SECTION EC

CONTENTS

CONTENTS (Cont'd.)

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

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

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC*3 ECM*1	DTC*3 CONSULT GST*2	Reference page
Unable to access ECCS	—	—	EC-71
A/T 1ST SIGNAL	1103	P0731	AT-75
A/T 2ND SIGNAL	1104	P0732	AT-78
A/T 3RD SIGNAL	1105	P0733	AT-81
A/T 4TH SIG OR TCC	1106	P0734	AT-84
A/T COMM LINE	—	P0600	EC-186
A/T DIAG COMM LINE	0804	P1605	EC-217
A/T TCC SIGNAL	1107	P0744	AT-92
CAMSHAFT POSI SEN	0101	P0340	EC-157
CLOSED LOOP	0307	P0130	EC-121
COOLANT TEMP SEN*4	0103	P0115	EC-100
*COOLANT TEMP SEN	0908	P0125	EC-111
COOLING FAN	1308	P1900	EC-220
CRANK P/S (OBD) COG	0905	P1336	EC-201
CRANK POS SEN (OBD)	0802	P0335	EC-152
CYL 1 MISFIRE	0608	P0301	EC-145
CYL 2 MISFIRE	0607	P0302	EC-145
CYL 3 MISFIRE	0606	P0303	EC-145
CYL 4 MISFIRE	0605	P0304	EC-145
CYL 5 MISFIRE	0604	P0305	EC-145
CYL 6 MISFIRE	0603	P0306	EC-145
ECM	0301	P0605	EC-189
EGR SYSTEM	0302	P0400	EC-163
EGR TEMP SENSOR	0305	P1401	EC-211
EGRC SOLENOID/V	1005	P1400	EC-206
EGRC-BPT VALVE	0306	P0402	EC-172
ENGINE SPEED SIG*5	1207	P0725	AT-73
FLUID TEMP SENSOR	1208	P0710	AT-68
FR O2 SEN HEATER	0901	P0135	EC-122
FRONT O2 SENSOR	0303	P0130	EC-116
FUEL SYS LEAN	0115	P0171	EC-135
FUEL SYS RICH	0114	P0172	EC-140
IACV-AAC VALVE	0205	P0505	EC-181
IGN SIGNAL-PRIMARY	0201	P1320	EC-195
INHIBITOR SWITCH	1101	P0705	AT-63
INT AIR TEMP SEN	0401	P0110	EC-95
KNOCK SENSOR	0304	P0325	EC-149
LINE PRESSURE S/V	1205	P0745	AT-97
MASS AIR FLOW SEN*4	0102	P0100	EC-89
MULTI CYL MISFIRE	0701	P0300	EC-145
NO SELF-DIAGNOSTIC FAILURE INDICATED	Flashing	No DTC	EC-42
OVERRUN CLUTCH S/V	1203	P1760	AT-108
PARK/NEUT POSI SW	1003	P0705	EC-191
REAR O2 SENSOR	0707	P0136	EC-126
RR O2 SEN HEATER	0902	P0141	EC-130
SHIFT SOLENOID/V A*4	1108	P0750	AT-100
SHIFT SOLENOID/V B*4	1201	P0755	AT-103
THROTTLE POSI SEN*4	0403	P0120	EC-105
THRTL POSI SEN A/T*4	1206	P1705	AT-106
TOR CONV CLUTCH SV	1204	P0740	AT-89
TW CATALYST SYS	0702	P0420	EC-174
VEHICLE SPEED SEN	0104	P0500	EC-177
VHCL SPEED SEN A/T*5	1102	P0720	AT-71

*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.

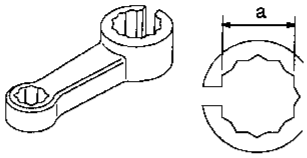
P NO. INDEX FOR DTC

DTC*3 CONSULT GST*2	DTC*3 ECM*1	Items (CONSULT screen terms)	Reference page
—	—	Unable to access ECCS	EC-71
No DTC	Flashing	NO SELF-DIAGNOSTIC FAILURE INDICATED	EC-42
P0000	**0505**	**NO SELF DIAGNOSTIC FAILURE INDICATED**	—
P0100	0102	MASS AIR FLOW SEN*4	EC-89
P0110	0401	INT AIR TEMP SEN	EC-95
P0115	0103	COOLANT TEMP SEN*4	EC-100
P0120	0403	THROTTLE POSI SEN*4	EC-105
P0125	0908	*COOLANT TEMP SEN	EC-111
P0130	0307	CLOSED LOOP	EC-121
P0130	0303	FRONT O2 SENSOR	EC-116
P0135	0901	FR O2 SEN HEATER	EC-122
P0136	0707	REAR O2 SENSOR	EC-126
P0141	0902	RR O2 SEN HEATER	EC-130
P0171	0115	FUEL SYS LEAN	EC-135
P0172	0114	FUEL SYS RICH	EC-140
P0300	0701	MULTI CYL MISFIRE	EC-145
P0301	0608	CYL 1 MISFIRE	EC-145
P0302	0607	CYL 2 MISFIRE	EC-145
P0303	0606	CYL 3 MISFIRE	EC-145
P0304	0605	CYL 4 MISFIRE	EC-145
P0305	0604	CYL 5 MISFIRE	EC-145
P0306	0603	CYL 6 MISFIRE	EC-145
P0325	0304	KNOCK SENSOR	EC-149
P0335	0802	CRANK POS SEN (OBD)	EC-152
P0340	0101	CAMSHAFT POSI SEN	EC-157
P0400	0302	EGR SYSTEM	EC-163
P0402	0306	EGRC-BPT VALVE	EC-172
P0420	0702	TW CATALYST SYS	EC-174
P0500	0104	VEHICLE SPEED SEN	EC-177
P0505	0205	IACV-AAC VALVE	EC-181
P0600	—	A/T COMM LINE	EC-186
P0605	0301	ECM	EC-189
P0705	1003	PARK/NEUT POSI SW	EC-191
P0705	1101	INHIBITOR SWITCH	AT-63
P0710	1208	FLUID TEMP SENSOR	AT-68
P0720	1102	VHCL SPEED SEN A/T*5	AT-71
P0725	1207	ENGINE SPEED SIG*5	AT-73
P0731	1103	A/T 1ST SIGNAL	AT-75
P0732	1104	A/T 2ND SIGNAL	AT-78
P0733	1105	A/T 3RD SIGNAL	AT-81
P0734	1106	A/T 4TH SIG OR TCC	AT-84
P0740	1204	TOR CONV CLUTCH SV	AT-89
P0744	1107	A/T TCC SIGNAL	AT-92
P0745	1205	LINE PRESSURE S/V	AT-97
P0750	1108	SHIFT SOLENOID/V A*4	AT-100
P0755	1201	SHIFT SOLENOID/V B*4	AT-103
P1320	0201	IGN SIGNAL-PRIMARY	EC-195
P1336	0905	CRANK P/S (OBD) COG	EC-201
P1400	1005	EGRC SOLENOID/V	EC-206
P1401	0305	EGR TEMP SENSOR	EC-211
P1605	0804	A/T DIAG COMM LINE	EC-217
P1705	1206	THRTL POSI SEN A/T*4	AT-106
P1760	1203	OVERRUN CLUTCH S/V	AT-108
P1900	1308	COOLING FAN	EC-220

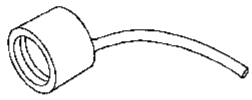
*4: When the fail-safe operation occurs, the MIL illuminates.
*5: The MIL illuminates after A/T control unit enters the fail-safe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.

Special Service Tool

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	
KV10114400 (J38365) Heated oxygen sensor wrench	 NT636	Loosening or tightening heated oxygen sensor **a: 22 mm (0.87 in)**

Commercial Service Tool

Tool name	Description	
Fuel filler cap adopter	 NT653	Checking fuel tank vacuum relief valve opening pressure

Supplemental Restraint System (SRS) "AIR BAG"

The Supplemental Restraint System "Air Bag", used along with a seat belt, helps to reduce the risk or severity of injury to the driver and front passenger in a frontal collision. The Supplemental Restraint System consists of air bag modules (located in the center of the steering wheel and in the instrument panel on the passenger side), a diagnosis sensor unit, warning lamp, wiring harness 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 and A/T

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 or A/T control unit before returning the vehicle to the customer.**

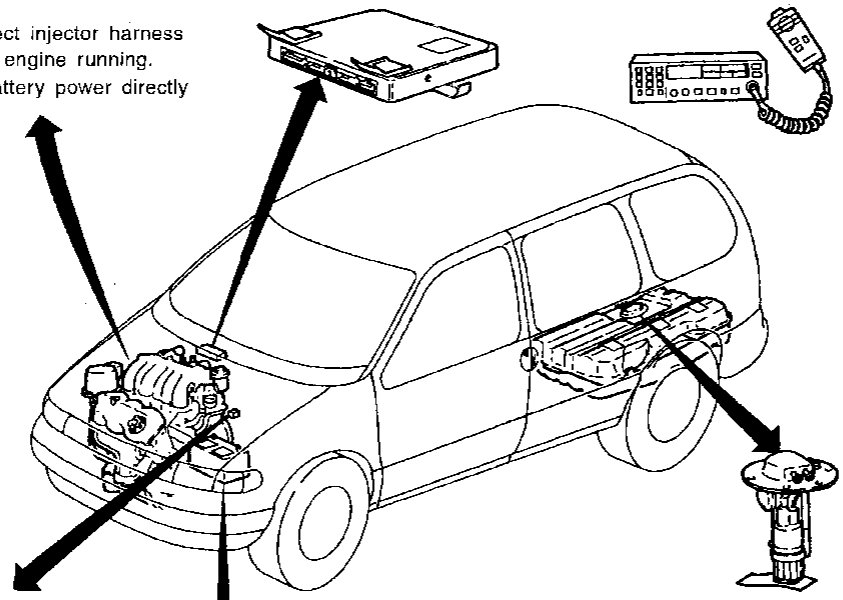
Engine Fuel & Emission Control System

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

ECM (ECCS Control Module)
- Do not disassemble ECM.
- If a battery terminal is disconnected, the memory will return to the ECM value.
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a problem. Do not replace parts because of a slight variation.

INJECTOR
- Do not disconnect injector harness connectors with engine running.
- Do not apply battery power directly to injectors.



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

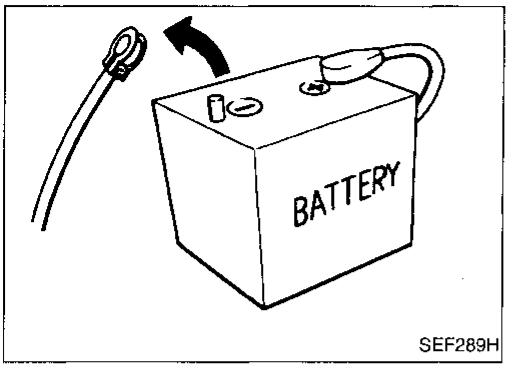
BATTERY
- Always use a 12 volt battery as power source.
- Do not attempt to disconnect battery cables while engine is running.

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

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

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

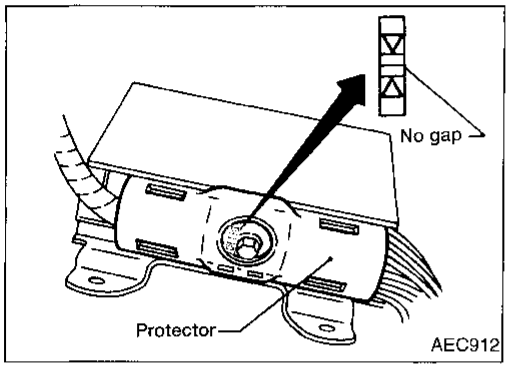
SEF753RA



SEF289H

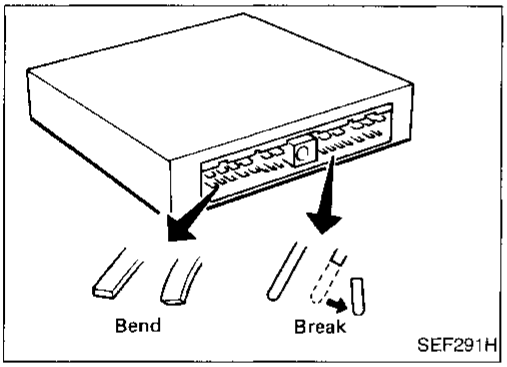
Precautions

- 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.



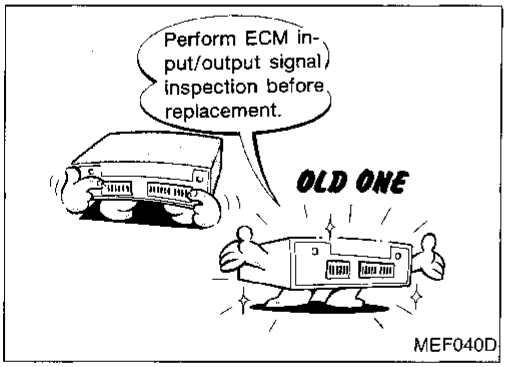
AEC912

- When connecting ECM harness connector, tighten securing bolt until the gap between orange indicators disappears.
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



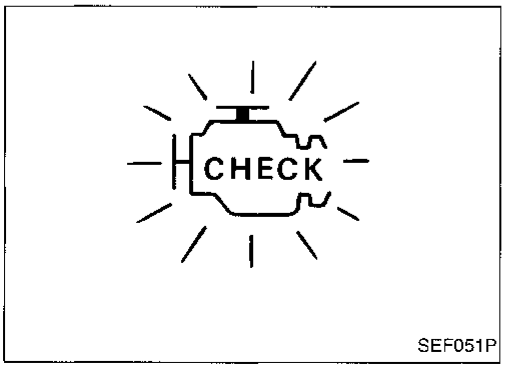
SEF291H

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



MEF040D

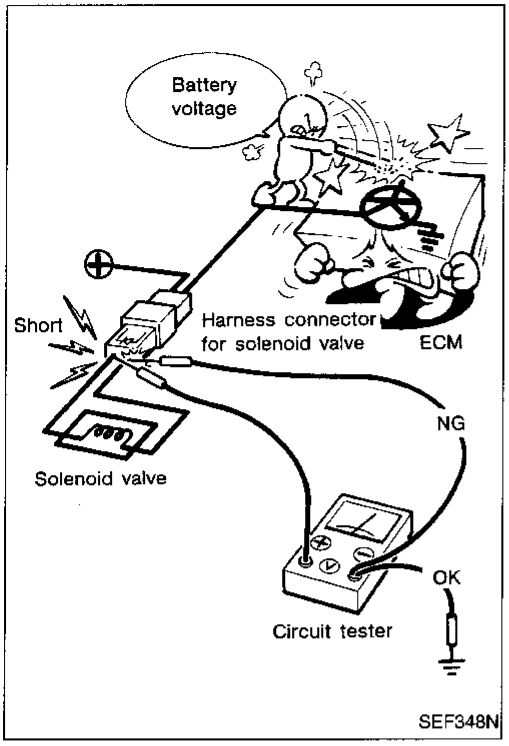
- Before replacing ECM, perform Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-79.



SEF051P

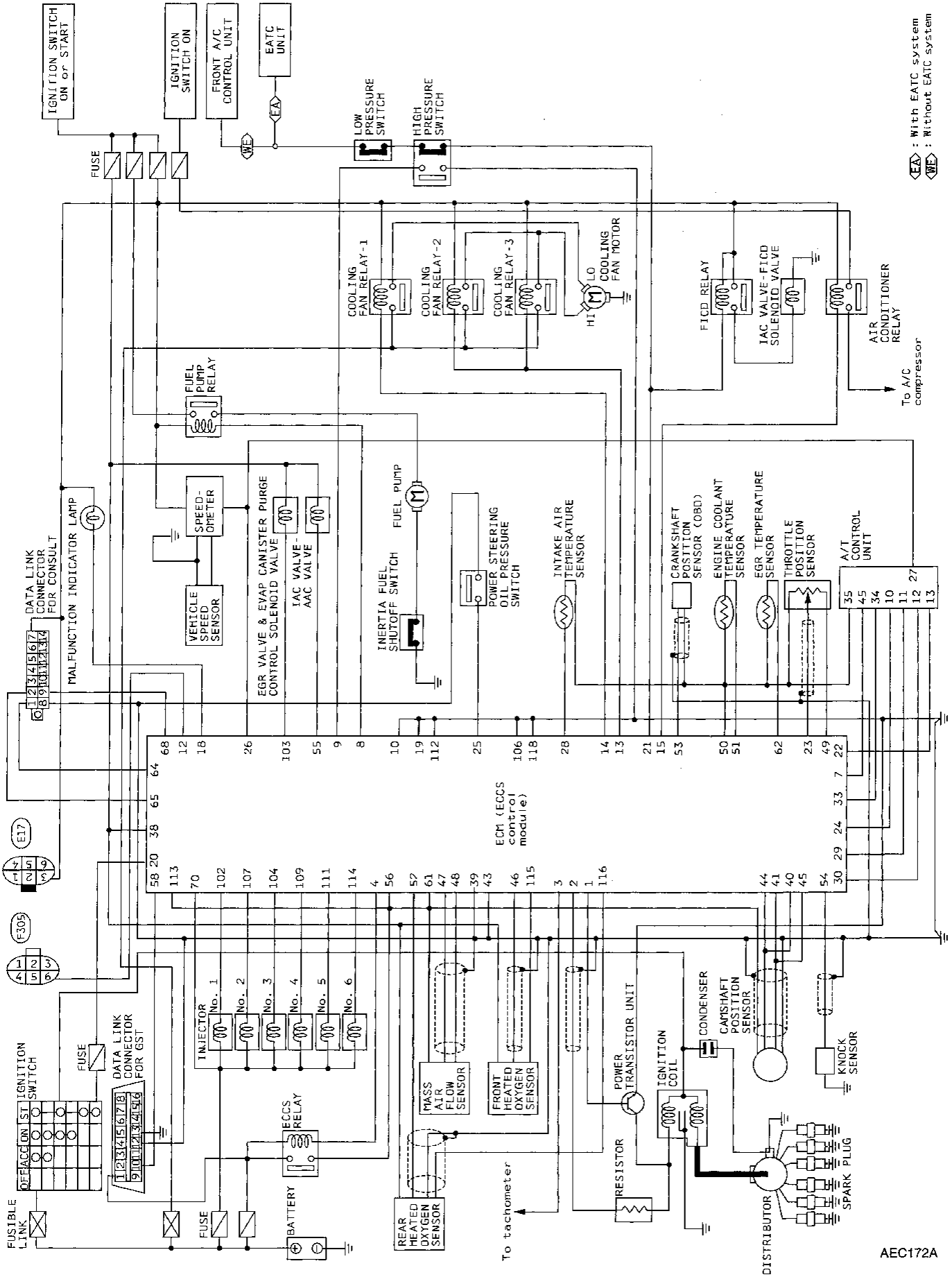
- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is completed.

Precautions (Cont'd)

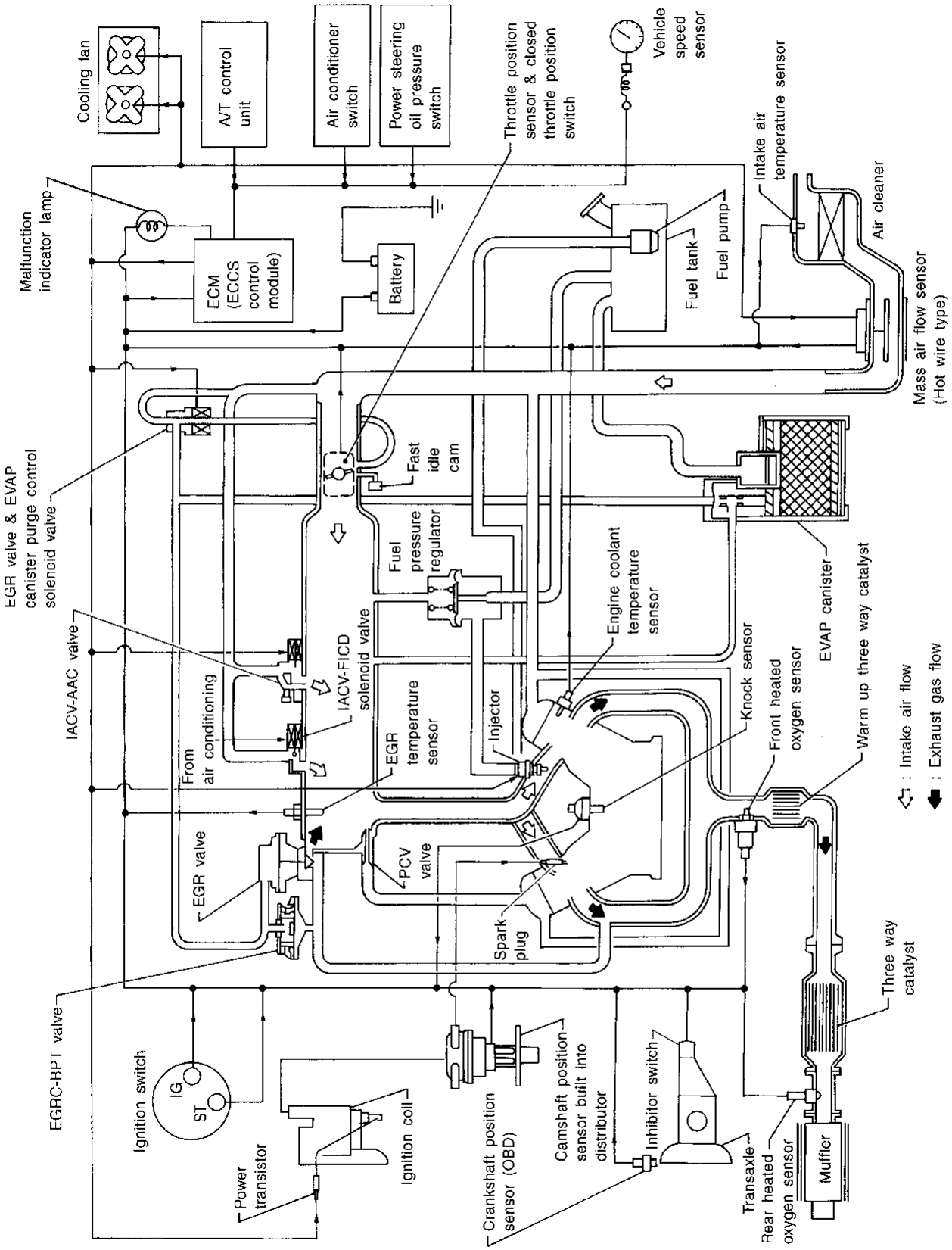


- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact. Accidental contact of probes will cause a short circuit and damage the ECM power transistor.**

Circuit Diagram

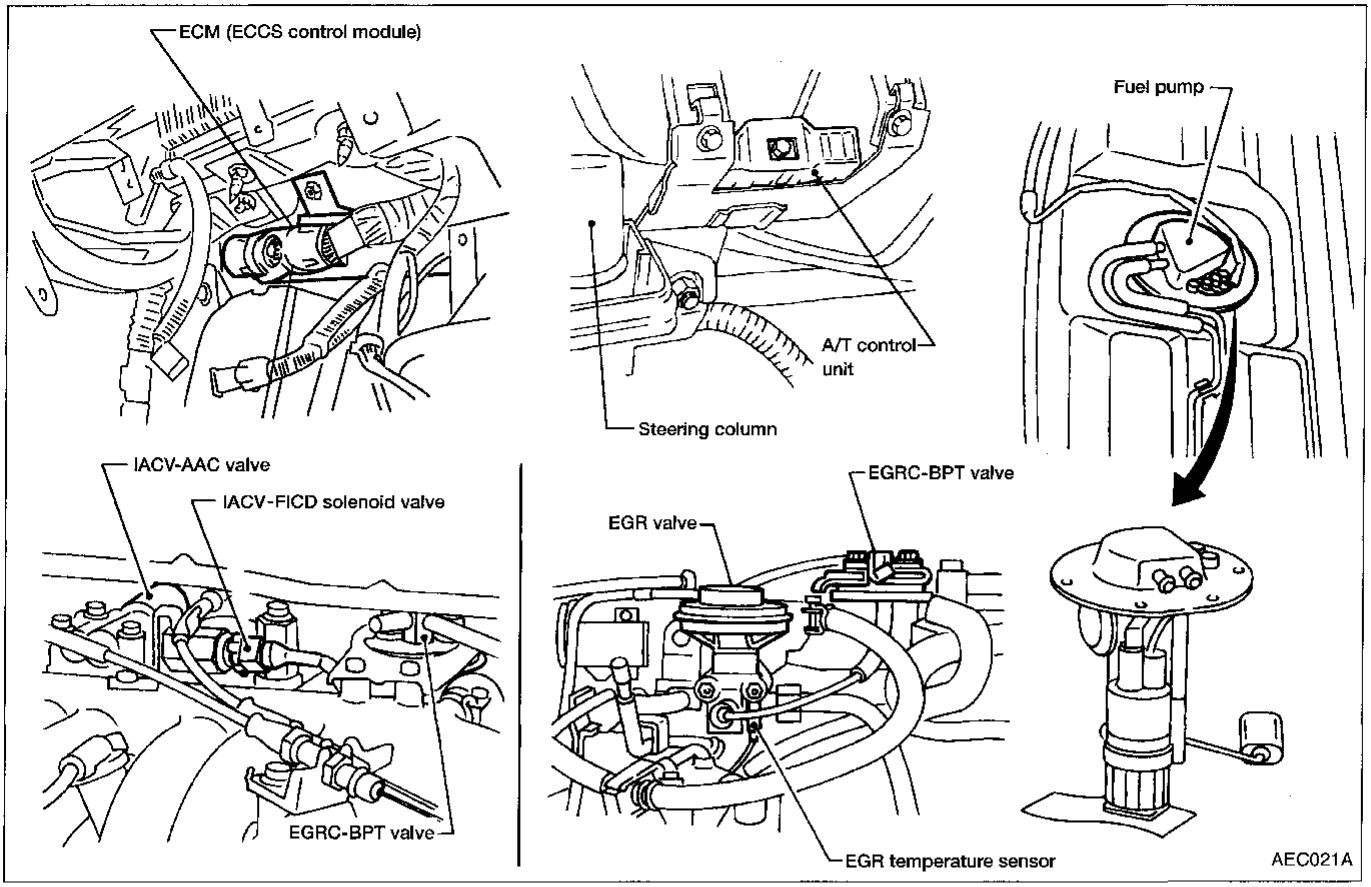


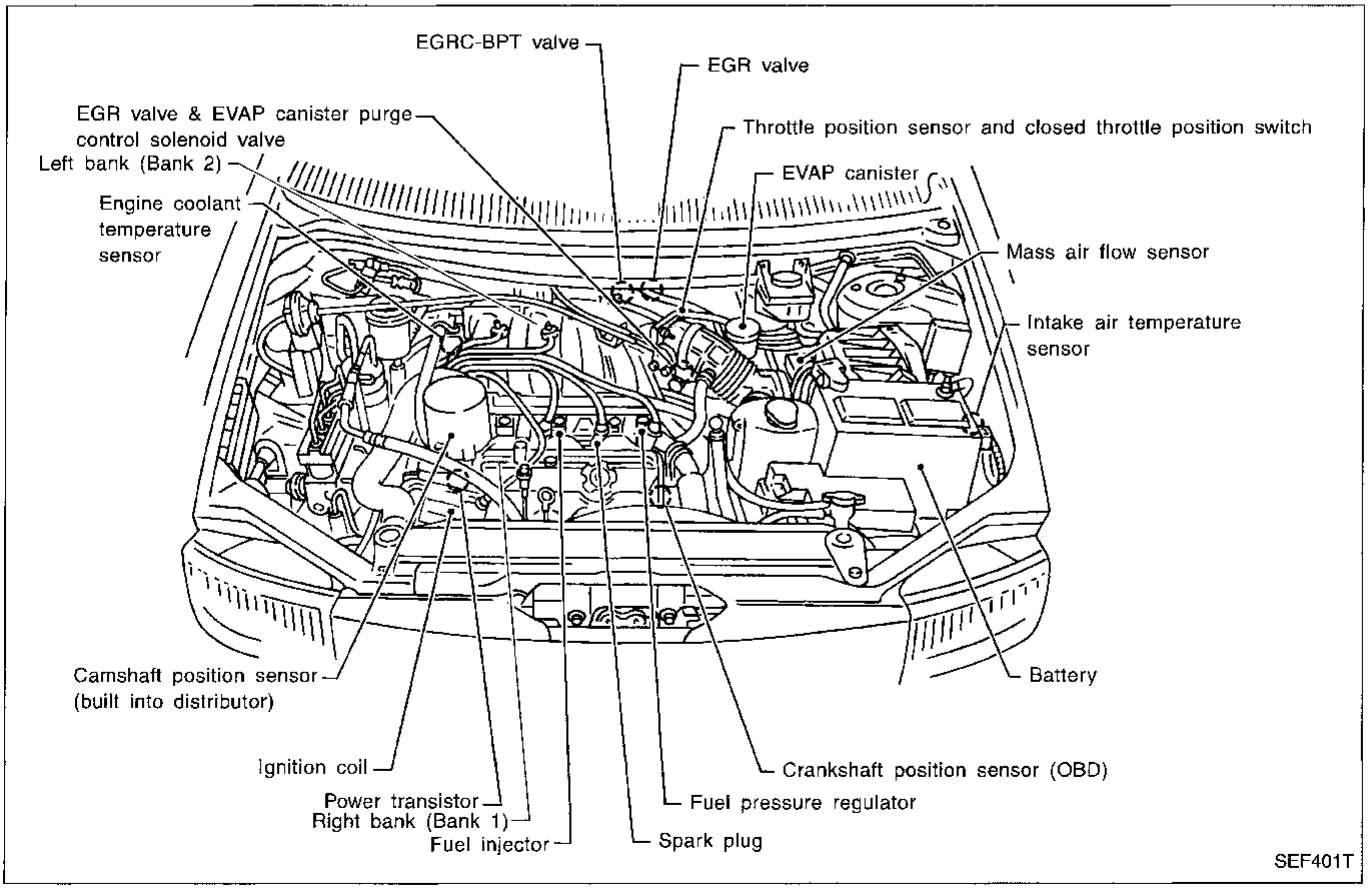
System Diagram



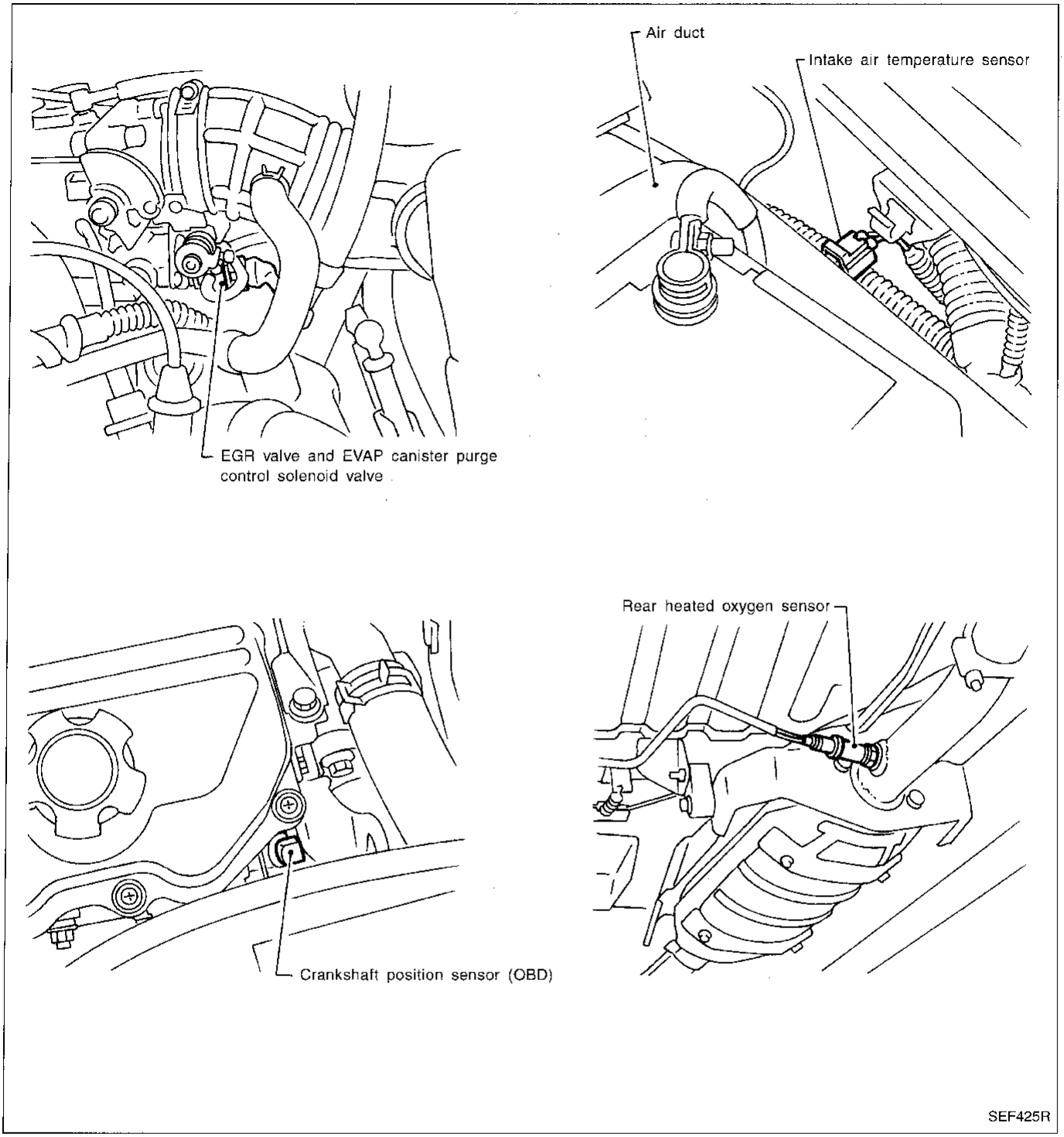
SEF045RA

ECCS Component Parts Location

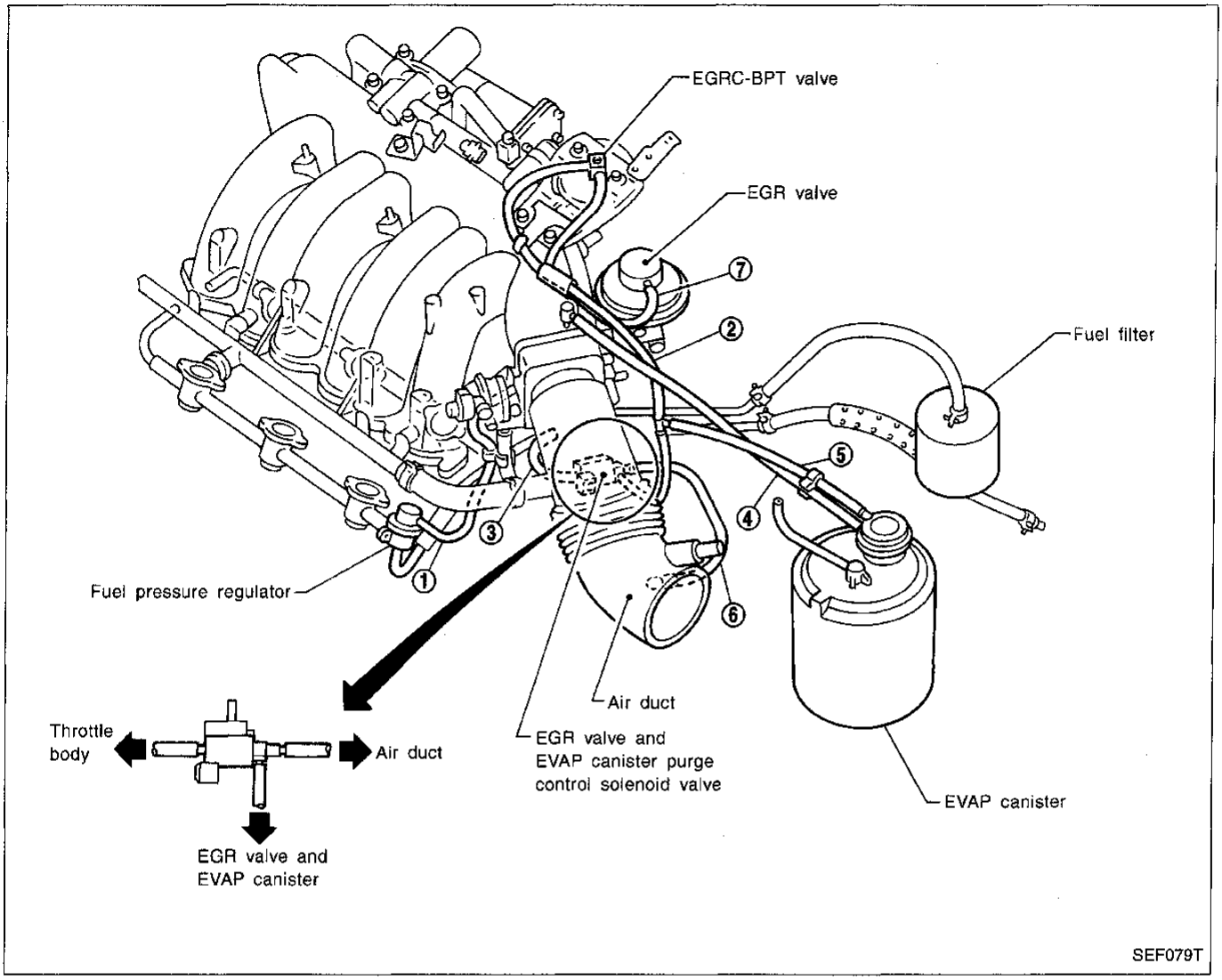




ECCS Component Parts Location (Cont'd)



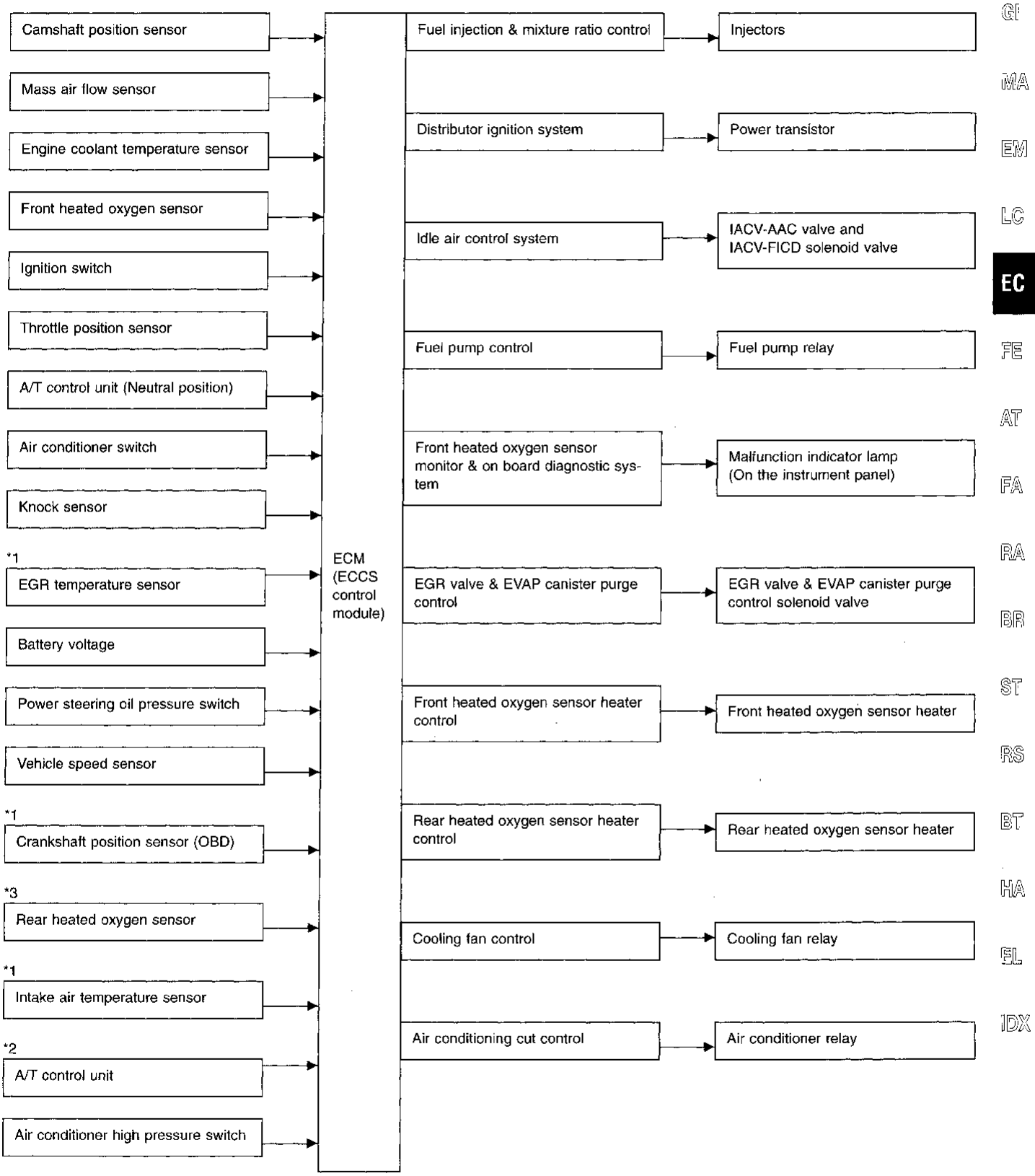
Vacuum Hose Drawing



① Fuel pressure regulator to intake manifold collector
② EGRC-BPT valve to EGR valve and EVAP canister purge control solenoid valve
③ EGR valve and EVAP canister purge control solenoid valve to throttle body
④ EVAP canister (purge port) to intake manifold collector
⑤ EVAP canister (vacuum port) to EGR valve and EVAP canister purge control solenoid valve
⑥ EGR valve and EVAP canister purge control solenoid valve to air duct
⑦ EGR valve to EGRC-BPT valve

Refer to "System Diagram", EC-9 for vacuum control system.

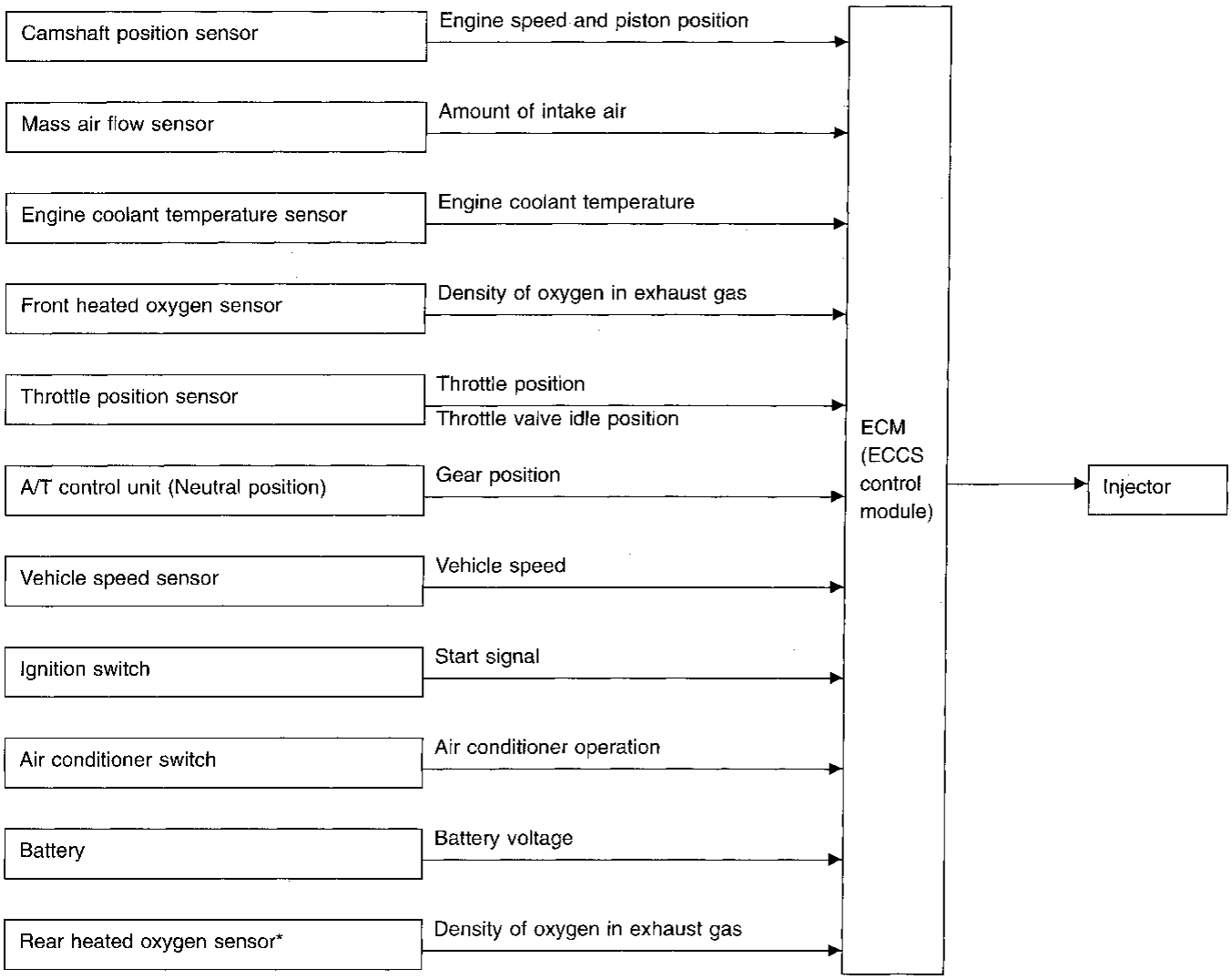
System Chart



*1: These sensors are not used to control the engine system. They are used only for the on board diagnosis.
*2: The DTC related to A/T will be sent to ECM.
*3: Under normal conditions, this sensor is not for engine control operation.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



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

BASIC MULTIPORT FUEL INJECTION SYSTEM

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

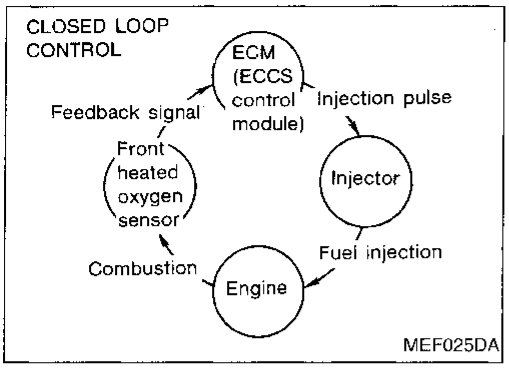
In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

〈Fuel increase〉

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

〈Fuel decrease〉

- During deceleration
- During high engine speed operation



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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about the front heated oxygen sensor, refer to EC-116. This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Rear heated oxygen sensor is located downstream of the three way catalyst. Even if the switching characteristics of the front heated oxygen sensor shift, the air-fuel ratio is controlled to stoichiometric by the signal from the rear heated oxygen sensor.

OPEN LOOP CONTROL

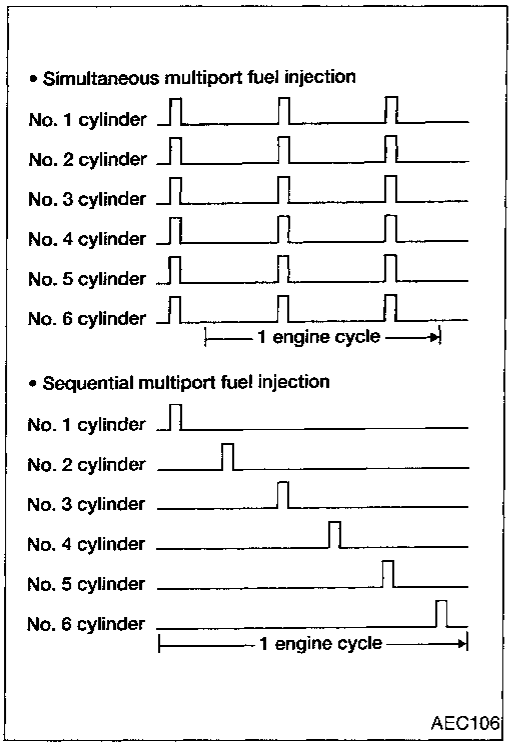
The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

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

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from the front heated oxygen sensor. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., injector clogging) directly affect mixture ratio. Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.
"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
"Short term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from the front heated oxygen sensor indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

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



FUEL INJECTION TIMING

Two types of systems are used.

Sequential multiport fuel injection system

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

Simultaneous multiport fuel injection system

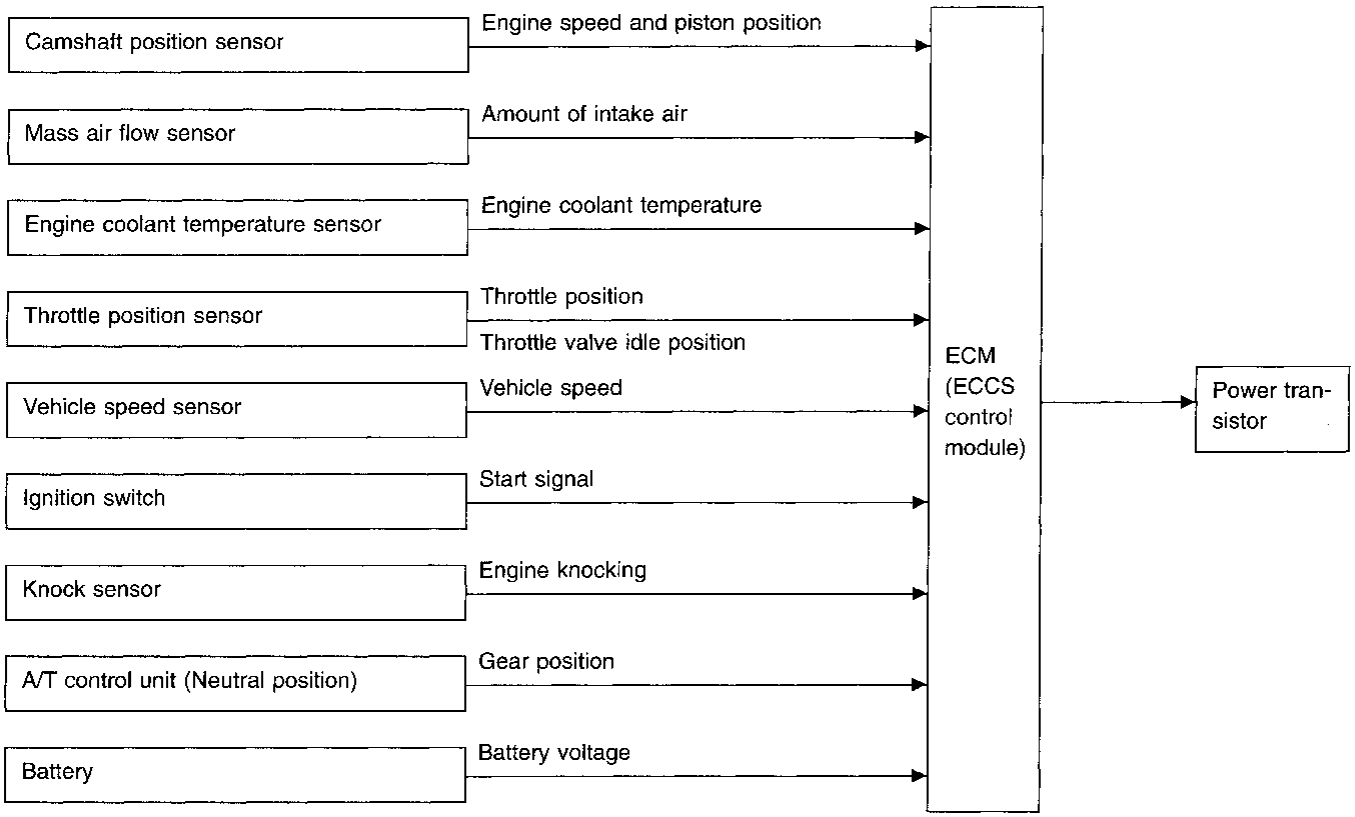
Fuel is injected simultaneously into all six cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The six injectors will then receive the signals two times for each engine cycle.
This system is used when the engine is being started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

FUEL SHUT-OFF

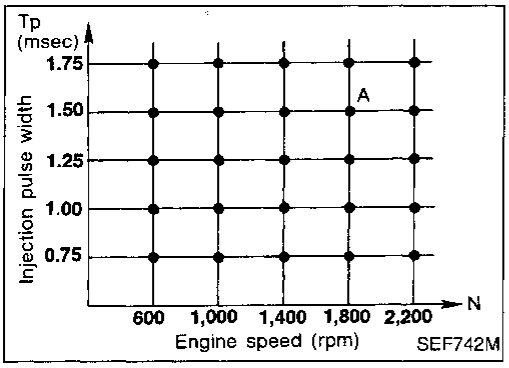
Fuel to each cylinder is cut off during deceleration or operation of the engine at excessively high speeds.

Distributor Ignition (DI) System

INPUT/OUTPUT SIGNAL LINE



Distributor Ignition (DI) System (Cont'd)



SYSTEM DESCRIPTION

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

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

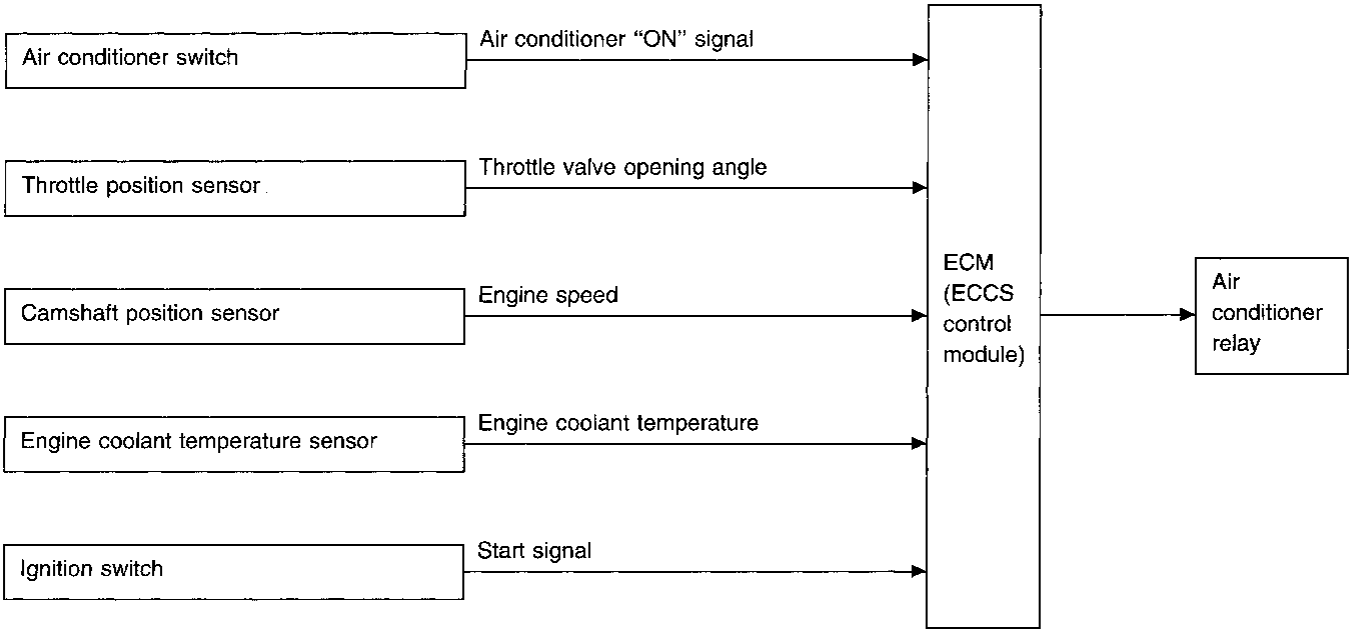
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

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

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE

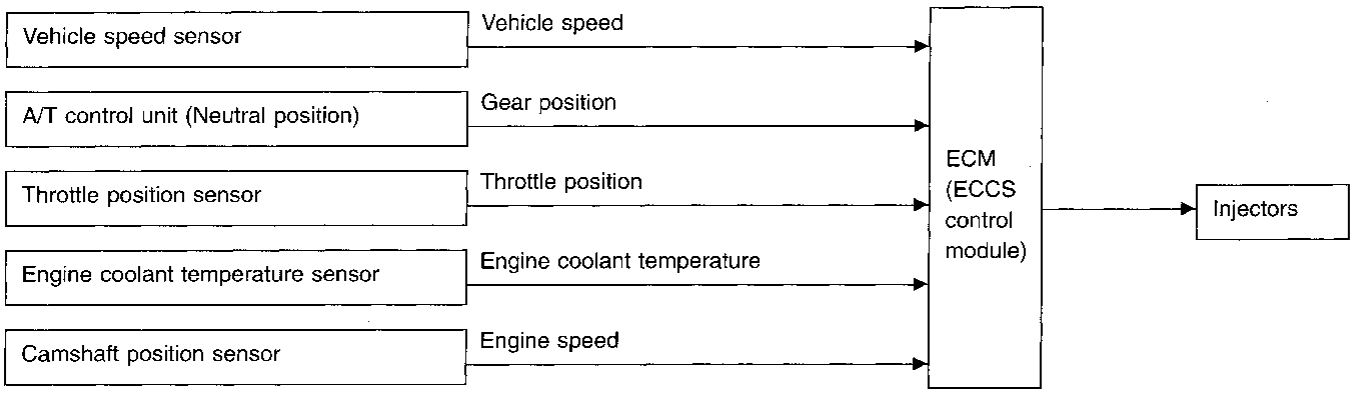


SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
When the accelerator pedal is fully depressed, the air conditioner is turned off for a few seconds.
When engine coolant temperature becomes excessively high, the air conditioner is turned off. This continues until the coolant temperature returns to normal.

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

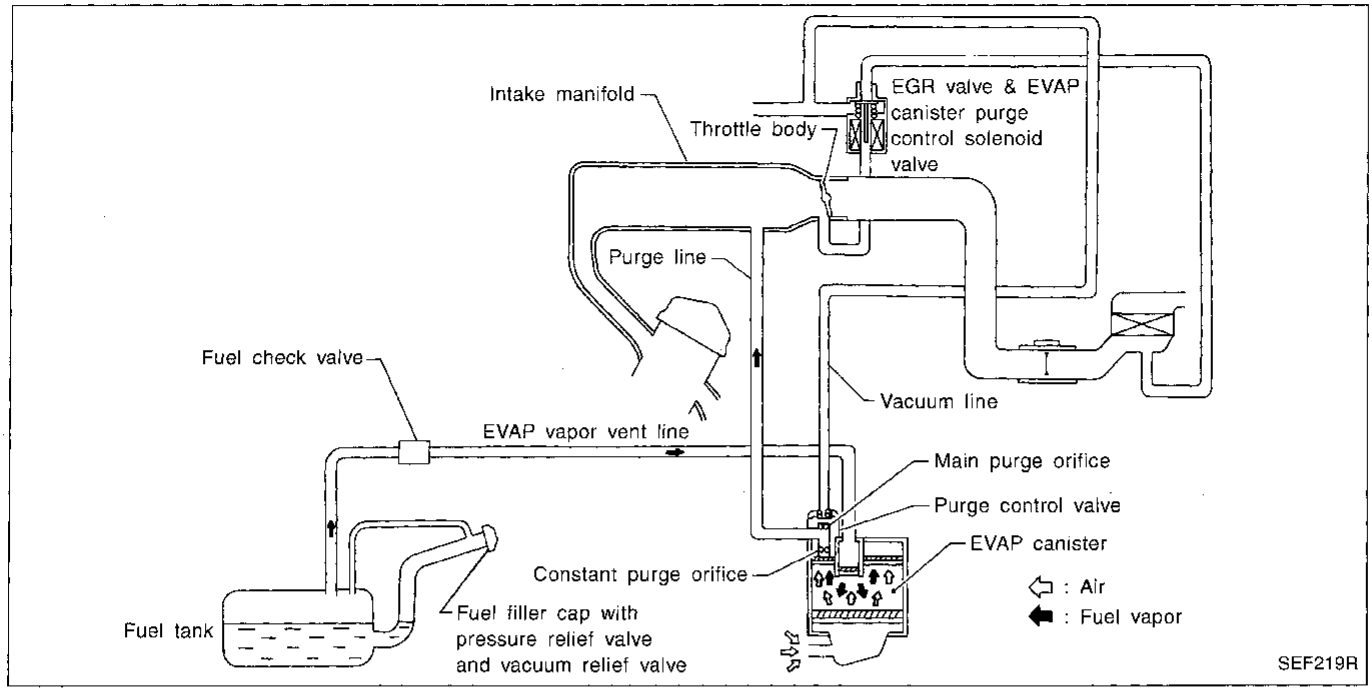
INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 3,000 rpm with no load (for example, in neutral and engine speed over 3,000 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.
Fuel cut will operate until the engine speed reaches 1,000 rpm, then fuel cut is cancelled.

NOTE:
This function is different from deceleration control listed under "Multiport Fuel Injection (MFI) System", EC-14.

Description



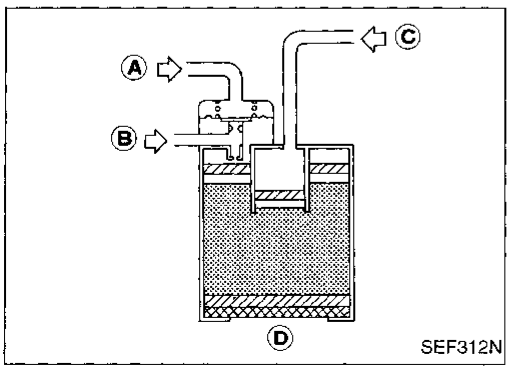
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor from the sealed fuel tank is led into the EVAP canister when the engine is off. The fuel vapor is then stored in the EVAP canister. The EVAP canister retains the fuel vapor until the EVAP canister is purged by air.

When the engine is running, the air is drawn through the bottom of the EVAP canister. The fuel vapor will then be led to the intake manifold.

When the engine runs at idle, the purge control valve is closed. Only a small amount of vapor flows into the intake manifold through the constant purge orifice.

As the engine speed increases and the throttle vacuum rises, the purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



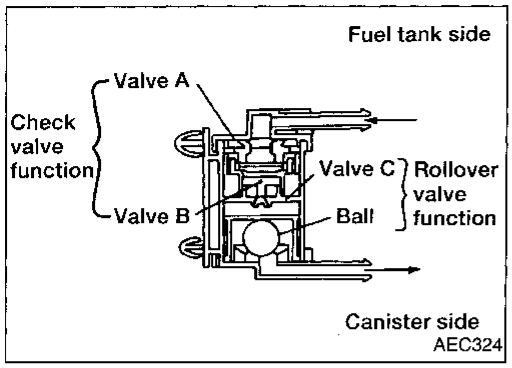
Inspection

EVAP CANISTER

Check EVAP canister as follows:

1. Blow air in port Ⓐ and check that there is no leakage.
2. Apply vacuum to port Ⓐ. [Approximately −13.3 to −20.0 kPa (−100 to −150 mmHg, −3.94 to −5.91 inHg)]
3. Cover port Ⓓ by hand.
4. Blow air in port Ⓒ and check that it flows freely out of port Ⓑ.

Inspection (Cont'd)

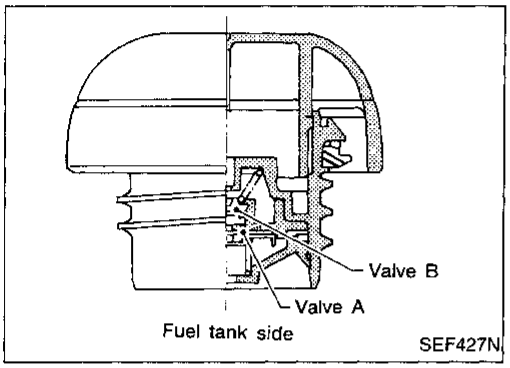


FUEL CHECK VALVE (With rollover valve)

1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check valve is suspected of not properly functioning in steps 1 and 2 above, replace it.

Rollover valve operation

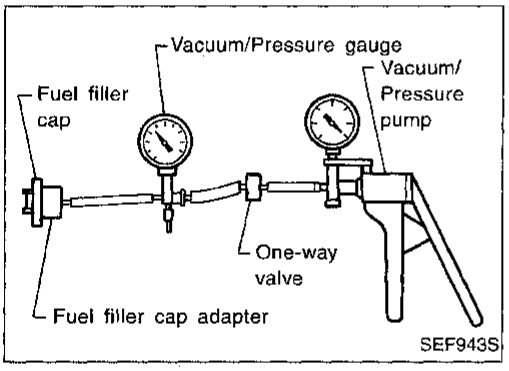
Ensure that continuity of air passage does not exist when the installed rollover valve is tilted to 90° or 180°.

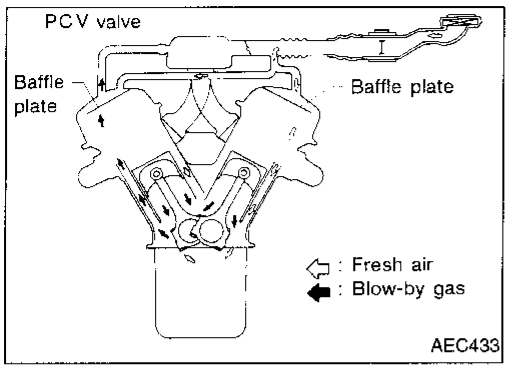


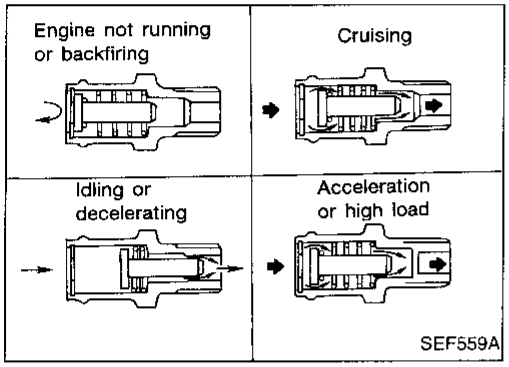
FUEL TANK VACUUM RELIEF VALVE (Built into fuel filler cap)

1. Wipe clean valve housing.
2. Check valve opening pressure and vacuum.
   Pressure:
   15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
   Vacuum:
   −6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)
3. If out of specification, replace fuel filler cap as an assembly.

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

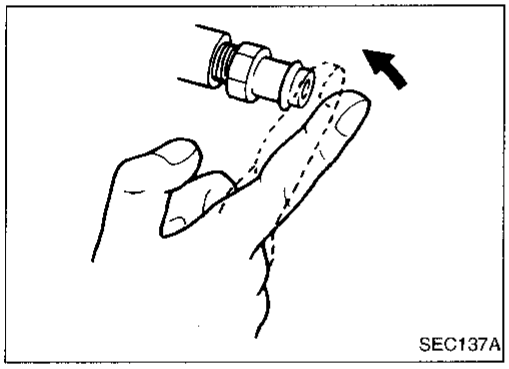






Description

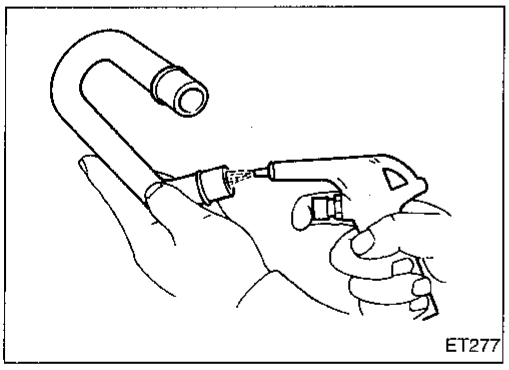
This system returns blow-by gas to the intake manifold.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



Inspection

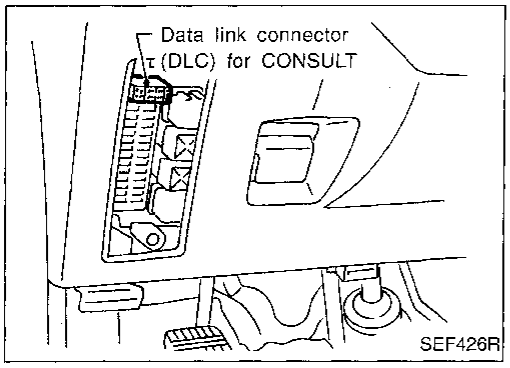
PCV (Positive Crankcase Ventilation)

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



PCV 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.

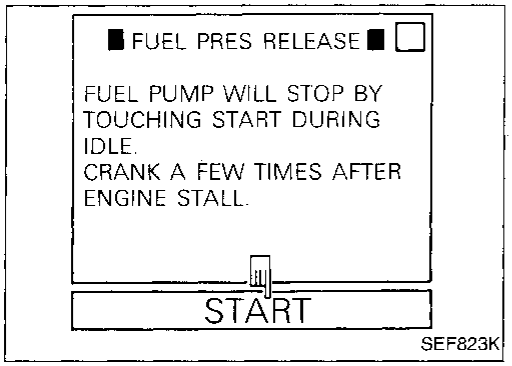


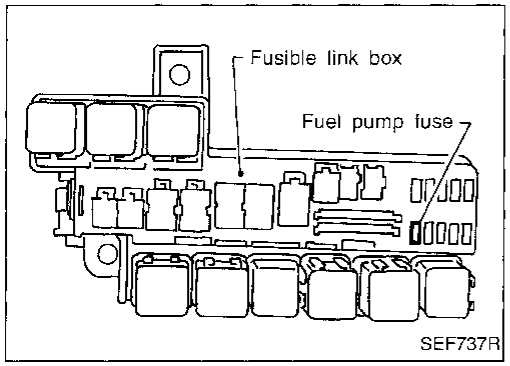
Fuel Pressure Release

WARNING:

Before disconnecting fuel line, release fuel pressure from fuel line.

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





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

Fuel Pressure Check

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

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

At idling:

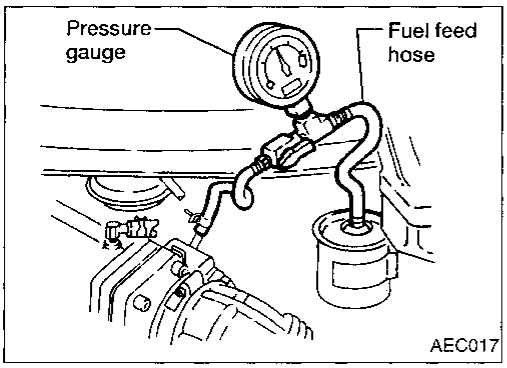
With vacuum hose connected

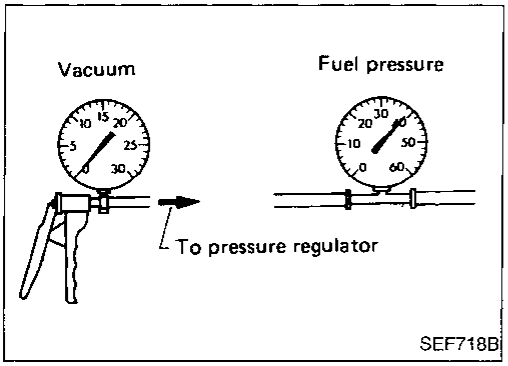
Approximately 235 kPa (2.4 kg/cm^2, 34 psi)

With vacuum hose disconnected

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

If results are unsatisfactory, perform Fuel Pressure Regulator Check.

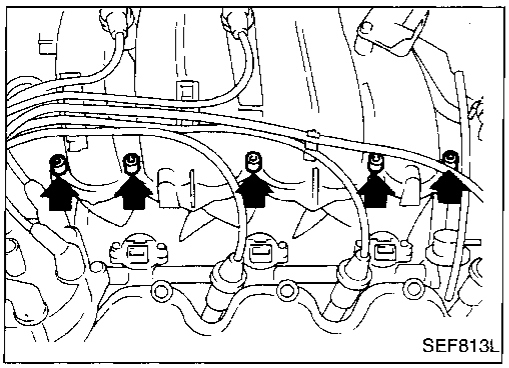




Fuel Pressure Regulator Check

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

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



Injector Removal and Installation

1. Release fuel pressure to zero.
2. Separate ASCD and accelerator control wire from intake manifold collector.
3. Remove intake manifold collector from engine.

The following parts should be disconnected or removed.

(1) Harness connectors for
- IACV-AAC valve
- IACV-FICD solenoid valve
- Closed throttle position switch
- Throttle position sensor
- EGR valve and EVAP canister purge control solenoid valve
- EGR temperature sensor
- Ground harness

(2) PCV hoses

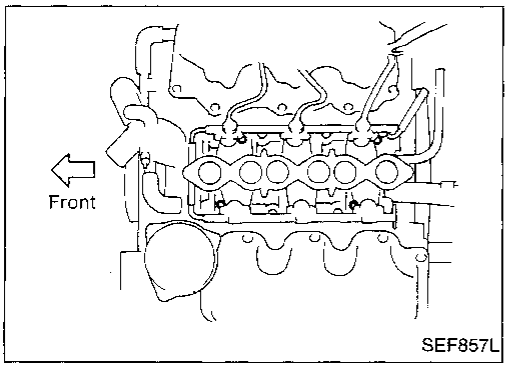
(3) Vacuum hoses for
- Brake booster
- EGR valve and EVAP canister purge control solenoid valve
- Fuel pressure regulator
- EVAP canister
- EGRC-BPT valve

(4) Air hoses from
- Air duct
- IACV-AAC valve

(5) Water hoses for
- Throttle body
- Air relief plug

(6) EVAP canister purge hose

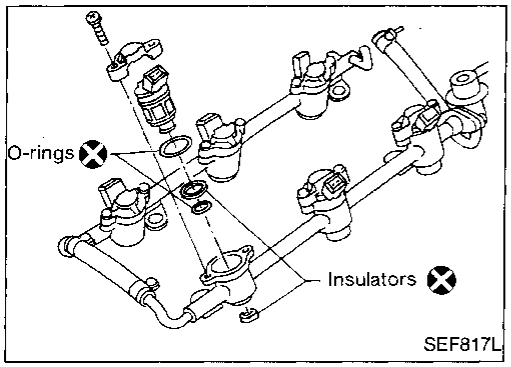
(7) EGR flare tube



4. Remove injector fuel tube assembly.

The following parts should be disconnected or removed.
- Vacuum hose for fuel pressure regulator
- Fuel feed and return hose
- All injector harness connectors

Injector Removal and Installation (Cont'd)



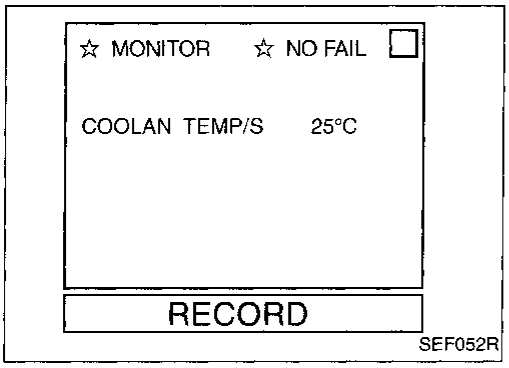
5. Remove any malfunctioning injector from injector fuel tube.
6. Replace or clean injector as necessary.

Always replace O-rings and insulators with new ones.

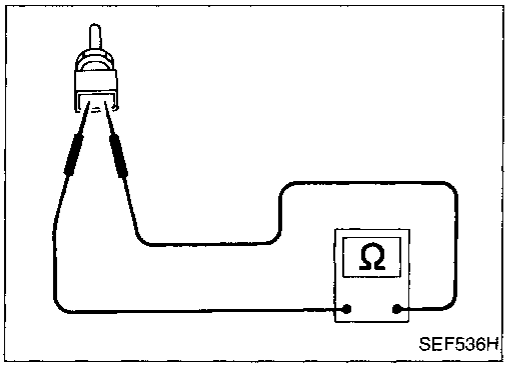
7. Connect injector to injector fuel tube.
8. Reinstall any part removed in reverse order of removal.

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

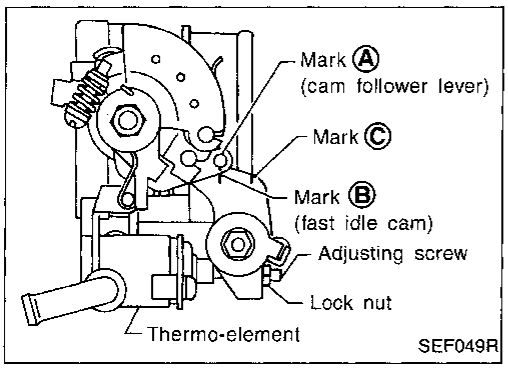
Fast Idle Cam (FIC) Inspection and Adjustment



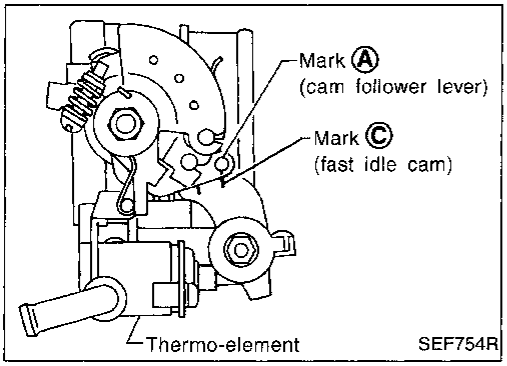
1. Turn ignition switch "ON".
2. See "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT.
3. When engine coolant temperature is 25±5°C (77±9°F), make sure that the center of mark Ⓐ is aligned with mark Ⓑ as shown in the figure.



1. Turn ignition switch "OFF".
2. Disconnect engine coolant temperature sensor harness connector and check resistance as shown in the figure.
3. Start engine and warm it up.
   When the resistance of engine coolant temperature sensor is 1.65 to 2.4 kΩ, make sure that the center of mark Ⓐ is aligned with mark Ⓑ as shown in the figure.



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



4. Start engine and warm it up.
5. Check the following when:
   - engine coolant temperature is 80±5°C (176±9°F).
   - the resistance of engine coolant temperature sensor is 0.26 to 0.39 kΩ.
     - The center of mark Ⓐ is aligned with mark Ⓒ.
     - The cam follower lever's roller is not touching the fast idle cam.
- If NG, replace thermo-element and perform the above inspection and adjustment again.

Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

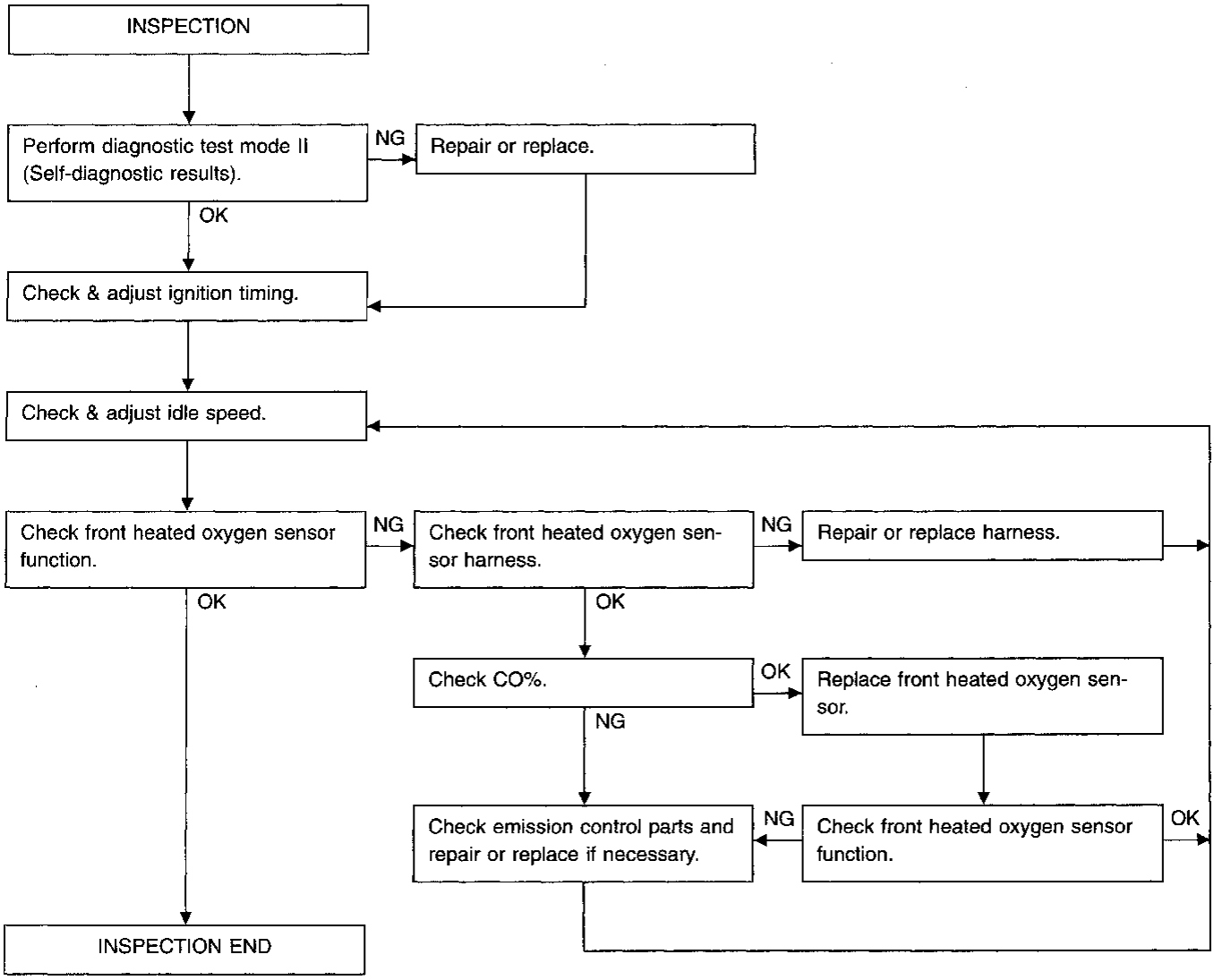
PREPARATION

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

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

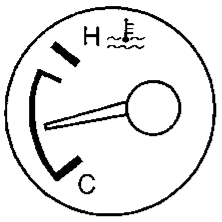
- **On models equipped with air conditioner, checks should be carried out while the air conditioner is "OFF".**
- **When checking idle speed, ignition timing and mixture ratio, checks should be carried out while shift lever is in "N" position.**
- **When measuring "CO" percentage, insert probe more than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

Overall inspection sequence



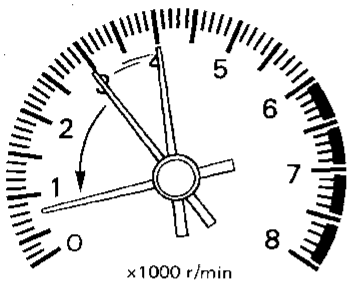
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

A



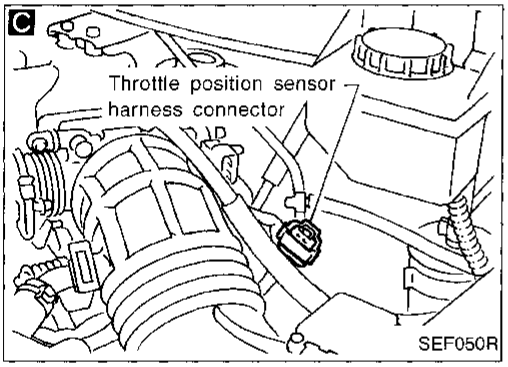
AEC692

B



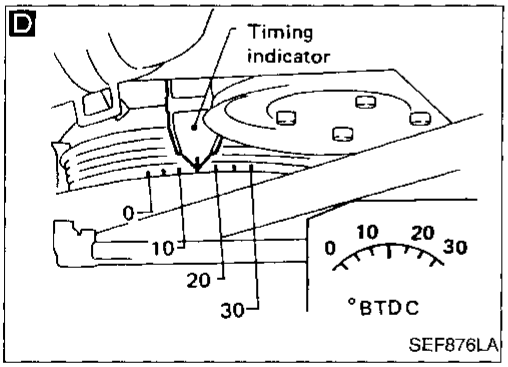
SEF248F

C



SEF050R

D



SEF876LA

START

Visually check the following:
- Air cleaner clogging
- Hoses and duct for leaks
- EGR valve operation
- Electrical connectors
- Gasket (intake manifold, cylinder head, exhaust system)
- Throttle valve and throttle position sensor operation

A

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

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

Perform the Diagnostic Test Mode II (Self-diagnostic results).

