SECTION EC

CONTENTS

CONTENTS (Cont'd)

CONTENTS (Cont'd)

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

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

Alphabetical & P No. Index for DTC

ALPHABETICAL INDEX FOR DTC

Items (CONSULT screen terms)	DTC*3		Reference page
	MIL*1	CONSULT GST*2	
UNABLE TO ACCESS ECCS	—	—	EC-76
ABS-TCS C/U SIGNAL	0107	—	EC-306
ECM-ABSTCS COMM NG	0404	—	EC-307
*COOLANT TEMP SEN	0908	P0125	EC-121
A/T 1ST SIGNAL	1103	P0731	AT-70
A/T 2ND SIGNAL	1104	P0732	AT-73
A/T 3RD SIGNAL	1105	P0733	AT-75
A/T 4TH SIG OR TCC	1106	P0734	AT-77
A/T COMM LINE	0504	P0600	EC-228
A/T DIAG COMM LINE	0804	P1605	EC-228
CAM POS SEN	0101	P0340	EC-197
CLOSED LOOP-B1	0307	P0130	EC-131
CLOSED LOOP-B2	0308	P0150	EC-131
COOLANT TEMP SEN*4	0103	P0115	EC-110
COOLING FAN	1308	P1900	EC-293
CRANK P/S (OBD) COG	0905	P1336	EC-278
CRANK POS SEN (OBD)	0802	P0335	EC-192
CYL 1 MISFIRE	0608	P0301	EC-185
CYL 2 MISFIRE	0607	P0302	EC-185
CYL 3 MISFIRE	0606	P0303	EC-185
CYL 4 MISFIRE	0605	P0304	EC-185
CYL 5 MISFIRE	0604	P0305	EC-185
CYL 6 MISFIRE	0603	P0306	EC-185
CYL 7 MISFIRE	0602	P0307	EC-185
CYL 8 MISFIRE	0601	P0308	EC-185
ECM	0301	P0605	EC-231
EGR SYSTEM	0302	P0400	EC-203
EGR TEMP SENSOR	0305	P1401	EC-288
EGRC SOLENOID/V	1005	P1400	EC-283
EGRC-BPT VALVE	0306	P0402	EC-213
ENGINE SPEED SIG*5	1207	P0725	AT-68
FLUID TEMP SENSOR	1208	P0710	AT-63
FPCM	1305	P1220	EC-264
FR O2 SEN HTR-B1	0901	P0135	EC-132
FR O2 SEN HTR-B2	1001	P0155	EC-150
FRONT O2 SENSOR-B1	0303	P0130	EC-126
FRONT O2 SENSOR-B2	0503	P0150	EC-145

NOTE: B1 indicates Left bank and B2 indicates Right bank.

Items (CONSULT screen terms)	DTC*3		Reference page
	MIL*1	CONSULT GST*2	
FUEL SYS LEAN/BK1	0115	P0171	EC-163
FUEL SYS LEAN/BK2	0210	P0174	EC-174
FUEL SYS RICH/BK1	0114	P0172	EC-169
FUEL SYS RICH/BK2	0209	P0175	EC-180
IACV-AAC VALVE	0205	P0505	EC-222
IGN SIGNAL-PRIMARY	0201	P1320	EC-270
INHIBITOR SWITCH	1101	P0705	AT-57
INT AIR TEMP SEN	0401	P0110	EC-105
INT/V TIM CONT-B1	0805	P1110	EC-238
INT/V TIM CONT-B2	1301	P1135	EC-245
INT/V TIM PS-B1	1303	P1140	EC-251
INT/V TIM PS-B2	1304	P1145	EC-256
KNOCK SENSOR-B1	0304	P0325	EC-189
KNOCK SENSOR-B2	0212	P0330	EC-189
LINE PRESSURE S/V	1205	P0745	AT-90
MASS AIR FLOW SEN*4	0102	P0100	EC-99
OVERHEAT	0208	P1900*6	EC-293
OVERRUN CLUTCH S/V	1203	P1760	AT-101
PARK/NEUT POSI SW	1003	P0705	EC-233
MULTI CYL MISFIRE	0701	P0300	EC-185
NO SELF-DIAGNOSTIC FAILURE INDICATED	FLASHING	NO DTC	EC-47
RR O2 SENSOR-B1	0707	P0136	EC-136
RR O2 SENSOR-B2	0708	P0156	EC-154
RR O2 SEN HTR-B1	0902	P0141	EC-140
RR O2 SEN HTR-B2	1002	P0161	EC-158
TCS THRTL POS SEN	0406	P1120	EC-316
SHIFT SOLENOID/V A*4	1108	P0750	AT-93
SHIFT SOLENOID/V B*4	1201	P0755	AT-96
TANDEM T/P SEN	1502	P1125	EC-244
TCS SIGNAL	0106	P1210	EC-261
THROTTLE POSI SEN*4	0403	P0120	EC-115
THRTL POSI SEN A/T*4	1206	P1705	AT-95
TOR CONV CLUTCH SV	1204	P0740	AT-82
TW CATALYST SYS-B1	0702	P0420	EC-215
TW CATALYST SYS-B2	0703	P0430	EC-215
VEHICLE SPEED SEN	0104	P0500	EC-218
VHCL SPEED SEN A/T*5	1102	P0720	AT-66

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
*2: These numbers are prescribed by SAE J2012.
*3: DTC No. is the same as that of 1st trip DTC.
*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.
*6: Since this diagnosis does not meet P1900 of SAE2012, it is indicated only by CONSULT.

P NO. INDEX FOR DTC

DTC*3		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	MIL*1		
—	—	UNABLE TO ACCESS ECCS	EC-76
—	0107	ABS-TCS C/U SIGNAL	EC-306
—	0404	ECM-ABSTCS COMM NG	EC-307
P0000	**0505**	**NO SELF-DIAGNOSTIC FAILURE INDICATED**	—
NO DTC	Flashing	NO SELF-DIAGNOSTIC FAILURE INDICATED	EC-47
P0100	0102	MASS AIR FLOW SEN*4	EC-99
P0110	0401	INT AIR TEMP SEN	EC-105
P0115	0103	COOLANT TEMP SEN*4	EC-110
P0120	0403	THROTTLE POSI SEN*4	EC-115
P0125	0908	*COOLANT TEMP SEN	EC-121
P0130	0307	CLOSED LOOP-B1	EC-131
P0130	0303	FRONT O2 SENSOR-B1	EC-126
P0135	0901	FR O2 SEN HTR-B1	EC-132
P0136	0707	RR O2 SENSOR-B1	EC-136
P0141	0902	RR O2 SEN HTR-B1	EC-140
P0150	0308	CLOSED LOOP-B2	EC-131
P0150	0503	FRONT O2 SENSOR-B2	EC-145
P0155	1001	FR O2 SEN HTR-B2	EC-150
P0156	0708	RR O2 SENSOR-B2	EC-154
P0161	1002	RR O2 SEN HTR-B2	EC-158
P0171	0115	FUEL SYS LEAN/BK1	EC-163
P0172	0114	FUEL SYS RICH/BK1	EC-169
P0174	0210	FUEL SYS LEAN/BK2	EC-174
P0175	0209	FUEL SYS RICH/BK2	EC-180
P0300	0701	MULTI CYL MISFIRE	EC-185
P0301	0608	CYL 1 MISFIRE	EC-185
P0302	0607	CYL 2 MISFIRE	EC-185
P0303	0606	CYL 3 MISFIRE	EC-185
P0304	0605	CYL 4 MISFIRE	EC-185
P0305	0604	CYL 5 MISFIRE	EC-185
P0306	0603	CYL 6 MISFIRE	EC-185
P0307	0602	CYL 7 MISFIRE	EC-185
P0308	0601	CYL 8 MISFIRE	EC-185
P0325	0304	KNOCK SENSOR-B1	EC-189
P0330	0212	KNOCK SENSOR-B2	EC-189
P0335	0802	CRANK POS SEN (OBD)	EC-192
P0340	0101	CAM POS SEN	EC-197
P0400	0302	EGR SYSTEM	EC-203
P0402	0306	EGRC-BPT VALVE	EC-213
P0420	0702	TW CATALYST SYS-B1	EC-215
P0430	0703	TW CATALYST SYS-B2	EC-215

NOTE: B1 indicates Left bank and B2 indicates Right bank.

DTC*3		Items (CONSULT screen terms)	Reference page
CONSULT GST*2	MIL*1		
P0500	0104	VEHICLE SPEED SEN	EC-218
P0505	0205	IACV-AAC VALVE	EC-222
P0600	0504	A/T COMM LINE	EC-228
P0605	0301	ECM	EC-231
P0705	1003	PARK/NEUT POSI SW	EC-233
P0705	1101	INHIBITOR SWITCH	AT-57
P0710	1208	FLUID TEMP SENSOR	AT-63
P0720	1102	VHCL SPEED SEN A/T*5	AT-66
P0725	1207	ENGINE SPEED SIG*5	AT-68
P0731	1103	A/T 1ST SIGNAL	AT-70
P0732	1104	A/T 2ND SIGNAL	AT-73
P0733	1105	A/T 3RD SIGNAL	AT-75
P0734	1106	A/T 4TH SIG OR TCC	AT-77
P0740	1204	TOR CONV CLUTCH SV	AT-82
P0745	1205	LINE PRESSURE S/V	AT-90
P0750	1108	SHIFT SOLENOID/V A*4	AT-93
P0755	1201	SHIFT SOLENOID/V B*4	AT-96
P1110	0805	INT/V TIM CONT-B1	EC-238
P1125	1502	TANDEM T/P SEN	EC-244
P1135	1301	INT/V TIM CONT-B2	EC-245
P1140	1303	INT/V TIM PS-B1	EC-251
P1145	1304	INT/V TIM PS-B2	EC-256
P1220	1305	FPCM	EC-264
P1320	0201	IGN SIGNAL-PRIMARY	EC-270
P1336	0905	CRANK P/S (POS) COG	EC-278
P1400	1005	EGRC SOLENOID/V	EC-283
P1401	0305	EGR TEMP SENSOR	EC-288
P1605	0804	A/T DIAG COMM LINE	EC-228
P1705	1206	THRTL POSI SEN A/T*4	AT-95
P1760	1203	OVERRUN CLUTCH S/V	AT-101
P1900	1308	COOLING FAN	EC-293
P1900*6	0208	OVERHEAT	EC-293

*1: In Diagnostic Test Mode II (Self-diagnostic results). These numbers are controlled by NISSAN.
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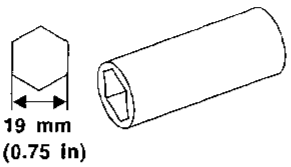
*4: When the fail-safe operation occurs, the MIL illuminates.
*5: The MIL illuminates after A/T control unit enters the fail-safe mode in two consecutive trips, if both the "Revolution sensor" and the "Engine speed signal" meet the fail-safe condition at the same time.
*6: Since this diagnosis does not meet P1900 of SAE2012, it is indicated only by CONSULT.

Commercial 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	 NT656 Removing and installing engine coolant temperature sensor

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

The Supplemental Restraint System "Air Bag" and "Seat Belt Pre-tensioner", used along with a seat belt, help 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 on the instrument panel on the passenger side), seat belt pre-tensioners, 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 INFINITI 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 the repair or inspection work. The open/short circuit of the related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after the work. The loose (unlocked) connector will cause the MIL to light up due to the open circuit. (Be sure to connect the connector without water, grease, dirt, bent terminals, etc. in it.)**
- **Be sure to route and clamp 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 the work. The misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EGR system or the fuel injection system, etc.**
- **Be sure to erase the unnecessary (already fixed) malfunction information in the ECM or A/T control unit before returning the vehicle to the customer.**

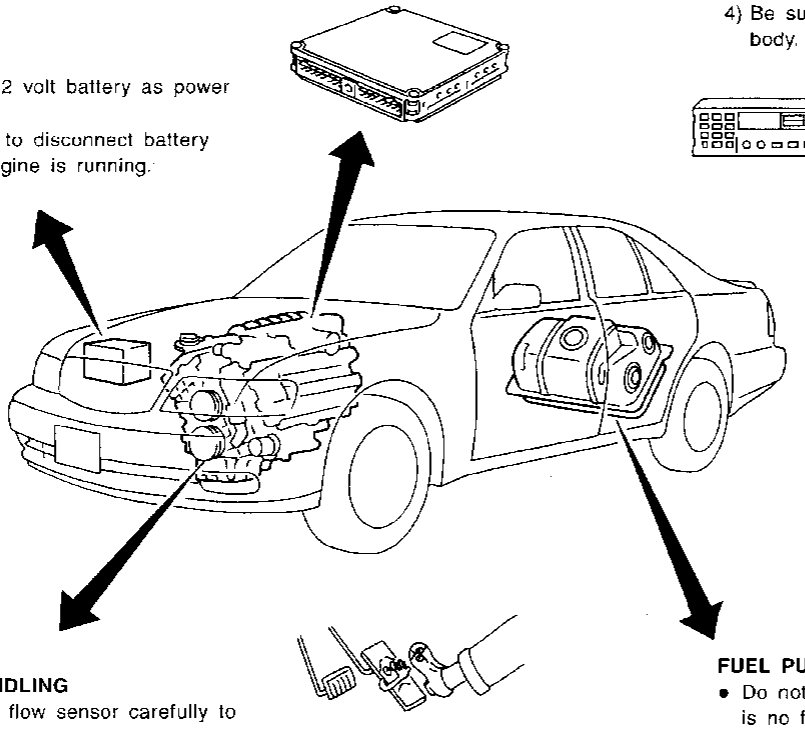
Engine Fuel & Emission Control System

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

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

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

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



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

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.

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

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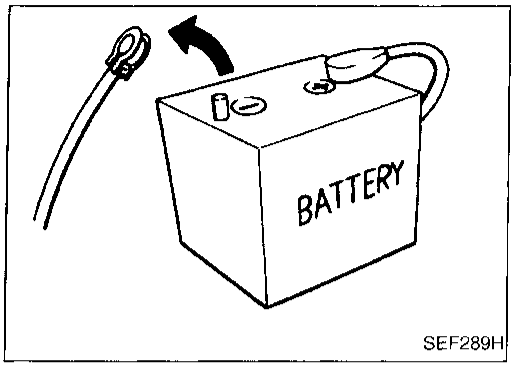
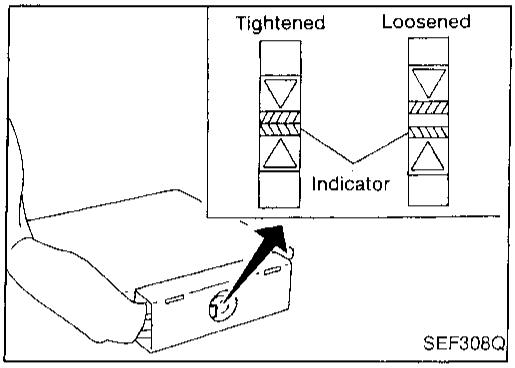
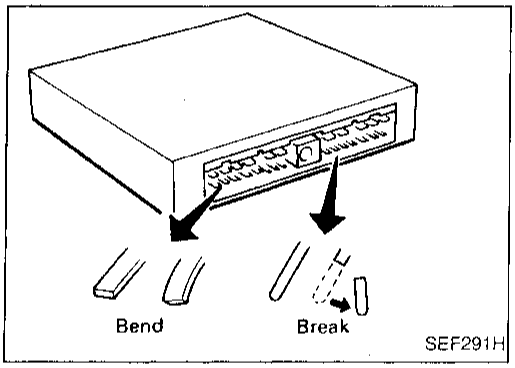


Precautions

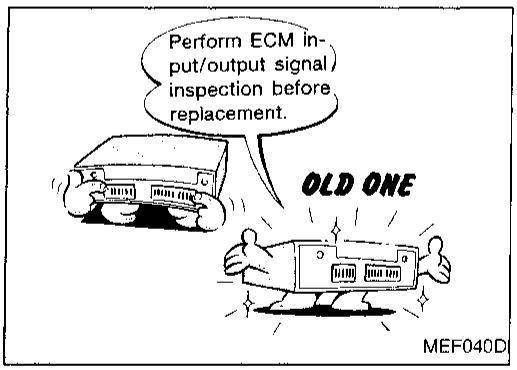
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery terminal. Failure to do so may damage the ECM. Because battery voltage is applied to ECM even if ignition switch is turned off.



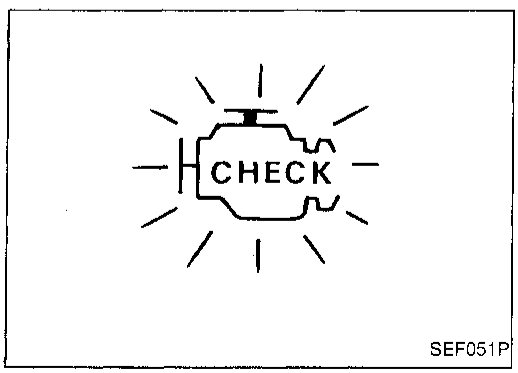
- When connecting ECM harness connector, tighten securing bolt until the gap between the orange indicators disappears.
  : 3.0 - 5.0 N·m (0.3 - 0.5 kg-m, 26 - 43 in-lb)



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

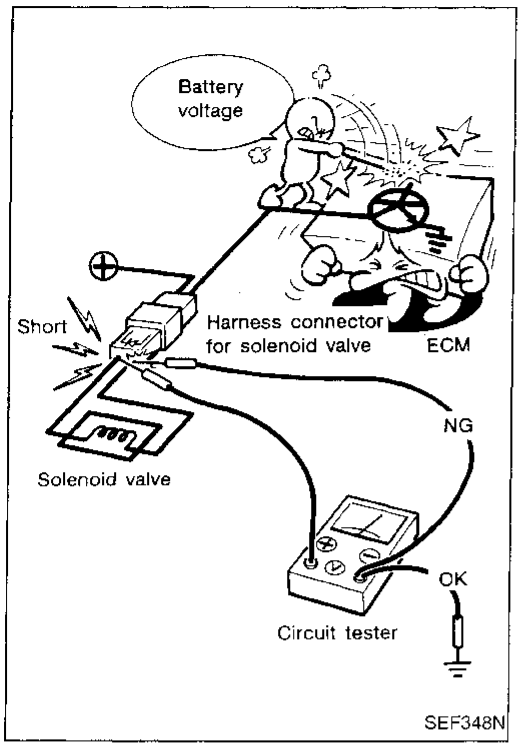


- Before replacing ECM, perform ECM input/output signal inspection and make sure whether ECM functions properly or not. (See page EC-84.)



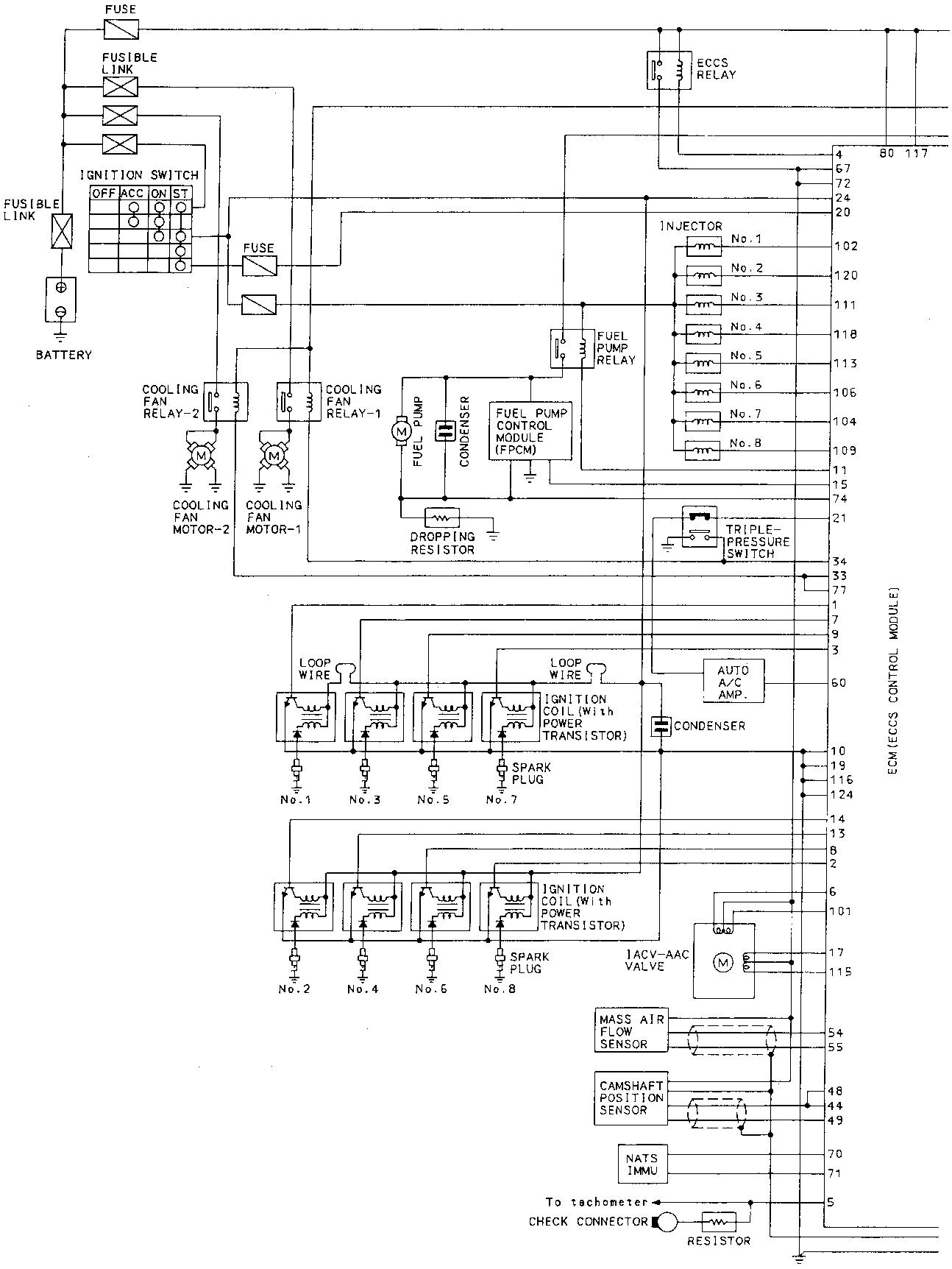
- After performing each TROUBLE DIAGNOSIS, perform "OVERALL FUNCTION CHECK" or "DTC (Diagnostic Trouble Code) CONFIRMATION PROCEDURE".
  The DTC should not be displayed in the "DTC CONFIRMATION PROCEDURE" if the repair is completed. The "OVERALL FUNCTION CHECK" should be a good result if the repair is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

