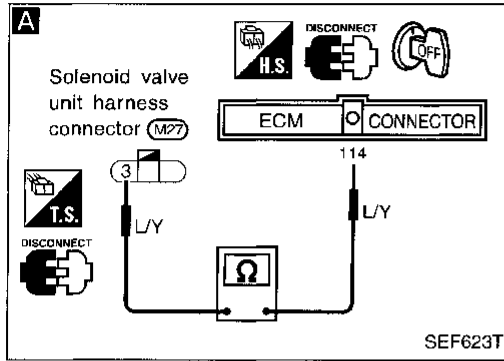


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# TROUBLE DIAGNOSIS FOR DTC P1550

## Torque Converter Clutch Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE



INSPECTION START

**A**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch to OFF position.
2. Disconnect ECM harness connector and torque converter clutch solenoid valve harness connector.
3. Check resistance between solenoid valve unit harness terminal No. (3) and ECM harness terminal No. (114).

**Resistance:**  
Approximately 0Ω

No

Repair or replace harness between ECM and torque converter clutch solenoid valve.

**B**

**CHECK POWER SOURCE CIRCUIT.**

1. Turn ignition switch to ON position.
2. Check voltage between solenoid valve unit harness terminal No. (1) and ground.

**Voltage:**  
Battery voltage

No

Check the following items:

- Ignition switch and fuse Refer to EL section ("POWER SUPPLY ROUTING").
- Harness continuity between fuse and torque converter clutch solenoid valve

**C**

**CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE (RESISTANCE).**

Check resistance between torque converter clutch solenoid valve terminal Nos. (1) and (3).

**Resistance:**  
Approximately 25Ω

NG

Replace torque converter clutch solenoid valve.

**D**

**CHECK TORQUE CONVERTER CLUTCH SOLENOID VALVE (OPERATION).**

1. Remove torque converter clutch solenoid valve. Refer to "ON-VEHICLE SERVICE" in AT section.
2. Check torque converter clutch solenoid valve operation.

NG

Replace torque converter clutch solenoid valve.

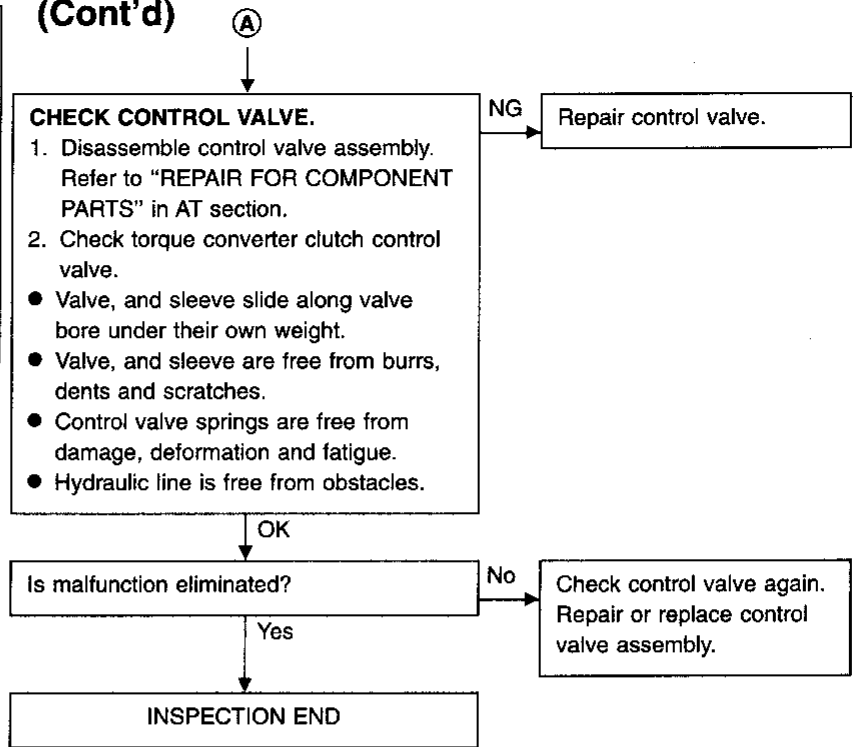
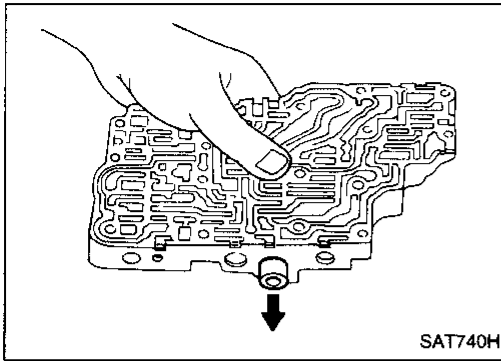
OK

**A**

(Go to next page.)

# TROUBLE DIAGNOSIS FOR DTC P1550

## Torque Converter Clutch Solenoid Valve (Cont'd)



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## Overheat

**Note:** Since this diagnosis does not meet P1900 of SAEJ2012, it is indicated only by CONSULT.

### ON BOARD DIAGNOSIS LOGIC

If the cooling fan or another component in the cooling system malfunctions, the engine coolant temperature will rise.

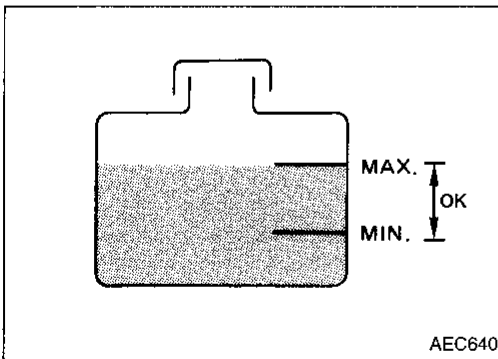
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic trouble code No.	Malfunction is detected when ...	Check Items (Possible Cause)
OVERHEAT (P1900) 0208	<ul style="list-style-type: none"> <li>● Engine coolant temperature reaches an abnormally high temperature.</li> </ul>	<ul style="list-style-type: none"> <li>● Cooling fan</li> <li>● Radiator hose</li> <li>● Radiator</li> <li>● Radiator cap</li> <li>● Water pump</li> <li>● Thermostat</li> </ul> <p>For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", (EC-302).</p>

### 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:

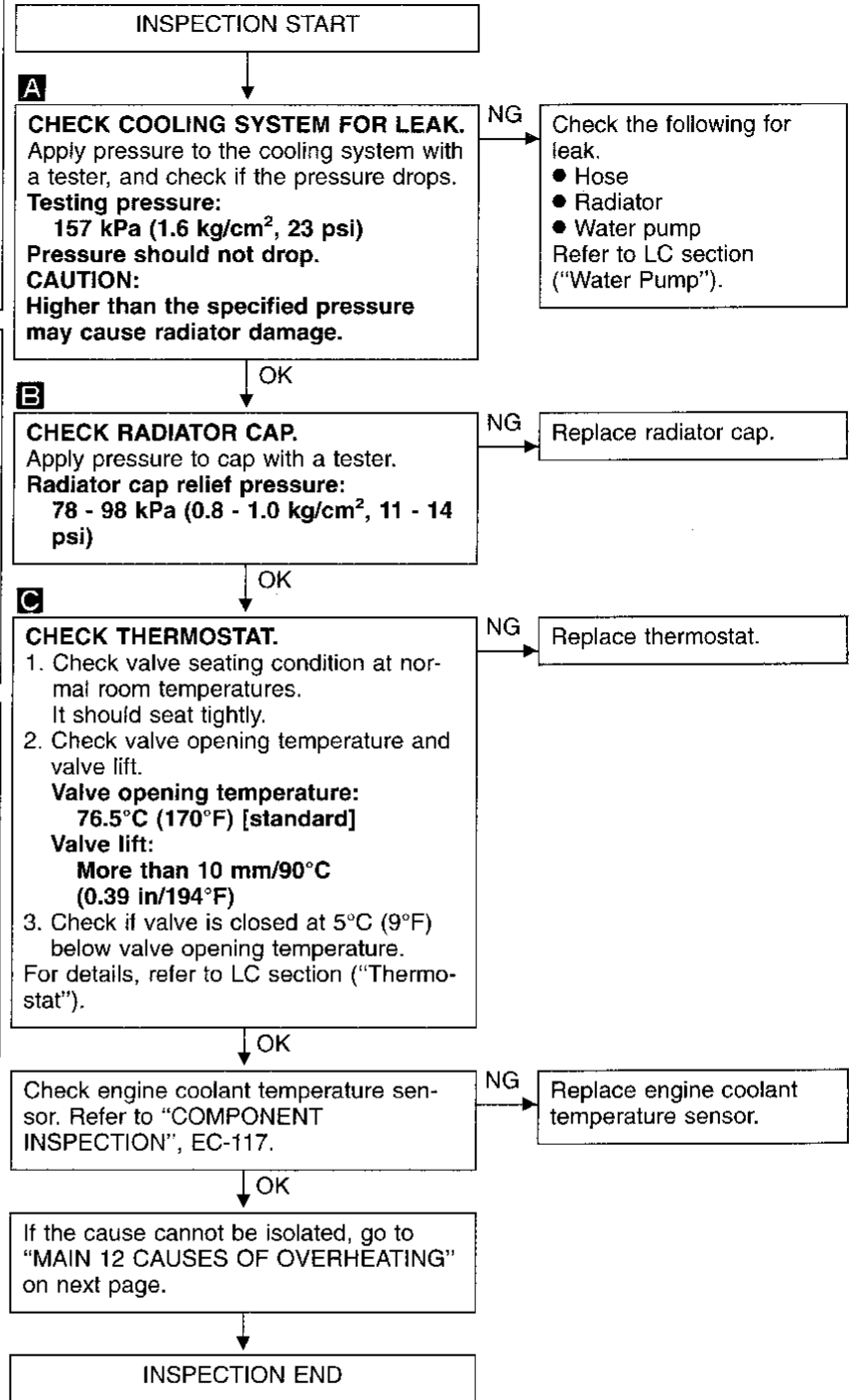
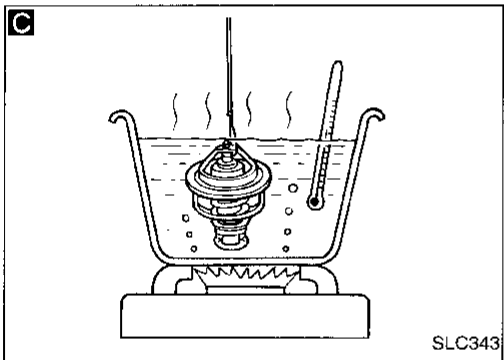
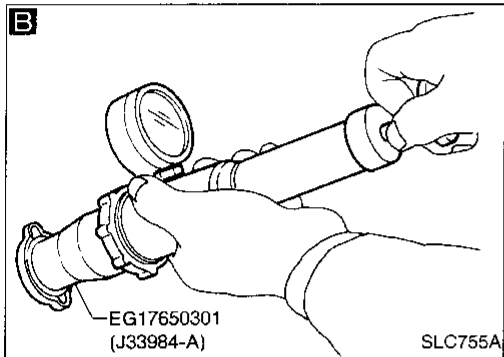
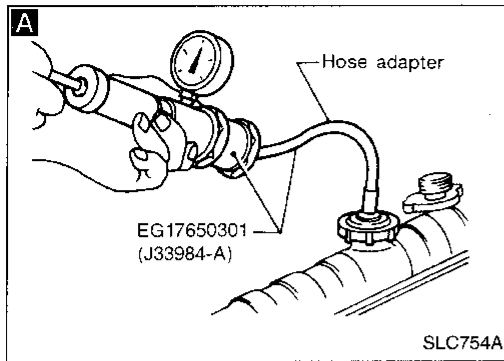
**Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.**