OK ← NG

Repair or replace components as necessary.

B

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 at idle speed for about 1 minute.

C

1. Turn off 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, then run engine at idle speed.

D

Check ignition timing with a timing light.

15°±2° BTDC (in "N" position)

OK ← NG

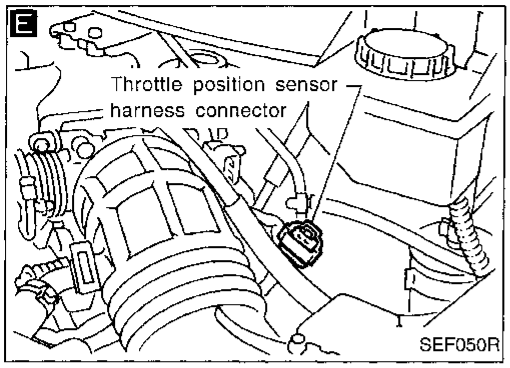
Adjust ignition timing to the specified value by turning distributor after loosening bolts which secure distributor.

15°±2° BTDC (in "N" position)

Ⓐ
(Go to next page.)

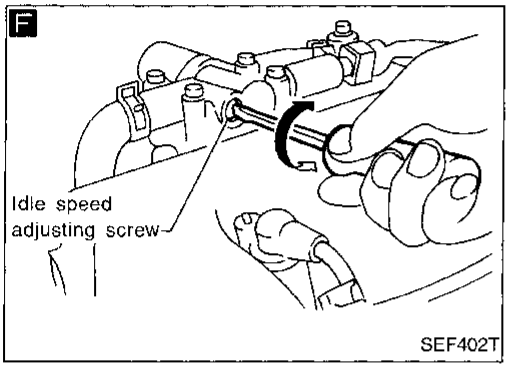
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

E



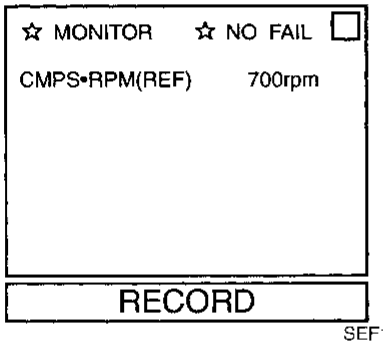
SEF050R

F



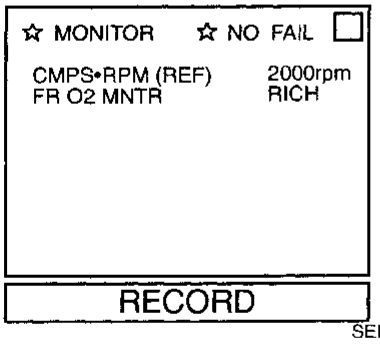
SEF402T

G



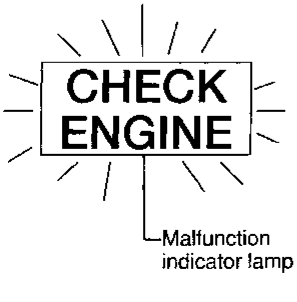
SEF190P

H



SEF054P

I



AEC379

Ⓐ

Ⓑ

E

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

Check base idle speed.

700±50 rpm (in "N" position)

OK

NG

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

F

Adjust base idle speed by turning idle speed adjusting screw.

700±50 rpm (in "N" position)

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

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

G

Check target idle speed.

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

OR

Check idle speed.

750±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.

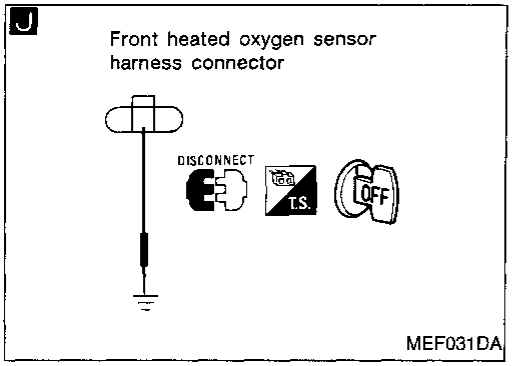
* ECM may be the cause of a problem, but this is rarely the case.

Ⓒ

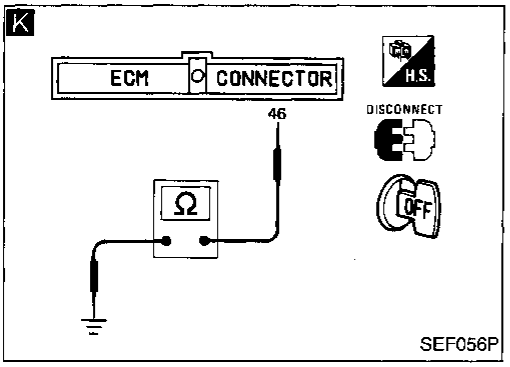
(Go to next page.)

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

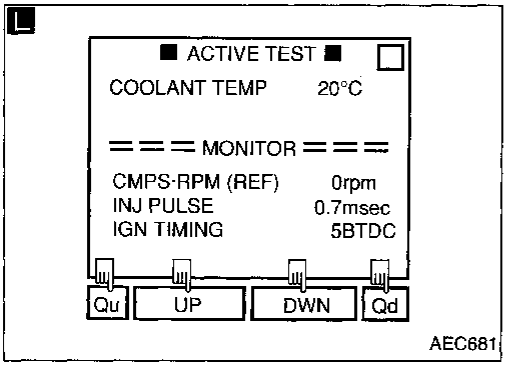
J



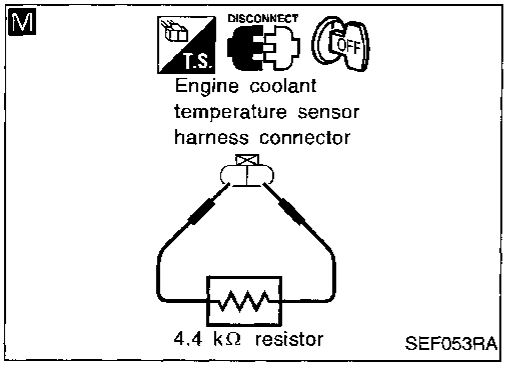
K



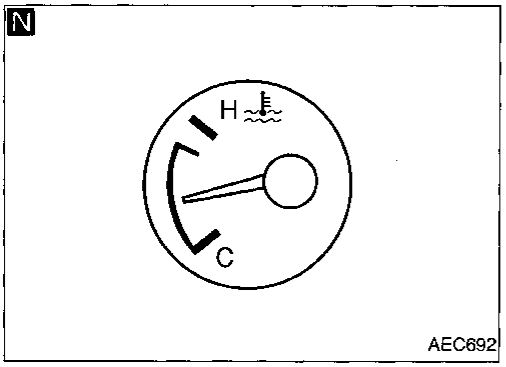
L



M



N



Ⓒ

H I

1. See "FR O2 MNTR" in "DATA MONITOR" mode.
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain 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 →LEAN → RICH

OR

1. Set "Front heated oxygen sensor monitor" in the Diagnostic Test Mode II. (See page EC-43.)
2. Run engine at about 2,000 rpm for about 2 minutes under no-load.
3. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp goes on and off more than 5 times during 10 seconds.

OK → END

NG

J K

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. Then connect harness side terminal for front heated oxygen sensor to ground with a jumper wire.
4. Check for continuity between terminal (46) of ECM harness connector and body ground.

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

OK

NG → Repair or replace harness. → Ⓑ (Go to EC-27.)

Connect ECM harness connector to ECM.

L M

1. Connect battery ground cable.
2. Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
3. Set "COOLANT TEMP" to 5°C (41°F) by touching "Qu" and "Qd" and "UP", "DOWN".

OR

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

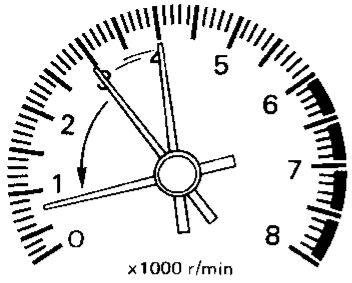
N

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

Ⓔ
(Go to next page.)

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

O



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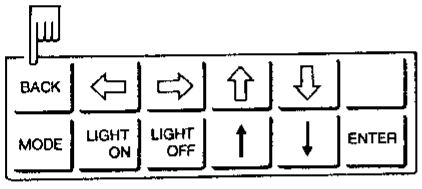
P



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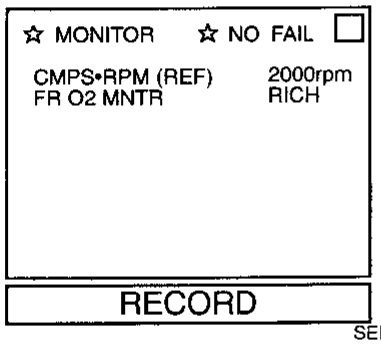
Q



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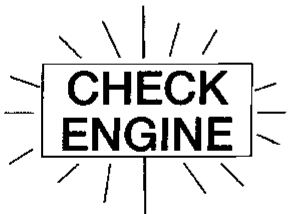
R



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Ⓔ

O

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

P

Check "CO"%.

Idle CO: 2.2 - 10.8% and engine runs smoothly.

After checking CO%,

1. Touch "BACK".

OR

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

NG

OK

Replace front heated oxygen sensor.

Q R

1. See "FR O2 MNTR" in "Data monitor" mode.
2. Maintain 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 →LEAN → RICH

OR

1. Set "Front heated oxygen sensor monitor" in the Diagnostic Test Mode II. (Refer to EC-43.)
2. Maintain engine at 2,000 rpm under no-load. Check that the malfunction indicator lamp goes ON and OFF more than 5 times during 10 seconds.

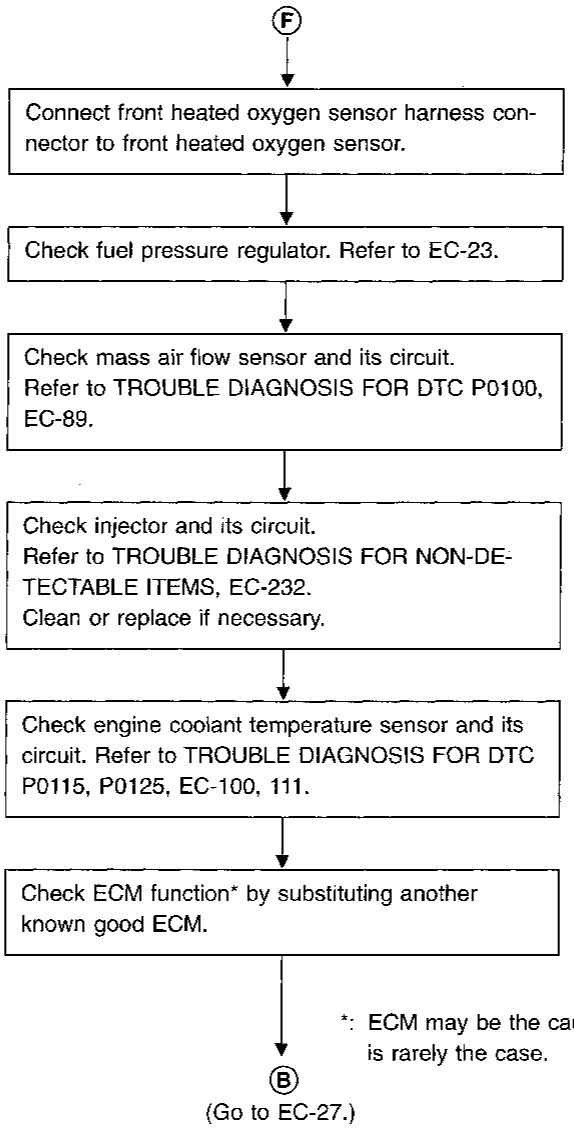
NG

OK

Ⓕ (Go to next page.)

Ⓑ (Go to EC-27.)

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.**

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-71.)

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 - P0306 (0701, 0603 - 0608) is being detected	X			X		X	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 (0701, 0603 - 0608) has been detected		X		X		X	
Closed loop control — DTC: P0130 (0307)		X		X		X	
Fail-safe items (Refer to EC-71.)		X		X*1		X*1	
Except above			X		X	X	X

*1: Except "ECM".

Emission-related Diagnostic Information

DTC AND 1ST TRIP DTC

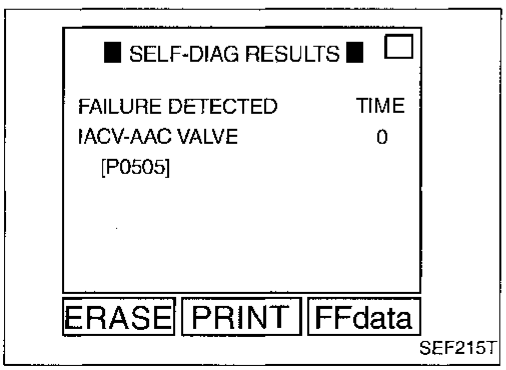
The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the first trip DTC did not reoccur, the first trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 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 first 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 first trip DTC is stored and a non-diagnostic operation is performed (for example, driving pattern A, refer to EC-50 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-40.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-38. These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.
1st trip DTC is specified in Mode 7 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a problem. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in "Work Flow" procedure Step II, refer to page EC-66. 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.

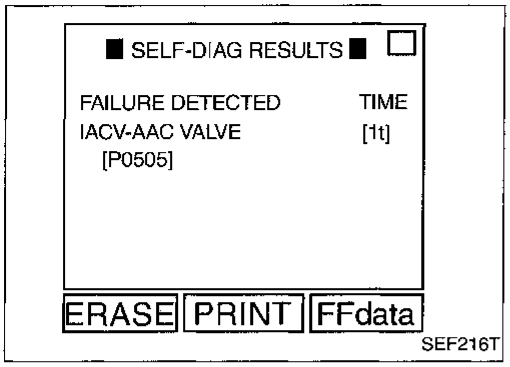
1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc.
   These DTCs are controlled by NISSAN.
2. CONSULT or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc.
   These DTCs are prescribed 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".

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 is stored in the ECM memory, along with the 1st trip DTC, is called 1st trip freeze frame data. The data, stored together with the DTC data is called freeze frame data and is 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-54.
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 - P0306 (0701, 0603 - 0608) Fuel Injection System Function — DTC: P0171 (0115), P0172 (0114)
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-40.

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Mode 1 of SAE J1979. It indicates whether the self-diagnostic tests for non-continuously monitored items have been completed or not.
Inspection/Maintenance (I/M) tests of the on board diagnostic (OBD) II system may become the legal requirements in some states/areas. All SRT codes must be set in this case. Unless all SRT codes are set, conducting the I/M test may not be allowed.
SRT codes are set after self-diagnosis has been performed 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 four SRT items (7 test items) for the ECCS used in V40 models.

Emission-related Diagnostic Information (Cont'd)

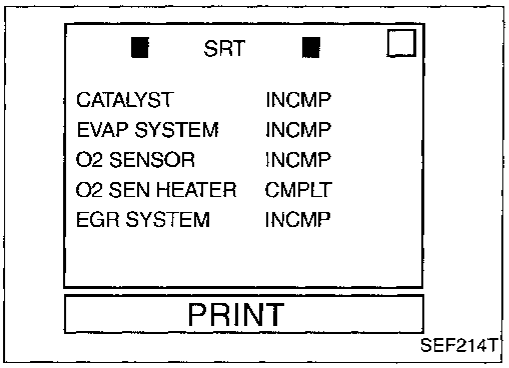
SRT items	Self-diagnostic test items
Catalyst monitoring	• Three way catalyst function P0420 (0720)
Oxygen sensor monitoring	• Front heated oxygen sensor P0130 (0503) • Rear heated oxygen sensor P0136 (0707)
Oxygen sensor heater monitoring	• Front heated oxygen sensor heater P0135 (0901) • Rear heated oxygen sensor heater P0141 (0902)
EGR system monitoring	• EGR function P0400 (0302) • EGRC-BPT valve function P0402 (0306)

Together with the DTC, the SRT code is cleared from the ECM memory using the method described later (Refer to EC-40). In addition, after ECCS components/system are repaired or if the battery terminals remain disconnected for more than 24 hours, all SRT codes may be cleared from the ECM memory.

How to display SRT code

1. Selecting "SRT" 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)



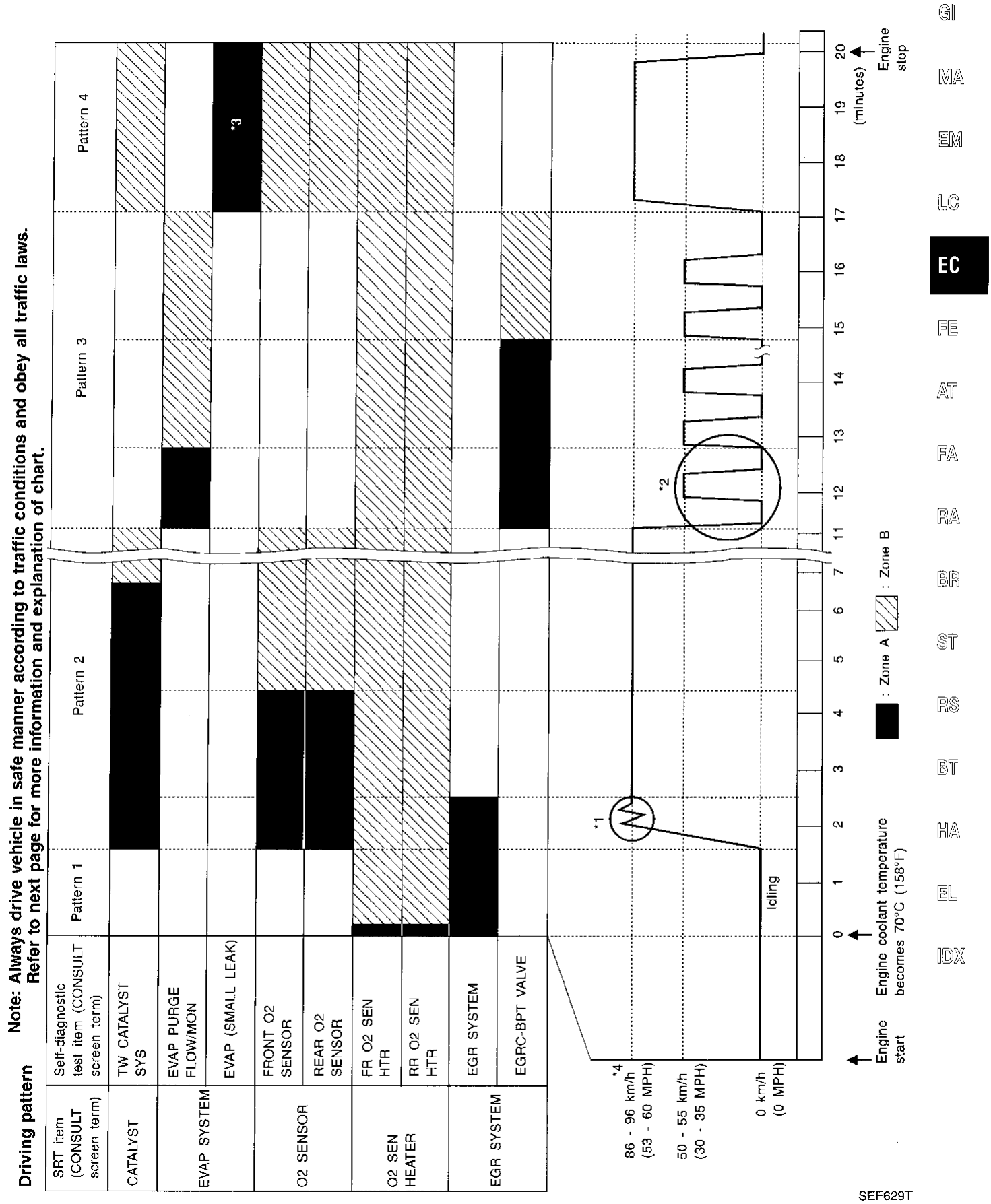
A sample of CONSULT display for SRT code is shown at left. "INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

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. Self-diagnoses of "EVAP PURGE FLOW/MON" and "EVAP (SMALL LEAK)" are not provided for V40 models. Use driving patterns 1 through 3 for these items.

Emission-related Diagnostic Information (Cont'd)

Driving pattern



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 ⑤⓪ 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 ⑤⓪ is lower than 1.4V).**

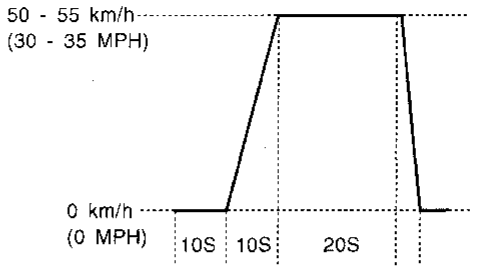
Pattern 2:
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

Pattern 3:
- The driving pattern outlined in *2 must be repeated as shown below.

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) Turn ignition switch "OFF" and wait 5 seconds.
2) Start engine and 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 step 1) and 2) until the EGR system SRT is set.



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*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.

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 (7 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.	—
	EVAP control system purge flow monitoring	06H	83H	Parameter 2	Min.	—
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

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				
NO SELF-DIAGNOSTIC FAILURE INDICATED	**P0000**	**0505**	—	—	—	—
MASS AIR FLOW SEN	P0100	0102	—	—	X	EC-89
INT AIR TEMP SEN	P0110	0401	—	—	X	EC-95
COOLANT TEMP SEN	P0115	0103	—	—	X	EC-100
THROTTLE POSI SEN	P0120	0403	—	—	X	EC-105
*COOLANT TEMP SEN	P0125	0908	—	—	X	EC-111
CLOSED LOOP	P0130	0307	—	—	X	EC-121
FRONT O2 SENSOR	P0130	0503	X	X	X*4	EC-116
FR O2 SEN HTR	P0135	0901	X	X	X*4	EC-122
REAR O2 SENSOR	P0136	0707	X	X	X*4	EC-126
RR O2 SEN HTR	P0141	0902	X	X	X*4	EC-130
FUEL SYS LEAN	P0171	0115	—	—	X	EC-135
FUEL SYS RICH	P0172	0114	—	—	X	EC-140
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-145
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-145
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-145
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-145
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-145
CYL 5 MISFIRE	P0305	0604	—	—	X	EC-145
CYL 6 MISFIRE	P0306	0603	—	—	X	EC-145
KNOCK SENSOR	P0325	0304	—	—	X	EC-149
CRANK POS SEN (OBD)	P0335	0802	—	—	X	EC-152
CAMSHAFT POSI SEN	P0340	0101	—	—	X	EC-157
EGR SYSTEM	P0400	0302	X	X	X*4	EC-163
EGRC-BPT valve	P0402	0306	X	X	X*4	EC-172
TW CATALYST SYS	P0420	0702	X	X	X*4	EC-174

*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.

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-177
IACV-AAC VALVE	P0505	0205	—	—	X	EC-181
A/T COMM LINE	P0600	—	—	—	—	EC-186
ECM	P0605	0301	—	—	X	EC-189
PARK/NEUT POSI SW	P0705	1003	—	—	X	EC-191
INHIBITOR SWITCH	P0705	1101	—	—	X	AT-63
FLUID TEMP SENSOR	P0710	1208	—	—	X	AT-68
VHCL SPEED SEN A/T	P0720	1102	—	—	X	AT-71
ENGINE SPEED SIG	P0725	1207	—	—	X	AT-73
A/T 1ST SIGNAL	P0731	1103	—	—	X	AT-75
A/T 2ND SIGNAL	P0732	1104	—	—	X	AT-78
A/T 3RD SIGNAL	P0733	1105	—	—	X	AT-81
A/T 4TH SIG OR TCC	P0734	1106	—	—	X	AT-84
TOR CONV CLUTCH SV	P0740	1204	—	—	X	AT-89
A/T TCC SIGNAL	P0744	1107	—	—	X	AT-92
LINE PRESSURE S/V	P0745	1205	—	—	X	AT-97
SHIFT SOLENOID/V A	P0750	1108	—	—	X	AT-100
SHIFT SOLENOID/V B	P0755	1201	—	—	X	AT-103
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-195
CRANK P/S (OBD) COG	P1336	0905	—	—	X	EC-201
EGRC SOLENOID/V	P1400	1005	—	—	X	EC-206
EGR TEMP SENSOR	P1401	0305	—	—	X	EC-211
A/T DIAG COMM LINE	P1605	0804	—	—	X	EC-217
THRTL POSI SEN A/T	P1705	1206	—	—	X	AT-106
OVERRUN CLUTCH S/V	P1760	1203	—	—	X	AT-108
COOLING FAN	P1900	1308	—	—	X	EC-220

*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.

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-43.)

- **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.

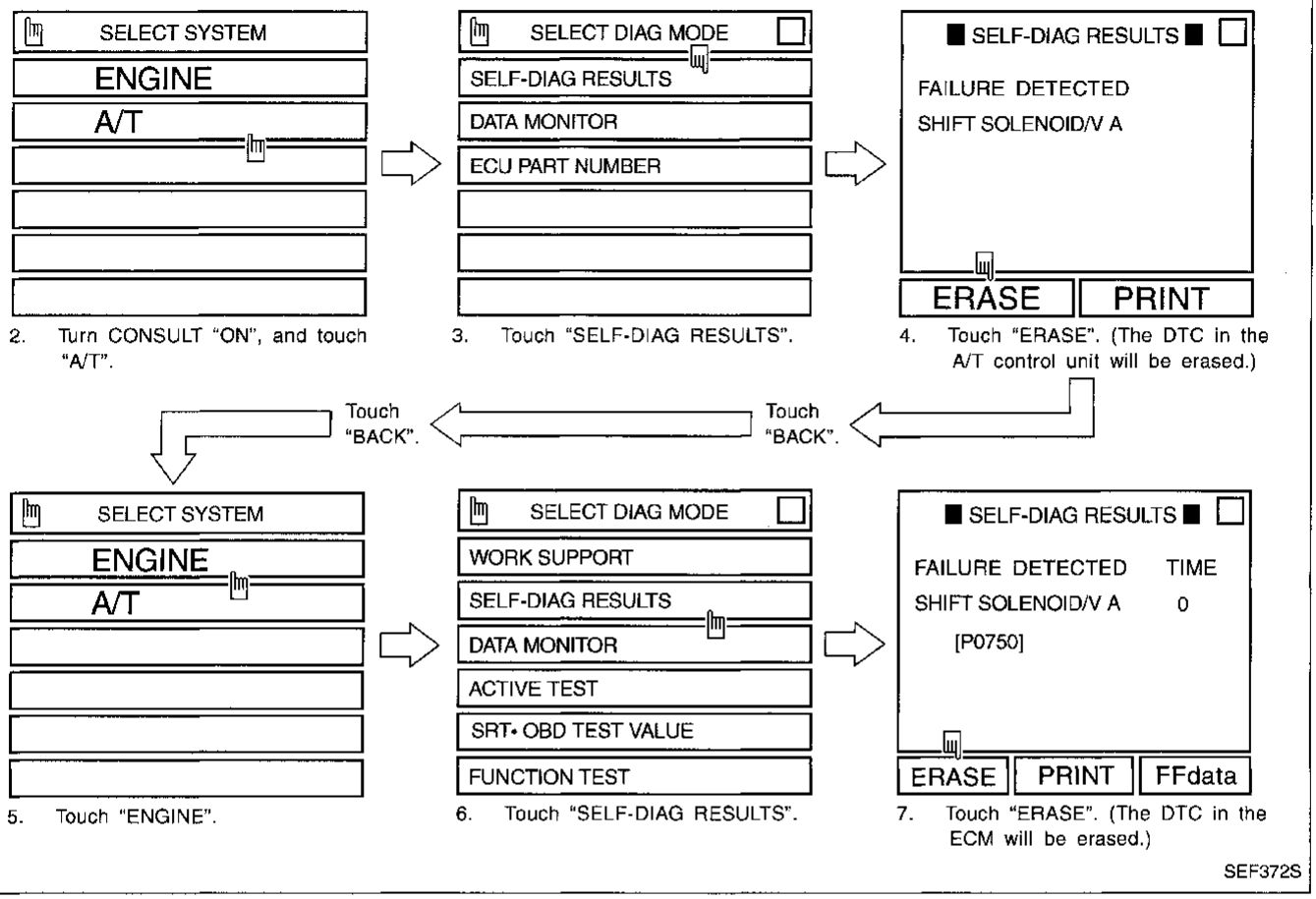
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Turn CONSULT "ON" and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the A/T control unit will be erased.)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

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 5 seconds and then turn it "ON" (engine stopped) again.



How to erase DTC (With GST)

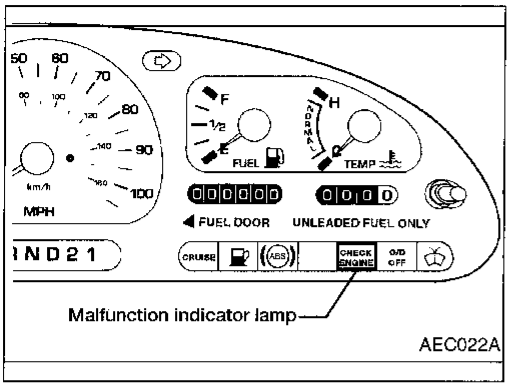
Note: If the diagnostic trouble code is not for A/T related items (see page EC-2), skip step 2.

1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Select Mode 4 with GST (Generic Scan Tool).

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 5 seconds and then turn it "ON" again.
2. Perform "SELF-DIAGNOSTIC PROCEDURE (Without CONSULT)" in AT section titled "TROUBLE DIAGNOSIS", "Self-diagnosis". (The engine warm-up step can be skipped when performing the diagnosis only to erase the DTC.)
3. Change the diagnostic test mode from Mode II to Mode I by turning the mode selector on the ECM. (See EC-43.)



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-257.
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.

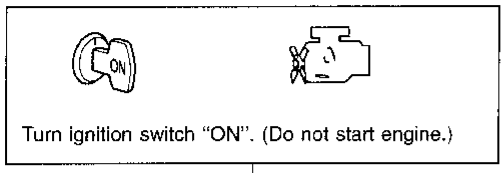
MIL flashing without DTC

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

Malfunction Indicator Lamp (MIL) (Cont'd)

HOW TO SWITCH DIAGNOSTIC TEST MODES



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

A

Mode I — MALFUNCTION INDICATOR LAMP CHECK. Refer to EC-42.
MIL should come on.

NG → Check MIL circuit. (See EC-257.) NG → Repair harness or connectors.

OK

Check whether ECM test mode selector can be turned counterclockwise.

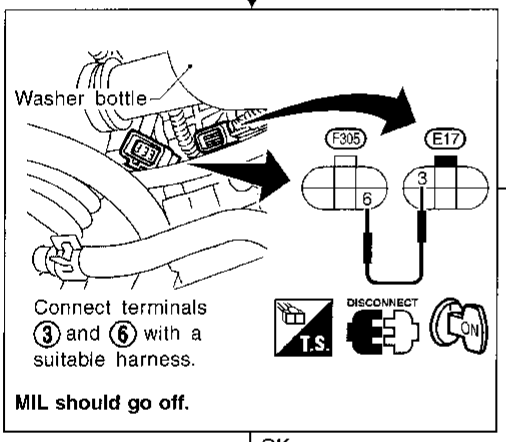
Yes

No → Repair or replace ECM test mode selector.

OK

Start engine.

Mode I — MALFUNCTION WARNING. Refer to EC-42.



MIL should go off.

Disconnect harness connectors E17 and F305. Then connect ③ and ⑥ terminals with a suitable jumper wire.

NG → Check MIL circuit. (See EC-257.) NG → Repair harness or connectors.

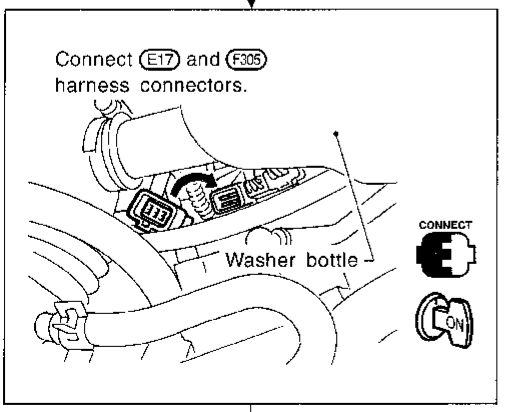
OK

Check ECM fail-safe. (See EC-71).

OK

OK

Wait at least 2 seconds.



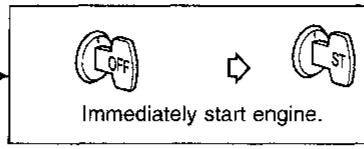
Remove jumper wire and reconnect harness connectors E17 and F305.

B

Malfunction Indicator Lamp (MIL) (Cont'd)

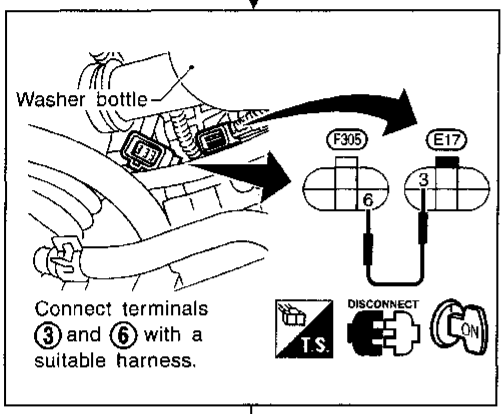
B

MODE II — SELF-DIAGNOSTIC RESULTS. Refer to next page.



Immediately start engine.

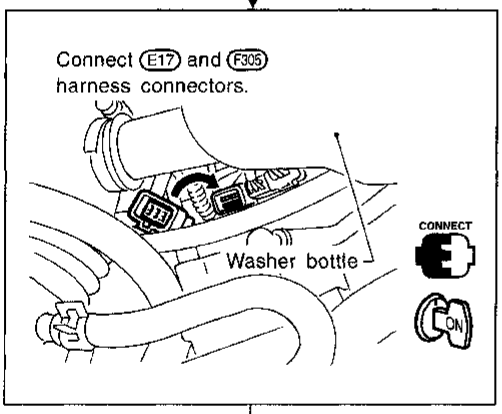
Mode II — HEATED OXYGEN SENSOR MONITOR. Refer to EC-46.



To erase stored codes, disconnect harness connectors (E17) and (F305). Then connect terminals ③ and ⑥ with a suitable jumper wire.
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

Wait at least 2 seconds.



Remove jumper wire and reconnect harness connectors (E17) and (F305).

A

- **Switching the modes is not possible when the engine is running.**
- **When the ignition switch is turned off during diagnosis, power to the ECM will drop off after approx. 5 seconds. The diagnosis mode will automatically return to On board Diagnostic Test Mode I. But stored codes will remain in memory unless the erasing procedure has been performed.**

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-257.

DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

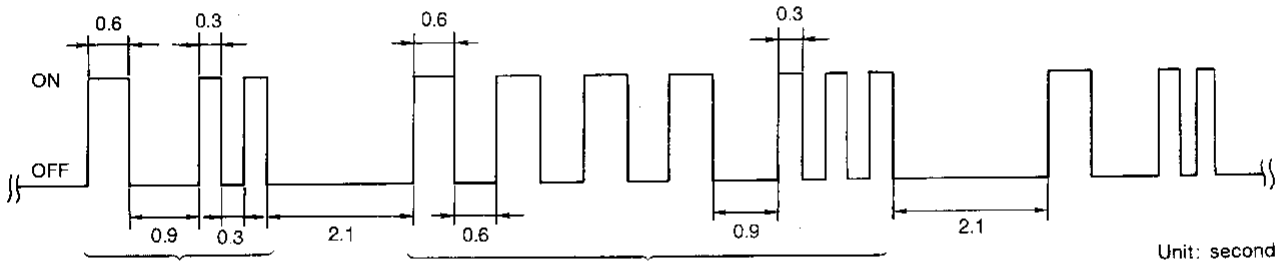
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction.

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

DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

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

Example: Diagnostic trouble code No. 0102 and No. 0403



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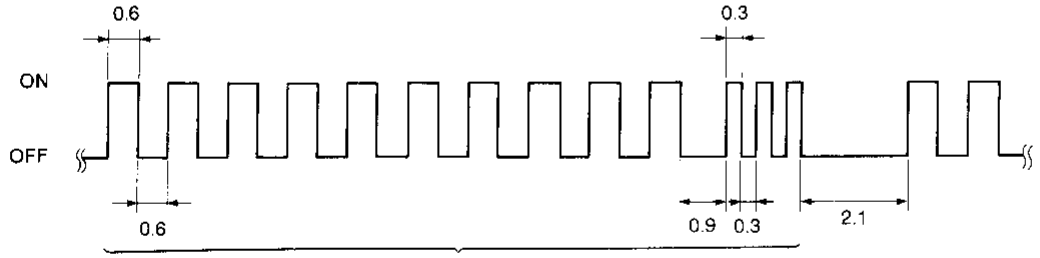
Example: Diagnostic trouble code No. 1003



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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", EC- 43.)

- **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.**

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-31.
- 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.

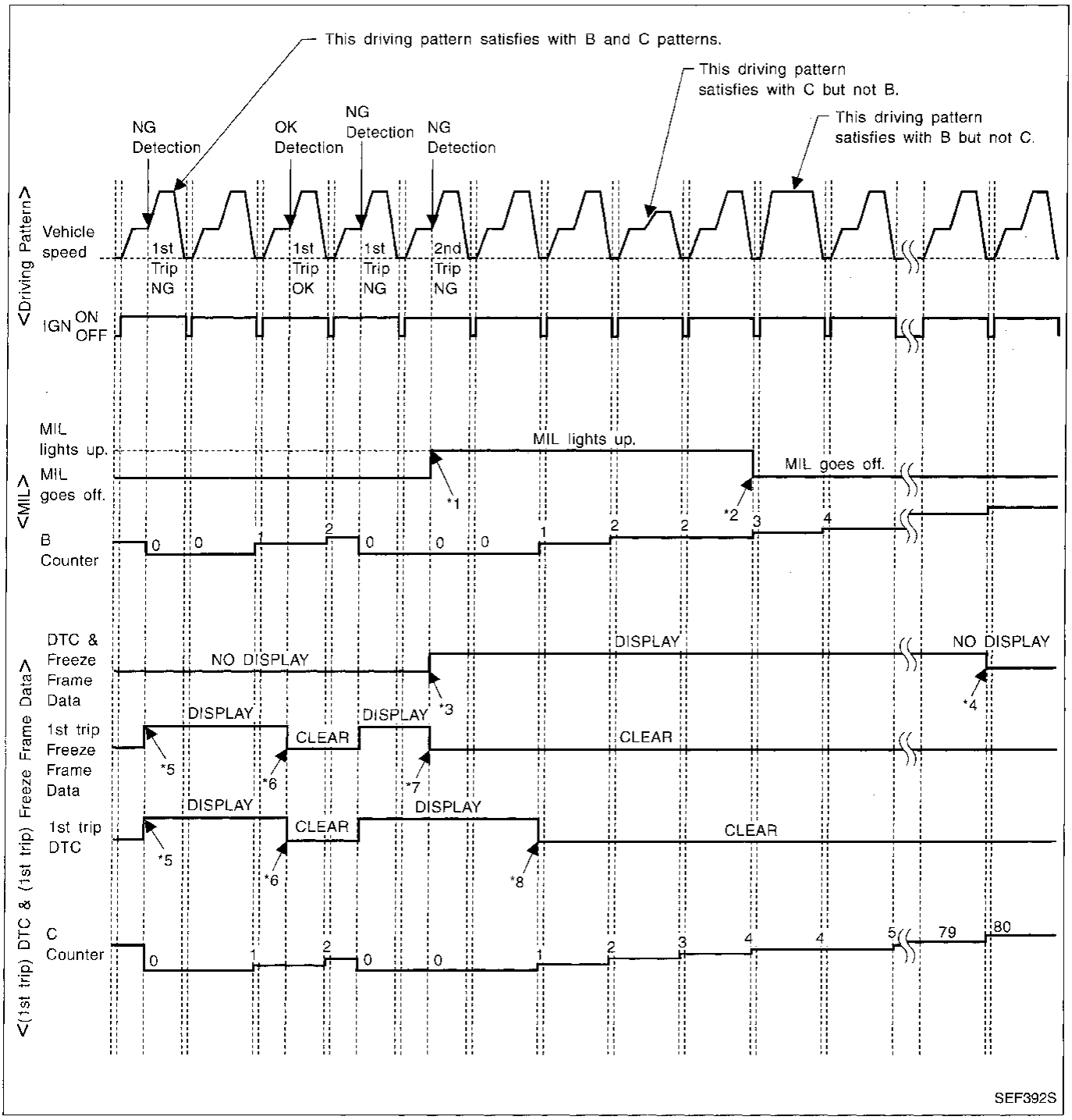
SUMMARY CHART

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-48.
*1: Clear timing is at the moment OK is detected.
*2: Clear timing is when the same malfunction is detected in the 2nd trip.

OBD System Operation Chart (Cont'd)

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



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

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

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

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

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

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

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

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

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 count up times 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) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:

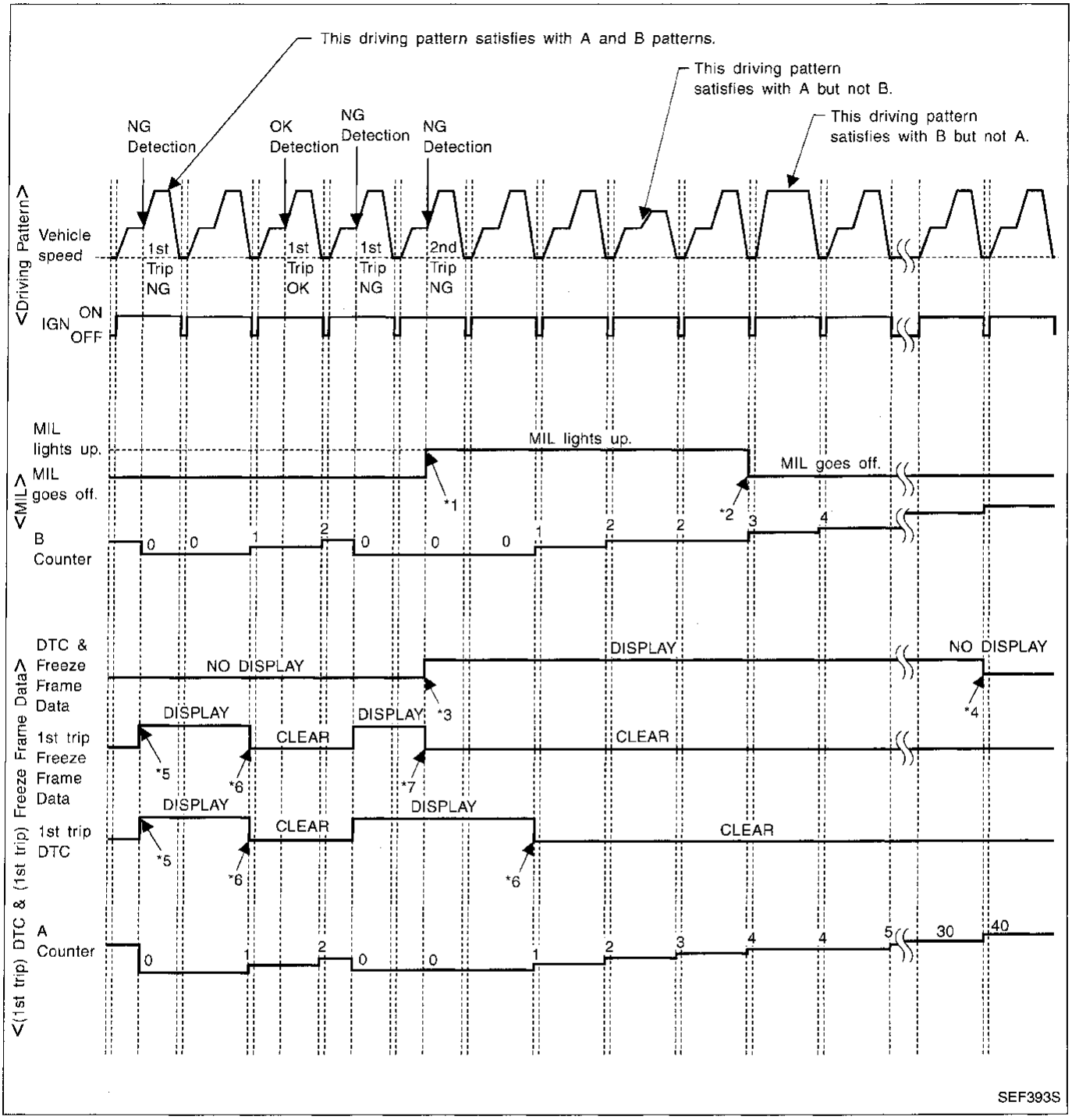
- When the freeze frame data shows lower than 70°C (158°F), "T" should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), "T" should be higher than or equal to 70°C (158°F).

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

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

OBD System Operation Chart (Cont'd)

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



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

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

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

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

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

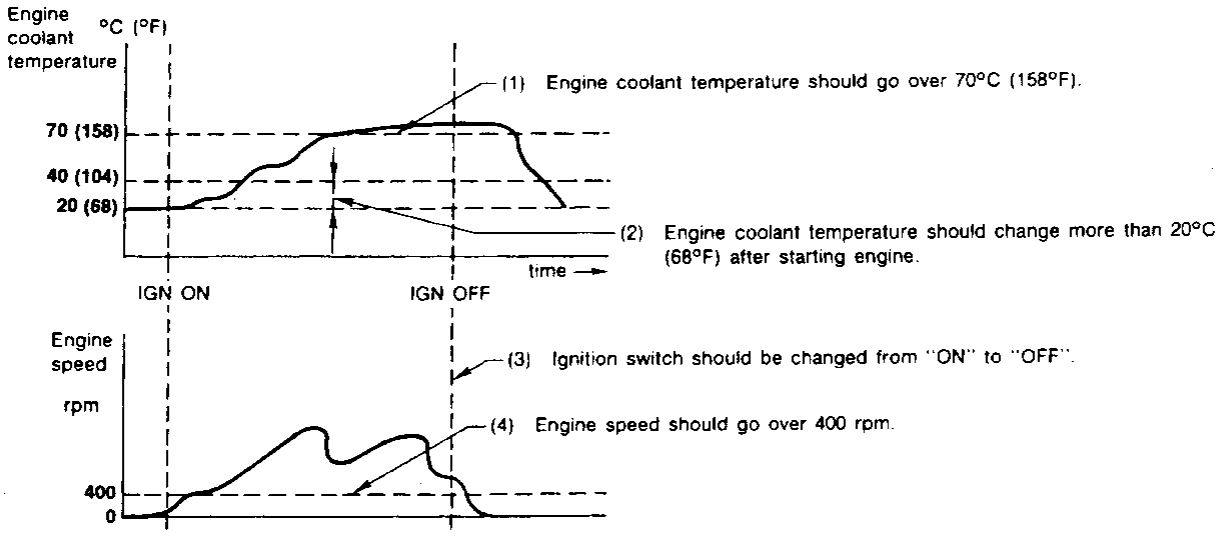
*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

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

OBD System Operation Chart (Cont'd)

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

〈**Driving pattern A**〉

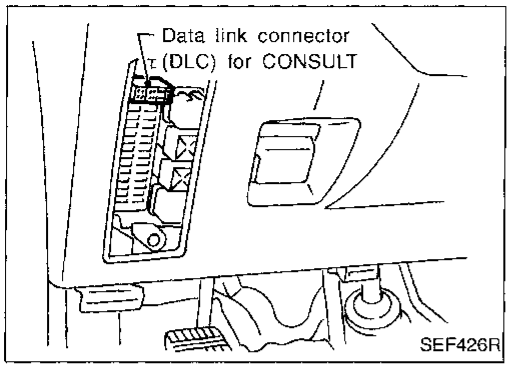


- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

〈**Driving pattern B**〉

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

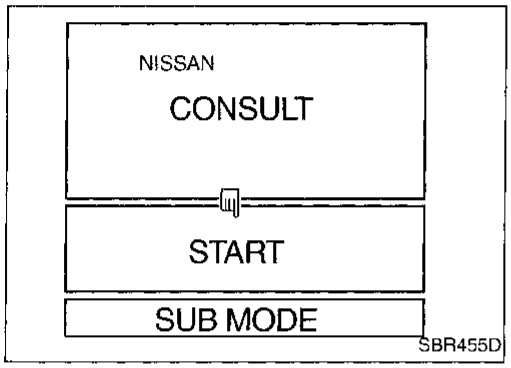
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").



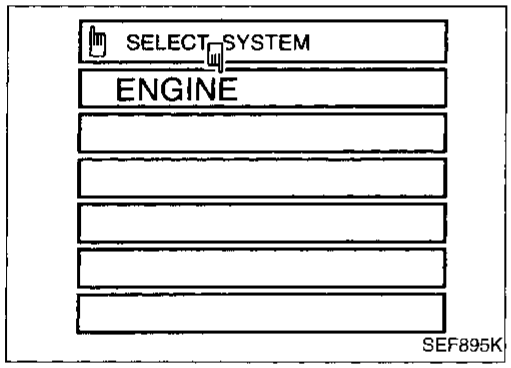
CONSULT

CONSULT INSPECTION PROCEDURE

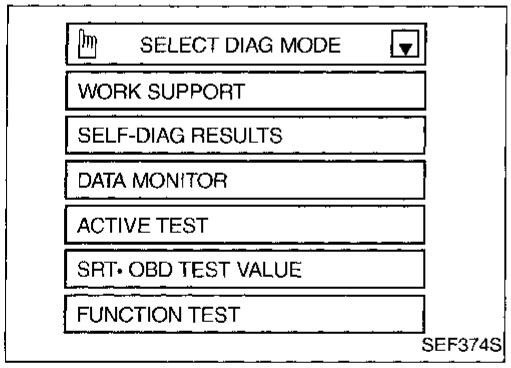
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located behind the fuse box cover.)



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



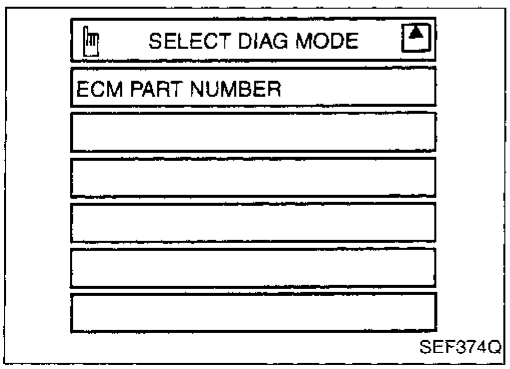
5. Touch "ENGINE".



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

For further information, see the CONSULT Operation Manual.

This sample shows the display when using the UE951 program card. Screen differs in accordance with the program card used.



CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE						
			WORK SUP-PORT	SELF-DIAGNOSTIC RESULTS*1		DATA MONITOR	ACTIVE TEST	FUNC-TION TEST	SRT-OBD TEST VALUE
					FREEZE FRAME DATA*2				
ECCS COMPONENT PARTS	INPUT	Camshaft position sensor		X	X	X			
		Mass air flow sensor		X		X			
		Engine coolant temperature sensor		X	X	X	X		
		Front heated oxygen sensor		X		X		X	X
		Rear heated oxygen sensor		X		X			X
		Vehicle speed sensor		X	X	X		X	
		Throttle position sensor	X	X		X		X	
		EGR temperature sensor		X		X			
		Intake air temperature sensor		X		X			
		Crankshaft position sensor (OBD)		X					
		Knock sensor		X					
		Ignition switch (start signal)				X		X	
		Closed throttle position switch				X		X	
		Air conditioner switch				X			
		Park/Neutral position switch		X		X		X	
		Power steering oil pressure switch				X		X	
		Air conditioner pressure switch				X			
		Battery voltage				X			
	OUTPUT	Injectors				X	X	X	
		Power transistor (Ignition timing)	X	X (Ignition signal)		X	X	X	
		IACV-AAC valve	X	X		X	X	X	
		Air conditioner relay				X			
		Fuel pump relay	X			X	X	X	
		Cooling fan		X		X	X	X	
		Front heated oxygen sensor heater		X		X			X
		Rear heated oxygen sensor heater		X		X			X
		EGR valve & EVAP canister purge control solenoid valve		X		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-33.

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. ● IGN SW "ON" ● ENG NOT RUNNING ● ACC PEDAL NOT PRESSED	When adjusting throttle position sensor initial position
IACV-AAC/V ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. ● ENGINE WARMED UP ● NO-LOAD	
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

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-38.)

Freeze frame data and 1st trip freeze frame data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	• ECCS component part/control system has a trouble code, it is displayed as "PXXXX". [Refer to "Alphabetical & P No. Index for DTC (EC-2).]
FUEL SYS DATA	• "Fuel injection system status" at the moment a malfunction is detected is displayed. • One mode in the following is displayed. "MODE 2": Open loop due to detected system malfunction "MODE 3": Open loop due to driving conditions (power enrichment, deceleration enrichment) "MODE 4": Closed loop - using oxygen sensor(s) as feedback for fuel control "MODE 5": Open loop - has not yet satisfied condition to go to closed loop
CAL/LD VALUE [%]	• The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	• The engine coolant temperature at the moment a malfunction is detected is displayed.
S-FUEL TRIM [%]	• "Short-term fuel trim" at the moment a malfunction is detected is displayed. • The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
L-FUEL TRIM [%]	• "Long-term fuel trim" at the moment a malfunction is detected is displayed. • The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
ENGINE SPEED [rpm]	• The engine speed at the moment a malfunction is detected is displayed.
VHCL SPEED [km/h] or [mph]	• The vehicle speed at the moment a malfunction is detected is displayed.

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

CONSULT (Cont'd)

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (REF) [rpm]	○	○	• Indicates the engine speed computed from the REF signal (120° signal) of the camshaft position sensor.	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS AIR/FL SE [V]	○	○	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated.
COOLAN TEMP/S [°C] or [°F]	○	○	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
FR O2 SENSOR [V]	○	○	• The signal voltage of the front heated oxygen sensor is displayed.	
RR O2 SENSOR [V]	○	○	• The signal voltage of the rear heated oxygen sensor is displayed.	
FR O2 MNTR [RICH/LEAN]	○	○	• Display of front heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture.	• After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
RR O2 MNTR [RICH/LEAN]	○		• Display of rear heated oxygen sensor signal: RICH ... means the amount of oxygen after three way catalyst is relatively small. LEAN ... means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	

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

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	• The throttle position sensor signal voltage is displayed.	
EGR TEMP SEN [V]	○		• The signal voltage of the EGR temperature sensor is displayed.	
INT/A TEMP SE [°C] or [°F]	○		• The intake air temperature determined by the signal voltage of the intake air temperature sensor is indicated.	
START SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the starter signal.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL/P SW [ON/OFF]	○	○	• Indicates the closed throttle position [ON/OFF] determined by the throttle position sensor signal. ON: Closed throttle position OFF: Other than closed throttle position	
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioning signal.	
P/N POSI SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the park/neutral position switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal.	
IGNITION SW [ON/OFF]	○		• Indicates [ON/OFF] condition from ignition switch.	
A/C PRESS SW [ON/OFF]	○		• Indicates [ON/OFF] condition of the air conditioner pressure switch.	
INJ PULSE [msec]		○	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.
B/FUEL SCHDL [msec]		○	• "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
IGN TIMING [BTDC]		○	• Indicates the ignition timing computed by ECM according to the input signals.	

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
IACV-AAC/V [%]		○	• Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	
A/F ALPHA [%]		○	• Indicates the mean value of the air-fuel ratio feedback correction factor per cycle.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control.
AIR COND RLY [ON/OFF]			• Indicates the air conditioner relay control condition (determined by ECM according to the input signal).	
FUEL PUMP RLY [ON/OFF]			• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
COOLING FAN [HI/LOW/OFF]			• Indicates the control condition of the cooling fans (determined by ECM according to the input signal). HI ... High speed operation LOW ... Low speed operation OFF ... Stopped	
EGRC SOL/V [ON/OFF]			• Indicates the control condition of the EGR valve & EVAP canister purge control solenoid valve (determined by ECM according to the input signal). ON ... EGR and EVAP canister purge operations are cut-off OFF ... EGR and EVAP canister purge are operational	
FR O2 HEATER [ON/OFF]			• Indicates [ON/OFF] condition of front or rear heated oxygen sensor heater determined by ECM according to the input signals.	
RR O2 HEATER [ON/OFF]				
CAL/LD VALUE [%]			• "Calculated load value" indicates the value of the current airflow divided by peak airflow.	
ABSOL TH·P/S [%]			• "Absolute throttle position sensor" indicates the throttle opening computed by ECM according to the signal voltage of the throttle position sensor.	
MASS AIRFLOW [g·m/s]			• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

CONSULT (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	● Engine: Return to the original trouble condition ● Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Fuel injectors ● Front heated oxygen sensor
IACV-AAC/V OPENING	● Engine: After warming up, idle the engine. ● Change the IACV-AAC valve opening percent using CONSULT.	Engine speed changes according to the opening percent.	● Harness and connector ● IACV-AAC valve
ENG COOLANT TEMP	● Engine: Return to the original trouble condition ● Change the engine coolant temperature indication using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	● Harness and connector ● Engine coolant temperature sensor ● Fuel injectors
IGNITION TIMING	● Engine: Return to the original trouble condition ● Timing light: Set ● Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	● Adjust initial ignition timing
POWER BALANCE	● Engine: After warming up, idle the engine. ● A/C switch "OFF" ● Shift lever "N" ● Cut off each injector signal one at a time using CONSULT.	Engine runs rough or dies.	● Harness and connector ● Compression ● Injectors ● Power transistor ● Spark plugs ● Ignition coils
COOLING FAN	● Ignition switch: "ON" ● Operate the cooling fan at "LOW" or "HIGH" speed and turn "OFF" using CONSULT.	Cooling fan moves at "LOW" or "HIGH" speed and stops.	● Harness and connector ● Cooling fan motor
FUEL PUMP RELAY	● Ignition switch: "ON" (Engine stopped) ● Turn the fuel pump relay "ON" and "OFF" using CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	● Harness and connector ● Fuel pump relay
EGRC SOLENOID VALVE	● Ignition switch: "ON" ● Turn solenoid valve "ON" and "OFF" with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	● Harness and connector ● Solenoid valve
SELF-LEARNING CONT	● In this test, the coefficient of self-learning control mixture ratio returns to the original coefficient by touching "CLEAR" on the screen.		

CONSULT (Cont'd)

FUNCTION TEST MODE

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
SELF-DIAG RESULTS	● Ignition switch: ON (Engine stopped) ● Displays the results of on board diagnostic system.	—		Objective system
CLOSED THROTTLE POSI	● Ignition switch: ON (Engine stopped) ● Closed throttle position switch circuit is tested when throttle is opened and closed fully. (Closed throttle position is selected by throttle position sensor.)	Throttle valve: opened	OFF	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	● Ignition switch: ON (Engine stopped) ● Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	● Harness and connector ● Throttle position sensor ● Throttle position sensor adjustment ● Throttle linkage ● Verify operation in DATA MONITOR mode.
PARK/NEUT POSI SW CKT	● Ignition switch: ON (Engine stopped) ● Inhibitor switch circuit is tested when shift lever is manipulated.	Out of N/P positions	OFF	● Harness and connector ● Inhibitor switch ● Linkage or inhibitor switch adjustment
		In N/P positions	ON	
FUEL PUMP CIRCUIT	● Ignition switch: ON (Engine stopped) ● Fuel pump circuit is tested by checking the pulsation in fuel pressure when fuel tube is pinched.	There is pressure pulsation on the fuel feed hose.		● Harness and connector ● Fuel pump ● Fuel pump relay ● Fuel filter clogging ● Fuel level
EGRC SOL/V CIRCUIT	● Ignition switch: ON (Engine stopped) ● EGR valve & EVAP canister purge control solenoid valve circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		● Harness and connector ● EGR valve & EVAP canister purge control solenoid valve
COOLING FAN CIRCUIT	● Ignition switch: ON (Engine stopped) ● Cooling fan circuit is tested when cooling fan is rotated.	The cooling fan rotates and stops every 3 seconds.		● Harness and connector ● Cooling fan motor ● Cooling fan relay
START SIGNAL CIRCUIT	● Ignition switch: ON → START ● Start signal circuit is tested when engine is started by operating the starter. Before cranking, battery voltage and engine coolant temperature are displayed. During cranking, average battery voltage, mass air flow sensor output voltage and cranking speed are displayed.	Start signal: OFF → ON		● Harness and connector ● Ignition switch

CONSULT (Cont'd)

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

CONSULT (Cont'd)

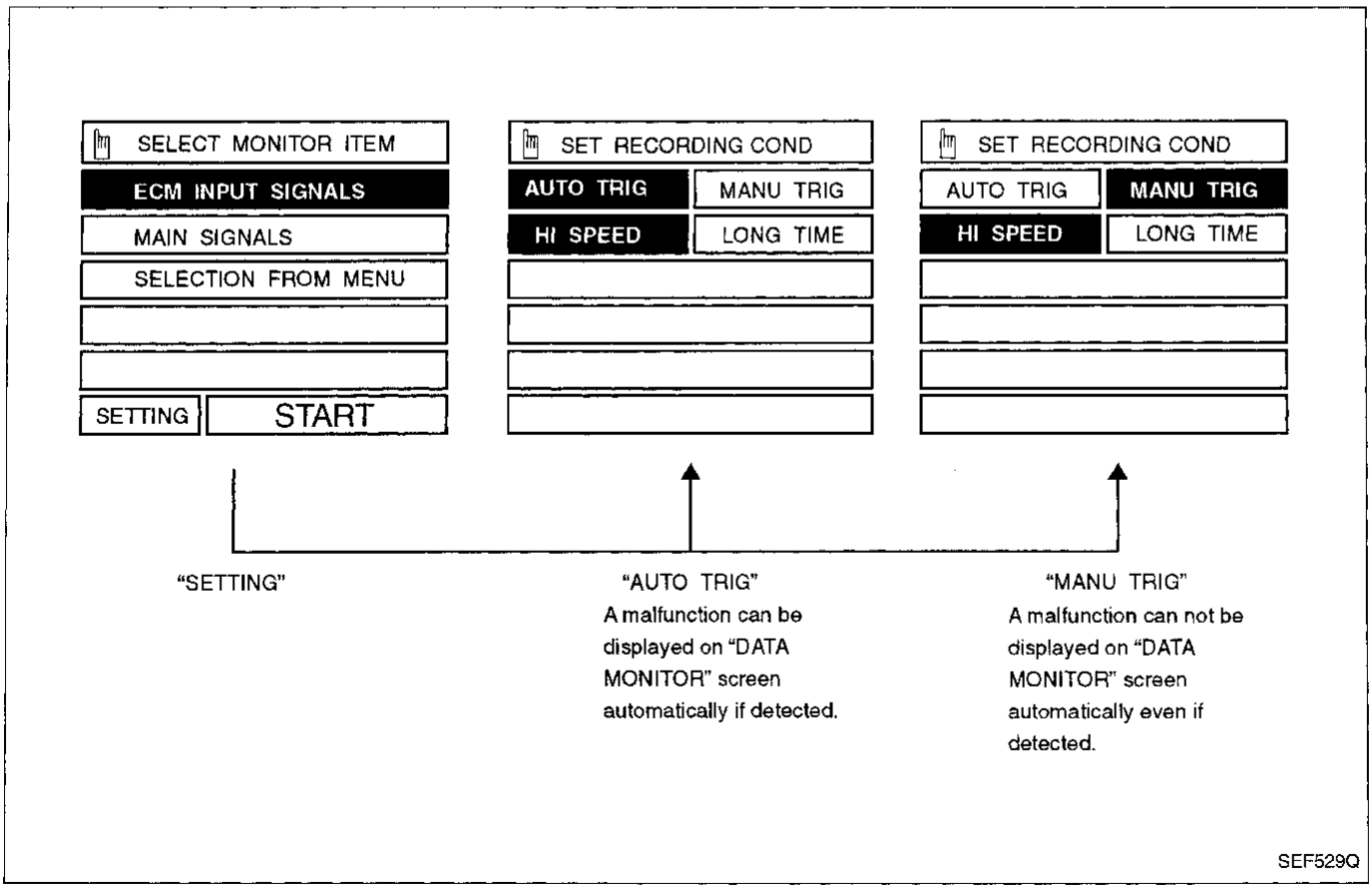
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

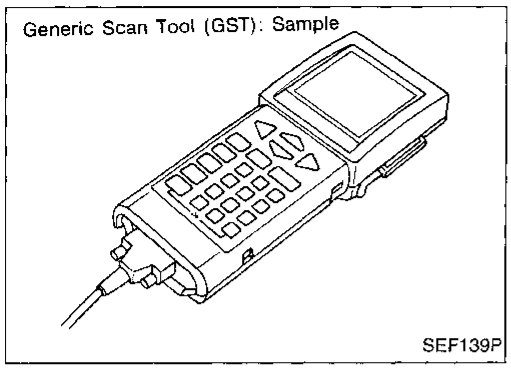
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

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 if the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC CONFIRMATION PROCEDURE", the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI section, "Incident Simulation Tests" in "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT".)
2. "MANU TRIG"
   - If the malfunction is displayed as soon as "DATA MONITOR" is selected, reset CONSULT to "MANU TRIG". By selecting "MANU TRIG" you can monitor and store the data. The data can be utilized for further diagnosis, such as a comparison with the value for the normal operating condition.

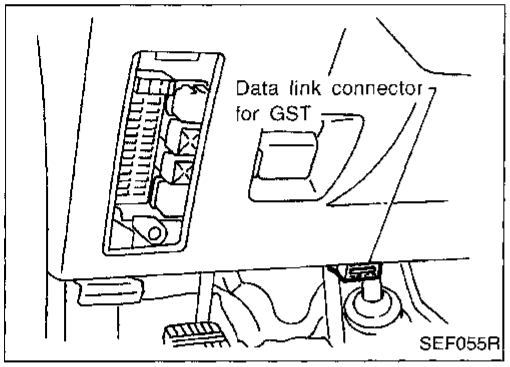




Generic Scan Tool (GST)

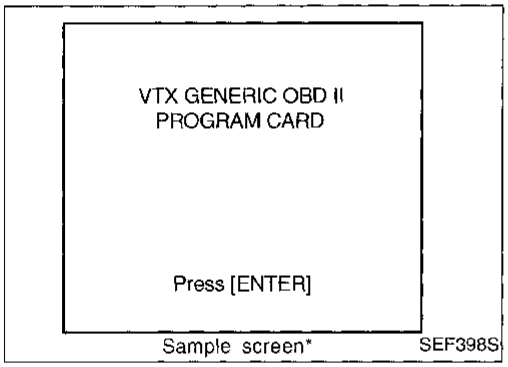
DESCRIPTION

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.



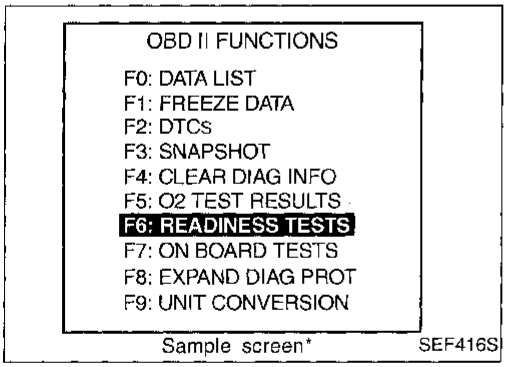
GST INSPECTION PROCEDURE

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.)



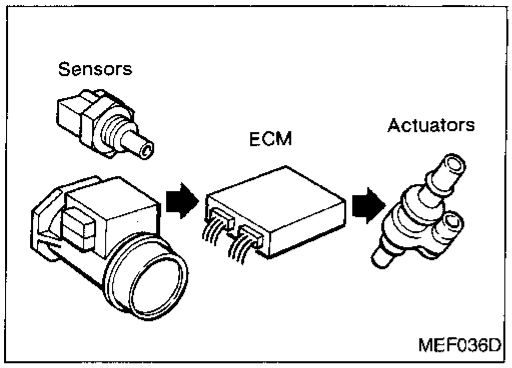
5. Perform each diagnostic mode according to each service procedure.

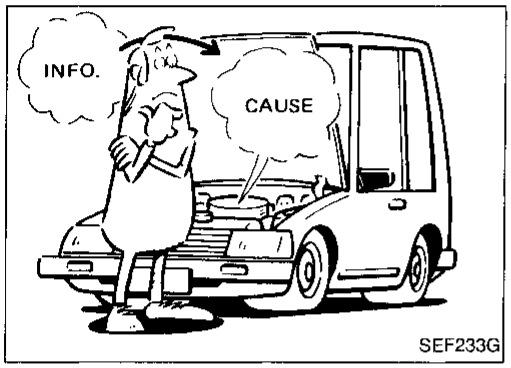
For further information, see the GST Operation Manual of the tool maker.

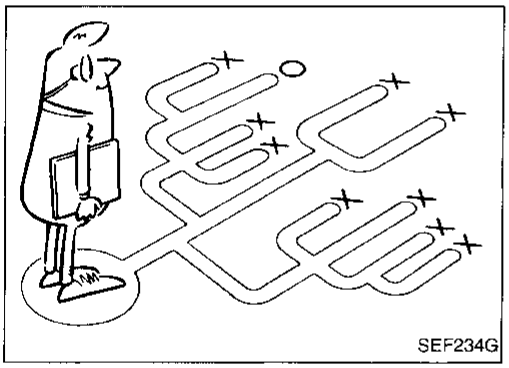
Generic Scan Tool (GST) (Cont'd)

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" (EC-54).]
MODE 3	DTCs	This mode gains access to emission-related power train trouble codes which were stored by ECM.
MODE 4	CLEAR DIAG INFO	This mode can clear all emission-related diagnostic information. This includes: ● Clear number of diagnostic trouble codes (MODE 1) ● Clear diagnostic trouble codes (MODE 3) ● Clear trouble code for freeze frame data (MODE 1) ● Clear freeze frame data (MODE 2) ● Clear heated oxygen sensor test data (MODE 5) ● Reset status of system monitoring test (MODE 1) ● Clear on board monitoring test results (MODE 6 and 7)
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.







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-66.

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

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

KEY POINTS

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

SEF907L

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 shown below in order to organize all the information for troubleshooting.

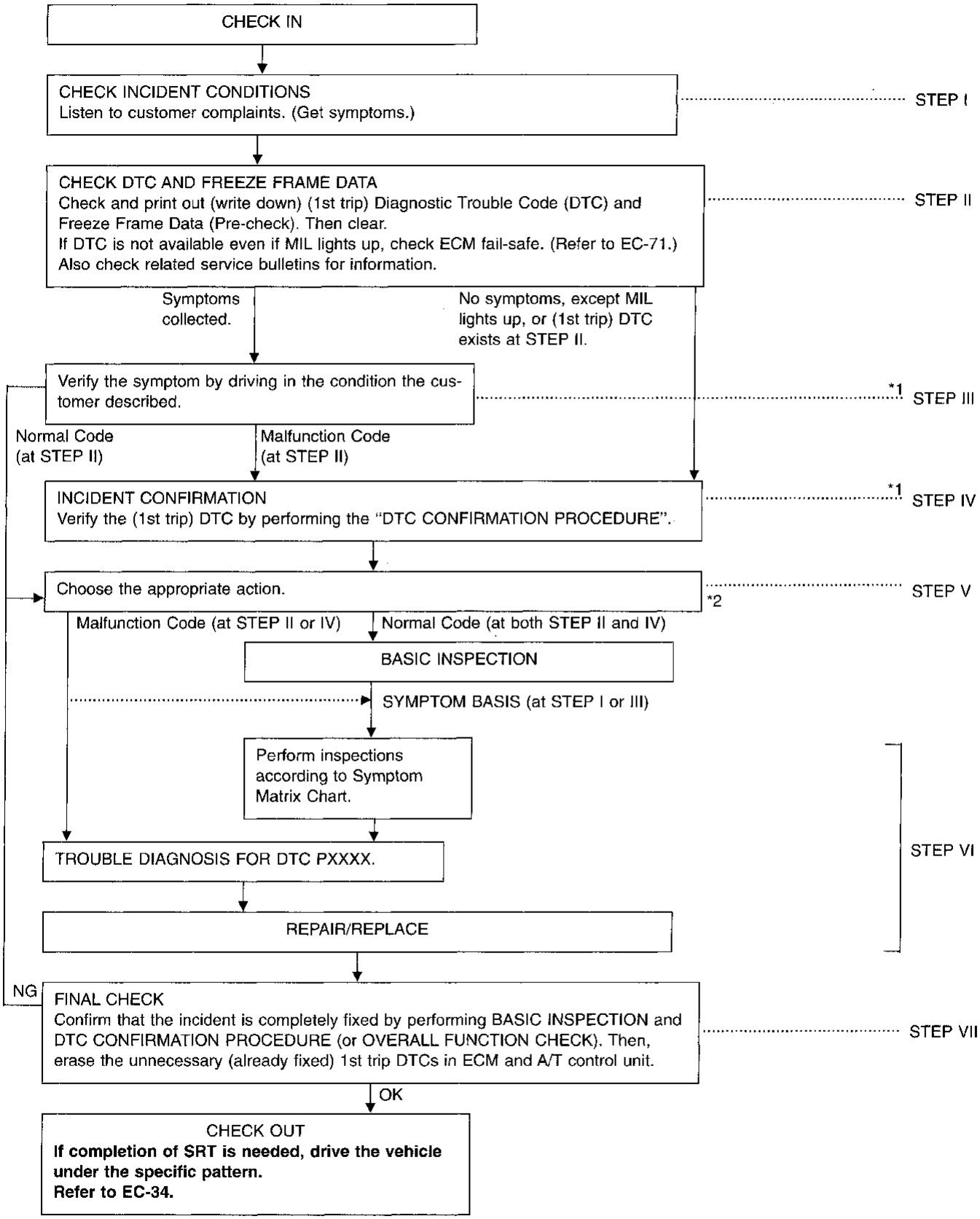
Some conditions may cause the malfunction indicator lamp to come on steady or blink and DTC to be detected. Examples:

- 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].

WORKSHEET SAMPLE

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

Work Flow



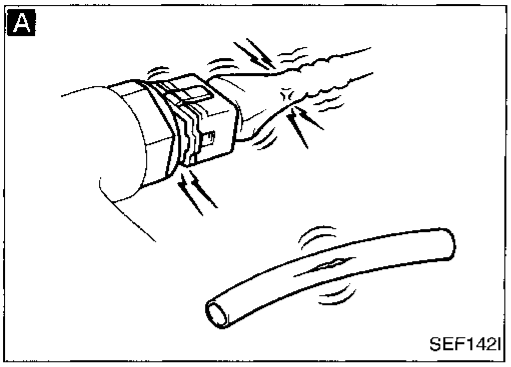
***1: If the incident cannot be duplicated, see "Incident Simulation Tests" of "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT" in GI section.**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY EC-85).**

Description for Work Flow

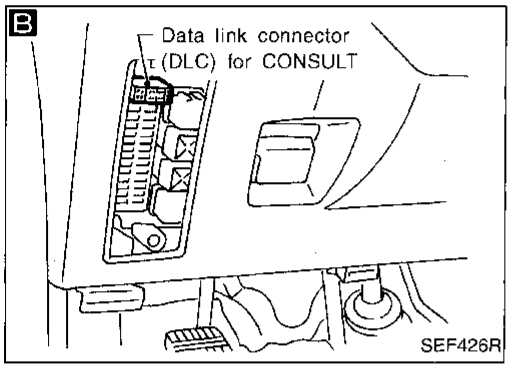
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-65.
STEP II	Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the (1st trip) Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-40.) 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-72.) 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-72.)
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-75, 79. The "DIAGNOSTIC PROCEDURE" in EC section contains a description based on open circuit inspection. A short circuit inspection is also required for the circuit check in the DIAGNOSTIC PROCEDURE. For details, refer to GI section ("HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT", "Circuit Inspection"). Repair or replace the malfunction parts.
STEP VII	Once you have repaired the circuit or replaced a component, you need to run the engine in the same conditions and circumstances which resulted in the customer's initial complaint. Perform the "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-40.)

A



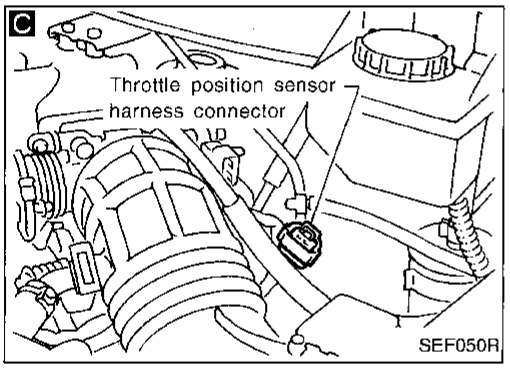
SEF142I

B



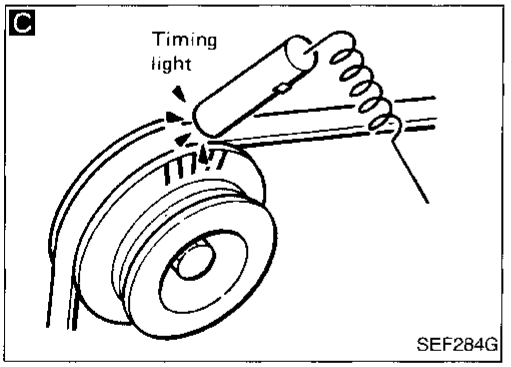
SEF426R

C



SEF050R

C



SEF284G

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

B

CONNECT CONSULT TO THE VEHICLE.

Connect "CONSULT" to the data link connector for CONSULT and select "ENGINE" from the menu. Refer to EC-51.

DOES ENGINE START? — No → Go to D.

Yes

C

CHECK IGNITION TIMING.

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:
15°±2° BTDC

NG → Adjust ignition timing by turning camshaft position sensor.

OK

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

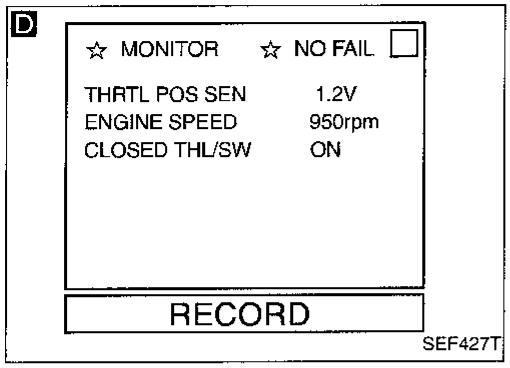
Does engine run at 700±50 rpm (A/T in "N" position)?

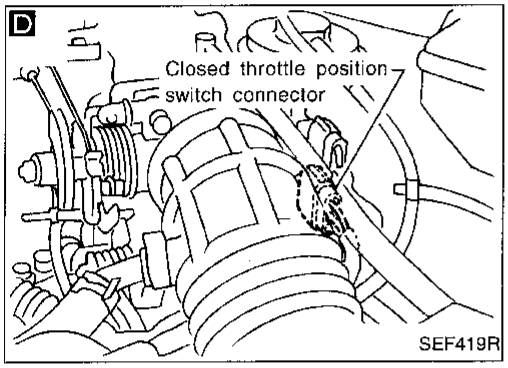
NG → Adjust base idle speed by turning idle speed adjusting screw.

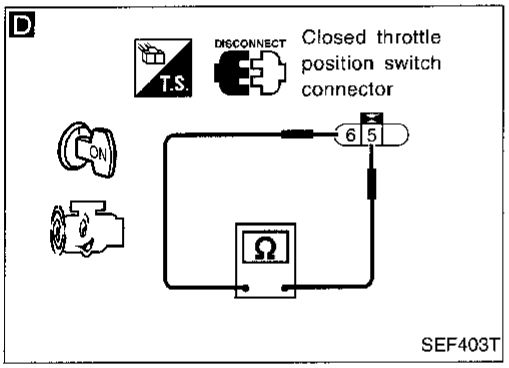
OK

Ⓐ
(Go to next page.)

Basic Inspection (Cont'd)







Ⓐ

CHECK CLOSED THROTTLE POSITION SWITCH IDLE POSITION.

1. Select "A/T", then "DATA MONITOR" mode with CONSULT.
2. Select "ENGINE SPEED" and "CLOSED THL/SW" from the menu.
3. 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 950±150 rpm with transaxle in "N" position.

OR

1. Disconnect throttle position sensor harness connector and closed throttle position switch harness connector.
2. Check continuity between closed throttle position switch terminals ⑤ and ⑥ under the following condition.
   - Raise engine speed to 2,000 rpm.
   - Gradually lower engine speed.

Continuity should exist (closed throttle position switch closes) at 950±150 rpm with transaxle in "N" position.

NG → Adjust continuity signal by rotating throttle position sensor body.

RESET IDLE POSITION MEMORY.

1. Warm up engine sufficiently.
2. Select "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT, then stop engine.
3. Reconnect throttle position sensor harness connector and closed throttle position switch harness connector.
4. Turn ignition switch "ON".
5. Turn ignition switch "OFF" and wait at least 5 seconds.
6. 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.

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

CHECK TARGET IDLE SPEED

Read the engine idle speed in "DATA MONITOR" mode with CONSULT.
750±50 rpm
(in "N" position)

OR

Check idle speed.
750±50 rpm
(in "N" position)

NG → Adjust idle speed. Refer to EC-25.

OK → After this inspection, unnecessary (1st trip) DTC might be displayed.
Erase the stored memory in ECM and A/T control unit.
Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-31) and "HOW TO ERASE DTC" in AT section.