Precautions (Cont'd)



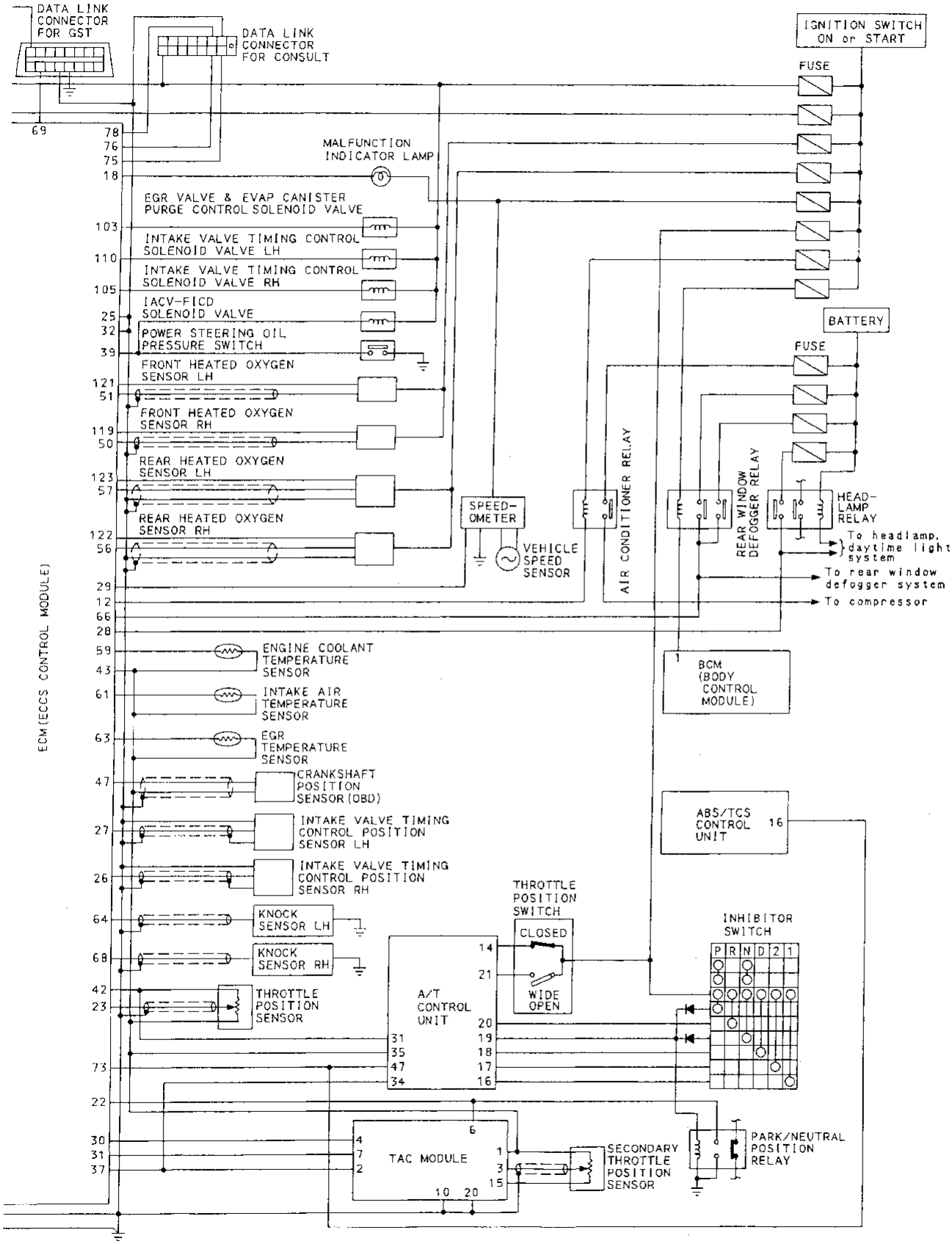
- **When measuring ECM signals with a circuit tester, never bring the two tester probes into contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

Circuit Diagram



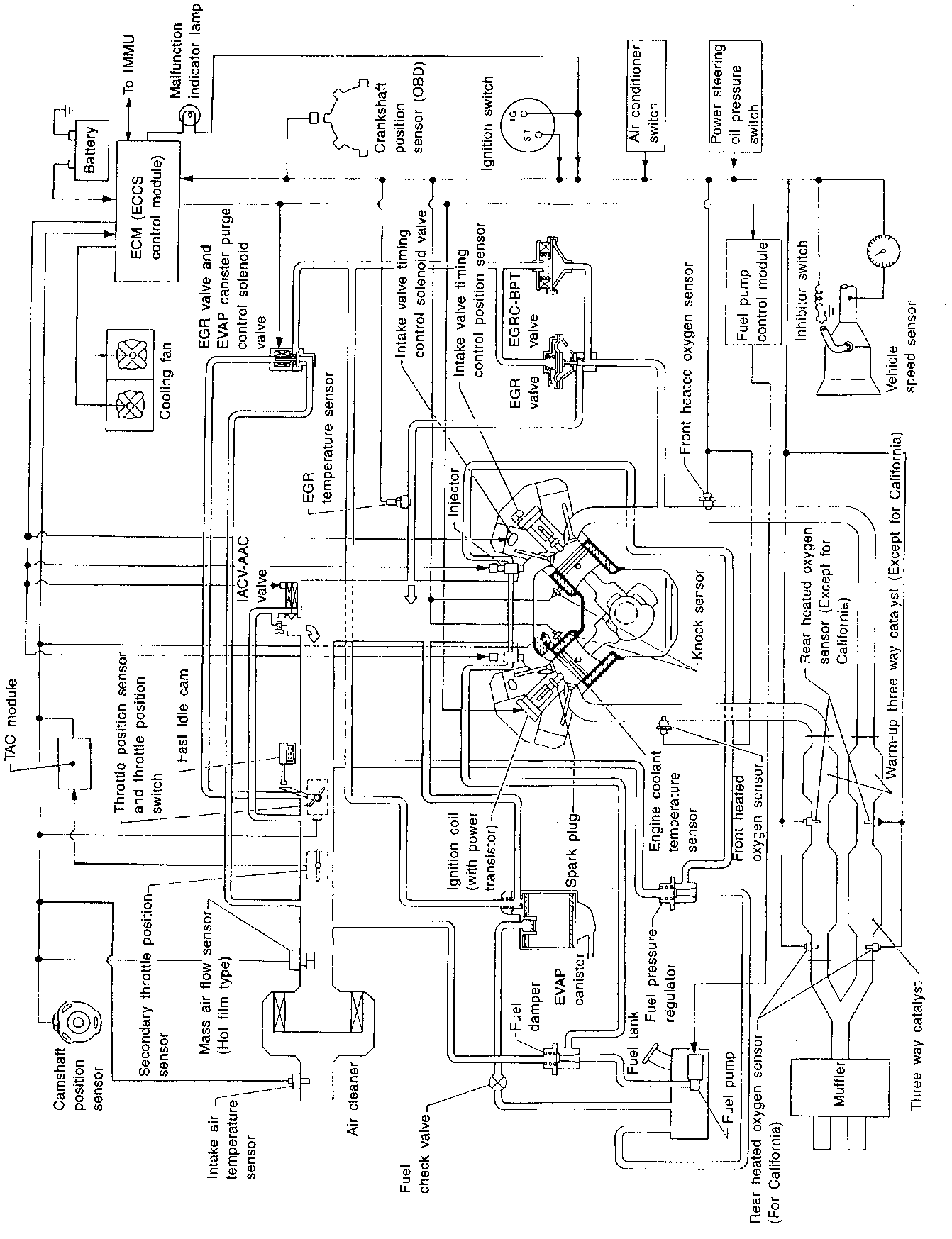
TEC184

Circuit Diagram (Cont'd)



TEC185

System Diagram



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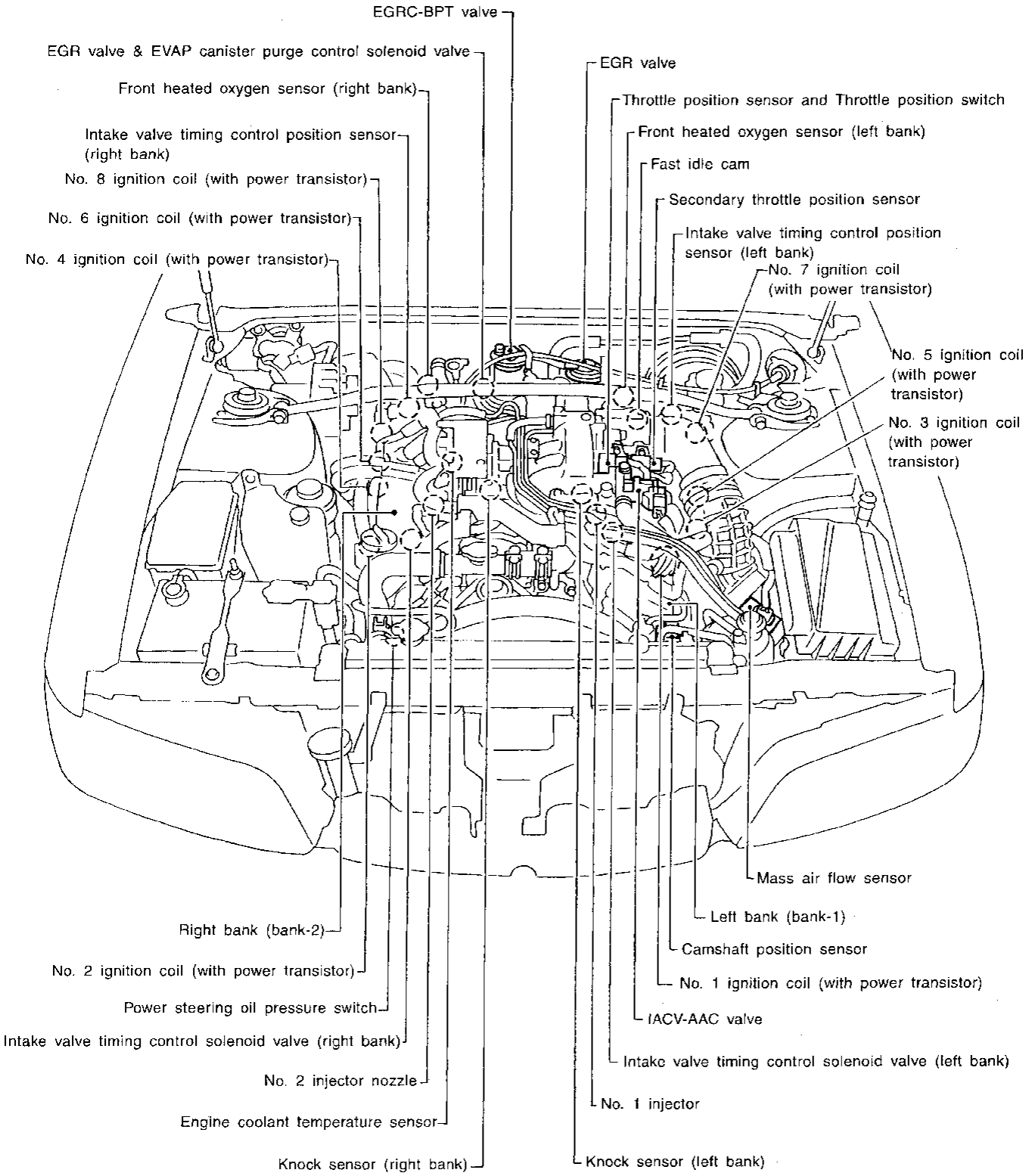
ECCS Component Parts Location



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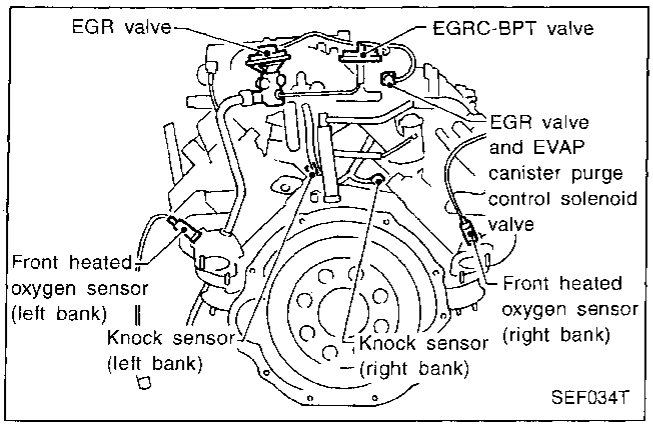
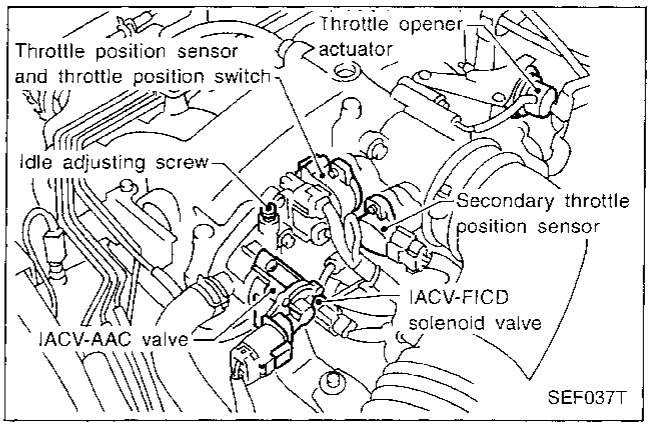
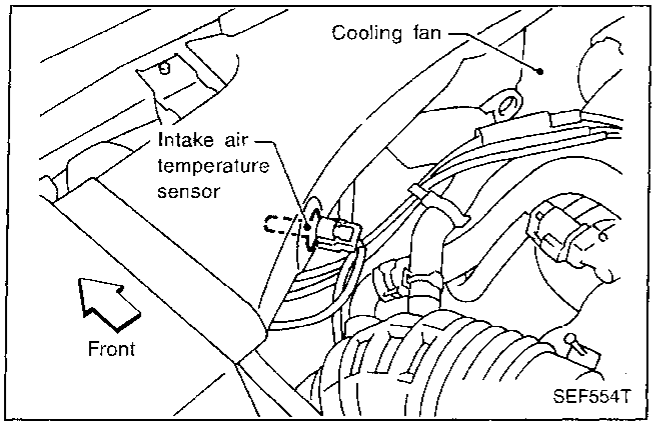
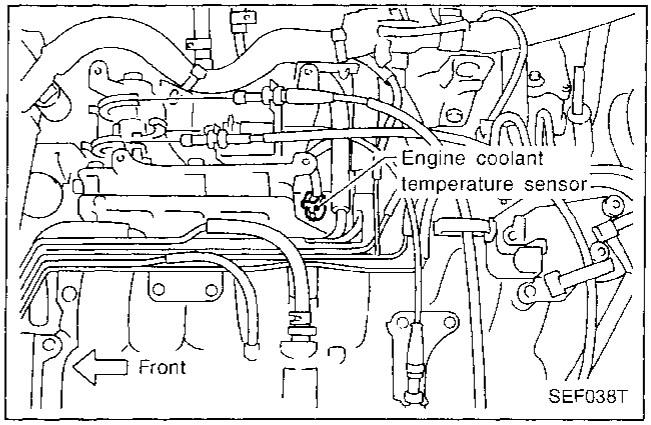
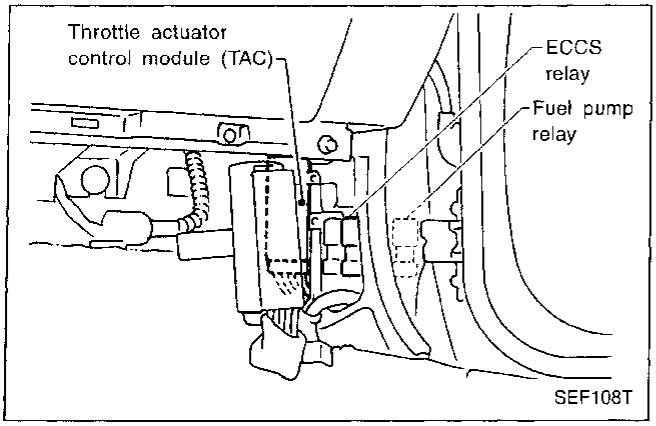
ECCS Component Parts Location (Cont'd)