**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 step and go to "DIAGNOSTIC PROCEDURE" on next page.
- 2) Confirm whether customer filled the coolant or not. If customer filled the coolant, go to "DIAGNOSTIC PROCEDURE" on next page.

# TROUBLE DIAGNOSIS FOR DTC P1900

## Overheat (Cont'd) DIAGNOSTIC PROCEDURE



### 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".

# TROUBLE DIAGNOSIS FOR DTC P1900

## Overheat (Cont'd)

### MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	<ul style="list-style-type: none"> <li>● Blocked radiator</li> <li>● Blocked condenser</li> <li>● Blocked radiator grille</li> <li>● Blocked bumper</li> </ul>	● 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 <sup>2</sup> , 11 - 14 psi) 59 - 98 kPa (0.6 - 1.0 kg/cm <sup>2</sup> , 9 - 14 psi) (Limit)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	● Cooling fan	● Visual	Operating	See "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.

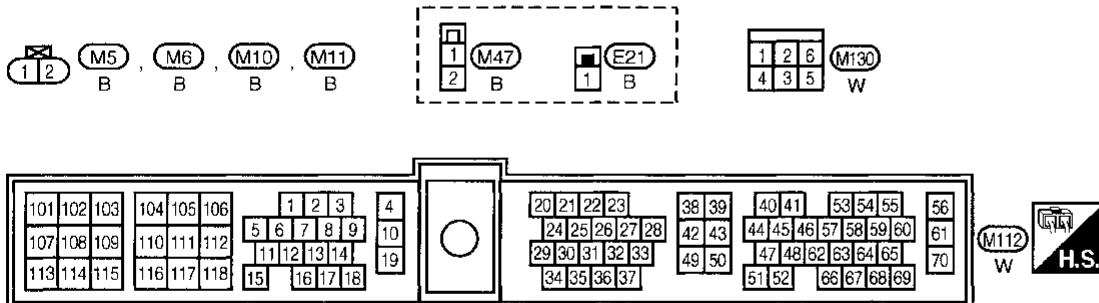
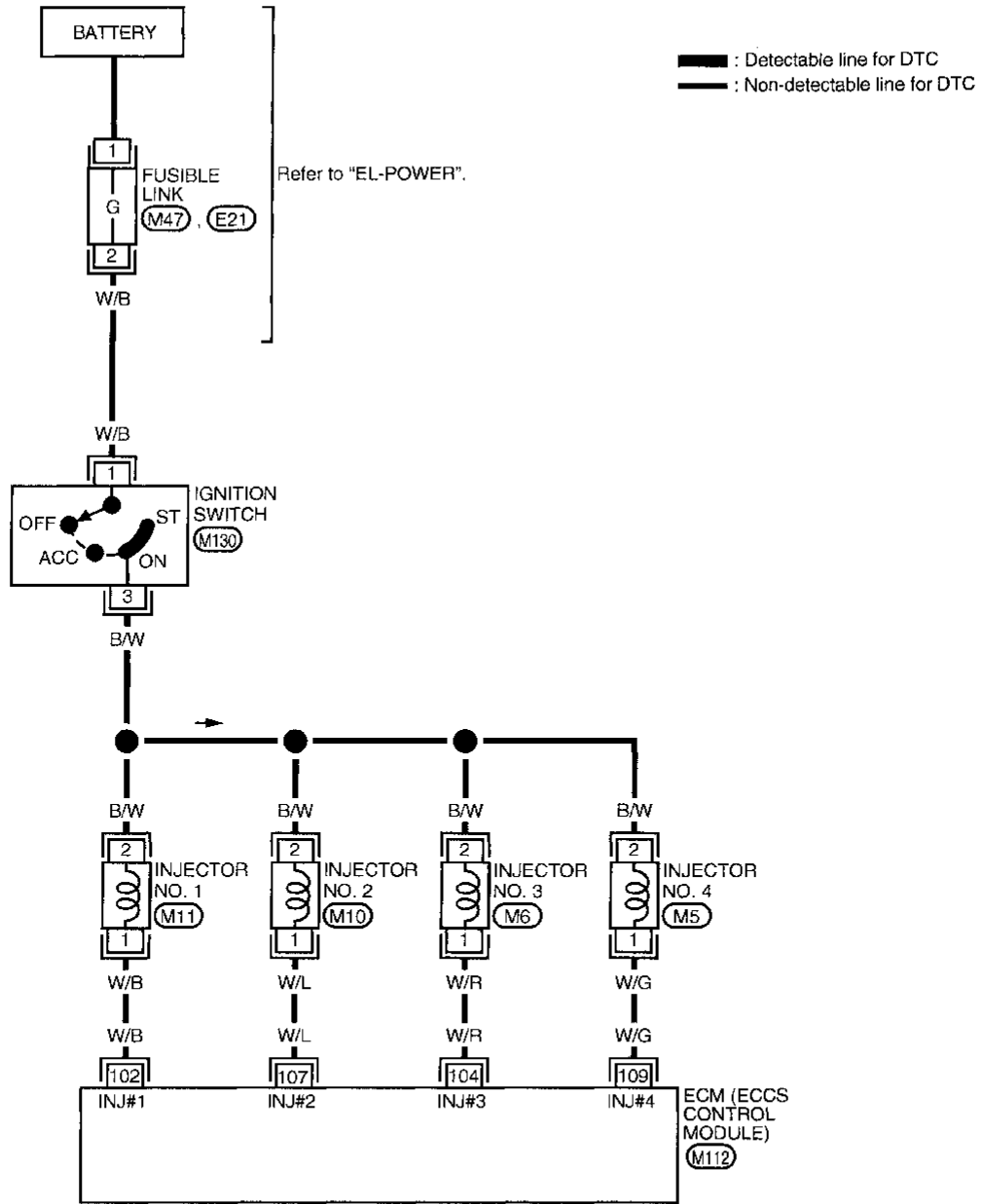
\*4: After 60 minutes of cool down time.

For more information, refer to "OVERHEATING CAUSE ANALYSIS" in LC section.

# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Injector

### EC-INJECT-01



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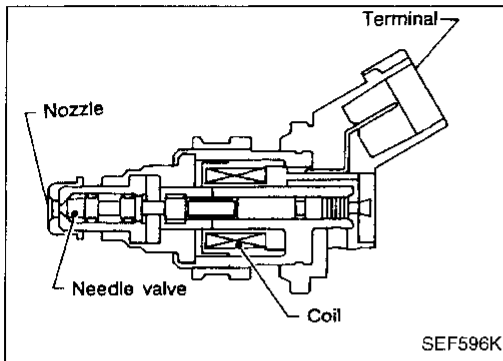


# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Injector (Cont'd)

### COMPONENT DESCRIPTION

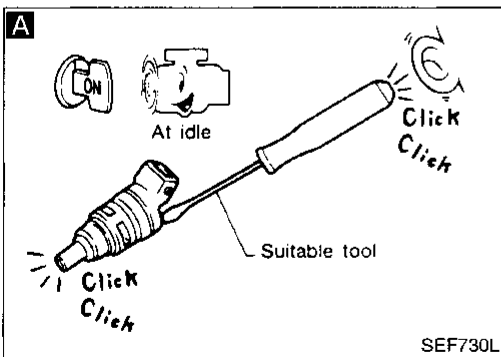
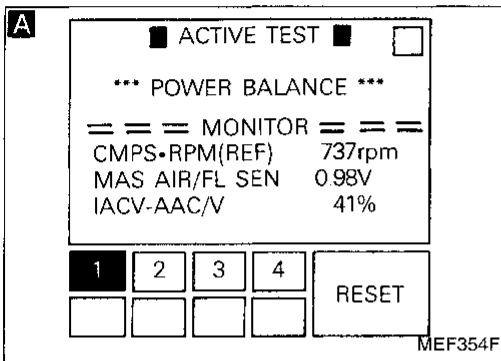
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends 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.