OK → INSPECTION END

Diagnostic Trouble Code (DTC) Chart

INSPECTION PRIORITY (ENGINE RELATED ITEMS)

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	● ECM (P0605, 0301) ● Mass air flow sensor circuit (P0100, 0102) ● Throttle position sensor circuit (P0120, 0403) ● EGR valve and EVAP canister purge control solenoid valve circuit (P1400, 1005) ● A/T diagnosis communication line (P1605, 0804)	● Camshaft position sensor circuit (P0340, 0101) ● Vehicle speed sensor circuit (P0500, 0104) ● Intake air temperature sensor circuit (P0110, 0401) ● Knock sensor circuit (P0325, 0304)	● Engine coolant temperature sensor circuit (P0115, 0103) (P0125, 0908) ● Ignition signal circuit (P1320, 0201) ● Park/Neutral position switch circuit (P0705, 1003)
2	● EGR temperature sensor circuit (P1401, 0305) ● A/T related sensors, solenoid valves and switches (P0705, 1101) (P0720, 1102) (P0750, 1108) (P0755, 1201) (P0740, 1204) (P0745, 1205) (P0725, 1207) (P0710, 1208) (P0744, 1107)	● Crankshaft position sensor circuit (P0335, 0802) (P1336, 0905) ● Cooling fan circuit (P1900, 1308) ● Front heated oxygen sensor heater circuit (P0135, 0901) ● Rear heated oxygen sensor heater circuit (P0141, 0902)	● Front heated oxygen sensor circuit (P0130, 0303) ● Rear heated oxygen sensor circuit (P0136, 0707)
3	● EGR function (P0400, 0302) ● EGRC-BPT valve function (P0402, 0306) ● IACV-AAC valve circuit (P0505, 0205)	● Misfire (P0300 - P0306, 0701 - 0603) ● Closed loop control (P0130, 0307) ● Improper shifting (P0731 - P0734, 1103 - 1106)	● Fuel injection system function (P0171, 0115) (P0172, 0114) ● Three way catalyst function (P0420, 0702) ● Signal circuit from A/T control unit to ECM (P0600)

Fail-Safe Chart

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

<table>
<tr><th colspan="2">DTC No.</th><th rowspan="2">Detected items</th><th rowspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><th>CONSULT GST</th><th>ECM*</th></tr>
<tr><td>P0100</td><td>0102</td><td>Mass air flow sensor circuit</td><td>Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0115</td><td>0103</td><td>Engine coolant temperature sensor circuit</td><td>Engine coolant temperature will be determined by ECM based on the time after turning ignition switch "ON" or "START".
CONSULT displays the engine coolant temperature decided by ECM.
<table>
<tr><th>Condition</th><th>Engine coolant temperature decided (CONSULT display)</th></tr>
<tr><td>Just as ignition switch is turned ON or START</td><td>20°C (68°F)</td></tr>
<tr><td>More than approx. 6 minutes after ignition ON or START</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>20 - 80°C (68 - 176°F)
(Depends on the time)</td></tr>
</table></td></tr>
<tr><td>P0120</td><td>0403</td><td>Throttle position sensor circuit</td><td>Throttle position will be determined based on the injected fuel amount and the engine speed.
Therefore, acceleration will be poor.
<table>
<tr><th>Condition</th><th>Driving condition</th></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table></td></tr>
<tr><td>Unable to access ECCS</td><td>Unable to access Diagnostic Test Mode II</td><td>ECM</td><td>ECM fail-safe activating condition
The computing function of the ECM was judged to be malfunctioning.
When the fail-safe system activates (i.e., if the ECM detects a malfunction condition in the CPU of ECM), the MALFUNCTION INDICATOR LAMP on the instrument panel lights to warn the driver.
However it is not possible to access ECCS and DTC cannot be confirmed.
Engine control with ECM fail-safe
When ECM fail-safe is operating, fuel injection, ignition timing, fuel pump operation, IACV-AAC valve operation and cooling fan operation are controlled under certain limitations.
<table>
<tr><th></th><th>ECM fail-safe operation</th></tr>
<tr><td>Engine speed</td><td>Engine speed will not rise more than 3,000 rpm</td></tr>
<tr><td>Fuel injection</td><td>Simultaneous multiport fuel injection system</td></tr>
<tr><td>Ignition timing</td><td>Ignition timing is fixed at the preset valve</td></tr>
<tr><td>Fuel pump</td><td>Fuel pump relay is "ON" when engine is running and "OFF" when engine stalls</td></tr>
<tr><td>IACV-AAC valve</td><td>Full open</td></tr>
<tr><td>Cooling fans</td><td>Cooling fan relay "ON" (High speed condition) when engine is running, and "OFF" when engine stalls</td></tr>
</table>
Replace ECM, if ECM fail-safe condition is confirmed.</td></tr>
</table>

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

Symptom Matrix Chart

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	●	●	●	○	●		○	○			○		○	EC-238
	Fuel pressure regulator system	●	○	●	○	○	○	○	○	○		○			EC-22
	Injector circuit	●	●	●	○	●		●	○			○			EC-232
	Evaporative emission system	○	○	○	○	○	○	○	○	○		○			EC-19
Air	Positive crankcase ventilation system	○	●	○	○	○	○	○	○	○		○	○		EC-21
	Incorrect idle speed adjustment	●	●				●	●	○	○		○			EC-25
	IACV-AAC valve circuit	○	●	○	○	○	●	●	○	○		○		○	EC-181
	IACV-FICD solenoid valve circuit	○	○	○	○	○	○	○	○	○		○			EC-248
Ignition	Incorrect ignition timing adjustment	●	●	●	●	●		●	○			●			EC-25
	Ignition circuit	●	●	●	●	●		●	○			●			EC-195
EGR	EGR valve & EVAP canister purge control solenoid valve circuit		○	●	○	○						○			EC-206
	EGR system	○	●	●	●	●	○	●	○	○		○			EC-163
Main power supply and ground circuit		●	○	○	○	○		○	○		○	○		○	EC-85
Cooling	Cooling fan circuit	○	○	○	○	○	○	○	○	○	●	○		○	EC-220
Air conditioner circuit		○	○	○	○	○	○	○	○	○		○		○	HA section

● : High Possibility Item
○ : Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
ECCS	Camshaft position sensor circuit	●	●	●	●	●		●	○			●			EC-157
	Mass air flow sensor circuit	●	●	●	○	●		●	○			●			EC-89
	Front heated oxygen sensor circuit		●	●	○	●		●	○			●			EC-116
	Engine coolant temperature sensor circuit	●	○	○	○	○	○	●	○	○		○			EC-100, 111
	Throttle position sensor circuit		●	●		●	●	●	○	○		●			EC-105
	Incorrect throttle position sensor adjustment		●	●		●	●	●	○	○		○			EC-68
	Vehicle speed sensor circuit		○	○		○						○			EC-177
	Knock sensor circuit			○	○	○						○			EC-149
	ECM	○	○	○	○	○	○	○	○	○	○	○			EC-189, 71
	Start signal circuit	○													EC-235
	Park/Neutral position switch circuit			○		○		○	○			○			EC-191
	Power steering oil pressure switch circuit		○					○	○						EC-244

● : High Possibility Item
○ : Low Possibility Item

(continued on next page)

Symptom Matrix Chart (Cont'd)

SYSTEM — Basic engine control system		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	○	○												
	Fuel piping	○	○	○	○	○		○	○			○			
	Vapor lock		○												
	Valve deposit	○	○	○	○	○		○	○			○			
	Poor fuel (Heavyweight 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	○	○	○		○		○	○			○		○	
	Generator circuit	○	○	○		○		○	○			○		○	EL section
	Starter circuit	●													
	Drive plate	○													—
	Inhibitor switch	○													AT section
Engine	Cylinder head	○	○	○	○	○		○	○			○			
	Cylinder head gasket	○	○	○	○	○		○	○		○	○	○		
	Cylinder block	○	○	○	○	○		○	○			○	○		
	Piston	○	○	○	○	○		○	○			○	○		
	Piston ring	○	○	○	○	○		○	○			○	○		
	Connecting rod	○	○	○	○	○		○	○			○			
	Bearing	○	○	○	○	○		○	○			○			
	Crankshaft	●	●	●	○	●		○	○			○			
Valve mechanism	Timing belt	○	●	○	○	●		●	○			○			
	Camshaft	○	○	○	○	○		○	○			○			
	Intake valve	○	○	○	○	○		○	○			○	○		
	Exhaust valve	○	○	○	○	○		○	○			○	○		
	Hydraulic valve lifter		○	○	○	○		○	○			○			—
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

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 component's signals/values/operations.
  (i.e., Adjust ignition timing with a timing light before monitoring IGN TIMING. Specification data might be displayed even when ignition timing is not adjusted to specification. This IGN TIMING monitors the data calculated by the ECM according to the input signals from the camshaft position sensor and other ignition timing related sensors.)
- If the real-time diagnosis results are NG, and the on board diagnostic system results are OK, when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS·RPM (REF)	● Tachometer: Connect ● Run engine and compare tachometer indication with the CONSULT value.		Almost the same speed as the CONSULT value.
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	1.0 - 1.7V
		2,000 rpm	1.4 - 2.2V
COOLAN TEMP/S	● Engine: After warming up		More than 70°C (158°F)
FR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
RR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR			LEAN ↔ RICH
VHCL SPEED SE	● Turn drive wheels and compare speedometer indication with the CONSULT value		Almost the same speed as the CONSULT value
BATTERY VOLT	● Ignition switch: ON (Engine stopped)		11 - 14V
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.3 - 0.7V
		Throttle valve fully opened	Approx. 4.0V
EGR TEMP SEN	● Engine: After warming up		Less than 4.5V
START SIGNAL	● Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL/P SW	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON* (Compressor operates)	ON
P/N POSI SW	● Ignition switch: ON	Shift lever "P" or "N"	ON
		Except above	OFF

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

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

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
IGNITION SW	● Ignition switch: ON → OFF		ON → OFF
INJ PULSE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	2.4 - 3.5 msec.
		2,000 rpm	2.3 - 3.2 msec.
B/FUEL SCHDL		Idle	1.0 - 1.6 msec
		2,000 rpm	0.7 - 1.3 msec
IGN TIMING		Idle	15° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V		Idle	15 - 40%
		2,000 rpm	—
A/F ALPHA	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	50 - 159%
AIR COND RLY	● Air conditioner switch: OFF → ON*		OFF → ON
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)		ON
	● Except as shown above		OFF
COOLING FAN	● After warming up engine, idle the engine ● Air conditioner switch: OFF	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: OFF ● Properly raise drive wheels off the ground ● Place A/T selector lever in "D" position ● No-load	Idle [Vehicle speed is below 8 km/h (5 MPH)]	ON
		2,000 rpm [Vehicle speed is over 8 km/h (5 MPH)]	OFF
FR O2 HEATER	● Engine speed: Idle		ON
	● Engine speed: Above 4,200 rpm		OFF
RR O2 HEATER	● Engine speed: Below 6,350 rpm		ON
	● Ignition switch: ON (Engine stopped)		OFF
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	18.2 - 38.0%
		2,500 rpm	14.8 - 33.5%
ABSOL TH·P/S	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.0%
		Throttle valve fully opened	Approx. 88%
MASS AIRFLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	3.2 - 6.7 gm/s
		2,500 rpm	8.7 - 21.9 gm/s

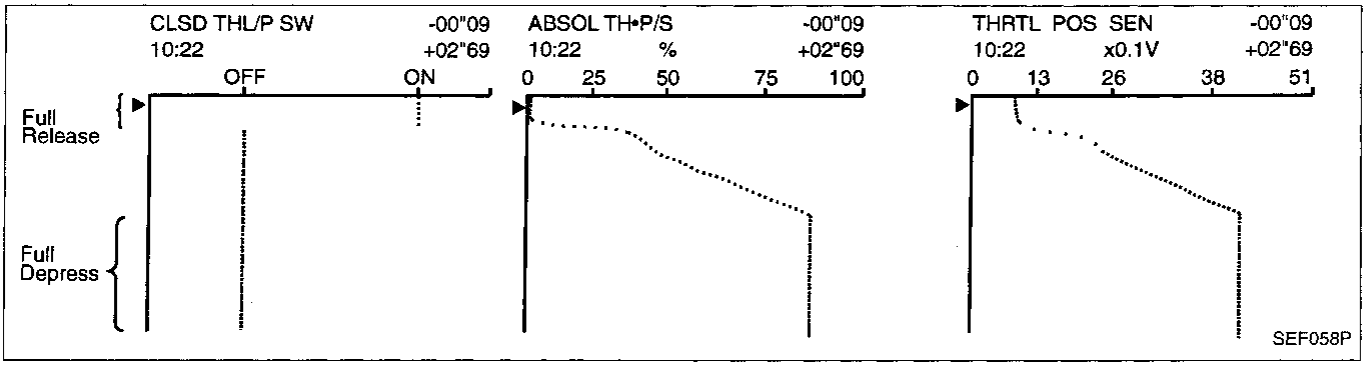
*: Any mode except OFF, ambient air temperature above 10°C (50°F)

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.)

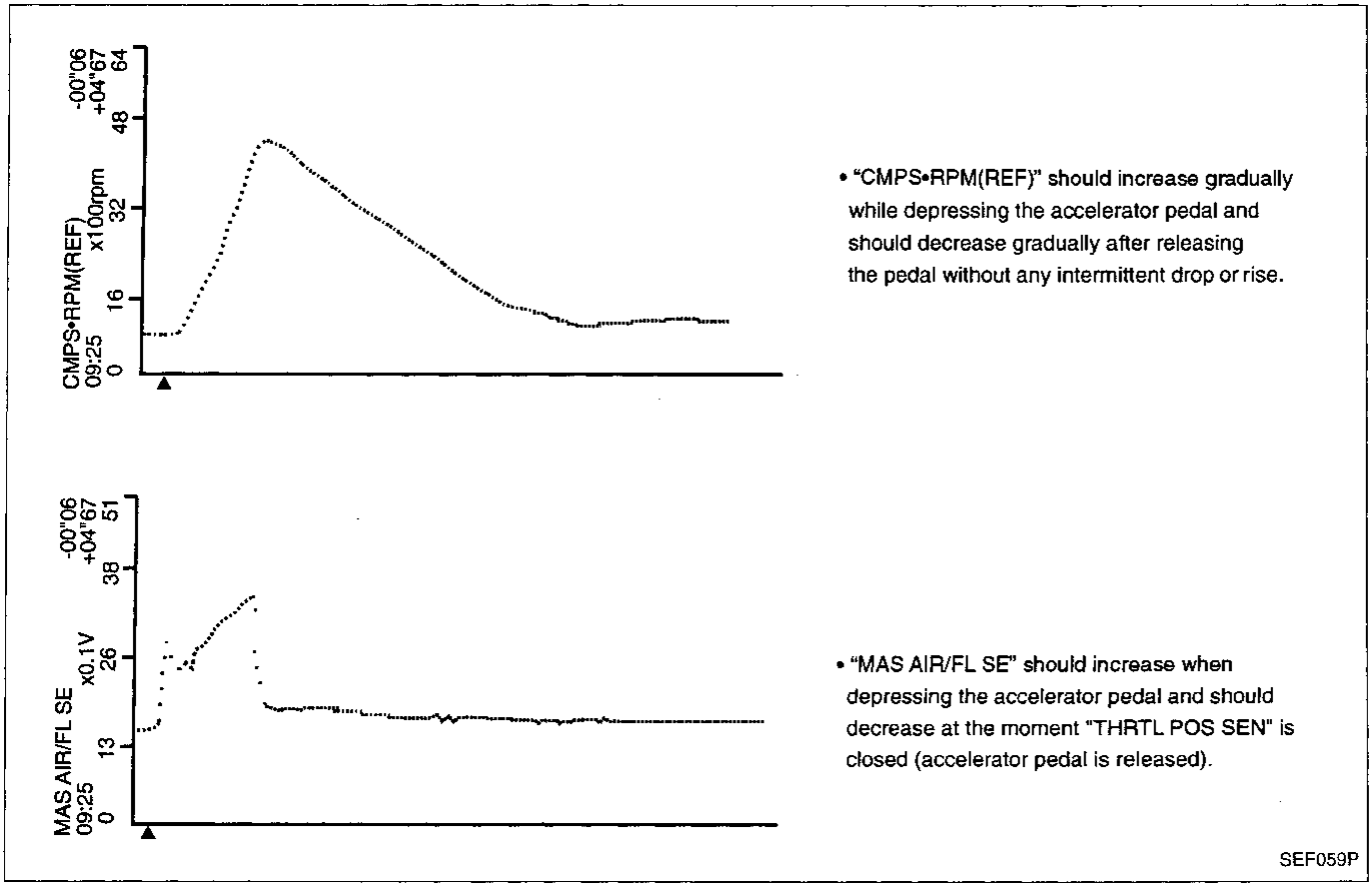
THRTL POS SEN, ABSOL TH·P/S, CLSD THL/P SW

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".

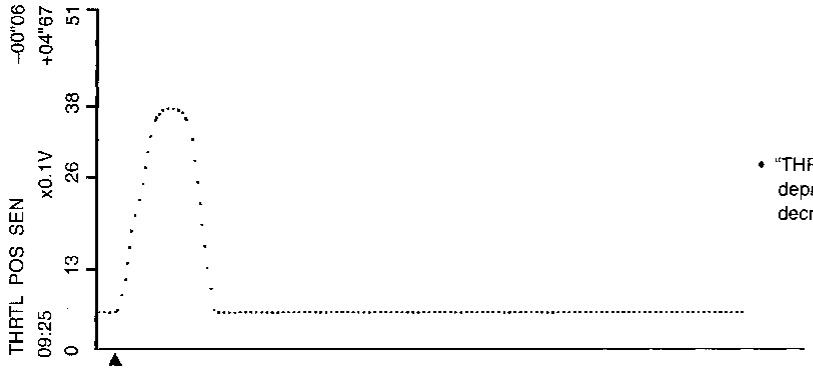


CMPS·RPM (REF), MAS AIR/FL SE, THRTL POS SEN, RR O2 SENSOR, FR O2 SENSOR, INJ PULSE

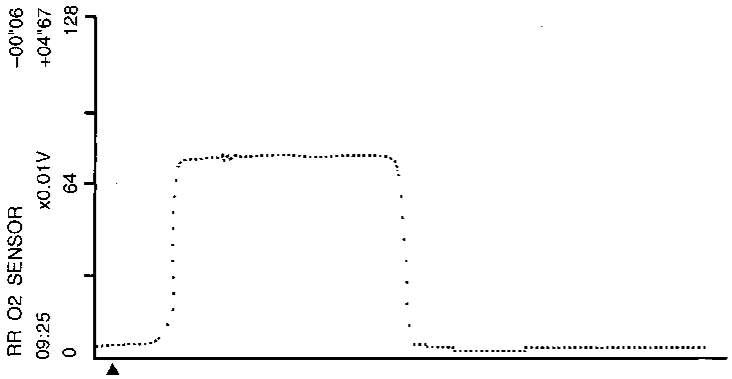
Below is the data for "CMPS·RPM (REF)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SENSOR", "FR O2 SENSOR" and "INJ PULSE" when revving quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



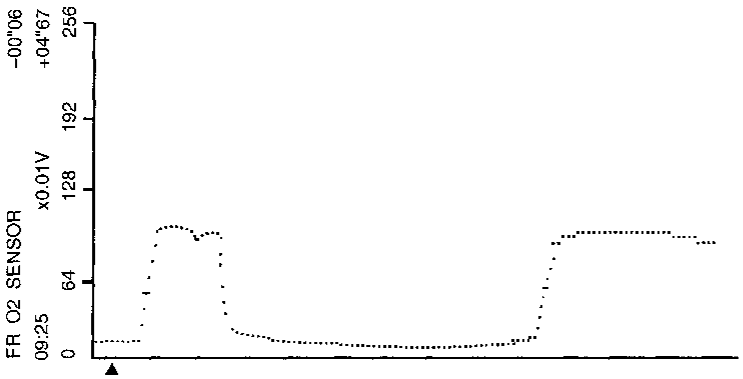
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



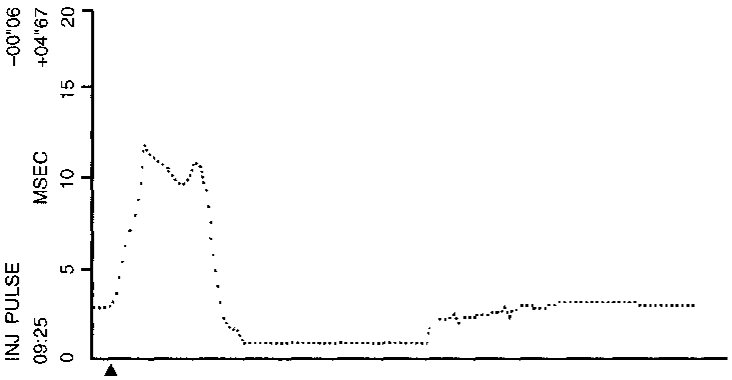
• "THRTL POS SEN" should increase while depressing the accelerator pedal and should decrease while releasing it.



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

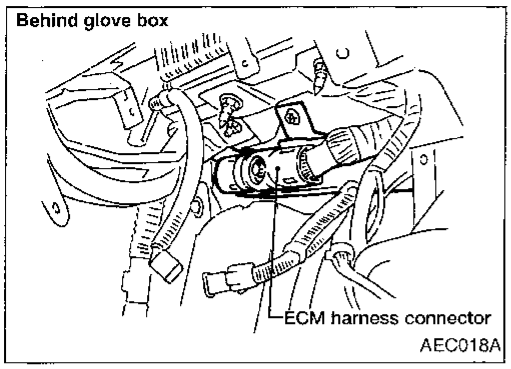


• "FR O2 SENSOR" may increase immediately after depressing the accelerator pedal and may decrease after releasing the pedal.



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

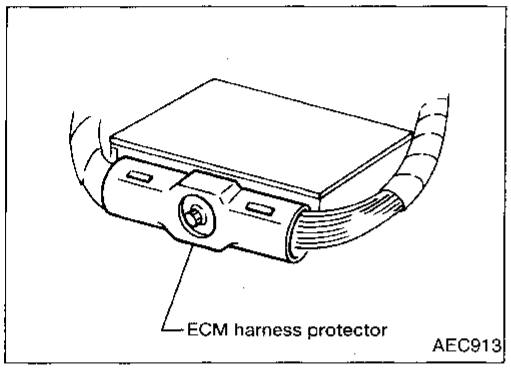
SEF417R



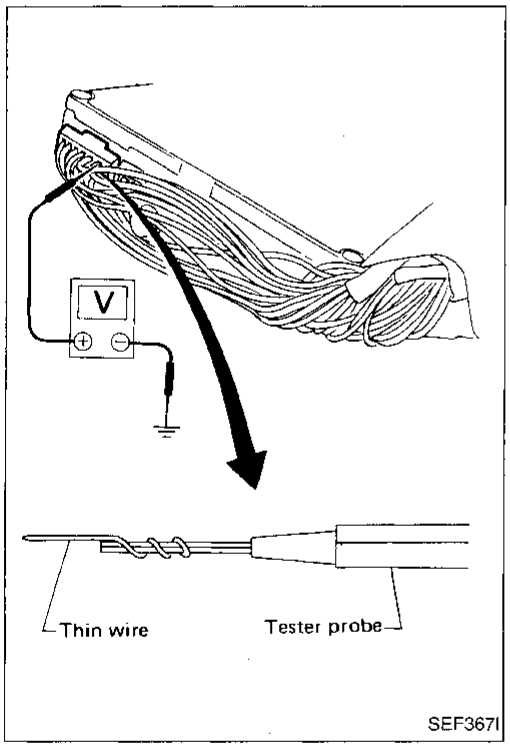
ECM Terminals and Reference Value

PREPARATION

1. ECM is located behind the glove box. For this inspection:
   - Remove glove box bucket.
   - Remove lower finisher panel by reaching through the glove box and releasing the spring clips.

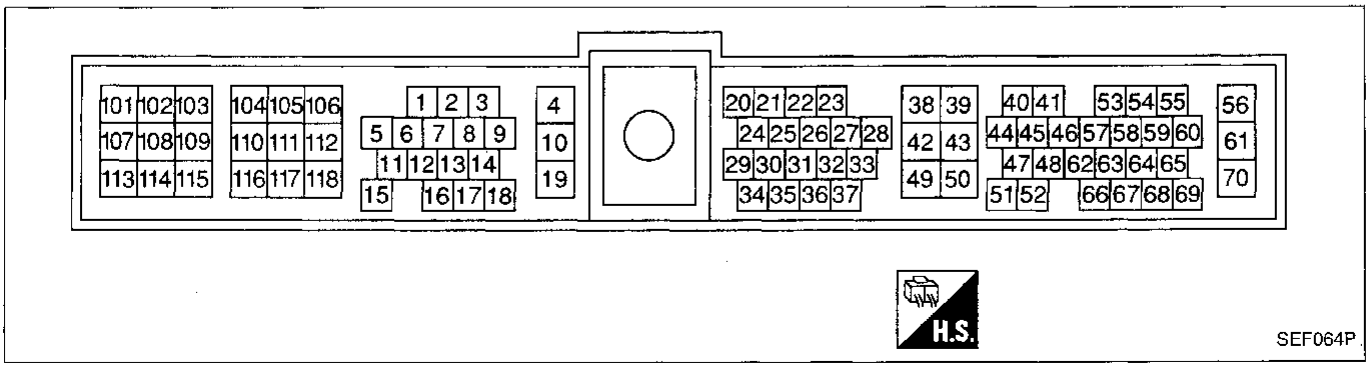


2. Remove ECM harness protector.



3. Perform all voltage measurements with the connector connected. Extend tester probe as shown to perform tests easily.
   - Open harness securing clip to make testing easier.
   - Use extreme care not to touch 2 pins at one time.
   - Data is for comparison and may not be exact.

ECM HARNESS CONNECTOR TERMINAL LAYOUT



ECM INSPECTION TABLE

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	L	Ignition signal	Engine is running. └ Idle speed	0.4 - 0.6V*
			Engine is running. └ Engine speed is 2,000 rpm	1.1 - 1.3V*
2	W	Ignition check	Engine is running. └ Idle speed	Approximately 9V*
3	G/W	Tachometer	Engine is running. └ Idle speed	0.6 - 1.6V*
4	W/G	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
7	G/B	A/T check signal	Ignition switch "ON" Engine is running.	0 - 3.0V
8	L/R	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
9	L/B	Air conditioner pressure switch	Ignition switch "ON"	Approximately 5V
10	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
13	BR/W	Cooling fan relay (High)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at high speed	0.7 - 0.8V

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

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	L/OR	Cooling fan relay (Low)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at low speed	0.7 - 0.8V
15	LG	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON"*	Approximately 0V
			Engine is running. └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
18	PU	Malfunction indicator lamp	Ignition switch "ON"	Approximately 0.7V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
20	L/B	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (8 - 12V)
21	W/R	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates)	2.0 - 2.5V
			Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
22	G/B	A/T control unit (Park/neutral position)	Ignition switch "ON" └ Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	4 - 6V
23	R	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.3 - 0.7V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
24	G/W	A/T signal No. 1	Ignition switch "ON" Engine is running. └ Idle speed	6 - 8V
25	P	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned	Approximately 0V
			Engine is running. └ Steering wheel is not being turned	Approximately 5V

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

ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
26	G/Y	Vehicle speed sensor	Engine is running. └ Slowly rotating front wheels	Approximately 5.0 - 6.0V* (AC voltage)
28	Y/G	Intake air temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with intake air temperature.
29	W	A/T signal No. 2	Ignition switch "ON" Engine is running. └ Idle speed	6 - 8V
30	G/Y	A/T signal No. 3	Ignition switch "ON"	0V
33	R/G	Throttle position sensor signal (To A/T control unit)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0.4V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
38	L/Y	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
39	B/R	ECCS ground	Engine is running. └ Idle speed	Engine ground
40	G/B	Camshaft position sensor (Reference signal)	Engine is running. └ Idle speed	0.2 - 0.5V*
44	G/B			
43	B/R	ECCS ground	Engine is running. └ Idle speed	Engine ground (Probe this terminal with ⊖ tester probe when measuring.)
41	G/Y	Camshaft position sensor (Position signal)	Engine is running. └ Idle speed	2.0 - 3.0V*
45	G/Y			
46	LG	Front heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V (periodically change)
47	W/L	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 2,000 rpm	1.7 - 2.1V
48	OR/L	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V
49	BR	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B/Y	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V

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

ECM Terminals and Reference Value (Cont'd)

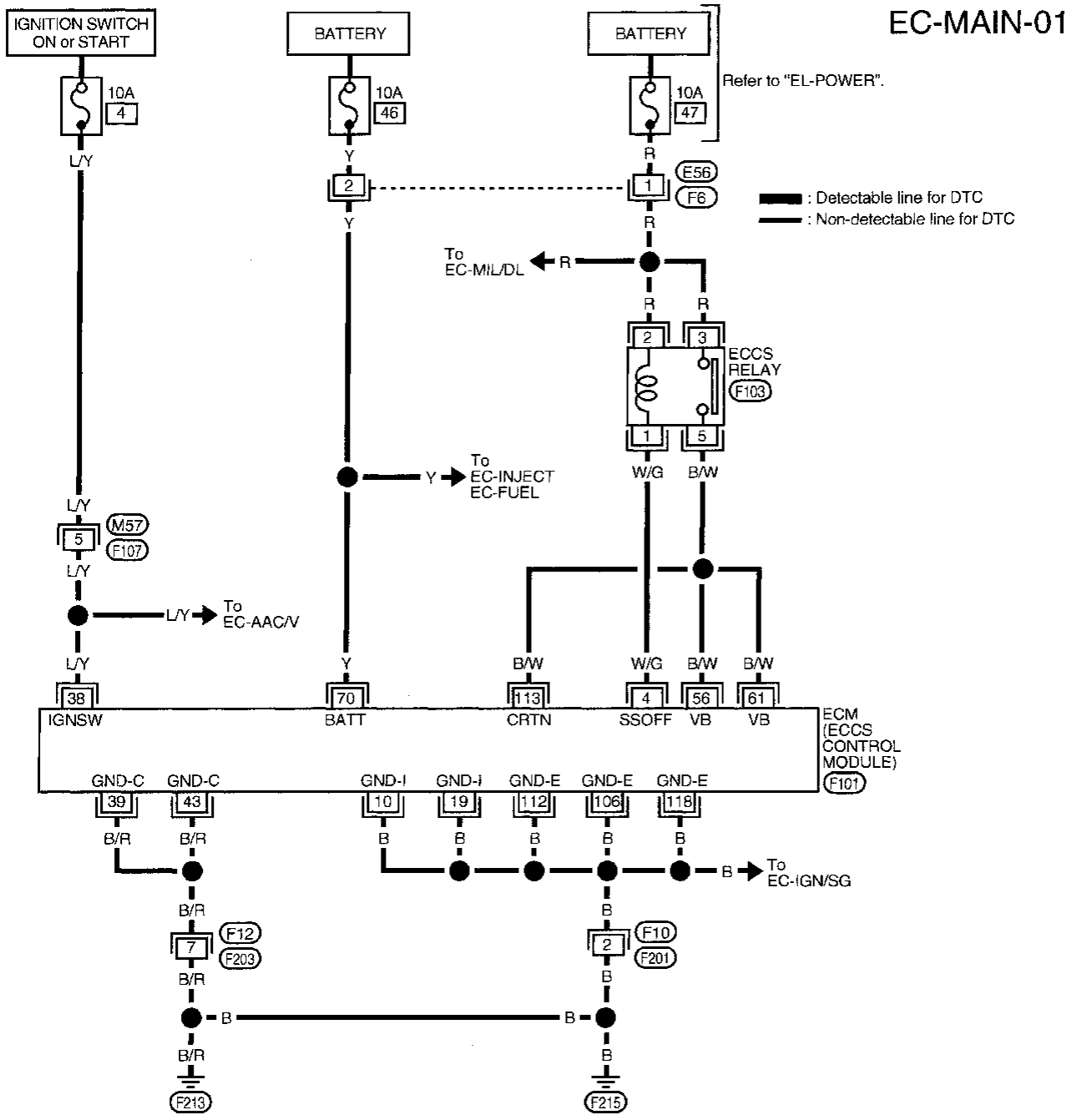
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
51	LG/R	Engine coolant temperature sensor	Engine is running.	Approximately 0 - 4.8V Output voltage varies with engine coolant temperature.
52	W	Rear heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V
53	LG	Crankshaft position sensor (OBD)	Engine is running. (in "N" position) └ Idle speed (Air conditioner switch "OFF")	More than 0.4V* (AC voltage)
54	W	Knock sensor	Engine is running. └ Idle speed	Approximately 2.5V
55	SB	IACV-AAC valve	Engine is running. └ Idle speed	8 - 11V
			Engine is running. ├ Rear window defogger is operating ├ Steering wheel is being turned ├ Air conditioner is operating └ Headlamps are in high position	4 - 7V
56	B/W	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
61	B/W			
58	Y/G	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected)	6 - 10V
62	W/PU	EGR temperature sensor	Engine is running. (Warm-up condition) └ Idle speed	Less than 4.5V
			Engine is running. (Warm-up condition) └ EGR system is operating	0 - 1.5V
64	Y/R	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
65	Y/B			Approximately 4 - 9V
68	Y/L			Approximately 3.5V*
70	Y	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
102	G/OR	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
104	G/R	Injector No. 3		
107	G	Injector No. 2		
109	Y/PU	Injector No. 4		
111	Y/G	Injector No. 5		
114	GY/L	Injector No. 6		

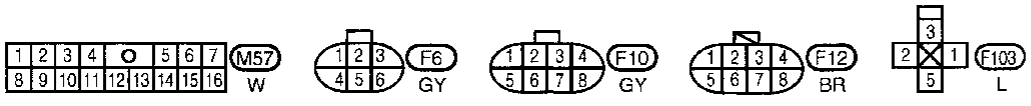
*: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

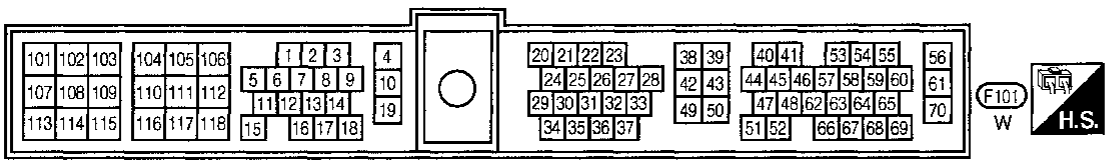
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
103	GY	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) — Properly raise drive wheels off the ground — Set A/T selector lever in "D" position — Engine speed is 2,000 rpm [Vehicle speed is over 8 km/h (5 MPH)]	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) — Engine speed is above 3,200 rpm — Idle speed	0.8 - 0.9V
106	B	ECCS ground	Engine is running. — Idle speed	Engine ground
112	B	ECCS ground	Engine is running. — Idle speed	Engine ground
113	B/W	Current return	Engine is running. — Idle speed	BATTERY VOLTAGE (11 - 14V)
115	B	Front heated oxygen sensor heater	Engine is running. — Engine speed is below 4,200 rpm	Approximately 0.2V
			Engine is running. — Engine speed is above 4,200 rpm	BATTERY VOLTAGE (11 - 14V)
116	Y	Rear heated oxygen sensor heater	Engine is running. — Engine speed is below 6,350 rpm	Approximately 0.2V
			Ignition switch "ON" — Engine is stopped	BATTERY VOLTAGE (11 - 14V)
118	B	ECCS ground	Engine is running. — Idle speed	Engine ground

Main Power Supply and Ground Circuit







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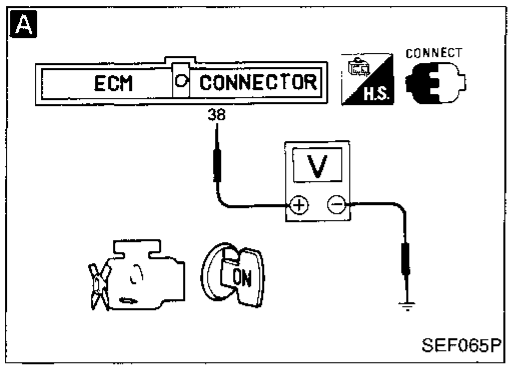
Main Power Supply and Ground Circuit (Cont'd)

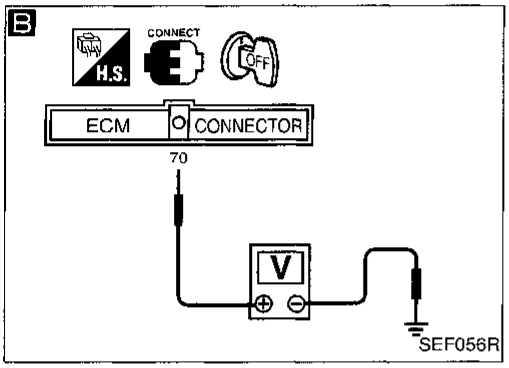
ECM TERMINALS AND REFERENCE VALUE

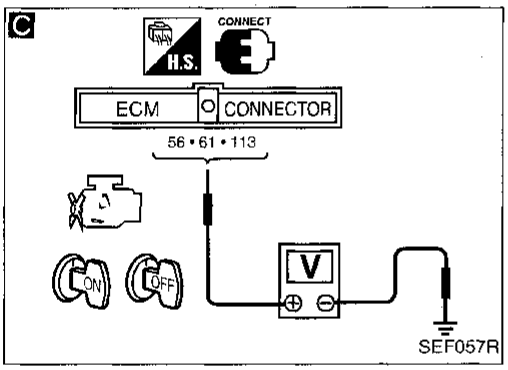
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

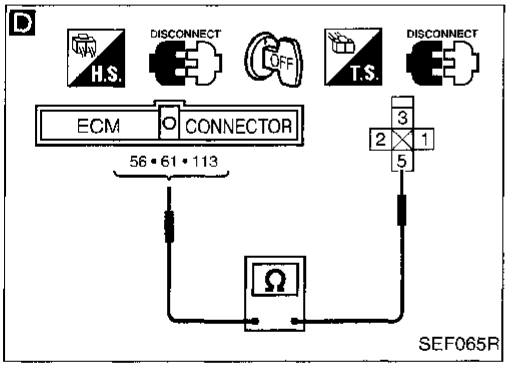
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
4	W/G	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)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

Main Power Supply and Ground Circuit (Cont'd)









INSPECTION START

Start engine.
Is engine running?

No → **A**

CHECK POWER SUPPLY-I.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminal (38) and ground with CONSULT or tester.
   Voltage: Battery voltage

If NG, check the following.
- Harness connectors (M57), (F107)
- 10A fuse
- Harness for open or short between ECM and fuse

If NG, repair harness or connectors.

OK → Go to H "CHECK GROUND CIRCUIT" on next page.

Yes

B

CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM terminal (70) and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E56), (F6)
- 10A fuse
- Harness for open or short between ECM and battery

If NG, repair harness or connectors.

OK

C

CHECK POWER SUPPLY-III.
1. Turn ignition switch "ON" and then "OFF".
2. Check voltage between ECM terminals (56), (61), (113) and ground with CONSULT or tester.
   Voltage:
   After turning ignition switch "OFF", battery voltage will exist for a few seconds, then drop to approximately 0V.

OK → Go to H "CHECK GROUND CIRCUIT" on next page.

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

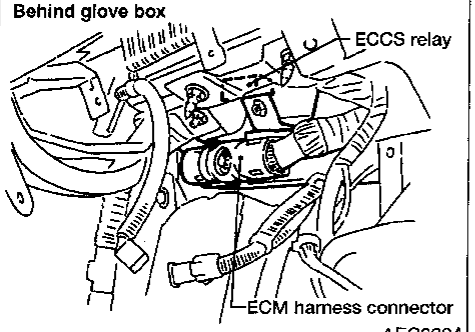
NG

Case-1 → (A) (Go to next page.)

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

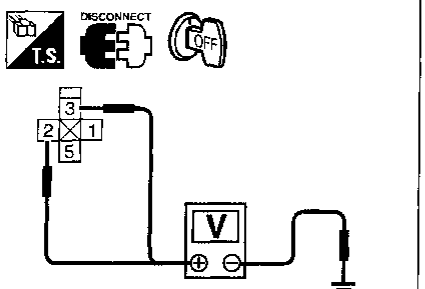
Main Power Supply and Ground Circuit (Cont'd)

D Behind glove box



AEC023A

E



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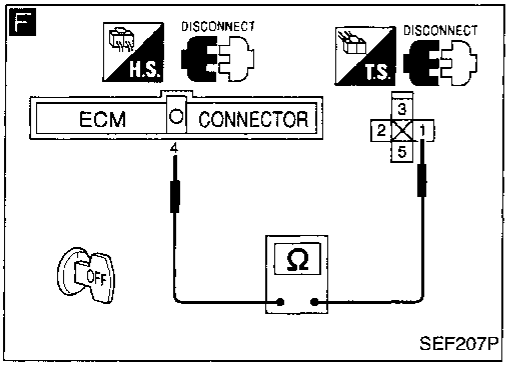
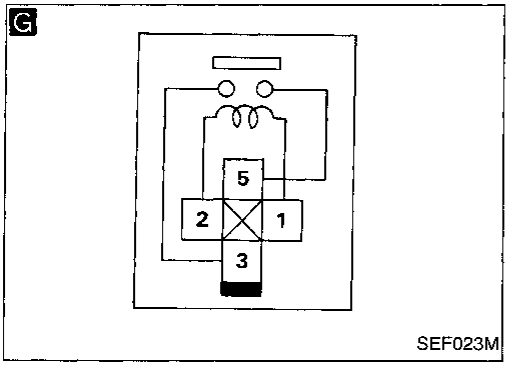
F



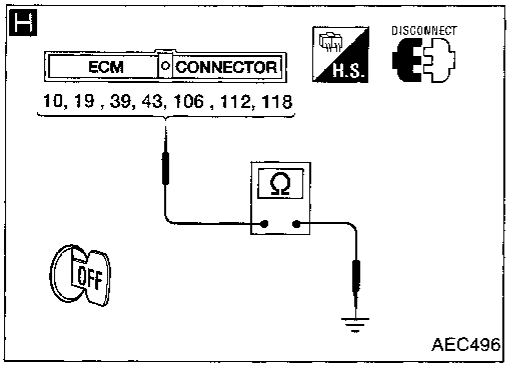
SEF207P

G



SEF023M

H



AEC496

(A)

D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay harness connector. (ECCS relay is mounted on top of ECM.)
3. Check harness continuity between ECM terminals (56), (61), (113) and relay 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 relay terminals (2), (3) and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (E56), (F6)
- 10A fuse
- 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 relay 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), (112), (118) and engine ground.

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

NG → Check the following.
- Harness connectors (F10), (F201)
- Harness connectors (F12), (F203)
- Harness for open or short between ECM and ground

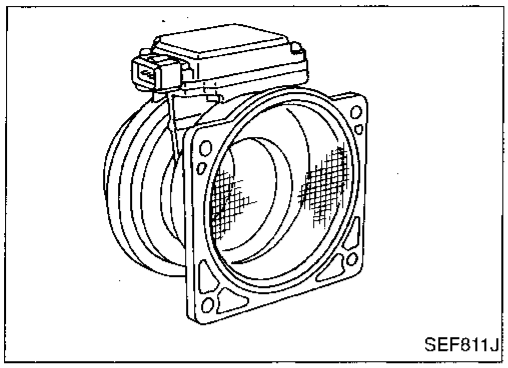
If NG, repair harness or connectors.

OK ↓

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

↓

INSPECTION END


SEF811J

Mass Air Flow Sensor (MAFS)

COMPONENT DESCRIPTION

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

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)
47	W/L	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 2,000 rpm	1.7 - 2.1V
48	OR/L	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

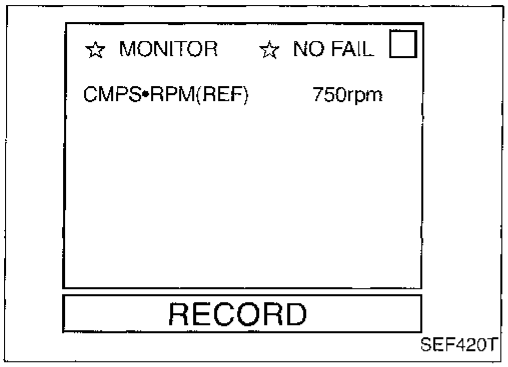
MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No load	Idle	1.0 - 1.7V
		2,000 rpm	1.4 - 2.2V
CAL/LD VALUE	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	18.2 - 38.0%
		2,500 rpm	14.8 - 33.5%
MASS AIR FLOW	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	3.2 - 6.7 gm/s
		2,500 rpm	8.7 - 21.9 gm/s

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0100 0102	A) An excessively high or low voltage from the sensor is sent to ECM.* ..... B), C) Voltage sent to ECM is not practical when compared with the camshaft position sensor and throttle position sensor signals.	● Harness or connectors (The sensor circuit is open or shorted.) ● Mass air flow sensor

*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up. (Refer to EC-71.)

Engine operating condition in fail-safe mode
Engine speed will not rise more than 2,400 rpm due to the fuel cut.



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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If 1st trip DTC cannot be confirmed, perform "Procedure for malfunction B". If 1st trip DTC still cannot be confirmed, perform "OVERALL FUNCTION CHECK", "Procedure for malfunction C".

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.

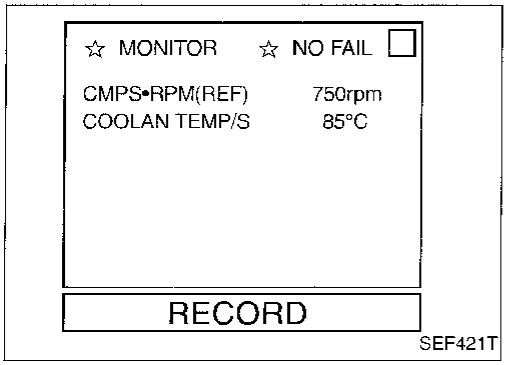
OR

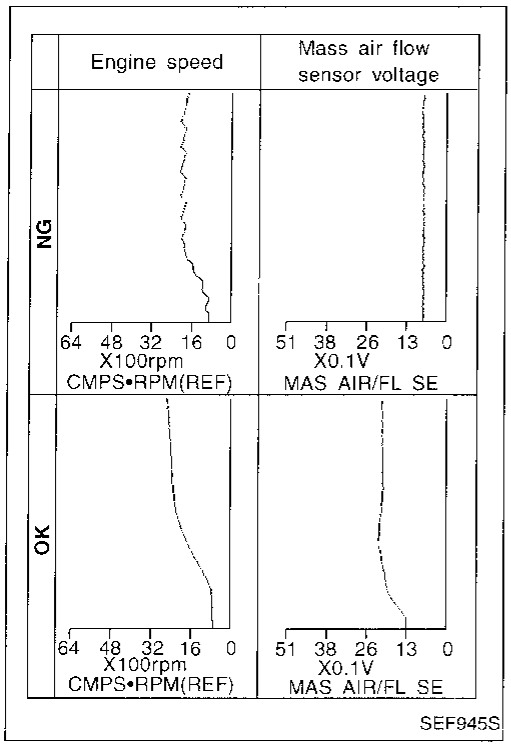
1) Turn ignition switch "ON", and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Select "MODE 7" with GST.

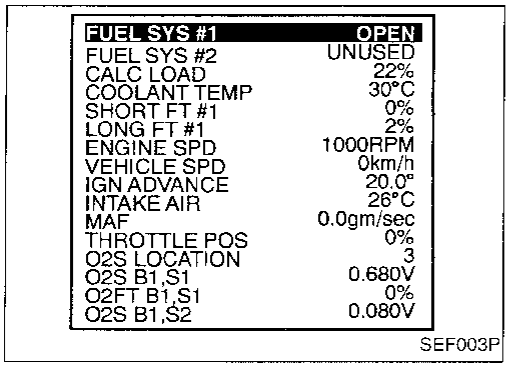
OR

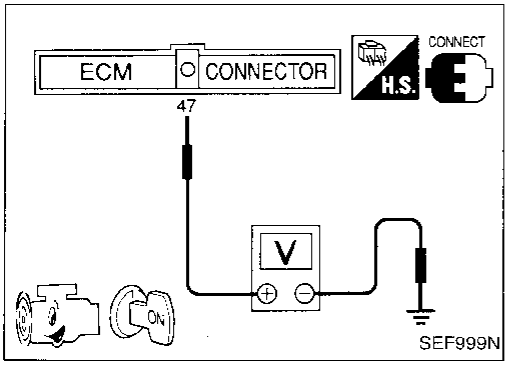
1) Turn ignition switch "ON", and wait at least 6 seconds.
2) Start engine and wait at least 3 seconds.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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









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 5 seconds and then turn "ON".
5) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

OVERALL FUNCTION CHECK

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

Procedure for malfunction 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.

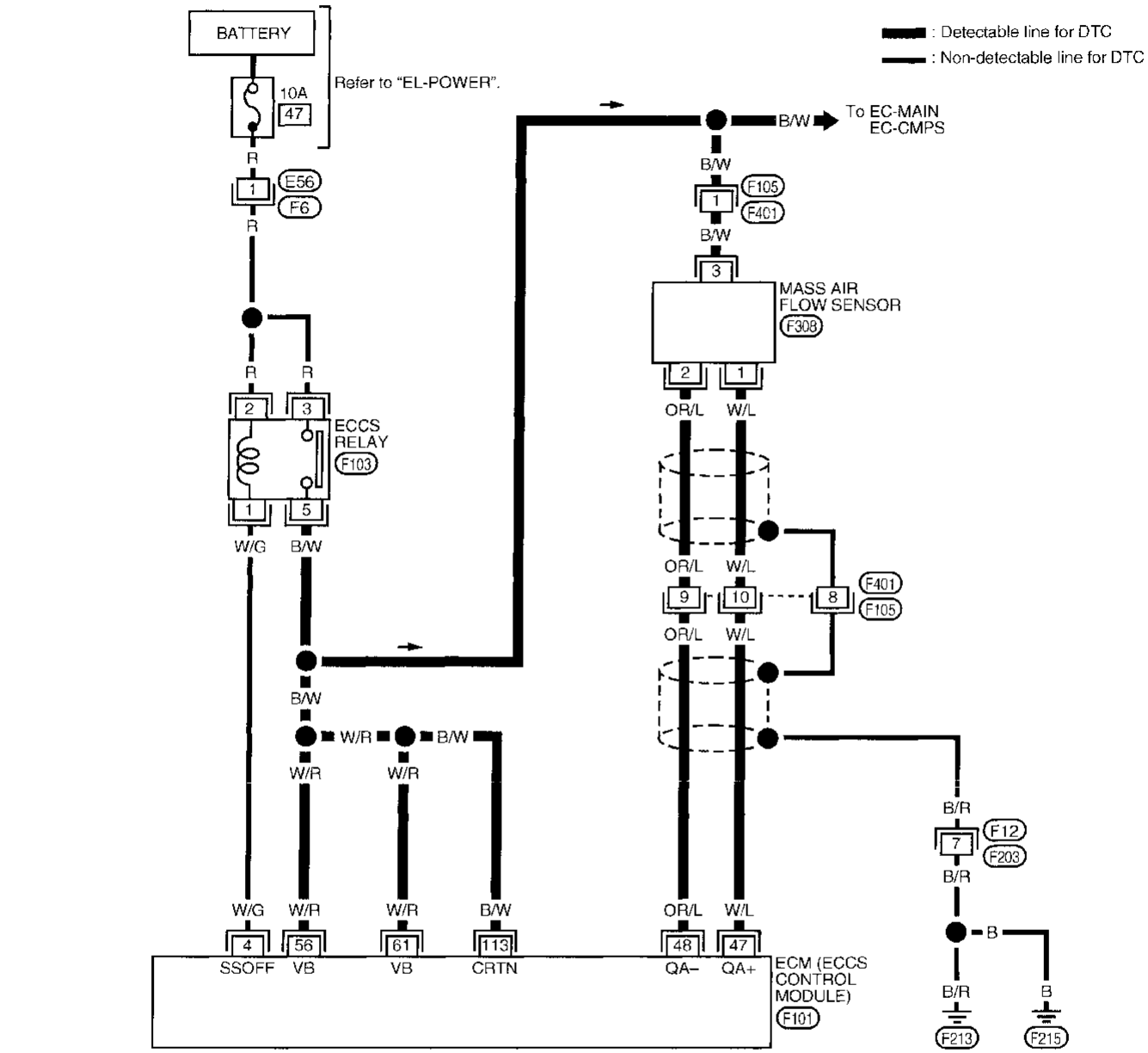
OR

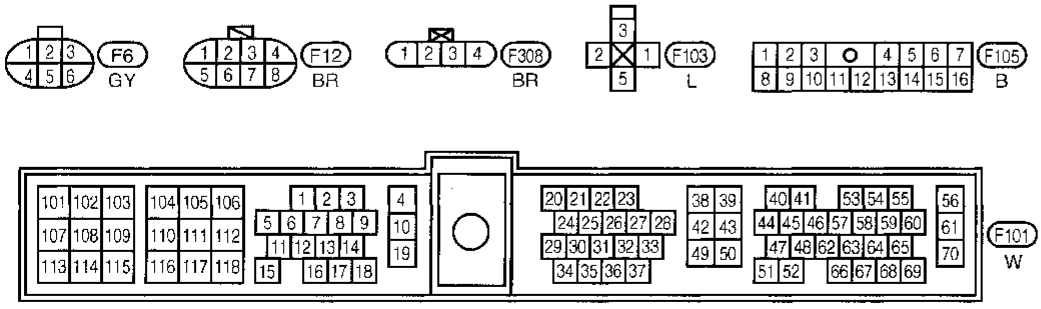
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Select "MODE 1" with GST.
4) Check the mass air flow with "MODE 1".
5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.

OR

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.

EC-MAFS-01





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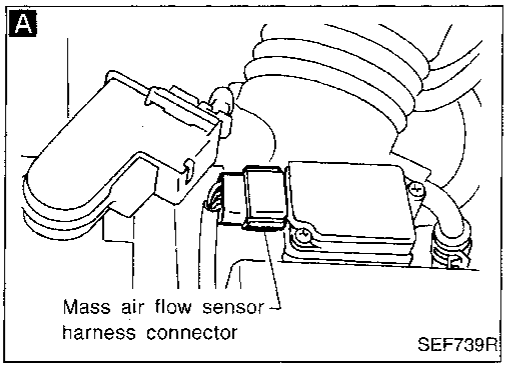
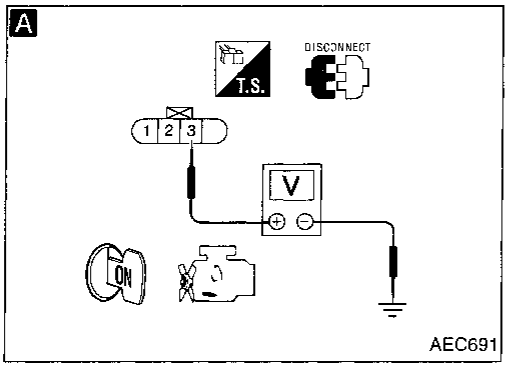
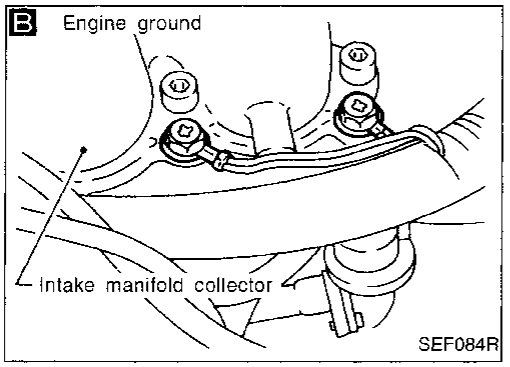
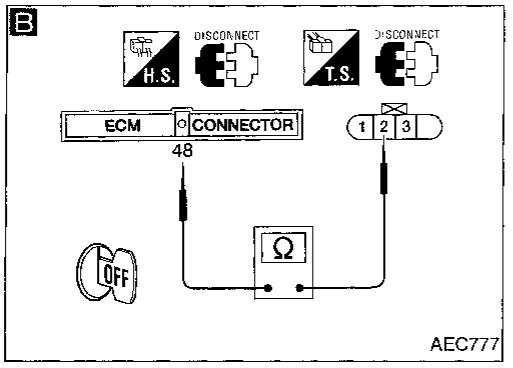
Mass Air Flow Sensor (MAFS) (Cont'd)

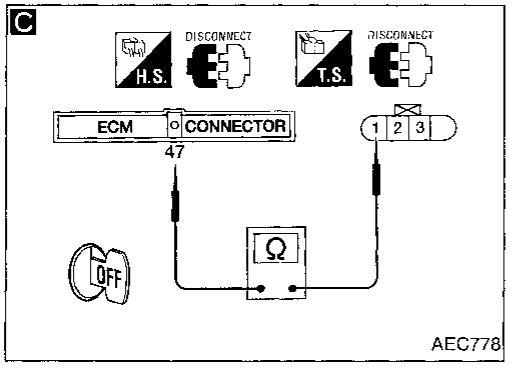
DIAGNOSTIC PROCEDURE











INSPECTION START

A

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

NG → Check the following.
- Harness connectors (F105), (F401)
- Harness for open or short between ECCS relay and mass air flow sensor
- Harness for open or short between ECM and mass air flow sensor

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Loosen and retighten engine ground screws.
4. Check harness continuity between terminal ② and ECM terminal ㊽.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F105), (F401)
- Harness for open or short between ECM and mass air flow sensor

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ① and ECM terminal ㊼.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (F105), (F401)
- Harness for open or short between ECM and mass air flow sensor

If NG, repair harness or connectors.

OK ↓

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

NG → Replace mass air flow sensor.

OK ↓

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

Trouble is not fixed. ↓

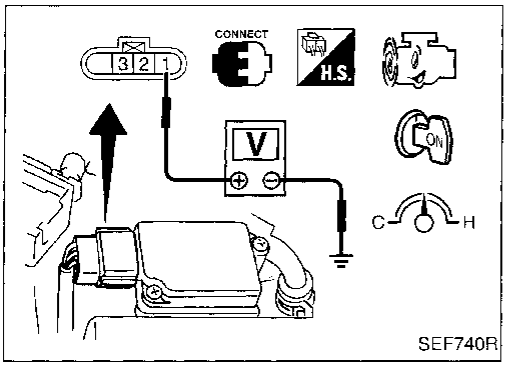
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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

COMPONENT INSPECTION

Mass air flow sensor



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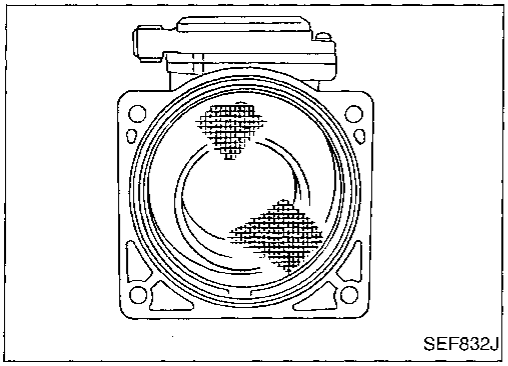
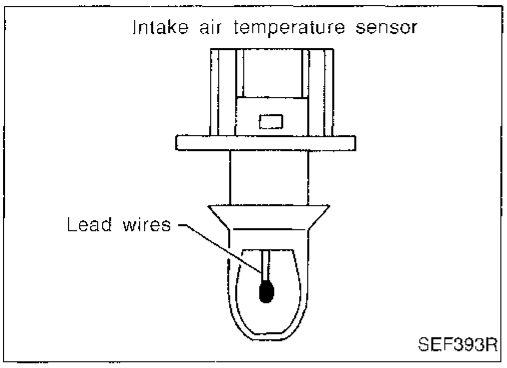

SEF832J

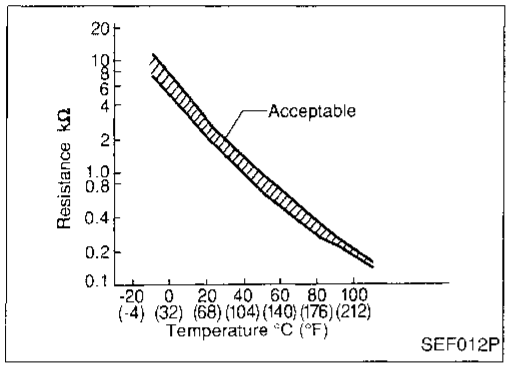
1. Turn ignition switch "ON".
2. Start engine and warm it up sufficiently.
3. Check voltage between terminal ① and ground.

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

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

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





Intake Air Temperature Sensor

COMPONENT DESCRIPTION

The intake air temperature sensor is mounted to the air duct housing. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.
This sensor is not used to control the engine system. It is used only for the on board diagnosis.

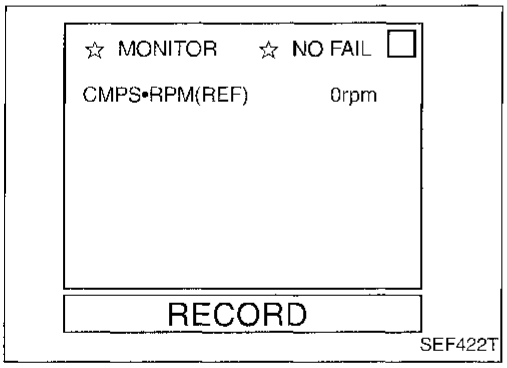
⟨Reference data⟩

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



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Perform "Procedure for malfunction A" first. If 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) Wait at least 5 seconds.

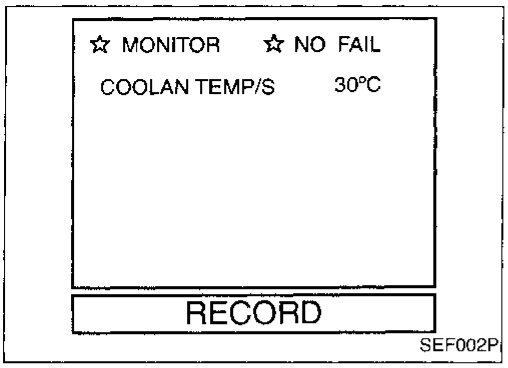
OR

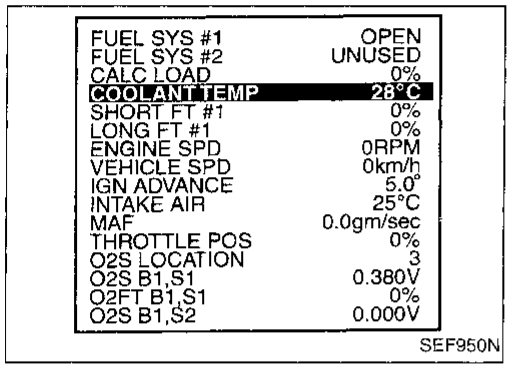
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select MODE 7 with GST.

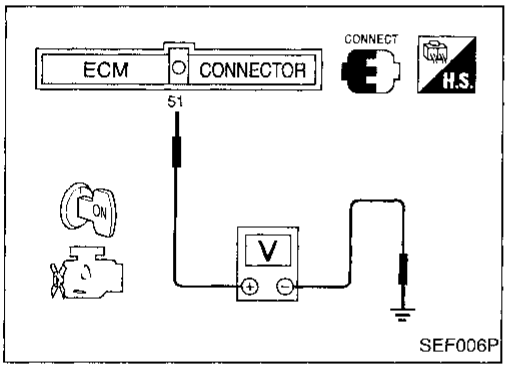
OR

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

Intake Air Temperature Sensor (Cont'd)







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 - 80 km/h (43 - 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 - 80 km/h (43 - 50 MPH) for 2 minutes.
6) Select MODE 7 with GST.

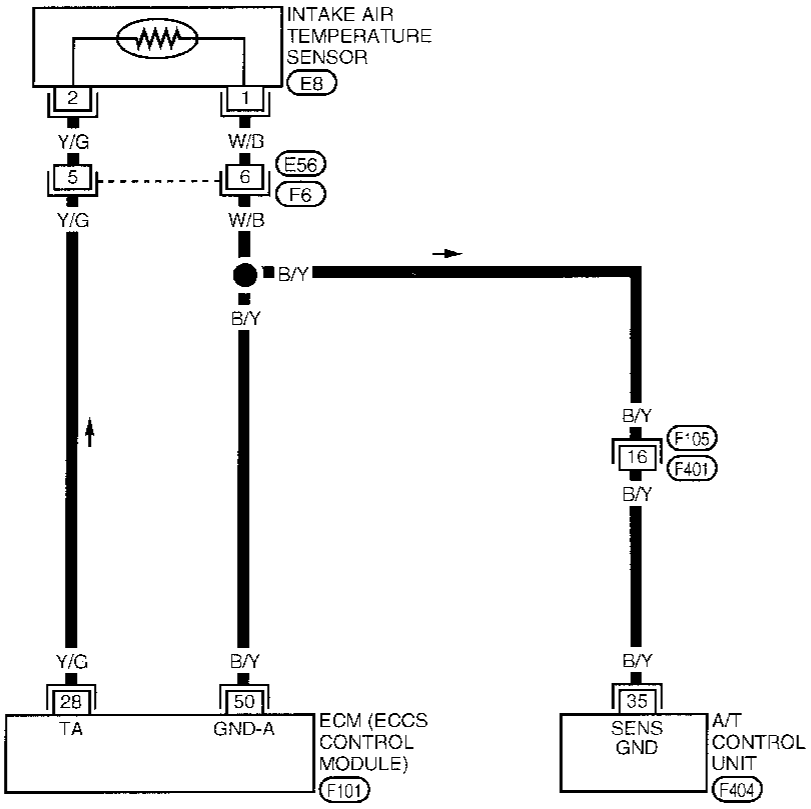
OR

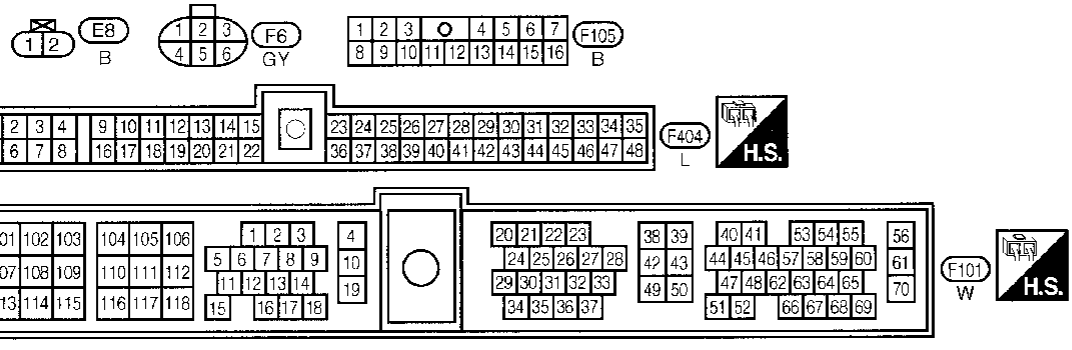
1) Lift up vehicle and open engine hood.
2) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Check voltage between ECM terminal ⑤① and ground.
   Voltage: More than 1.0 (V)
   (c) If the voltage is not more than 1.0 (V), turn ignition switch "OFF" 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 - 80 km/h for 2 minutes.
6) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
7) Perform diagnostic test mode II (Self-diagnostic results) with ECM.

EC-IATS-01

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

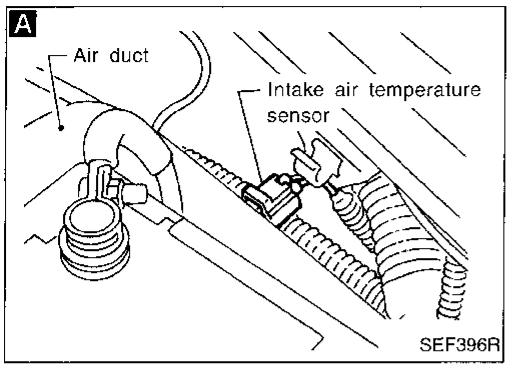


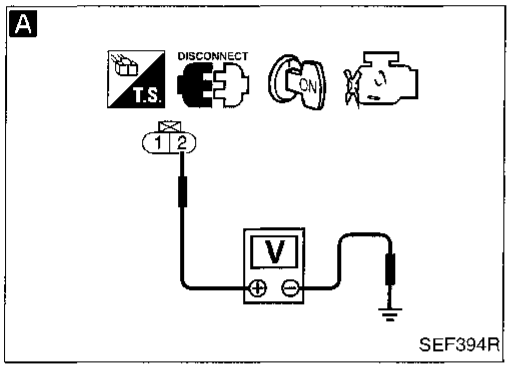


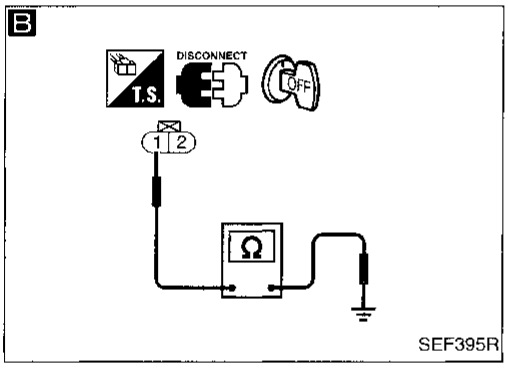
AEC175A

Intake Air Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness for open or short between ECM and intake air temperature sensor
- Harness connectors (E56), (F6)

If NG, repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- Harness for open or short between ECM and intake air temperature sensor
- Harness for open or short between A/T control unit and intake air temperature sensor
- Harness connectors (E56), (F6)
- Harness connectors (F105), (F401)

If NG, repair harness or connectors

OK ↓

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

NG → Replace intake air 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.

↓

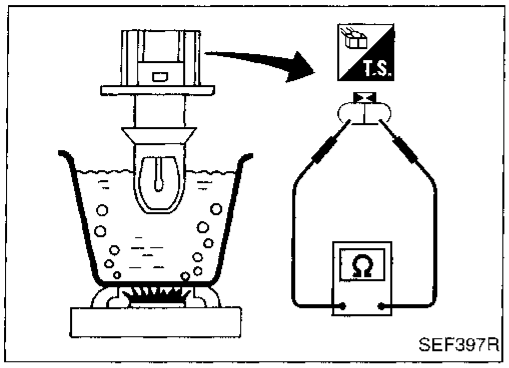
INSPECTION END

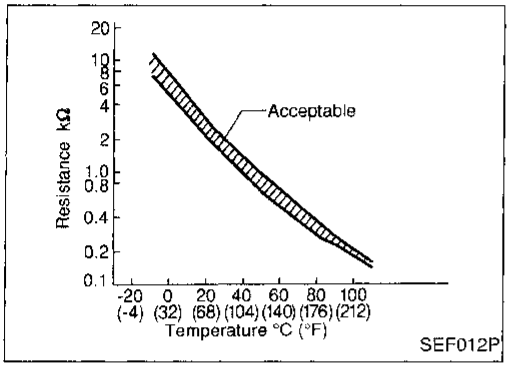
Intake Air Temperature Sensor (Cont'd)

COMPONENT INSPECTION

Intake air temperature sensor

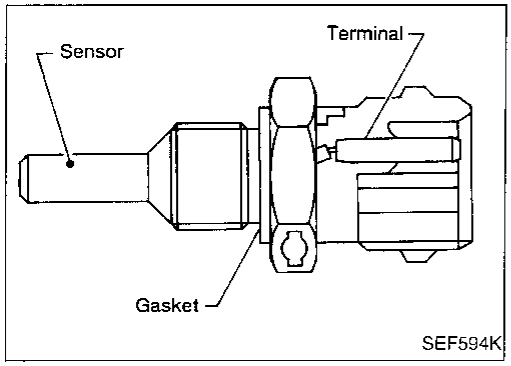
Check resistance as shown in the figure.

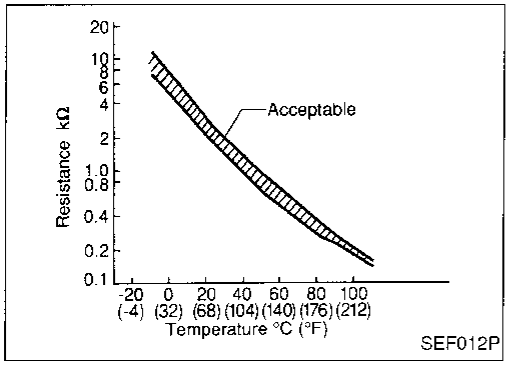




⟨Reference data⟩

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





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

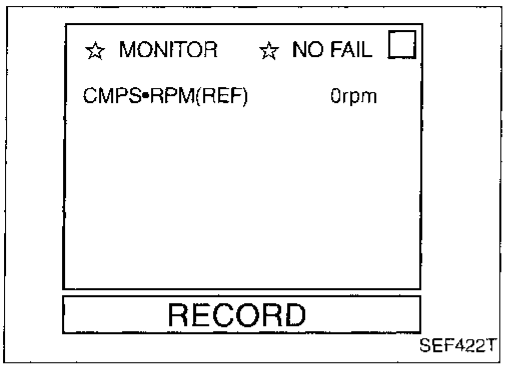
ON BOARD DIAGNOSIS LOGIC

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

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

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)



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.

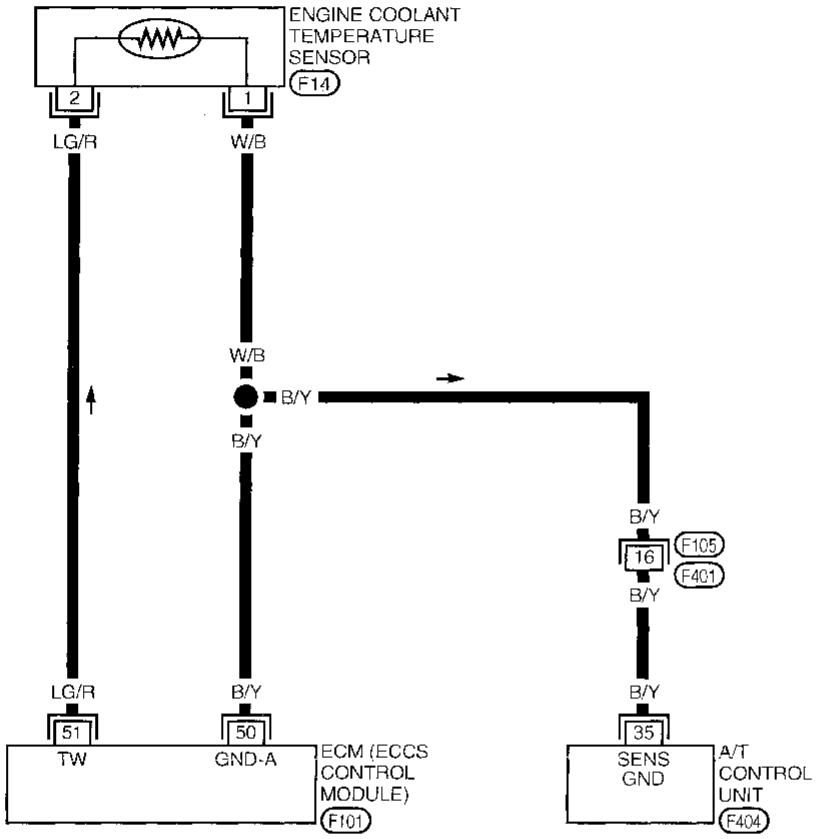
OR

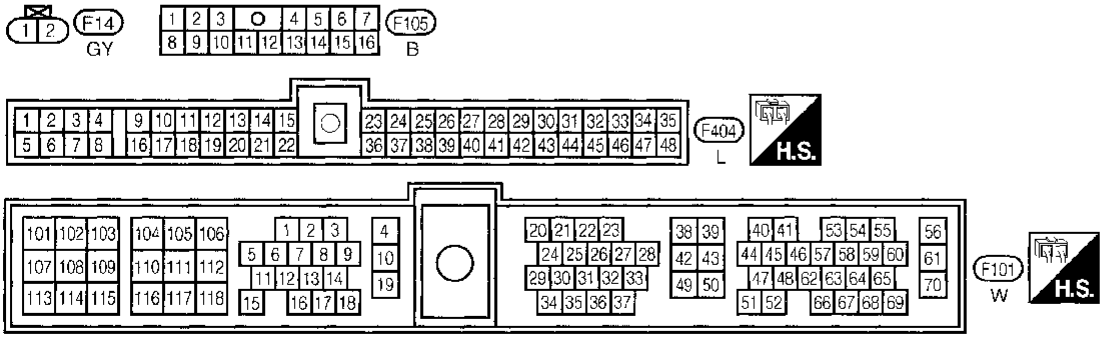
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-ECTS-01

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

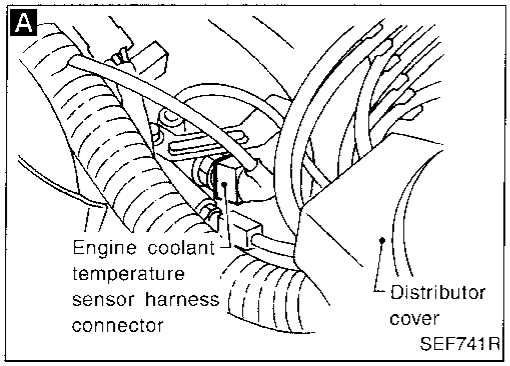


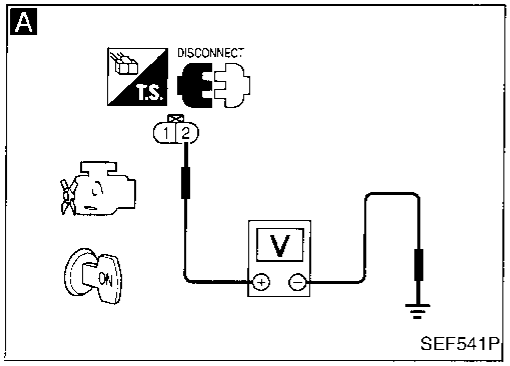


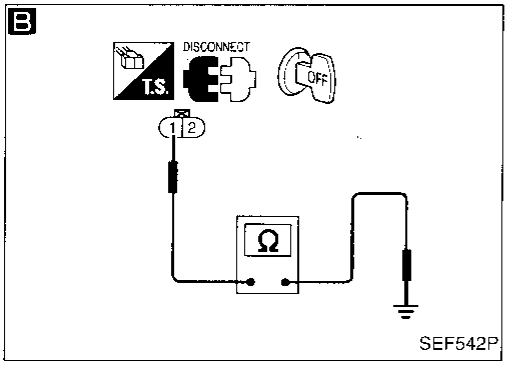
AEC176A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

Voltage:
Approximately 5V

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

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ① and engine ground.

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

NG → Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness for open or short between A/T control unit and engine coolant temperature sensor
- Harness connectors (F105), (F401)

If NG, repair harness or connectors.

OK

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

NG → Replace engine coolant temperature sensor.

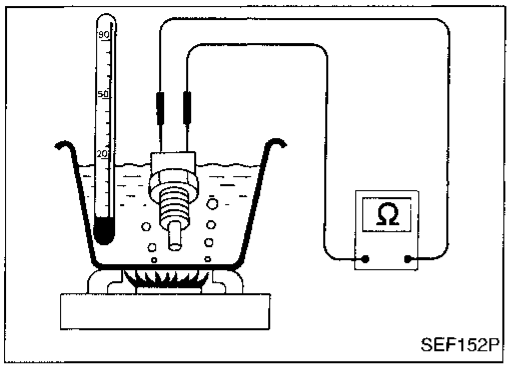
OK

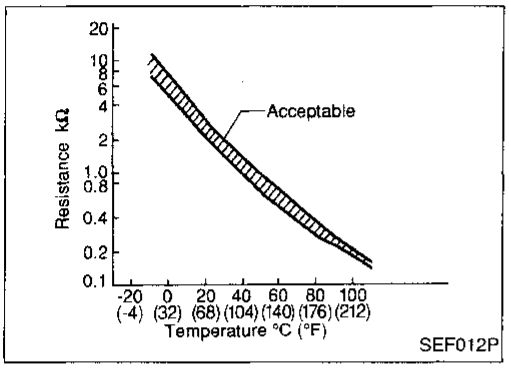
Disconnect and reconnect harness connectors in the circuits. Then retest.

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





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

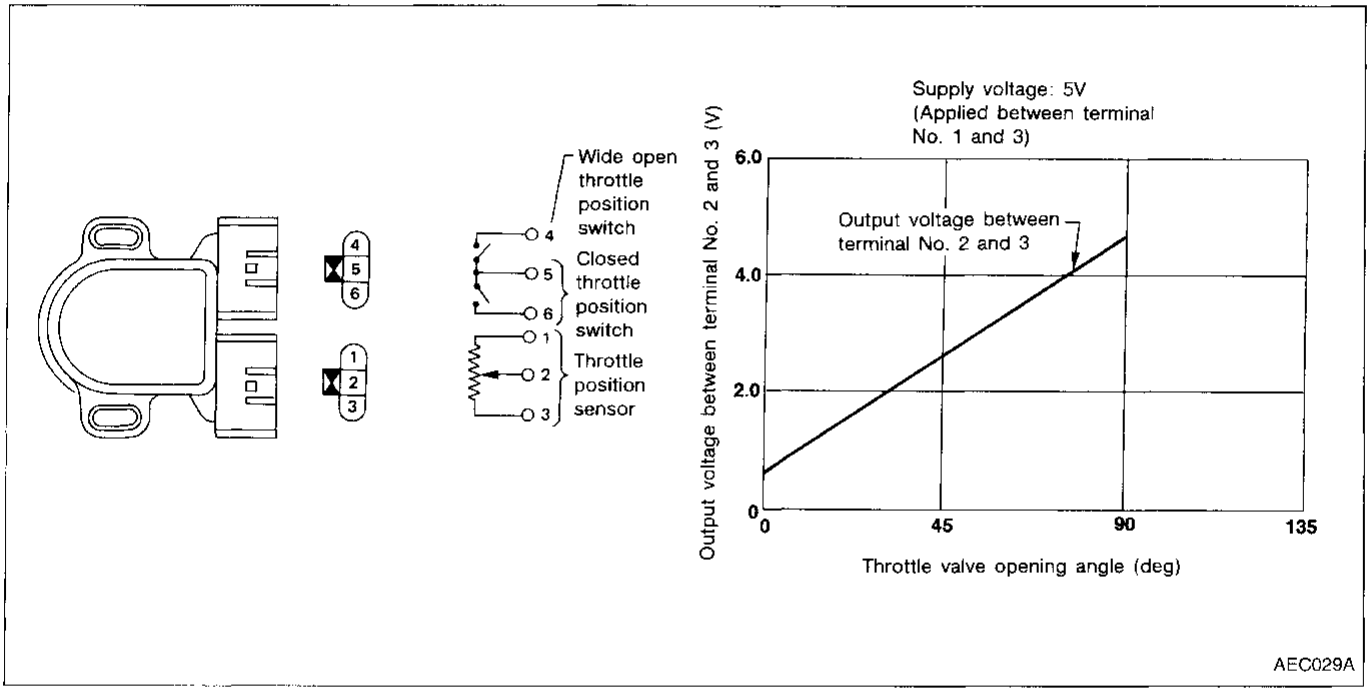
If NG, replace engine coolant temperature sensor.

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 sensor controls engine operation such as fuel cut. On the other hand, the "Wide open and closed throttle position switch", which is built into the throttle position sensor unit, is not used for engine control.