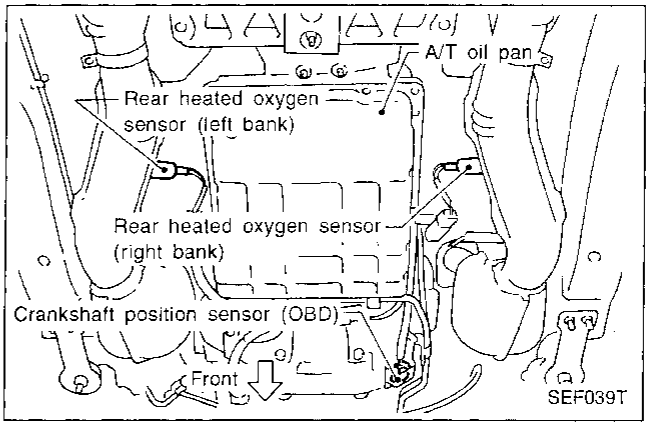


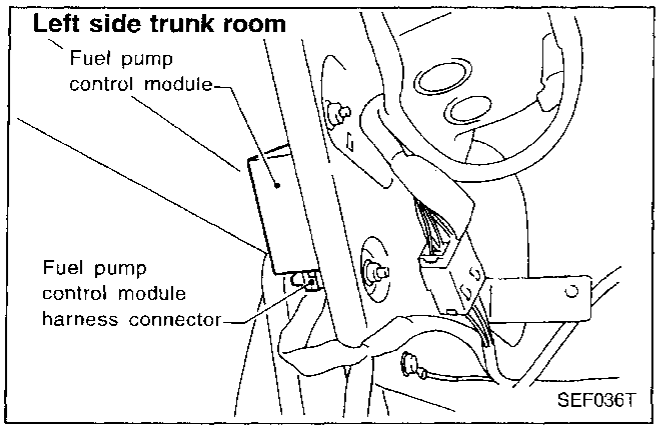


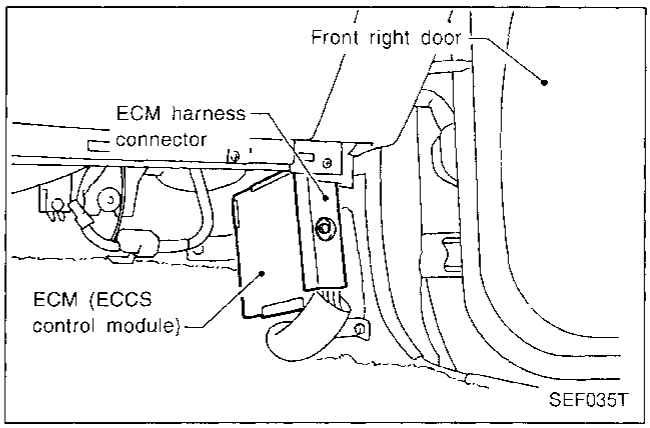




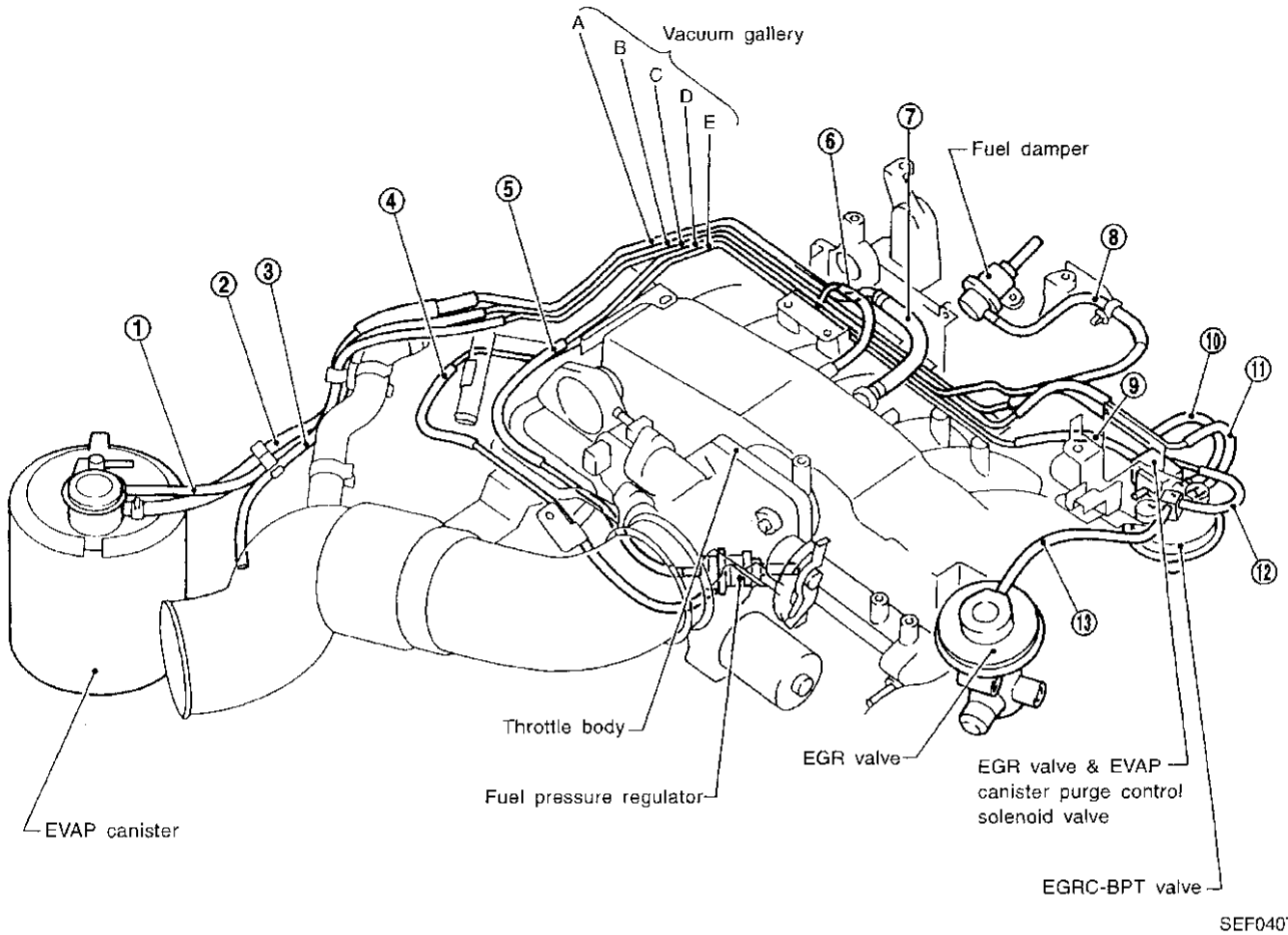








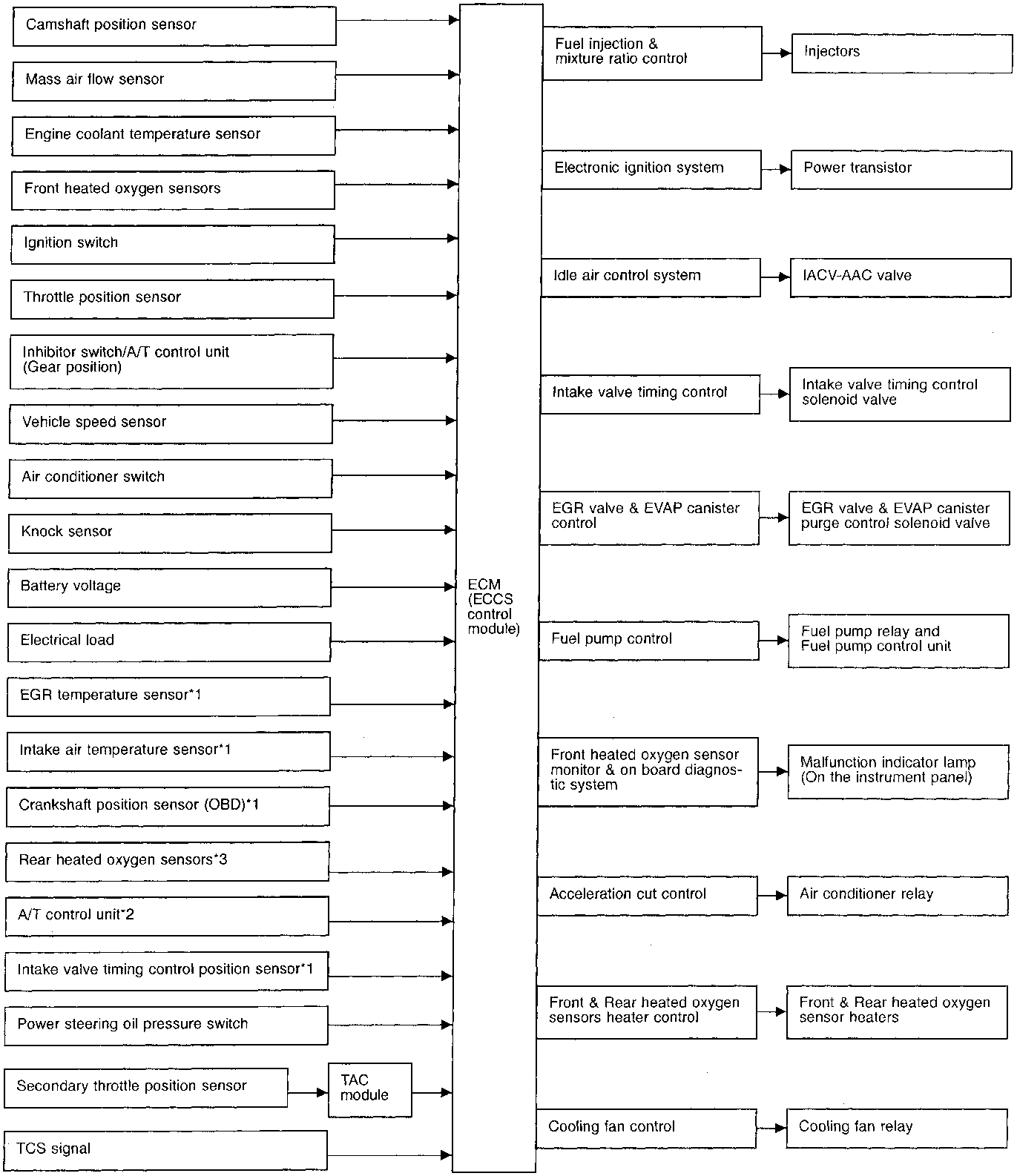
Vacuum Hose Drawing



① EVAP canister to vacuum gallery B
② EVAP canister to vacuum gallery A
③ Intake air duct to vacuum gallery C
④ Vacuum gallery E to throttle body
⑤ Fuel pressure regulator to vacuum gallery D
⑥ Intake manifold collector to vacuum gallery D
⑦ Intake manifold collector to vacuum gallery A
⑧ Fuel damper to vacuum gallery D
⑨ EGR valve and EVAP canister purge control solenoid valve to vacuum gallery E
⑩ EGR valve and EVAP canister purge control solenoid valve to T-type vacuum pipe
⑪ EGR valve and EVAP canister purge control solenoid valve to vacuum gallery C via pipe and hose
⑫ EGR valve and EVAP canister purge control solenoid valve to T-type vacuum pipe
⑬ EGRC-BPT valve to EGR valve

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

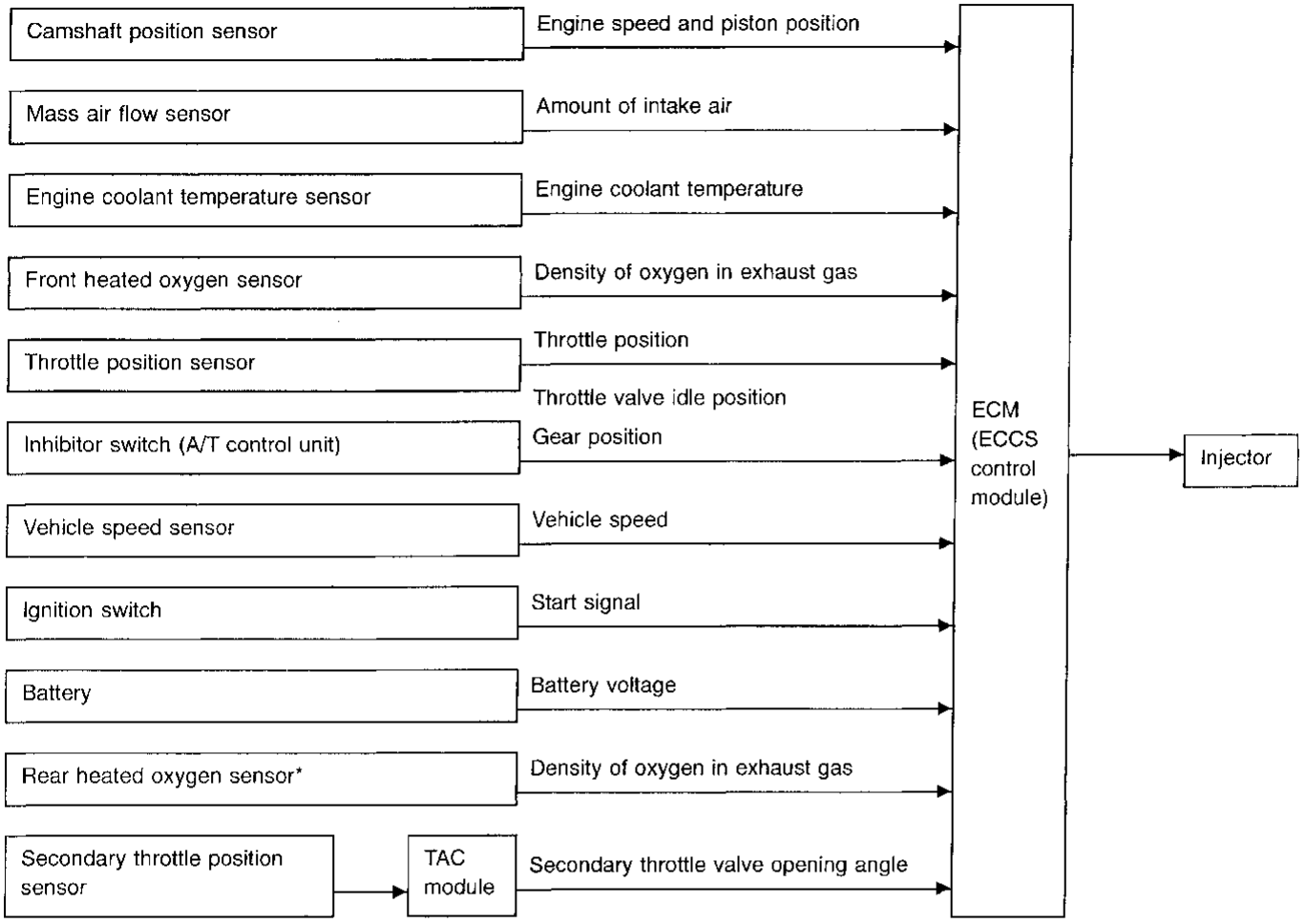
System Chart



*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 and gear position will be sent to ECM.
*3: This sensor is not used to control the engine system under normal conditions.

Multiport Fuel Injection (MFI) System

INPUT/OUTPUT SIGNAL LINE



*: This sensor is not used to control the engine system under normal conditions.

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.

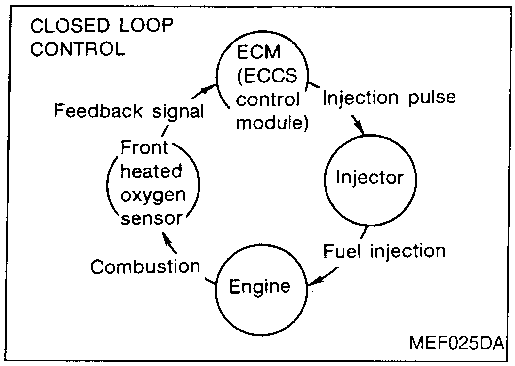
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

The amount of fuel injected is compensated for to improve engine performance. This will be made under various operating conditions as listed below.

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

⟨Fuel decrease⟩
- During deceleration
- During high speed operation
- Extremely high engine coolant temperature
- During TCS operation

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



MIXTURE RATIO FEEDBACK CONTROL

The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst can then better reduce CO, HC and NOx emissions. This system uses a front heated oxygen sensor in the exhaust manifold to monitor if the engine is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about front heated oxygen sensor, refer to pages EC-145, 126. 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
- High-engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

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

Two types of systems are used.

Sequential multiport fuel injection system

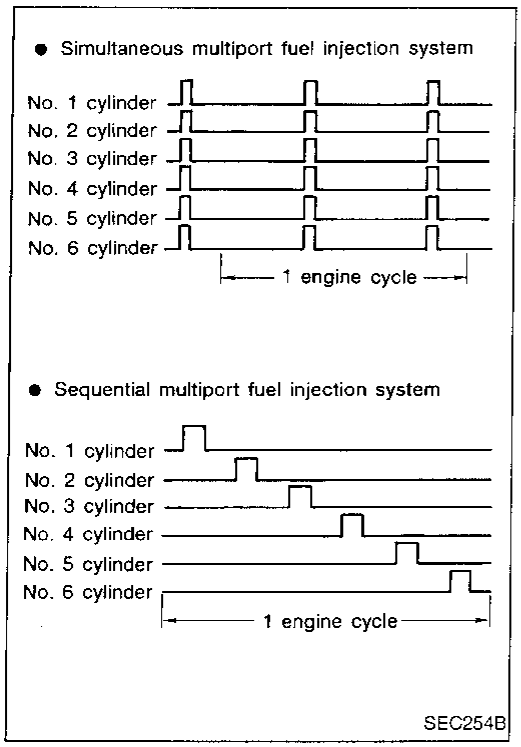
Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.

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 mode (CPU) or crankshaft position sensor (REF) is operating.

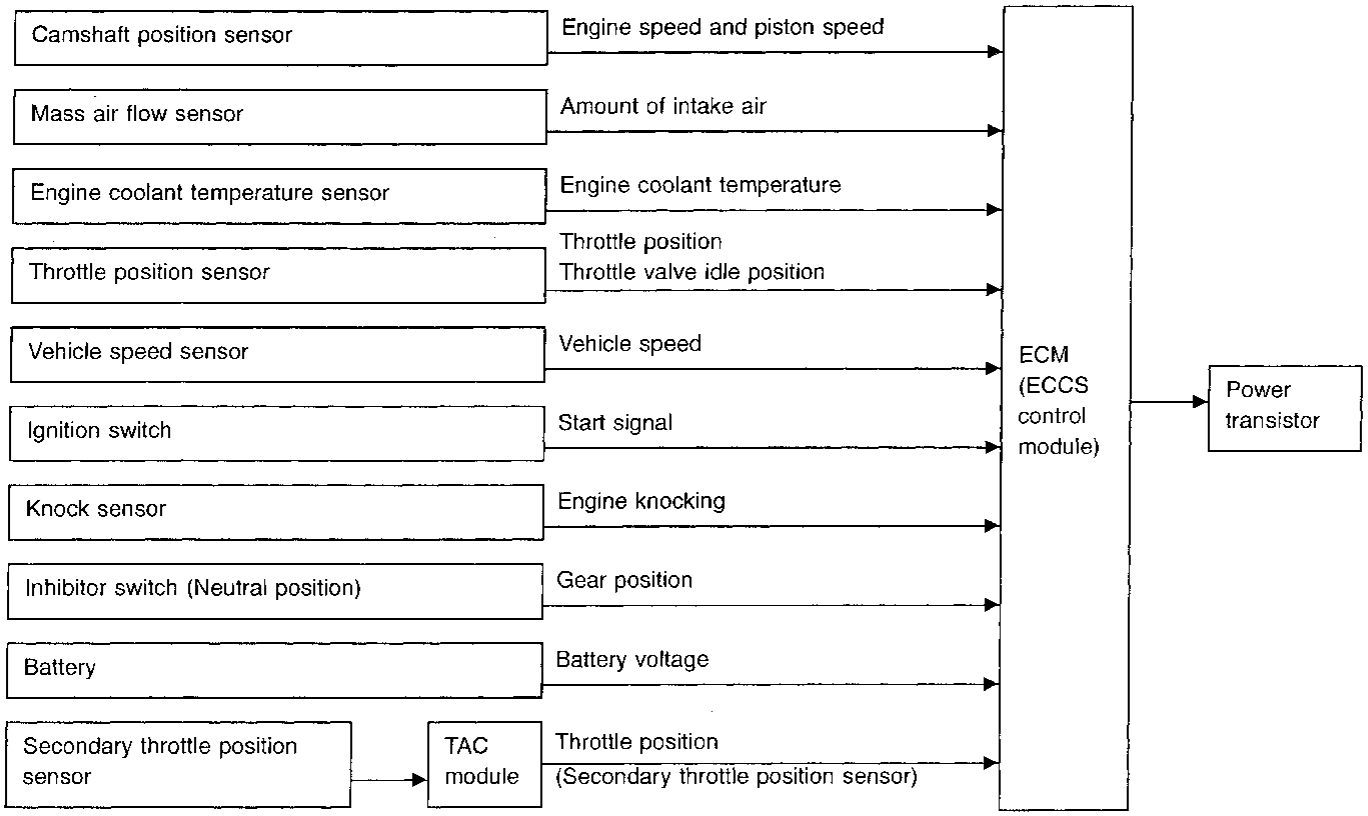


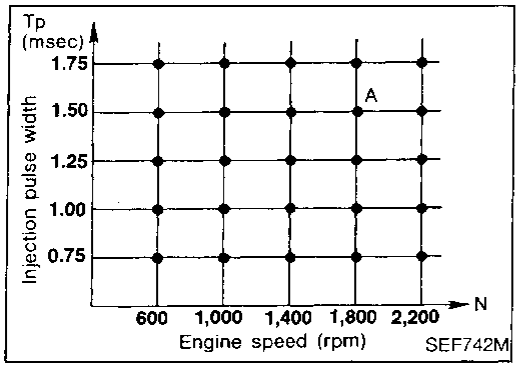
FUEL SHUT-OFF

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

Electronic Ignition (EI) System

INPUT/OUTPUT SIGNAL LINE





SYSTEM DESCRIPTION

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

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

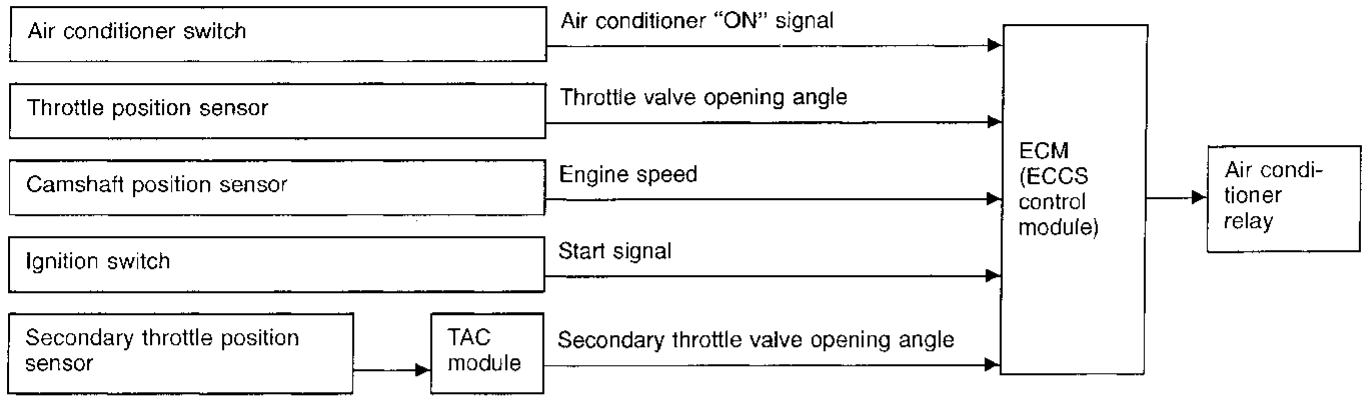
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

1 At starting
2 During warm-up
3 At idle
4 Hot engine operation
5 At acceleration

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

Air Conditioning Cut Control

INPUT/OUTPUT SIGNAL LINE



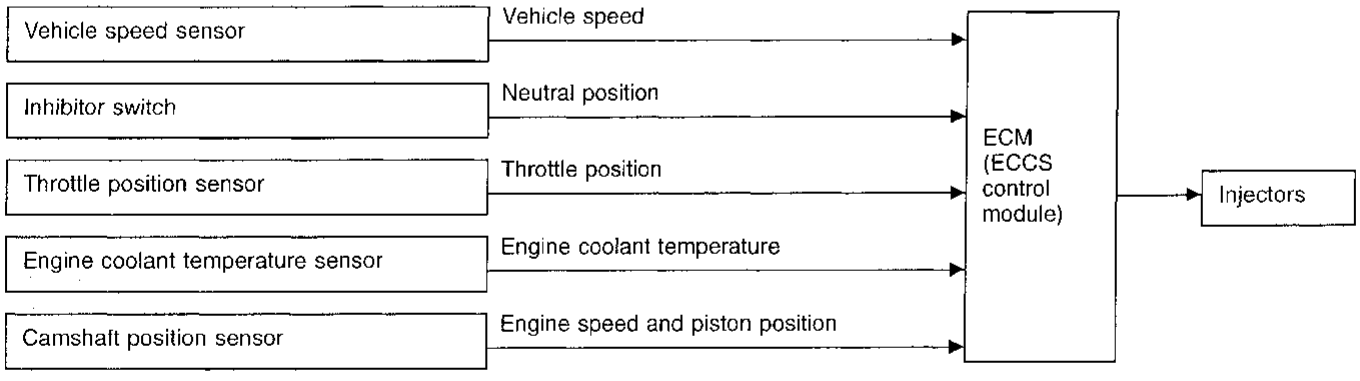
SYSTEM DESCRIPTION

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

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- After a few seconds when the TCS has started operating.

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

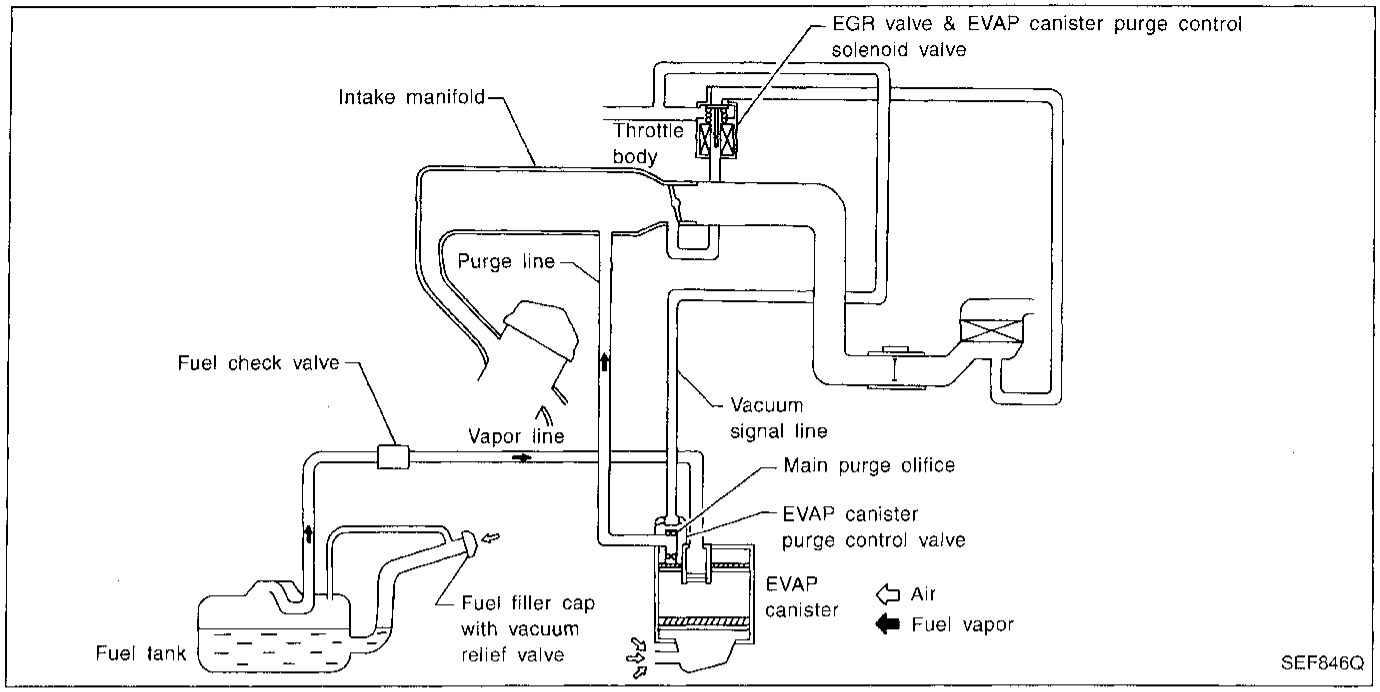
INPUT/OUTPUT SIGNAL LINE



If the engine speed is above 1,400 rpm with no load (for example, in neutral and engine speed over 1,400 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 than deceleration control listed under multiport fuel injection on EC-15.