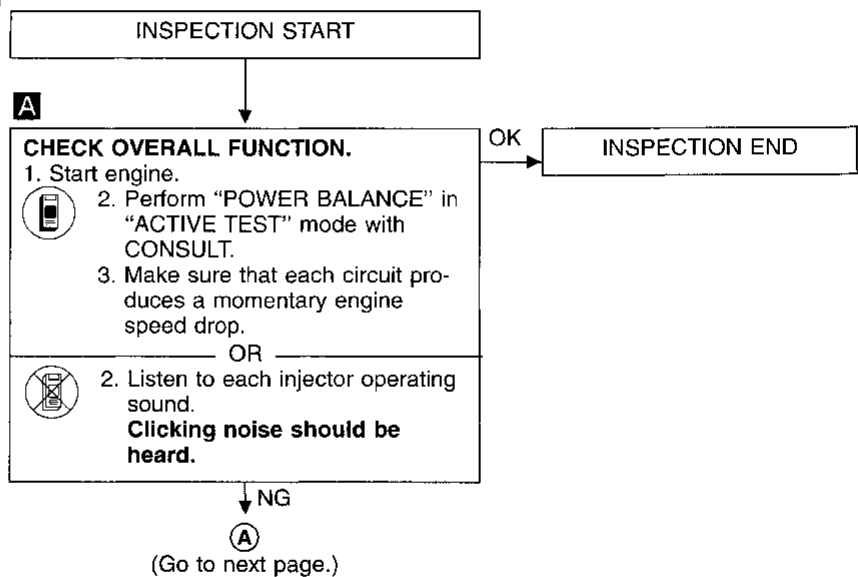
### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④③ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
102	W/B	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
104	W/R	Injector No. 3		
107	W/L	Injector No. 2		
109	W/G	Injector No. 4		

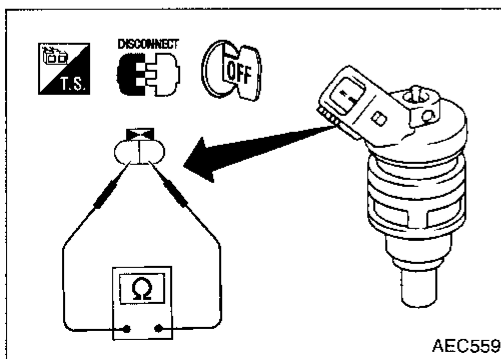
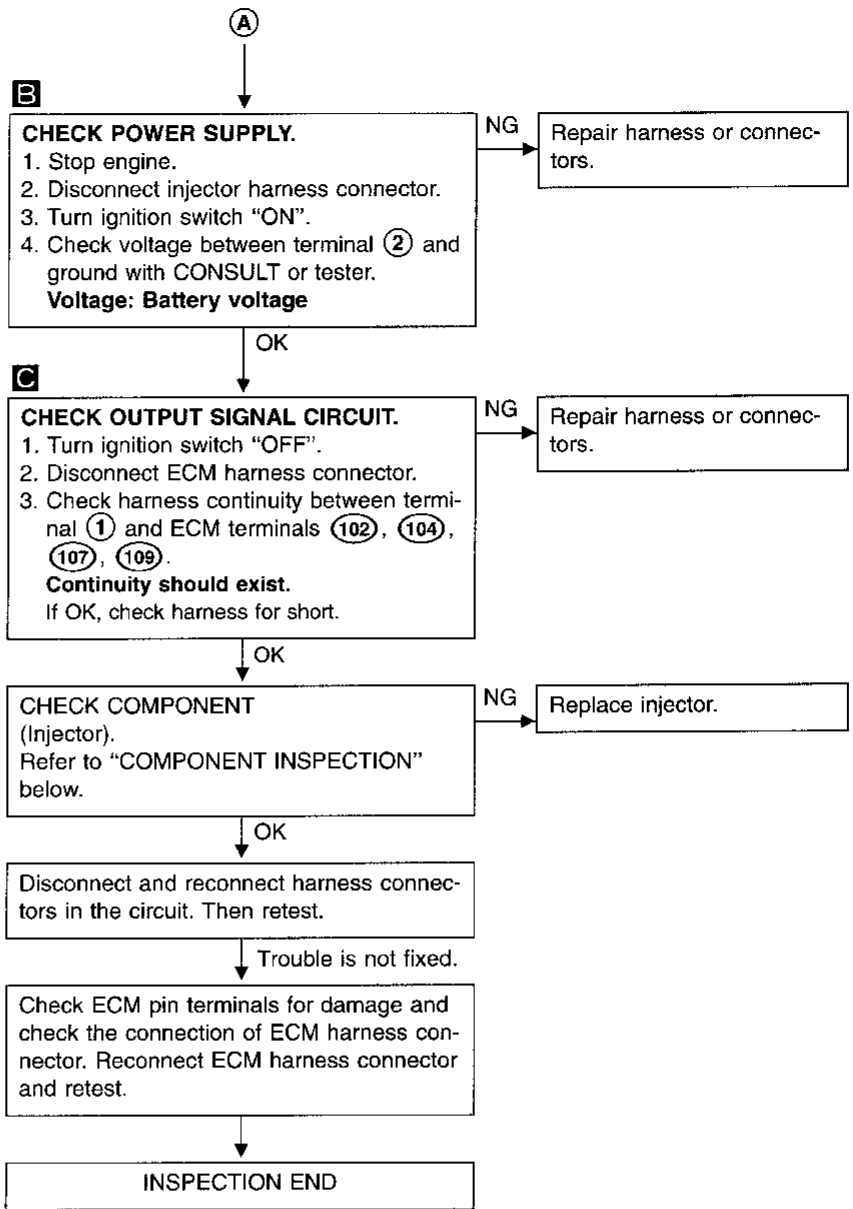
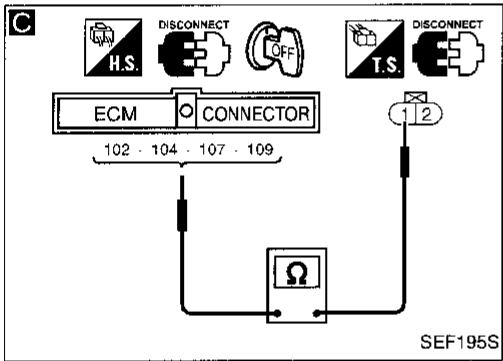
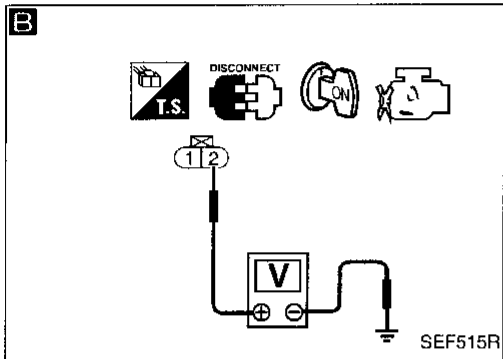
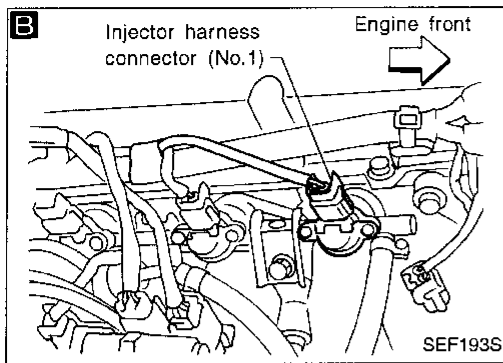


### DIAGNOSTIC PROCEDURE



# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Injector (Cont'd)



### COMPONENT INSPECTION

#### Injector

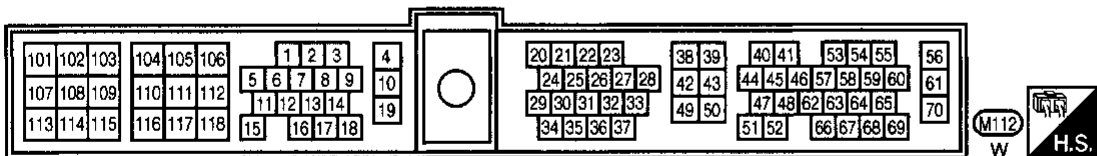
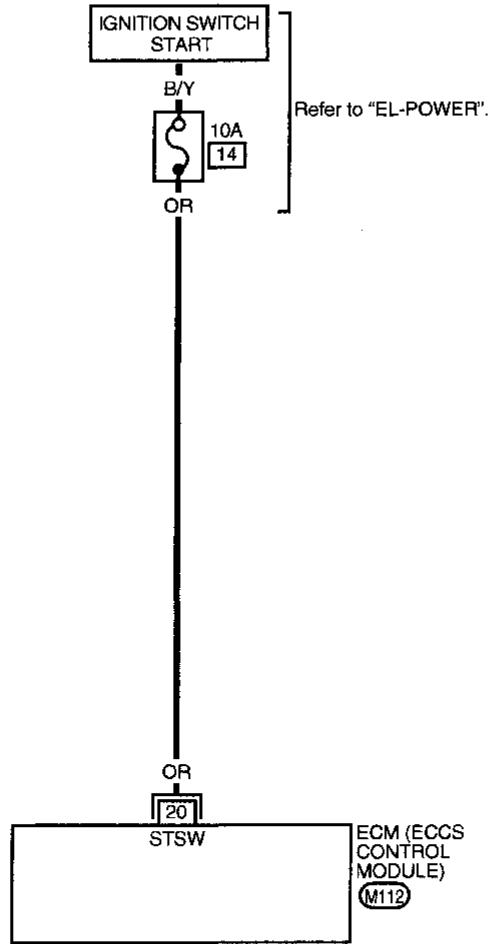
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.  
**Resistance: 10 - 14Ω at 25°C (77°F)**  
If NG, replace injector.

GI  
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TF  
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ST  
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BT  
HA  
EL  
IDX

Start Signal

EC-S/SIG-01

— : Detectable line for DTC  
 — : Non-detectable line for DTC



# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Start Signal (Cont'd)

### SYSTEM DESCRIPTION

If the ECM always receives a start signal, the ECM will judge the start signal "OFF" when engine speed is above 1,000 rpm. This prevents extra enrichment. After the engine speed is below 200 rpm, start-up enrichment will be allowed until the engine speed reaches 1,000 rpm.

### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
20	OR	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)

### 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

GI

MA

EM

LC

EC

FE

CL

MT

AT

TF

PD

FA

RA

BR

ST

RS

BT

HA

EL

IDX

# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Start Signal (Cont'd) DIAGNOSTIC PROCEDURE

**A**

■ START SIGNAL CKT ■

1. CLOSE THROTTLE, SHIFT TO P OR N RANGE.
2. TOUCH START AND START ENGINE IMMEDIATELY.

NEXT      START

SEF191L

**A**

☆ MONITOR      ☆ NO FAIL

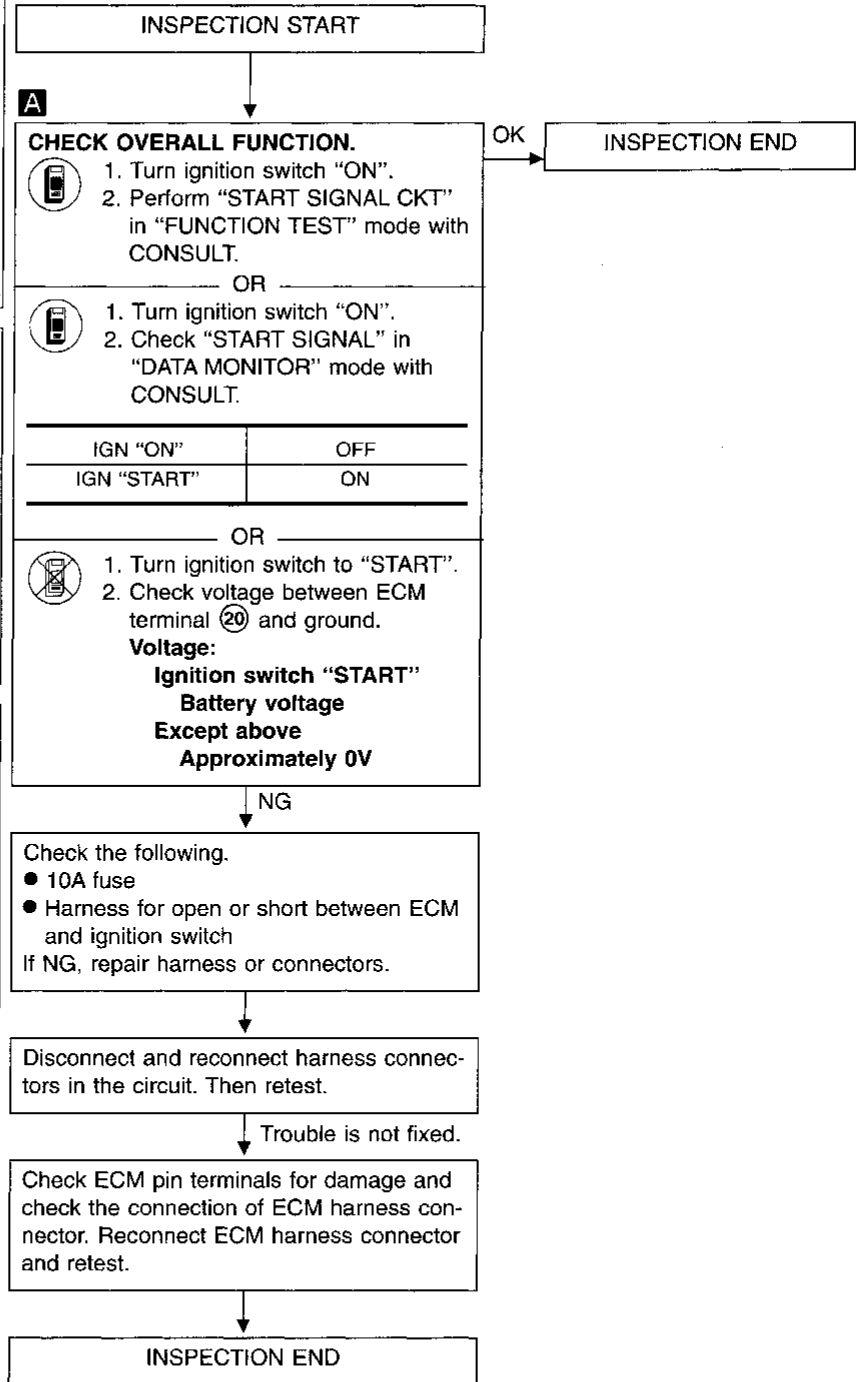
START SIGNAL	OFF
CLSD TH/P SW	ON
AIR COND SIG	OFF
P/N POSI SW	ON

RECORD

SEF111P

**A**

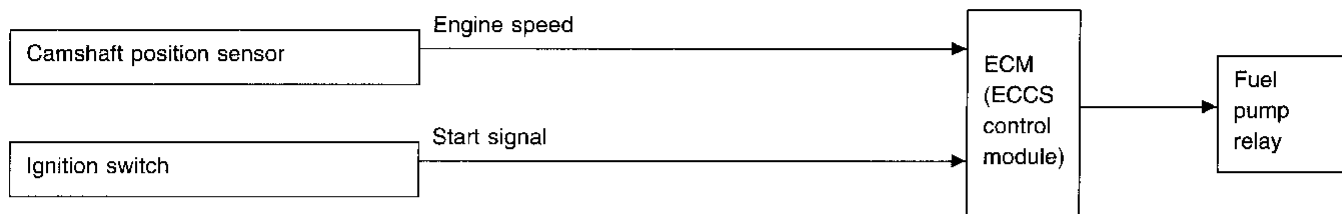
SEF109P



# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## 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
When engine is stopped	Stops in 1 second
Except as shown above	Stops

### ECM TERMINALS AND REFERENCE VALUE

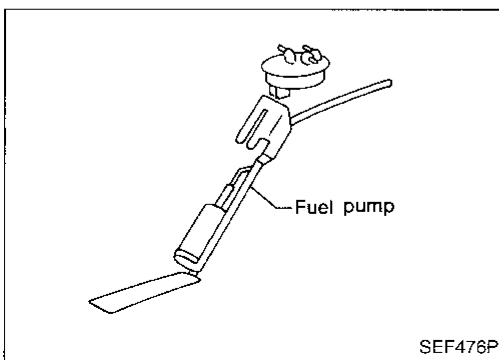
Specification data are reference values and are measured between each terminal and ④3 (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
8	W/R	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON"	Approximately 1V
			Engine is running.	
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	<ul style="list-style-type: none"> <li>Ignition switch is turned to ON (Operates for 5 seconds)</li> <li>Engine running and cranking</li> <li>When engine is stopped (Stops in 1.0 seconds)</li> </ul>	ON
	<ul style="list-style-type: none"> <li>Except as shown above</li> </ul>	OFF



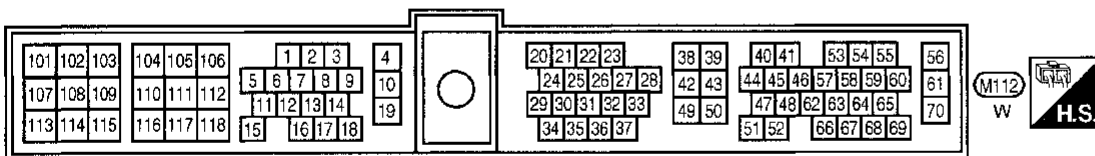
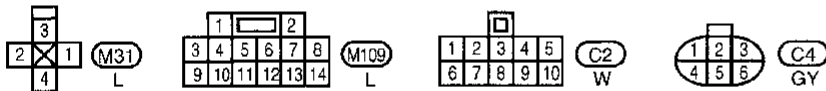
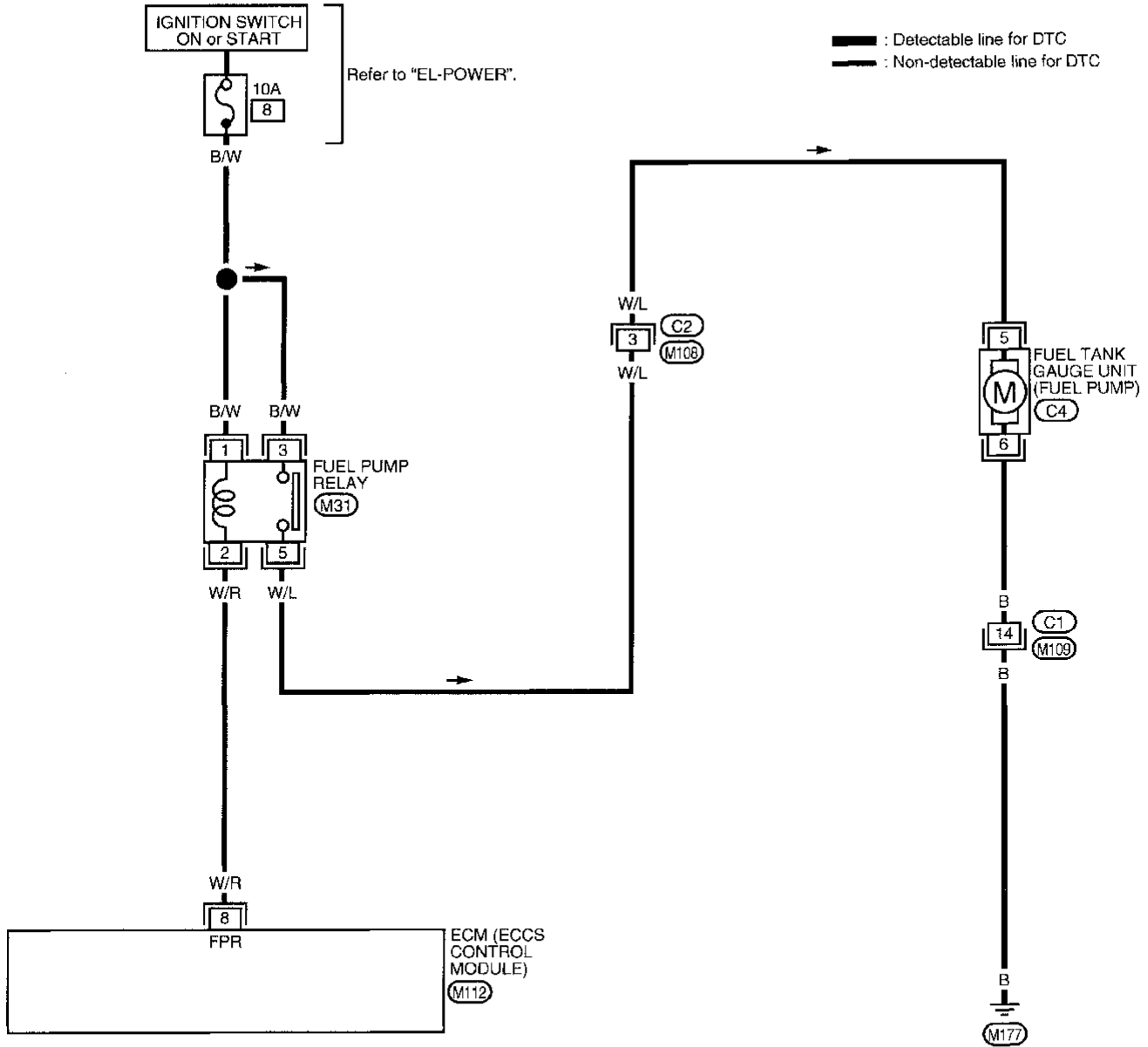
### COMPONENT DESCRIPTION

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).

# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Fuel Pump (Cont'd)

EC-F/PUMP-01



# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Fuel Pump (Cont'd) DIAGNOSTIC PROCEDURE

GI

MA

EM

LC

EC

FE

CL

MT

AT

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ST

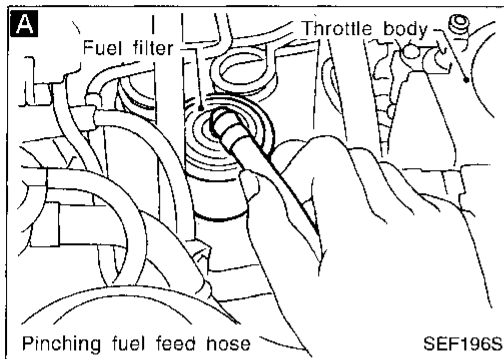
RS

BT

HA

EL

IDX



INSPECTION START

**A**

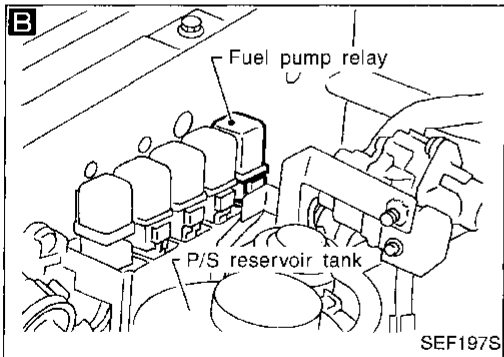
**CHECK OVERALL FUNCTION.**

1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.

**Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".**

OK → INSPECTION END

NG →



**B**

**CHECK POWER SUPPLY.**

1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".
4. Check voltage between terminals ①, ③ and ground with CONSULT or tester.

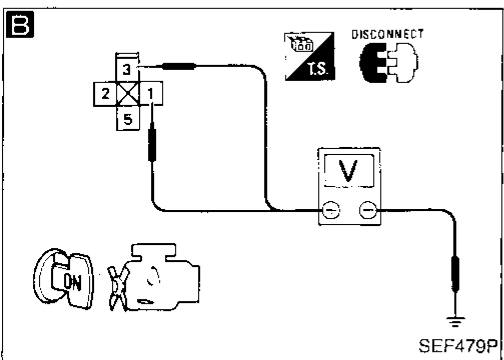
**Voltage: Battery voltage**

NG → Check the following.

- 10A fuse
- Harness for open or short between fuse and fuel pump relay

If NG, repair harness or connectors.

OK →



**C**

**CHECK GROUND CIRCUIT.**

1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal ⑥ and body ground, relay terminal ⑤ and terminal ⑤.

**Continuity should exist.**

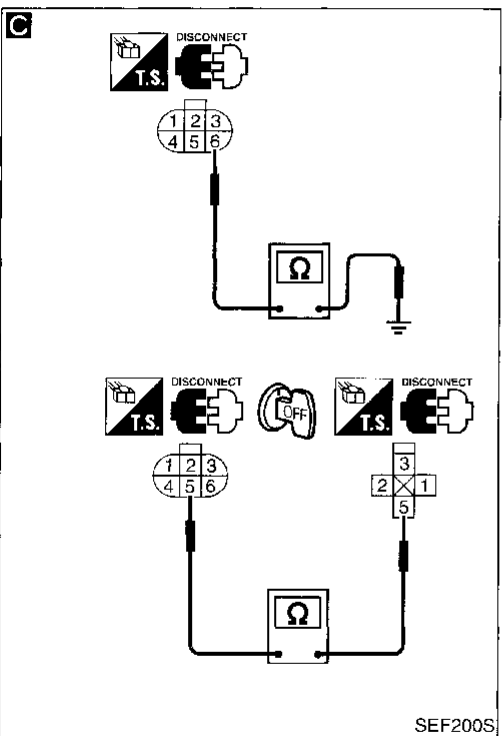
If OK, check harness for short.

NG → Check the following.

- Harness connectors (C1), (M109)
- Harness connectors (C2), (M108)
- 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 harness or connectors.

OK →



**D**

**CHECK OUTPUT SIGNAL CIRCUIT.**

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑧ and terminal ②.

**Continuity should exist.**

If OK, check harness for short.

NG → Repair harness or connectors.

OK →

OK

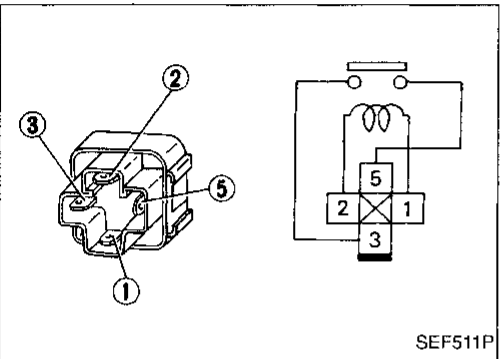
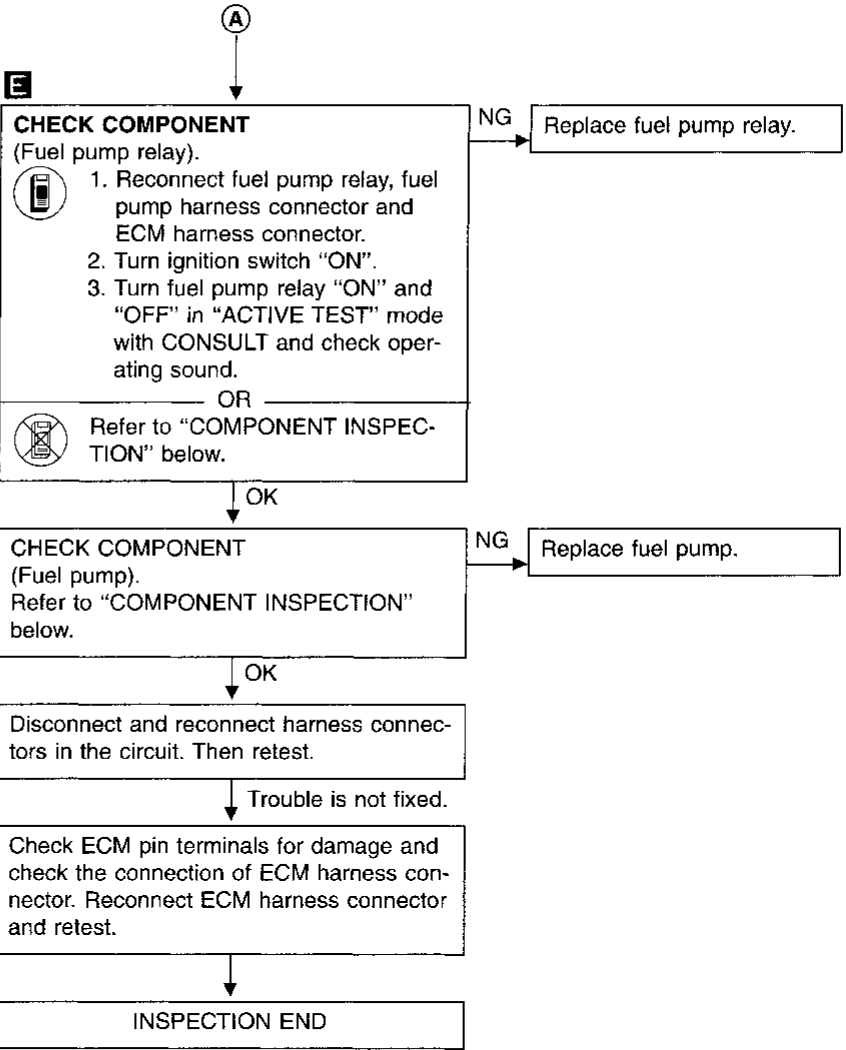
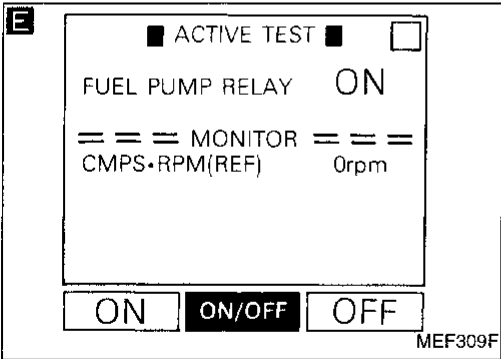
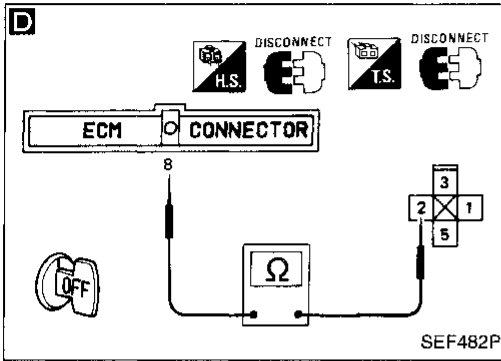
Ⓐ

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# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Fuel Pump (Cont'd)



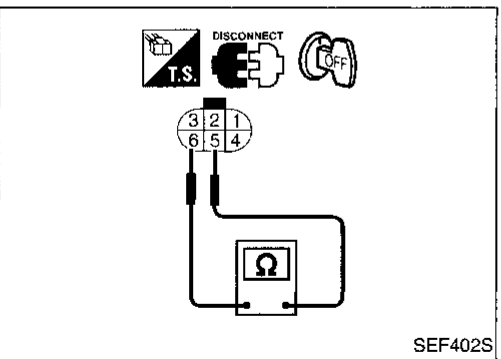
### COMPONENT INSPECTION

#### Fuel pump relay

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.