Throttle Position Sensor (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)
23	R	Throttle position sensor	Ignition switch "ON" └ Accelerator pedal released	0.3 - 0.7V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
33	R/G	Throttle position sensor signal (To A/T control unit)	Ignition switch "ON" └ Accelerator pedal released	Approximately 0.4V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
49	BR	Throttle position sensor power supply	Ignition switch "ON"	Approximately 5V
50	B/Y	Sensors' ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.3 - 0.7V
		Throttle valve fully open	Approx. 4.0V
CLSD THL/P SW	● Ignition switch: ON (Engine stopped)	Throttle valve: Idle position	ON
		Throttle valve: Slightly open	OFF
ABSOL TH·P/S	● Ignition switch: ON (Engine stopped)	Throttle valve fully closed	0.0%
		Throttle valve fuliy open	Approx. 88%

ON BOARD DIAGNOSIS LOGIC

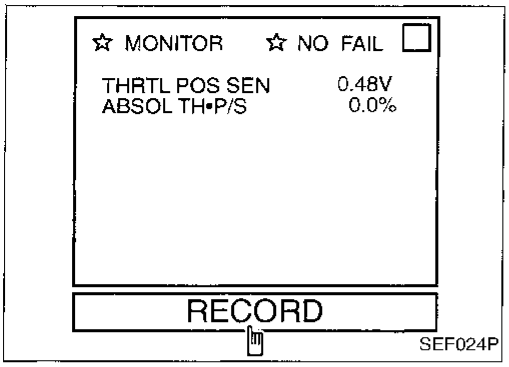
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	● An excessively low or high voltage from the sensor is sent to ECM.* ● An incorrect voltage, compared with the signals from mass air flow sensor, camshaft position sensor and IACV-AAC valve, is sent to ECM.	● Harness or connectors (The sensor circuit is open or shorted.) ● Throttle position sensor

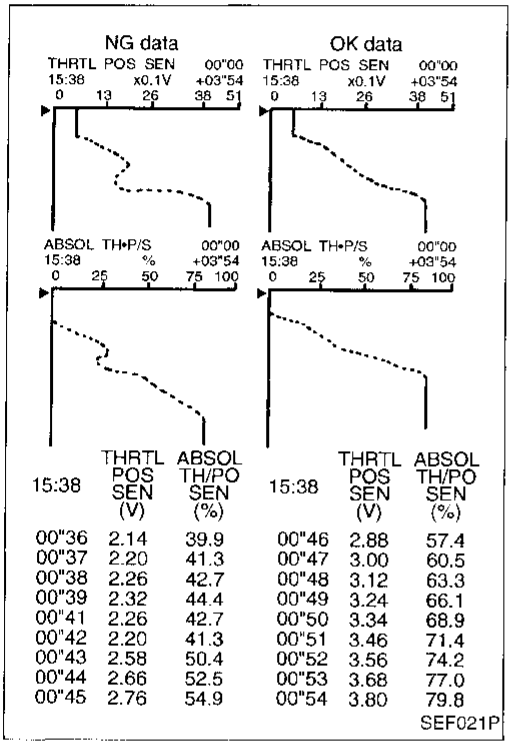
*: When this malfunction is detected, the ECM enters fail-safe mode and the MIL lights up.

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.

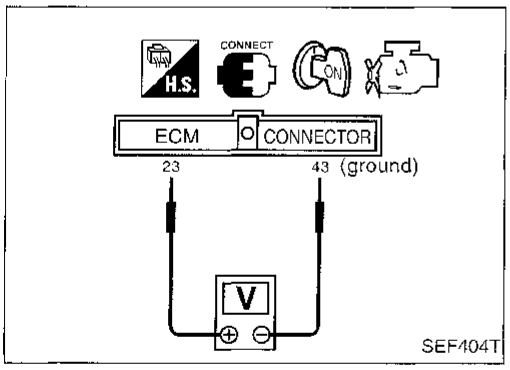
Condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

Throttle Position Sensor (Cont'd)





15:38	THRTL POS SEN (V)	ABSOL TH/PO SEN (%)	15:38	THRTL POS SEN (V)	ABSOL TH/PO SEN (%)
00"36	2.14	39.9	00"46	2.88	57.4
00"37	2.20	41.3	00"47	3.00	60.5
00"38	2.26	42.7	00"48	3.12	63.3
00"39	2.32	44.4	00"49	3.24	66.1
00"41	2.26	42.7	00"50	3.34	68.9
00"42	2.20	41.3	00"51	3.46	71.4
00"43	2.58	50.4	00"52	3.56	74.2
00"44	2.66	52.5	00"53	3.68	77.0
00"45	2.76	54.9	00"54	3.80	79.8



OVERALL FUNCTION CHECK

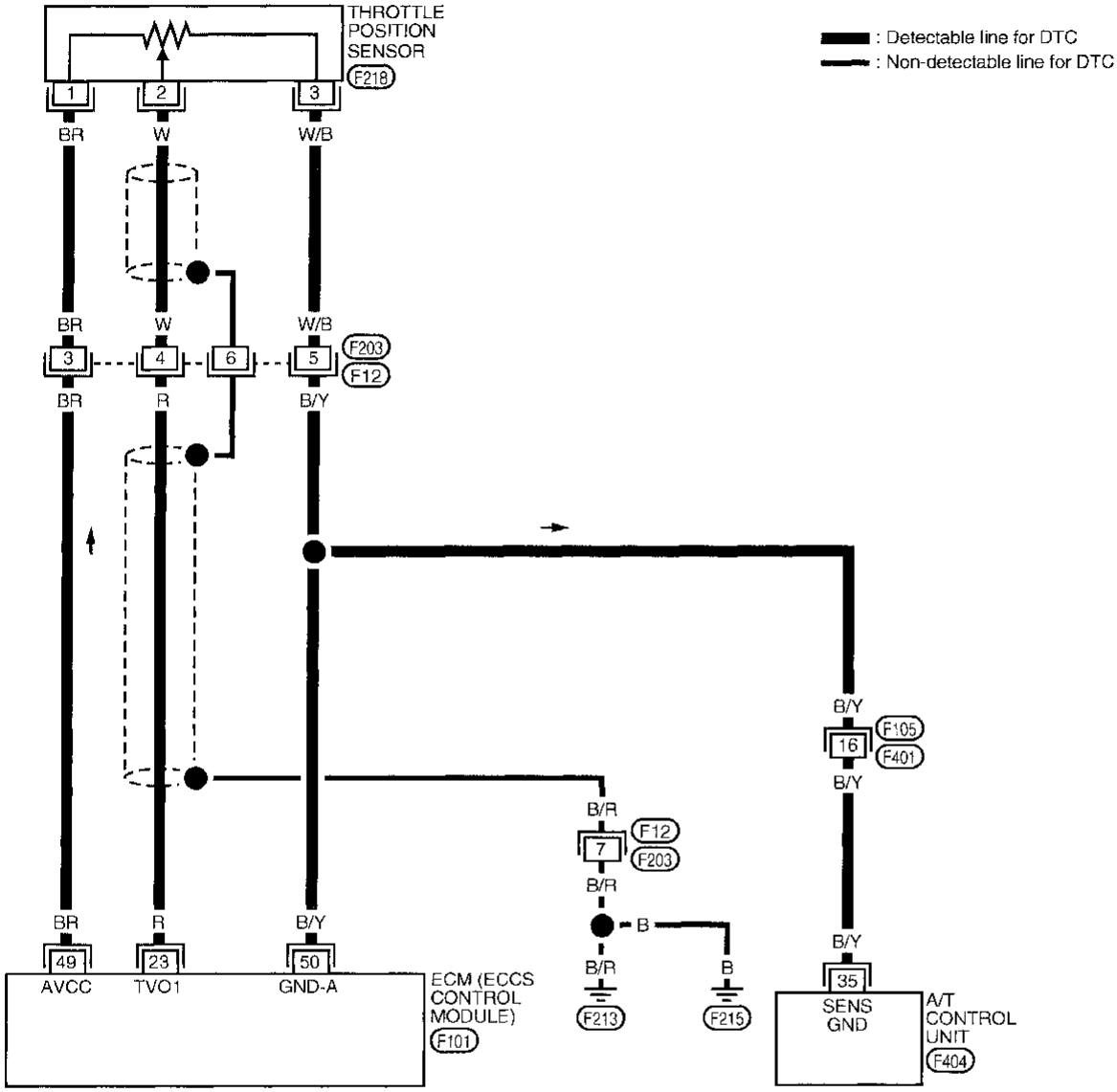
Use this procedure to check the overall function of the throttle position sensor circuit. During this check, a 1st trip DTC might not be confirmed.

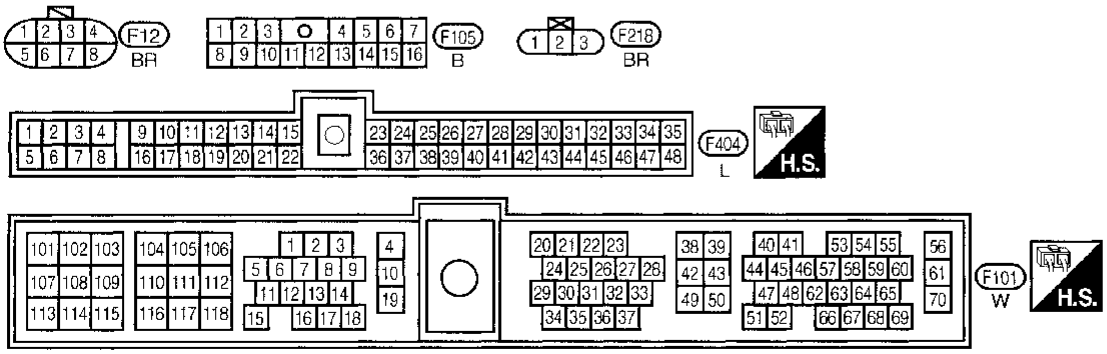
1) Turn ignition switch "ON".
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
3) Select "THRTL POS SEN" and "ABSOL TH/PS" in "DATA MONITOR" mode with CONSULT.
4) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
5) Print out the recorded data and check the following:
   - The voltage when accelerator pedal fully released is approximately 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) Turn ignition switch "ON".
2) Check the voltage between ECM terminal ㉓ and ㊸ (ground) and check the following:
   - The voltage when accelerator pedal fully released is approximately 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.

EC-TPS-01





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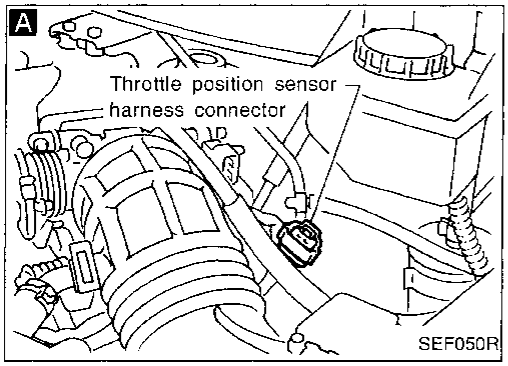
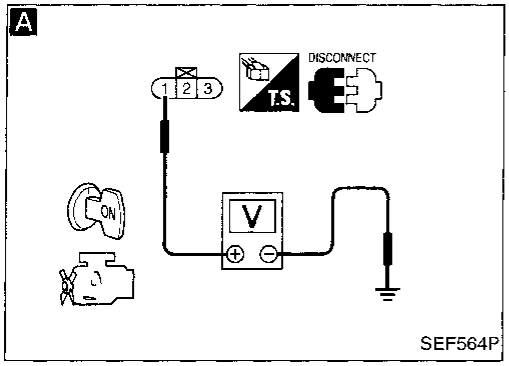
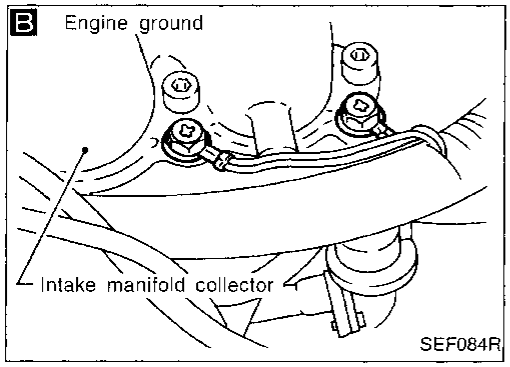
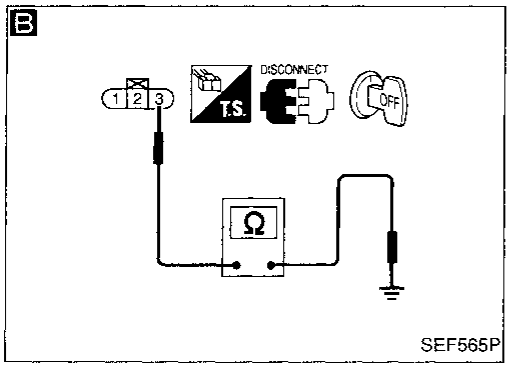
Throttle Position Sensor (Cont'd)

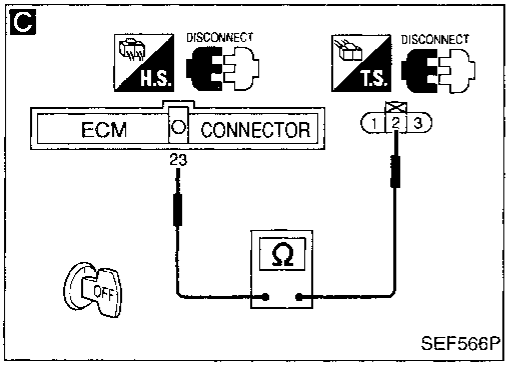
DIAGNOSTIC PROCEDURE











INSPECTION START

↓

ADJUST THROTTLE POSITION SENSOR.
Perform "Basic Inspection", EC-68.

↓ OK

A

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

NG → Check the following.
- Harness connectors (F203) , (F12)
- Harness for open or short between ECM and throttle position sensor

If NG, repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Harness connectors (F203) , (F12)
- Harness connectors (F105) , (F401)
- Harness for open or short between ECM and throttle position sensor
- Harness for open or short between A/T control unit and throttle position sensor

If NG, repair harness or connectors.

↓ OK

C

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

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-68.

↓ OK

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

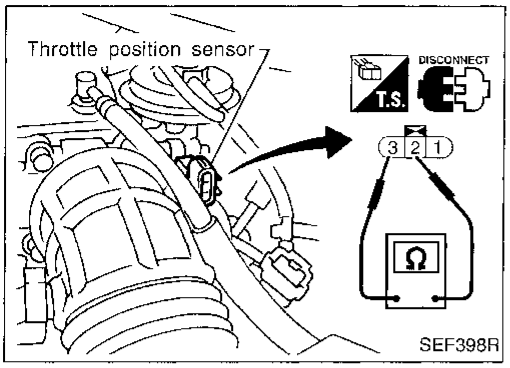
↓ Trouble is not fixed.

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

↓

INSPECTION END

Throttle Position Sensor (Cont'd)



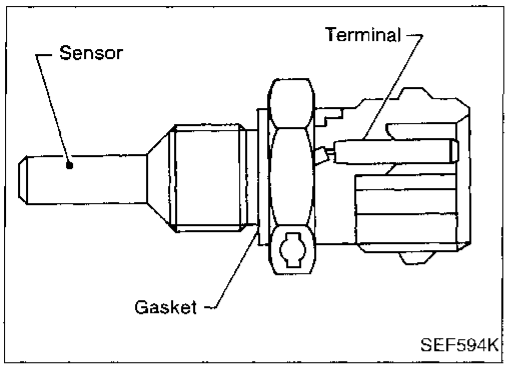
COMPONENT INSPECTION

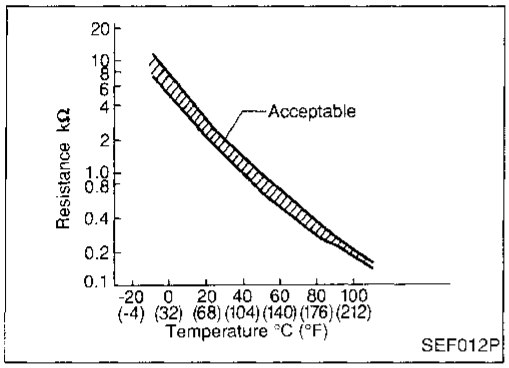
Throttle position sensor

1. Disconnect throttle position sensor harness connector.
2. Make sure that resistance between terminals ② and ③ changes when opening throttle valve manually.

Throttle valve conditions	Resistance [at 25°C (77°F)]
Completely closed	Approximately 0.5 kΩ
Partially open	0.5 - 4 kΩ
Completely open	Approximately 4 kΩ

If NG, replace throttle position sensor.
To adjust it, perform "Basic Inspection", EC-68.





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.

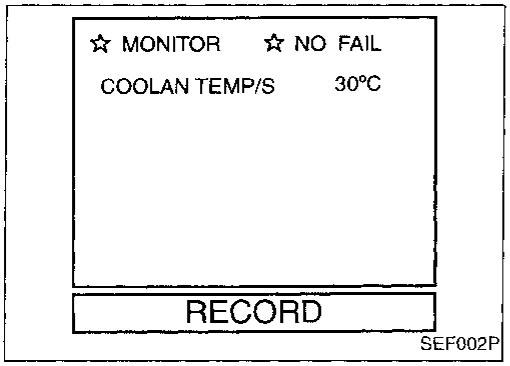
〈Reference data〉

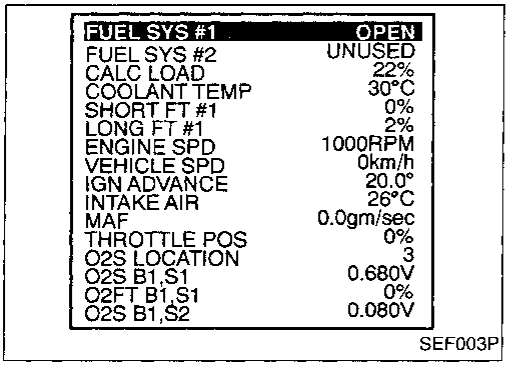
Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	9.2
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

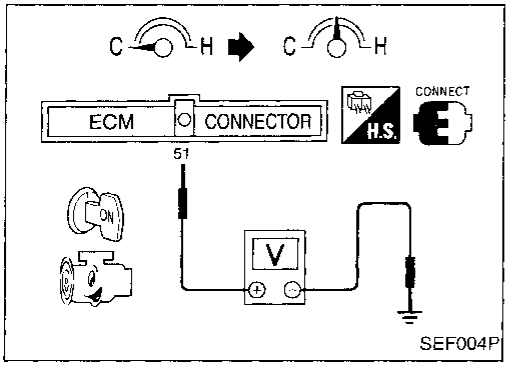
*: These data are reference values and are measured between ECM terminal ⑤① (Engine coolant temperature sensor) and ECM terminal ④③ (ECCS ground).

ON BOARD DIAGNOSIS LOGIC

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







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. Refer to EC-100.

1) Turn ignition switch "ON".
2) Select "COOLANT 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 16 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 16 minutes. (Be careful not to overheat engine.)

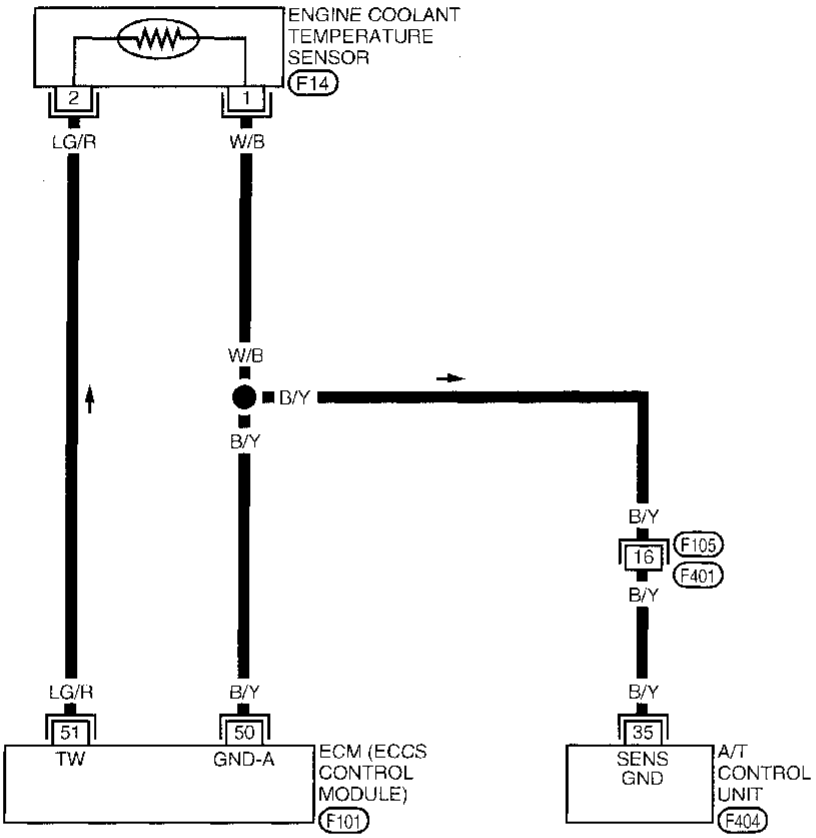
OR

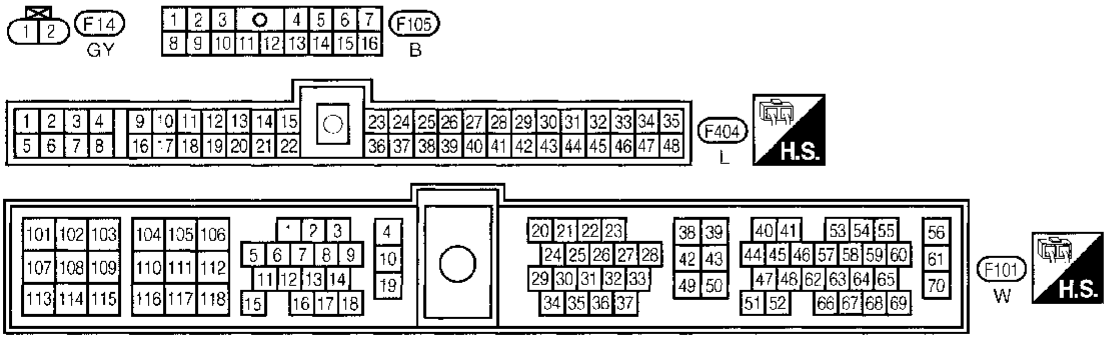
1) Turn ignition switch "ON".
2) Probe voltage meter between ECM terminal (51) and ground.
3) Start engine and run it at idle speed.
4) Check that voltage of engine coolant temperature changes to less than 3.5 (V) within 16 minutes. (Be careful not to overheat engine.)

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

EC-ECTS-01

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

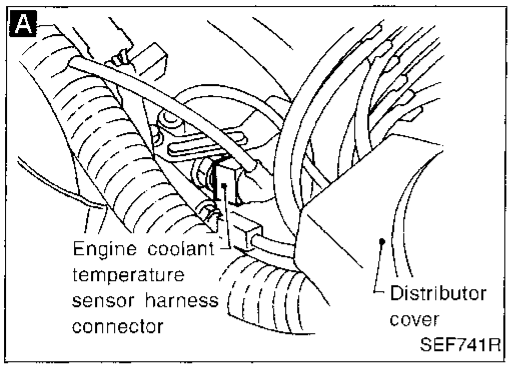


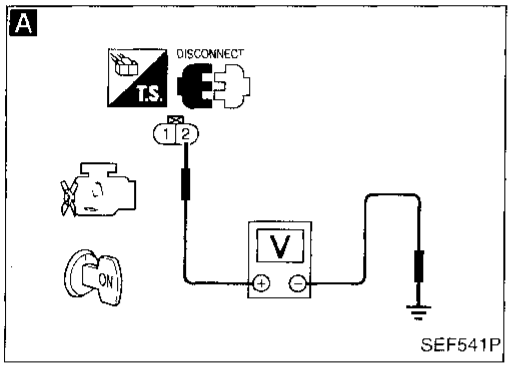


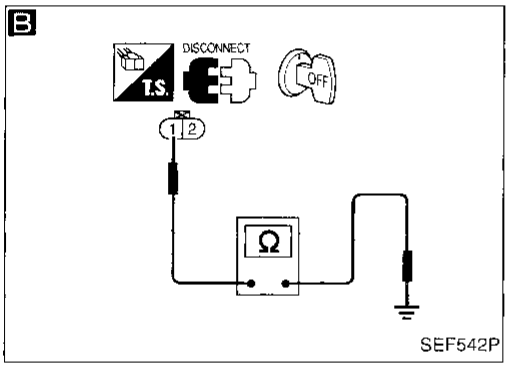
AEC176A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

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

If NG, repair harness or connectors.

OK

B

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

NG → Check the following.
- Harness for open or short between ECM and engine coolant temperature sensor
- Harness connectors (F105), (F401)
- Harness for open or short between A/T control unit and engine coolant temperature sensor

If NG, repair harness or connectors.

OK

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

NG → Replace engine coolant temperature sensor.

OK

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

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

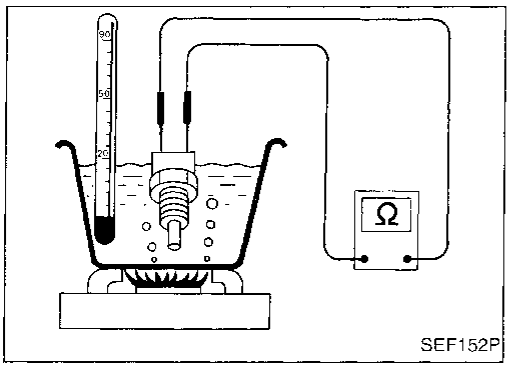
OK

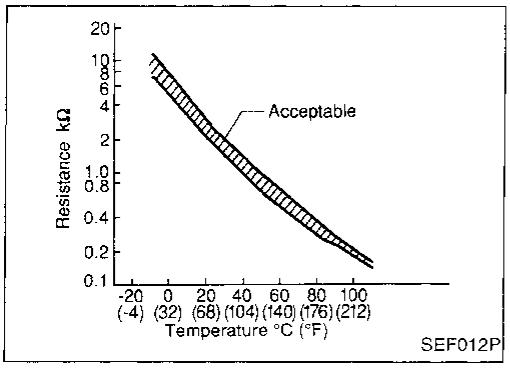
Disconnect and reconnect harness connectors in the circuit. Then retest.

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





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

COMPONENT INSPECTION

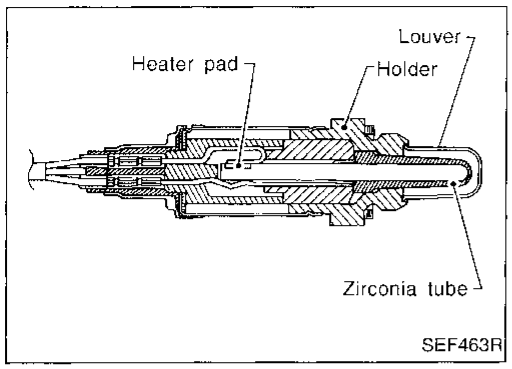
Engine coolant temperature sensor

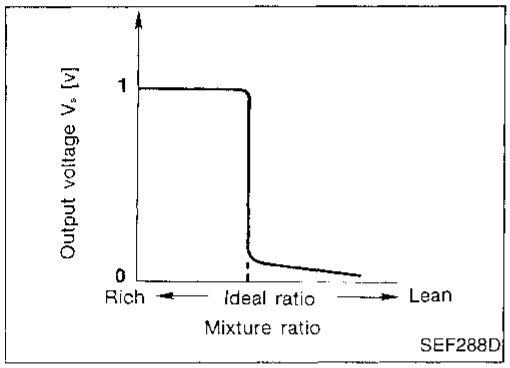
Check resistance as shown in the figure.

⟨Reference data⟩

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

If NG, replace engine coolant temperature sensor.





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 ㊸ (ECCS ground).

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

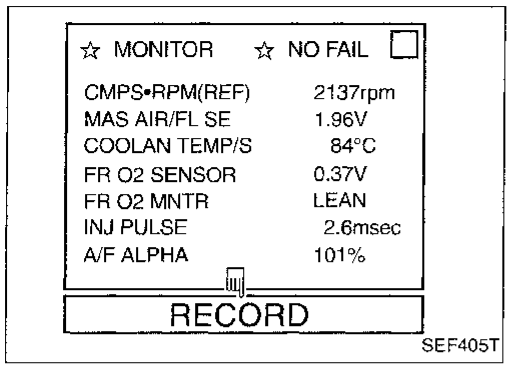
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR			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	● An excessively high voltage from the sensor is sent to ECM. ● The voltage from the sensor is constantly approx. 0.3V. ● The maximum and minimum voltages from the sensor do not reach the specified voltages. ● The sensor does not respond between rich and lean within the specified time.	● Harness or connectors (The sensor circuit is open or shorted.) ● Front heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

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



OVERALL FUNCTION CHECK

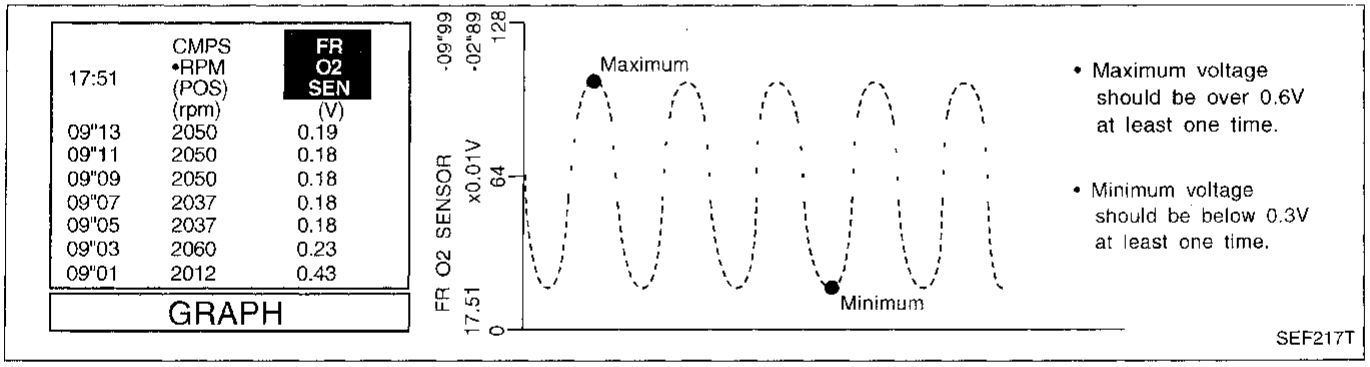
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

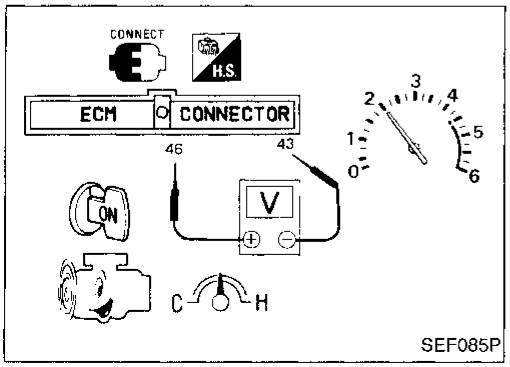
1) Start engine and warm it up sufficiently.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SENSOR" and "FR O2 MNTR".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT screen.
5) Check the following.

- "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-L

  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

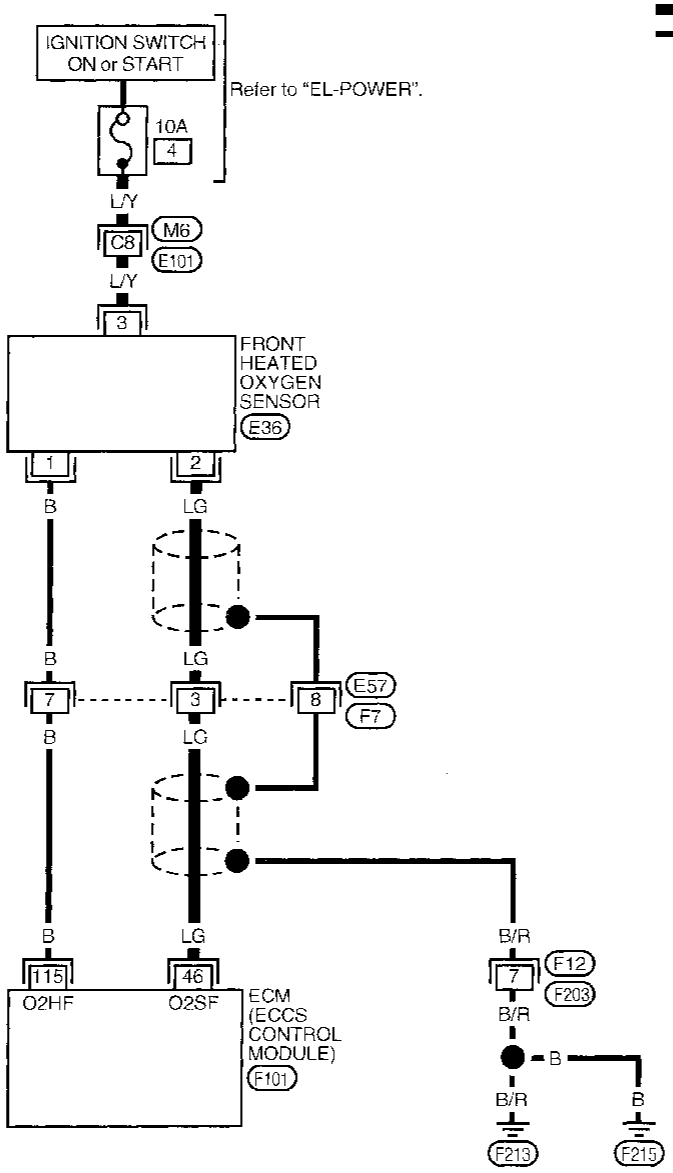
1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminal ㊻ (sensor signal) and ㊸ (engine ground).
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- 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.

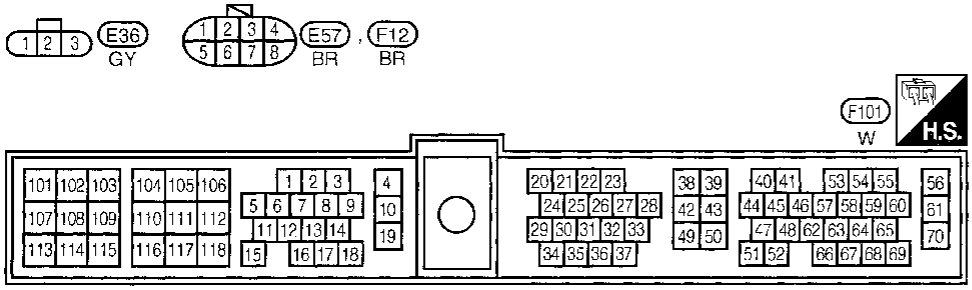
Front Heated Oxygen Sensor (Front HO2S) (Cont'd)

EC-FRO2-01

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



Refer to last page (Foldout page).
M6 , E101



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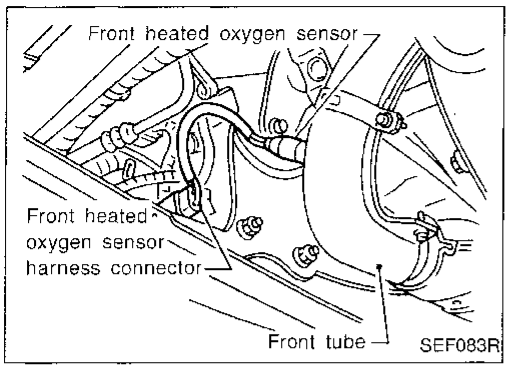
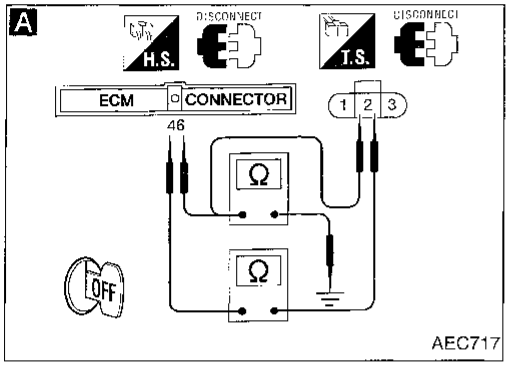
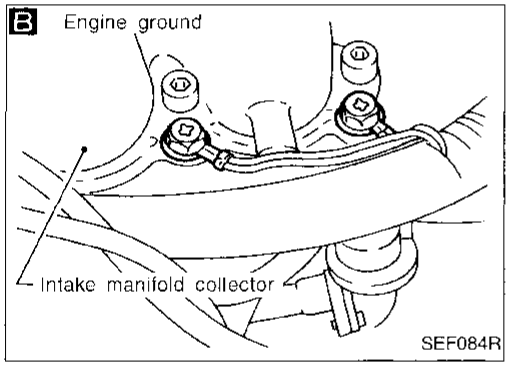
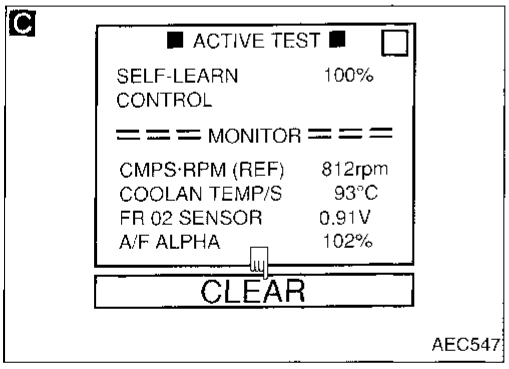
Front Heated Oxygen Sensor (Front HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
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 → Check the following.
- Harness connectors (E57), (F7)
- Harness for open or short between ECM and front heated oxygen sensor

If NG, repair harness or connectors.

OK ↓

B

Loosen and retighten engine ground screws.

C

CLEAR THE SELF-LEARNING DATA.
1. Start engine and warm it up sufficiently.
2. Select "SELF-LEARNING CONTROL" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0172 detected?
   Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171 or P0172", EC-135, 140.

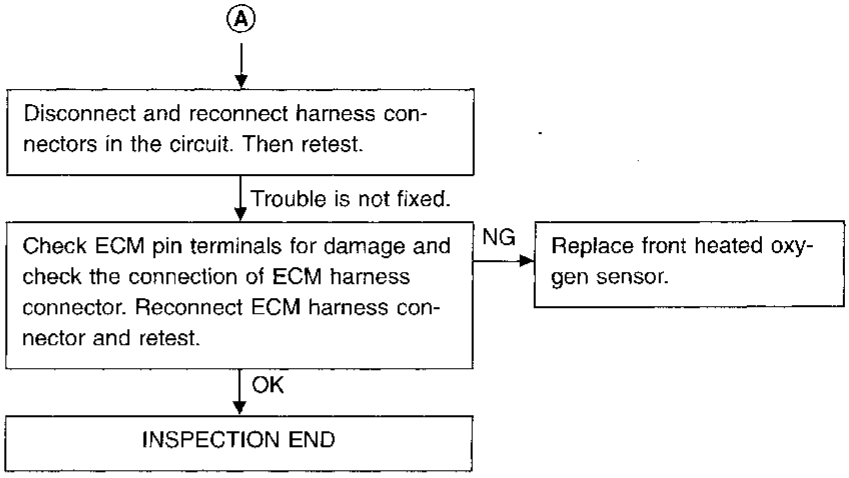
OR

2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure 1st trip DTC No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC 0114 or 0115 detected?
   Is it difficult to start engine?

No ↓

(A)
(Go to next page.)

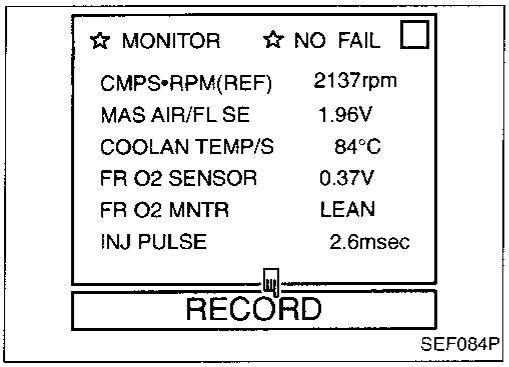
Front Heated Oxygen Sensor (Front HO2S) (Cont'd)



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	• The closed loop control function does not operate even when vehicle is driving in the specified condition.	• The front heated oxygen sensor circuit is open or short. • Front heated oxygen sensor. • Front heated oxygen sensor heater.



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-L				

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

OR

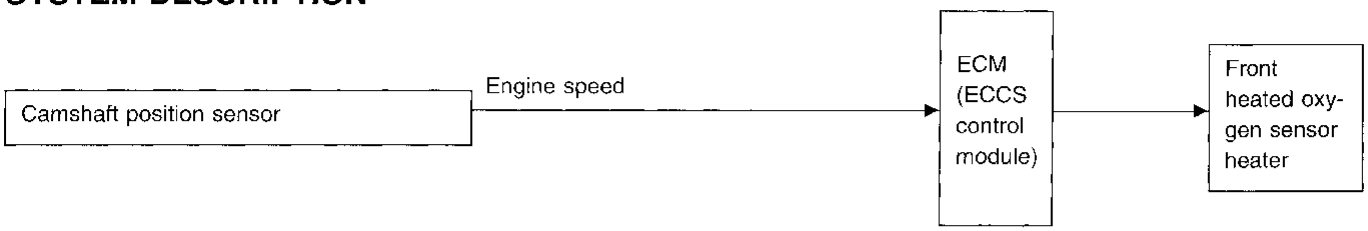
1) Start engine and warm it up sufficiently.
2) Check that malfunction indicator lamp goes on more than 5 times in 10 seconds while keeping at 2,000 rpm in Diagnostic Test Mode II.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0130, EC-116 and TROUBLE DIAGNOSIS FOR DTC P0135, EC-122.

Front Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Front heated oxygen sensor heater
Above 4,200	OFF
Below 4,200	ON

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)
115	B	Front heated oxygen sensor heater	Engine is running. └ Engine speed is below 4,200 rpm	Approximately 0.2V
			Engine is running. └ Engine speed is above 4,200 rpm	BATTERY VOLTAGE (11 - 14V)

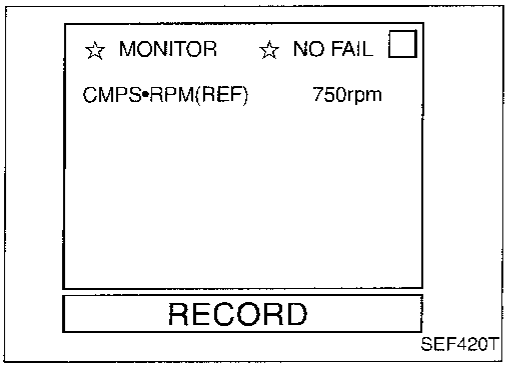
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FR O2 HEATER	● Engine speed: Idle	ON
	● Engine speed: Above 4,200 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

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

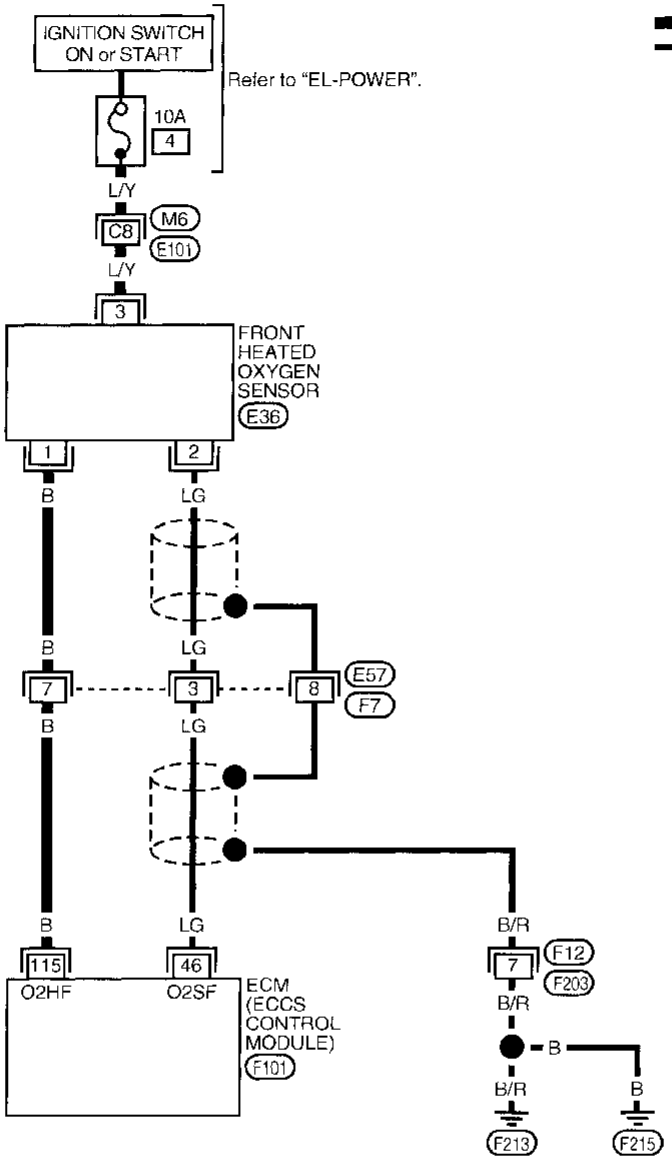
1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and run it for at least 6 seconds at idle speed.
4) Select "MODE 3" with GST.

OR

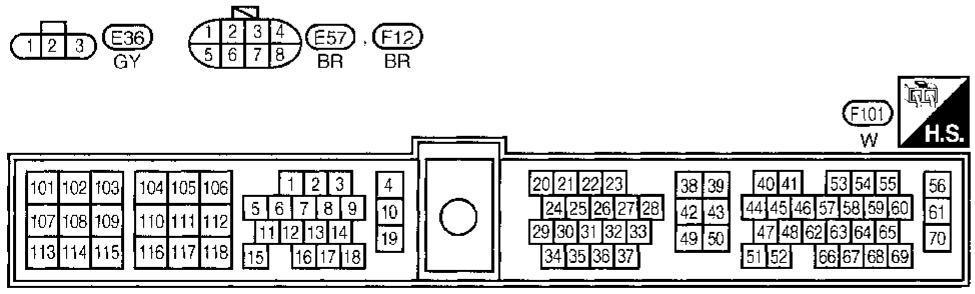
1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

- **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.**

EC-FRO2/H-01



Refer to last page (Foldout page).
M6 , E101



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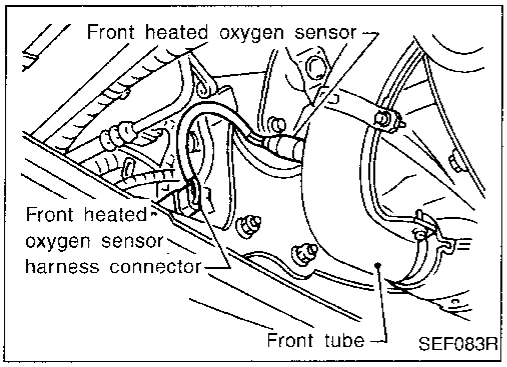
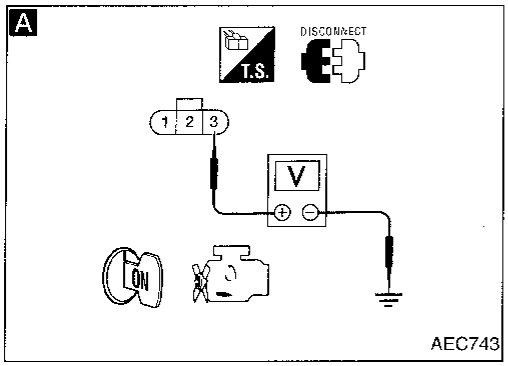
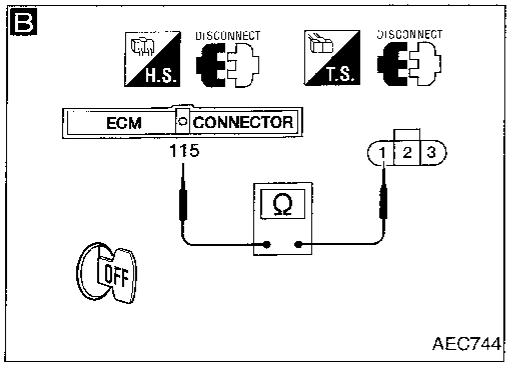
Front Heated Oxygen Sensor Heater (Cont'd)

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.
- Harness connectors (M6), (E101)
- 10A 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 (115).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E57), (F7)
- Harness for open or short between front heated oxygen sensor and ECM

If 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 ↓

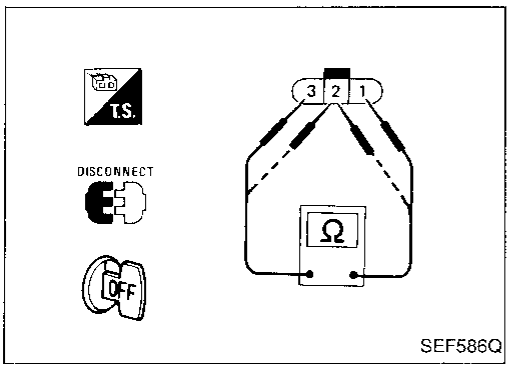
Disconnect and reconnect harness connectors in the circuit, and retest.

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

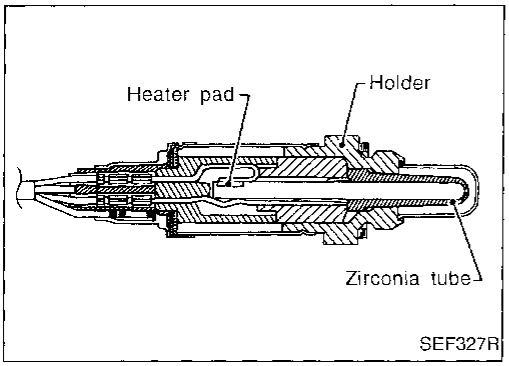
Front heated oxygen sensor heater

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.



Rear Heated Oxygen Sensor (Rear HO2S)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after the three way catalyst, monitors the oxygen level in the exhaust gas.
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.
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.
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 ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
52	W	Rear heated oxygen sensor	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm	0 - Approximately 1.0V

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

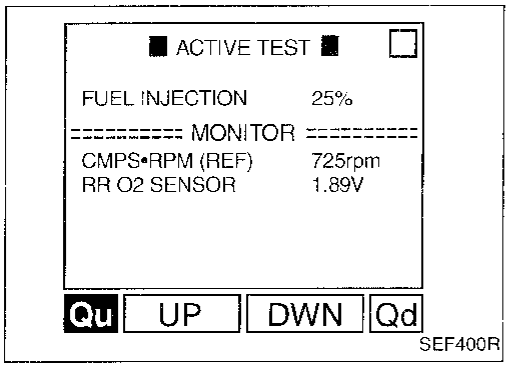
MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SENSOR	● Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR			LEAN ↔ RICH

ON BOARD DIAGNOSIS LOGIC

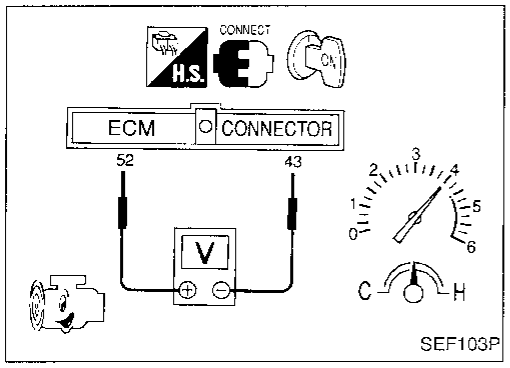
The rear heated oxygen sensor has a much longer switching time between rich and lean than the front heated oxygen sensor. The oxygen storage capacity before the three way catalyst causes the longer switching time. To judge the malfunctions of rear heated oxygen sensor, ECM monitors the sensor's voltage value and the switching response during the various driving conditions such as fuel-cut.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0136 0707	● An excessively high voltage from the sensor is sent to ECM.	● Harness or connectors (The sensor circuit is open.) ● Rear heated oxygen sensor
	● The specified maximum and minimum voltages from the sensor are not reached. ● It takes more than the specified time for the sensor to respond between rich and lean.	● Harness or connectors (The sensor circuit is shorted.) ● Rear heated oxygen sensor ● Fuel pressure ● Injectors ● Intake air leaks

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



SEF400R



SEF103P

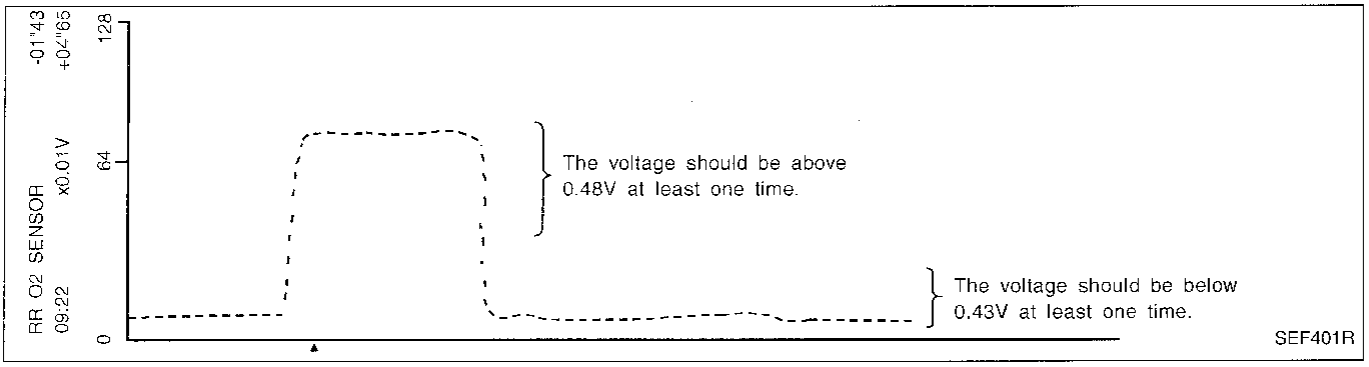
OVERALL FUNCTION CHECK

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 ±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

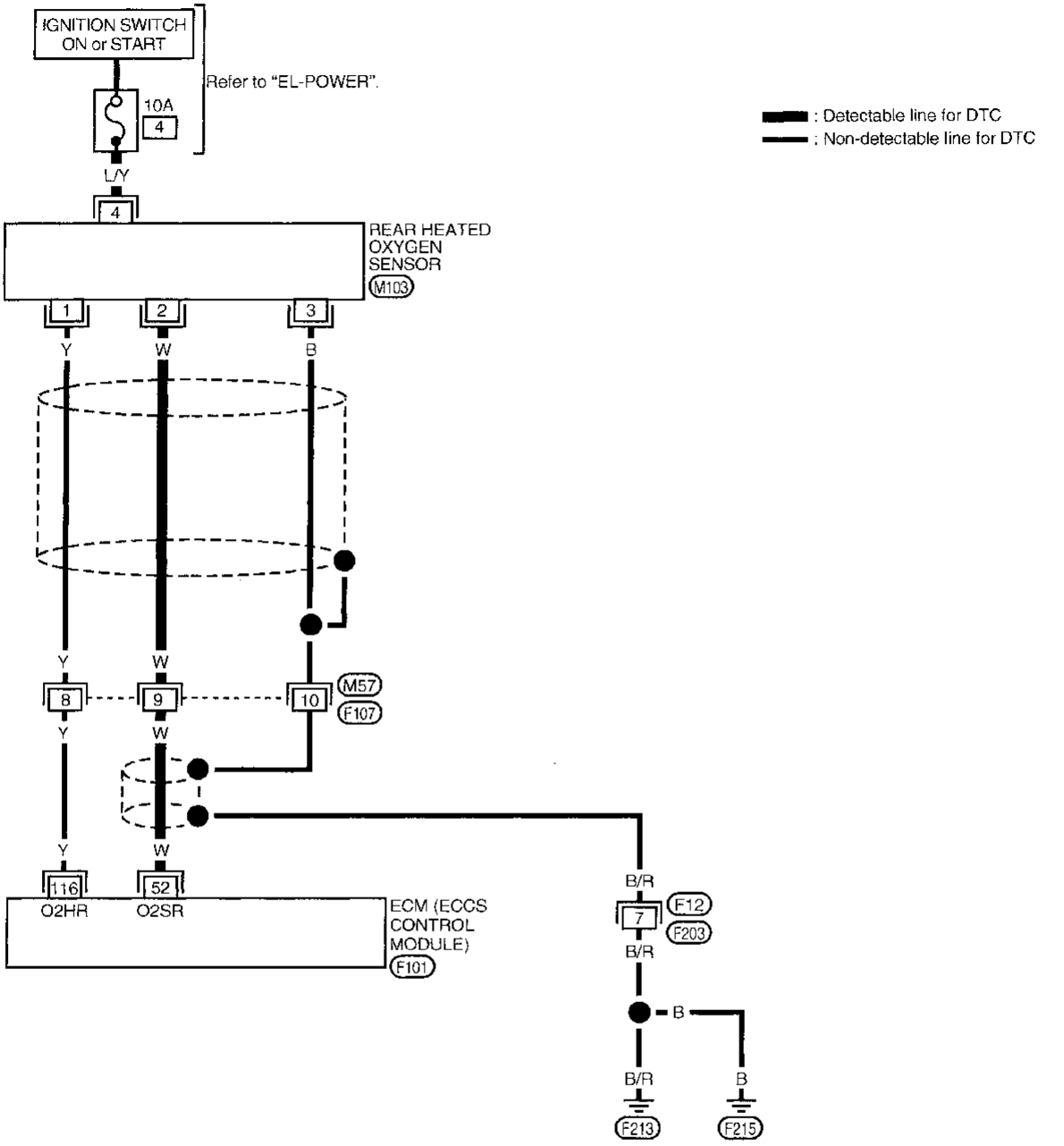
1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminals ㊷(sensor signal) and ㊸(engine ground).
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)
   The voltage should be above 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 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.

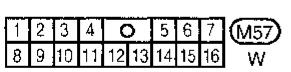


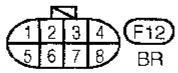
SEF401R

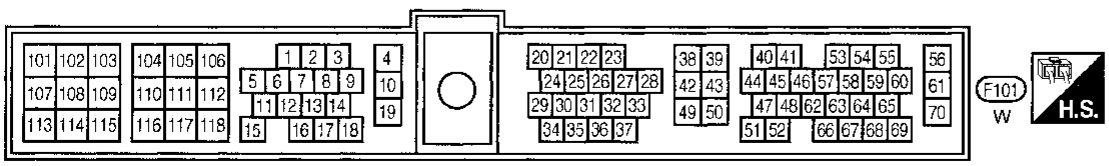
Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

EC-RRO2-01





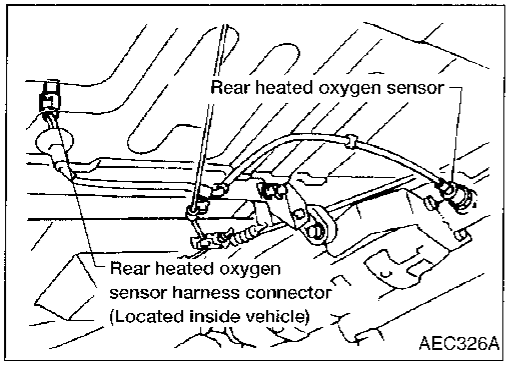


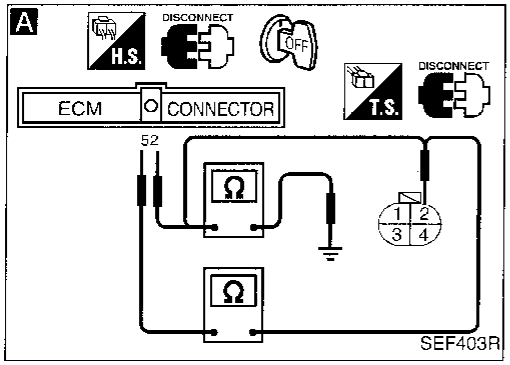


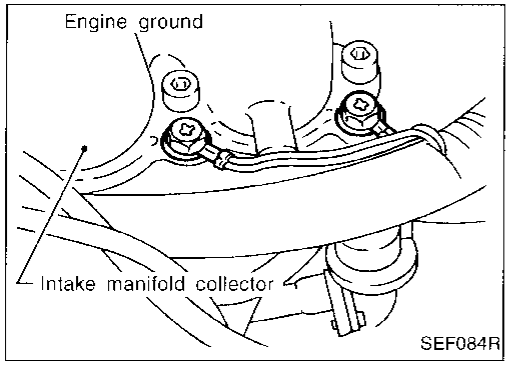
AEC180A

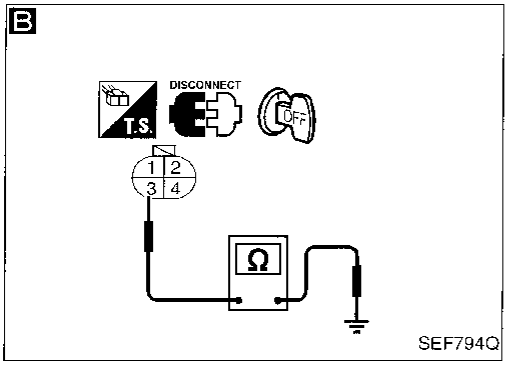
Rear Heated Oxygen Sensor (Rear HO2S) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect rear heated oxygen sensor harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal (52) and sensor terminal (2).
   Continuity should exist.
4. Check harness continuity between ECM terminal (52) (or sensor terminal (2)) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M57), (F107)
- Harness for open or short between rear heated oxygen sensor and ECM

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Loosen and retighten engine ground screws.
2. Check harness continuity between terminal (3) and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M57), (F107)
- Harness connectors (F12), (F203)
- Harness for open or short between rear heated oxygen sensor and engine ground

If NG, repair harness or connectors.

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.

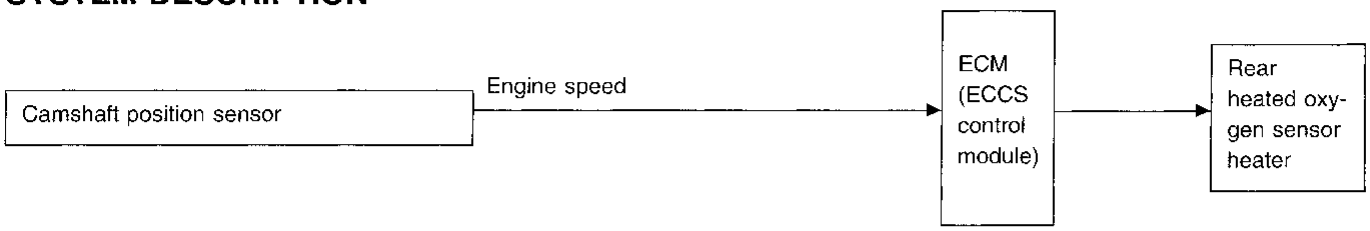
NG → Replace rear heated oxygen sensor.

OK ↓

INSPECTION END

Rear Heated Oxygen Sensor Heater

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Rear heated oxygen sensor heater
Above 3,600	OFF
Below 3,600	ON

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)
116	Y	Rear heated oxygen sensor heater	Ignition switch "ON" └ Engine speed is below 6,350 rpm	Approximately 0.2V
			Ignition switch "ON" └ Engine is stopped	BATTERY VOLTAGE (11 - 14V)

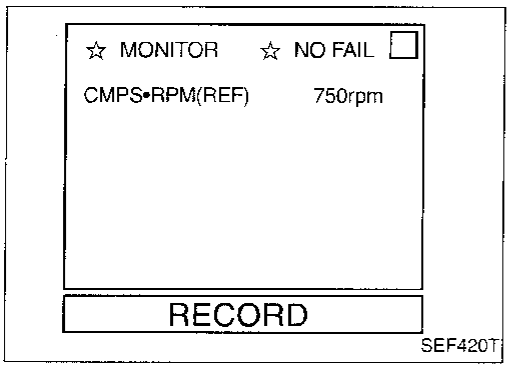
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
RR O2 HEATER	● Engine speed: Idle	ON
	● Engine speed: Above 3,600 rpm	OFF

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0141 0902	● The current amperage in the rear heated oxygen sensor heater circuit is out of the normal range. (An improper voltage drop signal is sent to ECM through the rear heated oxygen sensor heater.)	● Harness or connectors (The rear heated oxygen sensor heater circuit is open or shorted.) ● Rear heated oxygen sensor heater

Rear Heated Oxygen Sensor Heater (Cont'd)



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

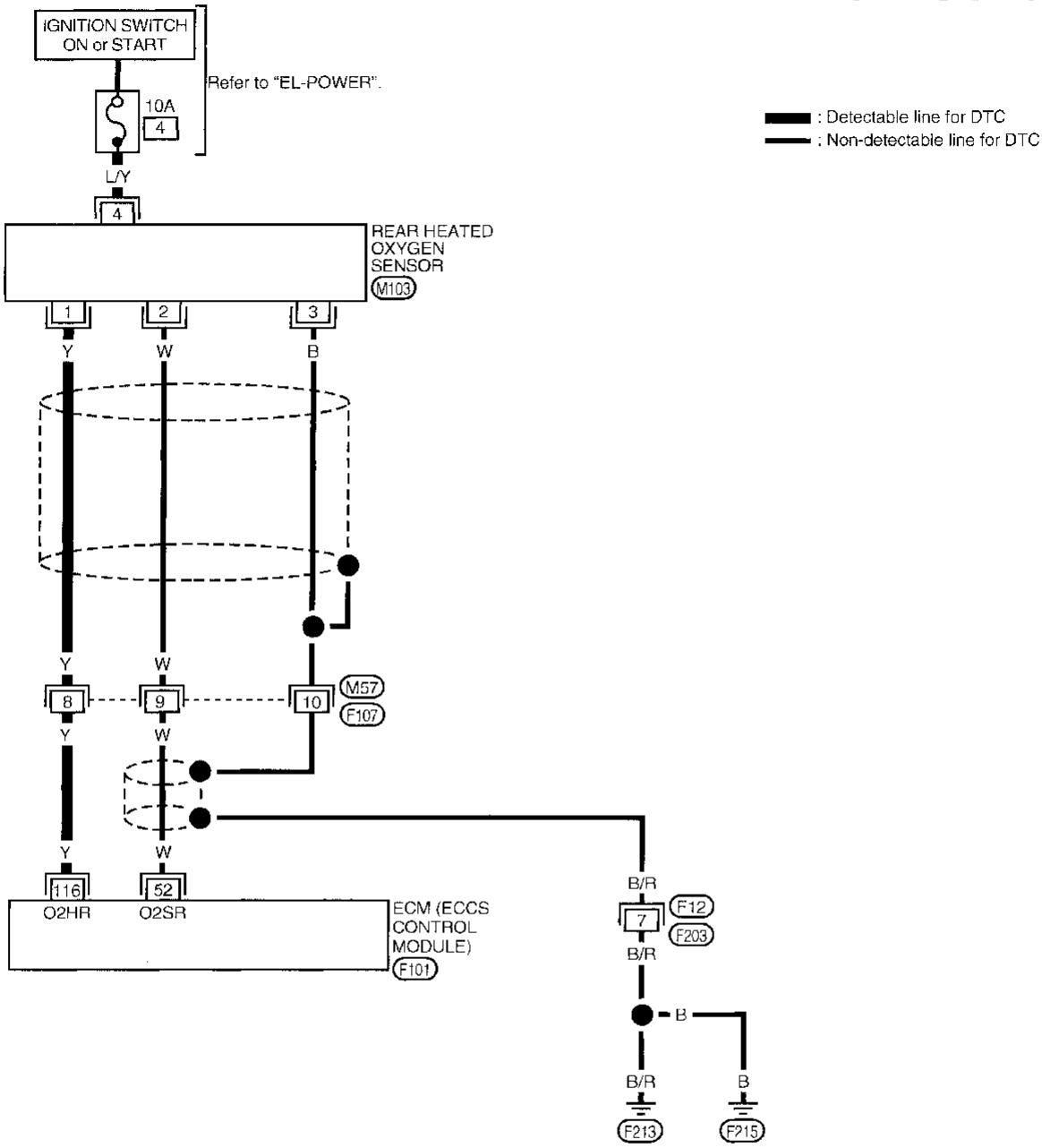
1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine and run it for at least 6 seconds at idle speed.
4) Select "MODE 3" with GST.

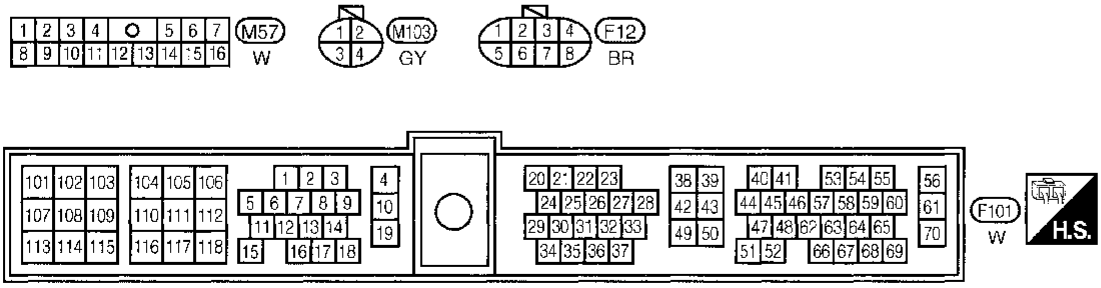
OR

1) Start engine and run it for at least 6 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 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.**

EC-RRO2/H-01

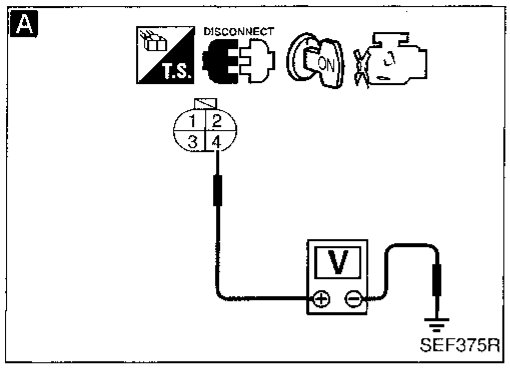


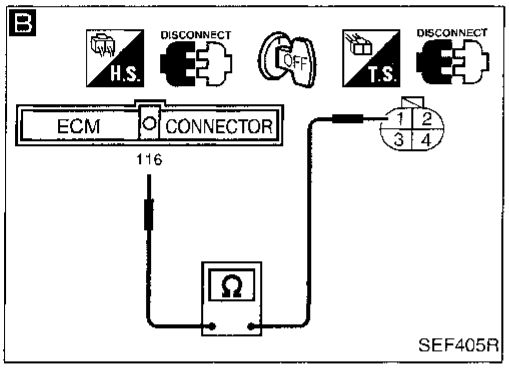


AEC181A

Rear Heated Oxygen Sensor Heater (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK POWER SUPPLY.
1. Disconnect rear heated oxygen sensor harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal (4) and ground.
   Voltage: Battery voltage

NG → Check the following.
- 10A fuse
- Harness for open or short between rear 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 (116).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M57), (F107)
- Harness for open or short between ECM and rear heated oxygen sensor

If NG, repair harness or connectors.

OK ↓

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

NG → Replace rear heated oxygen sensor.

OK ↓

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

Trouble is not fixed. ↓

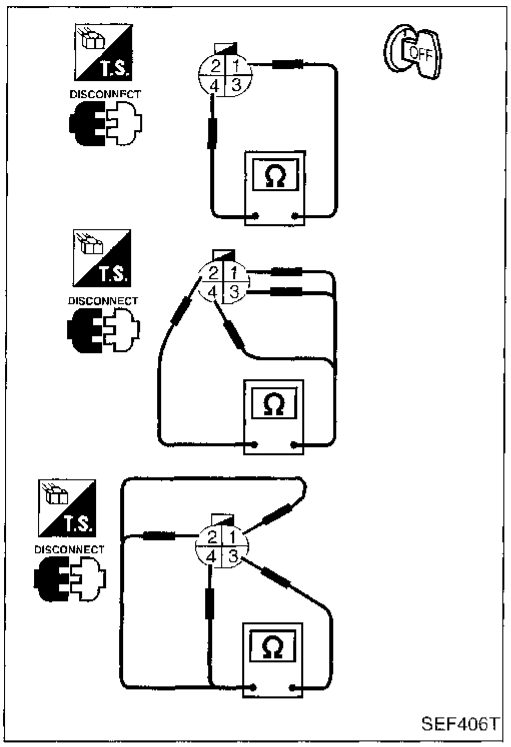
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Rear Heated Oxygen Sensor Heater (Cont'd)

COMPONENT INSPECTION



Rear heated oxygen sensor heater

Check the following.

1. Check resistance between terminals ① and ④.
   Resistance: 2.3 - 4.3Ω [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:

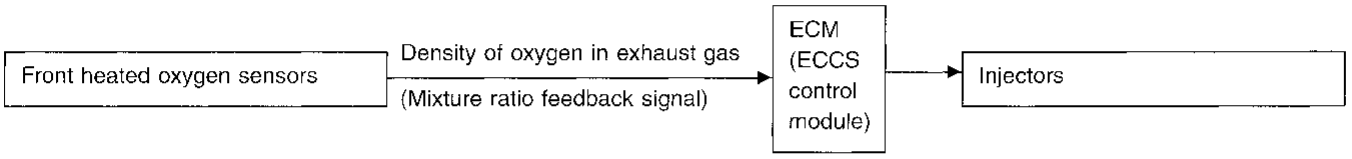
Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.

Fuel Injection System Function (Lean side)

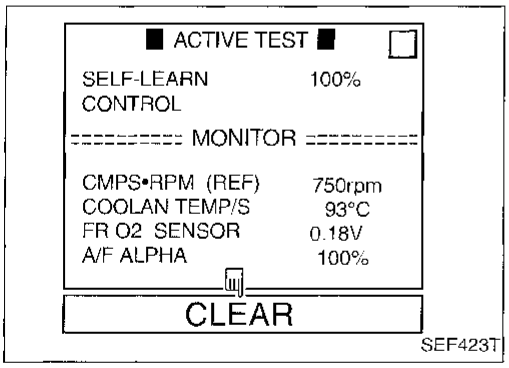
ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.

In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and light up the MIL (2 trip detection logic).



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0171 0115	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leaks • Front heated oxygen sensor • Injectors • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor

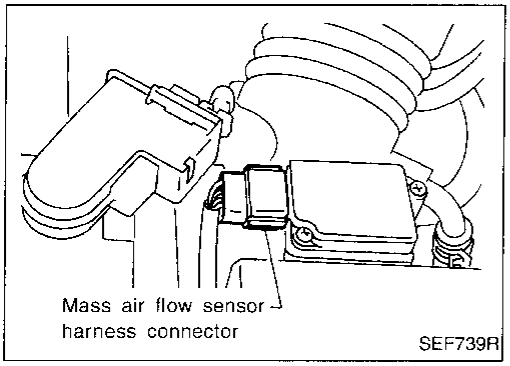


DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
4) Clear the self-learning control coefficient by touching "CLEAR".
5) Select "DATA MONITOR" mode with CONSULT.
6) Start engine again and run it for at least 10 minutes at idle speed.
   The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
7) If it is difficult to start engine at step 6, the fuel injection system has a malfunction, too.
   Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-138. If engine does not start, check exhaust and intake air leak visually.

OR

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



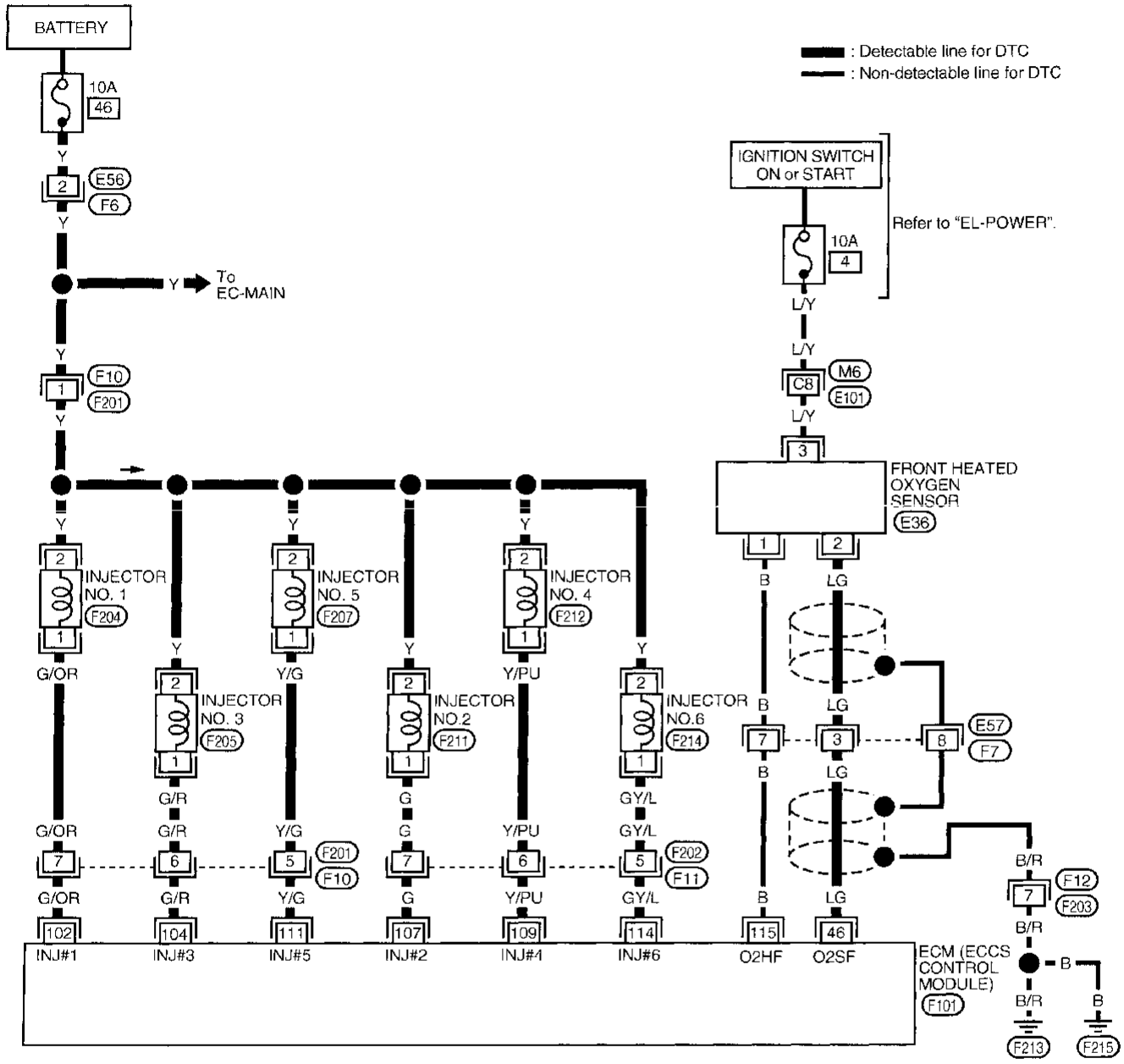
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0171 should be detected at this stage, if a malfunction exists.
9) If it is difficult to start engine at step 8, the fuel injection system has a malfunction.
   Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-138. If engine does not start, check exhaust and intake air leak visually.

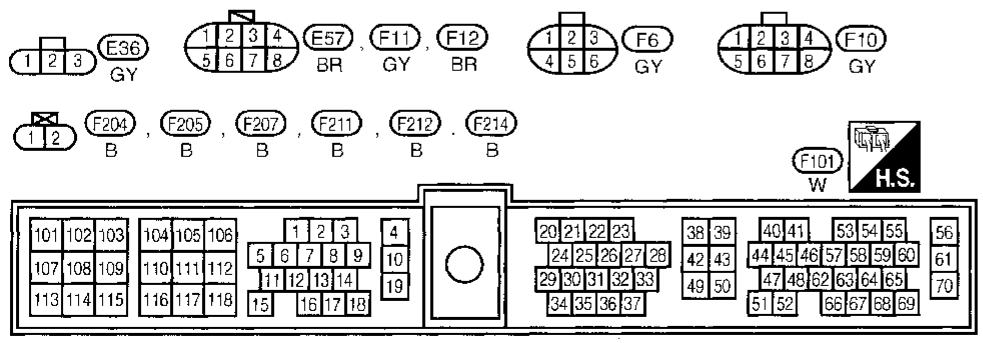
OR

1) Disconnect mass air flow sensor harness connector.
2) Start engine and run it for at least 3 seconds at idle speed.
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Turn ignition switch "ON".
5) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
6) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
8) 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.
9) If it is difficult to start engine at step 8, the fuel injection system also has a malfunction.
   Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-138. If engine does not start, check exhaust and intake air leak visually.

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

EC-FUEL-01



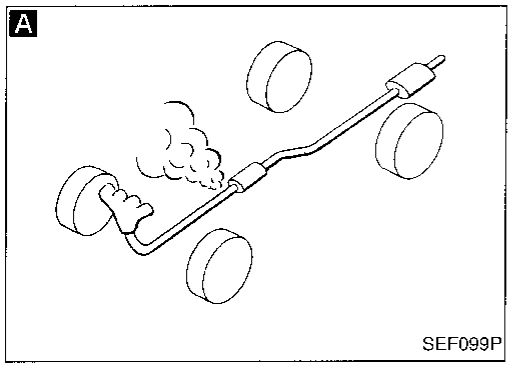


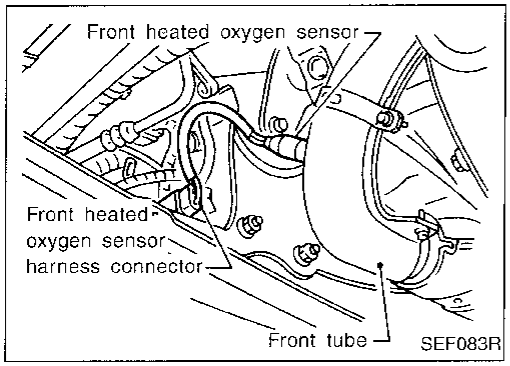
Refer to last page (Foldout page).
M6, E101

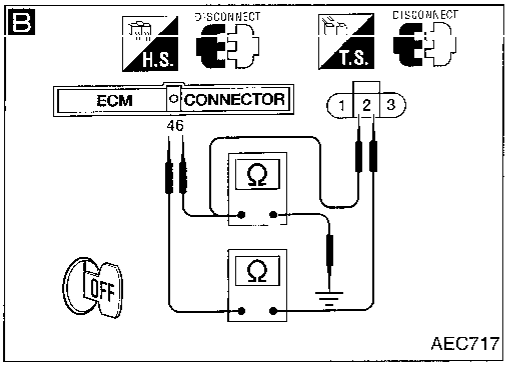
AEC182A

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 three way catalyst.
NG → Repair or replace.
OK ↓

CHECK FOR INTAKE AIR LEAK.
Start engine and run it at idle. Listen for an intake air leak 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 sensor terminal (2).
   Continuity should exist.
4. Check harness continuity between ECM terminal (46) (or sensor terminal (2)) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E57), (F7)
- Harness for open or short between front heated oxygen sensor and ECM

If NG, repair harness or connectors.

OK ↓

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-22.
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa (2.4 kg/cm², 34 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm², 43 psi)

NG → Check fuel pump and circuit. Refer to EC-238.
OK ↓

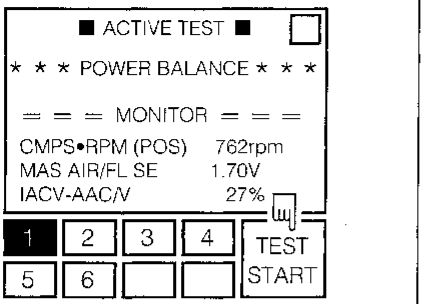
CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
OR
Check "mass air flow" in MODE 1 with GST.
3.2 - 6.7 g·m/sec: at idling
8.7 - 21.9 g·m/sec: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-89.
OK ↓

(A)
(Go to next page.)