Description



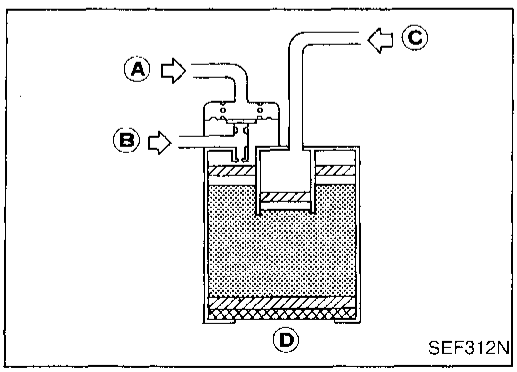
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor from 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 EVAP canister 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 EVAP canister purge control valve opens. The vapor is sucked through both main purge and constant purge orifices.



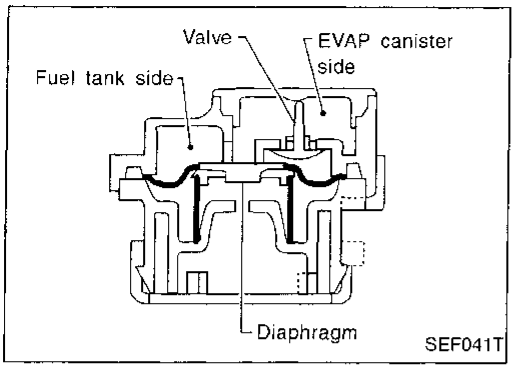
Inspection

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 air flows freely out of port Ⓑ.

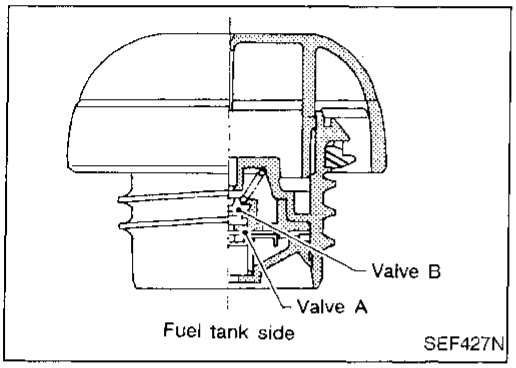
Inspection (Cont'd)



FUEL CHECK VALVE

Check valve operation

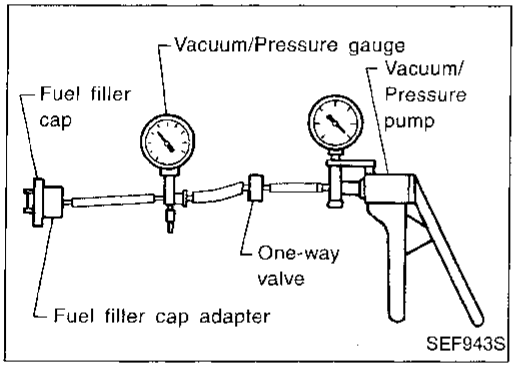
1. Blow air through connector on fuel tank side.
   A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.
2. Blow air through connector on EVAP canister side.
   Air flow should be smoothly directed toward fuel tank side.
3. If fuel check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



FUEL TANK VACUUM RELIEF VALVE

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.

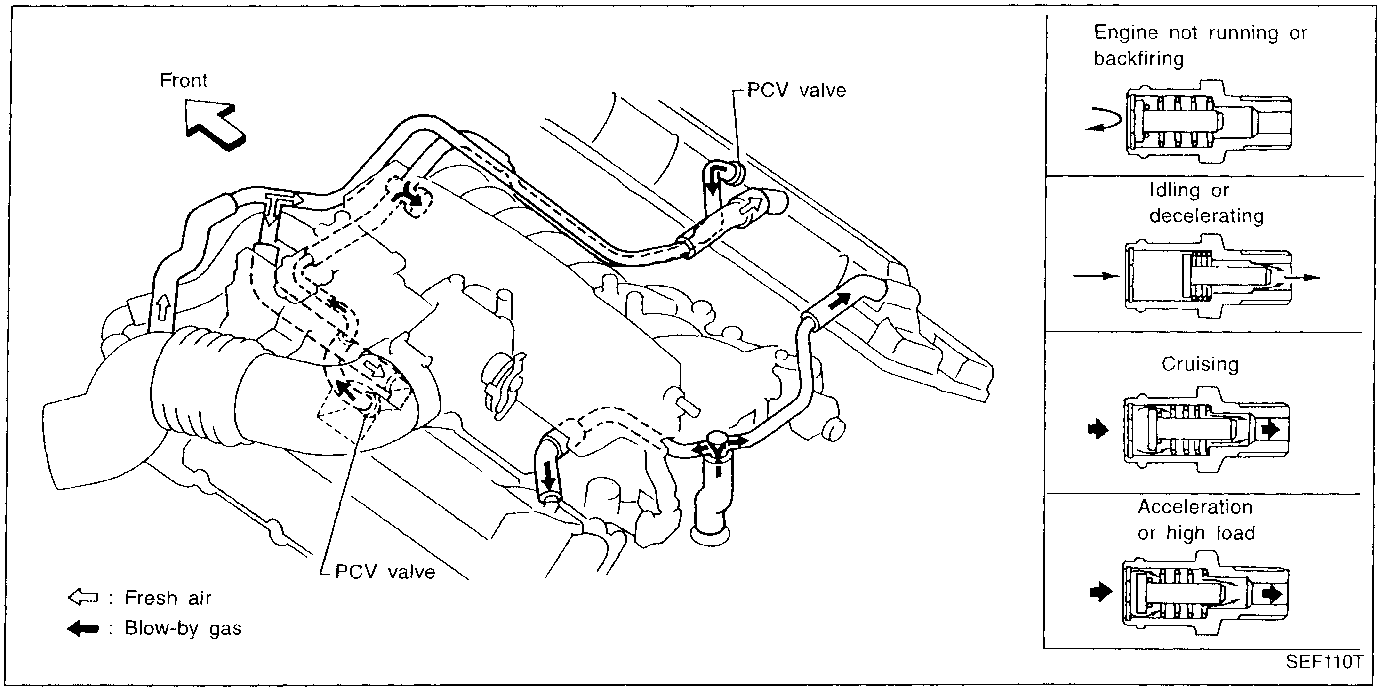


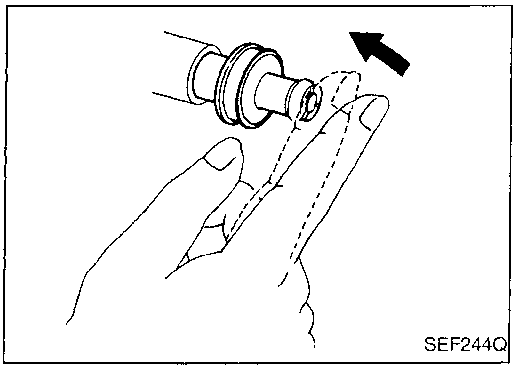
EGR VALVE & EVAP CANISTER PURGE CONTROL SOLENOID VALVE

Refer to EC-283.

Description

This system returns blow-by gas to both the intake manifold and air cleaner.
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 cleaner, through the hose connecting air cleaner to rocker cover, into the crankcase.
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve, and its flow goes through the hose connection in the reverse direction.
On vehicles with an excessively high blow-by some of the flow will go through the hose connection to the air cleaner under all conditions.

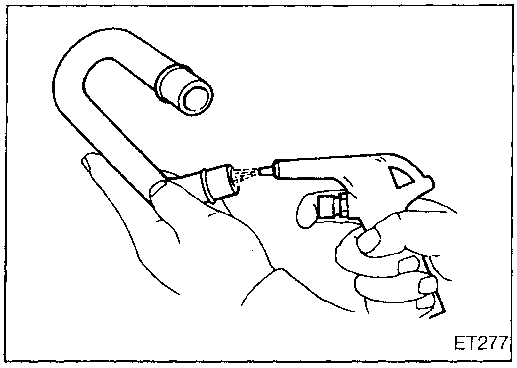




Inspection

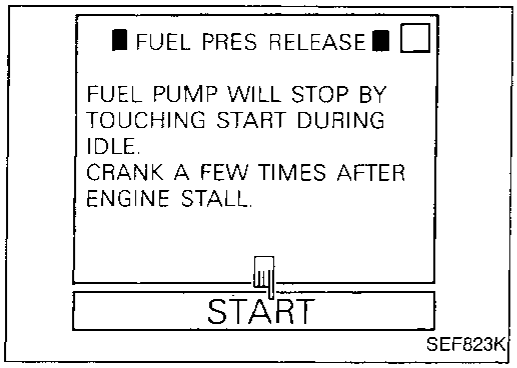
PCV (Positive Crankcase Ventilation) VALVE

With engine running at idle, remove ventilation hose from PCV valve; if 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

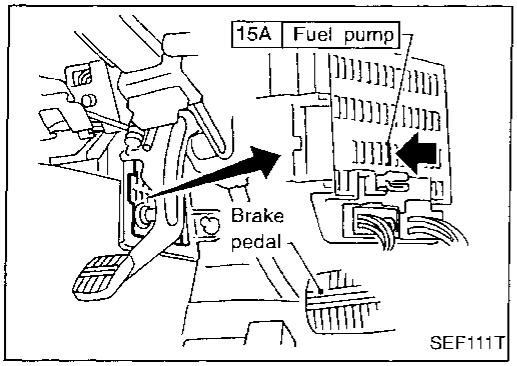
1. Check hoses and hose connections for leaks.
2. Disconnect all hoses and clean with compressed air. If any hose cannot be freed of obstructions, replace.



Fuel Pressure Release

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

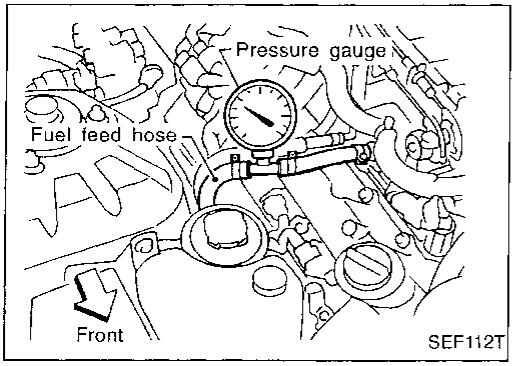
1. Start engine.
2. Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT.
   (Touch "START" and after engine stalls, crank it two or three times to release all fuel pressure.)
3. Turn ignition switch off.



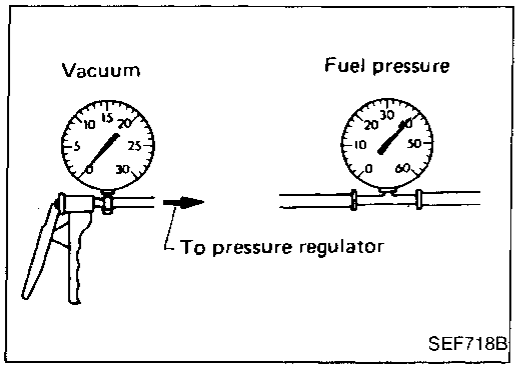
1. Remove fuse for fuel pump.
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch off and reconnect fuel pump fuse.

Fuel Pressure Check

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

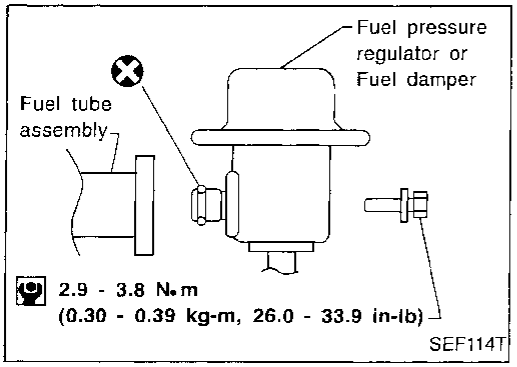


1. Release fuel pressure to zero, refer to previous page.
2. Disconnect fuel hose between fuel filter and fuel tube (engine side).
3. Install pressure gauge between fuel filter and fuel tube.
4. Start engine and check for fuel leakage.
5. Read the indication of fuel pressure gauge.
   At idling:
   Approximately 235 kPa (2.4 kg/cm^2, 34 psi)
   A few seconds after ignition switch is turned OFF to ON:
   Approximately 294 kPa (3.0 kg/cm^2, 43 psi)
6. Stop engine and disconnect fuel pressure regulator vacuum hose from intake manifold.
7. Plug intake manifold with a rubber cap.
8. Connect variable vacuum source to fuel pressure regulator.

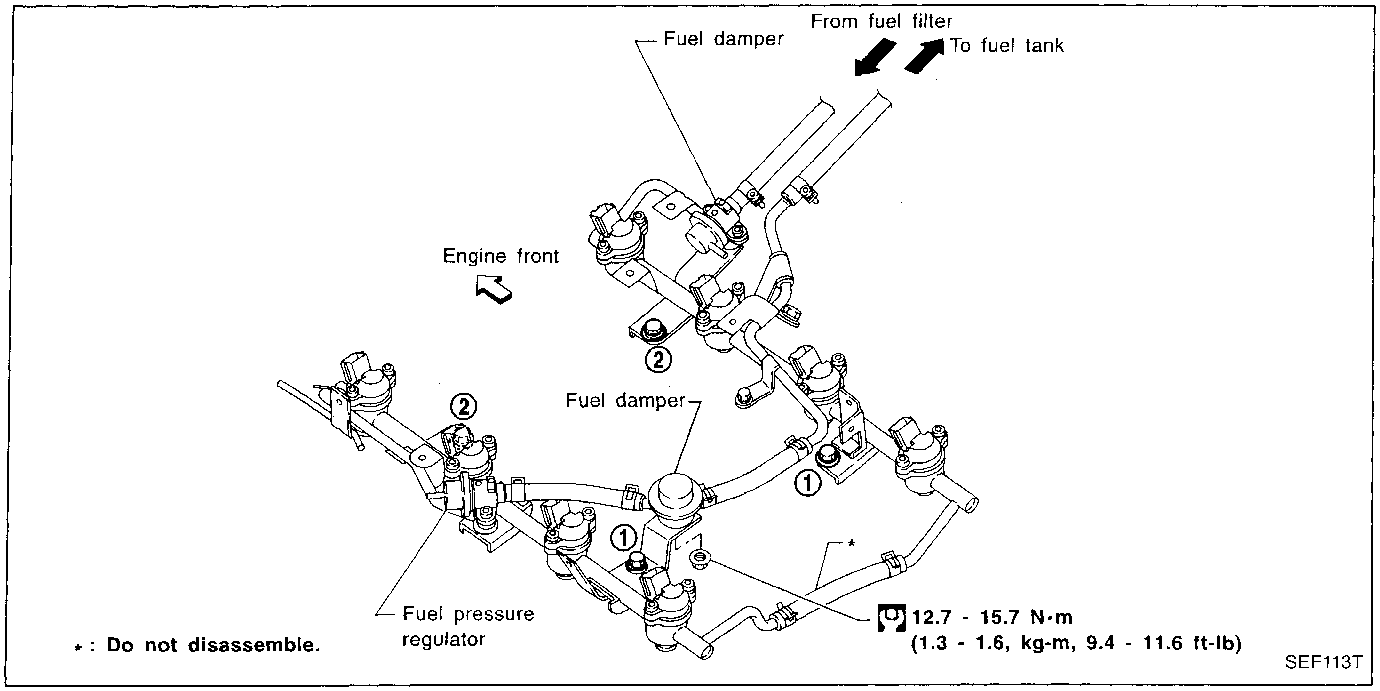


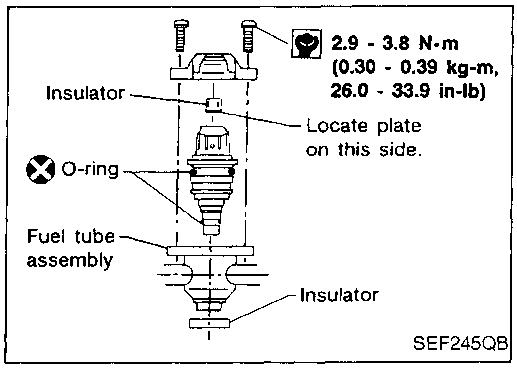
9. Start engine and read indication of fuel pressure gauge as vacuum is changed.

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



Injector Removal and Installation





1. Release fuel pressure to zero, refer to previous page.
2. Remove intake manifold collector. Refer to EM section ("TIMING CHAIN").
3. Disconnect vacuum hose from pressure regulator.
4. Disconnect fuel hoses from fuel tube assembly.
   - **Do not disassemble fuel tube assembly.**
5. Disconnect injector harness connectors.
6. Remove injectors with fuel tube assembly.
   - Push injector tail piece.
   - Do not pull on the connector.
7. Push out any malfunctioning injector from fuel tube assembly.
8. Replace or clean injector as necessary.
9. Install injector to fuel tube assembly.

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

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

Tighten in numerical order shown in the figure.

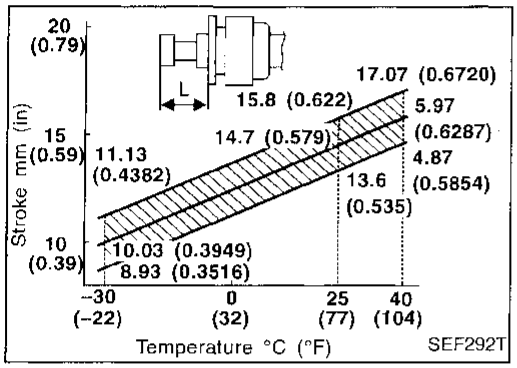
a) First, tighten all bolts to 9.3 to 10.8 N·m (0.95 to 1.1 kg-m, 6.9 to 8.0 ft-lb).
b) Then, tighten all bolts to 21 to 26 N·m (2.1 to 2.7 kg-m, 15 to 20 ft-lb).

11. Install fuel hoses to fuel tube assembly.
12. Reinstall any parts removed in reverse order of removal.

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

Fast Idle Cam (FIC) Inspection and Adjustment

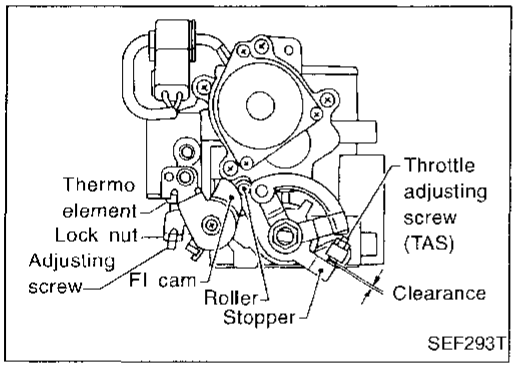
1. Remove throttle body from engine.
2. Wait for at least 3 hours.
   (This step is necessary to bring the temperature of the thermo-element to the room temperature



3. Measure thermo-element stroke (L) and room temperature.
4. Check thermo-element stroke (L) as shown in the figure.

CAUTION:
Do not adjust TAS.

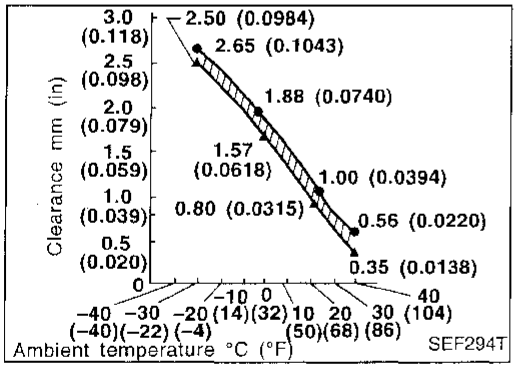
L: Thermo-element stroke	Judgement
Within oblique line	Thermo-element is normal → Adjust FI cam (go to step 5).
Out of oblique line	Replace thermo-element → Adjust FI cam (go to step 2).

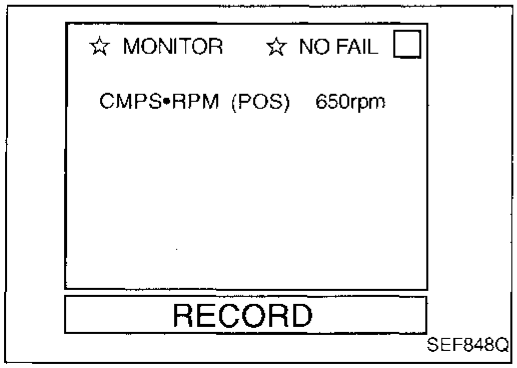


5. Measure clearance between stopper and throttle adjusting screw (TAS) as shown in the figure. If out of specification, adjust the clearance using adjusting screw.

CAUTION:
Do not adjust throttle adjusting screw (TAS).

6. After adjustment, tighten lock nut of adjusting screw.
   : 1.5 - 2.0 N·m (0.15 - 0.2 kg-m, 13.0 - 17.4 in-lb)
7. Reinstall throttle body.
8. After warming up engine, check that there is a clearance between FI cam and roller.