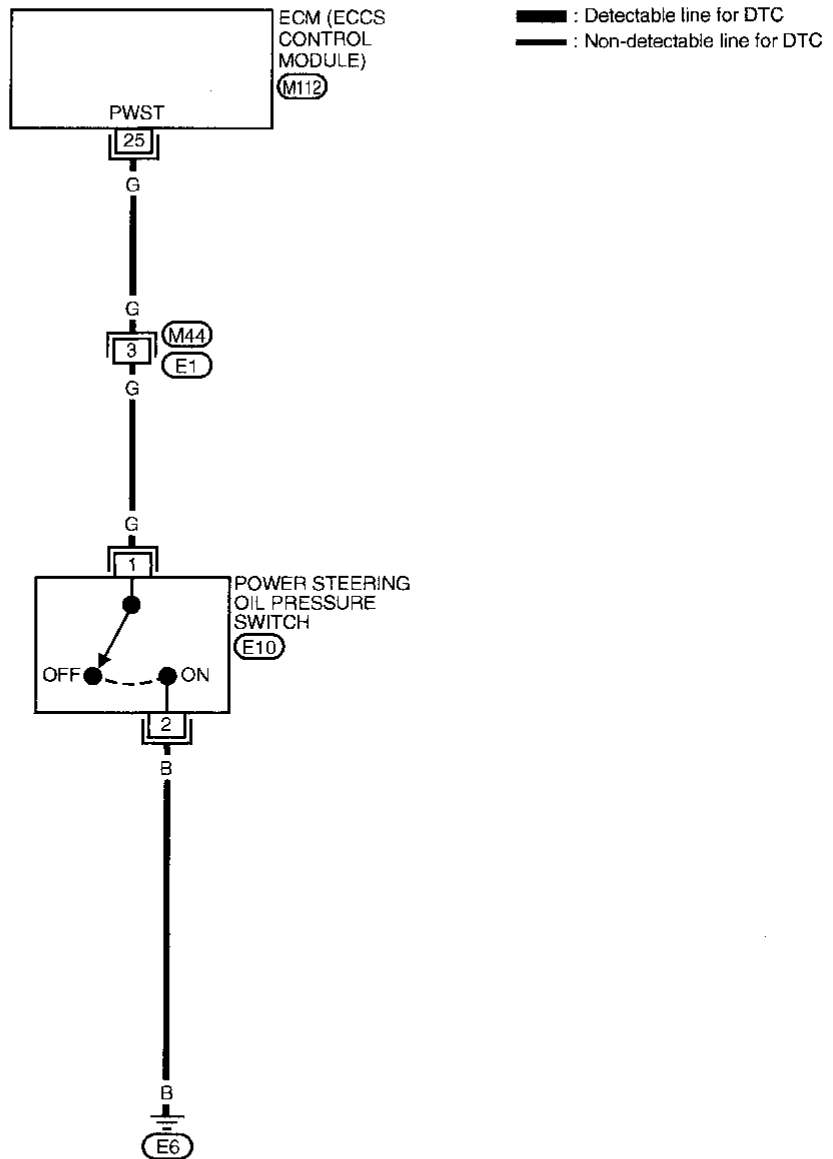


#### Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ⑤ and ⑥.  
**Resistance: 0.2 - 5.0Ω at 25°C (77°F)**  
If NG, replace fuel pump.

Power Steering Oil Pressure Switch

EC-PST/SW-01



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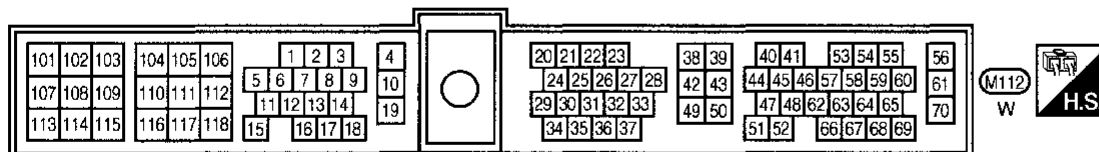
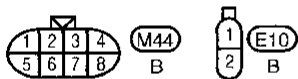
RS

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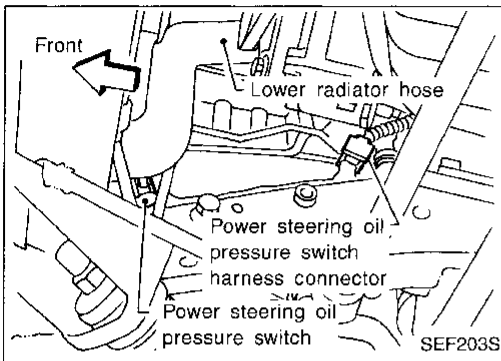


## TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

### 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.



#### ECM TERMINALS AND REFERENCE VALUE

Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
25	G	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0V
			Engine is running. └ Steering wheel is not being turned.	Approximately 5V

#### CONSULT REFERENCE VALUE IN DATA MONITOR MODE

Specification data are reference values

MONITOR ITEM	CONDITION	SPECIFICATION
PW/ST SIGNAL	<ul style="list-style-type: none"> <li>Engine: After warming up, idle the engine</li> </ul>	Steering wheel in neutral position (forward direction)
		The steering wheel is turned

# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Power Steering Oil Pressure Switch (Cont'd)