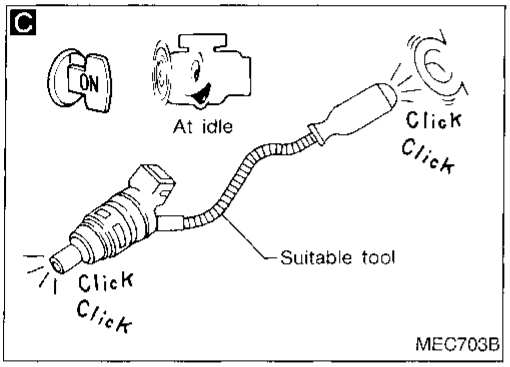
Fuel Injection System Function (Lean side) (Cont'd)

C



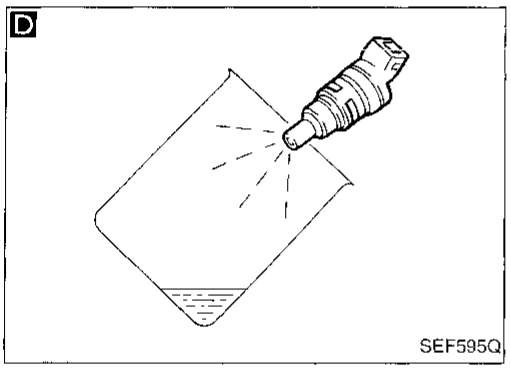
AEC383

C



MEC703B

D


SEF595Q

Ⓐ

C

CHECK FUNCTION OF INJECTORS.
1. Install all parts removed.
2. Start engine.
3. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
4. Make sure that each circuit produces a momentary engine speed drop.

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-232. Repair harness or connectors.

OR

3. Listen to each injector operating sound.
Clicking noise should be heard.

OK ↓

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

↓

1. Turn ignition switch "OFF".
2. Remove injector gallery.
Refer to EC-23.
Keep fuel hose and all injectors connected to injector gallery.
The injector harness connectors should remain connected.

↓

D

1. Disconnect camshaft position sensor harness connector.
2. Crank engine for about 3 seconds. Make sure that fuel sprays out from injectors.

NG → Replace injectors from which fuel does not spray out.

OK ↓

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

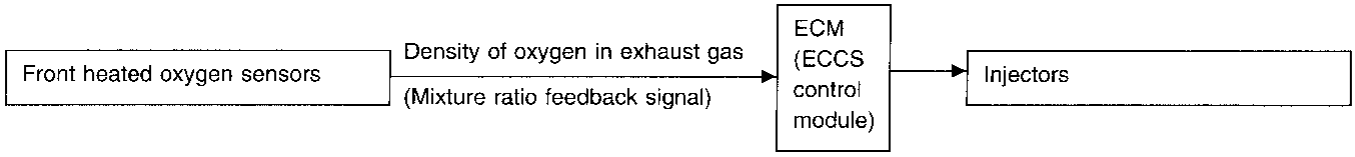
↓

INSPECTION END

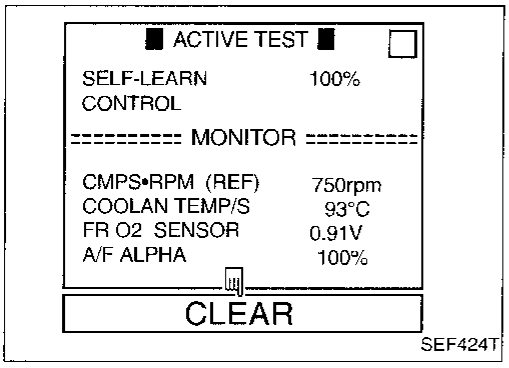
Fuel Injection System Function (Rich side)

ON BOARD DIAGNOSIS LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from the front heated oxygen sensors. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as a fuel injection system malfunction and lights up the MIL (2 trip detection logic).



Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0172 0114	● Fuel injection system does not operate properly. ● The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	● Front heated oxygen sensor ● Injectors ● Exhaust gas leaks ● Incorrect fuel pressure ● Mass air flow sensor

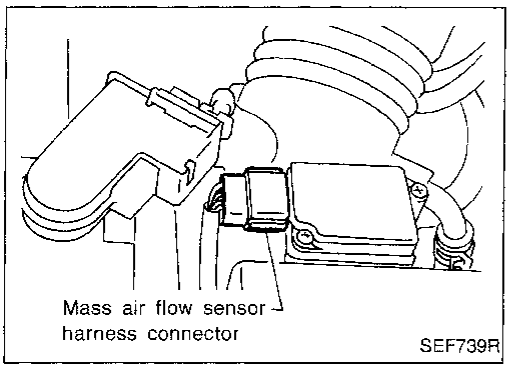


DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
4) Clear the self-learning control coefficient by touching "CLEAR".
5) Select "DATA MONITOR" mode with CONSULT.
6) Start engine again and 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-143.
   If engine does not start, remove ignition plugs and check for fouling, etc.

OR

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



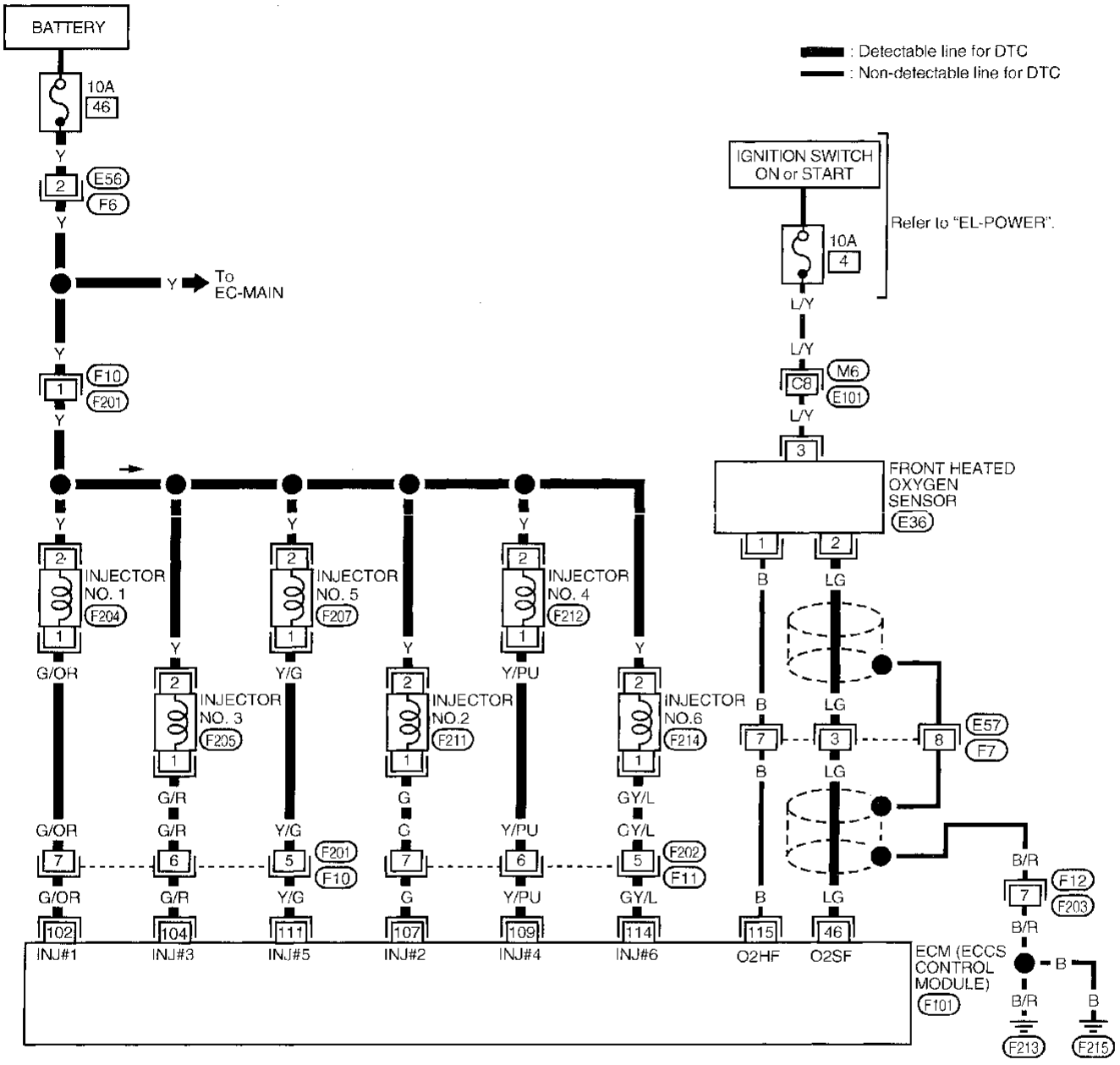
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "MODE 7" with GST. Make sure 1st trip DTC P0100 is detected.
6) Select "MODE 4" with GST and erase the 1st trip DTC P0100.
7) Start engine again and run it for at least 10 minutes at idle speed.
8) Select "MODE 7" with GST. The 1st trip DTC P0172 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-143.
   If engine does not start, remove ignition plugs and check for fouling, etc.

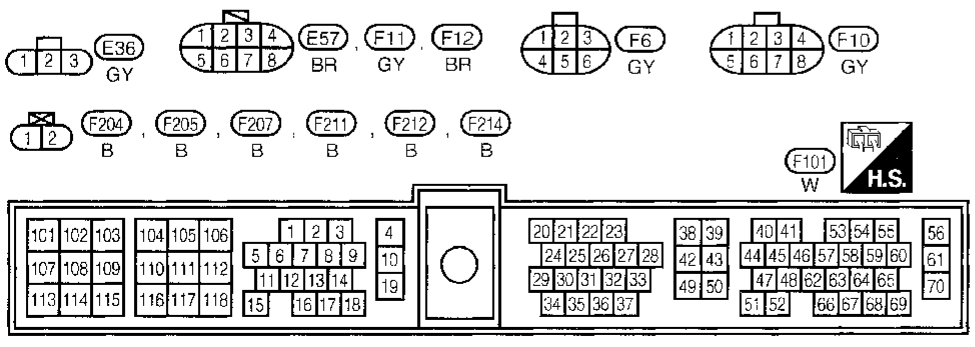
OR

1) Disconnect mass air flow sensor harness connector.
2) Start engine and run it for at least 3 seconds at idle speed.
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Turn ignition switch "ON".
5) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure 1st trip DTC 0102 is detected.
6) Erase the 1st trip DTC 0102 by changing from Diagnostic Test Mode II to Diagnostic Test Mode I.
7) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM. Make sure DTC 0505 is detected.
8) 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.
9) If it is difficult to start engine at step 8, the fuel injection system also has a malfunction.
   Crank engine while depressing accelerator pedal. If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-143.
   If engine does not start, remove ignition plugs and check for fouling, etc.

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

EC-FUEL-01



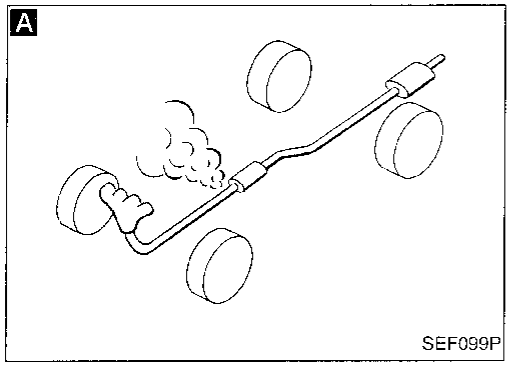


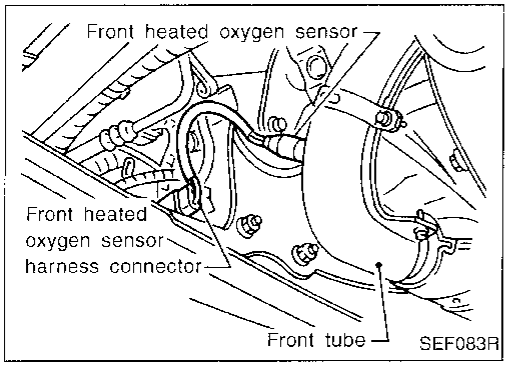
Refer to last page (Foldout page).
M6, E101

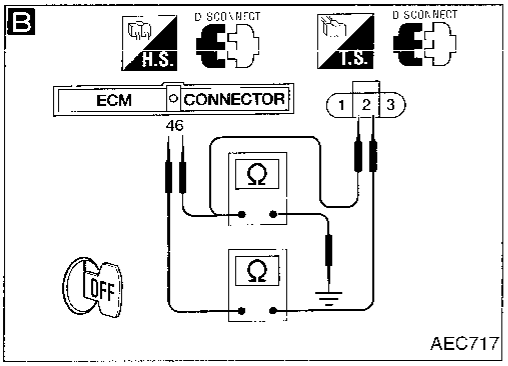
AEC182A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK FOR 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

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

NG → Check the following.
- Harness connectors (E57), (F7)
- Harness for open or short between front heated oxygen sensor and ECM

If NG, repair harness or connectors.

OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-22.
2. Install fuel pressure gauge and check fuel pressure.
   At idle:
   Approx. 235 kPa (2.4 kg/cm², 34 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approx. 294 kPa (3.0 kg/cm², 43 psi)

NG → Check fuel pump and circuit. Refer to EC-238.

OK

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

OR

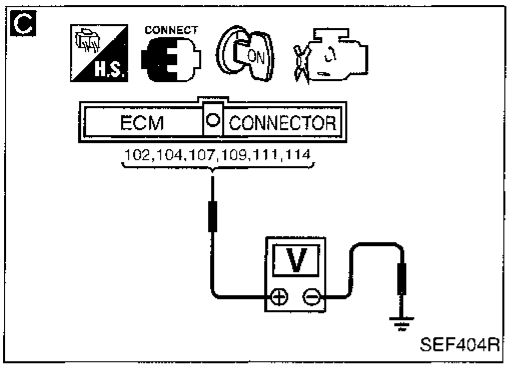
Check "mass air flow" in MODE 1 with GST.
3.2 - 6.7 g·m/sec: at idling
8.7 - 21.9 g·m/sec: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-89.

OK

(A)
(Go to next page.)

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



Ⓐ

C

CHECK INJECTORS.
1. Turn ignition switch "ON".
2. Check voltage between ECM terminals (102), (104), (107), (109), (111), (114) and ground with CONSULT or tester.
   Battery voltage should exist.
3. Turn ignition switch "OFF".

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-232. Repair harness or connectors.

OK ↓

Remove injector assembly.
Refer to EC-23.
Keep fuel hose and all injectors connected to injector gallery.

↓

Confirm that the engine is cooled down and there are no fire hazards near the vehicle.

↓

1. Disconnect all injector harness connectors.
2. Disconnect camshaft position sensor harness connector.
3. Crank engine for about 3 seconds.
   Make sure fuel does not drip from injector.

Drips → Replace the injectors from which fuel is dripping.

Does not drip. ↓

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

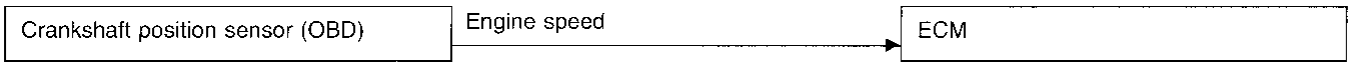
↓

INSPECTION END

No. 6 - 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 each 1,000 revolutions of the engine.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0300 (0701)	● Multiple cylinders misfire.	● Improper spark plug ● Insufficient compression ● Incorrect fuel pressure ● EGR valve ● Injector circuit is open or shorted ● Injectors ● Intake air leak ● Ignition secondary circuit is open or shorted ● Lack of fuel ● Magnetized flywheel (drive plate)
P0301 (0608)	● No. 1 cylinder misfires.	
P0302 (0607)	● No. 2 cylinder misfires.	
P0303 (0606)	● No. 3 cylinder misfires.	
P0304 (0605)	● No. 4 cylinder misfires.	
P0305 (0604)	● No. 5 cylinder misfires.	
P0306 (0603)	● No. 6 cylinder misfires.	

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 5 seconds.
4) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible during driving.
   Note: Refer to the freeze frame data for the test driving conditions.

OR

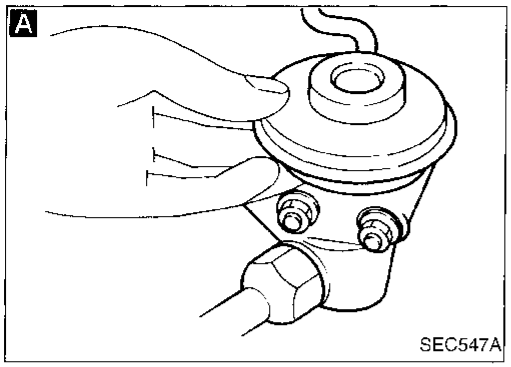
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible during driving.
   Note: Refer to the freeze frame data for the test driving conditions.
4) Select "MODE 7" with GST.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and drive at 1,500 - 3,000 rpm for at least 3 minutes.
   Hold the accelerator pedal as steady as possible during driving.
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

No. 6 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

DIAGNOSTIC PROCEDURE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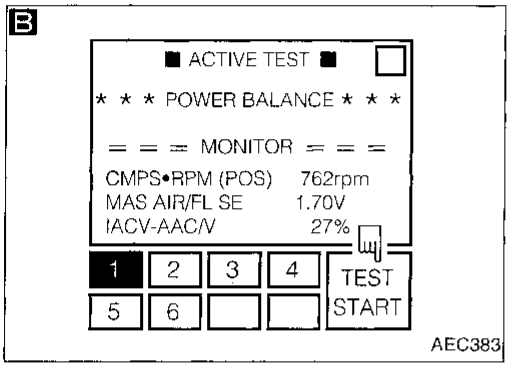
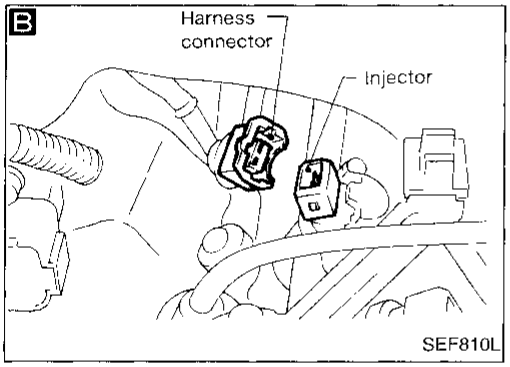


AEC383



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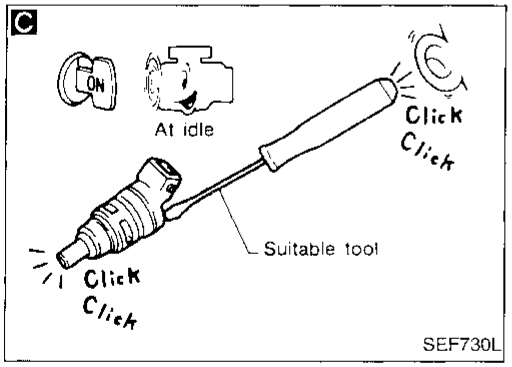
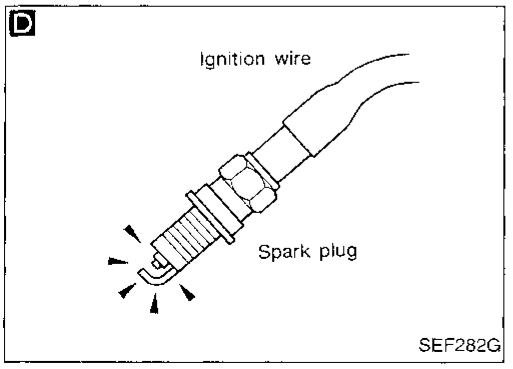


SEF730L



SEF282G

INSPECTION START

CHECK FOR INTAKE AIR LEAK.
Start engine and run it at idle speed. Listen for an intake air leak.
NG → Discover air leak location and repair.
OK

CHECK FOR EXHAUST SYSTEM CLOGGING.
Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.
NG → Repair or replace it.
OK

A

CHECK EGR FUNCTION.
Perform OVERALL FUNCTION CHECK (Procedure for malfunction B) for EGR Function.
Refer to EC-163.
NG → Repair EGR system.
OK

B

PERFORM POWER BALANCE TEST.
1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
2. Is there any cylinder which does not produce a momentary engine speed drop?

OR

When disconnecting each injector harness connector one at a time, is there any cylinder which does not produce a momentary engine speed drop?

No → Go to E on next page.
Yes

C

CHECK INJECTOR.
Does each injector make an operating sound at idle?
No → Check injector(s) and circuit(s). Refer to EC-232.
Yes

D

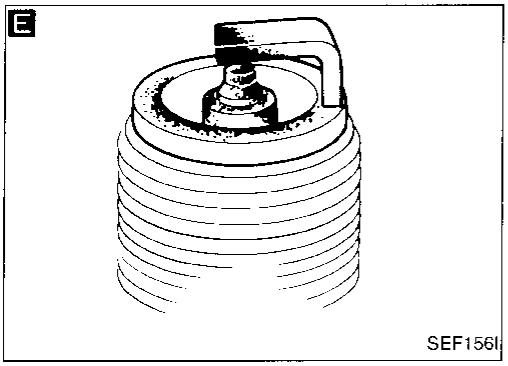
CHECK IGNITION SPARK.
1. Disconnect ignition wire from spark plug.
2. Connect a known good spark plug to the ignition wire.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → CHECK COMPONENT (Ignition wires).
Refer to "COMPONENT INSPECTION", EC-148.
OK → Check ignition coil, power transistor and their circuits.
Refer to EC-195.
NG → Replace.
OK

Ⓐ
(Go to next page.)

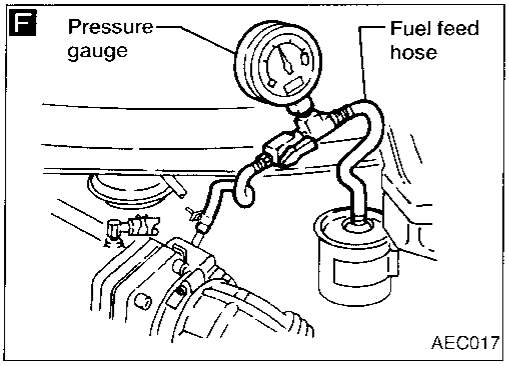
No. 6 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

E



SEF156I

F



AEC017

Ⓐ

E

CHECK SPARK PLUGS.
Remove the spark plugs and check for fouling, etc.

NG → Repair or replace spark plug(s).

OK

F

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-22.
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa
(2.4 kg/cm^2, 34 psi)

NG → Check fuel pump and circuit. (Refer to EC-238.)

OK

CHECK COMPRESSION PRESSURE.
Refer to EM section.
- Check compression pressure.

Standard:
kPa (kg/cm^2, psi)/300 rpm
1,196 (12.2, 173)
Minimum:
kPa (kg/cm^2, psi)/300 rpm
883 (9.0, 128)
Difference between each cylinder:
kPa (kg/cm^2, psi)/300 rpm
98 (1.0, 14)

NG → Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

OK

CHECK IGNITION TIMING.
Perform "Basic Inspection", EC-68.

NG → Adjust ignition timing.

OK

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

OR

Check "MASS AIR FLOW" in MODE 1 with GST.
3.2 - 6.7 g·m/sec: at idling
8.7 - 21.9 g·m/sec: at 2,500 rpm

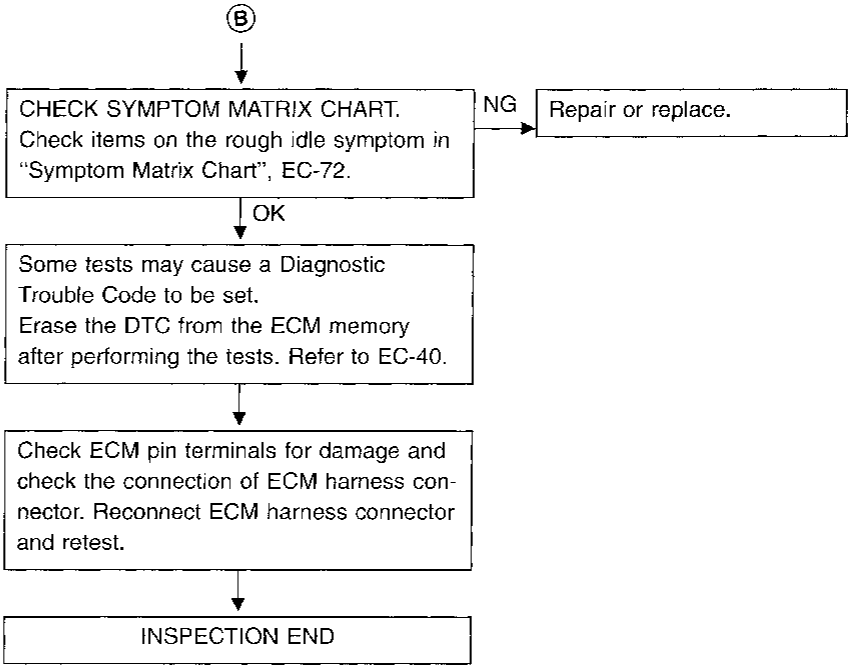
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-89.
If NG, repair or replace it.

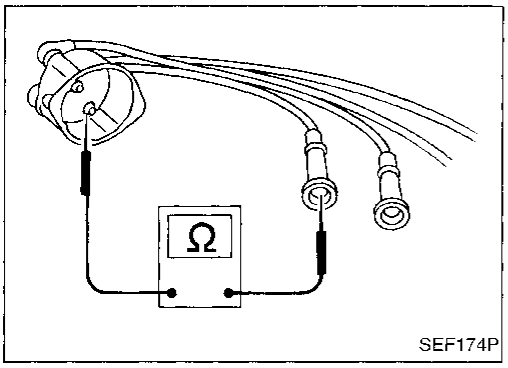
OK

Ⓑ

(Go to next page.)

No. 6 - 1 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)





COMPONENT INSPECTION

Ignition wires

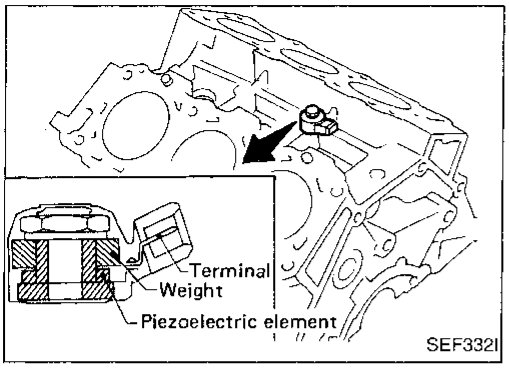
1. Inspect wires for cracks, damage, burned terminals and for improper fit.
2. Measure the resistance of wires to their distributor cap terminal. Move each wire while testing to check for intermittent breaks.

   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.



Knock Sensor (KS)

COMPONENT DESCRIPTION

The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

*** Freeze frame data will not be stored in the ECM for the knock sensor. The MIL will not light for knock sensor malfunction.**

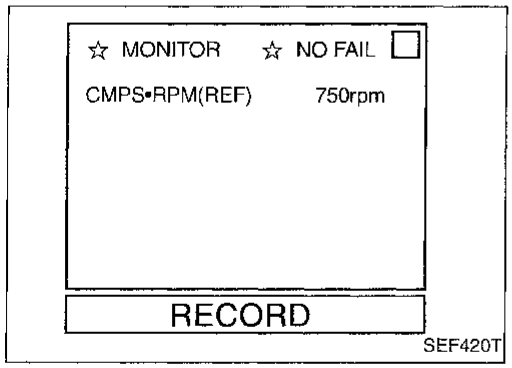
ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
54	W	Knock sensor	Engine is running. └ Idle speed	Approximately 2.5V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0325 0304	• An excessively low or high voltage from the knock sensor is sent to ECM.	• Harness or connectors (The knock sensor circuit is open or shorted.) • Knock sensor



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 5 seconds at idle speed.

OR

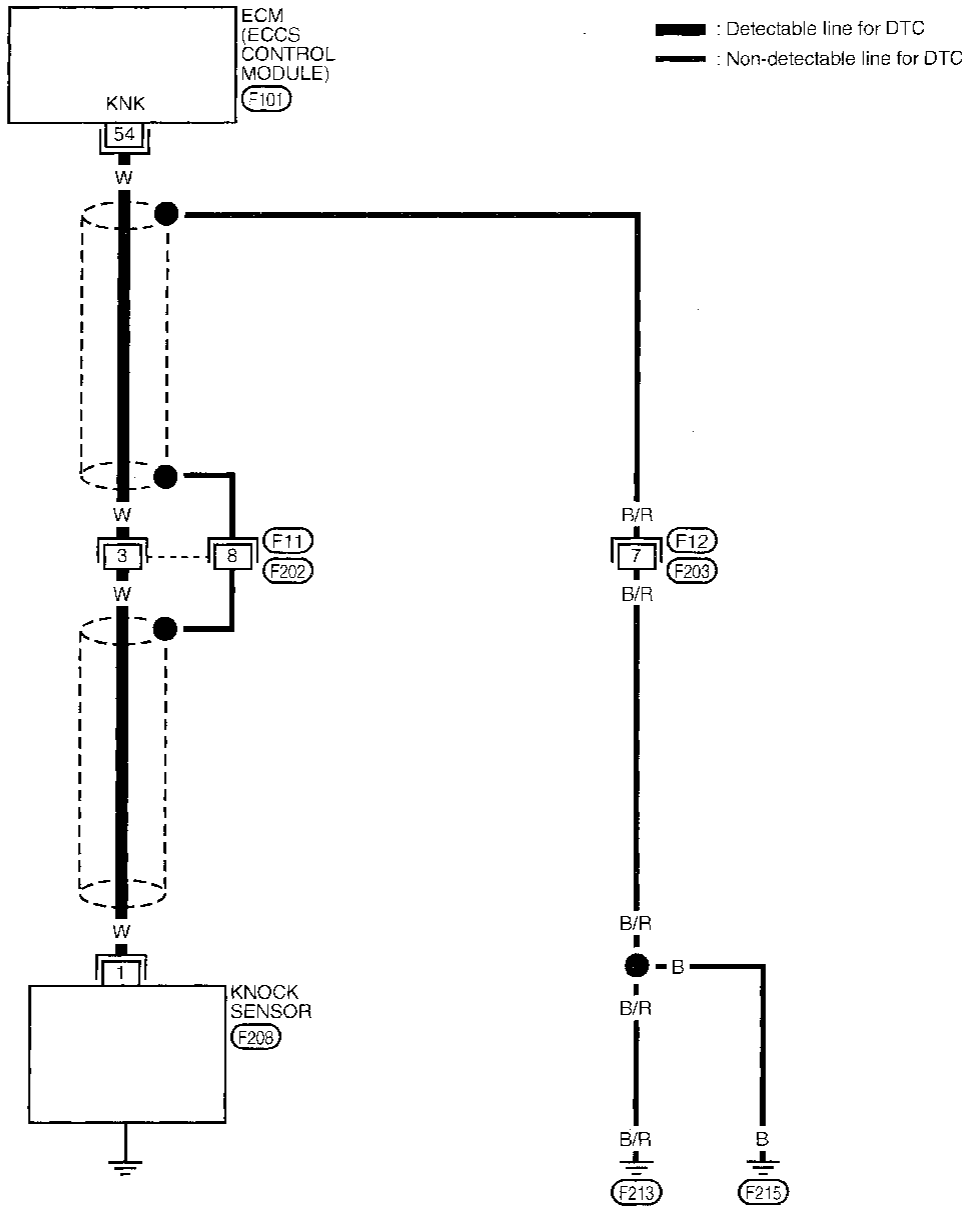
1) Start engine and run it for at least 5 seconds at idle speed.
2) Select "MODE 7" with GST.

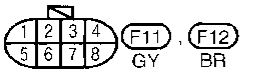
OR

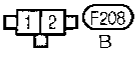
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

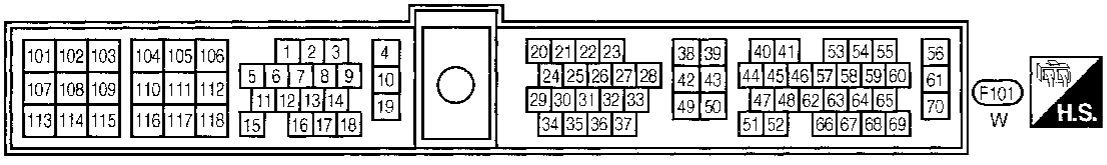
Knock Sensor (KS) (Cont'd)

EC-KS-01





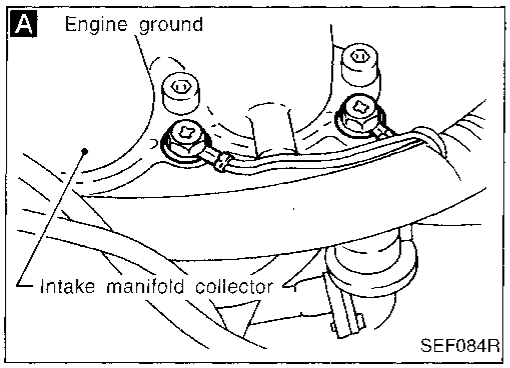


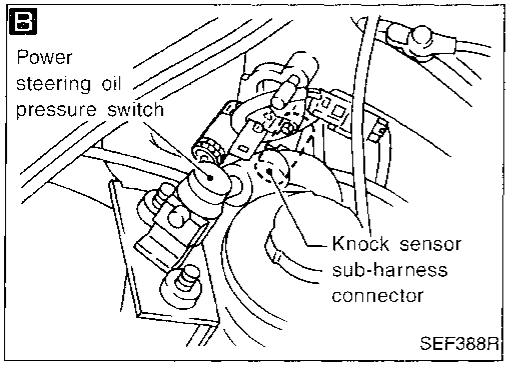


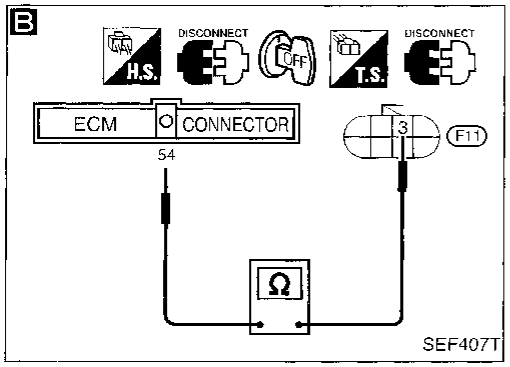
AEC183A

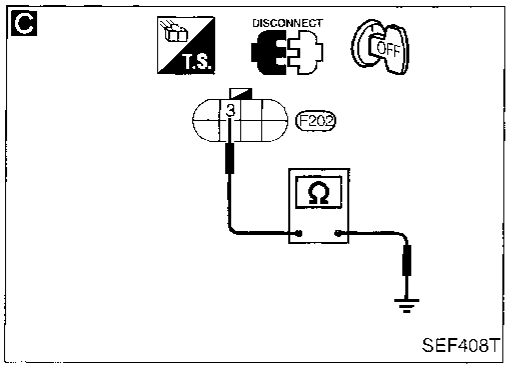
Knock Sensor (KS) (Cont'd)

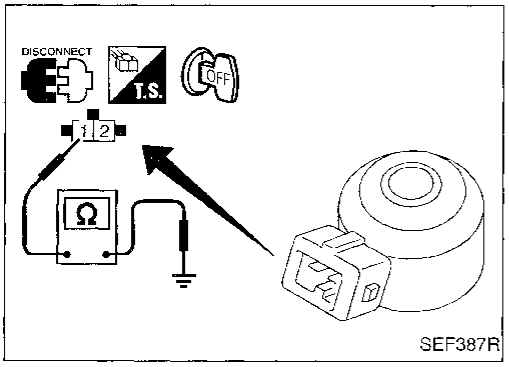
DIAGNOSTIC PROCEDURE











INSPECTION START

A

Loosen and retighten engine ground screws.

B

CHECK INPUT SIGNAL CIRCUIT-1.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and harness connectors (F11), (F202).
3. Check harness continuity between harness connector terminal (3) and ECM terminal (54).

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

NG → Repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCIT-2.
Check resistance between harness connector terminal (3) and engine ground.
Resistance: Approximately 500 - 620 kΩ
If OK, check harness for short.
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

NG → Check the following.
- Harness for open or short between knock sensor and harness connector (F202)
- Continuity between sensor body and engine ground

If NG, repair harness or connectors.
- Knock sensor (Refer to "COMPONENT INSPECTION" below.)

If NG, replace knock 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

COMPONENT INSPECTION

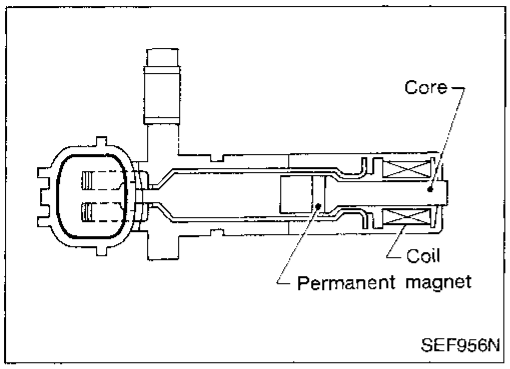
Knock sensor

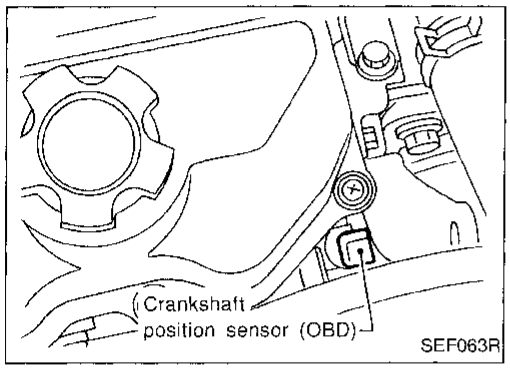
- Use an ohmmeter which can measure more than 10 MΩ.

1. Disconnect knock sensor harness connector.
2. Check resistance between terminal (1) and ground.

Resistance: 500 - 620 kΩ [at 25°C (77°F)]

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.





Crankshaft Position Sensor (CKPS) (OBD)

COMPONENT DESCRIPTION

The crankshaft position sensor (OBD) is located on the transaxle housing facing the gear teeth (cogs) of the 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

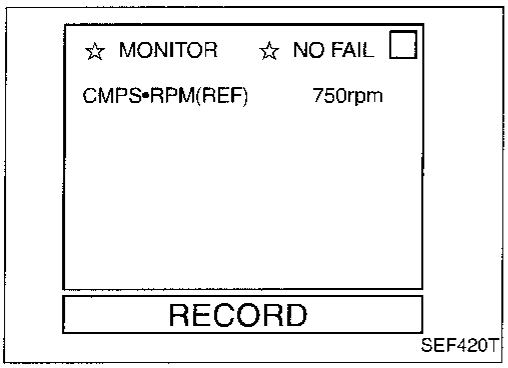
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	LG	Crankshaft position sensor (OBD)	Engine is running. (in "N" position) └ Idle speed (Air conditioner switch "OFF")	More than 0.4V* (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)
P0335 0802	● The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed.	● Harness or connectors (The crankshaft position sensor (OBD) circuit is open.) ● Crankshaft position sensor (OBD)



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 15 seconds at idle speed.

OR

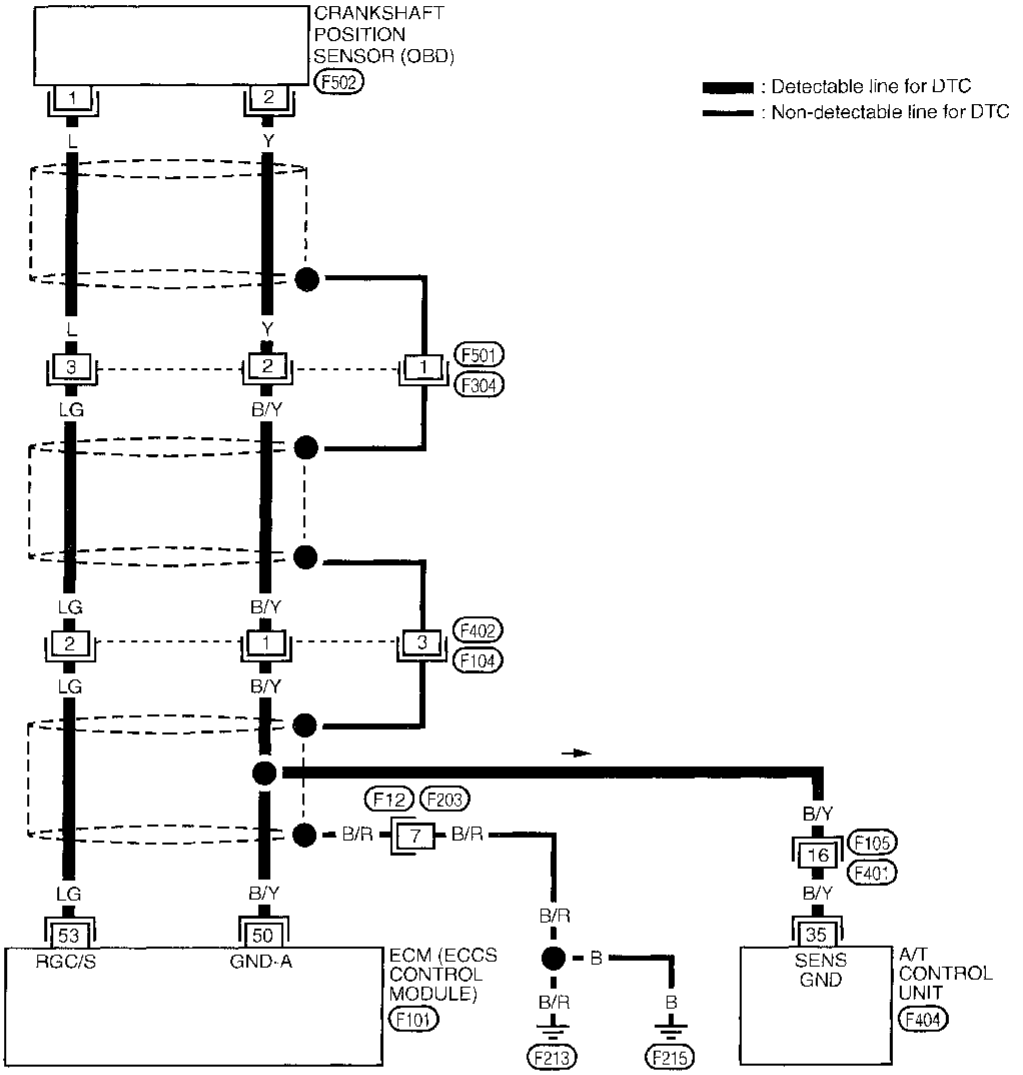
1) Start engine and run it for at least 15 seconds at idle speed.
2) Select "MODE 7" with GST.

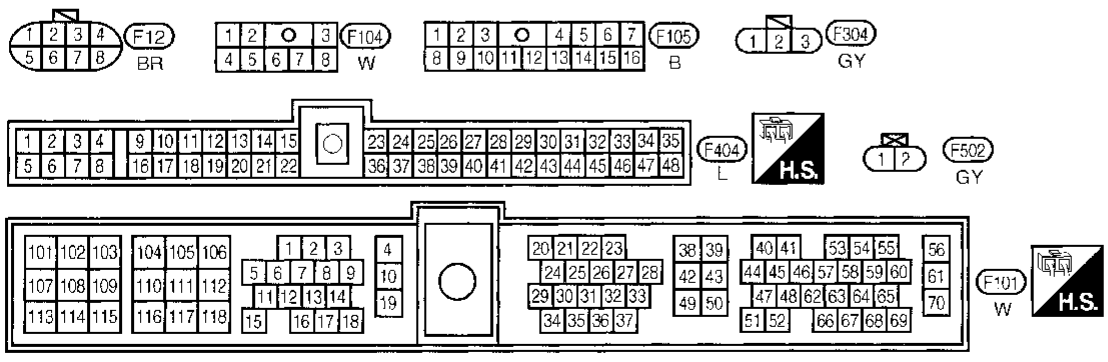
OR

1) Start engine and run it for at least 15 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-CKPS-01

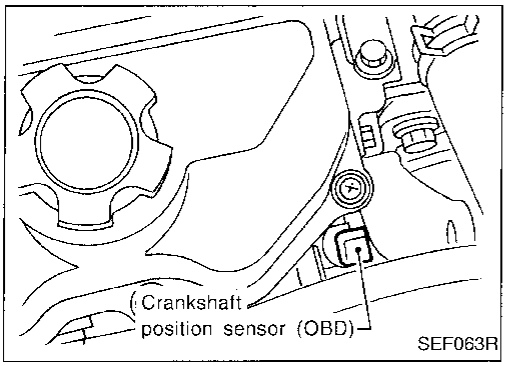


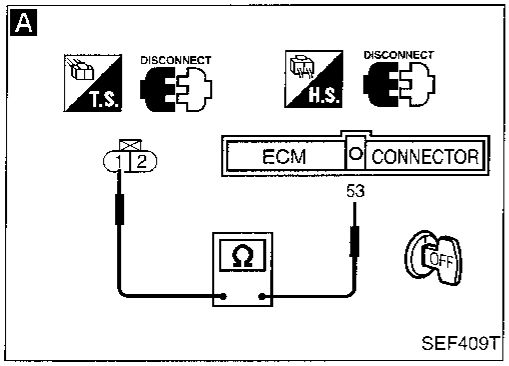


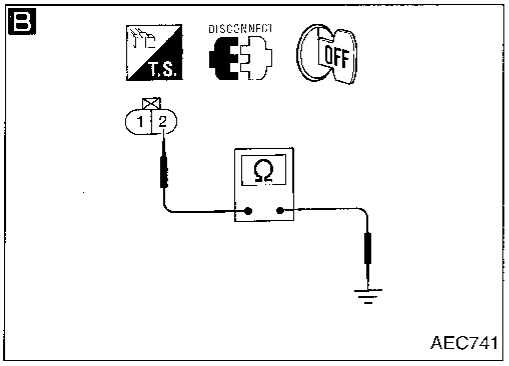
AEC184A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.
3. Check continuity between ECM terminal (53) and terminal (1).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F501), (F304)
- Harness connectors (F402), (F104)
- Harness for open or short between ECM and crankshaft position sensor (OBD)

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 (F501), (F304)
- Harness connectors (F402), (F104)
- Harness connectors (F105), (F401)
- Harness for open or short between ECM and crankshaft position sensor (OBD) harness connector
- Harness for open or short between A/T control unit and crankshaft position sensor (OBD)

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
[Crankshaft position sensor (OBD)].
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (OBD).

OK ↓

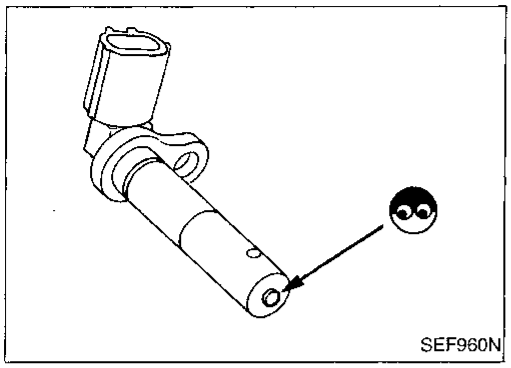
Disconnect and reconnect harness connectors in the circuit. Then retest.

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

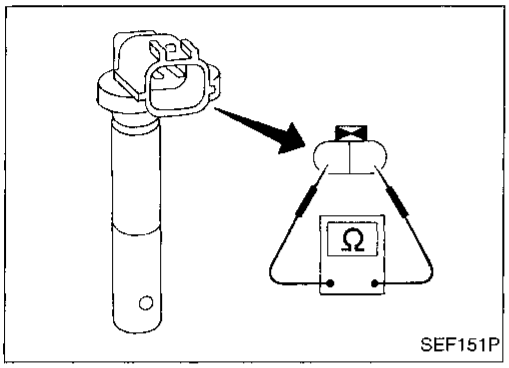
Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)


SEF960N

COMPONENT INSPECTION

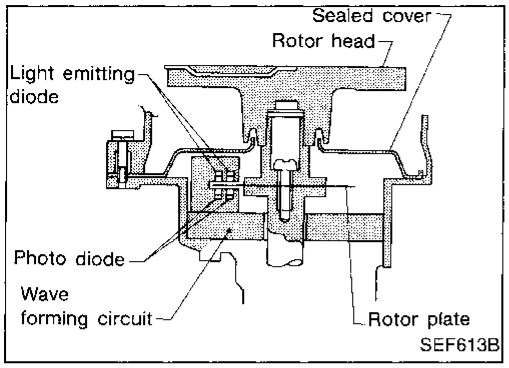
Crankshaft position sensor (OBD)

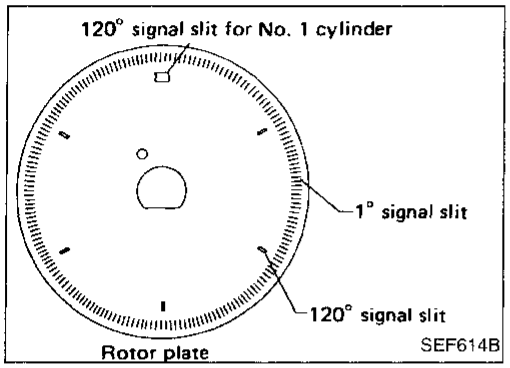
1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



SEF151P

5. Check resistance as shown in the figure.
   Resistance: Approximately 432 - 528Ω
   [at 25°C (77°F)]





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° (POS) signal and 6 slits for a 120° (REF) signal. The wave-forming circuit consists of Light Emitting Diodes (LED) and photo diodes.

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

ECM TERMINALS AND REFERENCE VALUE

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

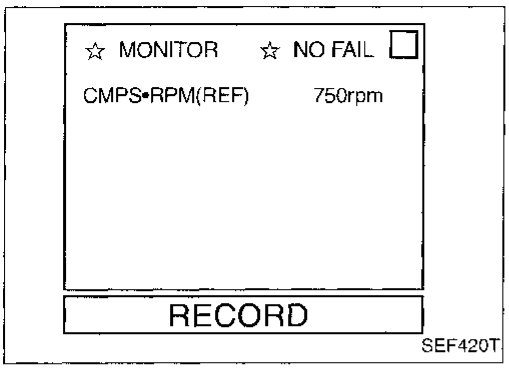
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
40	G/B	Camshaft position sensor (Reference signal)	Engine is running. — Idle speed	0.2 - 0.5V*
44	G/B			
41	G/Y	Camshaft position sensor (Position signal)	Engine is running. — Idle speed	2.0 - 3.0V*
45	G/Y			

*: 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	● Either 1° or 120° signal is not sent to ECM for the first few seconds during engine cranking. ● Either 1° or 120° signal is not sent to ECM often enough while the engine speed is higher than the specified engine speed. ● The relation between 1° and 120° signal is not in the normal range during the specified engine speed.	● Harness or connectors (The camshaft position sensor circuit is open or shorted.) ● Camshaft position sensor ● Starter motor (Refer to EL section.) ● Starting system circuit (Refer to EL section.) ● Dead (weak) battery

Camshaft Position Sensor (CMPS) (Cont'd)



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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

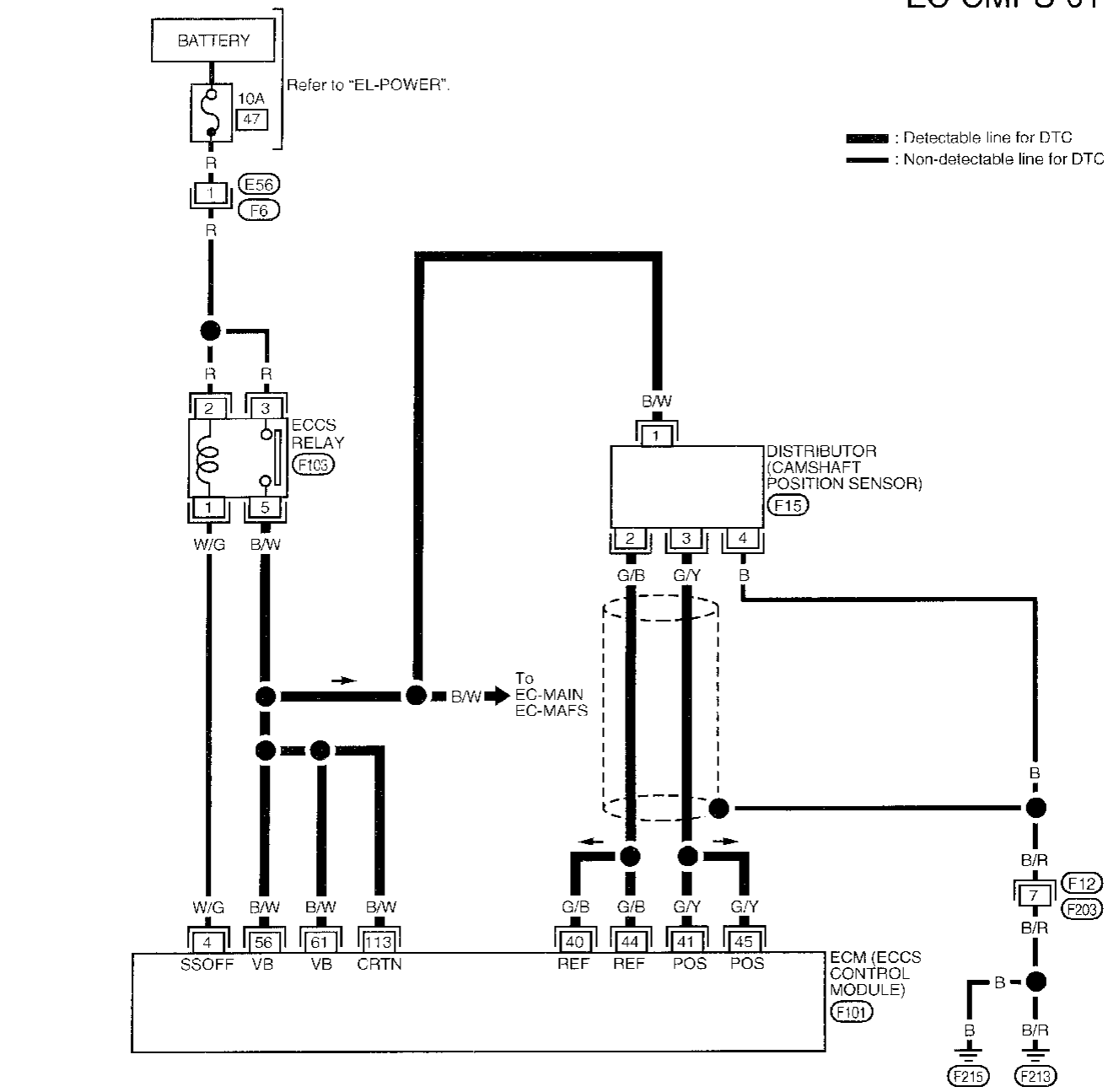
OR

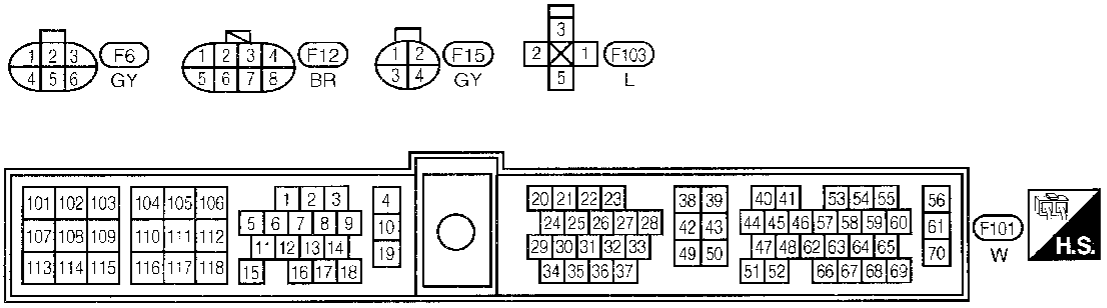
1) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
2) Select "MODE 7" with GST.

OR

1) Start engine and run it for at least 2 seconds at idle speed. (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform Diagnostic Test Mode II (Self-diagnostic results) with ECM.

EC-CMPS-01

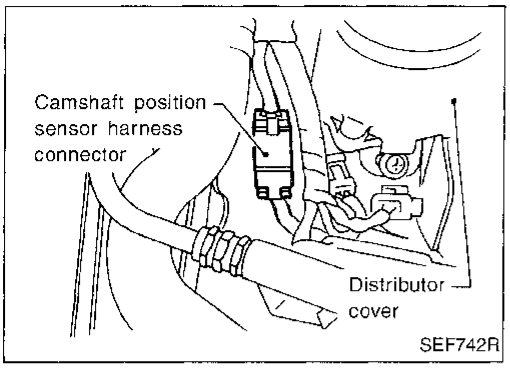


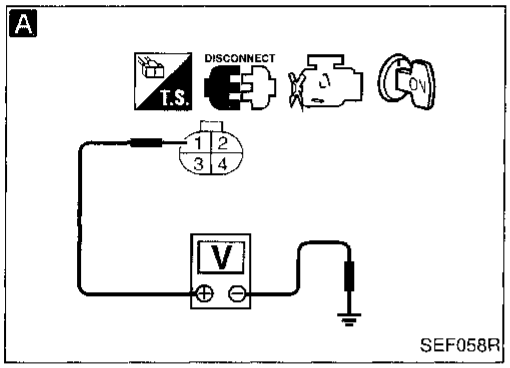


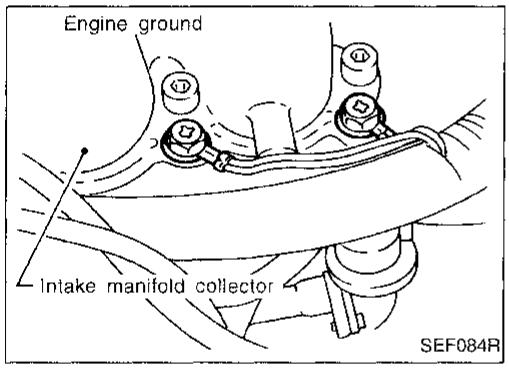
AEC185A

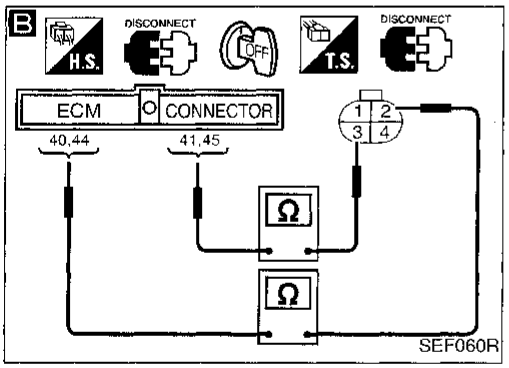
Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (DETECTABLE CIRCUIT)









INSPECTION START

A

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

NG → Check the following.
- Harness for open or short between camshaft position sensor and ECCS relay
- Harness for open or short between camshaft position sensor and ECM

If NG, repair harness or connectors.

OK ↓

Loosen and retighten engine ground screws.

B

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between sensor terminal ③ and ECM terminals ㊶, ㊺, sensor terminal ② and ECM terminals ㊵, ㊹.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace camshaft position sensor.

OK ↓

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

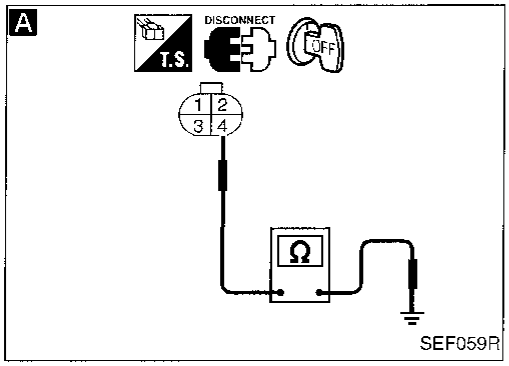
Trouble is not fixed. ↓

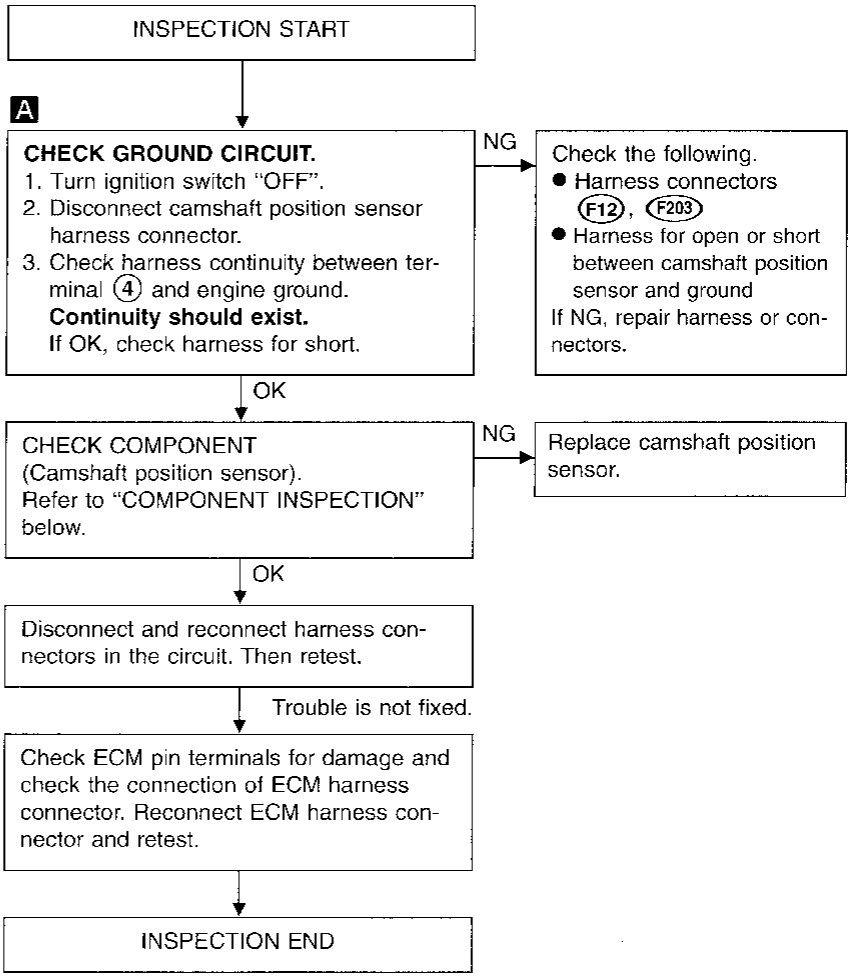
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

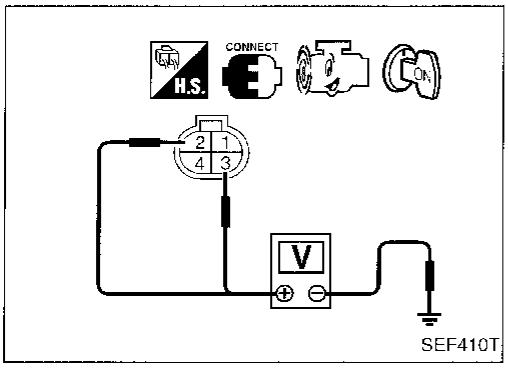
INSPECTION END

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE (NON-DETECTABLE CIRCUIT)







COMPONENT INSPECTION

Camshaft position sensor

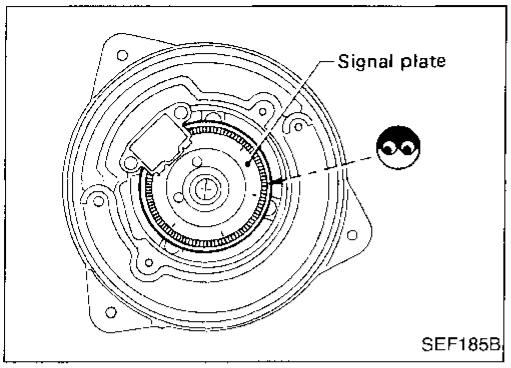
1. Start engine.
2. Check voltage between camshaft position sensor terminals ②, ③ and ground with AC range.

Condition	Terminal	Voltage
Engine running at idle	② and ground	Approximately 1.0V* (AC)
	③ and ground	Approximately 2.4V* (AC)

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

If NG, replace distributor assembly with camshaft position sensor.

Camshaft Position Sensor (CMPS) (Cont'd)

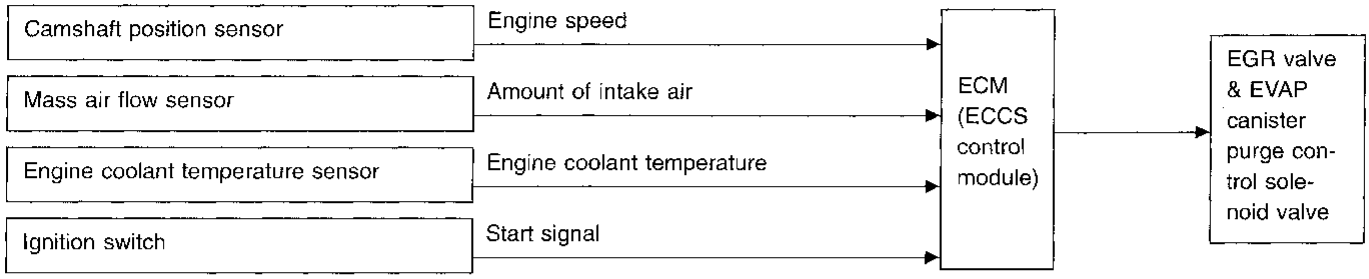


3. Remove distributor cap. Visually check signal plate for damage or dust.

After this inspection, 1st trip DTC P0340 (0101) might be displayed with camshaft position sensor functioning properly. Erase the stored memory.

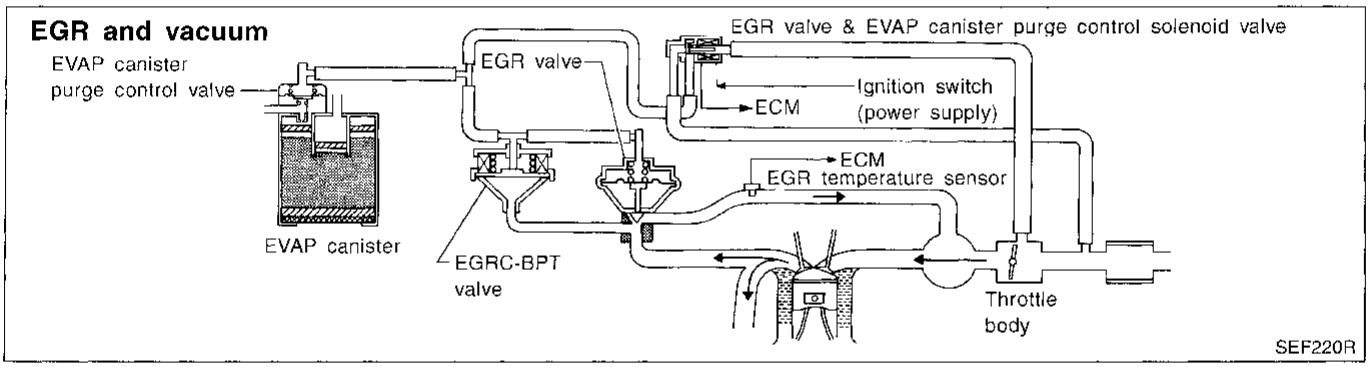
EGR Function

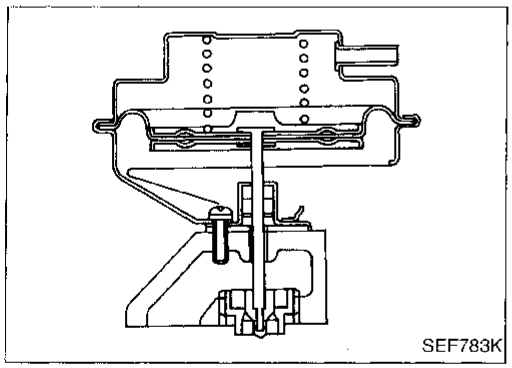
SYSTEM DESCRIPTION



This system cuts and controls vacuum applied to the EGR valve and EVAP canister to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the EGR valve & EVAP canister purge control solenoid valve. When the ECM detects any of the following conditions, current flows through the solenoid valve. This causes the port vacuum to be discharged into the atmosphere. The EGR valve and EVAP canister remain closed.

- Low engine coolant temperature
- Engine starting
- High-speed engine operation
- Engine idling
- Excessively high engine coolant temperature
- Low vehicle speed [less than 8 km/h (5 MPH)]
- Mass air flow sensor malfunction

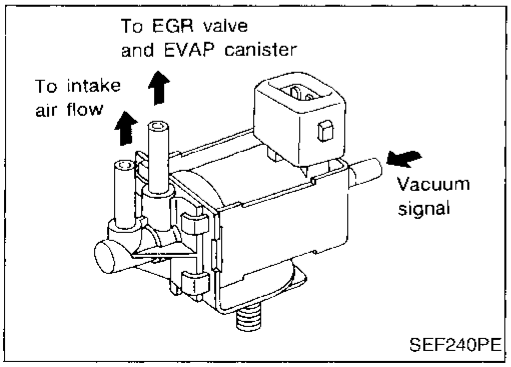




COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

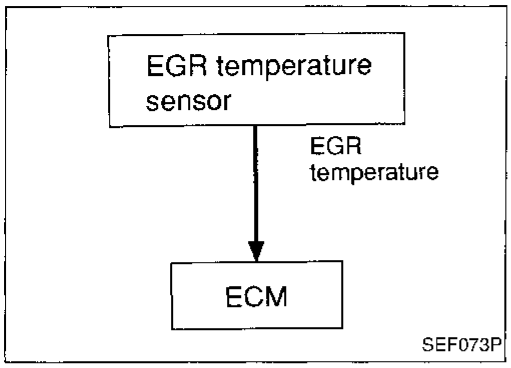
The EGR valve controls the amount of exhaust gas routed to the intake manifold. Vacuum is applied to the EGR valve in response to throttle valve opening. The vacuum controls the movement of a taper valve connected to the vacuum diaphragm in the EGR valve.



EGR valve and EVAP canister purge control solenoid valve

The EGR valve and EVAP canister purge control 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 and EVAP canister).
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and EVAP canister.

EGR Function (Cont'd)



ON BOARD DIAGNOSIS LOGIC

If the absence of EGR flow is detected by the 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.

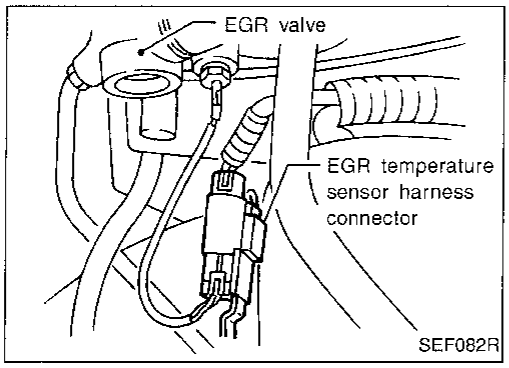
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0400 0302	A) The exhaust gas recirculation (EGR) flow is excessively low during the specified driving condition.	● EGR valve stuck closed ● EGRC-BPT valve leaking ● Passage blocked ● EGR valve & EVAP canister purge control solenoid valve ● Tube leaking for EGR valve ● EGR temperature sensor
	B) The exhaust gas recirculation (EGR) flow is excessively high during the specified driving condition.	● EGR valve & EVAP canister purge control solenoid valve ● EGR valve leaking or stuck open ● EGR temperature sensor

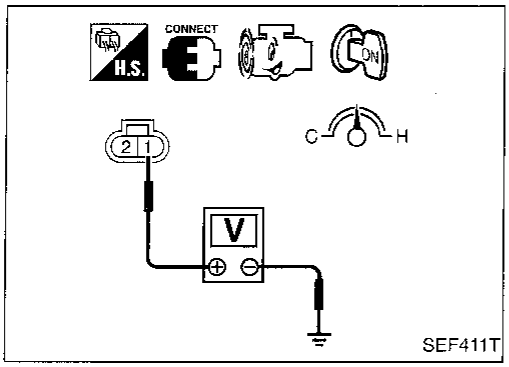
OVERALL FUNCTION CHECK

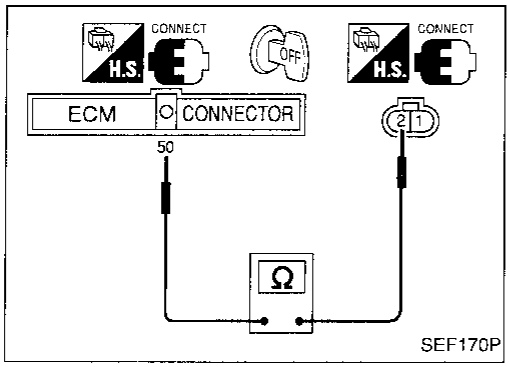
Use this procedure to check the overall EGR function. During this check, a 1st trip DTC might not be confirmed.

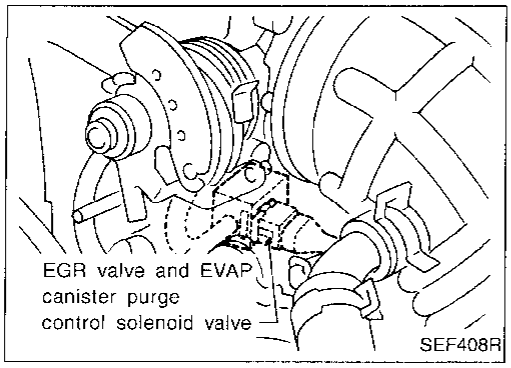
Before starting the following procedure, check the engine coolant temperature of the freeze frame data with CONSULT or Generic Scan Tool.
If the engine coolant temperature is higher than or equal to 75°C (167°F), perform only "Procedure for malfunction A".
If the engine coolant temperature is lower than 75°C (167°F), perform both "Procedure for malfunction A" and "Procedure for malfunction B".
If the 1st trip freeze frame data or the freeze frame data for another malfunction is stored in the ECM, perform both "Procedure for malfunction A" and "Procedure for malfunction B". In this case, check 1st trip DTCs and/or DTCs in the ECM and perform inspections one by one based on "INSPECTION PRIORITY", EC-70.

EGR Function (Cont'd)







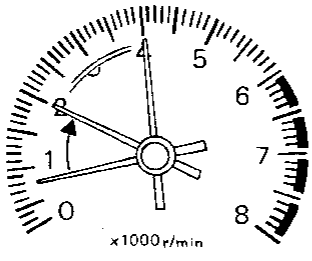


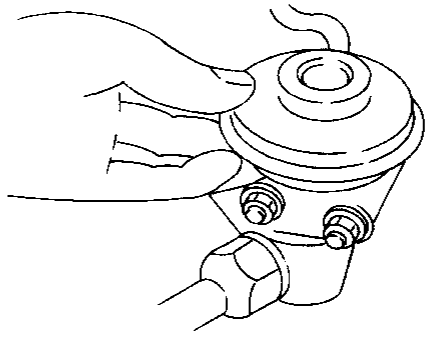
Procedure for malfunction A

1) Start engine and warm it up sufficiently.
2) Check the EGR valve lifting when revving from 2,000 rpm up to 4,000 rpm under no load using either of the following methods.
   - Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
   - Disconnect EGR valve & EVAP canister purge control solenoid valve harness connector.
     (The 1st trip DTC for EGR valve & EVAP canister purge control solenoid valve will be displayed, however, ignore it.)

   EGR valve should lift up and down without sticking.
   If NG, go to **A** in DIAGNOSTIC PROCEDURE on EC-168.
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 "COMPONENTS INSPECTION", "EGR temperature sensor". Refer to EC-171.

Overall function check

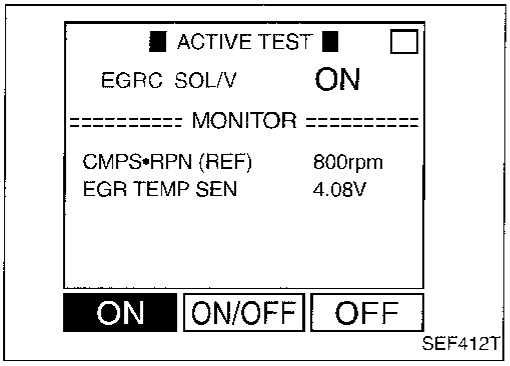


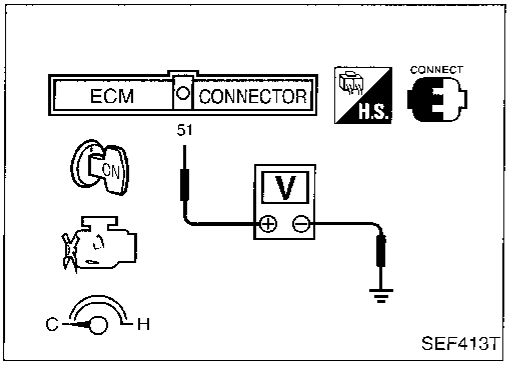


Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

SEF642Q

EGR Function (Cont'd)





Procedure for malfunction B

1) Start engine.
2) Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "ON".
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 75°C (167°F) in "Mode 1" with generic scan tool. Perform the following steps before its temperature becomes higher than 75°C (167°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.

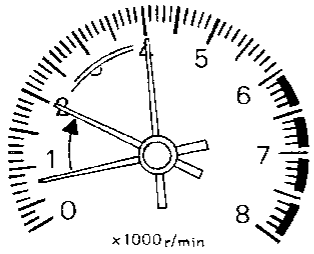
EGR valve should be closed and should not lift up.

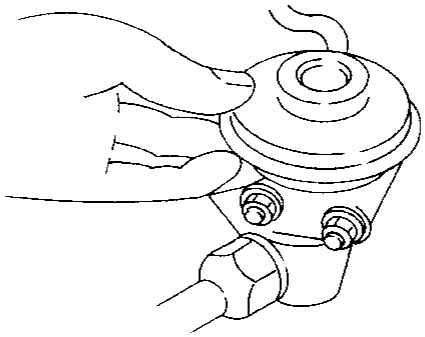
OR

1) Confirm the voltage between ECM terminal (51) and ground is higher than 1.44V. Perform the following steps before the voltage becomes lower than 1.44V.
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

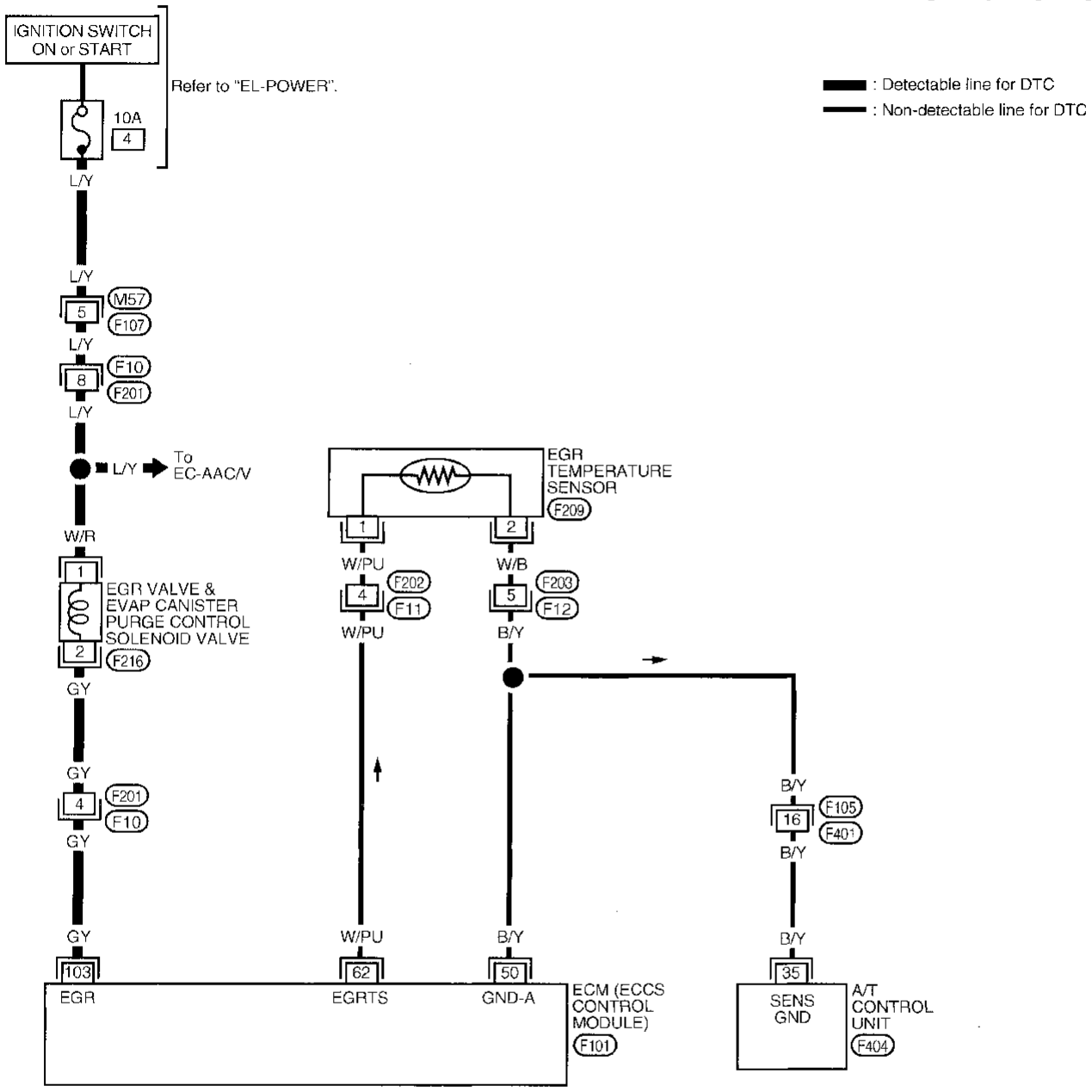


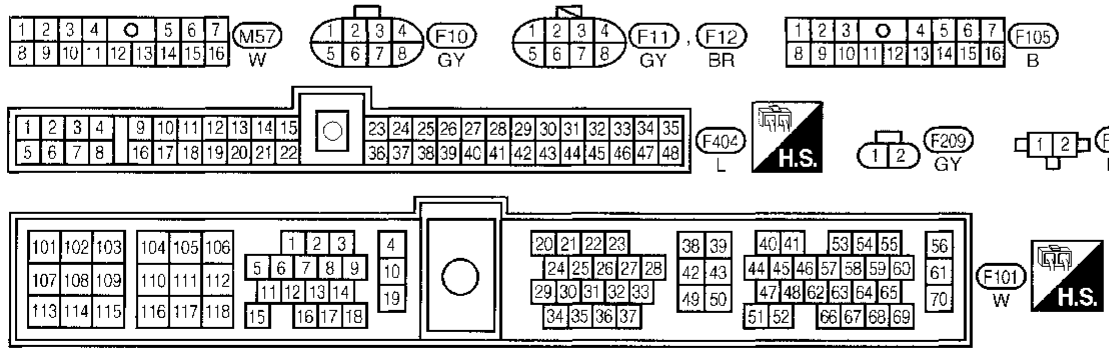


Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

SEF642Q

EC-EGRC1-01



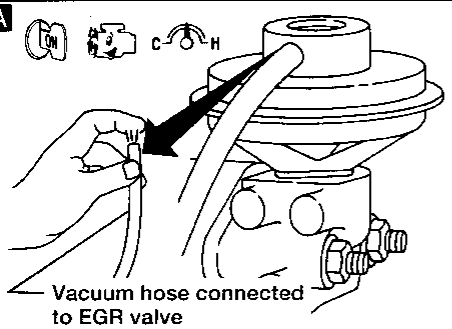


AEC186A

EGR Function (Cont'd)

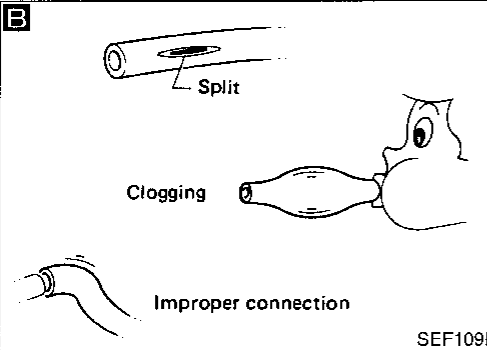
DIAGNOSTIC PROCEDURE

A



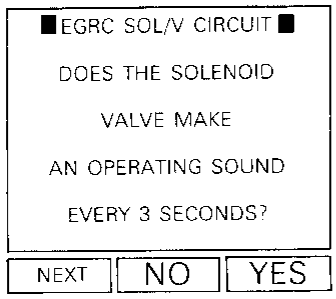
AEC039

B



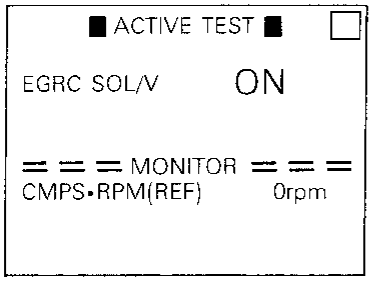
SEF109L

C



MEF957D

C



MEF298F

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 at hose.
   Vacuum should not exist at idle.
4. Check for vacuum when revving from 2,000 rpm up to 4,000 rpm using either of the following methods:

- Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".