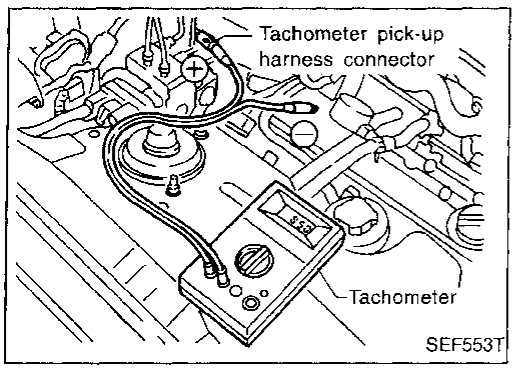
Direct Ignition System — How to Check Idle Speed and Ignition Timing

IDLE SPEED

- **Method A (Using CONSULT)**

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

Direct Ignition System — How to Check Idle Speed and Ignition Timing (Cont'd)



- **Method B (Using check connector)**

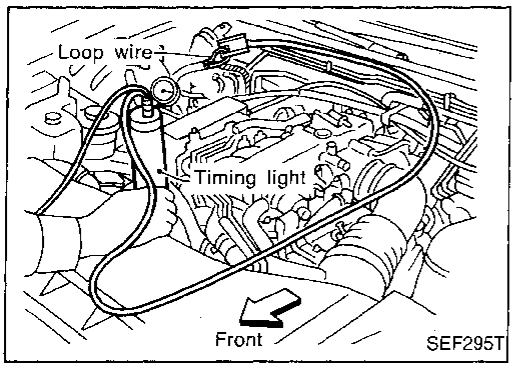
Check the idle speed using check connector as shown in the figure. (Check connector is located in the harness protector).

IGNITION TIMING

Any of the following two methods may be used.

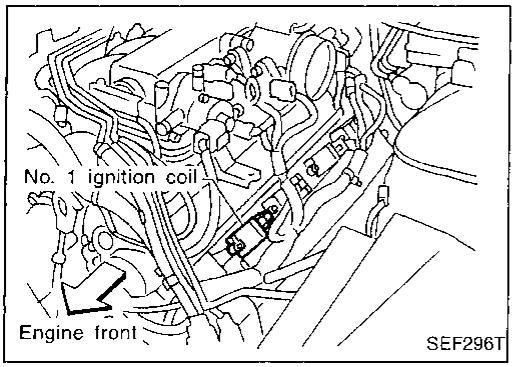
- **Method A**

1. Attach timing light to loop wire as shown.
2. Check ignition timing.

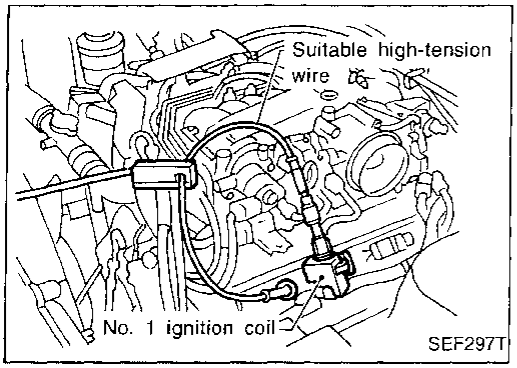


- **Method B**

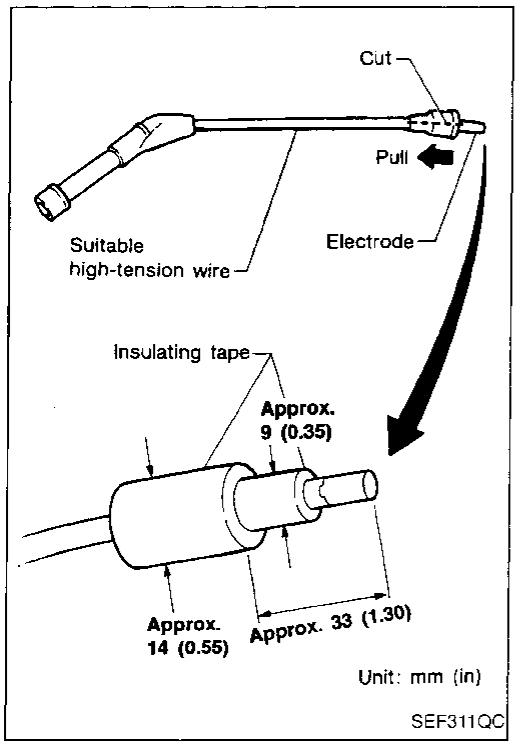
1. Remove intake air duct.
2. Remove No. 1 ignition coil.



3. Connect No. 1 ignition coil and No. 1 spark plug with suitable high-tension wire as shown, and attach timing light clamp to this wire.
4. Install air duct.
5. Check ignition timing.



Direct Ignition System — How to Check Idle Speed and Ignition Timing (Cont'd)



Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment

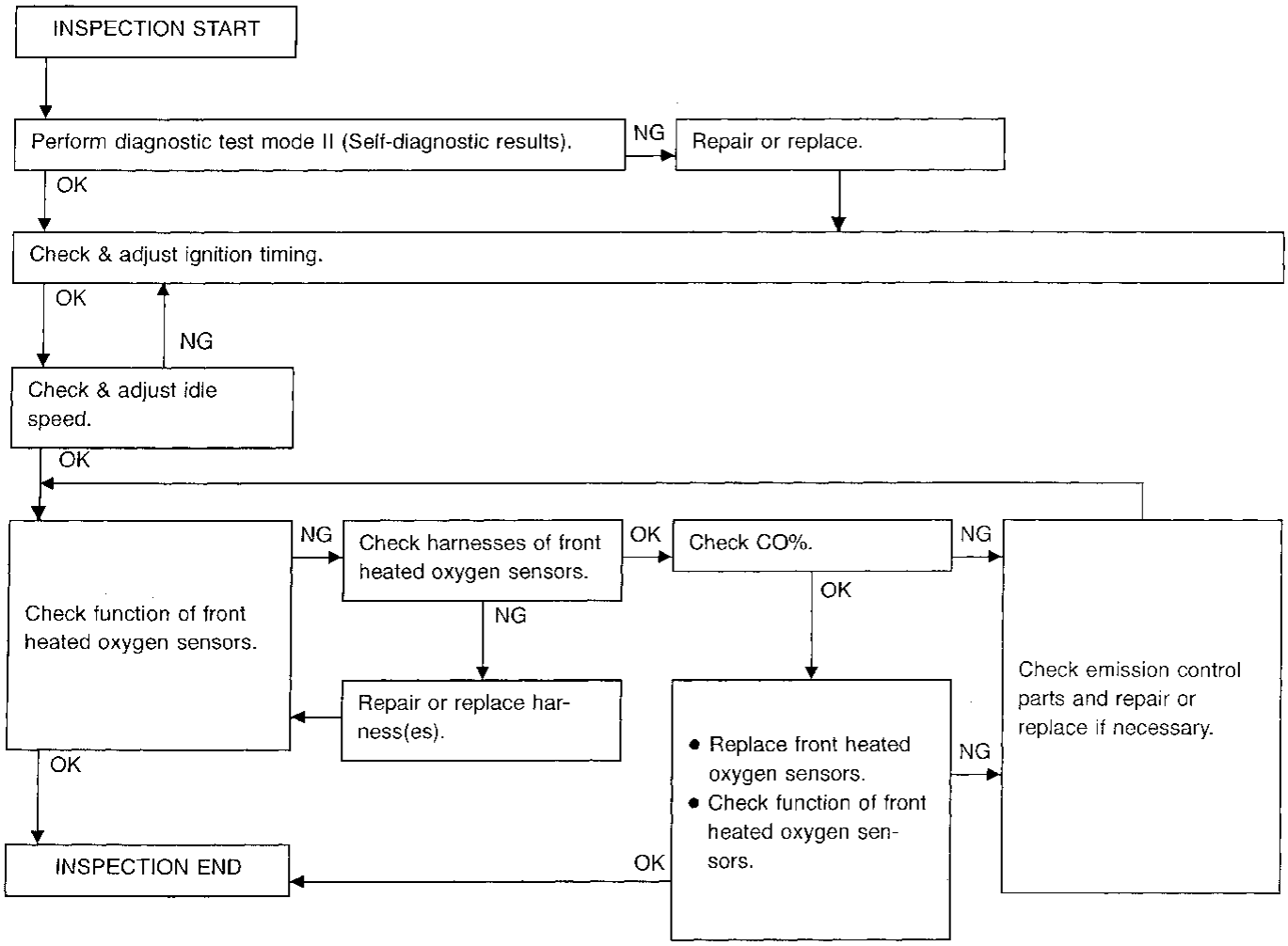
PREPARATION

- 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

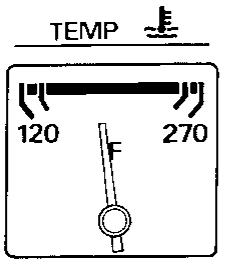
- On air conditioner equipped models, checks should be carried out while the air conditioner is "OFF".
- When checking idle speed, ignition timing and mixture ratio of A/T models, shift lever to "N" position.
- When measuring "CO" percentage, insert probe more than 40 cm (15.7 in) into tail pipe.
- Turn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

Overall inspection sequence



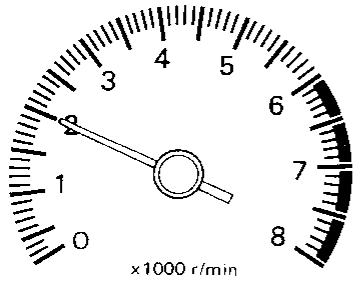
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

A



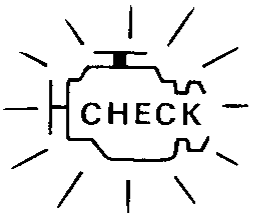
SEF246F

B



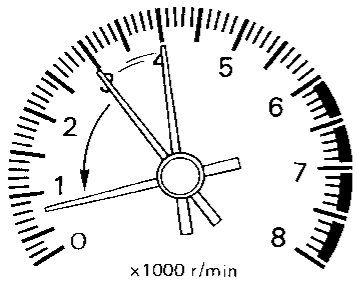
SEF247F

C



SEF051P

D



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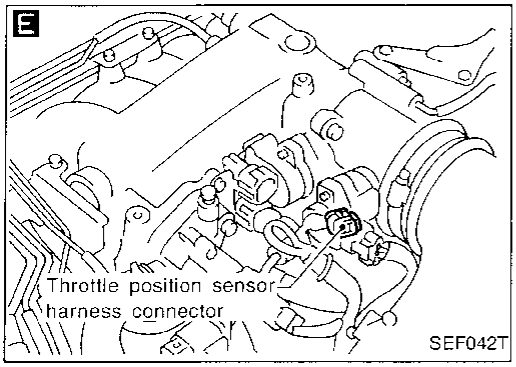
E



SEF042T

START

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

A

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

B

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

C

Perform diagnostic test mode II (Self-diagnostic results).

OK / NG

NG → Repair or replace components as necessary.

Does engine run smoothly?

OK / NG

NG → Clean injectors.

D

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

E

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

F

Check ignition timing with a timing light.

15°±2° BTDC (in "N" position)

OK / NG

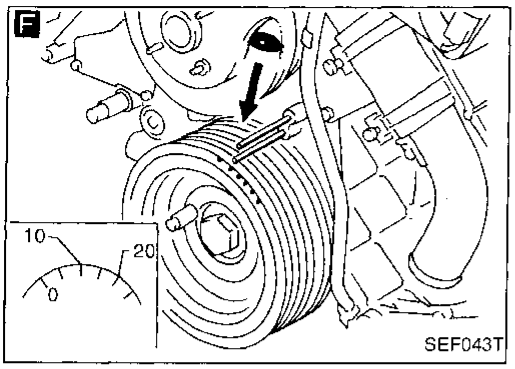
NG → Adjust ignition timing by turning camshaft position sensor after loosening securing bolts which secures camshaft position sensor.

Connect throttle position sensor harness connector. → Ⓑ

Ⓐ

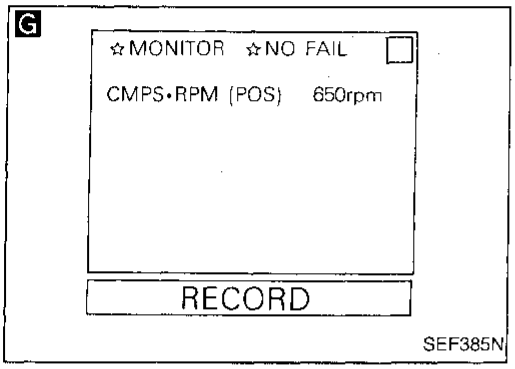
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

F



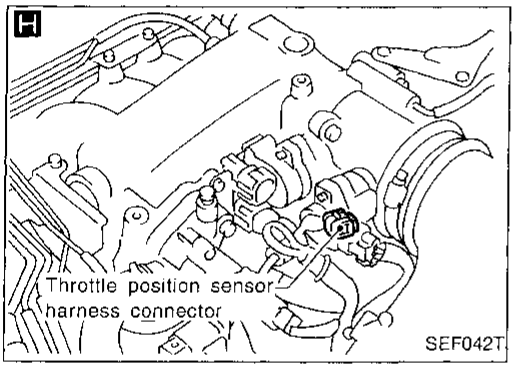
SEF043T

G



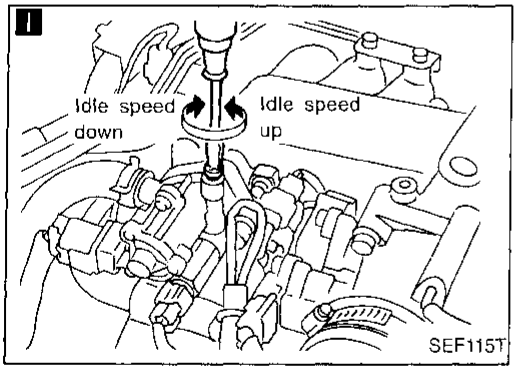
SEF385N

H



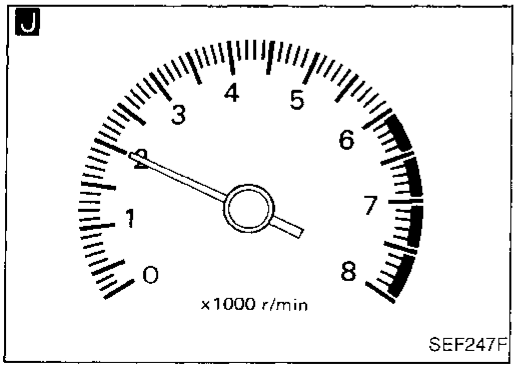
SEF042T

I



SEF115T

J



SEF247F

Ⓐ

Connect throttle position sensor harness connector.

G

Check target idle speed.

Read idle speed in "DATA MONITOR" mode with CONSULT

OR

Check idle speed.

650±50 rpm (in "N" position)

OK

NG

H

Disconnect throttle position sensor harness connector.

I

Adjust base idle speed by turning idle speed adjusting screw.

600±25 rpm (in "N" position)

1) Connect throttle position sensor harness connector.
2) Erase diagnostic trouble code, EC-49.

Ⓑ

J

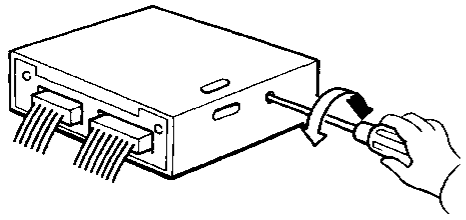
Run engine at about 2,000 rpm for about 2 minutes under no-load.

Ⓗ

Ⓓ

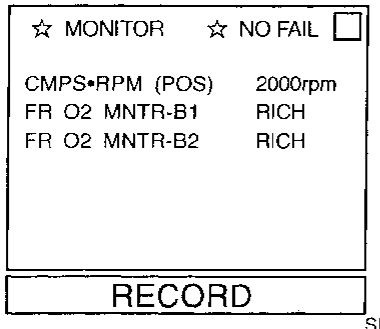
Idle Speed/Ignition Timing/Idle Mixture Ratio Adjustment (Cont'd)

K



SEF957D

L



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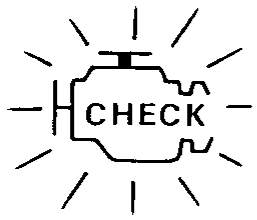
M



SEF051P

Ⓓ

K

Set on board diagnostic system of ECM to Diagnostic Test Mode II (Front heated oxygen sensor monitor).

L M

Check left bank front heated oxygen sensor signal.

1) See "FR O2 SEN MNTR-B1 and B2 (left and right sides)" in "Data monitor" mode.
2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

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

Monitor does not fluctuate. Malfunction indicator lamp does not blink. → Ⓕ

OK

Less than 5 times

Replace left bank front heated oxygen sensor. ← Ⓙ

← Ⓔ

OK

Check left bank front heated oxygen sensor signal.

1) See "FR O2 SEN MNTR-B1 and B2 (right and left sides)" in "Data monitor" mode.
2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

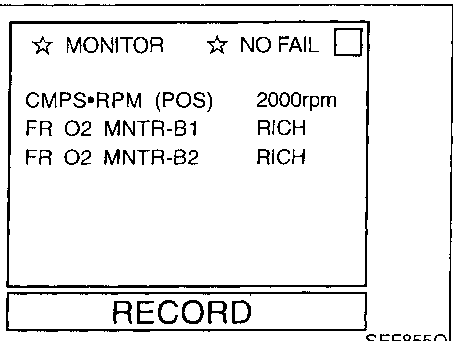
Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds at 2,000 rpm.

NG → Ⓚ

Ⓛ

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

N



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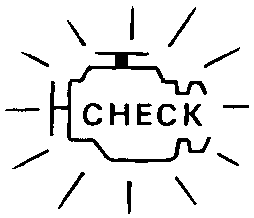
O



SEF051P

Ⓛ

N O

Check right bank front heated oxygen sensor signal.

1) See "FR O2 SEN MNTR-B1 and -B2 (left and right sides)" in "Data monitor" mode.
2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

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

Monitor does not fluctuate.
Malfunction indicator lamp does not blink.

Ⓒ

OK

END

Less than 5 times

Replace right bank front heated oxygen sensor.

Ⓔ

Check right bank front heated oxygen sensor signal.

1) See "FR O2 SEN MNTR-B1 and -B2 (left and right sides)" in "Data monitor" mode.
2) Maintaining engine at 2,000 rpm under no-load (engine is warmed up sufficiently.), check that the monitor fluctuates between "LEAN" and "RICH" more than 5 times during 10 seconds.
   1 cycle: RICH → LEAN → RICH
   2 cycles: RICH → LEAN → RICH → LEAN → RICH

OR

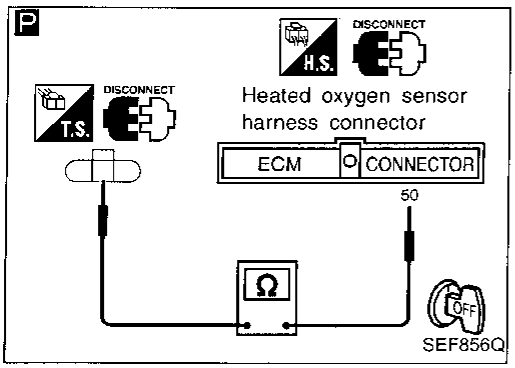
Make sure that malfunction indicator lamp goes on and off more than 5 times during 10 seconds at 2,000 rpm.

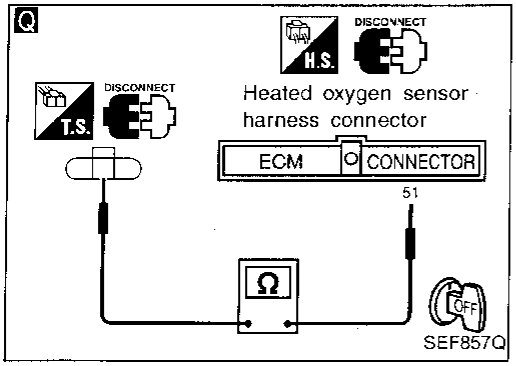
NG

OK

END

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





P

Check right bank front heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable
2) Disconnect ECM harness connector from ECM.
3) Disconnect right bank front heated oxygen sensor harness connector.
4) Check for continuity between terminal No. 50 of ECM harness connector and harness connector for front heated oxygen sensor.

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

OK

NG: Repair or replace ECM harness. → Ⓗ

Connect ECM harness connector to ECM. → Ⓖ

Q

Check left bank front heated oxygen sensor harness:
1) Turn off engine and disconnect battery ground cable
2) Disconnect ECM harness connector from ECM.
3) Disconnect left bank front heated oxygen sensor harness connector.
4) Check for continuity between terminal No. 51 of ECM harness connector and harness connector for front heated oxygen sensor.

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

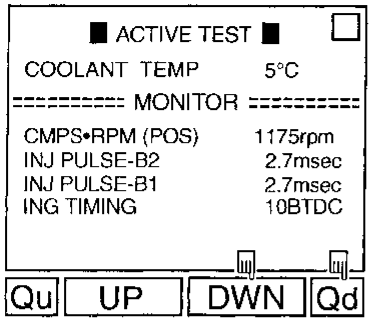
OK

NG: Repair or replace ECM harness. → Ⓗ

Connect ECM harness connector to ECM. → Ⓖ

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

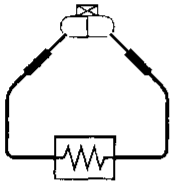
R



SEF411S

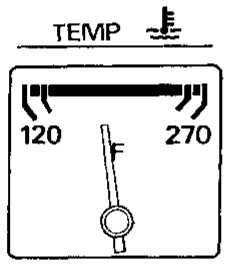
S

Engine coolant temperature sensor harness connector



SEF858QA

T



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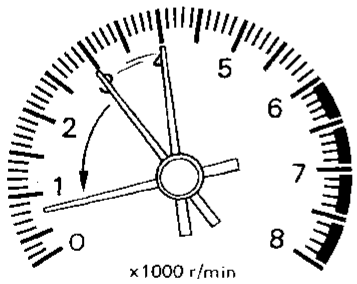
U



SEF248F

Ⓖ

R S

1) Select "ENG COOLANT TEMP" in "ACTIVE TEST" mode.
2) Set "COOLANT TEMP" to 5°C (41°F) by touching "DWN" and "Qd".

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.