### DIAGNOSTIC PROCEDURE

**A**

■ PW/ST SIGNAL CIRCUIT ■

HOLD STEERING WHEEL  
IN A FULL  
LOCKED POSITION  
THEN  
TOUCH START

NEXT    START

MEF023E

**A**

☆ MONITOR ☆ NO FAIL

PW/ST SIGNAL      OFF

RECORD

SEF591I

**A**

ECM    CONNECTOR    H.S.    ON

25

SEF126P

**A**

Front

Lower radiator hose

Power steering oil pressure switch

Power steering oil pressure switch harness connector

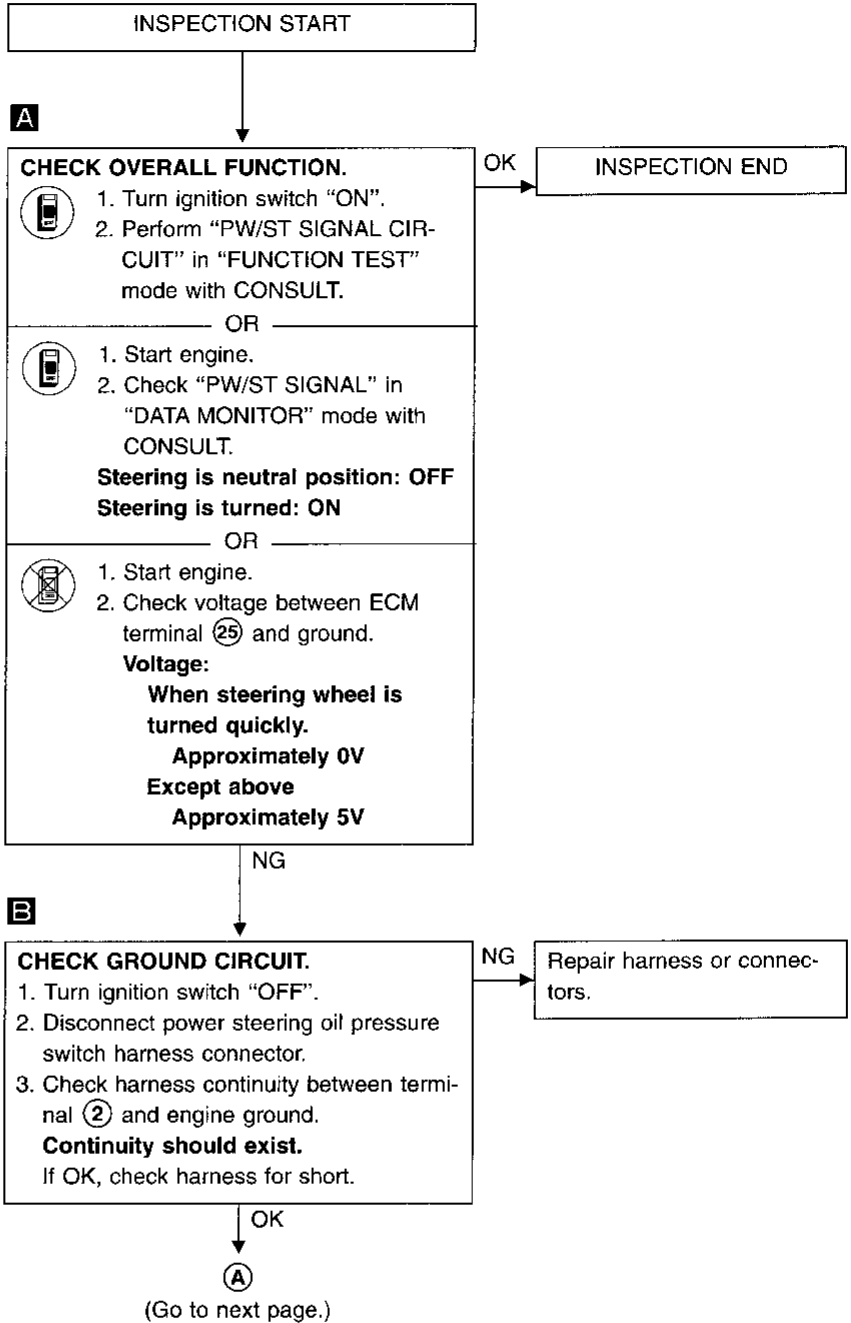
SEF203S

**B**

DISCONNECT T.S.    OFF

1    2

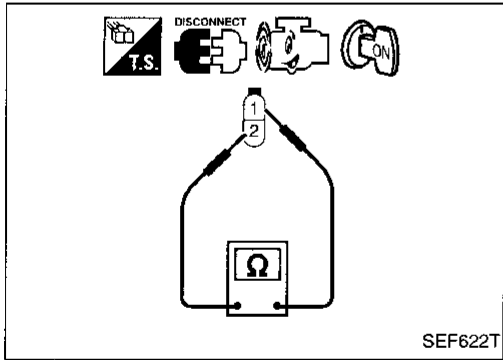
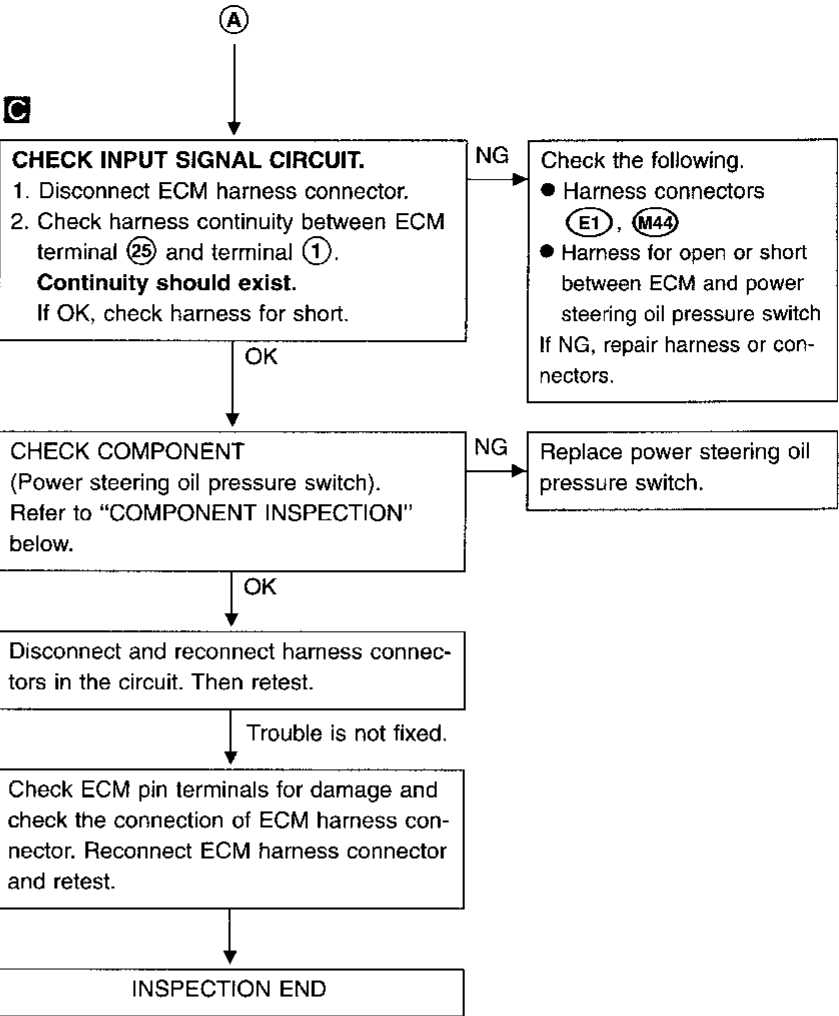
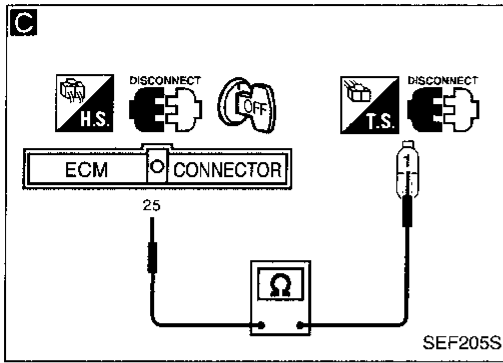
SEF204S



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# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## Power Steering Oil Pressure Switch (Cont'd)



### COMPONENT INSPECTION

#### Power steering oil pressure switch

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ②.

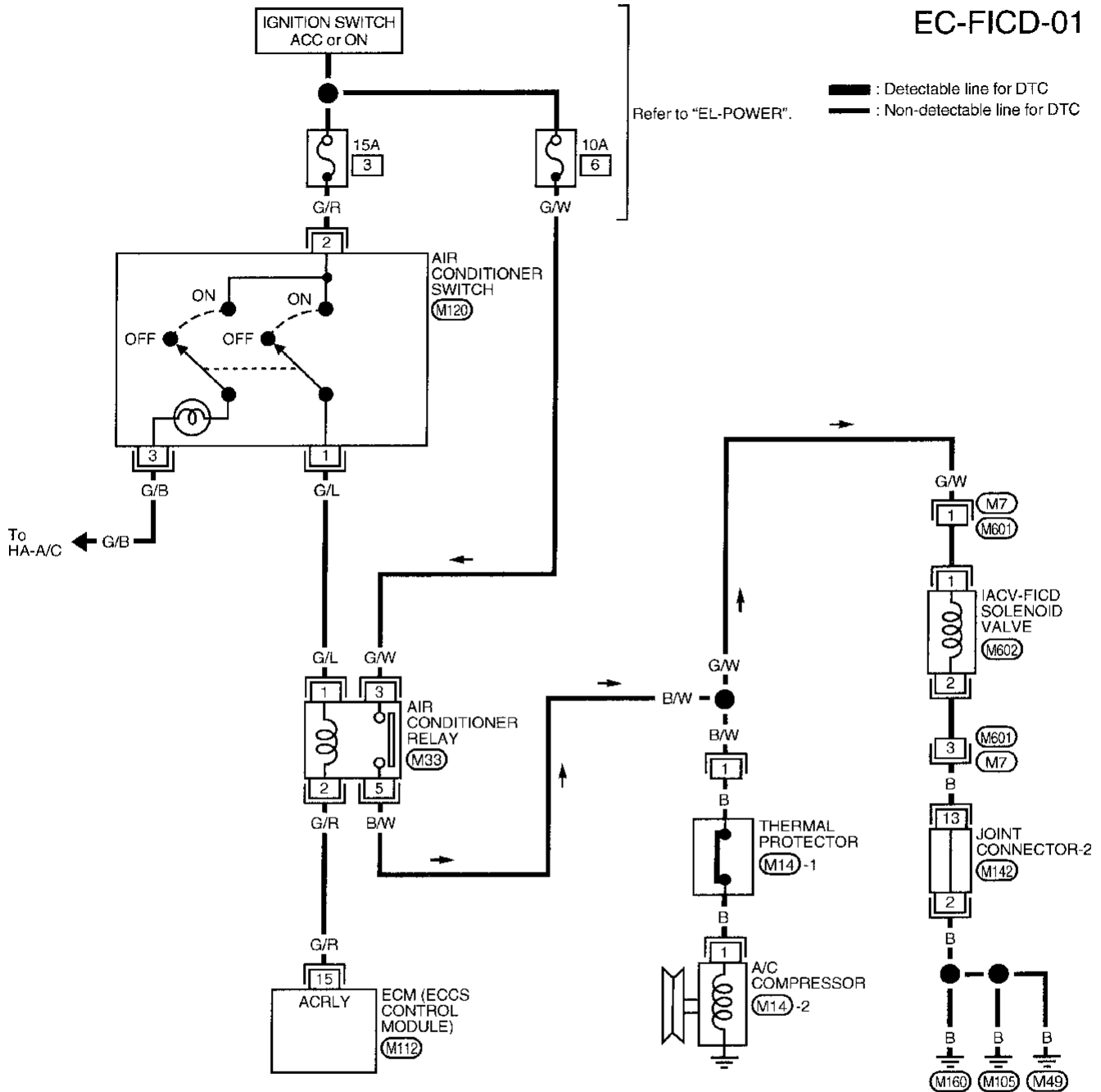
Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

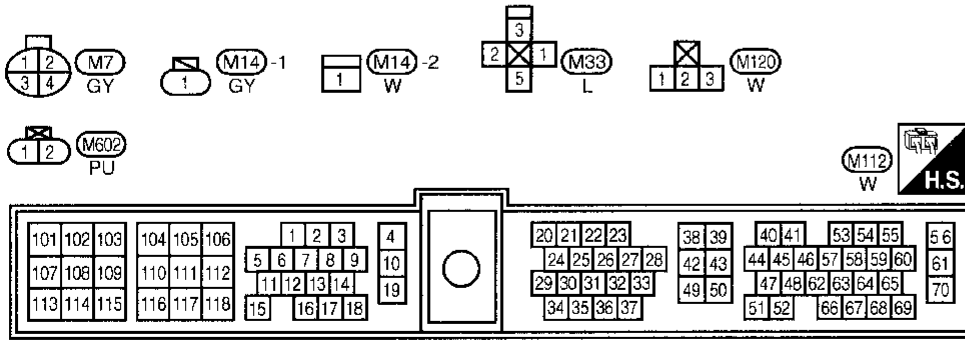
# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## IACV-FICD Solenoid Valve

EC-FICD-01



- GI
- MA
- EM
- LC
- EC**
- FE
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- PD
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- BT
- HA
- EL
- IDX

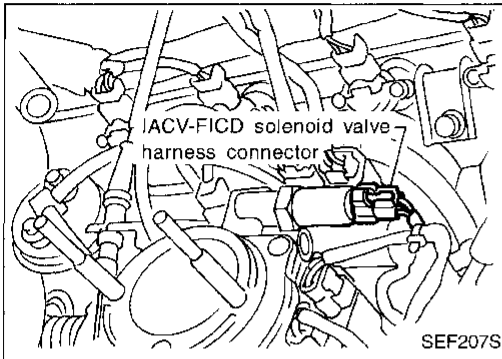


## TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

### IACV-FICD Solenoid Valve (Cont'd)

#### COMPONENT DESCRIPTION

The idle air adjusting (IAA) unit is made up of the IACV-AAC valve, IACV-FICD solenoid valve and idle adjusting screw. It receives the signal from the ECM and controls the idle speed at the preset value.