OR

- Disconnect EGR valve & EVAP canister purge control solenoid valve harness connector.
  (The 1st trip DTC for EGR valve & EVAP canister purge control solenoid valve will be displayed, however, ignore it.)

Vacuum should exist when revving engine.

OK → CHECK COMPONENTS (EGR valve). Refer to "COMPONENTS INSPECTION", EC-170.

NG → Replace EGR valve.

NG

B

CHECK VACUUM HOSE.
Check vacuum hose for clogging, cracks, improper connection, or misrouting.
Refer to "Vacuum Hose Drawing", EC-12.

NG → Repair or replace vacuum hose, or correct routing.

OK

C

CHECK COMPONENT
(EGR valve & EVAP canister purge control 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 EGR valve & EVAP canister purge control solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

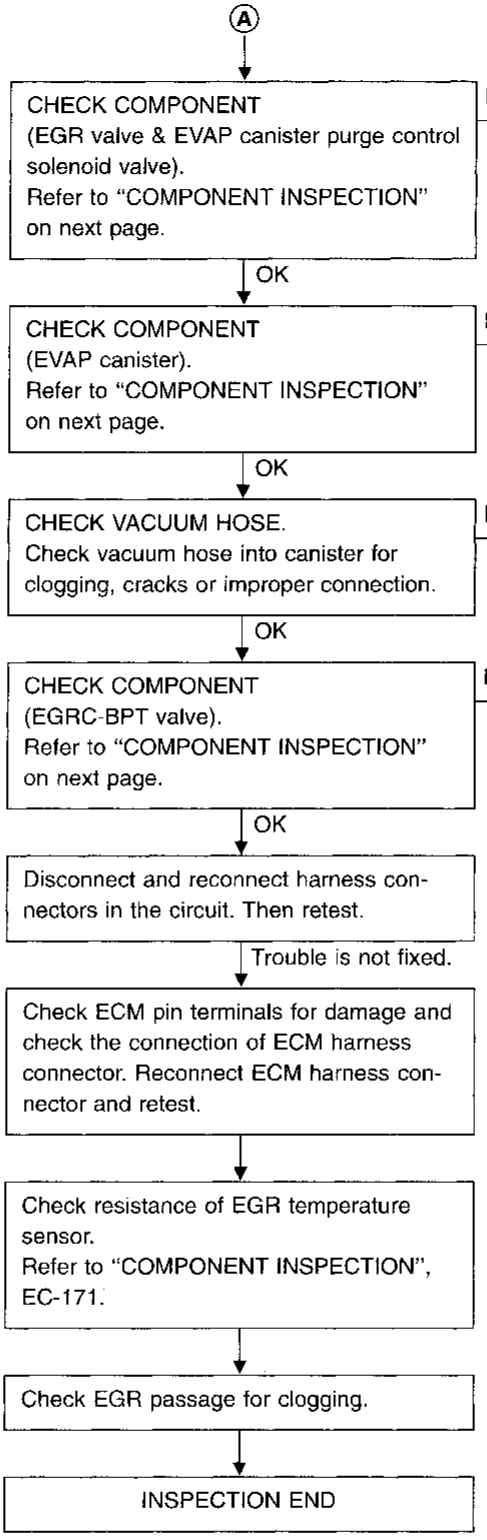
1. Turn ignition switch "ON".
2. Check operating sound of the solenoid valve when disconnecting and reconnecting EGR valve & EVAP canister purge control solenoid valve harness connector.

NG → Repair or replace EGR valve & EVAP canister purge control solenoid valve circuit.

OK

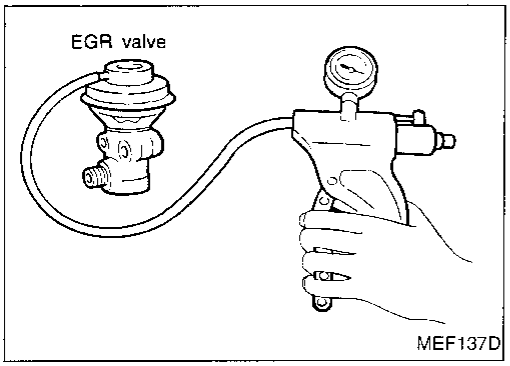
Ⓐ
(Go to next page.)

EGR Function (Cont'd)



EGR Function (Cont'd)

COMPONENT INSPECTION

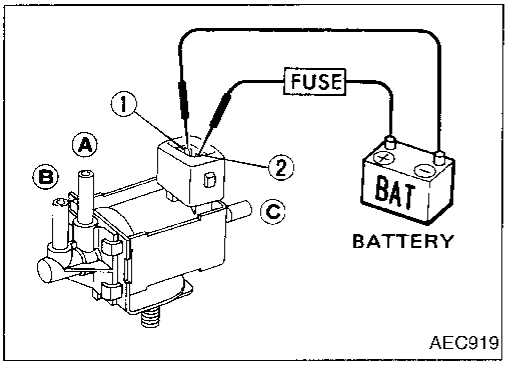


EGR valve

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

EGR valve spring should lift.

If NG, replace EGR valve.

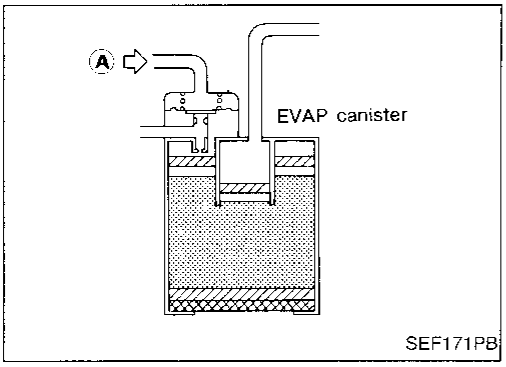


EGR valve & EVAP canister purge control solenoid valve

Check solenoid valve, following the table as shown below:

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

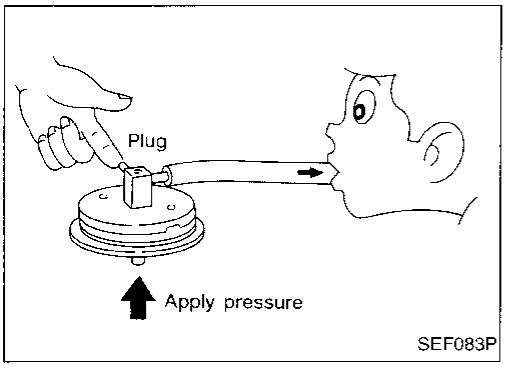
If NG, replace EGR valve & EVAP canister purge control solenoid valve.



EVAP canister

Gently blow air from Ⓐ.

No leakage should exist.



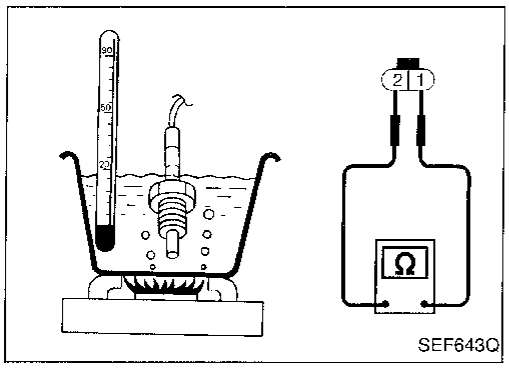
EGRC-BPT valve

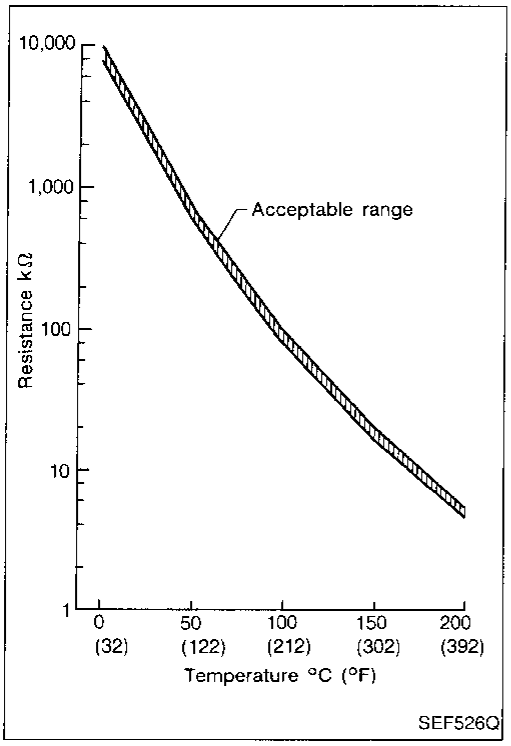
1. Plug one of two ports of EGRC-BPT valve.
2. Vacuum from the other port and check for leakage while applying a pressure above 0.981 kPa (100 mmH_2O, 3.94 inH_2O) from under EGRC-BPT valve.
3. If a leakage is noted, replace the valve.

EGR Function (Cont'd)

EGR temperature sensor

Check resistance change and resistance value.



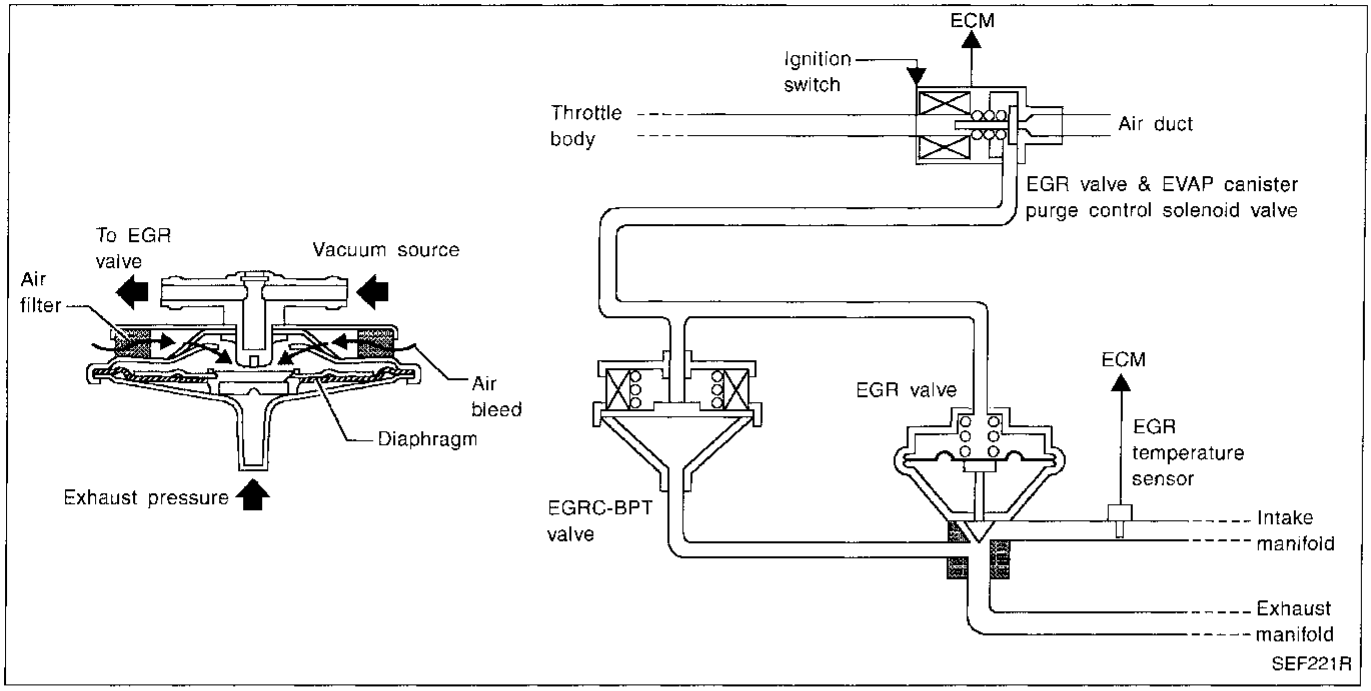


⟨Reference data⟩

EGR temperature °C (°F)	Voltage (V)	Resistance (MΩ)
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

If NG, replace EGR temperature sensor.

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

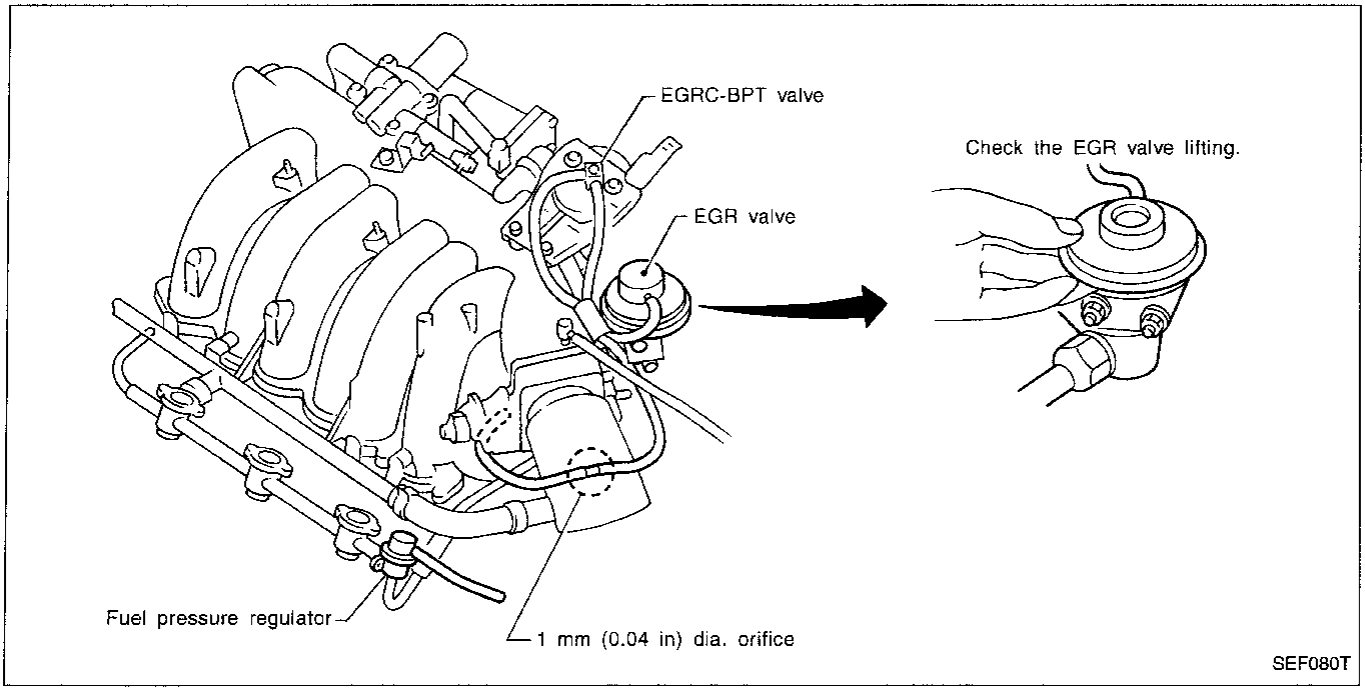
If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is large, then the vacuum to the EGR valve is interrupted through the EGR & EVAP canister purge control solenoid valve. If the engine roughness is reduced at that time, the EGRC-BPT valve malfunction is indicated.

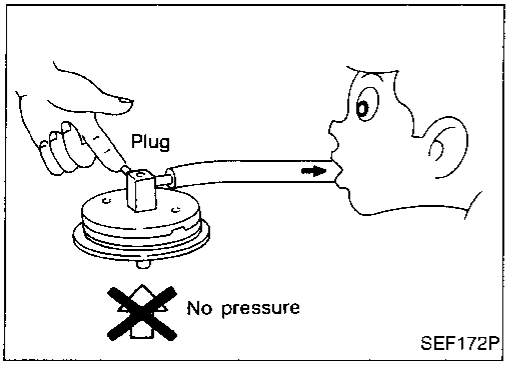
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0402 0306	● The EGRC-BPT valve does not operate properly.	● EGRC-BPT valve ● Misconnected rubber tube ● Blocked rubber tube ● Intake manifold EGR passage

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 fuel pressure regulator at the intake manifold.
2. Disconnect the rubber tube to the EGR valve & EVAP canister purge control solenoid valve at the EGRC-BPT valve.
   Connect the intake manifold and the EGRC-BPT valve with a rubber tube that has 1 mm (0.04 in) dia. orifice installed. (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 EGR valve & EVAP canister purge control solenoid valve and throttle body for misconnection, cracks or blockages.





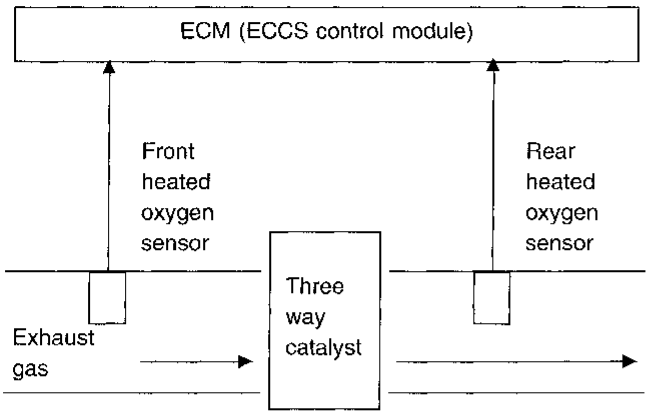
COMPONENT INSPECTION

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

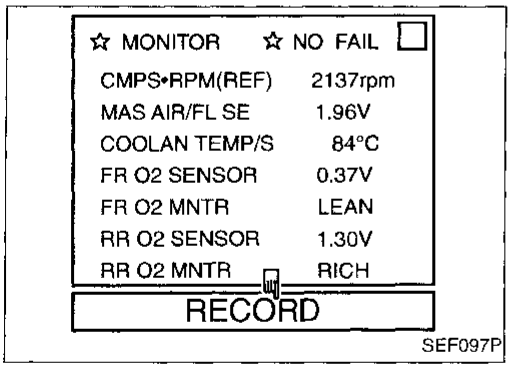


The ECM monitors the switching frequency ratio of front heated oxygen sensor and rear heated oxygen sensor.
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor 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	• Three way catalyst does not operate properly. • Three way catalyst does not have enough oxygen storage capacity.	• Three way catalyst • Exhaust tube • Intake air leak • Injectors • Injector leak

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 very less than that of "FR O2 MNTR".

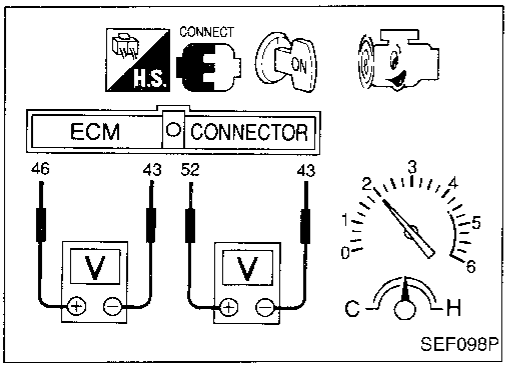
Switching frequency ratio =

$$\frac{\text{Rear heated oxygen sensor switching frequency}}{\text{Front heated oxygen sensor switching frequency}}$$

This ratio should be less than 0.5.
If the ratio is greater than the above value, the three way catalyst is not operating properly.

Note: If the "FR O2 MNTR" does not indicate "RICH" and "LEAN" periodically more than 5 times for 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC P0130 "Front heated oxygen sensor", EC-116 first.

Three Way Catalyst Function (Cont'd)



OR

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 ㊷ (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 ㊷ 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

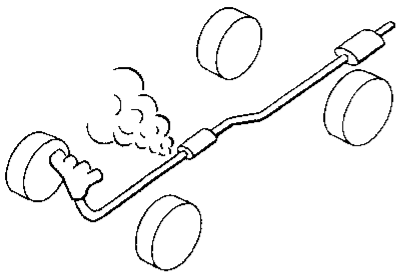
This ratio should be less than 0.5.
If the ratio is greater than the above value, it means three way catalyst does not operate properly.

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", EC-116 first.

Three Way Catalyst Function (Cont'd)

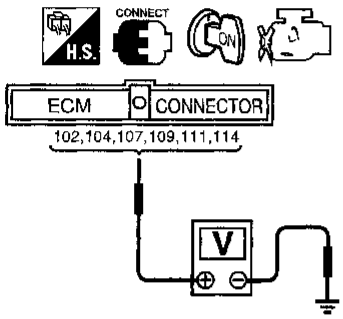
DIAGNOSTIC PROCEDURE

A



SEF099P

B



SEF414T

INSPECTION START

CHECK EXHAUST SYSTEM.
Visually check exhaust tubes and muffler for dent.

NG → Repair or replace.

OK

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 INJECTORS.
1. Refer to WIRING DIAGRAM for Injectors, EC-232.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals (102), (104), (107), (109), (111) and (114) and ground with CONSULT or tester.
   Battery voltage should exist.
4. Turn ignition switch "OFF".

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injector", EC-232. Repair harness or connectors.

OK

Remove injector assembly.
Refer to EC-23.
Keep fuel hose and all injectors connected to injector gallery.

1. Disconnect camshaft position sensor harness connector.
2. Turn ignition switch "ON".
   Make sure fuel does not drip from injector.

Drips → Replace the injector(s) from which fuel is dripping.

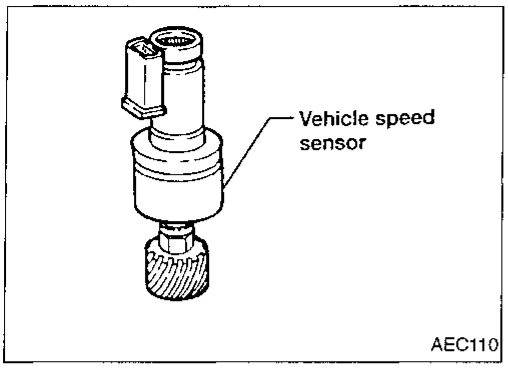
Does not drip

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

Trouble is not fixed → Replace three way catalyst.

Trouble is fixed

INSPECTION END



Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

The vehicle speed sensor is installed in the transaxle. It contains a pulse generator which provides a vehicle speed signal to the speedometer. The speedometer then sends a signal to the ECM.

ECM TERMINALS AND REFERENCE VALUE

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

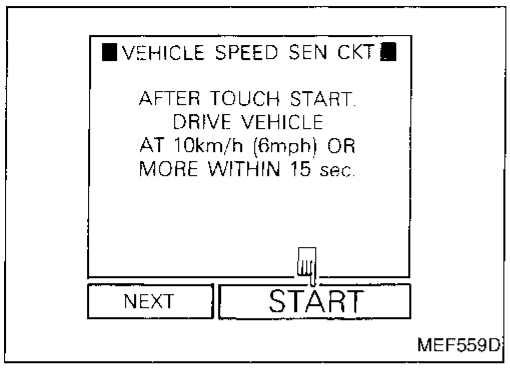
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
26	G/Y	Vehicle speed sensor	Engine is running. └ Slowly rotating front wheels	Approximately 5.0 - 6.0V* (AC voltage)

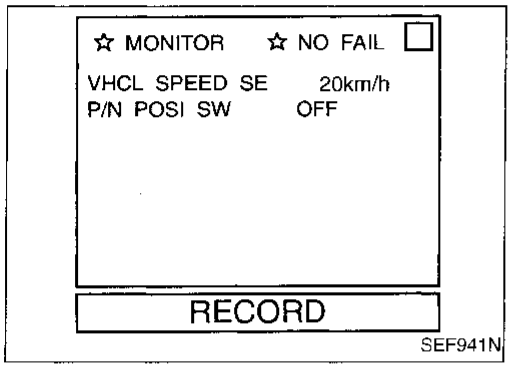
*: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

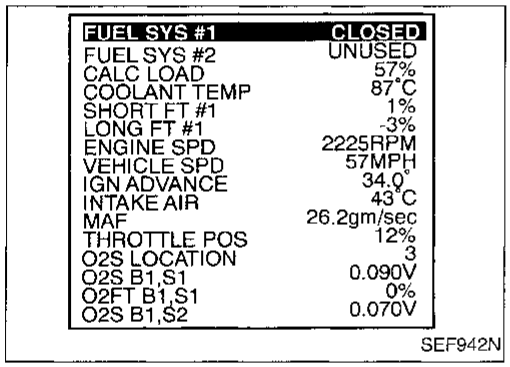
ON BOARD DIAGNOSIS LOGIC

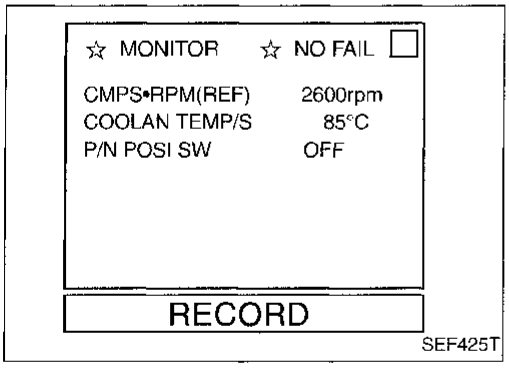
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	● The almost 0 km/h (0 MPH) signal from vehicle speed sensor is sent to ECM even when vehicle is being driven.	● Harness or connector (The vehicle speed sensor circuit is open or shorted.) ● Vehicle speed sensor

Vehicle Speed Sensor (VSS) (Cont'd)









OVERALL FUNCTION CHECK

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

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

OR

1) Jack up drive wheels.
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.

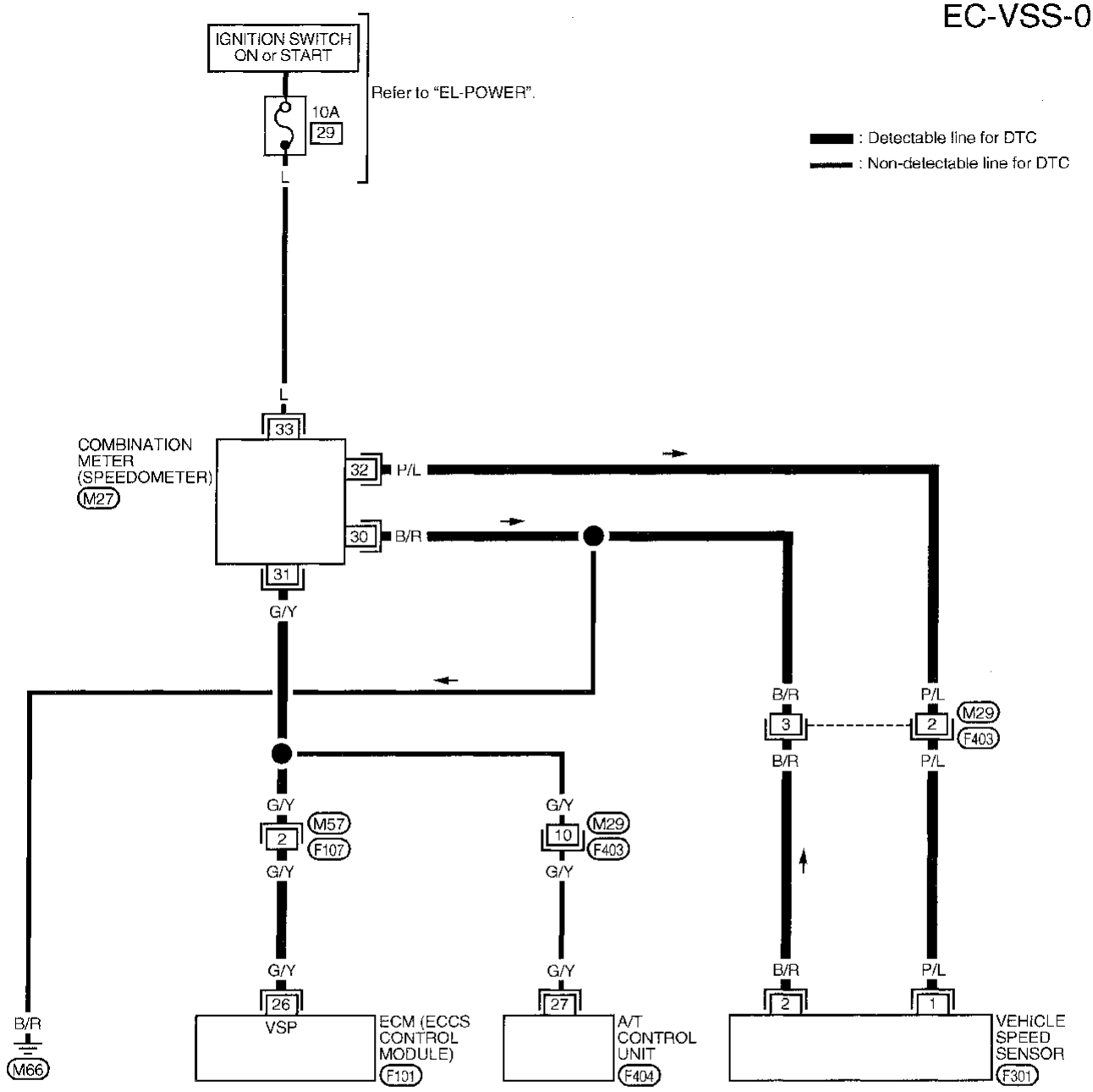
OR

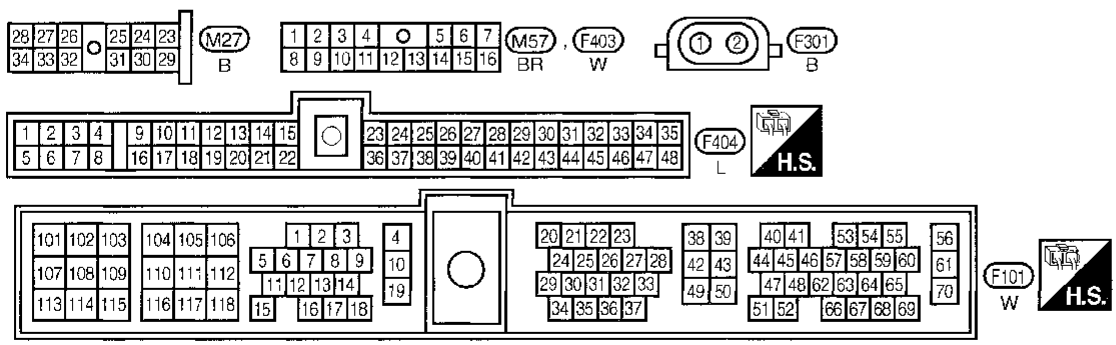
DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Start engine and warm it up sufficiently.
2) Perform test drive for at least 10 seconds continuously under the following recommended condition.
   Engine speed : 1,800 - 3,000 rpm
   Intake manifold vacuum: –36.0 to –20.0 kPa (–270 to –150 mmHg, –10.63 to –5.91 inHg)
   Gear position : OD position
3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

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

EC-VSS-01

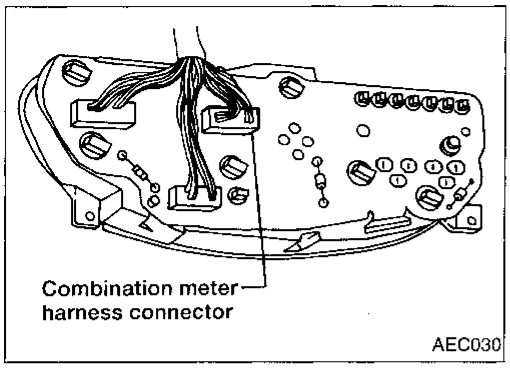


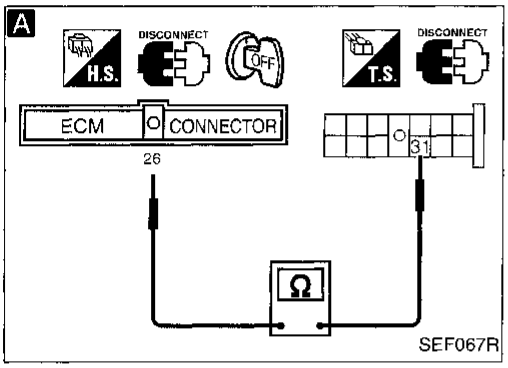


AEC187A

Vehicle Speed Sensor (VSS) (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and combination meter harness connector.
3. Check harness continuity between ECM terminal (26) and meter terminal (31).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F107), (M57)
- Harness for open or short between ECM and combination meter

If NG, repair harness or connectors.

OK ↓

CHECK SPEEDOMETER FUNCTION.
Make sure that speedometer functions properly.

NG → Check the following.
- Harness connectors (M29), (F403)
- Harness for open or short between combination meter and vehicle speed sensor

If NG, repair harness or connectors.
Check vehicle speed sensor and its circuit.
Refer to EL section.

OK ↓

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

Trouble is not fixed. ↓

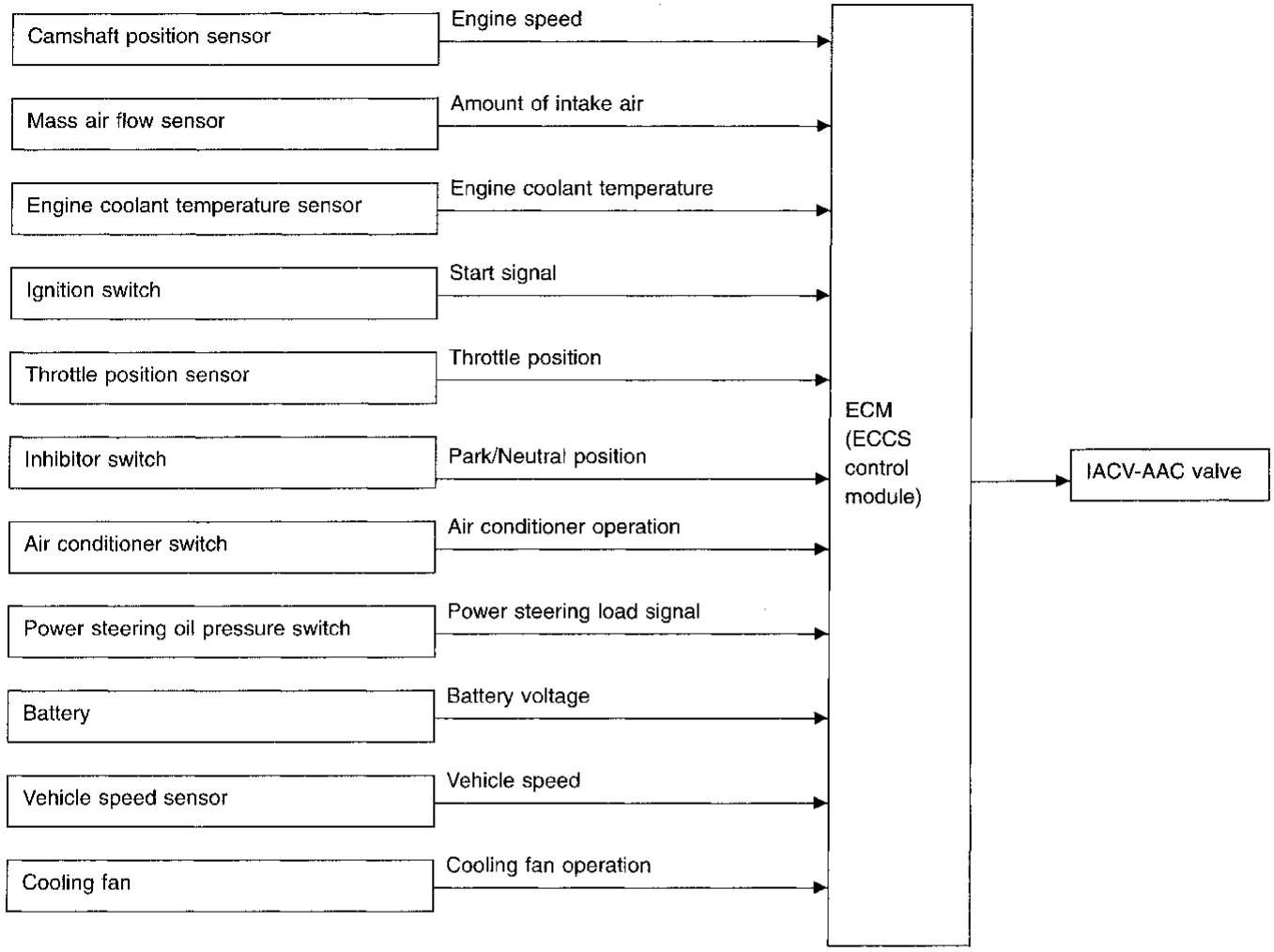
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

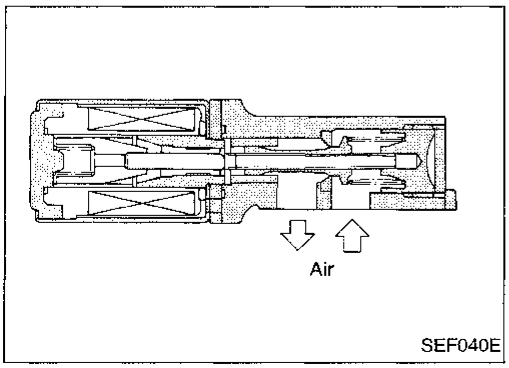
INSPECTION END

Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve

SYSTEM DESCRIPTION



This system automatically controls engine idle speed to a specified level. Idle speed is controlled through fine adjustment of the amount of air which bypasses the throttle valve via IACV-AAC valve. The IACV-AAC valve repeats ON/OFF operation according to the signal sent from the ECM. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the ON/OFF time of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions such as during warm up, deceleration, and engine load (air conditioner, power steering and cooling fan operation).



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.

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

ECM TERMINALS AND REFERENCE VALUE

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

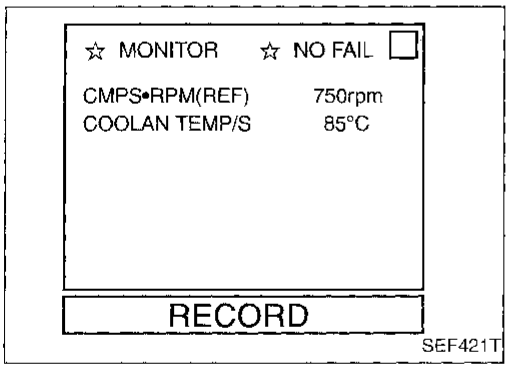
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
55	SB	IACV-AAC valve	Engine is running. └ Idle speed	8 - 11V
			Engine is running. — Rear window defogger is operating — Steering wheel is being turned — Air conditioner is operating └ Headlamps are in high position	4 - 7V

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	● Engine: After warming up ● Air conditioner switch: OFF ● Shift lever: "N" ● No-load	Idle	15 - 40%
		2,000 rpm	—

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0505 0205	● The IACV-AAC valve does not operate properly.	● Harness or connectors (The IACV-AAC valve circuit is open or shorted.) ● IACV-AAC valve



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" again and select "DATA MONITOR" mode with CONSULT.
4) Start engine and run it for at least 1 minute at idle speed.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it for at least 1 minute at idle speed.
4) Select "MODE 7" with GST.

OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and run it for at least 1 minute at idle speed.

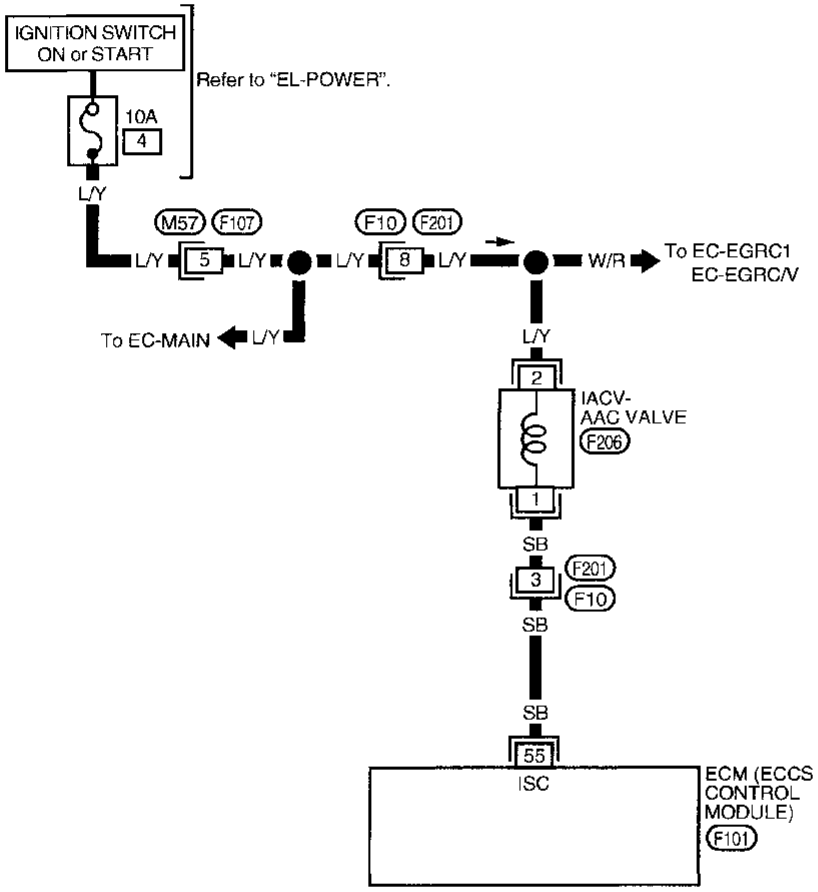
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

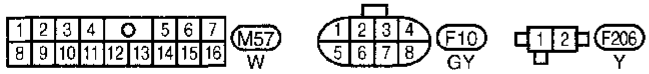
4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
5) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

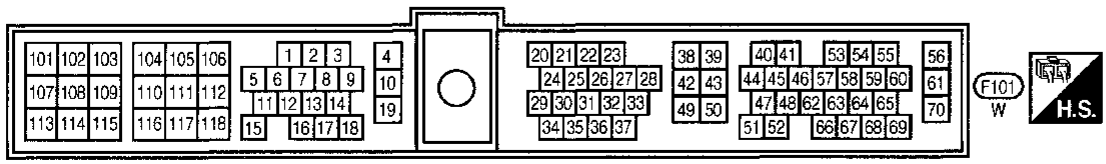
Idle Air Control Valve (IACV) — Auxiliary Air Control (AAC) Valve (Cont'd)

EC-AAC/V-01

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



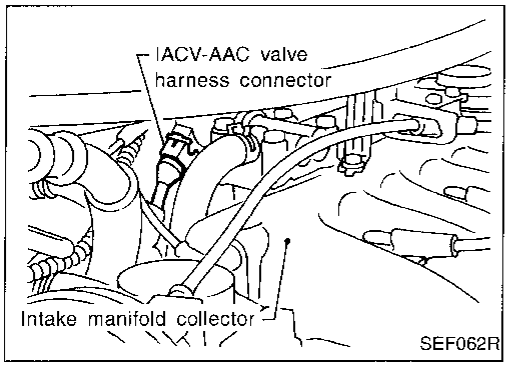


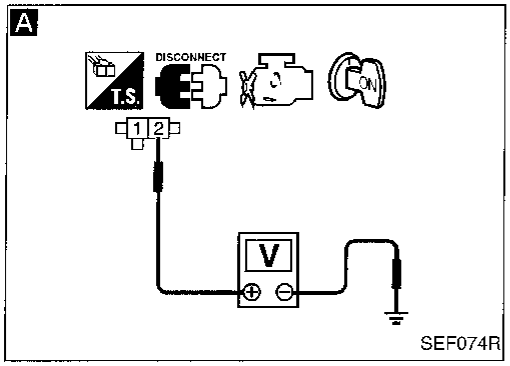


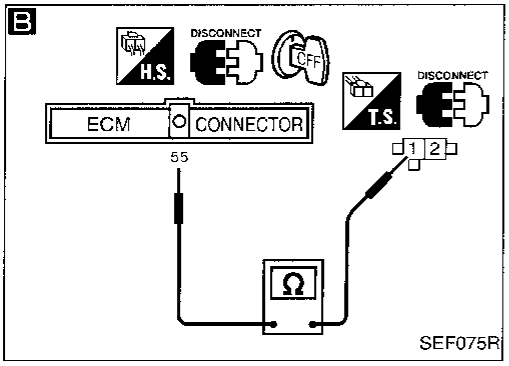
AEC188A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

↓

A

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect IACV-AAC valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal (2) and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M57), (F107)
- Harness connectors (F10), (F201)
- 10A fuse
- Harness for open or short between IACV-AAC valve and fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (55) and terminal (1).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F10), (F201)
- Harness for open or short between IACV-AAC valve and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (IACV-AAC valve).
Refer to "COMPONENT INSPECTION" below.

NG → Replace IACV-AAC valve.

OK ↓

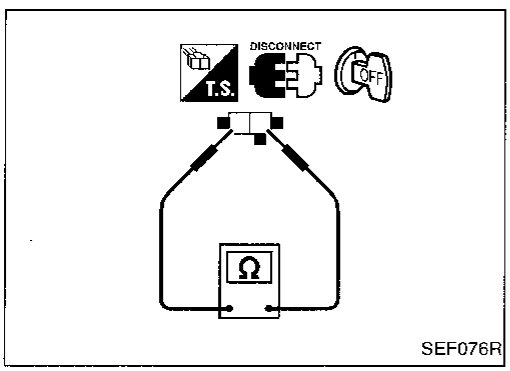
Disconnect and reconnect harness connectors in the circuit. Then retest.

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



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.

A/T Control

These circuit lines are used to control the smooth shifting up and down of A/T during the hard acceleration/deceleration.
Voltage signals are exchanged between ECM and A/T control unit.

ECM TERMINALS AND REFERENCE VALUE

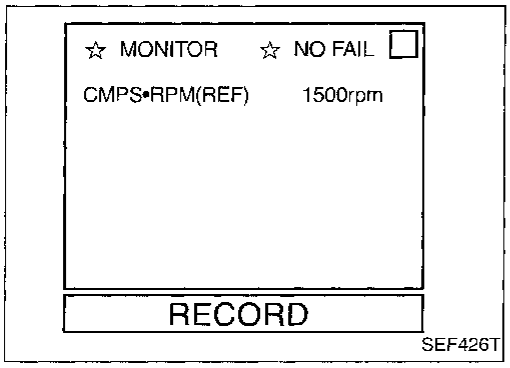
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

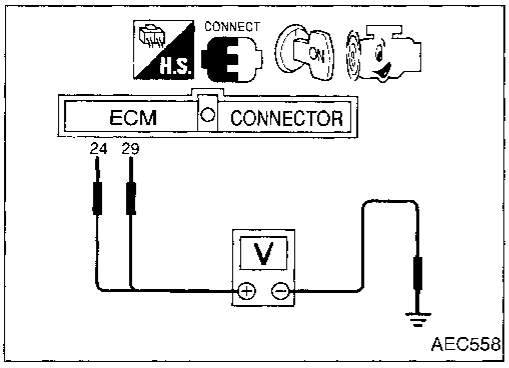
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	G/W	A/T signal No. 1	Ignition switch "ON" Engine is running. └ Idle speed	6 - 8V
29	W	A/T signal No. 2	Ignition switch "ON" Engine is running. └ Idle speed	6 - 8V
30	G/Y	A/T signal No. 3	Ignition switch "ON"	0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Item (Possible Cause)
P0600 0504	● ECM receives incorrect voltage from A/T control unit continuously.	● Harness or connectors (The circuit between ECM and A/T control unit is open or shorted.)

*: This DTC can be detected only by "DATA MONITOR (AUTO TRIG)" with CONSULT.





DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine, and rev it more than 1,000 rpm once, then wait at least 40 seconds.

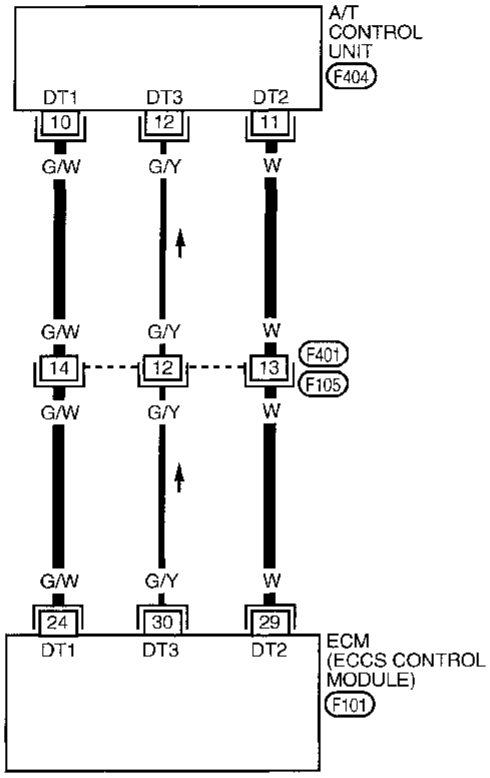
OVERALL FUNCTION CHECK

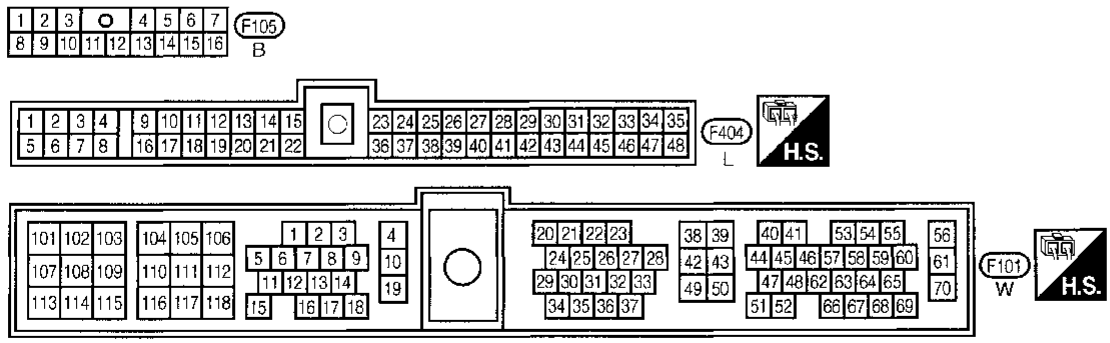
Use this procedure to check the overall function of the A/T control. During this check, a DTC might not be confirmed.

1) Turn ignition switch "ON".
2) Start engine.
3) Check voltage between
   ECM terminal ㉔ and ground.
   ECM terminal ㉙ and ground.
   Voltage: Approximately 7V

EC-AT/C-01

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

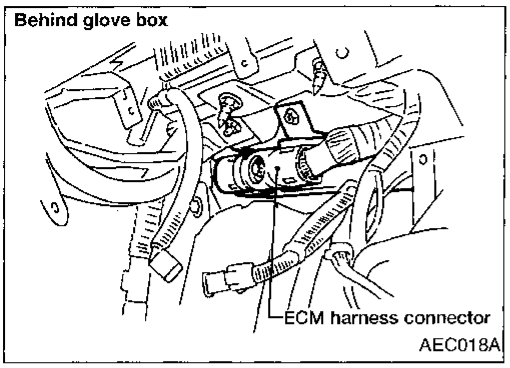


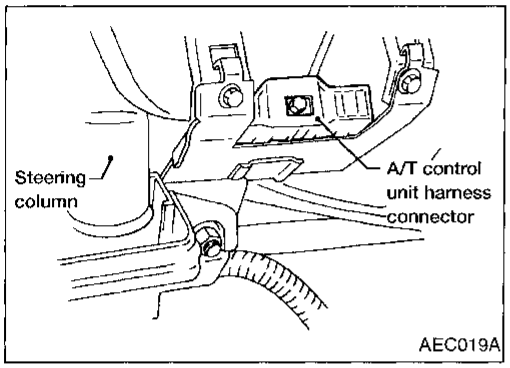


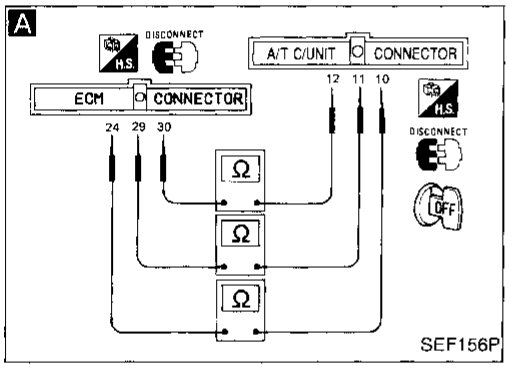
AEC189A

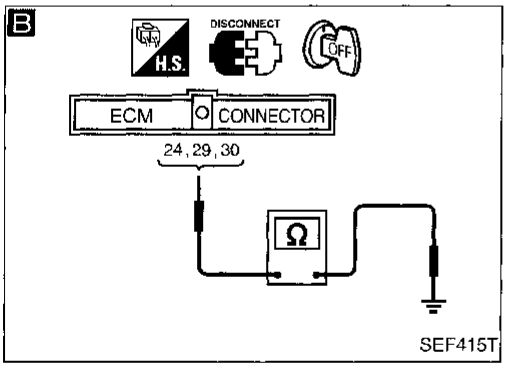
A/T Control (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and A/T control unit harness connector.
3. Check harness continuity between ECM terminal (24) and terminal (10), ECM terminal (29) and terminal (11), ECM terminal (30) and terminal (12).

Continuity should exist.

NG → Check the following.
- Harness connectors (F401), (F105)
- Harness for open or short between ECM and A/T control unit.

If NG, repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between ECM terminal (24) and ground, ECM terminal (29) and ground, ECM terminal (30) and ground.

Continuity should not exist.
If OK, check harness for short.

NG → Check the harness for open or short between ECM and A/T control unit. If NG, repair harness.

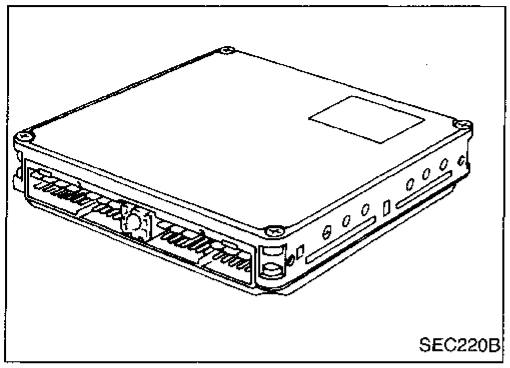
OK ↓

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

Trouble is not fixed. ↓

Check ECM pin terminals and A/T control unit pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

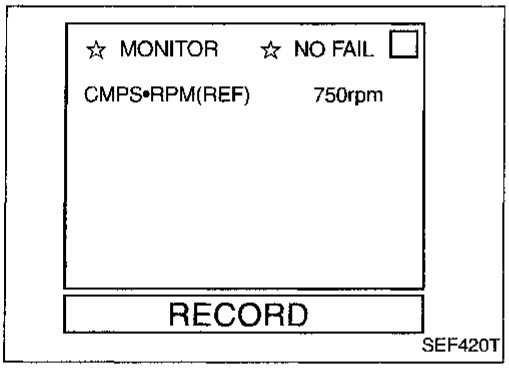

SEC220B

Engine Control Module (ECM)-ECCS Control Module

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 Items (Possible Cause)
P0605 0301	• ECM calculation function is malfunctioning.	• ECM (ECCS control module)



SEF420T

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

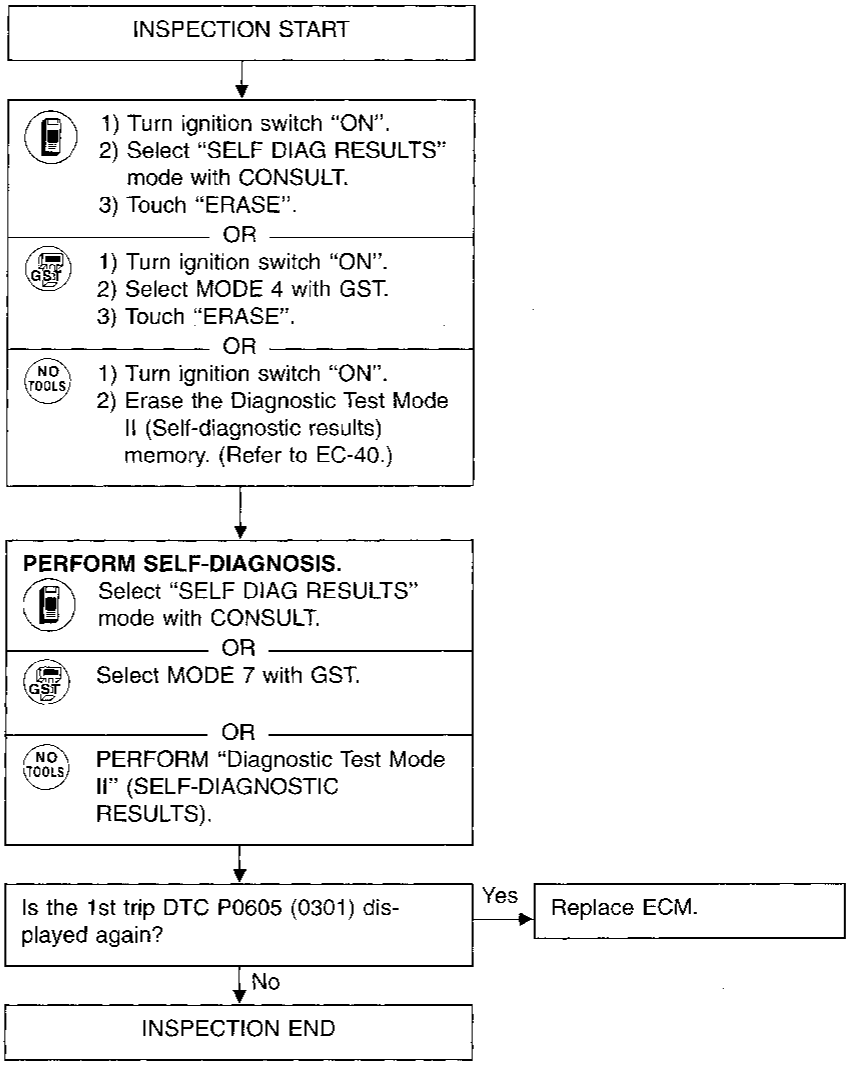
1) Turn ignition switch "ON".
2) Select "Mode 7" with GST.
3) Start engine and run it for at least 2 seconds at idle speed.

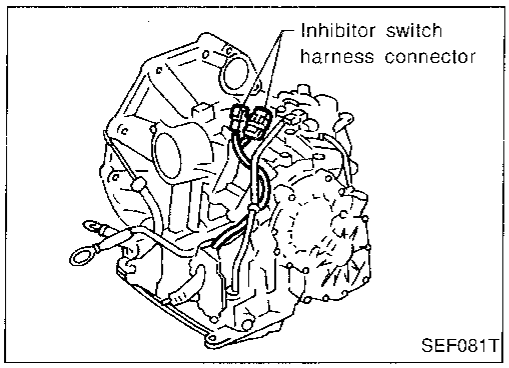
OR

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

Engine Control Module (ECM)-ECCS Control Module (Cont'd)

DIAGNOSTIC PROCEDURE





Park/Neutral Position Switch

COMPONENT DESCRIPTION

When the gear position is "P" or "N", park/neutral position switch is "ON". The A/T control unit detects the position because the continuity of the line (the "ON" signal) exists. The A/T control unit sends the park/neutral 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)
22	G/B	A/T control unit (Park/neutral position)	Ignition switch "ON" └ Gear position is "N" or "P" (A/T models)	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	4 - 6V

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	● Ignition switch: ON	Shift lever: "P" or "N"	ON
		Except above	OFF

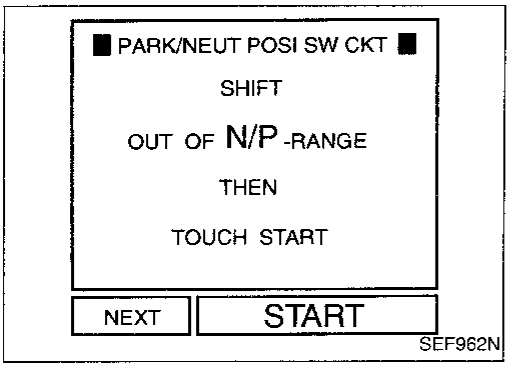
ON BOARD DIAGNOSIS LOGIC

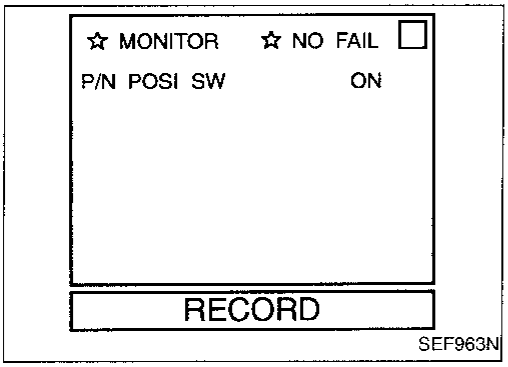
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0705 1003	● The signal of the park/neutral position switch is not changed in the process of engine starting and driving.	● Harness or connectors (The inhibitor switch circuit is open or shorted.) ● Harness or connectors (The circuit between ECM and A/T control unit is open or shorted.) ● Inhibitor switch ● A/T control unit

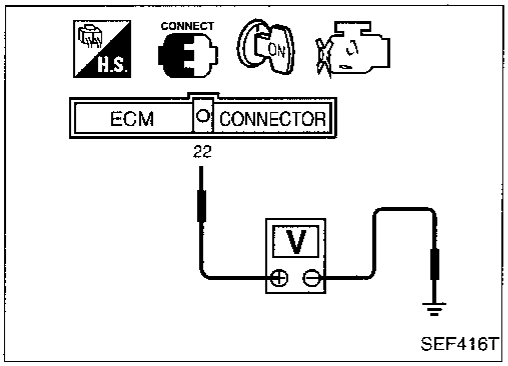
Park/Neutral Position Switch (Cont'd)

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)	Signal
"P" and "N" position	ON
Except the above position	OFF

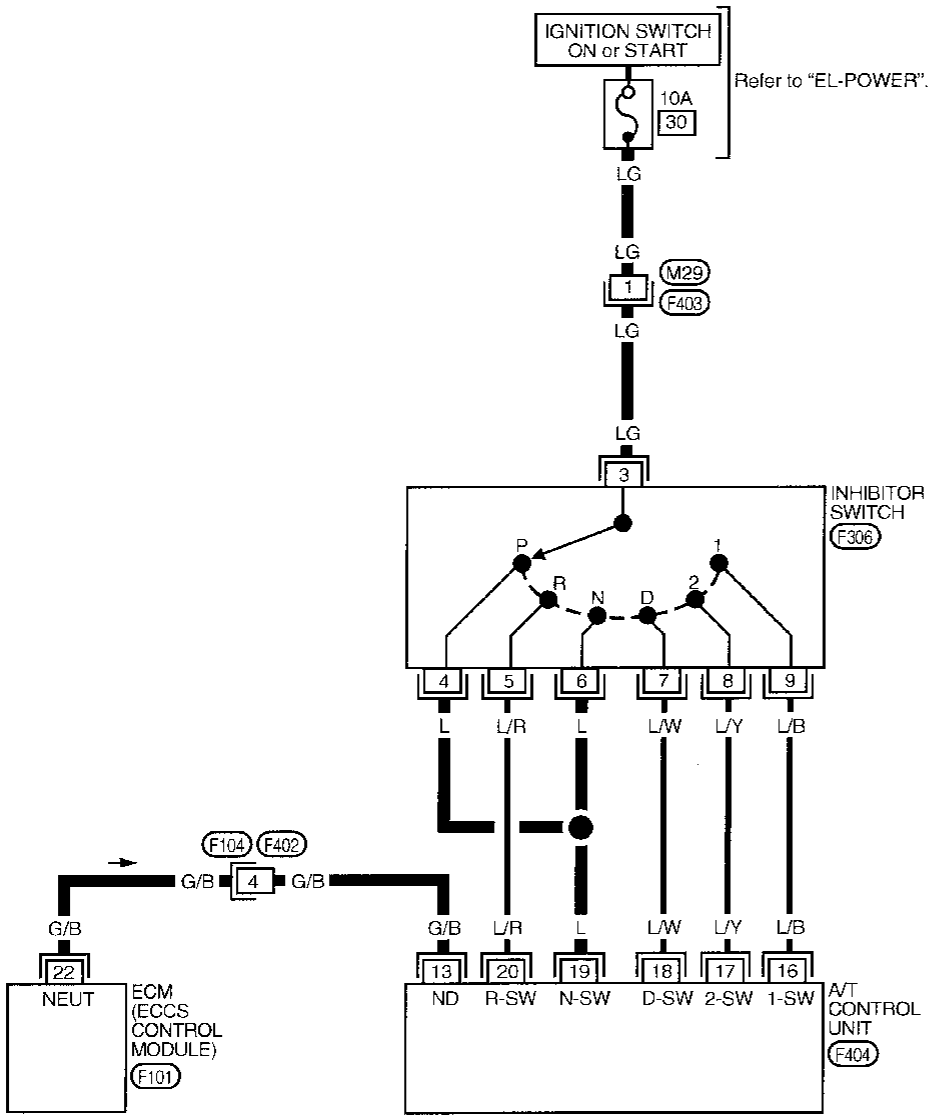
OR

1) Turn ignition switch "ON".
2) Check voltage between ECM terminal ㉒ and body ground under the following conditions.

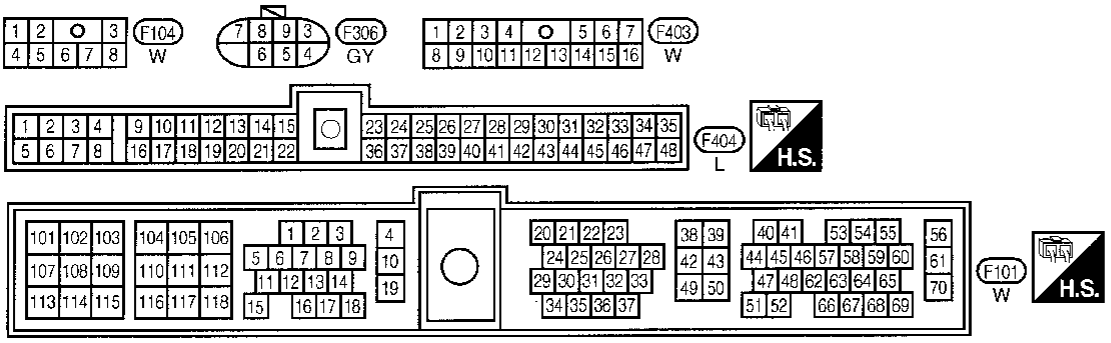
Condition (Gear position)	Voltage (V)
"P" and "N" position	Approximately 0
Except the above position	Approximately 5

Park/Neutral Position Switch (Cont'd)

EC-PNP/SW-01



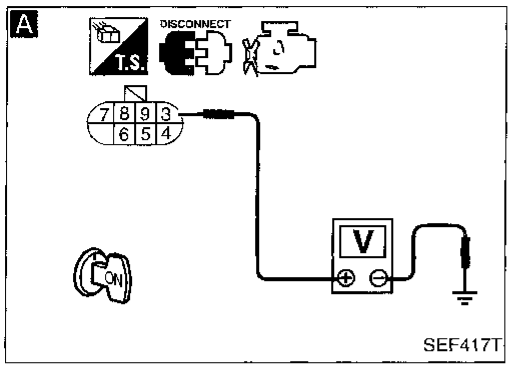
: Detectable line for DTC
: Non-detectable line for DTC

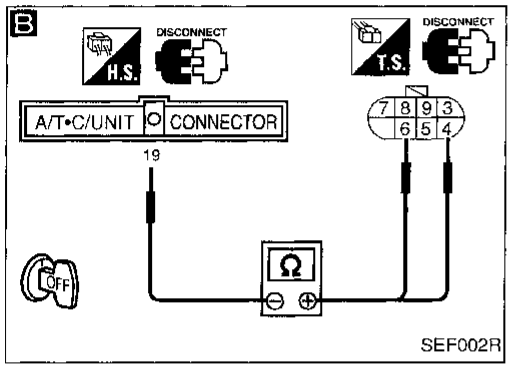


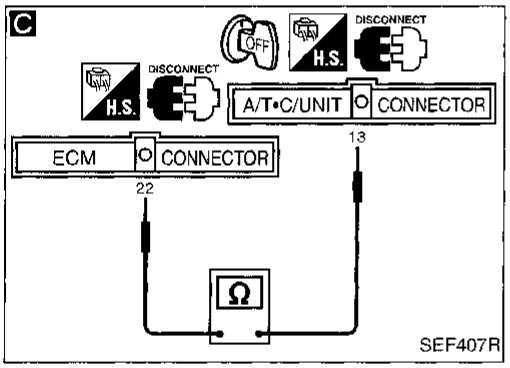
AEC190A

Park/Neutral Position Switch (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors (M29), (F403)
- 10A fuse
- Harness for open or short between inhibitor switch and fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT-I.
1. Turn ignition switch "OFF".
2. Disconnect A/T control unit harness connector.
3. Check harness continuity between A/T control unit terminal ⑲ and terminals ④, ⑥.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
1) Turn ignition switch "OFF".
2) Disconnect A/T control unit harness connector.
3) Check harness continuity between ECM terminal ㉒ and terminal ⑬.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (F104), (F402)
- Harness for open or short between ECM and A/T control unit

If NG, repair harness or connectors.

OK ↓

CHECK INHIBITOR SWITCH CIRCUIT.
Refer to AT section ("INHIBITOR SWITCH, OVERDRIVE SWITCH AND CLOSED THROTTLE POSITION SWITCH CIRCUIT CHECKS", "Self-diagnosis", "TROUBLE DIAGNOSES").

NG → Replace inhibitor switch.

OK ↓

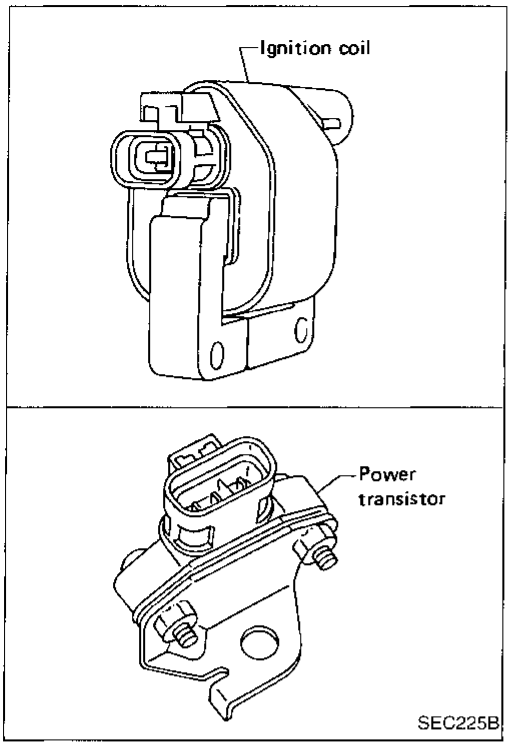
Disconnect and reconnect harness connectors in the circuit, and retest.

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



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor

The ignition signal from the ECM is sent to the power transistor. The power transistor switches on and off the ignition coil primary circuit. As the primary circuit is turned on and off, the proper high voltage is induced 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).

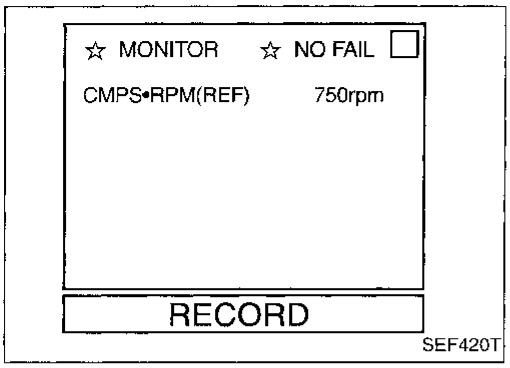
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	L	Ignition signal	Engine is running. └ Idle speed	0.4 - 0.6V*
			Engine is running. └ Engine speed is 2,000 rpm	1.1 - 1.3V*
2	W	Ignition check	Engine is running. └ Idle speed	Approximately 9V*
3	G/W	Tachometer	Engine is running. └ Idle speed	Approximately 1.0V*
			Engine is running. └ Engine speed is 2,000 rpm	3.2 - 3.6V*

*: 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	● The ignition signal in the primary circuit is not sent to ECM during engine cranking or running.	● Harness or connectors (The ignition primary circuit is open or shorted.) ● Power transistor unit ● Resistor ● Camshaft position sensor ● Camshaft position sensor circuit

Ignition Signal (Cont'd)



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both 1st trip DTC P0340 (0101) and P1320 (0201) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340 first. Refer to EC-157.

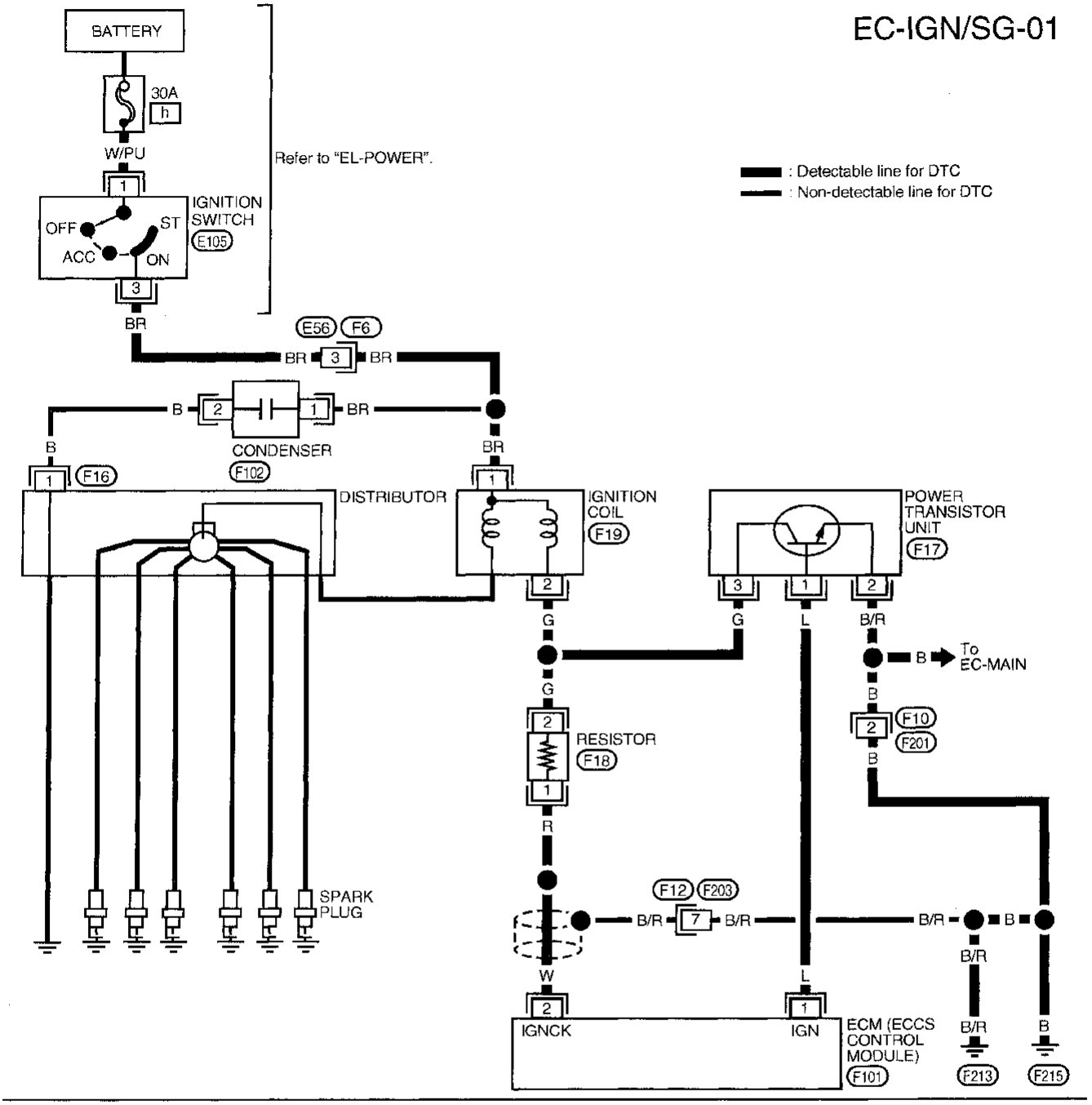
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)

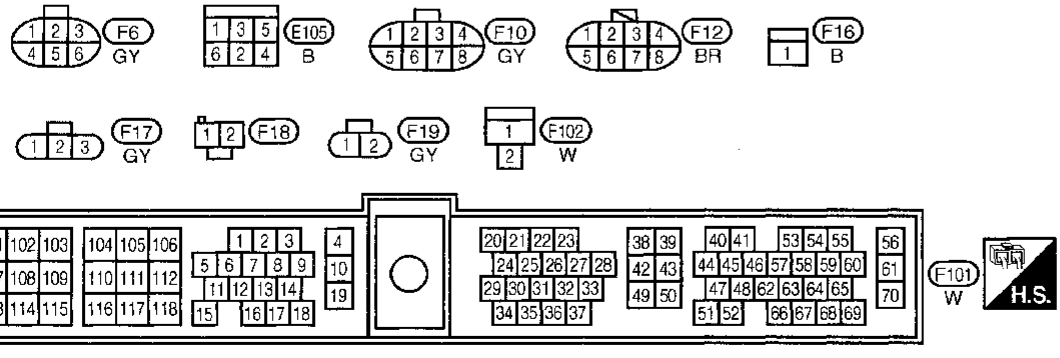
OR

1) Turn ignition switch "ON".
2) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
3) Select MODE 7 with GST.

OR

1) Turn ignition switch "ON".
2) Start engine and wait at least 4 seconds. (If engine does not run, turn ignition switch to "START" for at least 5 seconds.)
3) Turn ignition switch "OFF" and wait at least 5 seconds, then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

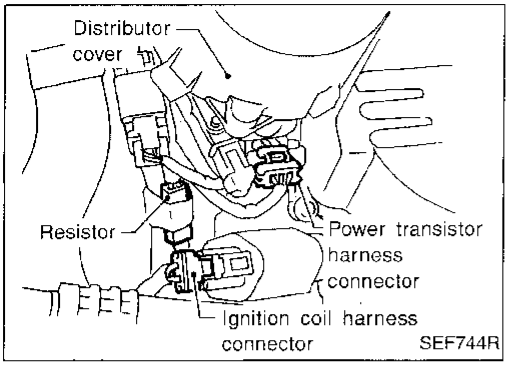

EC-IGN/SG-01
BATTERY
30A
h
W/PU
IGNITION SWITCH
E105
OFF
ACC
ST
ON
Refer to "EL-POWER".
: Detectable line for DTC
: Non-detectable line for DTC
E56
F6
BR
B
CONDENSER
F102
B
F16
DISTRIBUTOR
BR
IGNITION COIL
F19
POWER TRANSISTOR UNIT
F17
G
L
B/R
To EC-MAIN
F10
F201
RESISTOR
F18
R
F12
F203
B/R
W
L
IGNCK
IGN
ECM (ECCS CONTROL MODULE)
F101
F213
F215
SPARK PLUG

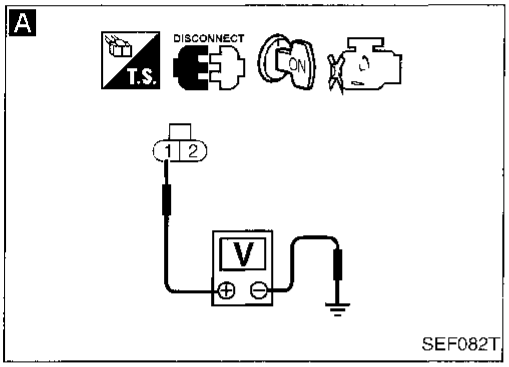

F6 GY
E105 B
F10 GY
F12 BR
F16 B
F17 GY
F18
F19 GY
F102 W
F101 W
H.S.

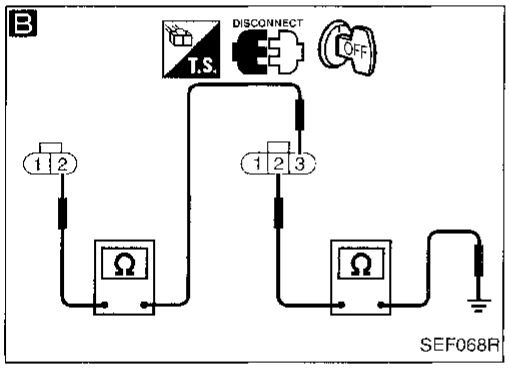
AEC191A

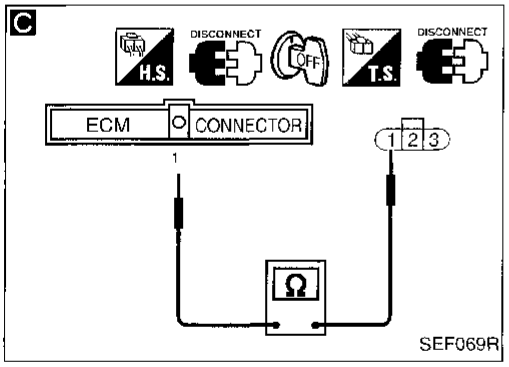
Ignition Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

Turn ignition switch "OFF", and restart engine.
Is engine running?

Yes → Ⓐ (Go to next page.)

No

A

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

NG → Check the following.
- Harness connectors (E56), (F6)
- Harness for open or short between ignition coil and ignition switch

If NG, repair harness or connectors.

OK

B

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

NG → Check the following.
- Harness connectors (F10), (F201)
- Harness for open or short between power transistor and ground
- Harness for open or short between power transistor and ignition coil

If NG, repair harness or connectors.

OK

C

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

NG → Repair harness or connectors.