T

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

U

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

Check "CO" %.

Idle CO: 0.4 - 9.4% with engine running smoothly

After checking CO%,
1) Disconnect the resistor from terminals of engine coolant temperature sensor.
2) Connect engine coolant temperature sensor harness connector to engine coolant temperature sensor.

OK → Ⓙ

NG

Connect front heated oxygen sensor harness connectors to front heated oxygen sensors.

Check fuel pressure regulator. ← Ⓚ

Check mass air flow sensor.

Check injector.
Clean or replace if necessary.

Check engine coolant temperature sensor. → Ⓗ

Check ECM function* by substituting another known good ECM.

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

Note: If a vehicle contains a part which is operating outside of design specifications with no MIL illumination, the part shall not be replaced prior to emission testing unless it is determined that the part has been tampered with or abused in such a way that the diagnostic system can not 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-76.).

Two Trip Detection Logic

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

Items	MIL			DTC		1st trip DTC	
	1st trip		2nd trip lighting up	1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Lighting up					
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 (0701, 0608 - 0601) is being detected	X			X		X	
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 (0701, 0608 - 0601) has been detected		X		X		X	
Closed loop control — DTC: P0130 (0307), P0150 (0308)		X		X		X	
Fail-safe items (Refer to EC-76.)		X		X*1		X*1	
Except above			X		X	X	X

*1: Except "ECM".

Emission-related Diagnostic Information

DTC AND 1ST TRIP DTC

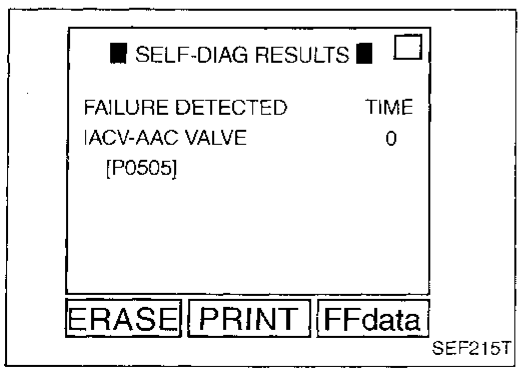
The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the first trip DTC did not reoccur, the first trip DTC will not be displayed. If a malfunction is detected during the 1st trip, the 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 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-45.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-43. 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-71. 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.

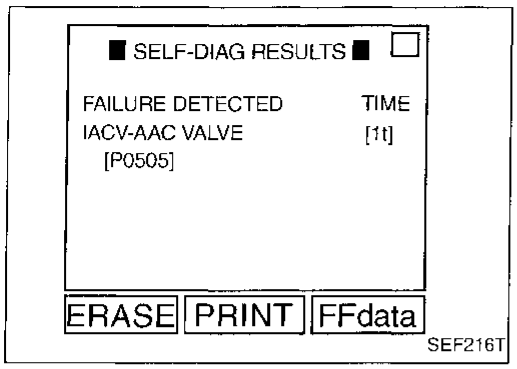
1. The number of blinks of the malfunction indicator lamp in the Diagnostic Test Mode II (Self-Diagnostic Results) Examples: 0101, 0201, 1003, 1104, etc.
   These DTCs are controlled by NISSAN.
2. CONSULT or GST (Generic Scan Tool) Examples: P0340, P1320, P0705, P0750, etc.
   These DTCs are prescribed 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 are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and are displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen, not on the GST. For details, see EC-59.

Only one set of freeze frame data (either 1st trip freeze frame data of 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 - P0308 (0701, 0608 - 0601) 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-45.

SYSTEM READINESS TEST (SRT) CODE

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

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

SRT codes are set after self-diagnosis has been performed two or more times. This occurs regardless of whether the diagnosis is in "OK" or "NG", and whether or not the diagnosis is performed in consecutive trips. The following table lists the four SRT items (12 test items) for the ECCS used in FY33 models.

Emission-related Diagnostic Information (Cont'd)

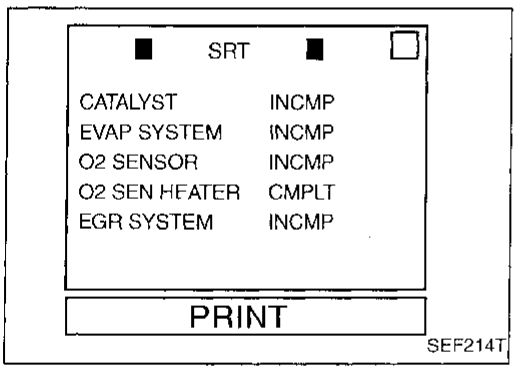
SRT items	Self-diagnostic test items
Catalyst monitoring	• Three way catalyst function (left bank) P0420 (0702) • Three way catalyst function (right bank) P0430 (0703)
Oxygen sensor monitoring	• Front heated oxygen sensor (right bank) P0130 (0303) • Rear heated oxygen sensor (right bank) P0136 (0707) • Front heated oxygen sensor (left bank) P0150 (0503) • Rear heated oxygen sensor (left bank) P0156 (0708)
Oxygen sensor heater monitoring	• Front heated oxygen sensor heater (right bank) P0135 (0901) • Rear heated oxygen sensor heater (right bank) P0141 (0902) • Front heated oxygen sensor heater (left bank) P0155 (1001) • Rear heated oxygen sensor heater (left bank) P0161 (1002)
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-49). In addition, if the 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-OBT 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)



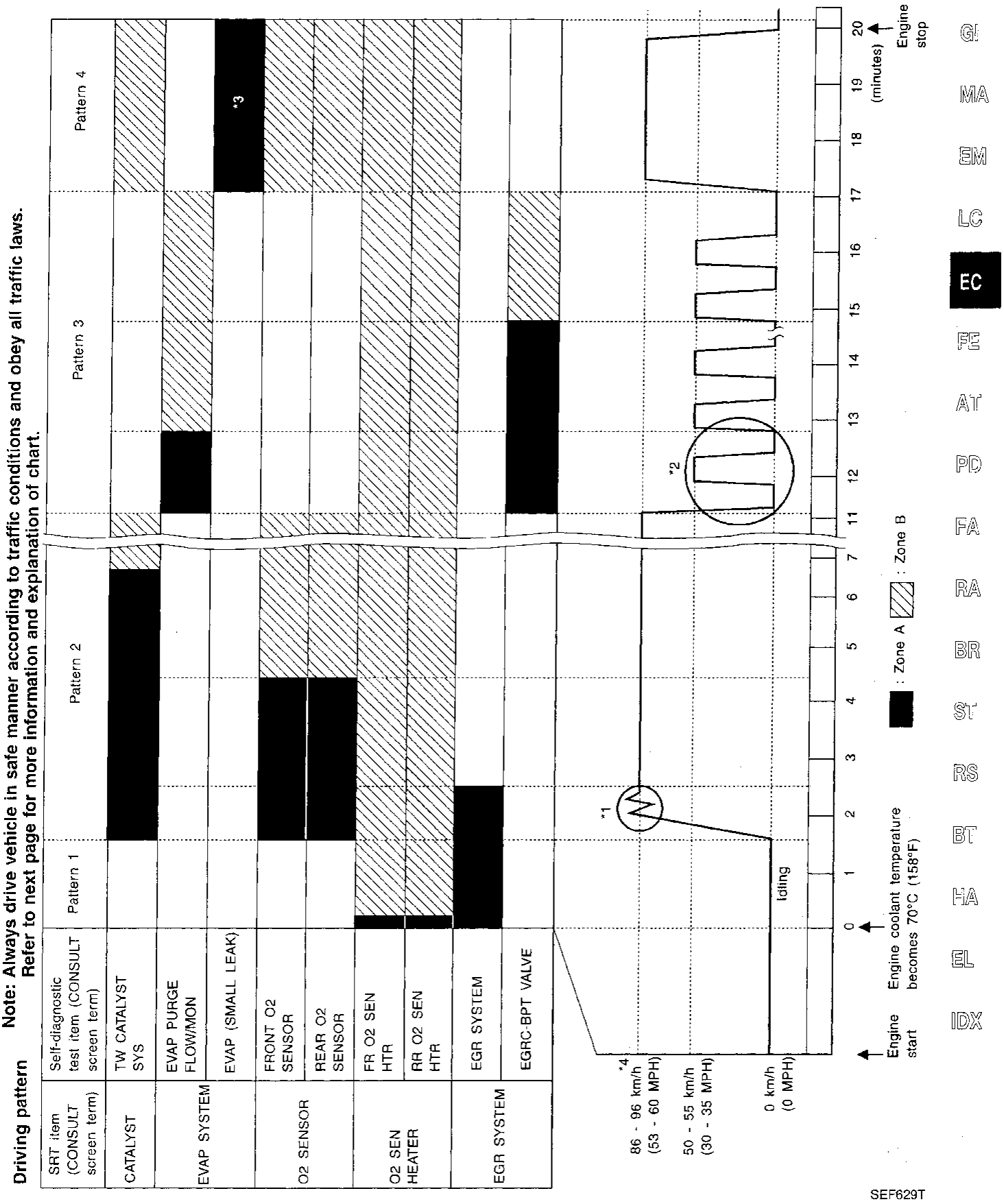
A sample of CONSULT display for SRT code is shown at left. "INCMP" means the self-diagnosis is incomplete and SRT is not set. "CMPLT" means the self-diagnosis is complete and SRT is set.

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 FY33 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 temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient temperature is 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 ⑲ and ㉕ is 3.0 - 4.3 V.)
- 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 ⑲ and ㉕ is lower than 1.4 V.)

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

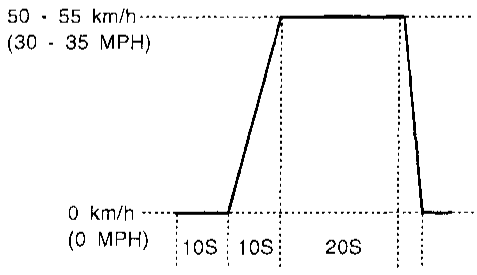
Pattern 3:
- The driving pattern outlined in *2 must be repeated at least 3 times.
  On M/T models, shift gears following "Suggested upshift speeds" schedule at right.

Pattern 4:
- Tests are performed after the engine has been operated for at least 12 minutes.
- The accelerator pedal must be held very steady during steady-state driving.
- If the accelerator pedal is moved, the test must be conducted all over again.

- The driving pattern must be started from pattern 1 and performed in the numerical order of the pattern.
- Any driving condition without stopping engine is permitted between the patterns, for example, between the pattern 1 and pattern 2.

*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.



SEF414S

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

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

Suggested transmission gear position for A/T models.

Set the selector lever in the "D" position with the overdrive on-off switch turned on.

Suggested upshift speeds for M/T models

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

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

Gear change	ACCEL shift point km/h (MPH)	CRUISE shift point km/h (MPH)
1st to 2nd	24 (15)	24 (15)
2nd to 3rd	40 (25)	29 (18)
3rd to 4th	58 (36)	48 (30)
4th to 5th	64 (40)	63 (39)

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

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

Suggested maximum speed in each gear

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

Gear	km/h (MPH)
1st	50 (30)
2nd	95 (60)
3rd	145 (90)
4th	—
5th	—

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

SRT item (CONSULT display)	Self-diagnostic test item	TID*1	CID*1	Test value	Test limit	Display
CATALYST	Three way catalyst function (Left bank)	01H	01H	Parameter 1	Max.	○
	Three way catalyst function (Right bank)	03H	02H	Parameter 1	Max.	○
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 (Left bank)	09H	04H	Parameter 1	Max.	○
		0AH	84H	Parameter 2	Min.	○
		0BH	04H	Parameter 3	Max.	○
		0CH	04H	Parameter 4	Max.	○
		0DH	04H	Parameter 5	Max.	○
	Front heated oxygen sensor (Right bank)	11H	05H	Parameter 1	Max.	○
		12H	85H	Parameter 2	Min.	○
		13H	05H	Parameter 3	Max.	○
		14H	05H	Parameter 4	Max.	○
		15H	05H	Parameter 5	Max.	○
	Rear heated oxygen sensor (Left bank)	19H	86H	Parameter 6	Min.	○
		1AH	86H	Parameter 7	Min.	○
		1BH	06H	Parameter 8	Max.	○
		1CH	06H	Parameter 9	Max.	○
	Rear heated oxygen sensor (Right bank)	21H	87H	Parameter 6	Min.	○
		22H	87H	Parameter 7	Min.	○
		23H	07H	Parameter 8	Max.	○
		24H	07H	Parameter 9	Max.	○

Emission-related Diagnostic Information (Cont'd)

SRT item (CONSULT display)	Self-diagnostic test item	TID*1	CID*1	Test value	Test limit	Display
O2 SENSOR HEATER	Front heated oxygen sensor heater (Left bank)	29H	08H	Parameter 1	Max.	○
		2AH	88H	Parameter 1	Min.	○
	Front heated oxygen sensor heater (Right bank)	2BH	09H	Parameter 1	Max.	○
		2CH	89H	Parameter 1	Min.	○
	Rear heated oxygen sensor heater (Left bank)	2DH	0AH	Parameter 1	Max.	○
		2EH	8AH	Parameter 1	Min.	○
	Rear heated oxygen sensor heater (Right bank)	2FH	0BH	Parameter 1	Max.	○
		30H	8BH	Parameter 1	Min.	○
EGR SYSTEM	EGR function	31H	8CH	Parameter 1	Min.	○
		32H	8CH	Parameter 2	Min.	○
		33H	8CH	Parameter 3	Min.	○
		34H	8CH	Parameter 4	Min.	○
		35H	0CH	Parameter 5	Max.	○
	EGRC-BPT valve function	36H	0CH	Parameter 6	Max.	○
		37H	8CH	Parameter 7	Min.	○

*1: TID and CID are hexadecimals and are shown only on GST.

Emission-related Diagnostic Information (Cont'd)

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*4		SRT code	Test value	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-99
INT AIR TEMP SEN	P0110	0401	—	—	X	EC-105
COOLANT TEMP SEN	P0115	0103	—	—	X	EC-110
THROTTLE POSI SEN	P0120	0403	—	—	X	EC-115
*COOLANT TEMP SEN	P0125	0908	—	—	X	EC-121
CLOSED LOOP-B1	P0130	0307	—	—	X	EC-131
FRONT O2 SENSOR-B1	P0130	0303	X	X	X*3	EC-126
FR O2 SEN HTR-B1	P0135	0901	X	X	X*3	EC-132
REAR O2 SENSOR-B1	P0136	0707	X	X	X*3	EC-136
RR O2 SEN HTR-B1	P0141	0902	X	X	X*3	EC-140
CLOSED LOOP-B2	P0150	0308	—	—	X	EC-131
FRONT O2 SENSOR-B2	P0150	0503	X	X	X*3	EC-145
FR O2 SEN HTR-B2	P0155	1001	X	X	X*3	EC-150
REAR O2 SENSOR-B2	P0156	0708	X	X	X*3	EC-154
RR O2 SEN HTR-B2	P0161	1002	X	X	X*3	EC-158
FUEL SYS LEAN/BK1	P0171	0115	—	—	X	EC-163
FUEL SYS RICH/BK1	P0172	0114	—	—	X	EC-169
FUEL SYS LEAN/BK2	P0174	0210	—	—	X	EC-174
FUEL SYS RICH/BK2	P0175	0209	—	—	X	EC-180
MULTI CYL MISFIRE	P0300	0701	—	—	X	EC-185
CYL 1 MISFIRE	P0301	0608	—	—	X	EC-185
CYL 2 MISFIRE	P0302	0607	—	—	X	EC-185
CYL 3 MISFIRE	P0303	0606	—	—	X	EC-185
CYL 4 MISFIRE	P0304	0605	—	—	X	EC-185
CYL 5 MISFIRE	P0305	0604	—	—	X	EC-185
CYL 6 MISFIRE	P0306	0603	—	—	X	EC-185
CYL 7 MISFIRE	P0307	0602	—	—	X	EC-185
CYL 8 MISFIRE	P0308	0601	—	—	X	EC-185
KNOCK SENSOR-B1	P0325	0304	—	—	X	EC-189
KNOCK SENSOR-B2	P0330	0212	—	—	X	EC-189
CRANK POS SEN (OBD)	P0335	0802	—	—	X	EC-192
CAMSHAFT POSI SEN	P0340	0101	—	—	X	EC-197
EGR SYSTEM	P0400	0302	X	X	X*3	EC-203
EGRC-BPT valve	P0402	0306	X	X	X	EC-213
TW CATALYST SYS-B1	P0420	0702	X	X	X*3	EC-215
TW CATALYST SYS-B2	P0430	0703	X	X	X*3	EC-215

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

Emission-related Diagnostic Information (Cont'd)

X: Applicable
—: Not applicable

Items (CONSULT screen terms)	DTC*3		SRT code	Test value	1st trip DTC	Reference page
	CONSULT GST*2	ECM*1				
VEHICLE SPEED SEN	P0500	0104	—	—	X	EC-218
IACV-AAC VALVE	P0505	0205	—	—	X	EC-222
A/T COMM LINE	P0600	0504	—	—	X	EC-228
ECM	P0605	0301	—	—	X	EC-231
PARK/NEUT POSI SW	P0705	1003	—	—	X	EC-233
INHIBITOR SWITCH	P0705	1101	—	—	X	AT-57
FLUID TEMP SENSOR	P0710	1208	—	—	X	AT-63
VHCL SPEED SEN A/T	P0720	1102	—	—	X	AT-66
ENGINE SPEED SIG	P0725	1207	—	—	X	AT-68
A/T 1ST SIGNAL	P0731	1103	—	—	X	AT-70
A/T 2ND SIGNAL	P0732	1104	—	—	X	AT-73
A/T 3RD SIGNAL	P0733	1105	—	—	X	AT-75
A/T 4TH SIG OR TCC	P0734	1106	—	—	X	AT-77
TOR CONV CLUTCH SV	P0740	1204	—	—	X	AT-82
LINE PRESSURE S/V	P0745	1205	—	—	X	AT-90
SHIFT SOLENOID/V A	P0750	1108	—	—	X	AT-93
SHIFT SOLENOID/V B	P0755	1201	—	—	X	AT-96
INT/V TIM CONT-B1	P1110	0805	—	—	X	EC-238
TANDEM T/P SEN	P1125	1502	—	—	X	EC-244
INT/V TIM CONT-B2	P1135	1301	—	—	X	EC-245
INT/V TIM PS-B1	P1140	1303	—	—	X	EC-251
INT/V TIM PS-B2	P1145	1304	—	—	X	EC-256
FPCM	P1220	1305	—	—	X	EC-264
IGN SIGNAL-PRIMARY	P1320	0201	—	—	X	EC-270
CRANK P/S (OBD) COG	P1336	0905	—	—	X	EC-278
EGRC SOLENOID/V	P1400	1005	—	—	X	EC-283
EGR TEMP SENSOR	P1401	0305	—	—	X	EC-288
A/T DIAG COMM LINE	P1605	0804	—	—	X	EC-228
THRTL POSI SEN A/T	P1705	1206	—	—	X	AT-95
OVERRUN CLUTCH S/V	P1760	1203	—	—	X	AT-101
COOLING FAN	P1900	1308	—	—	X	EC-293

*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-48.)

- **If the battery terminal is disconnected, the emission-related diagnostic information will be lost within 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.

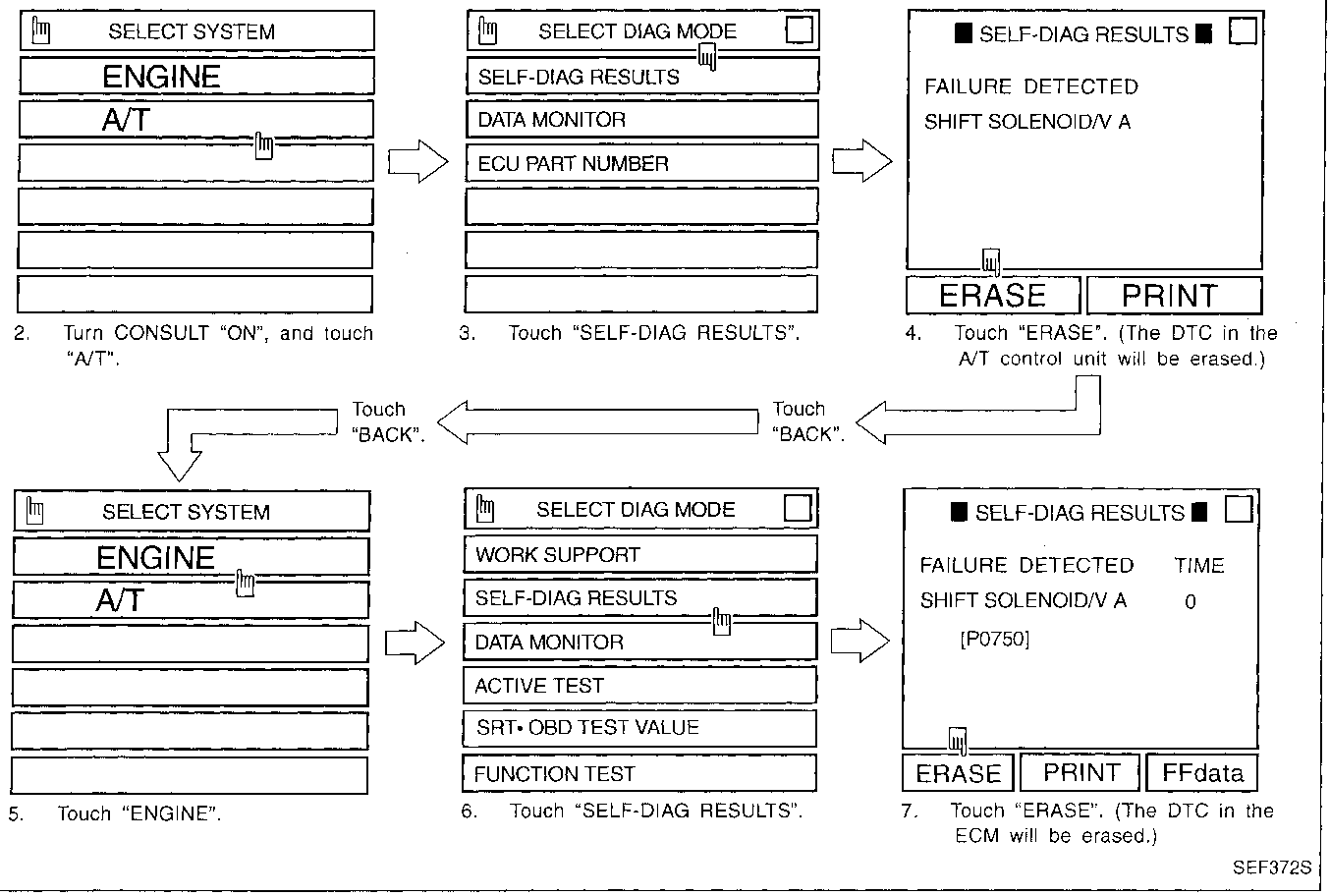
1. If the ignition switch stays "ON" after repair work, be sure to turn ignition switch "OFF" once. Wait at least 5 seconds and then turn it "ON" (engine stopped) again.
2. Turn CONSULT "ON" and touch "A/T".
3. Touch "SELF-DIAG RESULTS".
4. Touch "ERASE". (The DTC in the A/T control unit will be erased.)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

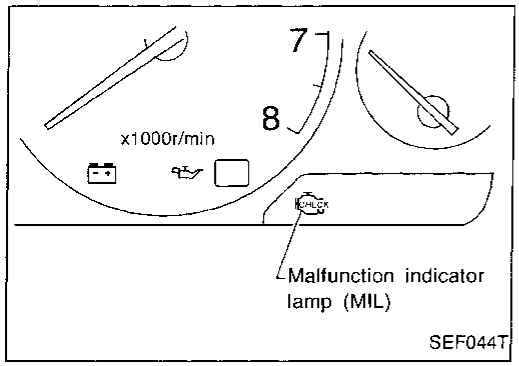
Note: If the diagnostic trouble code is not for A/T related items (see page EC-2), skip step 2.