#### ECM TERMINALS AND REFERENCE VALUE

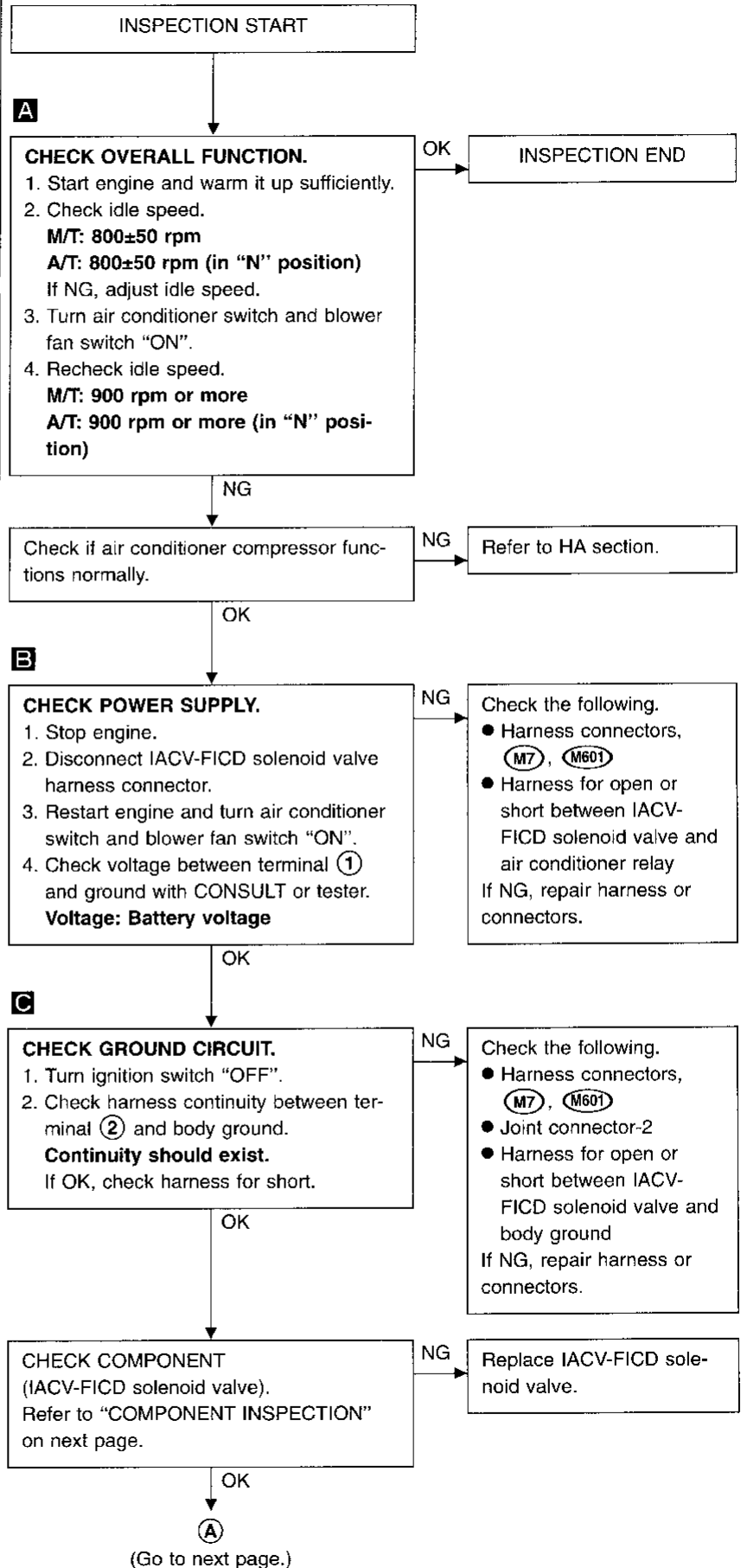
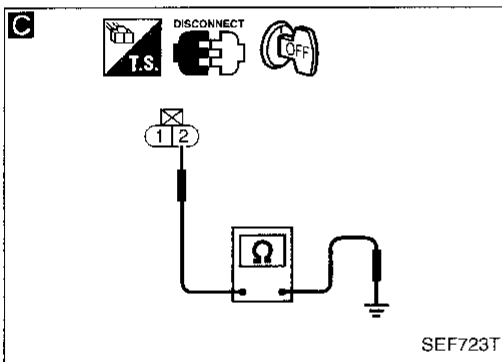
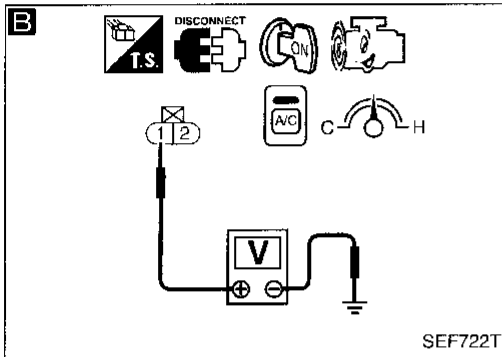
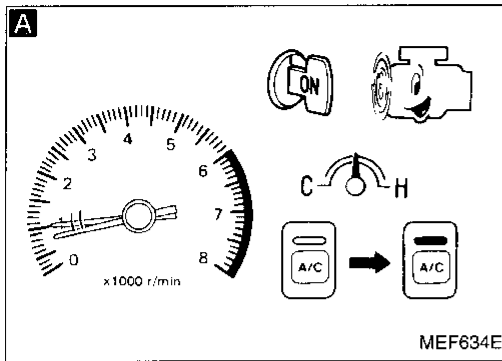
Specification data are reference values and are measured between each terminal and ④ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
15	G/R	Air conditioner relay	Engine is running. └ Both air conditioner switch and blower switch are "ON".	Approximately 1V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
21	G/R	Air conditioner 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)

# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## IACV-FICD Solenoid Valve (Cont'd)

### DIAGNOSTIC PROCEDURE

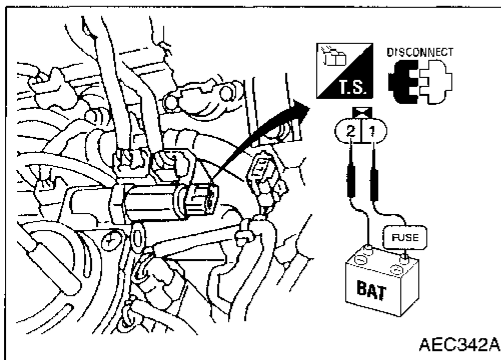
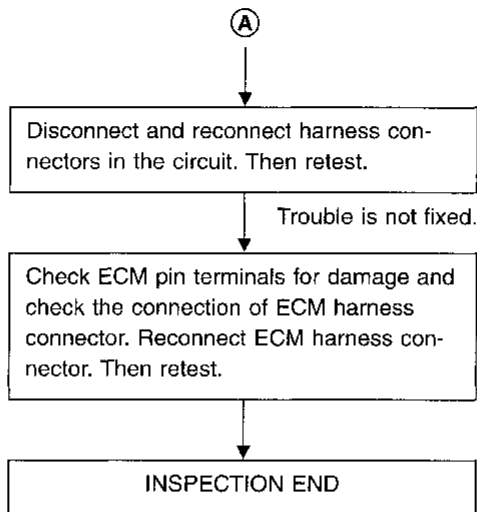


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# TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

## IACV-FICD Solenoid Valve (Cont'd)

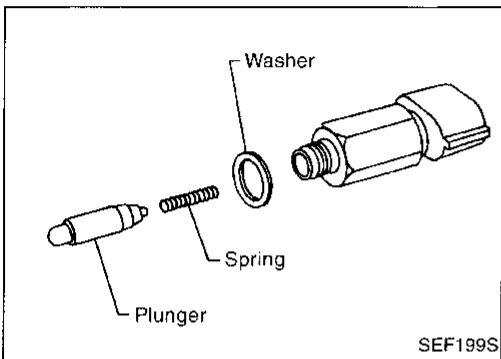


### COMPONENT INSPECTION

#### IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

- Check for clicking sound when applying 12V direct current to terminals.



- Check plunger for seizing or sticking.
- Check for broken spring.



## TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS

### MIL & Data Link Connectors (Cont'd)

#### ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
18	R/W	Malfunction indicator lamp	Ignition switch "ON"	0 - 1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
58	R	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected.)	Approximately 9V
64	Y	Data link connector for CONSULT	Engine is running. └ Idle speed (Connect CONSULT and select DATA MONITOR mode.)	Approximately 0.1V
65	R			Approximately 4 - 9V
68	G			Approximately 3.5V*

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

# SERVICE DATA AND SPECIFICATIONS (SDS)

## General Specifications

PRESSURE REGULATOR	
Fuel pressure at idling kPa (kg/cm <sup>2</sup> , psi)	
Vacuum hose is connected	Approximately 235 (2.4, 34)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

## Inspection and Adjustment

Idle speed*1	rpm	
No-load*2 (in "N" position)		800±50
Air conditioner: ON (in "N" position)		900 or more
Ignition timing		10°±2° BTDC
Throttle position touch speed	rpm	1,000±150

\*1: Feedback controlled and needs no adjustments

\*2: Under the following conditions:

- Air conditioner switch: OFF
- Steering wheel: Kept in straight-ahead position
- Electrical load: OFF (Lights, heater fan & rear window defogger)

## IGNITION COIL

Primary voltage	V	Battery voltage (11 - 14)
Primary resistance [at 25°C (77°F)]	Ω	Less than 1.0
Secondary resistance [at 25°C (77°F)]	kΩ	7 - 13

## MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage at idle	V	1.3 - 1.7
Mass air flow (Using CONSULT or GST) gm/sec		1.8 - 6.5 at idle* (2WD) 2.1 - 6.0 at idle* (4WD) 7.7 - 15.0 at 2,500 rpm* (2WD) 6.8 - 13.3 at 2,500 rpm* (4WD)

\*: Engine is warmed up sufficiently and running under no-load.

## ENGINE COOLANT TEMPERATURE SENSOR

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

## EGR TEMPERATURE SENSOR

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

## FUEL PUMP

Resistance [at 25°C (77°F)]	Ω	0.2 - 5.0
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## IACV-AAC VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 10.0
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## INJECTOR

Resistance [at 25°C (77°F)]	Ω	10 - 14
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## RESISTOR

Resistance [at 25°C (77°F)]	kΩ	Approximately 2.2
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## THROTTLE POSITION SENSOR

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 0.5 kΩ
Partially open	0.5 - 4.0 kΩ
Completely open	Approximately 4.0 kΩ

## CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	16.8 - 34.7* (2WD) 15.9 - 33.2* (4WD)
At 2,500 rpm	14.1 - 27.6* (2WD) 13.3 - 26.1* (4WD)

\*: Engine is warmed up sufficiently and running under no-load.

## SERVICE DATA AND SPECIFICATIONS (SDS)

### Inspection and Adjustment (Cont'd)

#### INTAKE AIR TEMPERATURE SENSOR

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

#### FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3
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#### REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	11.4 - 17.4
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#### CRANKSHAFT POSITION SENSOR (OBD)

Resistance [at 20°C (68°F)]	Ω	166.5 - 203.5
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