OK

CHECK COMPONENTS
(Ignition coil, power transistor).
Refer to "COMPONENT INSPECTION", EC-200.

NG → Replace malfunctioning component(s).

OK

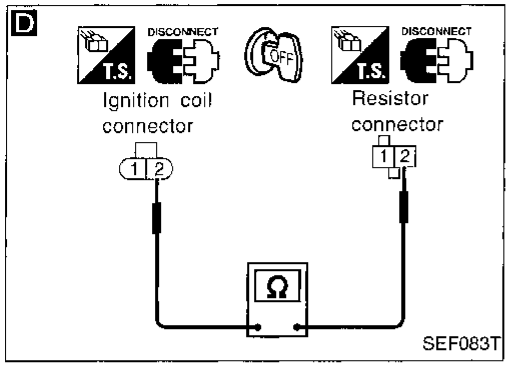
Disconnect and reconnect harness connectors in the circuit. Then retest.

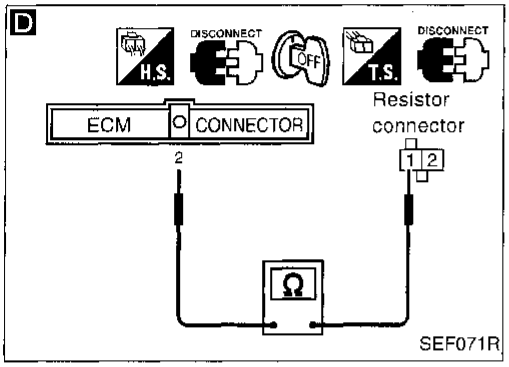
Trouble is not fixed.

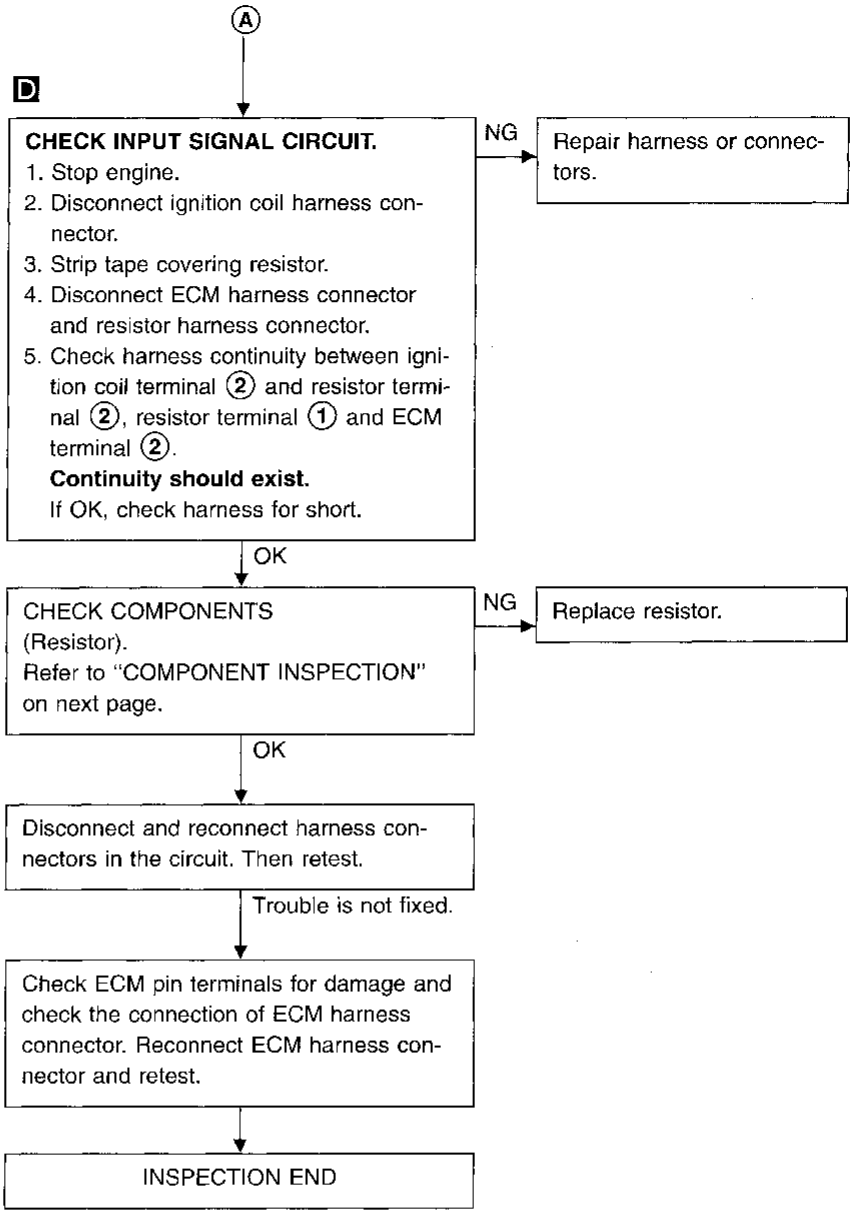
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Ignition Signal (Cont'd)

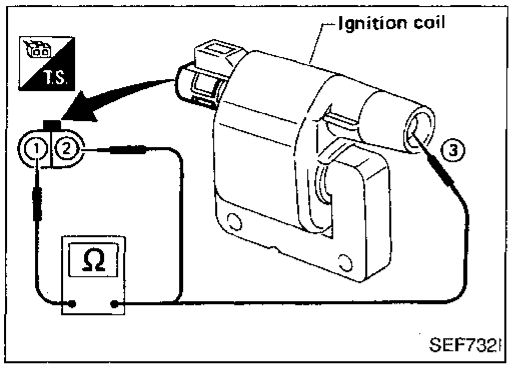






Ignition Signal (Cont'd)

COMPONENT INSPECTION

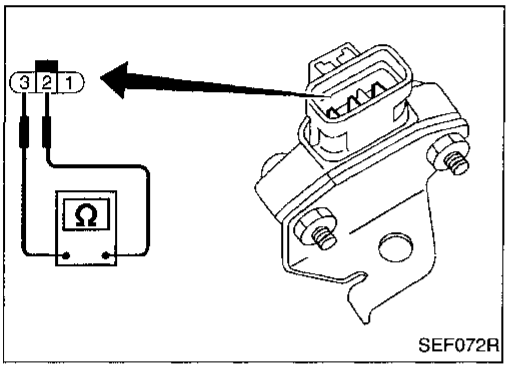


Ignition coil

1. Disconnect ignition coil harness connector.
2. Check resistance as shown in the figure.

Terminal	Resistance [at 25°C (77°F)]
① - ② (Primary coil)	Approximately 1.0 Ω
① - ③ (Secondary coil)	Approximately 10 kΩ

If NG, replace ignition coil.

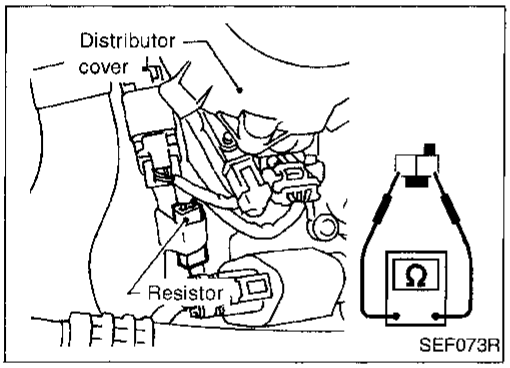


Power transistor

1. Disconnect power transistor harness connector.
2. Check power transistor resistance between terminals ② and ③.

Terminals	Resistance	Result
② and ③	Except 0Ω	OK
	0Ω	NG

If NG, replace power transistor.

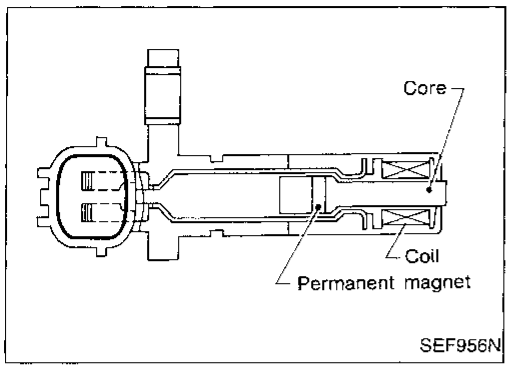


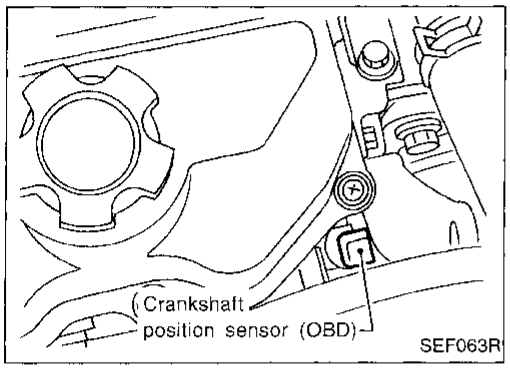
Resistor

1. Disconnect resistor harness connector.
2. Check resistance between terminals.

Resistance: Approximately 2.2 kΩ [at 25°C (77°F)]

If NG, replace resistor.





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 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

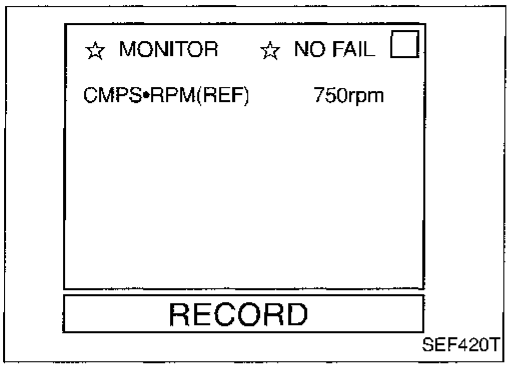
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	LG	Crankshaft position sensor (OBD)	Engine is running. (in "N" position) └ Idle speed (Air conditioner switch "OFF")	More than 0.4V* (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)
P1336 0905	● A chipping of the drive plate gear tooth (cog) is detected by the ECM.	● Harness or connectors ● Crankshaft position sensor (OBD) ● Drive plate



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

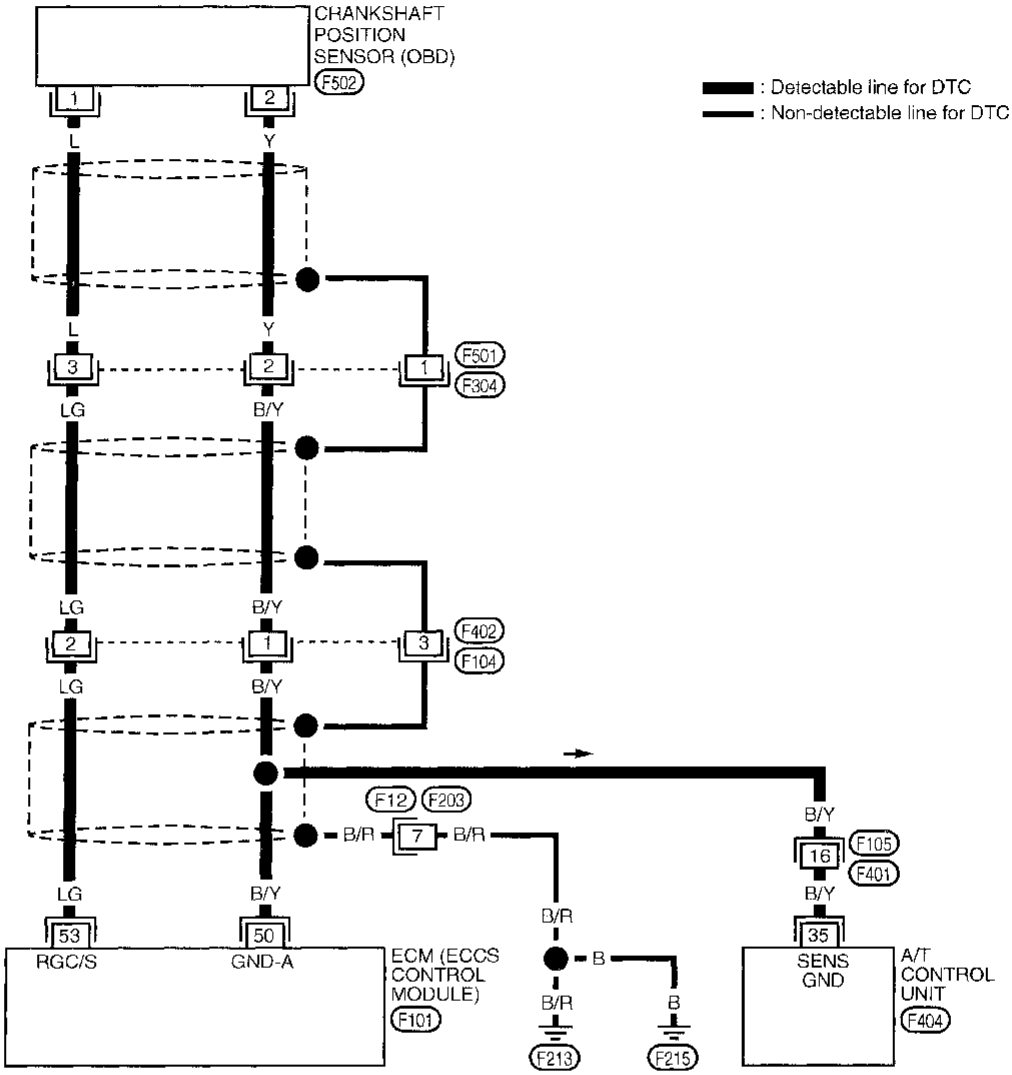
1) Start engine and run it for at least 2 minutes at idle speed.
2) Select "MODE 7" with GST.

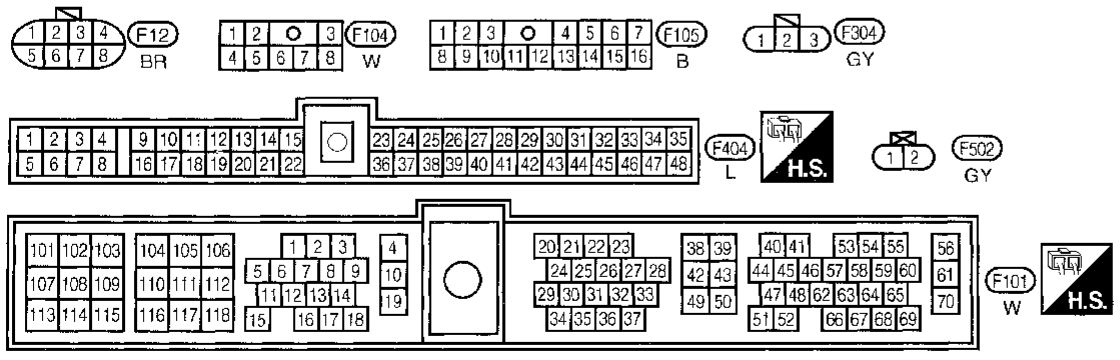
OR

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

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

EC-CKPS-01

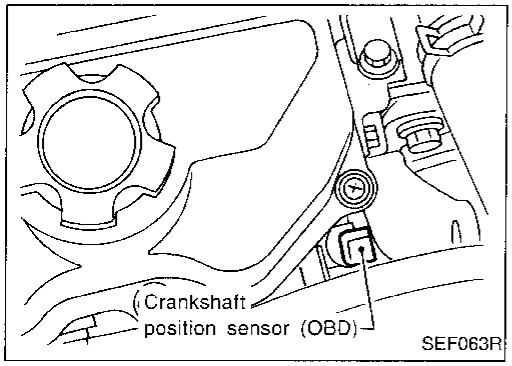


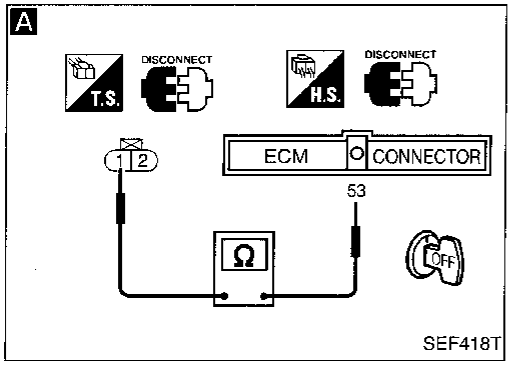


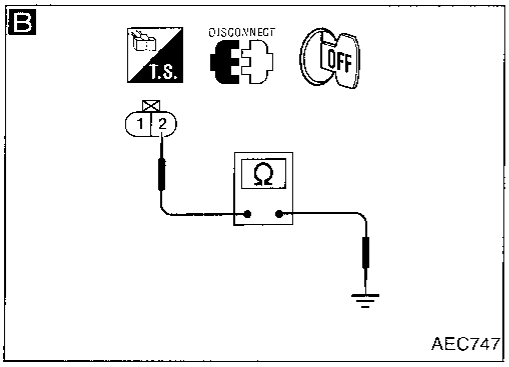
AEC184A

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (OBD) and ECM harness connectors.
3. Check harness continuity between ECM terminal (53) and terminal (1).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F501), (F304)
- Harness connectors (F402), (F104)
- Harness for open or short between ECM and crankshaft position sensor (OBD)

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 (F501), (F304)
- Harness connectors (F402), (F104)
- Harness connectors (F105), (F401)
- Harness for open or short between ECM and crankshaft position sensor (OBD)
- Harness for open or short between A/T control unit and crankshaft position sensor (OBD)

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.

CHECK COMPONENT
[Crankshaft position sensor (OBD)].
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace crankshaft position sensor (OBD).

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.

Trouble is not fixed.

Visually check for chipping drive plate gear tooth (cog).

NG → Replace the drive plate.

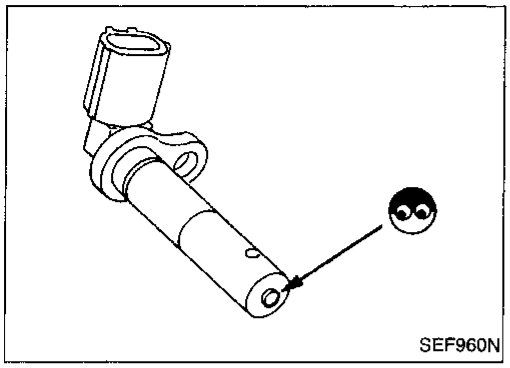
OK

INSPECTION END

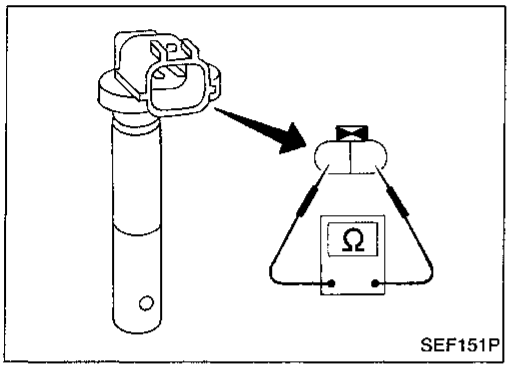
Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

COMPONENT INSPECTION

Crankshaft position sensor (OBD)

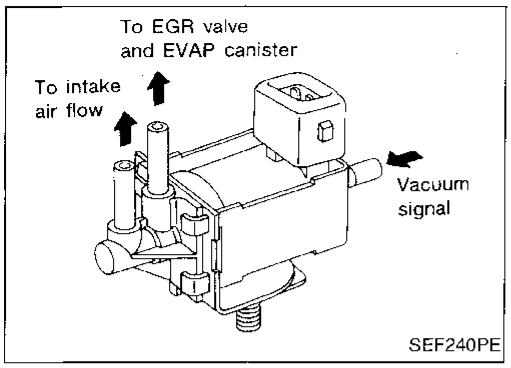

SEF960N

1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



SEF151P

5. Check resistance as shown in the figure.
   Resistance: Approximately 432 - 528Ω [at 25°C (77°F)]



EGR Valve and EVAP Canister Purge Control Solenoid Valve

COMPONENT DESCRIPTION

The EGR valve and EVAP canister purge control 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 and EVAP canister purge control solenoid valve.
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EGR valve and EVAP canister.

ECM TERMINALS AND REFERENCE VALUE

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

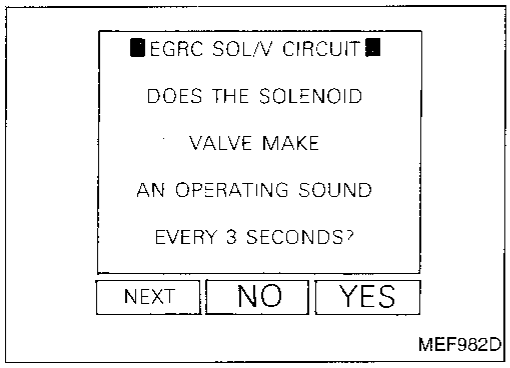
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
103	GY	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) — Properly raise drive wheels off the ground — Set A/T selector lever in "D" position — Engine speed is 2,000 rpm [Vehicle speed is over 8 km/h (5 MPH)]	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) — Engine speed is above 3,200 rpm — Idle speed	0.8 - 0.9V

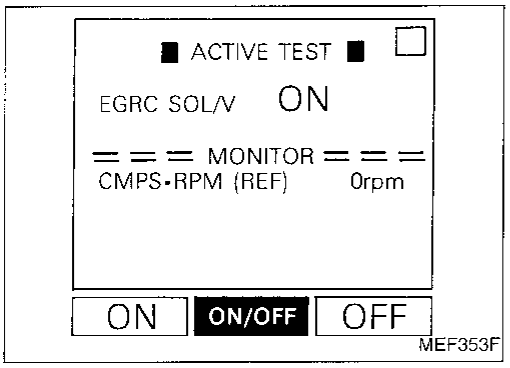
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

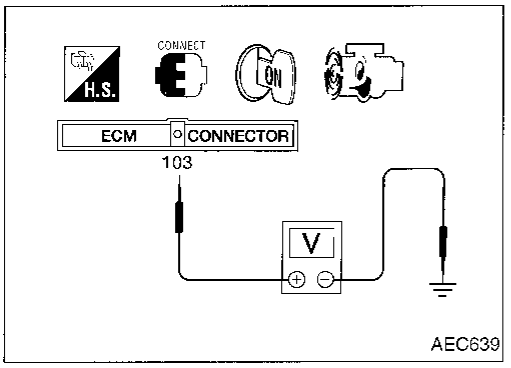
MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V	● Engine: After warming up ● Air conditioner switch: OFF ● Properly raise drive wheels off the ground ● Place A/T selector lever in "D" position ● No-load	Idle [Vehicle speed is below 8 km/h (5 MPH)]	ON
		2,000 rpm [Vehicle speed is over 8 km/h (5 MPH)]	OFF

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1400 1005	● The improper voltage signal is sent to ECM through EGR valve & EVAP canister purge control solenoid valve.	● Harness or connectors (The EGR valve & EVAP canister purge control solenoid valve circuit is open or shorted.) ● EGR valve & EVAP canister purge control solenoid valve







EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the EGR valve and EVAP canister purge control 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

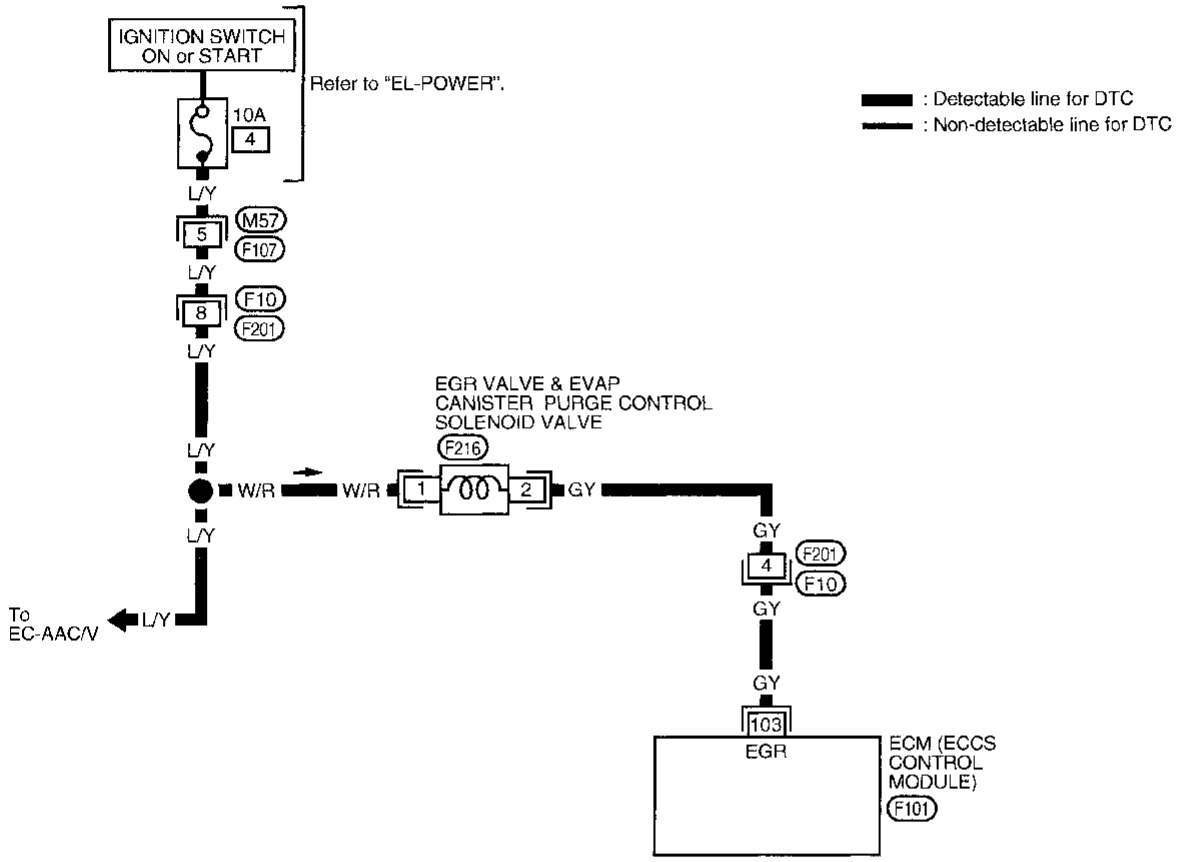
1) Turn ignition switch "ON".
2) Perform "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and check the operating sound, according to ON/OFF switching.

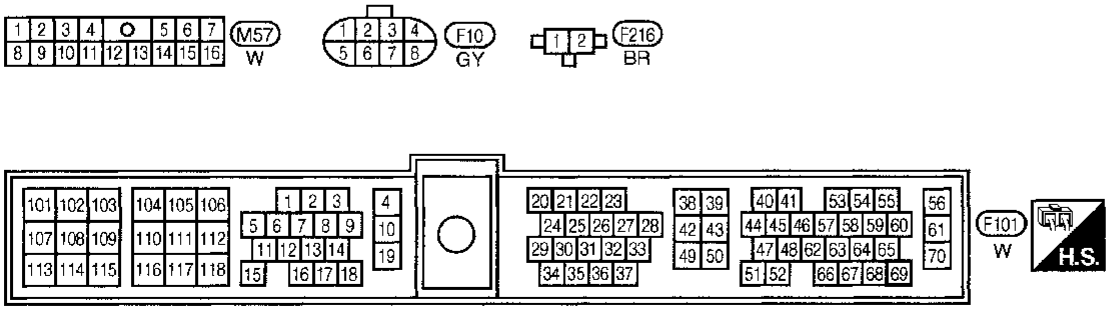
OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Raise drive wheels off the ground. Ensure that vehicle is properly and securely supported, and that drive wheels can spin freely.
4) Start engine again.
5) Set A/T selector lever in "D" position.
6) Check the voltage between ECM terminal (103) and ground at idle speed.
   Voltage: 0.8 - 0.9V
7) Check that the voltage changes to battery voltage and returns to 0.8 - 0.9V when the engine speed increases to over 3,200 rpm.

EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

EC-EGRC/V-01

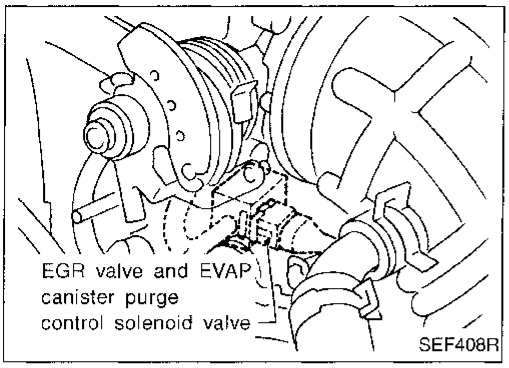


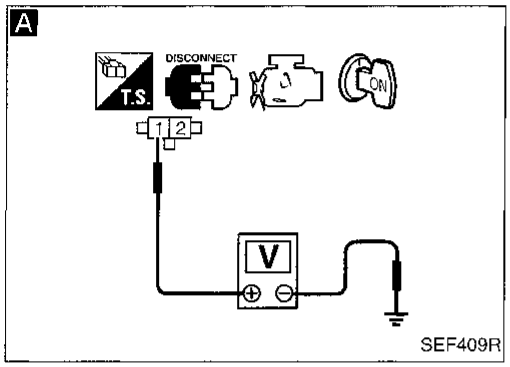


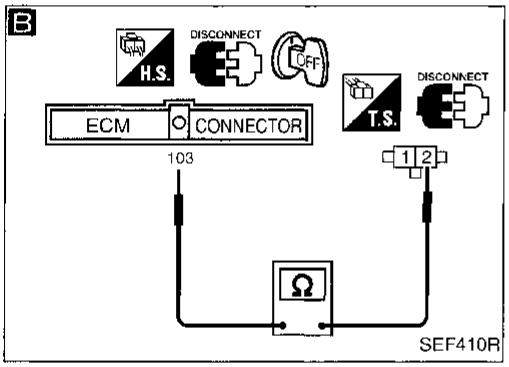
AEC192A

EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Disconnect EGR valve & EVAP canister purge control solenoid valve harness connector.
2. Turn ignition switch "ON".
3. Check voltage between terminal (1) and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M57), (F107)
- Harness connectors (F10), (F201)
- 10A fuse
- Harness for open or short between EGR valve & EVAP canister purge control solenoid valve and fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal (103) and terminal (2).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F10), (F201)
- Harness for open or short between EGR valve & EVAP canister purge control solenoid valve and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(EGR valve & EVAP canister purge control solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace EGR valve & EVAP canister purge control solenoid valve.

OK ↓

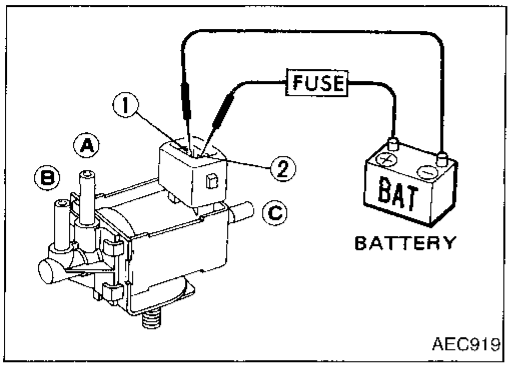
Disconnect and reconnect harness connectors in the circuit. Then retest.

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



EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

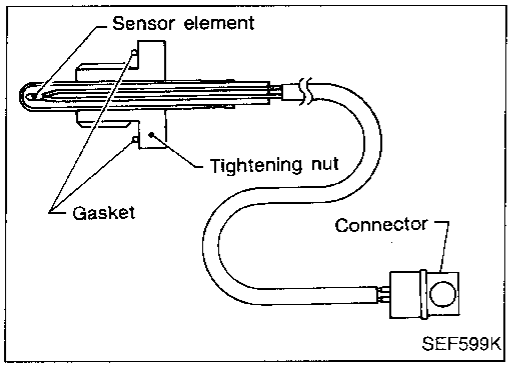
COMPONENT INSPECTION

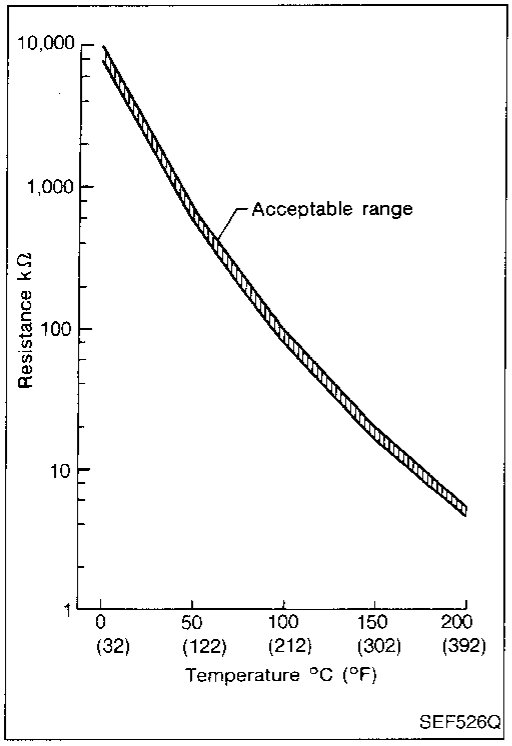
EGR valve and EVAP canister purge control solenoid valve

Check air passage continuity.

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

If NG, replace solenoid valve.





EGR Temperature Sensor

COMPONENT DESCRIPTION

The EGR temperature sensor detects temperature changes in the EGR passageway. 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 are measured between ECM terminal (62) (EGR temperature sensor) and ECM terminal (43) (ECCS ground).
When EGR system is operating, voltage: 0 - 1.5V

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	● Engine: After warming up	EGR system is not operating.	Less than 4.5V
		EGR system is operating.	0 - 1.5V

EGR Temperature Sensor (Cont'd)

ON BOARD DIAGNOSIS LOGIC

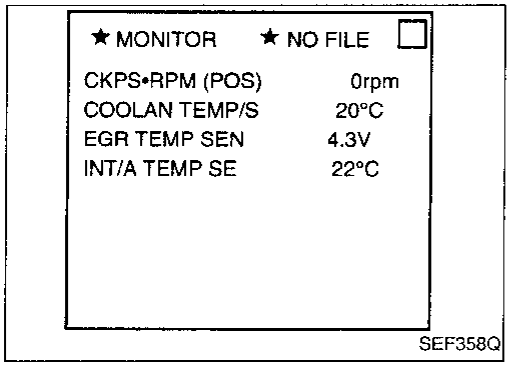
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is low.	● Harness or connectors (The EGR temperature sensor circuit is shorted.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGR valve & EVAP canister purge control solenoid valve
	B) An excessively high voltage from the EGR temperature sensor is sent to ECM even when engine coolant temperature is high.	● Harness or connectors (The EGR temperature sensor circuit is open.) ● EGR temperature sensor ● Malfunction of EGR function, EGRC-BPT valve or EGR valve & EVAP canister purge control solenoid valve

EGR Temperature Sensor (Cont'd)

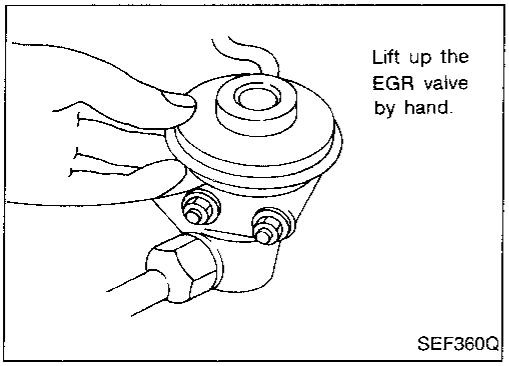
OVERALL FUNCTION CHECK

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

Procedure for malfunction A and B

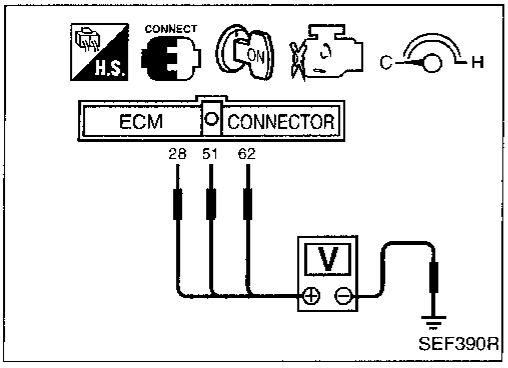


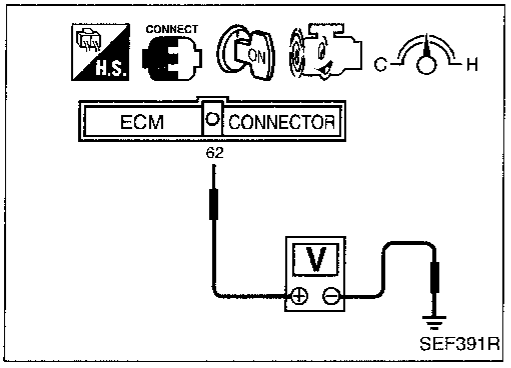
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Confirm that engine coolant temperature and intake air temperature are lower than 40°C (104°F). (If necessary, wait until the temperatures equal atmospheric temperature.)
3) Confirm that "EGR TEMP SEN" reading is between 3.45V and 4.8V.
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, EC-163 and 172.
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, EC-163, 172 and 206.



OR

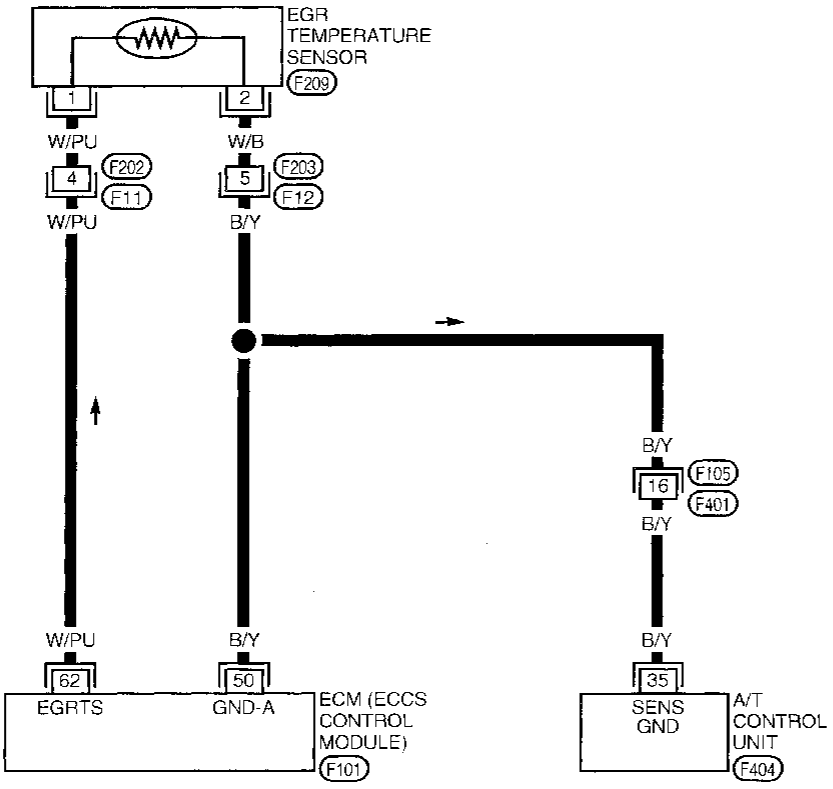
1) Turn ignition switch "ON".
2) Confirm that voltage between ECM terminals ㉘, ㊶ and ground are more than 2.72V. (If necessary, wait until engine coolant temperature and intake air temperature equal atmospheric temperature.)
3) Confirm that voltage between ECM terminal ㊷ and ground is between 3.45V and 4.8V.
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, EC-163 and 172.
7) Check voltage between ECM terminal ㊷ 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, EC-163, 172 and 206.

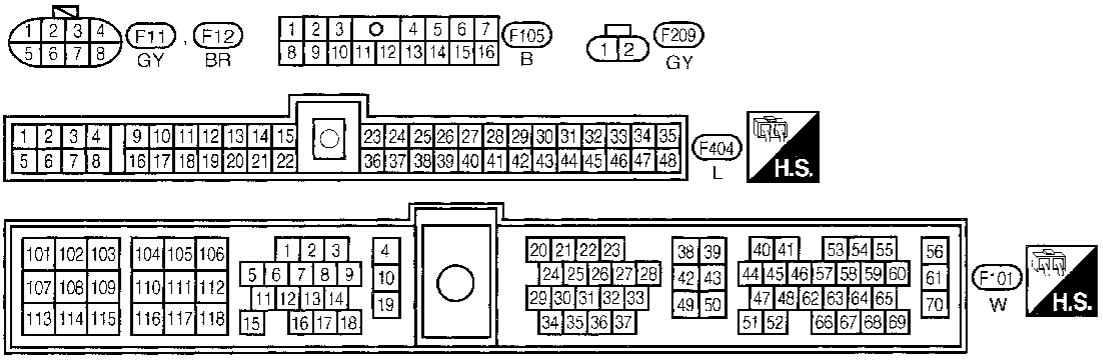




EC-EGR/TS-01

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





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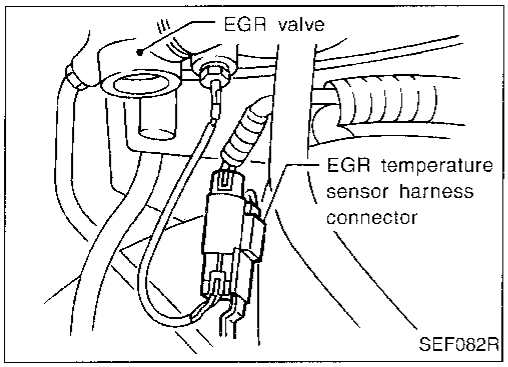
EGR Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

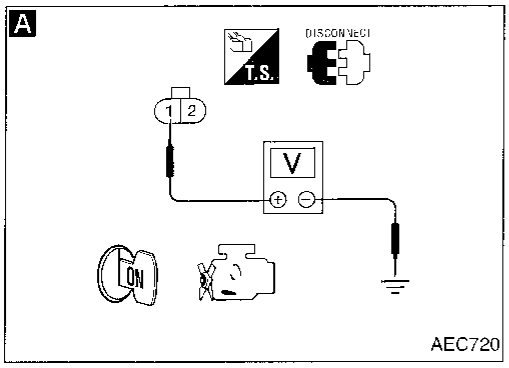
A

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 → Check the following.
- Harness for open or short between ECM and EGR temperature sensor
- Harness connectors (F202), (F11)

If NG, repair harness or connectors.

OK



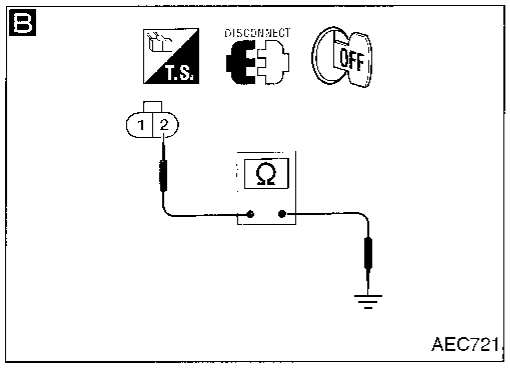
B

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 for open or short between ECM and EGR temperature sensor
- Harness for open or short between A/T control unit and EGR temperature sensor
- Harness connectors (F105), (F401)
- Harness connectors (F203), (F12)

If NG, repair harness or connector.

OK



CHECK COMPONENT
(EGR temperature sensor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace EGR temperature sensor.

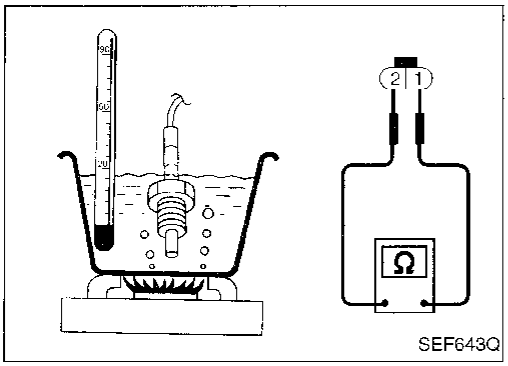
OK

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

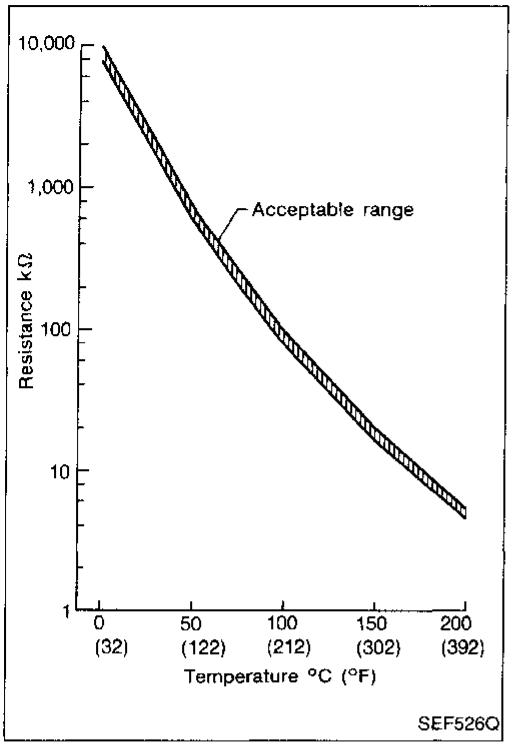


COMPONENT INSPECTION

EGR temperature sensor

Check resistance as shown in the figure.

EGR Temperature Sensor (Cont'd)



〈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.

A/T Diagnosis Communication Line

SYSTEM DESCRIPTION

The malfunction information related to A/T (Automatic Transaxle) is transferred through the line (circuit) from A/T control unit to ECM. Therefore, be sure to erase the malfunction information such as (1st trip) DTC not only in A/T control unit but also ECM after the A/T related repair.

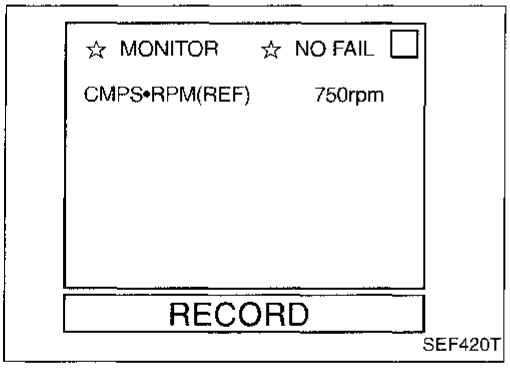
ECM TERMINALS AND REFERENCE VALUE

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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
7	G/B	A/T check signal	Ignition switch "ON" Engine is running.	0 - 3.0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1605 0804	• An incorrect signal from A/T control units is sent to ECM.	• Harness or connectors (The communication line circuit between ECM and A/T control unit is open or shorted.) • Dead (Weak) battery • A/T control unit



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 40 seconds.

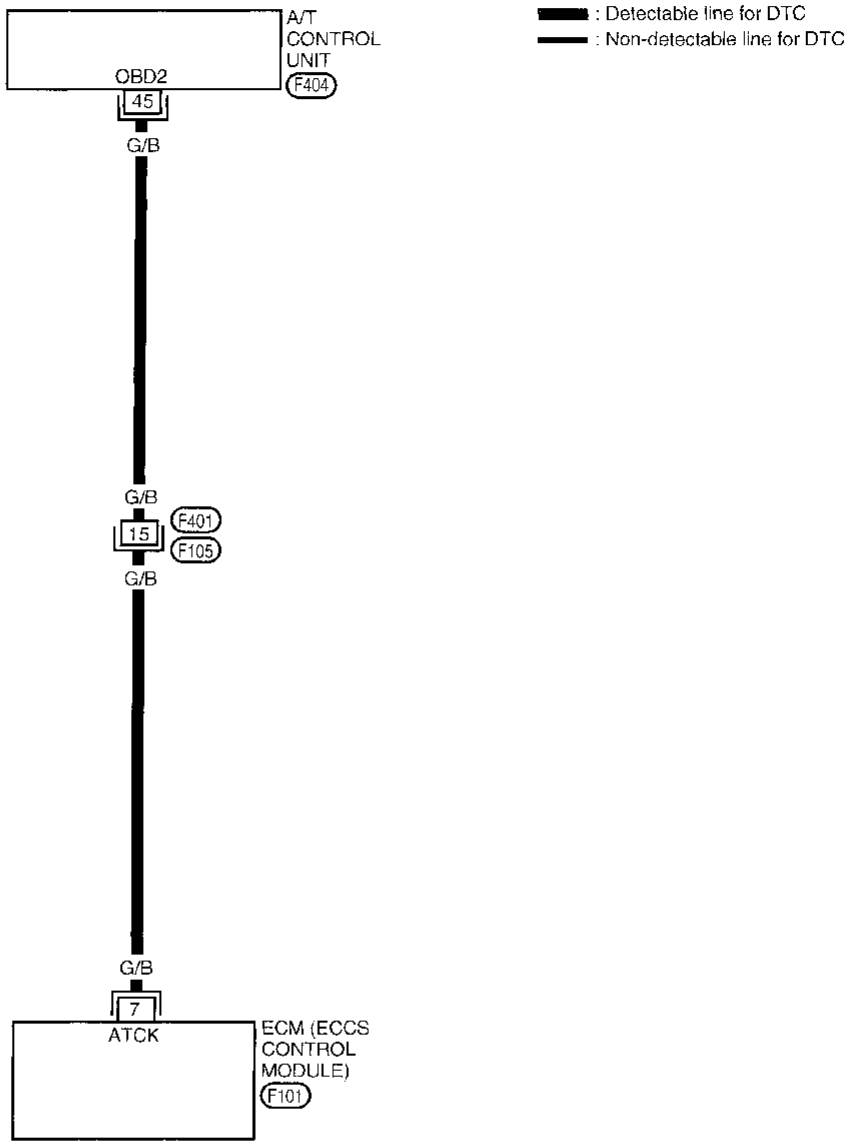
OR

1) Turn ignition switch "ON".
2) Start engine and wait at least 40 seconds.
3) Select "MODE 7" with GST.

OR

1) Turn ignition switch "ON".
2) Start engine and wait at least 40 seconds.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II" (Self-diagnostic results) with ECM.

EC-ATDIAG-01



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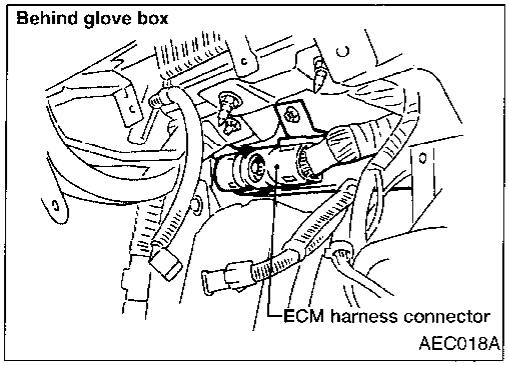
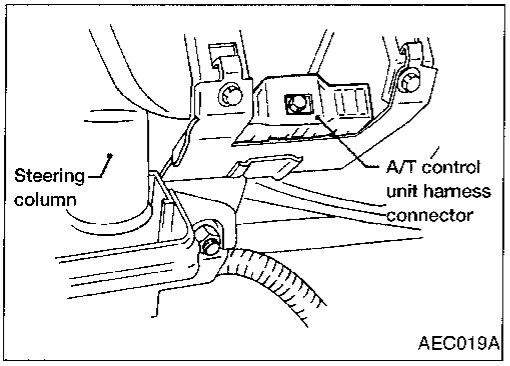
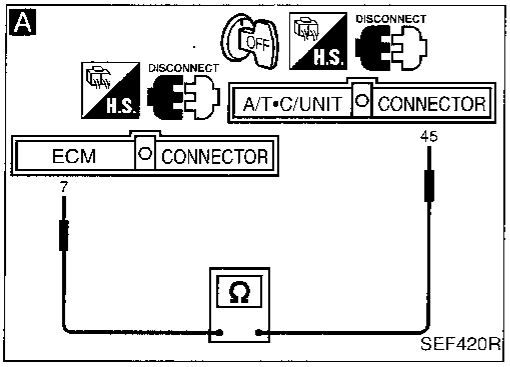
A/T Diagnosis Communication Line (Cont'd)







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and A/T control unit harness connector.
3. Check harness continuity between ECM terminal (7) and A/T control unit terminal (45).

Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (F401), (F105)
- Harness for open or short between ECM and A/T control unit.

If NG, repair harness or connectors.

OK ↓

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

Trouble is not fixed. ↓

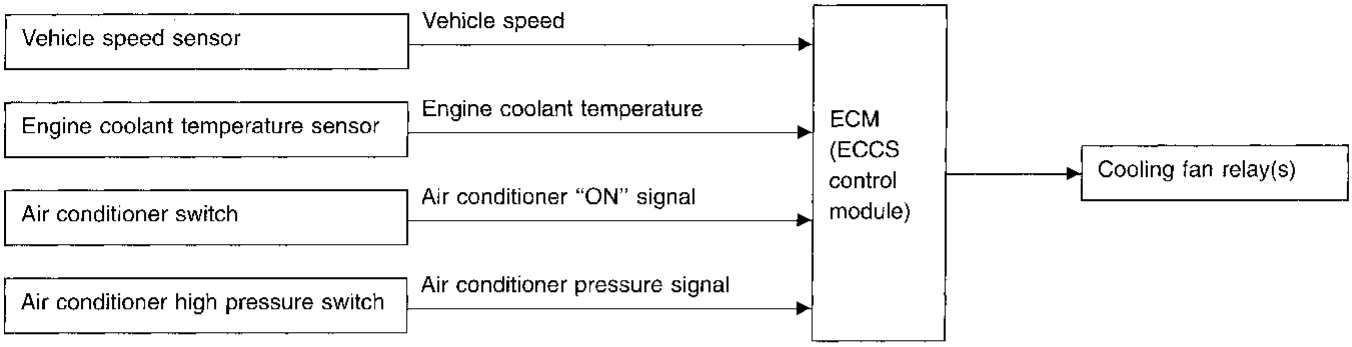
Check ECM pin terminals and A/T control unit pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

Cooling Fan

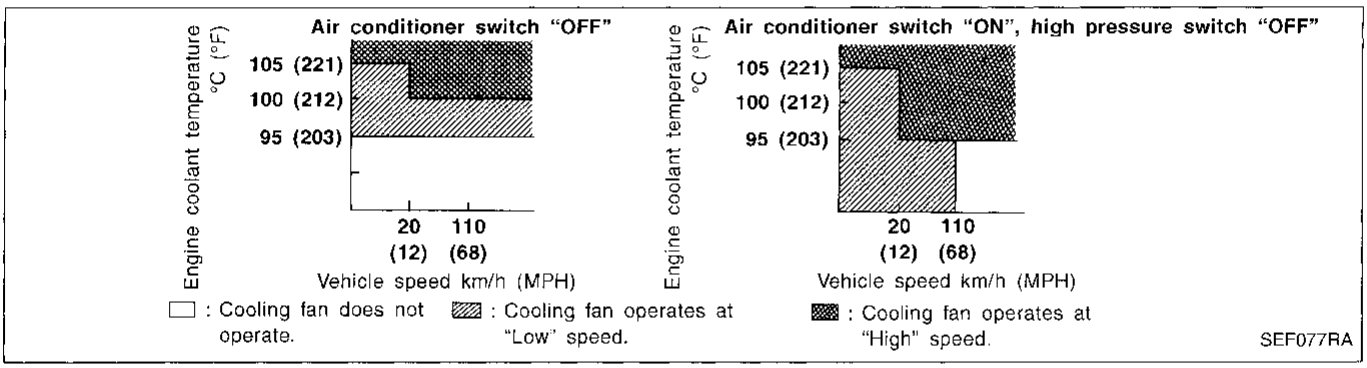
SYSTEM DESCRIPTION

Cooling fan control



The ECM controls the cooling fan corresponding to the vehicle speed, engine coolant temperature, and air conditioner and high pressure switch signals. The control system has 3-step control [HIGH/LOW/OFF]. When both air conditioner switch and high pressure switch are "ON", cooling fan operates at "High" speed.

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)
9	L/B	Air conditioner pressure switch	Ignition switch "ON"	Approximately 5V
13	BR/W	Cooling fan relay (High)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at high speed	0.7 - 0.8V
14	L/OR	Cooling fan relay (Low)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at low speed	0.7 - 0.8V

Cooling Fan (Cont'd)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	● After warming up engine, idle the engine. ● Air conditioner switch: off	Engine coolant temperature is 94°C (201°F) or less	OFF
		Engine coolant temperature is between 95°C (203°F) and 104°C (219°F)	LOW
		Engine coolant temperature is 105°C (221°F) or more	HIGH

ON BOARD DIAGNOSIS LOGIC

This diagnosis continuously monitors the engine coolant temperature.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

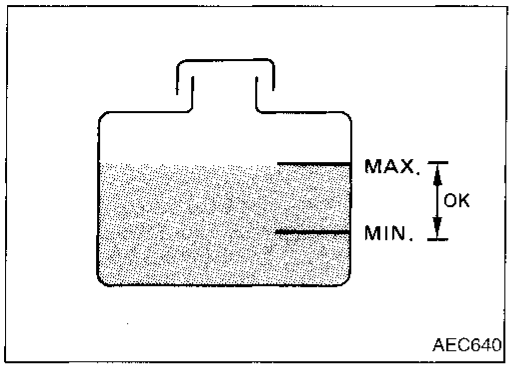
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check items (Possible cause)
P1900 1308	● Cooling fan does not operate properly (Overheat). ● Cooling fan system does not operate properly (Overheat). ● Engine coolant was not added to the system using the proper filling method.	● Harness or connectors (The cooling fan circuit is open or shorted.) ● Cooling fan ● Radiator hose ● Radiator ● Radiator cap ● Water pump ● Thermostat For more information, refer to "MAIN 12 CAUSES OF OVERHEATING", EC-230.

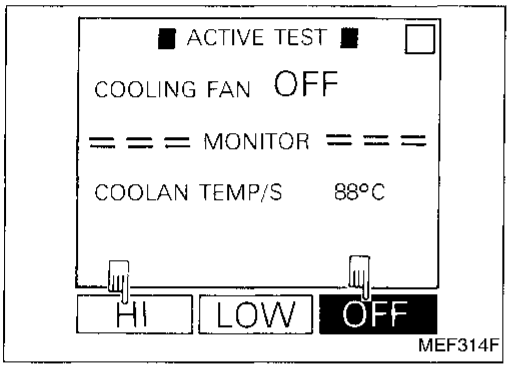
CAUTION:
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

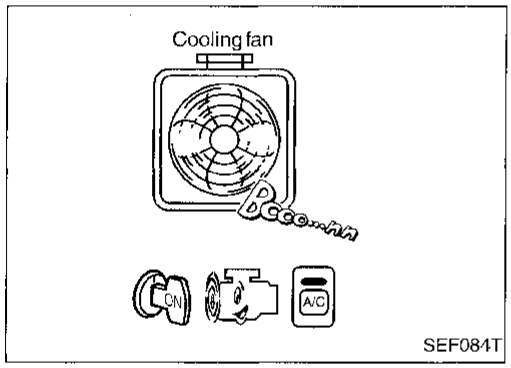
a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Antifreeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").

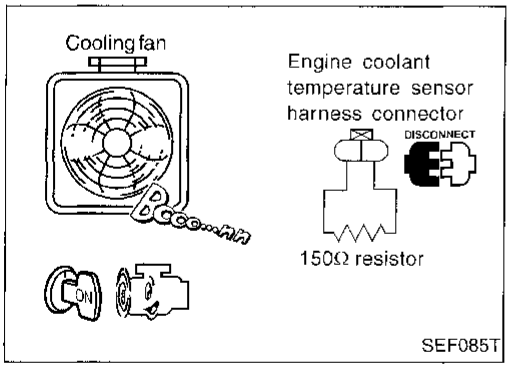
b. After refilling coolant, run engine to ensure that no water-flow noise is emitted.

Cooling Fan (Cont'd)









OVERALL FUNCTION CHECK

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

WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

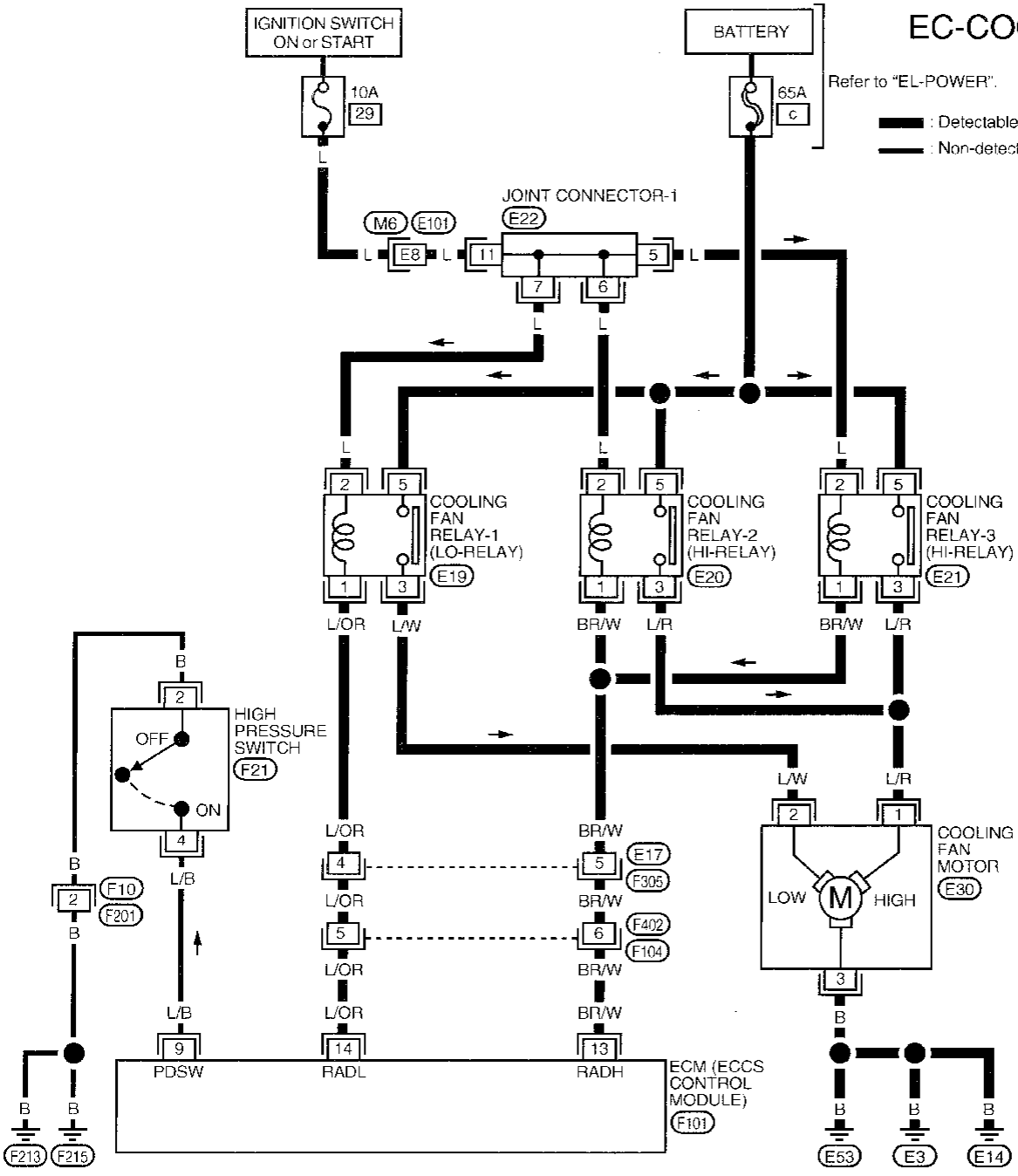
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

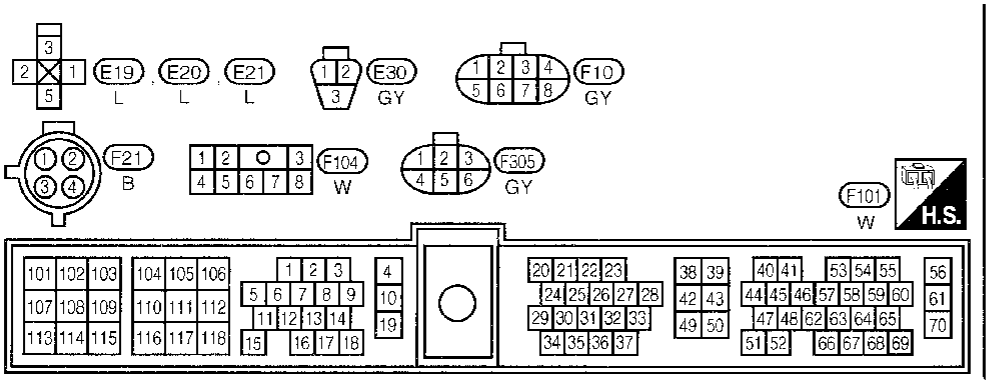
1) Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to "DIAGNOSTIC PROCEDURE" (EC-224).
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE" (EC-224).

3) Turn ignition switch "ON".
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT (LOW speed and HI speed).

OR

3) Start engine.
   Be careful not to overheat engine.
4) Set temperature control lever to full cold position.
5) Turn air conditioner switch "ON".
6) Turn blower fan switch "ON".
7) Run engine at idle for a few minutes with air conditioner operating.
   Be careful not to overheat engine.
8) Make sure that cooling fan operates at low speed.
9) Turn ignition switch "OFF".
10) Turn air conditioner switch and blower fan switch "OFF".
11) Disconnect engine coolant temperature sensor harness connector.
12) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
13) Restart engine and make sure that cooling fan operates at higher speed.
    Be careful not to overheat engine.



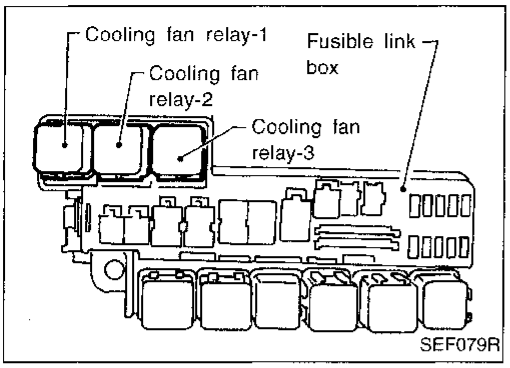


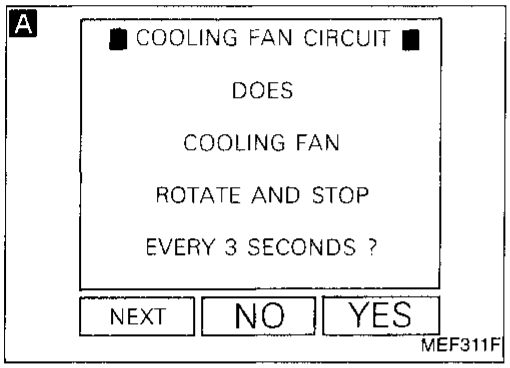
Refer to last page (Foldout page).
E22
M6 , E101

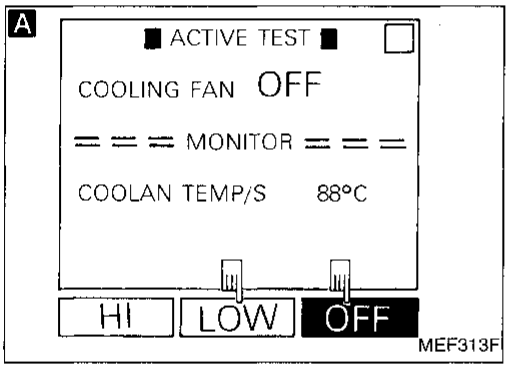
AEC195A

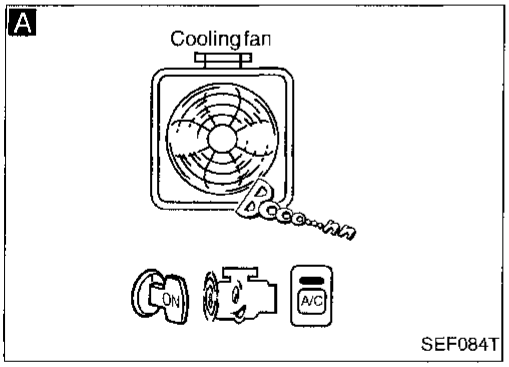
Cooling Fan (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK COOLING FAN LOW SPEED OPERATION.

1. Disconnect cooling fan relays-2 and -3.
2. Turn ignition switch "ON".
3. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

2. Turn ignition switch "ON".
3. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

2. Start engine.
3. Set temperature lever at full cold position.
4. Turn air conditioner switch "ON".
5. Turn blower fan switch "ON".
6. Run engine at idle for a few minutes with air conditioner operating.
7. Make sure that cooling fan operates at low speed.

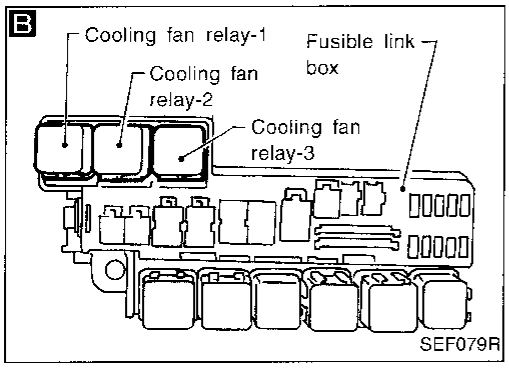
NG → Check cooling fan low speed control circuit. (Go to PROCEDURE A.)

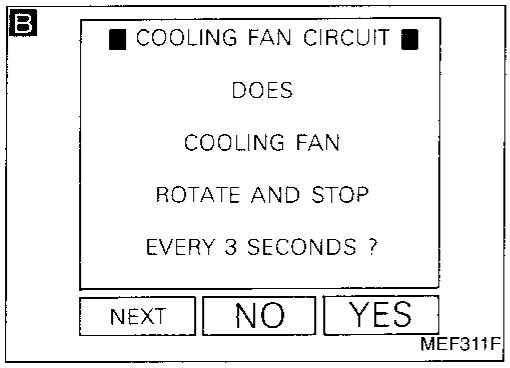
OK

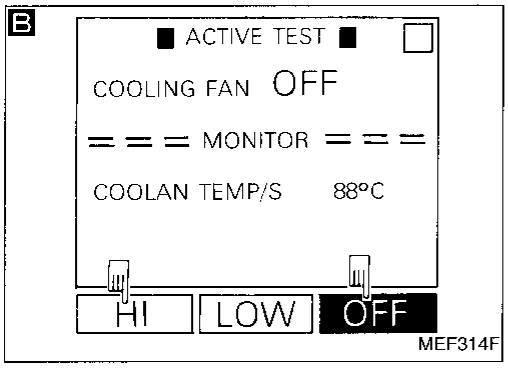
Ⓐ

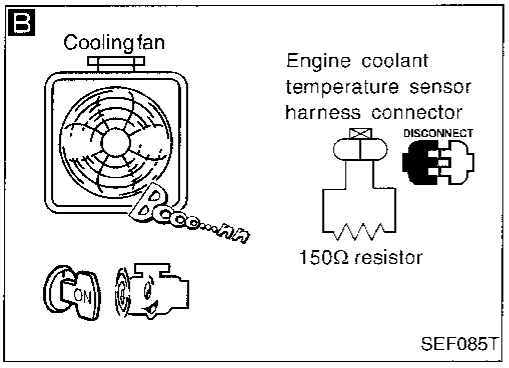
(Go to next page.)

Cooling Fan (Cont'd)









Ⓐ

B

CHECK COOLING FAN HIGH SPEED OPERATION.

1. Turn ignition switch "OFF".
2. Reconnect cooling fan relays-2 and -3.
3. Disconnect cooling fan relay-1.

4. Turn ignition switch "ON".
5. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

4. Turn ignition switch "ON".
5. Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

OR

4. Turn air conditioner switch and blower fan switch "OFF".
5. Disconnect engine coolant temperature sensor harness connector.
6. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
7. Restart engine and make sure that cooling fan operates at higher speed than low speed.

NG → Check cooling fan high speed control circuit. (Go to PROCEDURE B.)

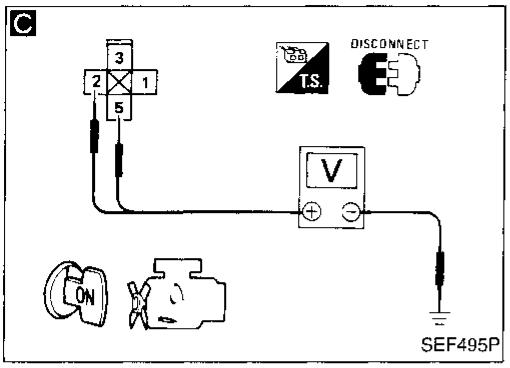
OK

Ⓑ

(Go to EC-229.)

Cooling Fan (Cont'd)

C



PROCEDURE A

INSPECTION START

C

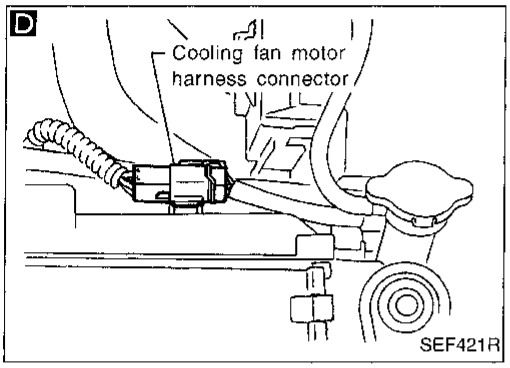
CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.
3. Turn ignition switch "ON".
4. Check voltage between terminals ②, ⑤ and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (M6), (E101)
- Joint connector-1
- 10A fuse
- 65A fusible link
- Harness for open or short between cooling fan relay-1 and fuse
- Harness for open or short between cooling fan relay-1 and battery

If NG, repair harness or connectors.

OK

D



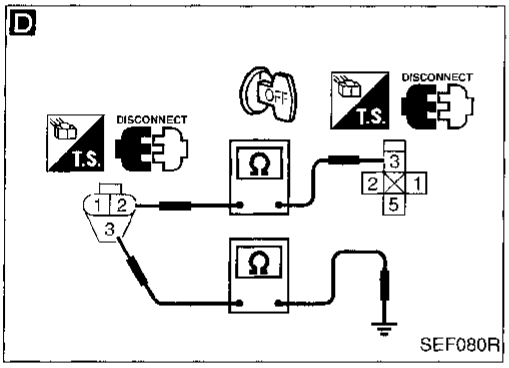
D

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor harness connector.
3. Check harness continuity between motor terminal ② and relay terminal ③.
Continuity should exist.
If OK, check harness for short.
4. Check harness continuity between motor terminal ③ and body ground.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK

D



E

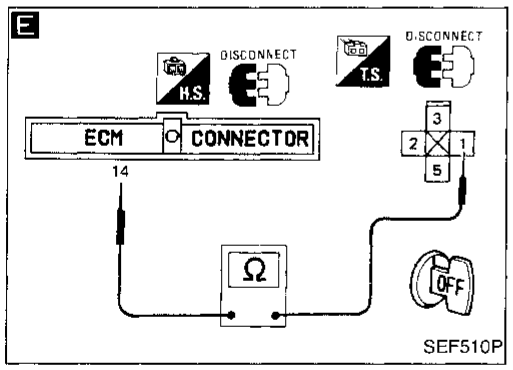
CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑭ and relay terminal ①.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (E17), (F305)
- Harness connectors (F402), (F104)
- Harness for open or short between cooling fan relay-1 and ECM

If NG, repair harness or connectors.

OK

E



CHECK COMPONENT
(Cooling fan relay-1).
Refer to "COMPONENT INSPECTION", EC-231.

NG → Replace cooling fan relay.

OK

Ⓒ
(Go to next page.)

Cooling Fan (Cont'd)

Ⓒ

CHECK COMPONENT
(Cooling fan motor).
Refer to "COMPONENT INSPECTION", EC-231.

NG → Replace cooling fan motor.

OK ↓

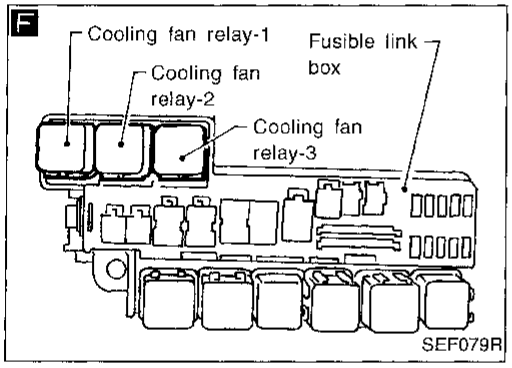
Disconnect and reconnect harness connectors in the circuit. Then retest.

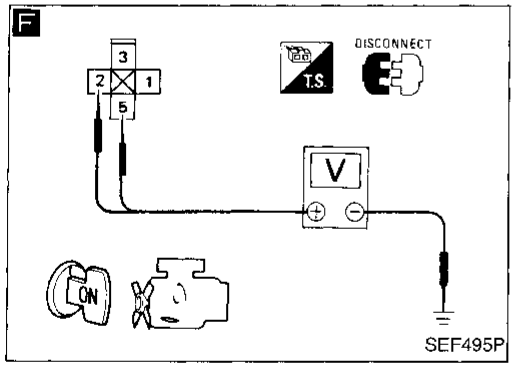
Trouble is not fixed. ↓

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

↓

INSPECTION END





PROCEDURE B

INSPECTION START ↓

F

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relays-2 and -3.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relays-2 and -3 terminals ②, ⑤ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Joint connector-1 (E22)
- Harness for open or short between cooling fan relays-2 and -3 and joint connector-1 (E22)
- Harness for open or short between cooling fan relays-2 and -3 and fusible link

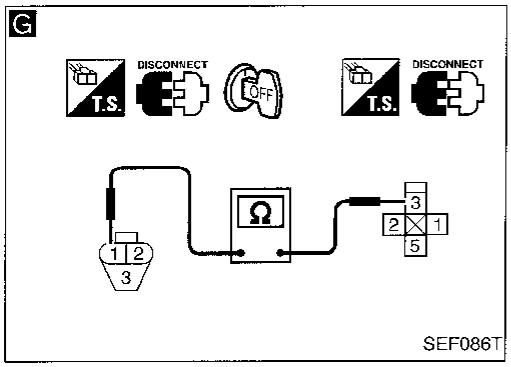
If NG, repair harness or connectors.

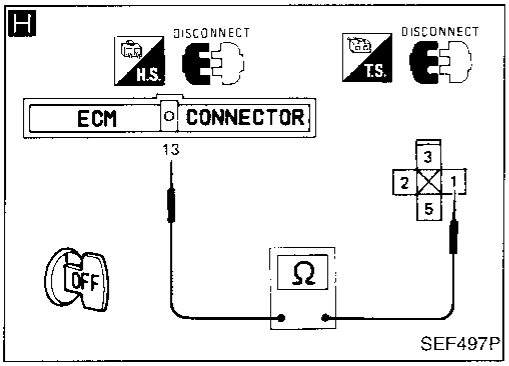
OK ↓

Ⓓ

(Go to next page.)

Cooling Fan (Cont'd)





Ⓓ

G

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor harness connector.
3. Check harness continuity between cooling fan relays-2 and -3 terminal ③ and cooling fan motor terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

H

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑬ and cooling fan relays-2 and -3 terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E17), (F305)
- Harness connectors (F402), (F104)
- Harness for open or short between cooling fan relays-2 and -3 and ECM

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENTS
(Cooling fan relays-2 and -3).
Refer to "COMPONENT INSPECTION", EC-231.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENT
(Cooling fan motor).
Refer to "COMPONENT INSPECTION", EC-231.

NG → Replace cooling fan motor.

OK ↓

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

Trouble is not fixed. ↓

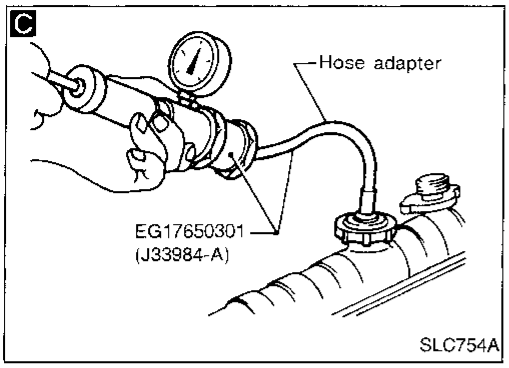
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

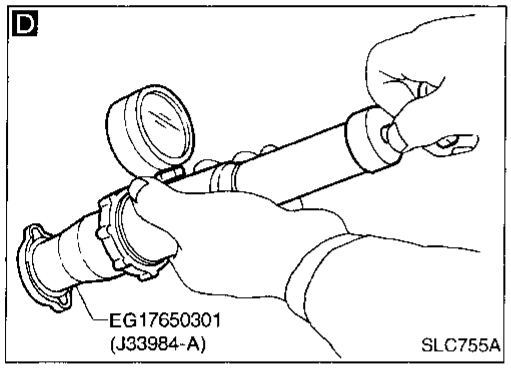
INSPECTION END

Cooling Fan (Cont'd)

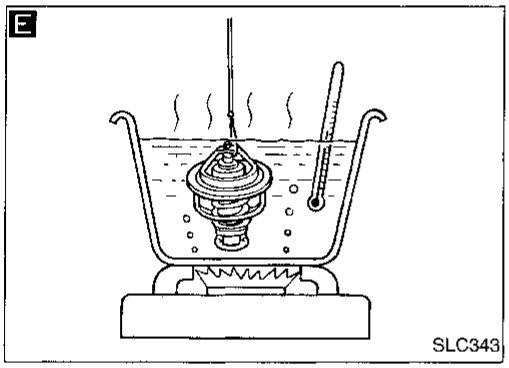
C



D



E



Ⓑ

C

CHECK COOLING SYSTEM FOR LEAK.
Apply pressure to the cooling system with a tester, and check if the pressure drops.
Testing pressure:
157 kPa (1.6 kg/cm², 23 psi)
Pressure should not drop.
CAUTION:
Higher than the specified pressure may cause radiator damage.

NG → Check the following for leak.
- Hose
- Radiator
- Water pump

Refer to LC section ("Water Pump").

OK ↓

D

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
81.4 - 108.9 kPa (0.83 - 1.11 kg/cm², 11.8 - 15.8 psi)

NG → Replace radiator cap.

OK ↓

E

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and valve lift.
   Valve opening temperature:
   82°C (180°F) [standard]
   Valve lift:
   More than 10 mm/90°C (0.39 in/194°F)
3. Check if valve is closed at 5°C (9°F) below valve opening temperature.

For details, refer to LC section ("Thermostat").

NG → Replace thermostat.

OK ↓

Check engine coolant temperature sensor. Refer to "COMPONENT INSPECTION", EC-104.

NG → Replace engine coolant temperature sensor.

↓

If the cause cannot be isolated, go to "MAIN 12 CAUSES OF OVERHEATING" on next page.

↓

INSPECTION END

Perform FINAL CHECK using 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".

Cooling Fan (Cont'd)

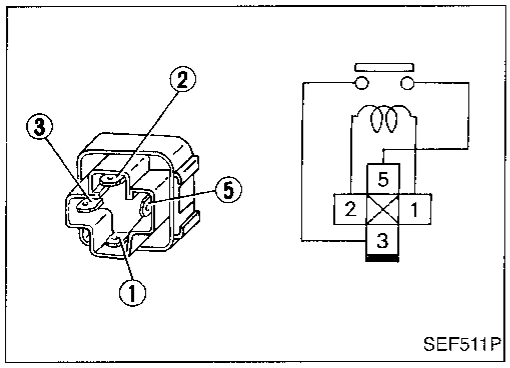
MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Condition	Reference page
OFF	1	● Blocked radiator ● Blocked condenser ● Blocked radiator grille ● Blocked bumper	● Visual	No blocking	—
	2	● Coolant mixture	● Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
	3	● Coolant level	● Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
	4	● Radiator cap	● Pressure tester	59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	● Coolant leaks	● Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	● Thermostat	● Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	● Cooling fan	● CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC P1900" (EC-220)
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.