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-48.)



Malfunction Indicator Lamp (MIL)

The malfunction indicator lamp is located on the instrument panel.

1. The malfunction indicator lamp will light up when the ignition switch is turned ON without the engine running. This is for checking the blown lamp.
   - If the malfunction indicator lamp does not light up, see the WARNING LAMPS AND CHIME (BUZZER) in the EL section. (Or see EC-335.)
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 bulb for damage (blown, open circuit, etc.) of the malfunction indicator lamp.
   If the MIL does not come on, check MIL circuit and ECM test mode. (See next page.)
2. MALFUNCTION WARNING : This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (2 trip detection logic), the MIL will light up to inform the driver that a malfunction has been detected.
   The following malfunctions will light up or blink the MIL in the 1st trip.
   - "Misfire (possible three way catalyst damage)"
   - "Closed loop control"
   - Fail-safe mode

Diagnostic Test Mode II

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

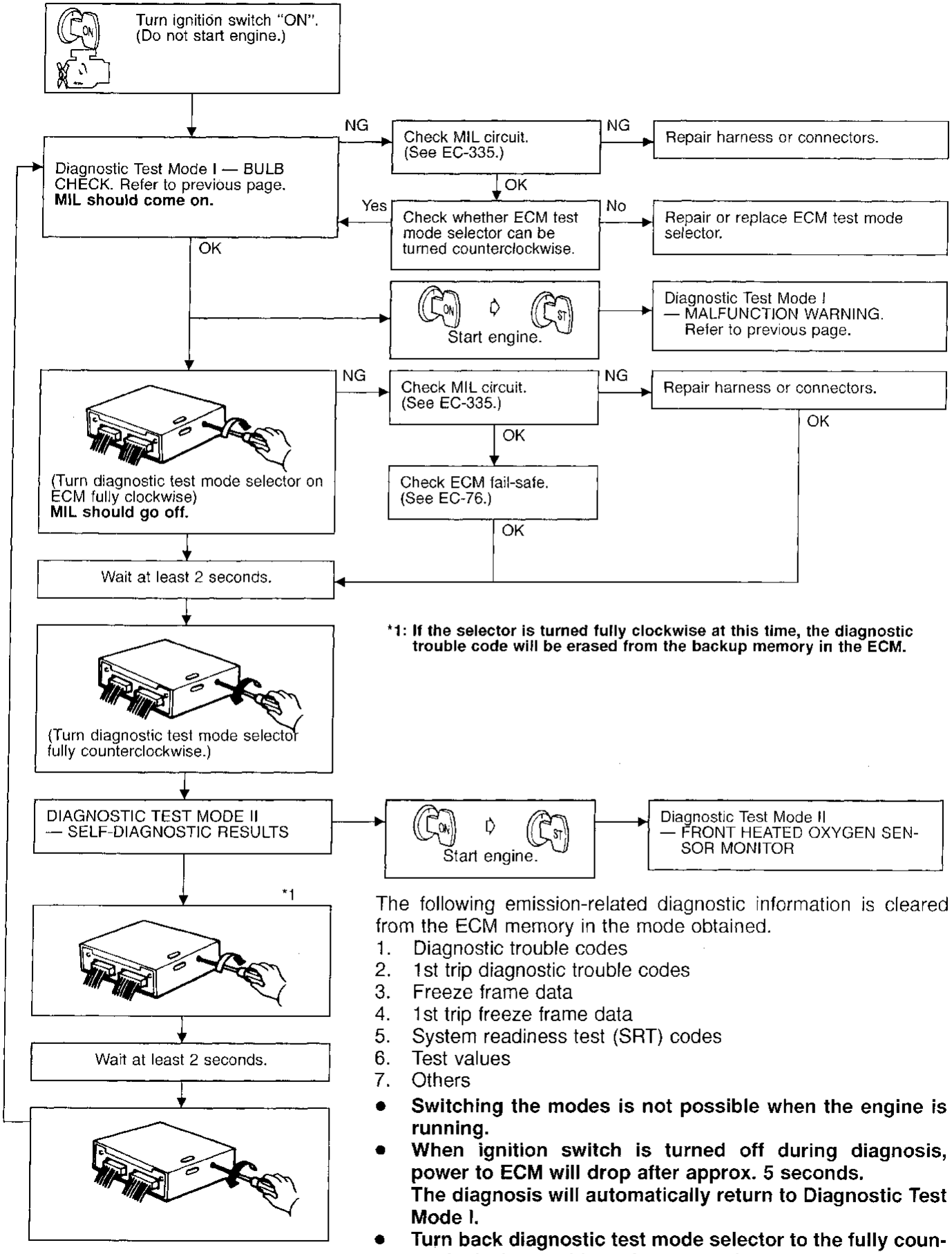
MIL Flashing without DTC

If the ECM is in Diagnostic Test Mode II, the MIL may flash when the engine is running. In this case, check ECM test mode selector following "HOW TO SWITCH DIAGNOSTIC TEST MODES" on next page.
How to switch the diagnostic test (function) modes and details of the above functions are described later. (See page EC-48.)

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



***1: If the selector is turned fully clockwise at this time, the diagnostic trouble code will be erased from the backup memory in the ECM.**

The following emission-related diagnostic information is cleared from the ECM memory in the mode obtained.

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

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

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. (See the WARNING LAMPS AND CHIME in the EL section. Or see EC-335.)

DIAGNOSTIC TEST MODE I—MALFUNCTION WARNING

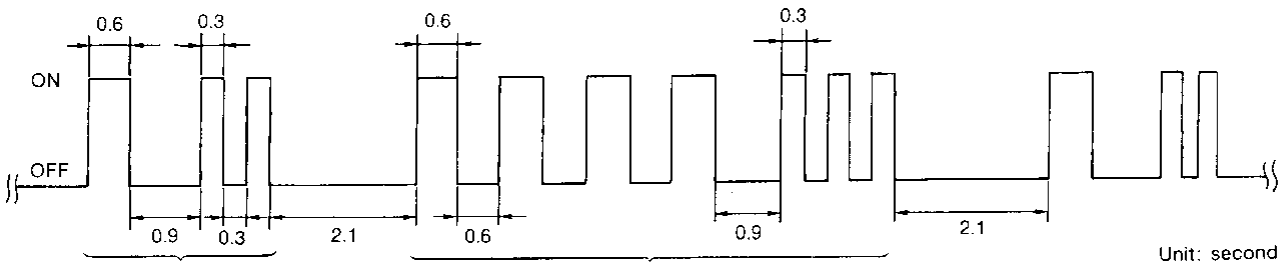
MALFUNCTION INDICATOR LAMP	Condition
ON	When the malfunction is detected or the ECM's CPU is malfunctioning.
OFF	No malfunction

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

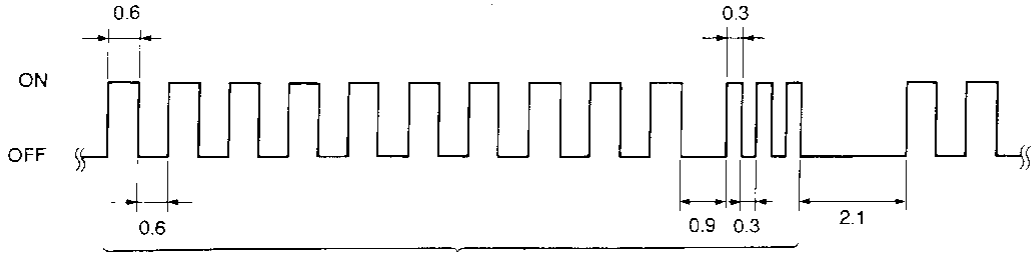
DIAGNOSTIC TEST MODE II—SELF-DIAGNOSTIC RESULTS

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

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



Example: Diagnostic trouble code No. 1003



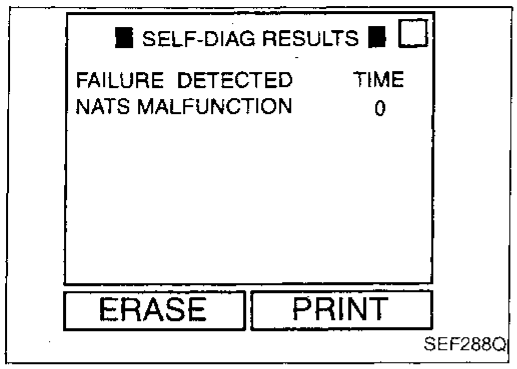
Long (0.6 second) blinking indicates the two LH digits of number and short (0.3 second) blinking indicates the two RH digits of number. For example, the malfunction indicator lamp blinks 10 times for 6 seconds (0.6 sec x 10 times) and then it blinks three times for about 1 second (0.3 sec x 3 times).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

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

Malfunction Indicator Lamp (MIL) (Cont'd)



- **If the security indicator lights up with the ignition switch in the "ON" position or "NATS MALFUNCTION" is displayed on "SELF-DIAG RESULTS" screen, perform self-diagnostic results mode with CONSULT using NATS program card (NATS-E960U). Refer to EL section.**
- **Confirm no self-diagnostic results of NATS is displayed before touching "ERASE" in "SELF-DIAG RESULTS" mode with CONSULT.**
- **When replacing ECM, initialization of NATS system and registration of all NATS ignition key IDs must be carried out with CONSULT using NATS program card (NATS-E960U).**
  Therefore, be sure to receive all keys from vehicle owner. Regarding the procedures of NATS initialization and NATS ignition key ID registration, refer to CONSULT operation manual, NATS.

Note:
NATS: IPPS (Infiniti Personal Protection System)

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 control
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop control

*: Maintains conditions just before switching to open loop.

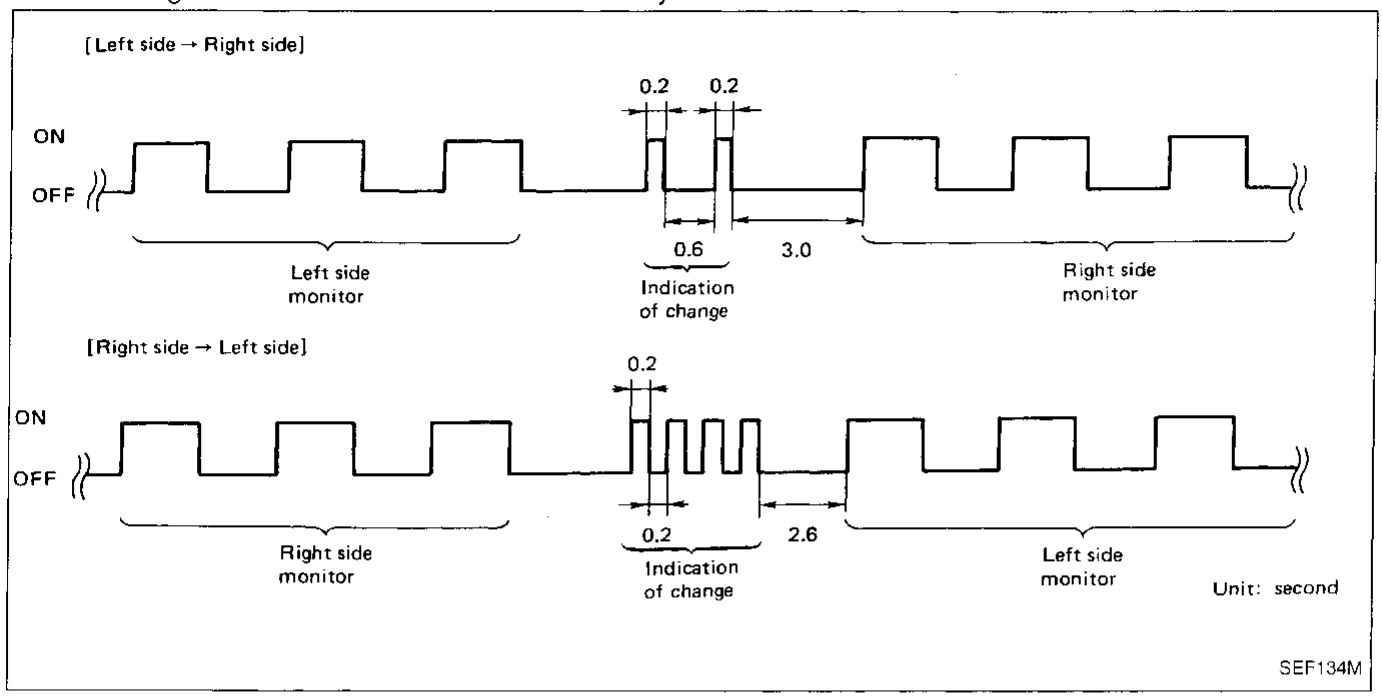
To check the front heated oxygen sensor function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no-load conditions. Then make sure that the MALFUNCTION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

Malfunction Indicator Lamp (MIL) (Cont'd)

How to switch monitored sensor from left bank to right bank or vice versa

- **The following procedure should be performed while the engine is running.**

1. Turn diagnostic test mode selector on ECM fully clockwise.
2. Wait at least 2 seconds.
3. Turn diagnostic test mode selector on ECM fully counterclockwise.



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-35.
- 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.

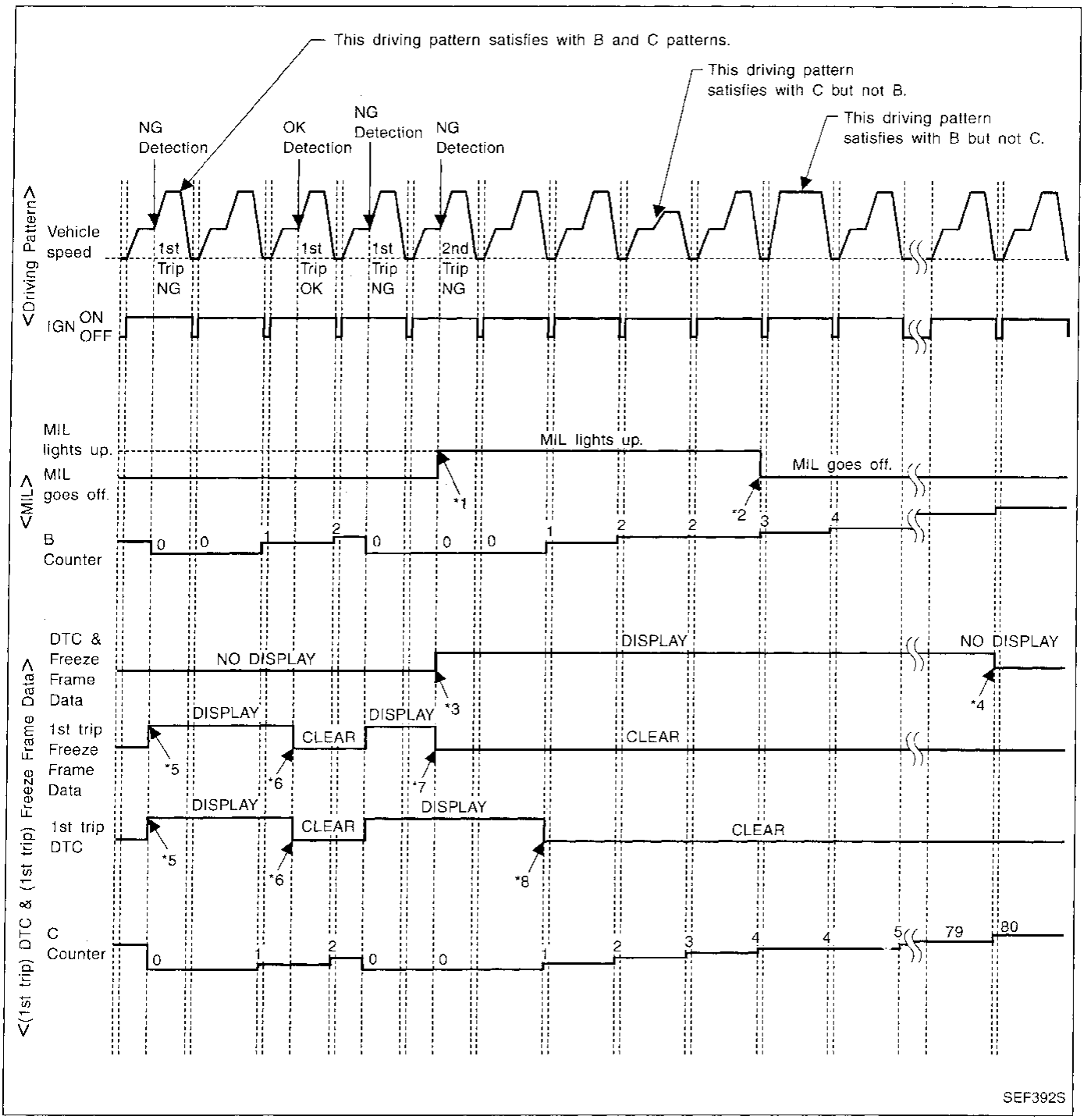
SUMMARY CHART

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-53.
*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 a time (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).

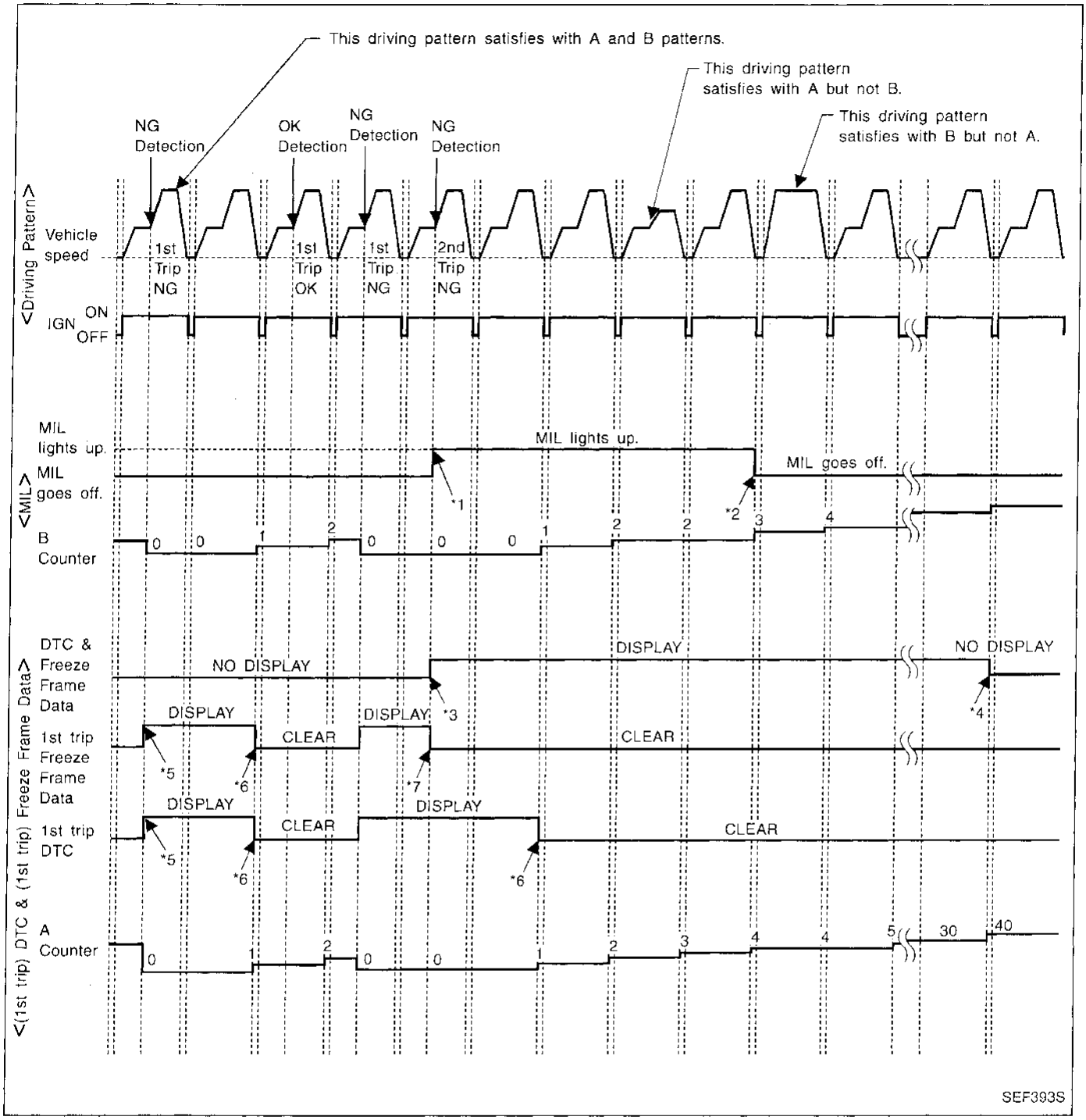
Example:

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 a time 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.