Cooling Fan (Cont'd)

COMPONENT INSPECTION

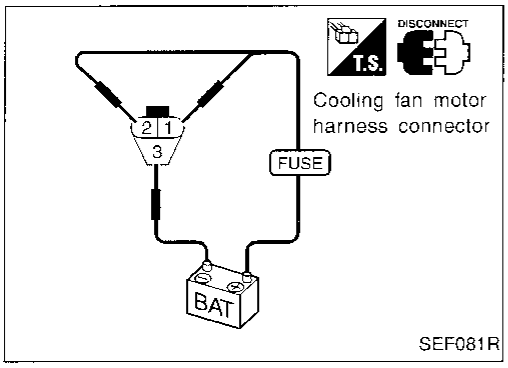


Cooling fan relays-1, -2 and -3

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.



Cooling fan motor

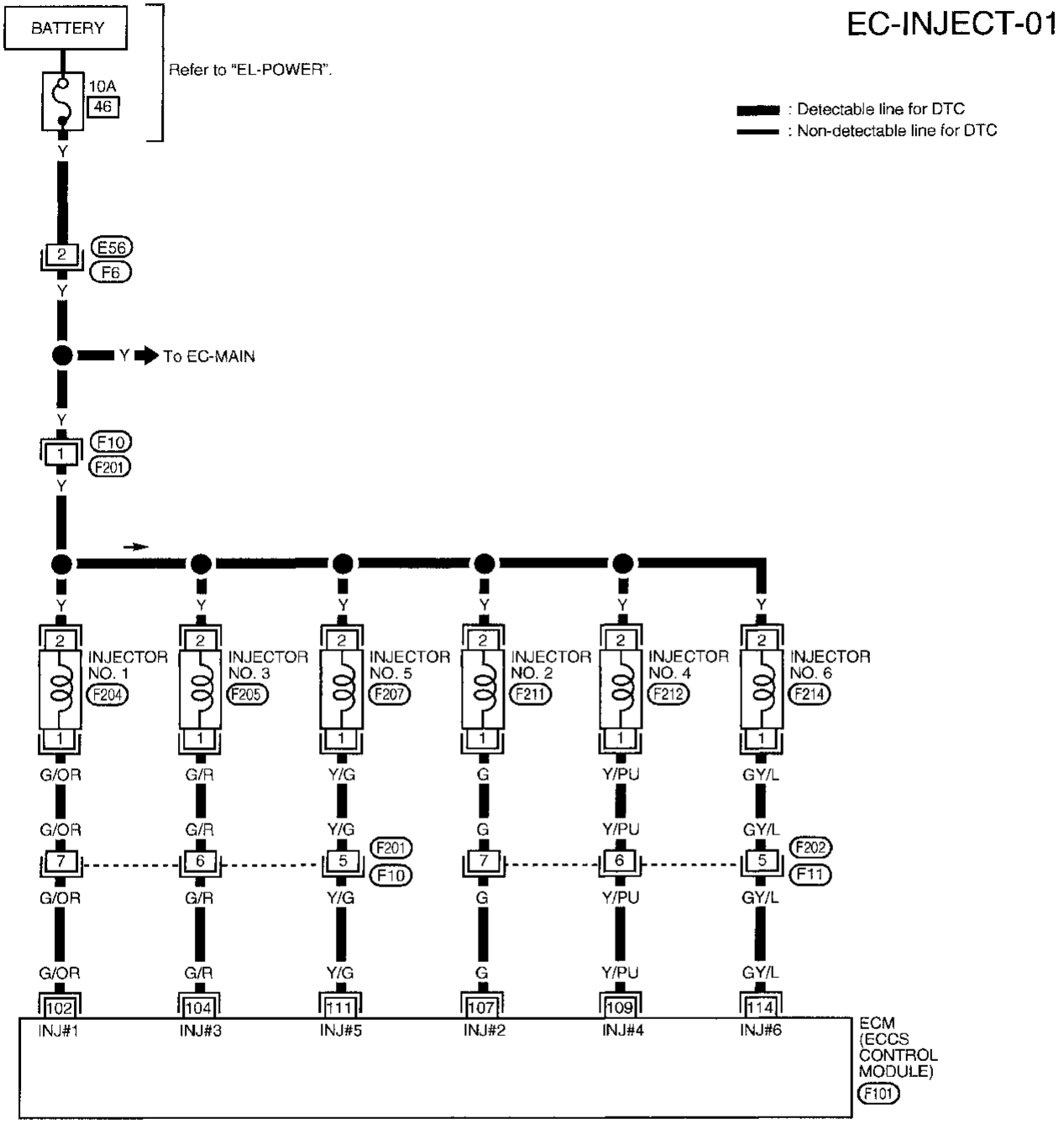
1. Disconnect cooling fan motor harness connector.
2. Supply cooling fan motor terminals with battery voltage and check operation.

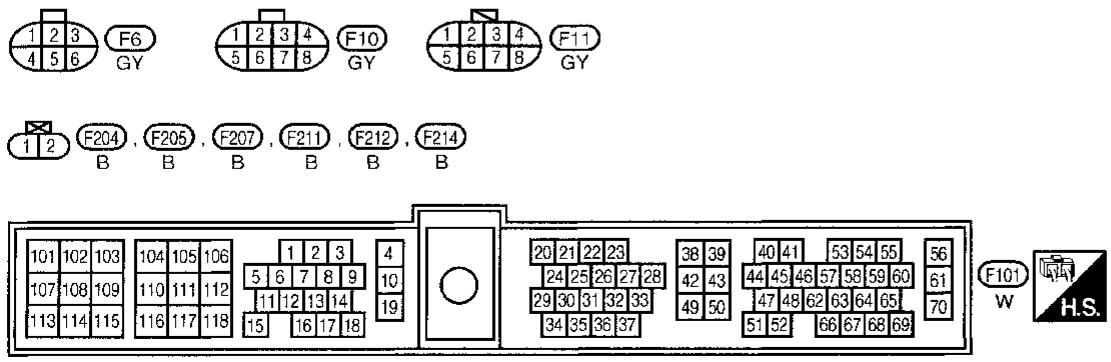
	Speed	Terminals	
		(⊕)	(⊖)
Cooling fan motor	Low	②	③
	High	①	③

Cooling fan motor should operate.

If NG, replace cooling fan motor.

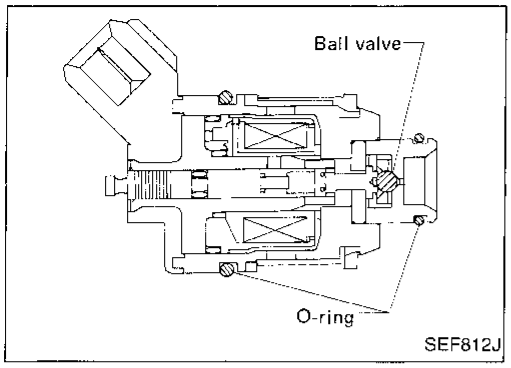
Injector





AEC196A

Injector (Cont'd)



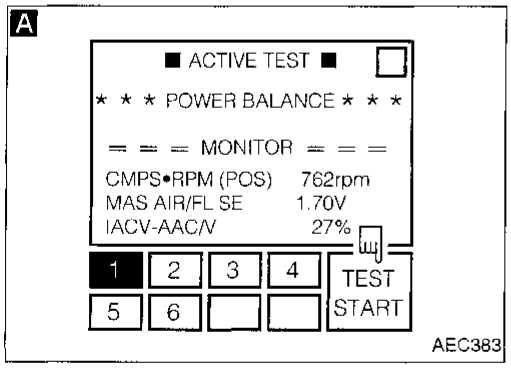
COMPONENT DESCRIPTION

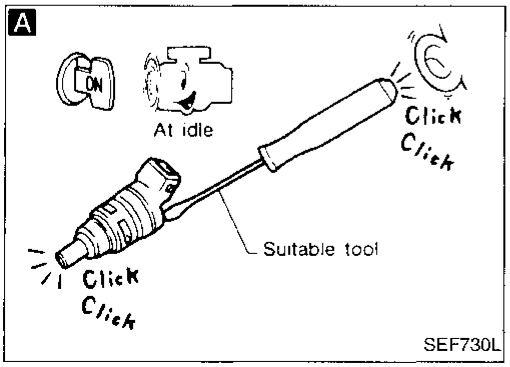
The fuel injector is a small, precise solenoid valve. When the ECM supplies a ground to the injector circuit, the coil in the injector is energized. The energized coil pulls the needle valve back and allows fuel to flow through the injector into the intake manifold. The amount of fuel injected depends 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

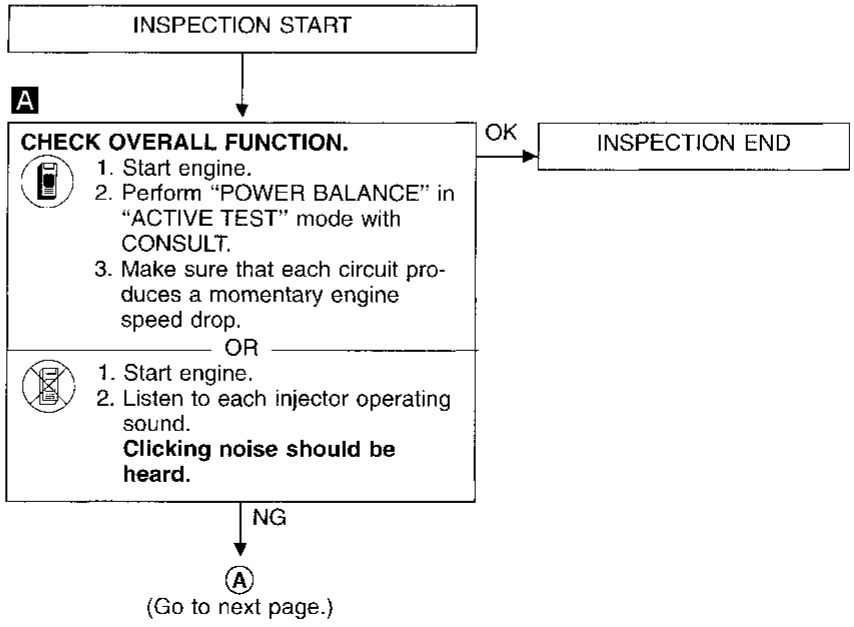
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	G/OR	Injector No. 1	Engine is running.	BATTERY VOLTAGE (11 - 14V)
104	G/R	Injector No. 3		
107	G	Injector No. 2		
109	Y/PU	Injector No. 4		
111	Y/G	Injector No. 5		
114	GY/L	Injector No. 6		

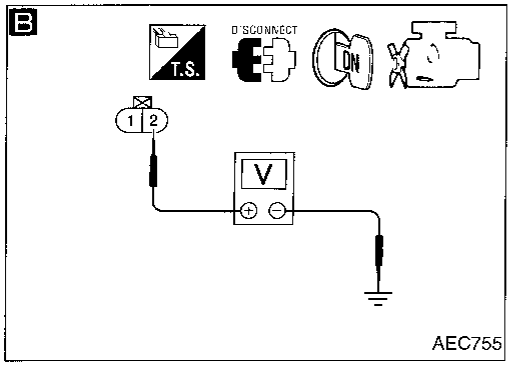


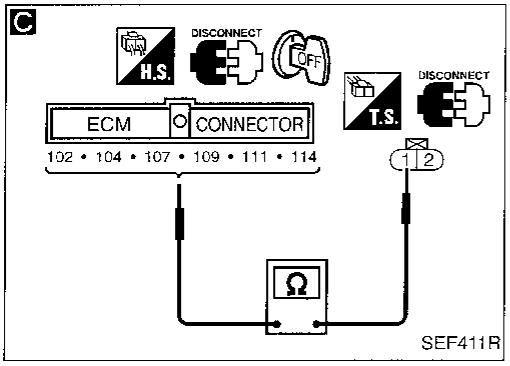


DIAGNOSTIC PROCEDURE



Injector (Cont'd)





Ⓐ

B

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect injector harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors E56, F6
- Harness connectors F10, F201
- 10A fuse
- Harness for open or short between injector and fuse

If NG, repair harness or connectors.

OK ↓

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between injector harness connector terminal ① and ECM terminals 102, 104, 107, 109, 111, 114.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors F201, F10
- Harness connectors F202, F11
- Harness for open or short between ECM and injector

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Injector).
Refer to "COMPONENT INSPECTION" below.

NG → Replace injector.

OK ↓

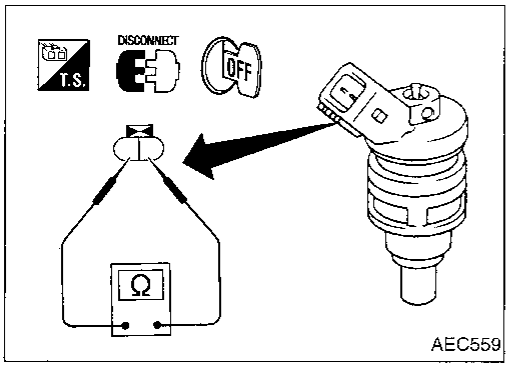
Disconnect and reconnect harness connectors in the circuit. Then retest.

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



COMPONENT INSPECTION

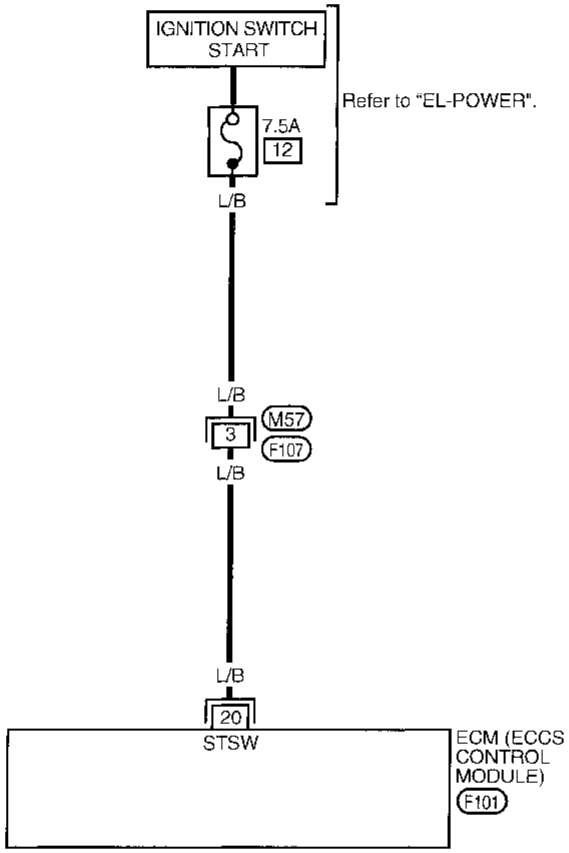
Injector

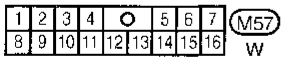
1. Disconnect injector harness connector.
2. Check resistance between terminals as shown in the figure.
   Resistance: 10 - 14Ω [at 25°C (77°F)]
   If NG, replace injector.

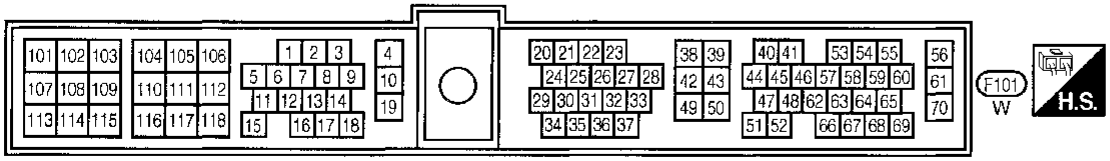
Start Signal

EC-S/SIG-01

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







AEC197A

Start Signal (Cont'd)

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.

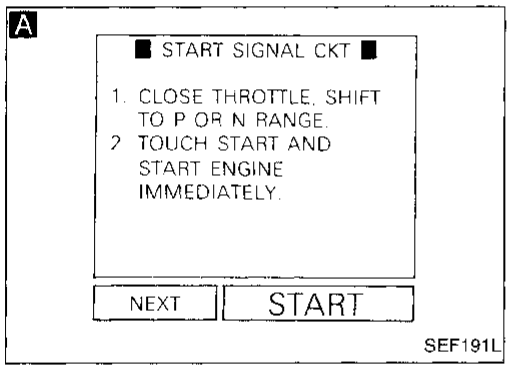
ECM TERMINALS AND REFERENCE VALUE

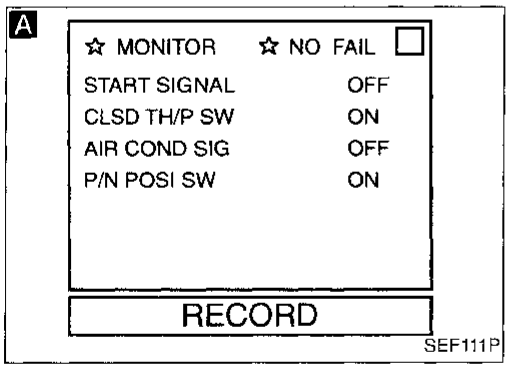
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

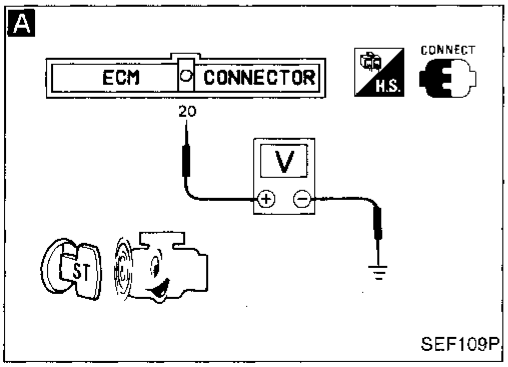
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
20	L/B	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (8 - 12V)

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
START SIGNAL	• Ignition switch: ON → START → ON	OFF → ON → OFF







DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Turn ignition switch "ON".
2. Check "START SIGNAL" in "DATA MONITOR" mode with CONSULT.

IGN "ON"	OFF
IGN "START"	ON

OR

1. Turn ignition switch to "START".
2. Check voltage between ECM terminal ⑳ and ground.

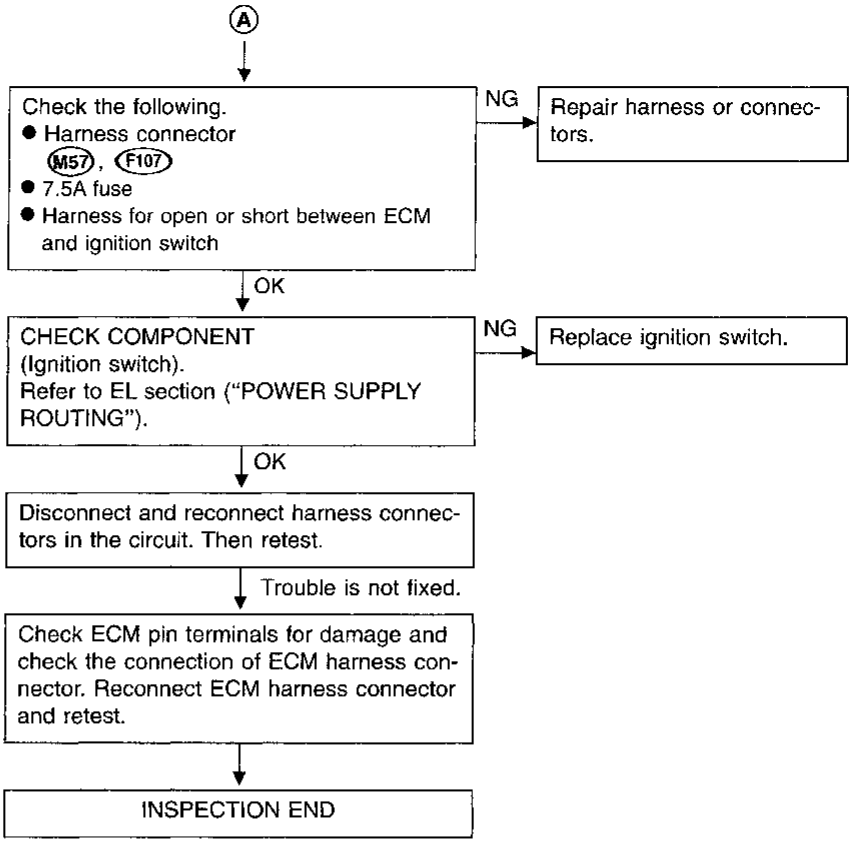
Voltage:
Ignition switch "START"
Battery voltage
Except above
Approximately 0V

OK → INSPECTION END

NG → Ⓐ

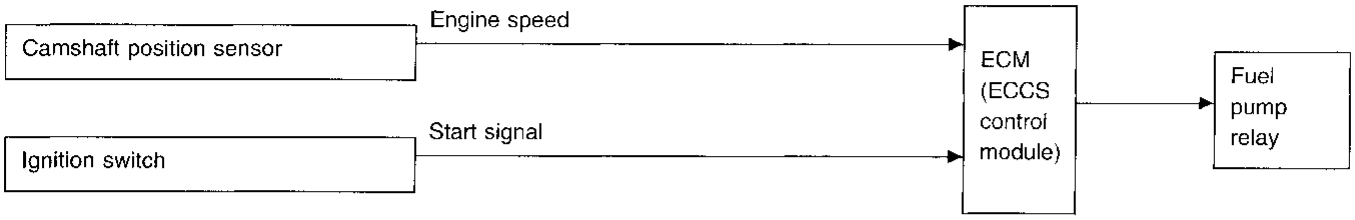
(Go to next page.)

Start Signal (Cont'd)



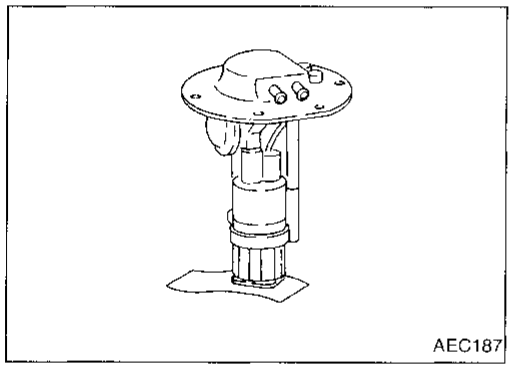
Fuel Pump

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 120° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to operate. If the 120° signal is not received when the ignition switch is on, the engine stalls. The ECM stops pump operation and prevents battery discharging, thereby improving safety. The ECM does not directly drive the fuel pump. It controls the ON/OFF fuel pump relay, which in turn controls the fuel pump.

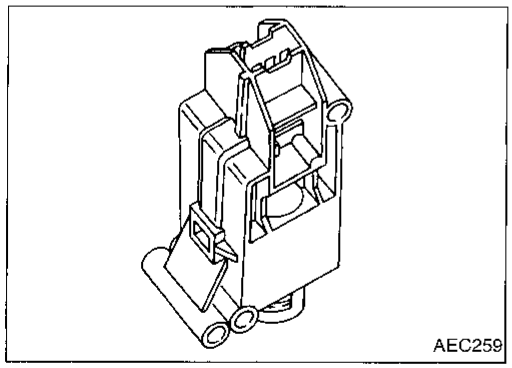
Condition	Fuel pump operation
Ignition switch is turned to ON.	Operates for 5 seconds
Engine running and cranking	Operates
When engine is stopped	Stops in 1.5 seconds
Except as shown above	Stops


AEC187

COMPONENT DESCRIPTION

Fuel pump

The fuel pump with a fuel damper is an in-tank type (the pump and damper are located in the fuel tank).


AEC259

Inertia fuel shutoff switch

The inertia fuel shutoff switch automatically stops the flow of fuel to the engine when the vehicle is involved in a collision. The impact does not have to be great to trigger the switch. Minor parking lot bumping and severe road impacts (such as potholes) may trigger the switch.

Once the switch is triggered, it must be reset manually before starting the vehicle. Reset the switch by pressing the red button located on the top of the switch.

The inertia fuel shutoff switch is located near the driver's door frame below the hood release handle.

Fuel Pump (Cont'd)

ECM TERMINALS AND REFERENCE VALUE

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

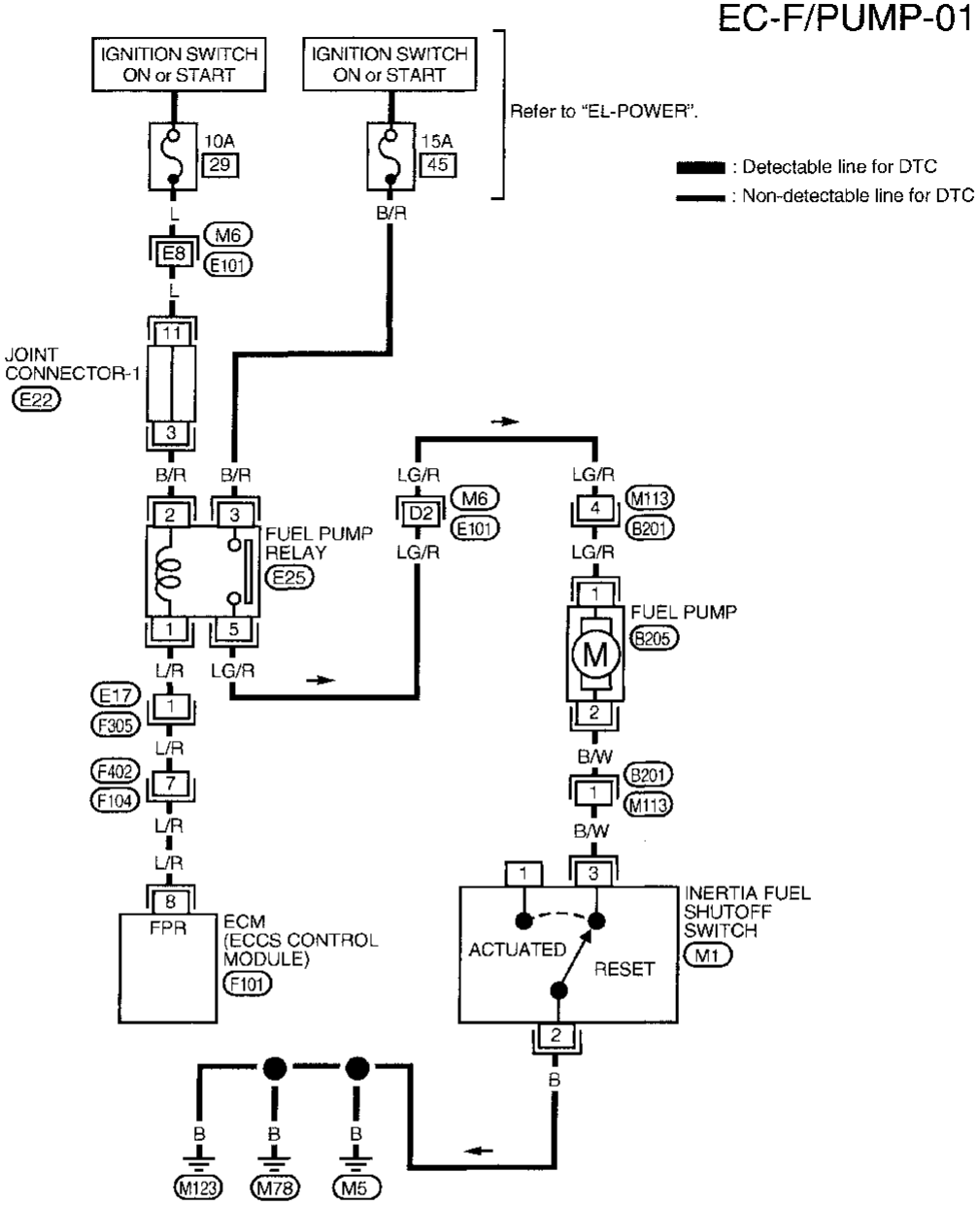
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
8	L/R	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0.7 - 0.9V
			Ignition switch "ON" └ More than 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

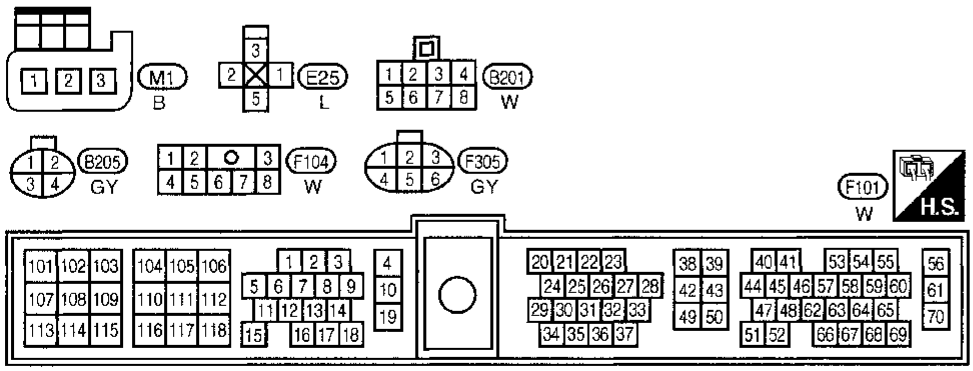
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	● Ignition switch is turned to ON (Operates for 5 seconds) ● Engine running and cranking ● When engine is stopped (stops in 1.5 seconds)	ON
	● Except as shown above	OFF

Fuel Pump (Cont'd)

EC-F/PUMP-01





Refer to last page (Foldout page).

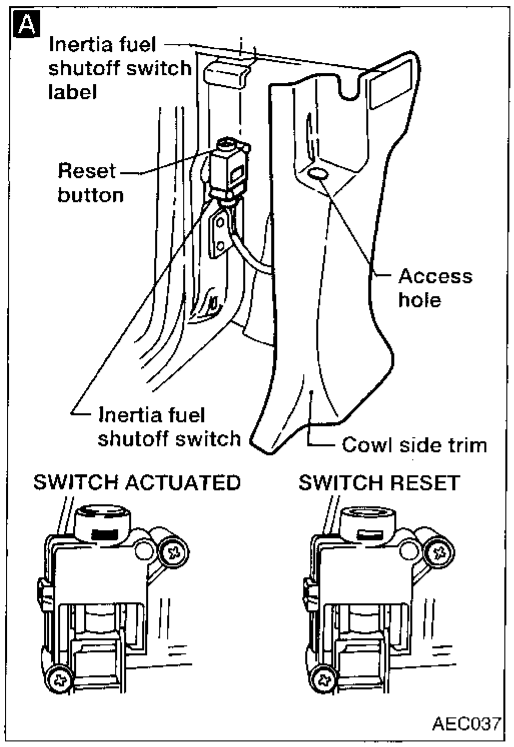
E22

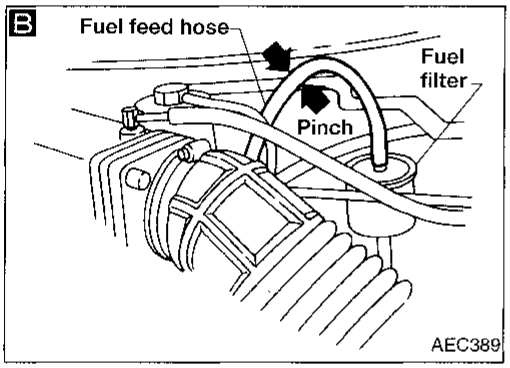
M6 E101

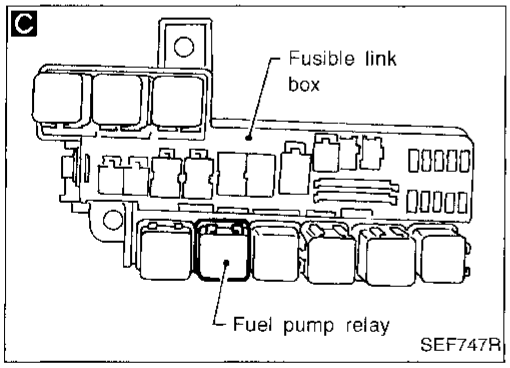
AEC198A

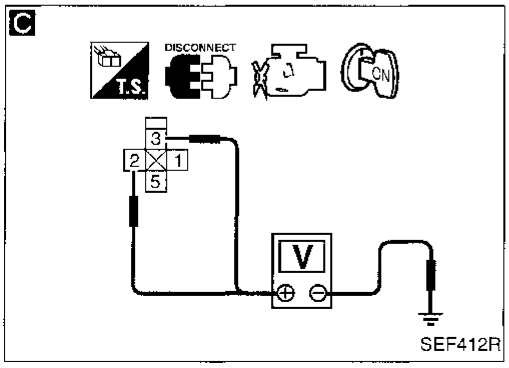
Fuel Pump (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INERTIA FUEL SHUTOFF SWITCH.
If the engine cranks but does not start after a collision, this switch may have been triggered.
Is the switch triggered?
Red reset button/indicator shows the switch ON/OFF condition.
And the indicator is visible through side slots of shroud.

Yes → Reset inertia fuel shutoff switch.
WARNING:
If you see or smell gasoline at any time other than during fueling, do not reset the switch.

No ↓

B

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 ↓

C

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump relay.
3. Turn ignition switch "ON".
4. Check voltage between terminals ②, ③ and ground with CONSULT or tester.
   Voltage: Battery voltage

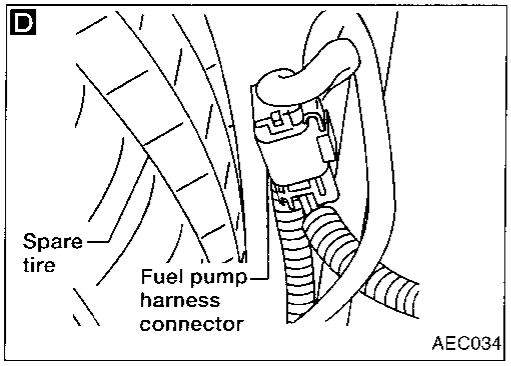
NG → Check the following.
- 15A and 10A fuses
- Harness connectors (M6), (E101)
- Joint connector-1 (E22)
- Harness for open or short between fuse and fuel pump relay

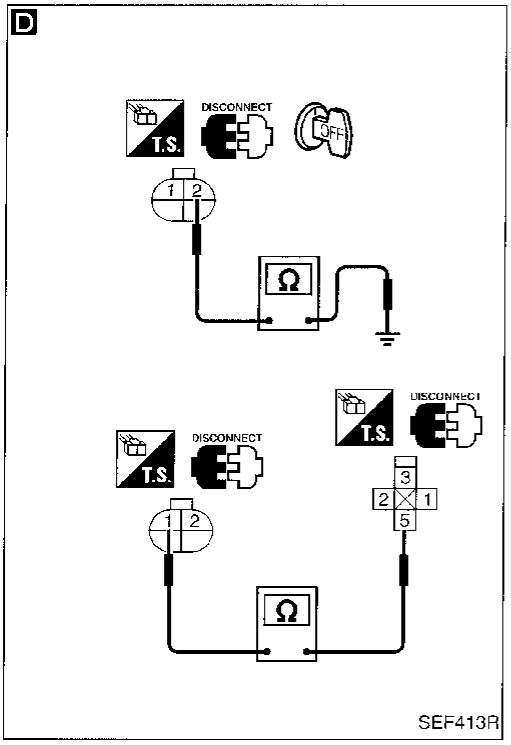
If NG, repair harness or connectors.

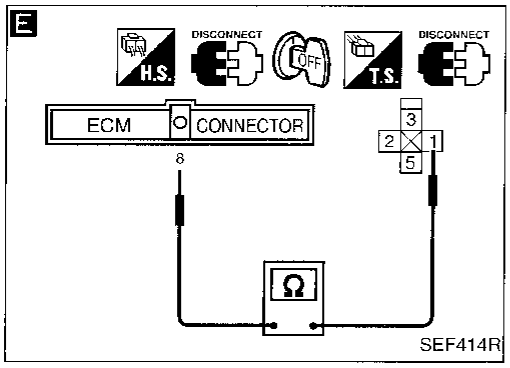
OK ↓

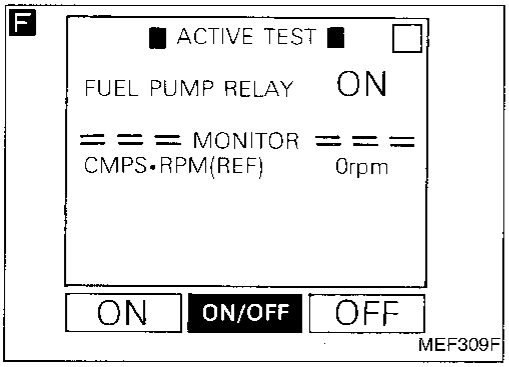
Ⓐ
(Go to next page.)

Fuel Pump (Cont'd)









Ⓐ

D

CHECK POWER AND GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector.
3. Check harness continuity between terminal ② and body ground, fuel pump terminal ① and fuel pump relay connector terminal ⑤.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M6), (E101)
- Harness connectors (M113), (B201)
- Inertia fuel shutoff switch Refer to "COMPONENT INSPECTION" on next page.
- 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 ↓

E

CHECK CONTROL SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑧ and fuel pump relay connector terminal ①.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E17), (F305)
- Harness connectors (F402), (F104)
- Harness for open or short between ECM and fuel pump relay

If NG, repair harness or connectors.

OK ↓

F

CHECK COMPONENT
(Fuel pump relay).
1. Reconnect fuel pump relay, fuel pump harness connector and ECM harness connector.
2. Turn ignition switch "ON".
3. Turn fuel pump relay "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump relay.

OK ↓

CHECK COMPONENT
(Fuel pump).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace fuel pump.

OK ↓

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

Trouble is not fixed. ↓

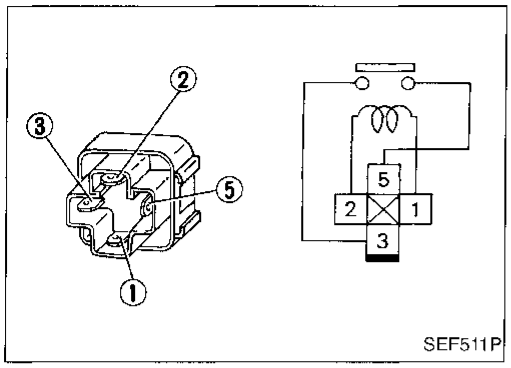
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

↓

INSPECTION END

Fuel Pump (Cont'd)

COMPONENT INSPECTION

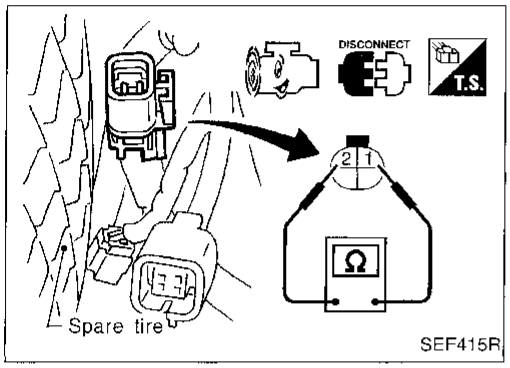


Fuel pump relay

Check continuity between terminals ③ and ⑤.

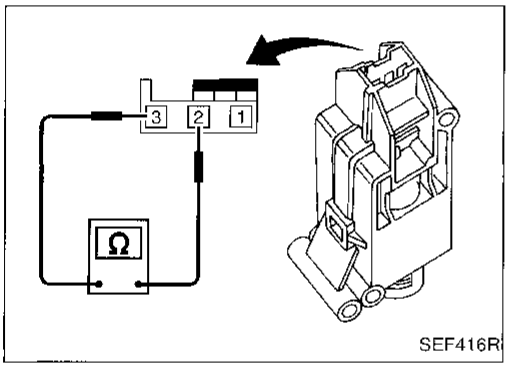
Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No

If NG, replace relay.



Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ②.
   Resistance: 0.2 - 5.0Ω [at 25°C (77°F)]
   If NG, replace fuel pump.



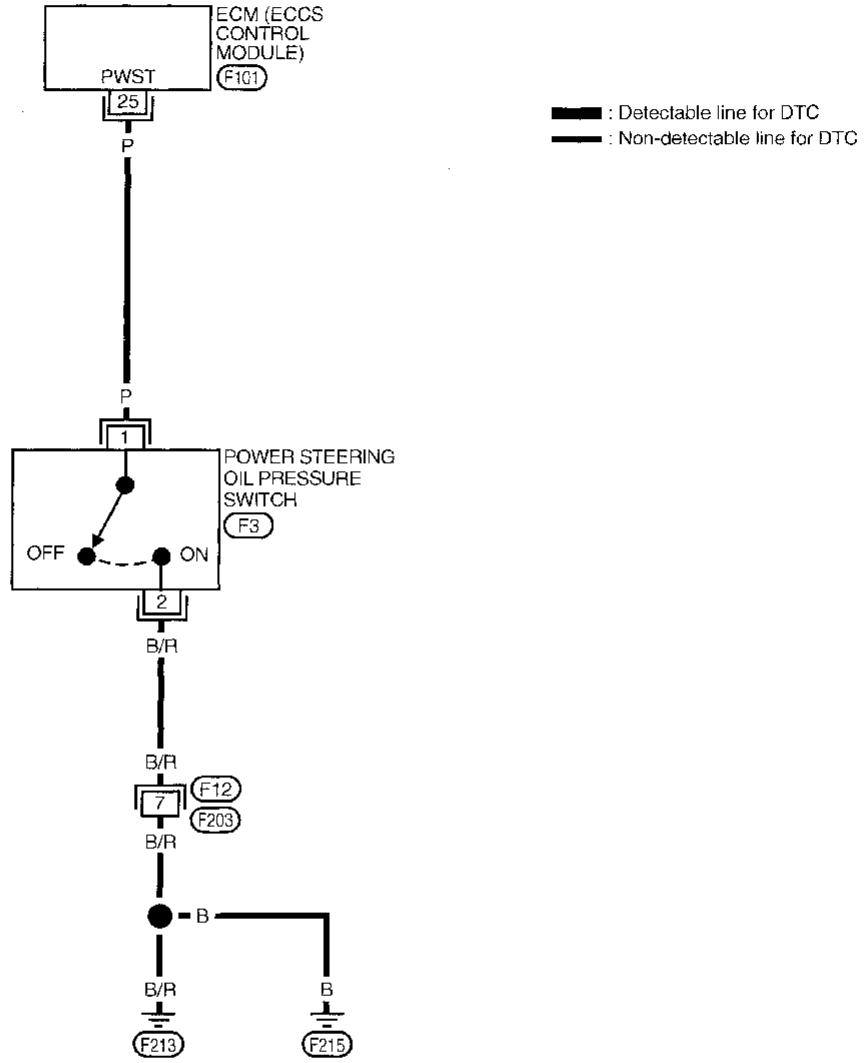
Inertia fuel shutoff switch

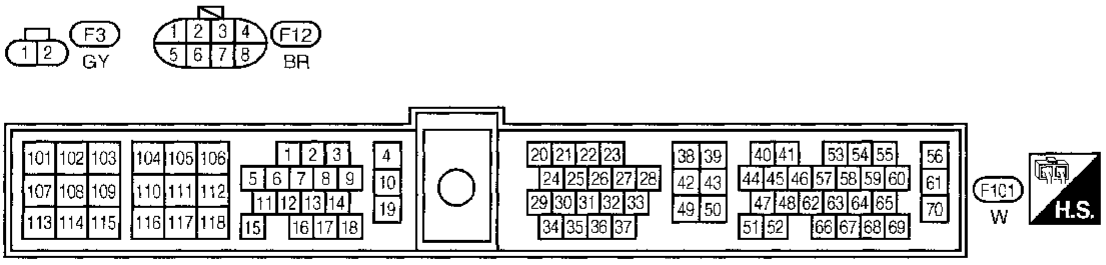
1. Disconnect inertia fuel shutoff switch harness connector.
2. Check inertia fuel shutoff switch, following the table as shown below:

Conditions	Continuity between terminals ② and ③
Switch open (tripped)	No
Switch closed (set)	Yes

Power Steering Oil Pressure Switch

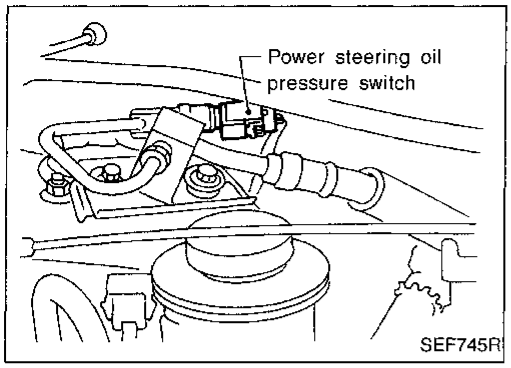
EC-PST/SW-01





AEC199A

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 ㊸ (ECCS ground).

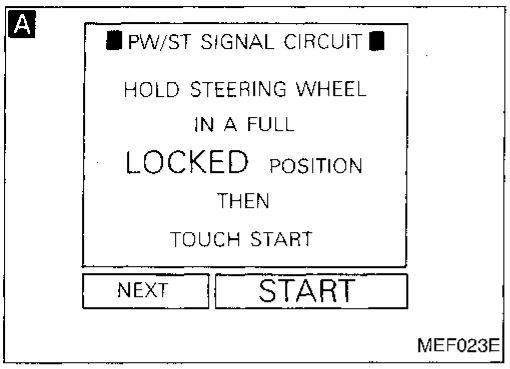
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	P	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned	Approximately 0V
			Engine is running. └ Steering wheel is not being turned	Approximately 5V

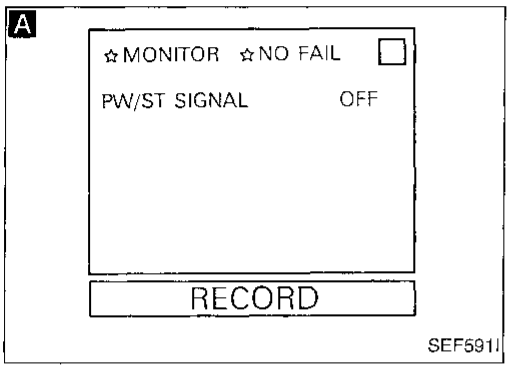
CONSULT REFERENCE VALUE IN DATA MONITOR MODE

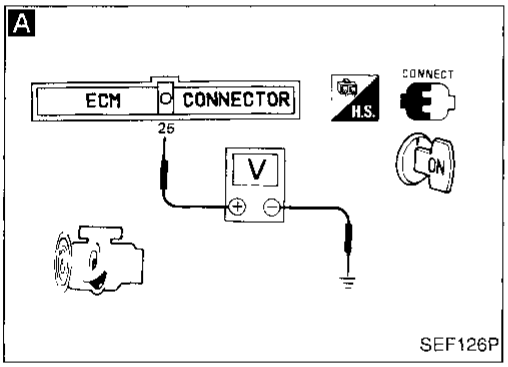
MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	● Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON

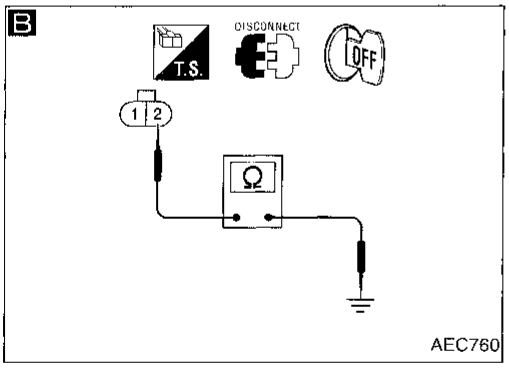
Power Steering Oil Pressure Switch (Cont'd)

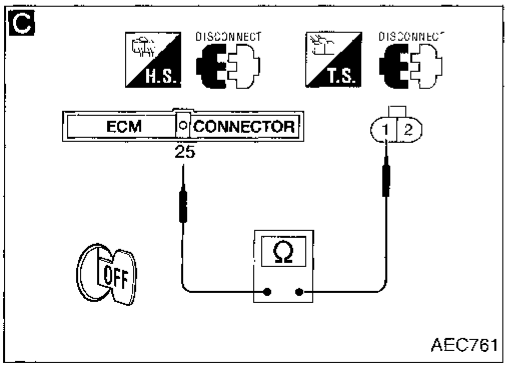
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "PW/ST SIGNAL CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

OR

1. Start engine.
2. Check "PW/ST SIGNAL" in "DATA MONITOR" mode with CONSULT.
   Steering is in neutral position:
   OFF
   Steering is turned:
   ON

OR

1. Start engine.
2. Check voltage between ECM terminal (25) and ground.
   Voltage:
   When steering wheel is turned quickly.
   Approximately 0V
   Except above
   Approximately 5V

OK → INSPECTION END

NG ↓

B

CHECK GROUND CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch 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 (F12), (F203)
- Harness for open or short between power steering oil pressure switch and engine ground

If NG, repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (25) and terminal (1).
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

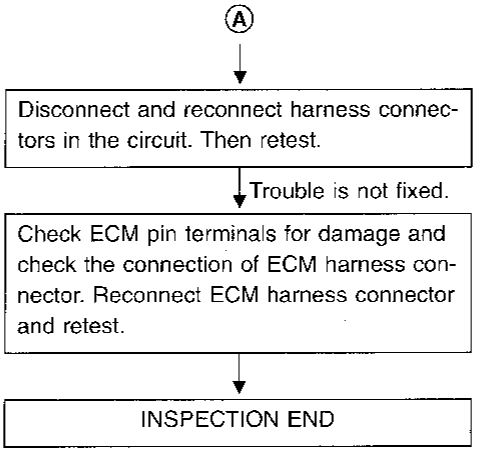
OK ↓

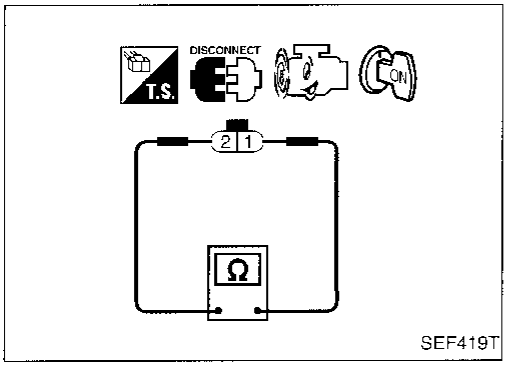
CHECK COMPONENT
(Power steering oil pressure switch).
Refer to "COMPONENT INSPECTION" below.

NG → Replace power steering oil pressure switch.

OK ↓

(A)
(Go to next page.)





COMPONENT INSPECTION

Power steering oil pressure switch

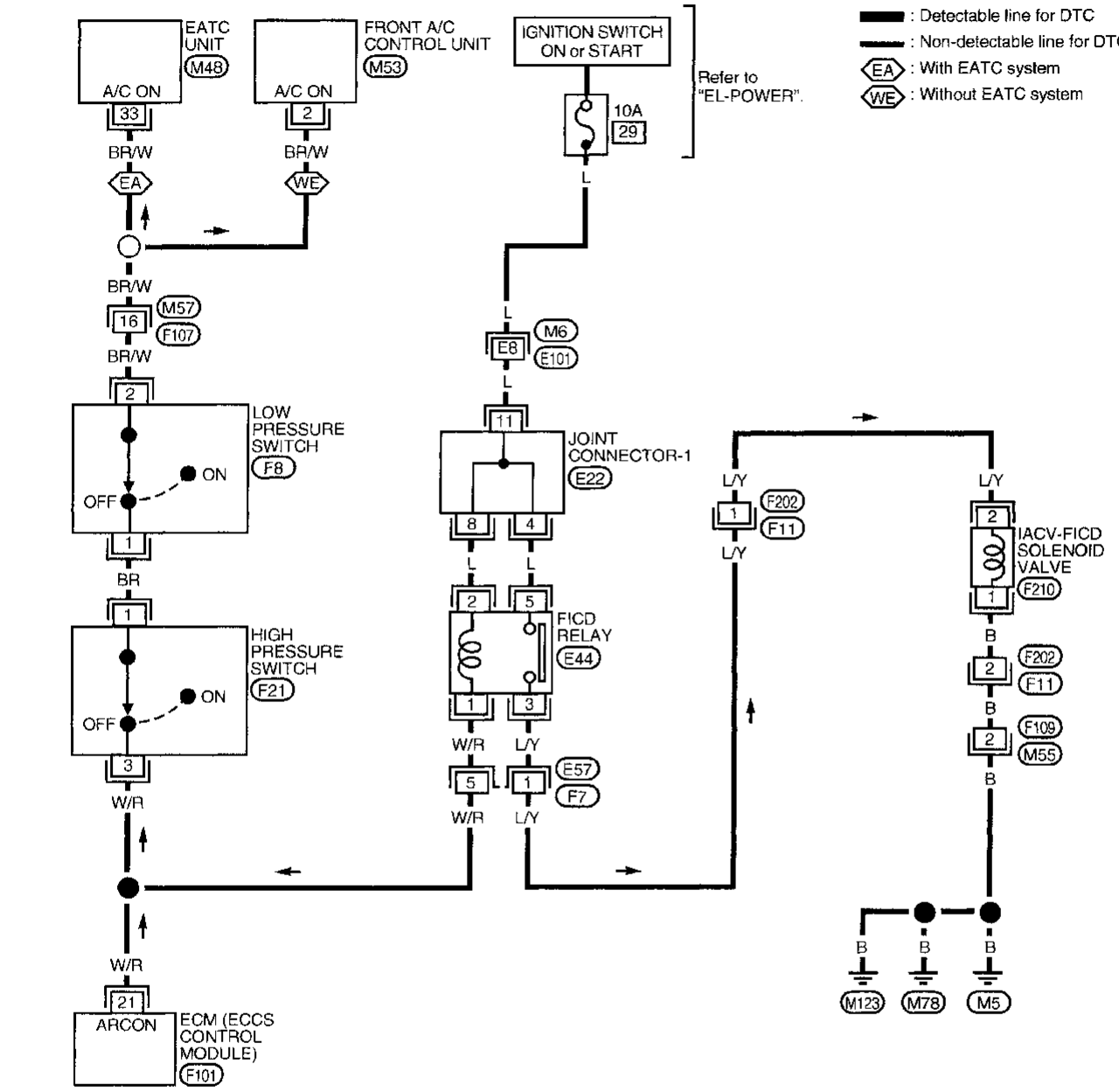
1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ②.

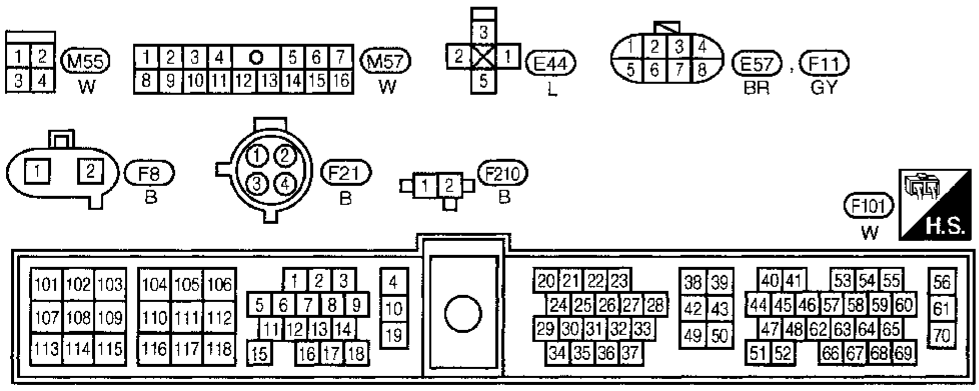
Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

If NG, replace power steering oil pressure switch.

IACV-FICD Solenoid Valve/Air Conditioning System Input

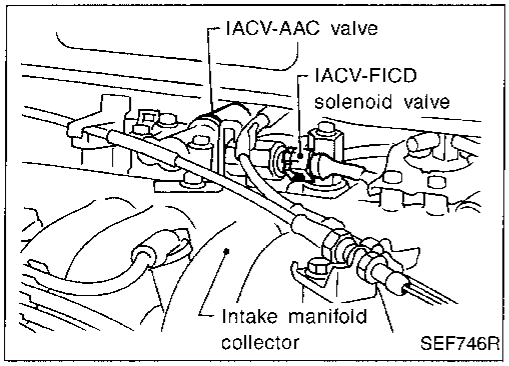
EC-FICD-01





Refer to last page (Foldout page).
M6, E101
E22
M48
M53

AEC200A



IACV-FICD Solenoid Valve/Air Conditioning System Input (Cont'd)

COMPONENT DESCRIPTION

When the air conditioner is on, the IACV-FICD solenoid valve supplies additional air to adjust to the increased load.

ECM TERMINALS AND REFERENCE VALUE

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

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21	W/R	Air conditioner switch	Engine is running. └ Both air conditioner switch and blower switch are "ON" (Compressor operates)	2.0 - 2.5V
			Engine is running. └ Air conditioner switch is "OFF"	BATTERY VOLTAGE (11 - 14V)
15	LG	Air conditioner relay	Engine is running. └ Both A/C switch and blower switch are "ON"*	Approximately 0V
			Engine is running. └ A/C switch is "OFF"	BATTERY VOLTAGE (11 - 14V)

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

CONSULT REFERENCE VALUE IN DATA MONITOR MODE

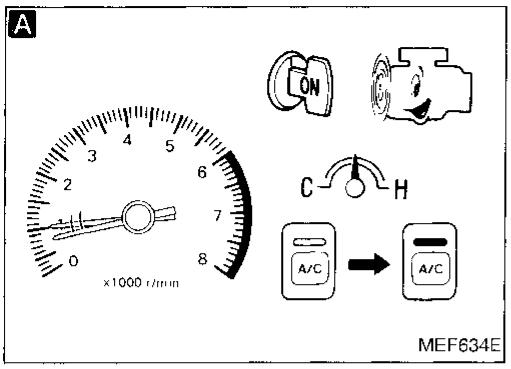
MONITOR ITEM	CONDITION		SPECIFICATION
AIR COND SIG	● Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON* (Compressor operates)	ON

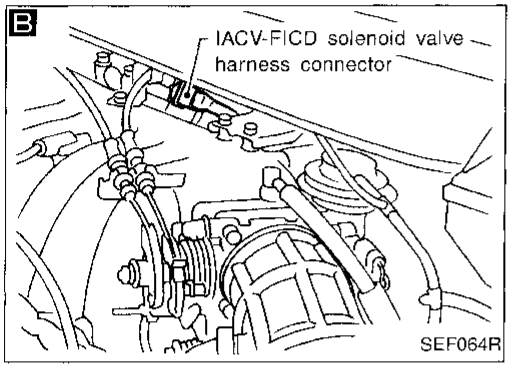
*: Any mode except OFF, ambient air temperature above 10°C (50°F)

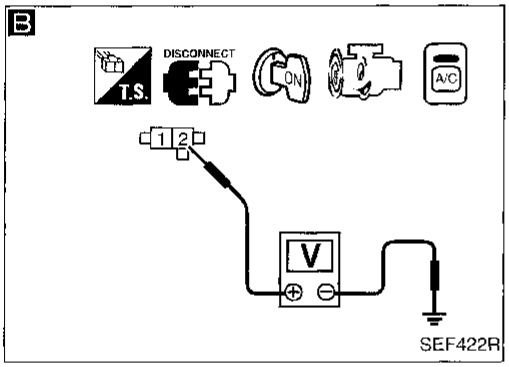
IACV-FICD Solenoid Valve/Air Conditioning System Input (Cont'd)

DIAGNOSTIC PROCEDURE

IACV-FICD solenoid valve







INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine and warm it up sufficiently.
2. Check idle speed.
   750±50 rpm (in "N" position)
   If NG, adjust idle speed.
3. Turn air conditioner switch and blower fan switch "ON".
4. Recheck idle speed.
   800 rpm or more (in "N" position)

OK → INSPECTION END

NG

Check if air conditioner compressor functions normally.

NG → Refer to HA section ("TROUBLE DIAGNOSES").

OK

B

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Start engine, then turn air conditioner switch and blower fan "ON".
4. Check voltage between terminal (2) and ground with CONSULT or tester.
   Voltage: Battery voltage

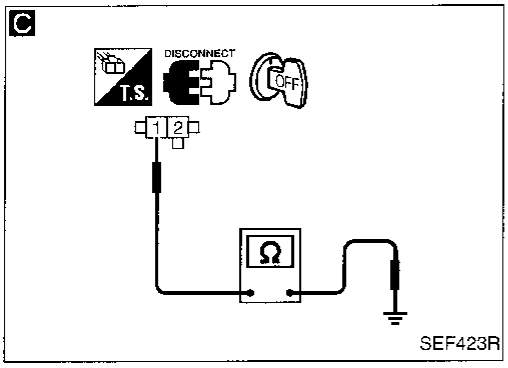
NG → Check the following.
- 10A fuse
- Harness connectors (M6), (E101)
- Harness connectors (E57), (F7)
- Harness connectors (F202), (F11)
- Joint connector-1 (E22)
- FICD relay
  Refer to "COMPONENT INSPECTION".
- Harness for open or short between IACV-FICD solenoid valve and FICD relay
- Harness for open or short between high pressure switch and FICD relay
- Harness for open or short between FICD relay and fuse

If NG, repair harness or connectors.

OK

(A)
(Go to next page.)

IACV-FICD Solenoid Valve/Air Conditioning System Input (Cont'd)



Ⓐ

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Check harness continuity between terminal ① and body ground.
   Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors F202 , F11
- Harness connectors F109 , M55
- Harness for open or short between IACV-FICD solenoid valve and ground

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (IACV-FICD solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace IACV-FICD solenoid valve.

OK ↓

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

Trouble is not fixed. ↓

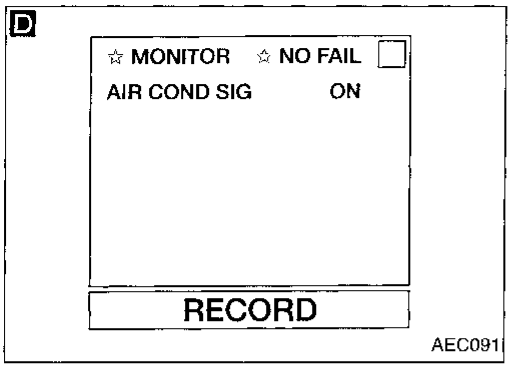
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector. Then retest.

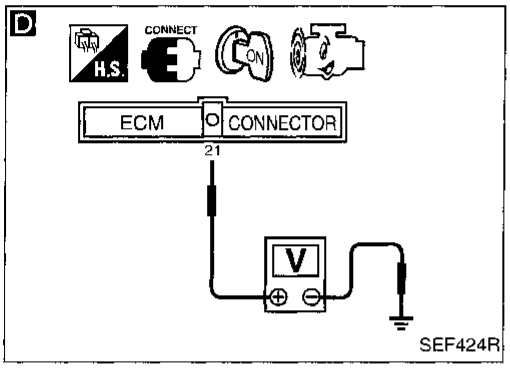
↓

INSPECTION END

IACV-FICD Solenoid Valve/Air Conditioning System Input (Cont'd)

Air conditioning system input





INSPECTION START

CHECK OVERALL FUNCTION.

1) Start engine.
2) Check A/C switch signal in "DATA MONITOR" mode with CONSULT.

With air conditioning switch "ON" and fan switch in any position and any mode except "OFF", ambient air temperature above 10°C (50°F):
ON
With air conditioning switch "OFF":
OFF

NG → Check harness continuity between A/C system and ECM terminal (21). Refer to HA section. If NG, repair harness or connectors.

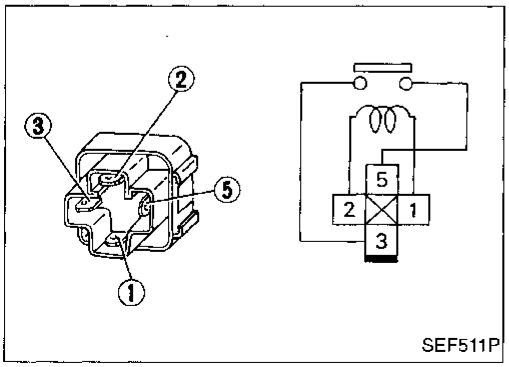
OR

1) Start engine.
2) Check voltage between ECM terminal (21) and ground.

Voltage:
With air conditioning switch "ON" and fan switch in any position and any mode except "OFF", ambient air temperature above 10°C (50°F)
Less than 2.3V
With air conditioning switch "OFF"
Battery positive voltage

OK

INSPECTION END



COMPONENT INSPECTION

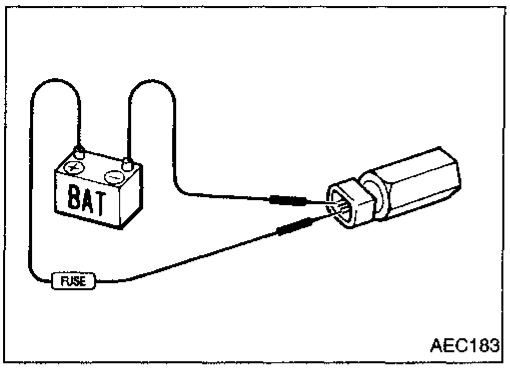
FICD relay

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.

IACV-FICD Solenoid Valve/Air Conditioning System Input (Cont'd)

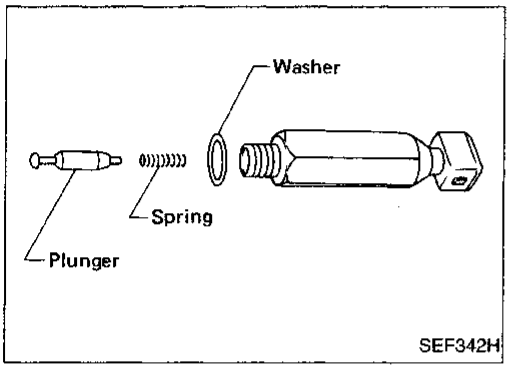


AEC183

IACV-FICD solenoid valve

Disconnect IACV-FICD solenoid valve harness connector.

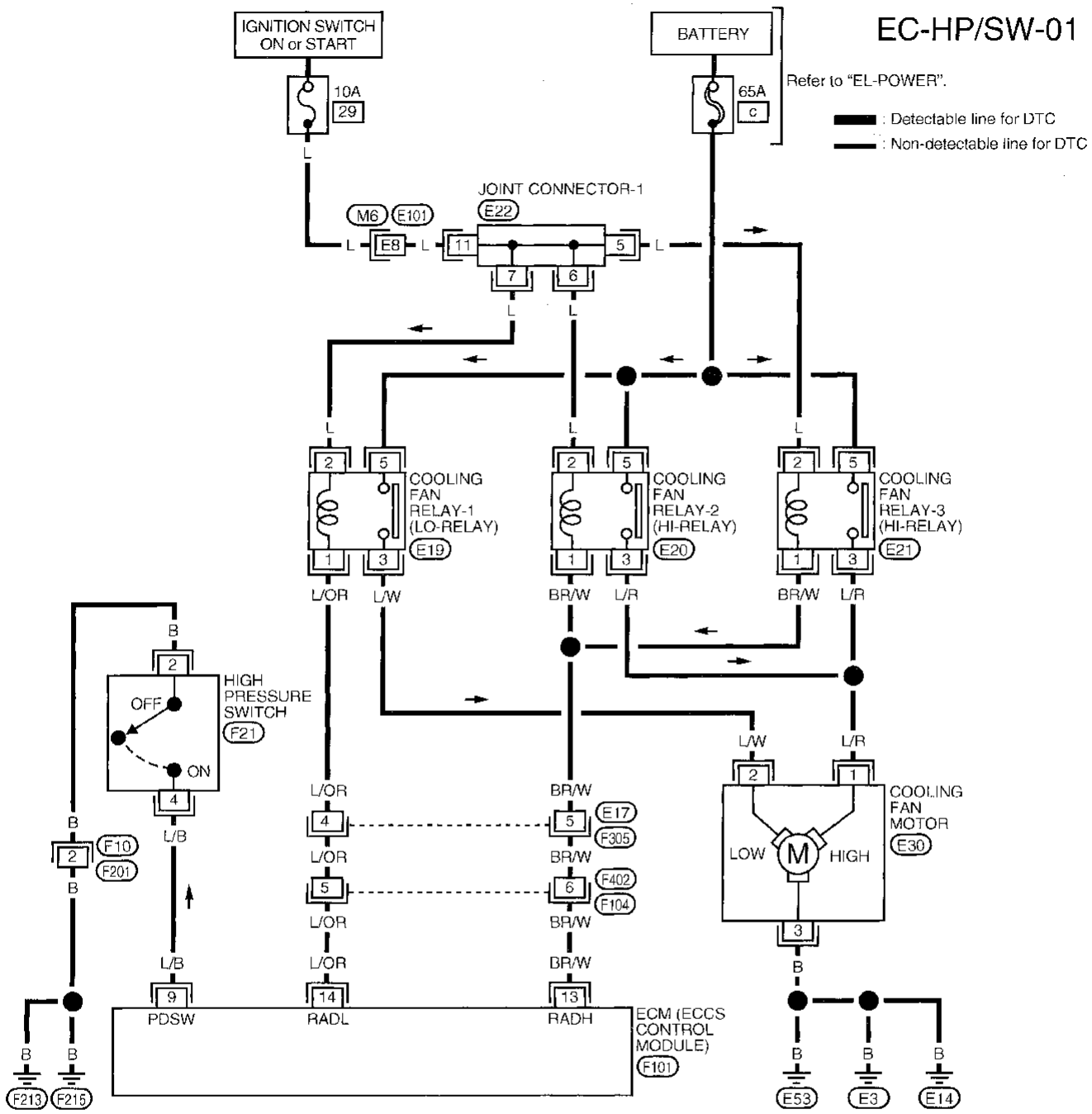
- Check for clicking sound when applying 12V direct current to terminals.

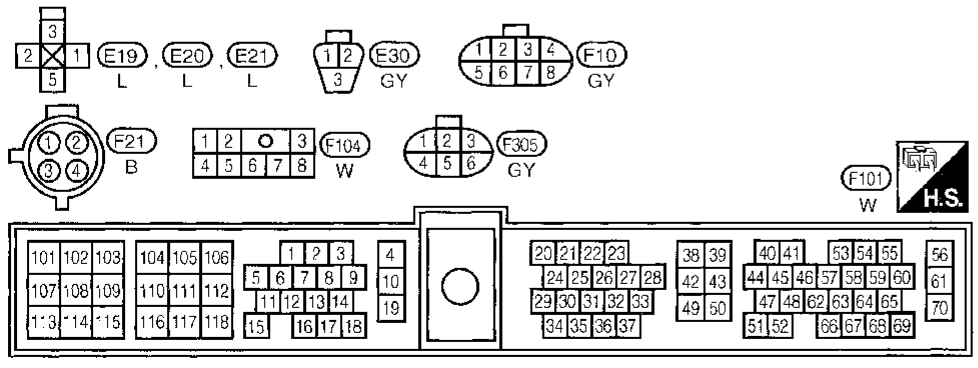


SEF342H

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

Air Conditioner High Pressure Switch





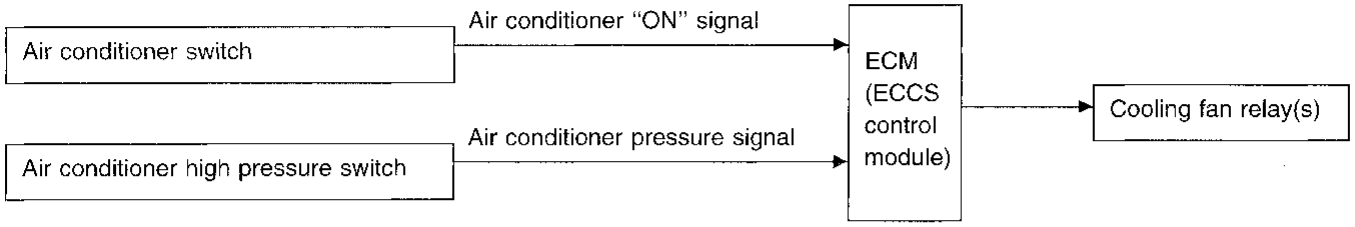
Refer to last page (Foldout page).
E22
M6 E101

AEC201A

Air Conditioner High Pressure Switch (Cont'd)

SYSTEM DESCRIPTION

Cooling fan control by air conditioner high pressure switch



When both air conditioner switch and high pressure switch are "ON", cooling fans operate at "High" speed.

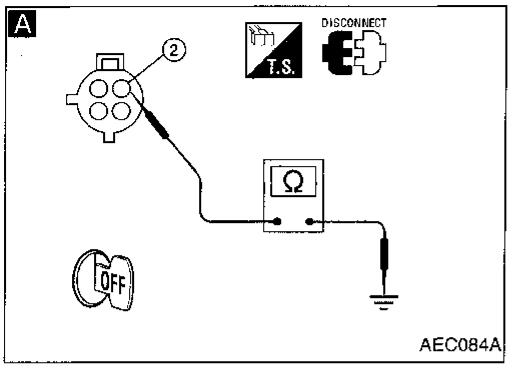
ECM TERMINALS AND REFERENCE VALUE

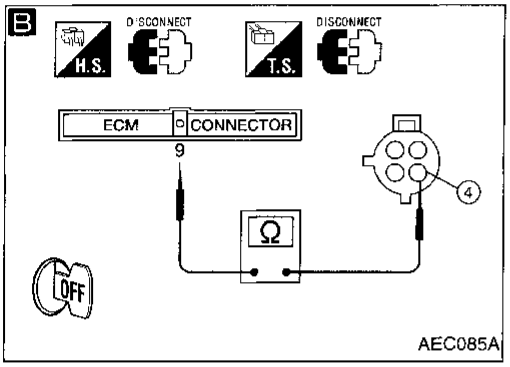
Specification data are reference values and are measured between each terminal and ㊸ (ECCS ground).

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
9	L/B	Air conditioner pressure switch	Ignition switch "ON"	Approximately 5V
13	BR/W	Cooling fan relay (High)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at high speed	0.7 - 0.8V
14	L/OR	Cooling fan relay (Low)	Engine is running. └ Cooling fan is not operating	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating at low speed	0.7 - 0.8V

Air Conditioner High Pressure Switch (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK GROUND CIRCUIT.
1. Disconnect high pressure switch harness connector.
2. Check harness for open or short between terminal (2) and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F10), (F201)
- Harness for open or short between high pressure switch and engine ground

If NG, repair harness or connectors.

OK ↓

B

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness for open or short between ECM terminal (9) and terminal (4).
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

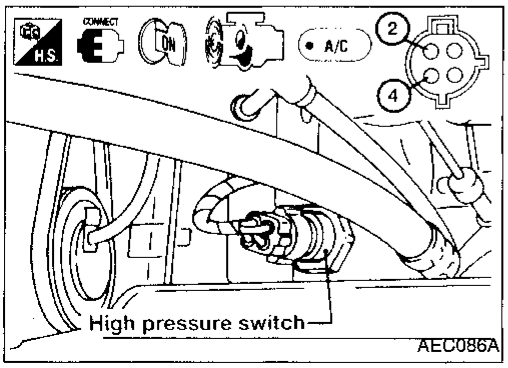
CHECK COMPONENT
(High pressure switch).
Refer to "COMPONENT INSPECTION" below.

NG → Replace high pressure switch.

OK ↓

Check ECM pin terminals for damage or the connection of ECM harness connector. Refer to EC-79.

INSPECTION END



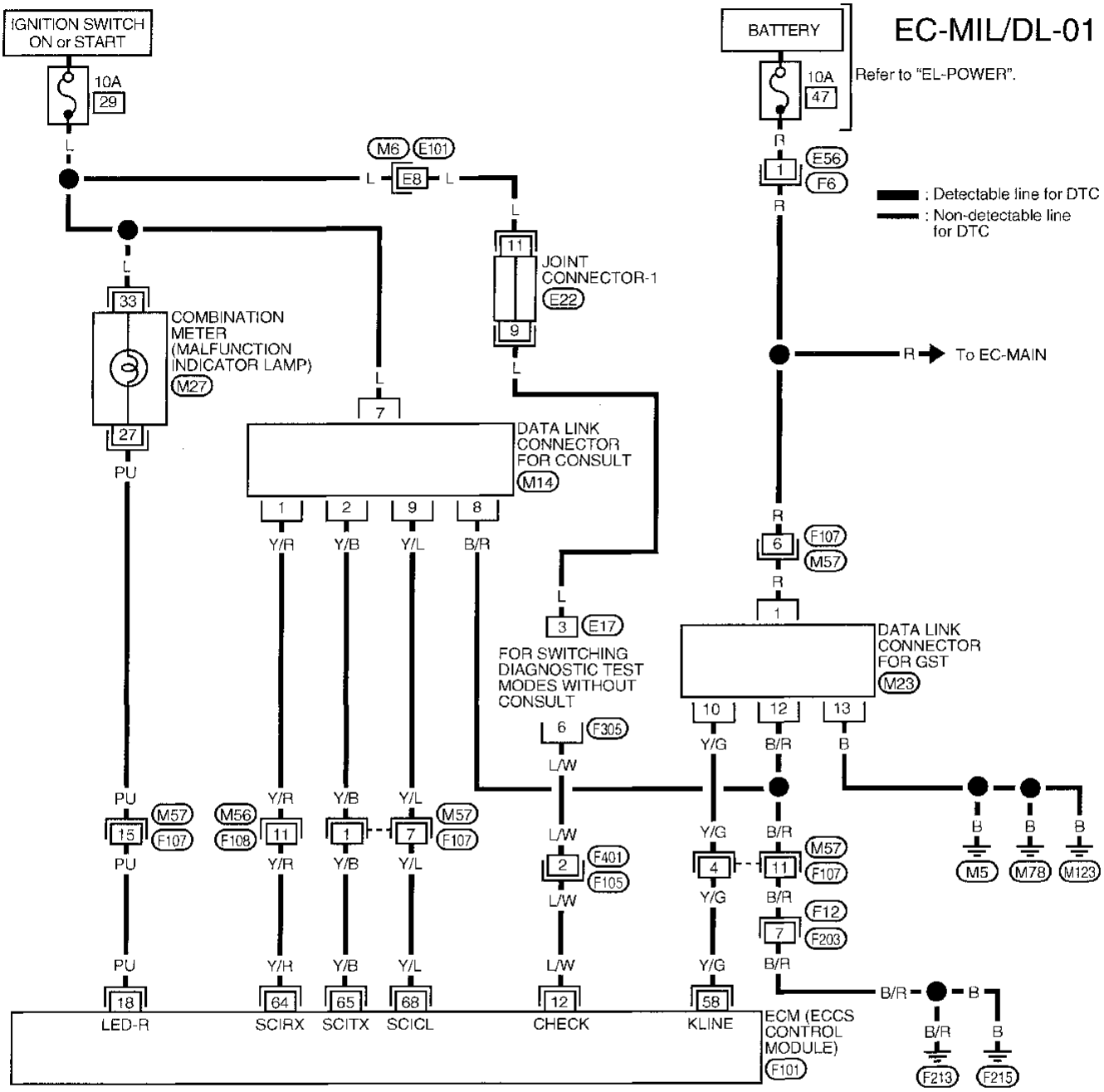
COMPONENT INSPECTION

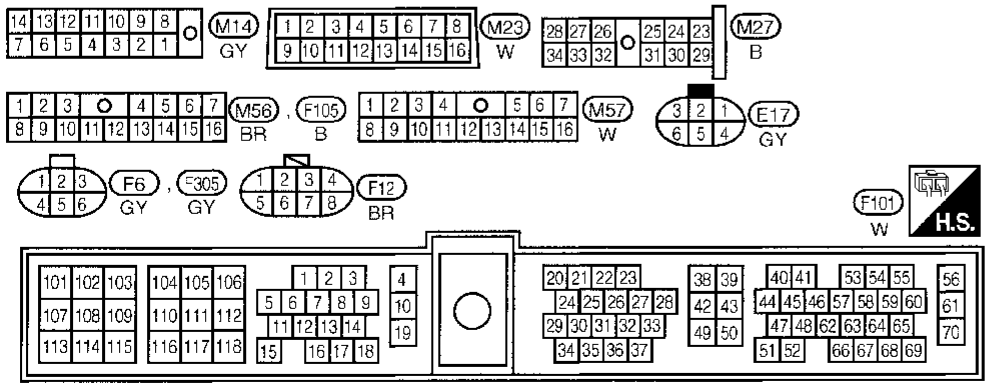
High pressure switch

Check continuity between terminals (2) and (4).

High-pressure side line pressure	kPa (kg/cm², psi)	Operation	Continuity
Increasing to	2,246 (22.9, 326)	Fan OFF	Does not exist
Decreasing to	1,824 (18.6, 264)	Fan ON	Exists

MIL & Data Link Connectors





Refer to last page (Foldout page).
E22
M6, E101

AEC202A

MIL & Data Link Connectors (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)
18	PU	Malfunction indicator lamp	Ignition switch "ON"	Approximately 0.7V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
58	Y/G	Data link connector for GST	Engine is running. └ Idle speed (GST is disconnected)	6 - 10V
64	Y/R	Data link connector for CONSULT	Engine is running. └ Idle speed (CONSULT is connected and turned on)	Approximately 0V
65	Y/B			Approximately 4 - 9V
68	Y/L			Approximately 3.5V*

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

General Specifications

FUEL PRESSURE REGULATOR Fuel pressure at idling kPa (kg/cm^2, psi)	
Vacuum hose is connected	Approximately 235 (2.4, 34)
Vacuum hose is disconnected	Approximately 294 (3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm No-load*2 (in "N" position)	750±50 (700*3)
Air conditioner: ON (in "N" position)	800 or more
Ignition timing	15°±2° BTDC
Closed throttle position switch touch speed ("OFF" to "ON") (in "N" position) rpm	950±150

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear defogger)
- Steering wheel: Kept in straight-ahead position

*3: Disconnect throttle position sensor

IGNITION COIL

Primary voltage	V	12
Primary resistance [at 20°C (68°F)]	Ω	Approximately 1.0
Secondary resistance [at 20°C (68°F)]	kΩ	Approximately 10

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage at idle	V	1.0 - 1.7*
Mass air flow	g·m/sec	3.2 - 6.7 at idle* 8.7 - 21.9 at 2,500 rpm*

*: Engine is warmed up sufficiently and running under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

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

EGR TEMPERATURE SENSOR

Resistance [at 100°C (212°F)]	kΩ	76.8 - 93.8

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3

FUEL PUMP

Resistance [at 25°C (77°F)]	Ω	0.2 - 5.0

IACV-AAC VALVE

Resistance [at 25°C (77°F)]	Ω	Approximately 10.0

INJECTOR

Resistance [at 25°C (77°F)]	Ω	10 - 14

RESISTOR

Resistance [at 25°C (77°F)]	kΩ	Approximately 2.2

THROTTLE POSITION SENSOR

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

CALCULATED LOAD VALUE

	Calculated load value %
At idle	18.2 - 38.0
At 2,500 rpm	14.8 - 33.5

INTAKE AIR TEMPERATURE SENSOR

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

REAR HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3

CRANKSHAFT POSITION SENSOR (OBD)

Resistance [at 25°C (77°F)]	Ω	432 - 528