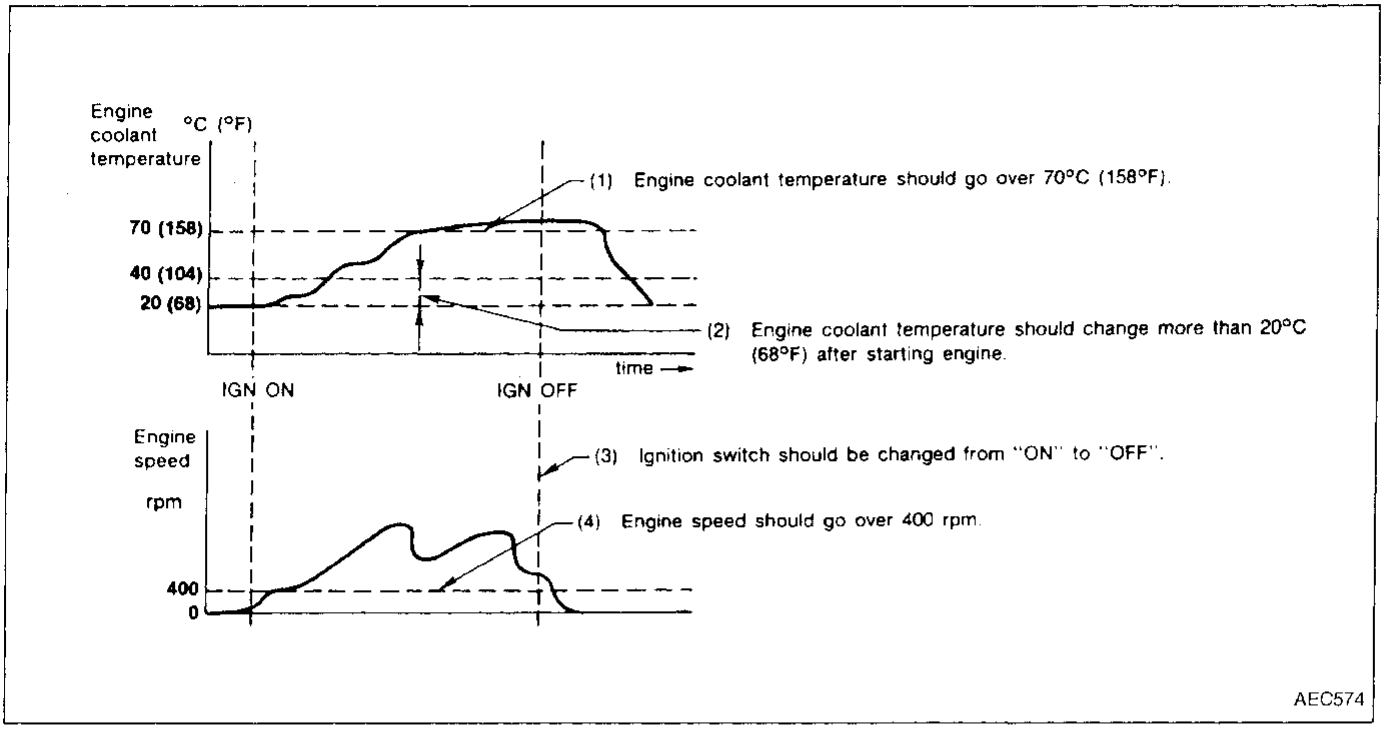
*6: 1st trip DTC will be cleared after vehicle is driven a time (pattern A) without the same malfunction.

*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〉

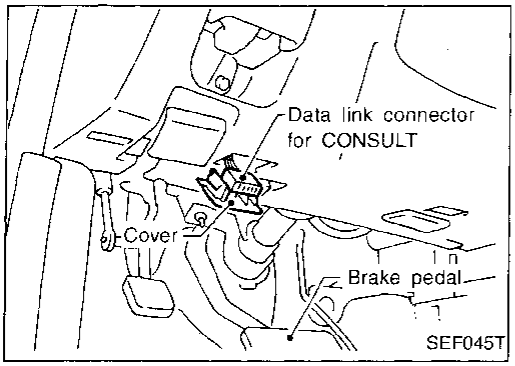


- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

〈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.

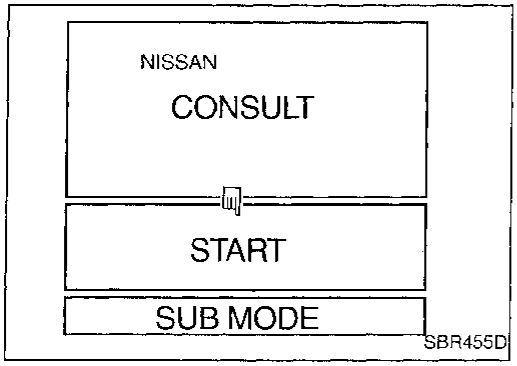
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will go off when the B counter reaches 3 (*2 in "OBD SYSTEM OPERATION CHART").



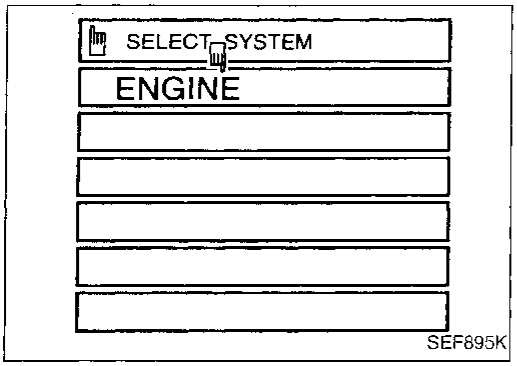
CONSULT

CONSULT INSPECTION PROCEDURE

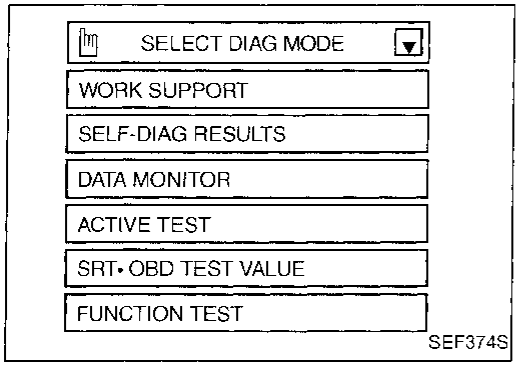
1. Turn off ignition switch.
2. Connect "CONSULT" to data link connector for CONSULT. (Data link connector for CONSULT is located beside the hood lock release handle.)



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

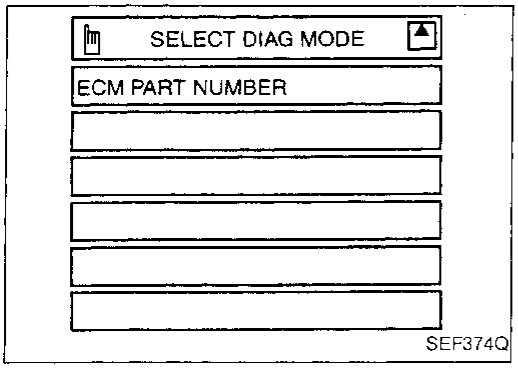


5. Touch "ENGINE".



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 according to the program card used.



CONSULT (Cont'd)

ECCS COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE						
			WORK SUPPORT	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
		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 (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-37.

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 from the ECM memory in the mode obtained.
1. Diagnostic trouble codes
2. 1st trip diagnostic trouble code
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 VALVE ADJ	SET ENGINE SPEED AT THE SPECIFIED VALUE UNDER THE FOLLOWING CONDITIONS. • ENGINE WARMED UP • NO-LOAD	When adjusting idle speed
FUEL PRESSURE RELEASE	• FUEL PUMP WILL STOP BY TOUCHING "START" DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

DTC and 1st trip DTC

Regarding items of "DTC and 1st trip DTC", refer to "DIAGNOSTIC TROUBLE CODE INDEX" (See EC-2.).

Freeze frame data and 1st trip freeze frame data

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

*1: The items are the same as those of 1st trip freeze frame data.
*2: Regarding FY33 model, "B1" indicates left bank and "B2" indicates right bank.

CONSULT (Cont'd)

SELF-DIAGNOSTIC MODE

DATA MONITOR MODE

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CMPS·RPM (POS) [rpm]	○	○	• Indicates the engine speed computed from the POS signal (1° signal) of the crankshaft position sensor (POS).	
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 SEN-B1 [V]	○	○	• The signal voltage of the front heated oxygen sensor is displayed.	
FR O2 SEN-B2 [V]	○			
RR O2 SEN-B1 [V]	○	○	• The signal voltage of the rear heated oxygen sensor is displayed.	
RR O2 SEN-B2 [V]	○	○		
FR O2 MNTR-B1 [RICH/LEAN]	○	○	• Display of front heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the mixture became "rich", and control is being affected toward a leaner mixture. LEAN ... means the mixture became "lean", and control is being affected toward a rich mixture.	• After turning ON the ignition switch, "RICH" is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
FR O2 MNTR-B2 [RICH/LEAN]	○	○		
RR O2 MNTR-B1 [RICH/LEAN]	○	○	• Display of rear heated oxygen sensor signal during air-fuel ratio feedback control: RICH ... means the amount of oxygen after three way catalyst is relatively large. LEAN ... means the amount of oxygen after three way catalyst is relatively small.	• When the engine is stopped, a certain value is indicated.
RR O2 MNTR-B2 [RICH/LEAN]	○	○		
VHCL SPEED SE [km/h] or [mph]	○	○	• The vehicle speed computed from the vehicle speed sensor signal is displayed.	
BATTERY VOLT [V]	○	○	• The power supply voltage of ECM is displayed.	
THRTL POS SEN [V]	○	○	• The throttle position sensor signal voltage is displayed.	
THRTL/P SEN2 [V]	○		• Secondary 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.

NOTE:
Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.
Regarding FY33 model, "B1" indicates left bank and "B2" indicates right bank.

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
CLSD THL/P SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the throttle position sensor signal.	
AIR COND SIG [ON/OFF]	○	○	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW [ON/OFF]	○	○	• Indicates [ON/OFF] condition from the park/neutral position switch signal.	
PW/ST SIGNAL [ON/OFF]	○	○	• [ON/OFF] condition of the power steering oil pressure switch determined by the power steering oil pressure signal is indicated.	
LOAD SIGNAL [ON/OFF]	○	○	• Indicate [ON/OFF] condition from the electrical load signal and/or lighting switch. ON ... rear defogger is operating. OFF ... rear defogger is not operating.	
AMB TEMP SW [ON/OFF]	○	○	• Indicate [ON/OFF] condition from the ambient temperature signal. ON ... When the ambient temperature is lower than specified value. OFF ... When the ambient temperature is higher than specified value.	
IGNITION SW [ON/OFF]	○		• Indicates [ON/OFF] condition from ignition switch.	
A/C PRESS SW [ON/OFF]			• Indicate [ON/OFF] condition of air conditioner pressure switch signal. ON ... A/C pressure is higher than specified value. OFF ... A/C pressure is lower than specified value.	
INJ PULSE-B1 [msec]		○	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2 [msec]				
B/FUEL SCHDL [msec]		○	• "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	
IGN TIMING [BTDC]		○	• Indicates the ignition timing computed by ECM according to the input signals.	• When the engine is stopped, a certain value is indicated.
IACV-AAC/V [step]		○	• Indicates the idle air control valve (AAC valve) control value computed by ECM according to the input signals.	
A/F ALPHA-B1 [%]			• The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control.
A/F ALPHA-B2 [%]				
AIR COND RLY [ON/OFF]		○	• The air conditioner relay control condition (determined by ECM according to the input signal) is indicated.	
FUEL PUMP RLY [ON/OFF]		○	• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
INT/V SOL-B1 INT/V SOL-B2 [ON/OFF]			• The control condition of the intake valve timing control solenoid valve is indicated. ON ... Intake valve timing control is operating. OFF ... Intake valve timing control is not operating.	
INT/V SOL-B1 INT/V SOL-B2 [deg]			• Indicate [deg] of intake camshaft advanced angle.	

CONSULT (Cont'd)

Monitored item [Unit]	ECM input signals	Main signals	Description	Remarks
COOLING FAN [HI/OFF]		○	• The control condition of the cooling fan (determined by ECM according to the input signal) is indicated. HI ... High speed operation OFF ... Stop	
EGRC SOL/V [ON/OFF]			• The control condition of the EGR valve & EVAP canister purge control solenoid valve (determined by ECM according to the input signal) is indicated. • ON ... EGR and EVAP canister purge operation is cut-off OFF ... EGR and EVAP canister purge is operational	
FR O2 HTR-B1 [ON/OFF]			• Indicates [ON/OFF] condition of front heated oxygen sensor's heater determined by ECM according to the input signals.	
FR O2 HTR-B2 [ON/OFF]				
RR O2 HTR-B1 [ON/OFF]			• Indicates [ON/OFF] condition of rear heated oxygen sensor's heater determined by ECM according to the input signals.	
RR O2 HTR-B2 [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 airflow computed by ECM according to the signal voltage of the mass airflow sensor.	
FPCM [LOW/HI]			• The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signal) is indicated. LOW ... Low amount of fuel flow HI ... High amount of fuel flow	
FPCM F/P VOLT [V]			• The voltage between fuel pump and FPCM is displayed.	
VOLTAGE [V]			• Voltage measured by the voltage probe.	
PULSE [msec] or [Hz] or [%]			• Pulse width, frequency or duty cycle measured by the pulse probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.

CONSULT (Cont'd)

ACTIVE TEST MODE

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Fuel injectors • Front heated oxygen sensor
IACV-AAC/V OPENING	• Engine: After warming up, idle the engine. • Change the IACV-AAC valve opening step using CONSULT.	Engine speed changes according to the opening percent.	• Harness and connector • IACV-AAC valve
ENG COOLANT TEMP	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connector • Engine coolant temperature sensor • Fuel injectors
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Adjust ignition timing (by moving camshaft position sensor)
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 • Ignition coil with power transistor • Spark plugs
COOLING FAN	• Ignition switch: ON • Turn the cooling fan "ON" and "OFF" using CONSULT.	Cooling fan moves 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 CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • EGR valve & EVAP canister purge control solenoid valve
VALVE TIMING SOL	• Ignition switch: ON • Turn solenoid valve "ON" and "OFF" with CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connector • Intake valve timing control 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.		
FPCM	• Ignition switch: ON • Select "LOW" and "HI" with CONSULT and check that "FPCM F/P VOLT" of CONSULT changes.	"FPCM F/P VOLT" of CONSULT changes as follows; LOW ... Approx. 4.7 V HI ... Approx. 0.4 V	• Harness and connector • FPCM

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) • Throttle position sensor circuit is tested when throttle is opened and closed fully. ("IDLE POSITION" is the test item name for the vehicles in which idle is selected by throttle position sensor.)	Throttle valve: opened	OFF	• Harness and connector • Throttle position sensor (Closed throttle position) • Throttle position sensor (Closed throttle position) adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
		Throttle valve: closed	ON	
THROTTLE POSI SEN CKT	• Ignition switch: ON (Engine stopped) • Throttle position sensor circuit is tested when throttle is opened and closed fully.	Range (Throttle valve fully opened — Throttle valve fully closed)	More than 3.0V	• Harness and connector • Throttle position sensor • Throttle position sensor adjustment • Throttle linkage • Verify operation in DATA MONITOR mode.
PARK/NEUT POSI SW CKT	• Ignition switch: ON (Engine stopped) • Inhibitor circuit is tested when shift lever is manipulated.	Out of N/P positions	OFF	• Harness and connector • Inhibitor switch • Park/Neutral position relay • 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
VALVE TIMING S/V CIRCUIT	• Ignition switch: ON (Engine stopped) • Intake valve timing control solenoid circuit is tested by checking solenoid valve operating noise.	The solenoid valve makes an operating sound every 3 seconds.		• Harness and connector • Intake valve timing control solenoid.
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

CONSULT (Cont'd)

FUNCTION TEST ITEM	CONDITION	JUDGEMENT		CHECK ITEM (REMEDY)
START SIGNAL CIRCUIT	• Ignition switch: ON → START • Start signal circuit is tested when engine is started by operating the starter. Battery voltage and water temperature before cranking, and average battery voltage, mass air flow sensor output voltage and cranking speed during cranking are displayed.	Start signal: OFF → ON		• Harness and connector • Ignition switch
PW/ST SIGNAL CIRCUIT	• Ignition switch: ON (Engine running) • Power steering circuit is tested when steering wheel is rotated fully and then set to a straight line running position.	Locked position	ON	• Harness and connector • Power steering oil pressure switch • Power steering oil pump
		Neutral position	OFF	
VEHICLE SPEED SEN CKT	• Vehicle speed sensor circuit is tested when vehicle is running at a speed of 10 km/h (6 MPH) or higher.	Vehicle speed sensor input signal is greater than 4 km/h (2 MPH)		• Harness and connector • Vehicle speed sensor • Electric speedometer
IGN TIMING ADJ	• After warming up, idle the engine. • Ignition timing is checked by reading ignition timing with a timing light and checking whether it agrees with specifications.	The timing light indicates the same value on the screen.		• Adjust ignition timing (by moving camshaft position sensor) • 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, ignition coil with power transistor harness or connector) • VACUUM SYS (Intake air leaks) • Front heated oxygen sensor circuit • Front heated oxygen sensor operation • Fuel pressure high or low • Mass air flow sensor
POWER BALANCE	• After warming up, idle the engine. • Injector operation of each cylinder is stopped one after another, and resultant change in engine rotation is examined to evaluate combustion of each cylinder. (This is only displayed for models where a sequential multiport fuel injection system is used.)	Difference in engine speed is greater than 25 rpm before and after cutting off the injector of each cylinder.		• Injector circuit (Injector, harness or connector) • Ignition circuit (Spark plug, ignition coil with power transistor harness or connector) • Compression • Valve timing
IACV-AAC/V SYSTEM	• After warming up, idle the engine. • IACV-AAC valve system is tested by detecting change in engine speed when IACV-AAC valve opening is changed to 1 step, 25 steps and 102 steps.	Difference in engine speed is greater than 150 rpm between when valve opening is at 102 steps and at 25 steps.		• Harness and connector • IACV-AAC valve • Air passage restriction between air inlet and IACV-AAC valve • IAS (Idle adjusting screw) adjustment

CONSULT (Cont'd)

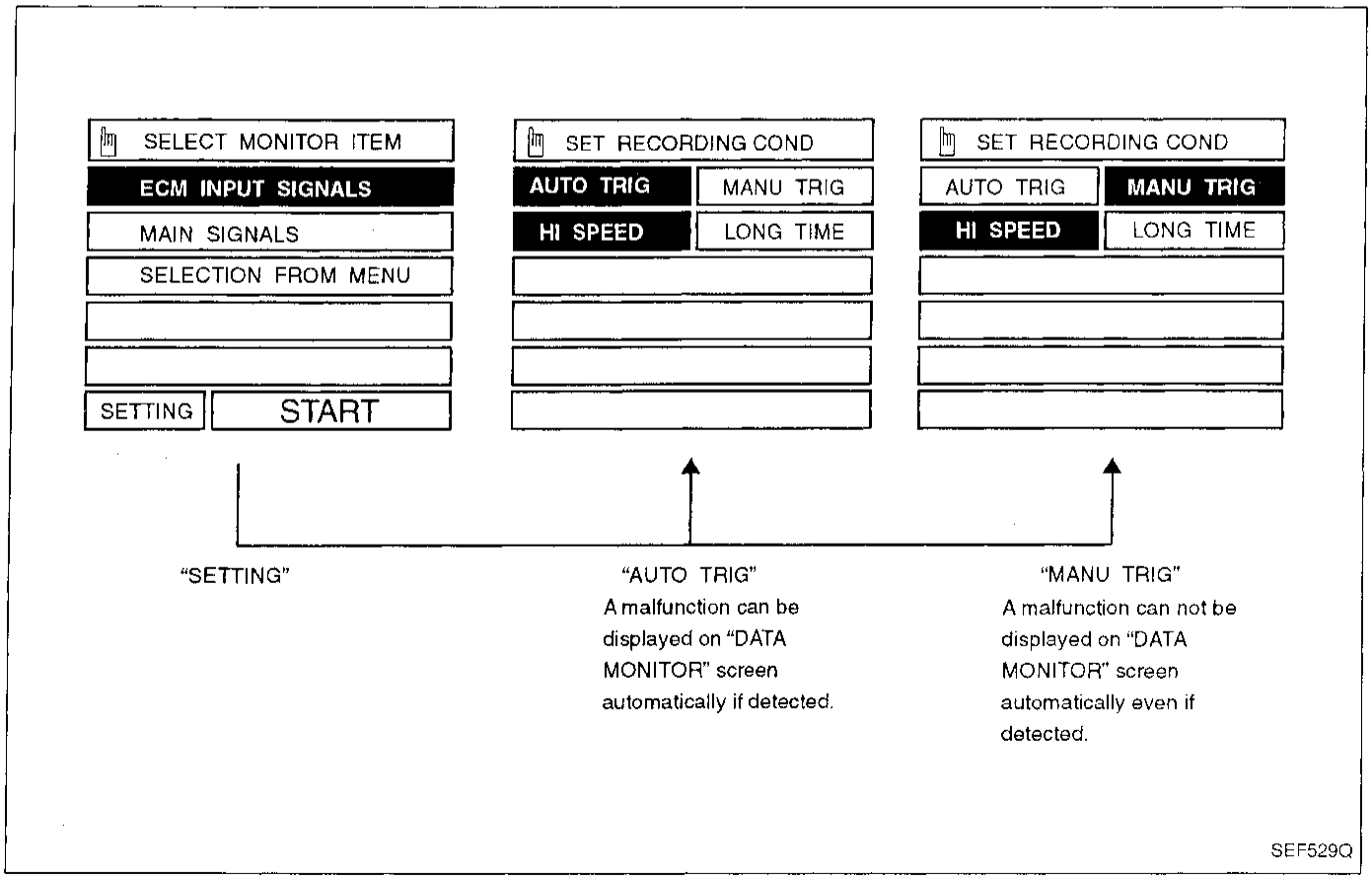
REAL TIME DIAGNOSIS IN DATA MONITOR MODE

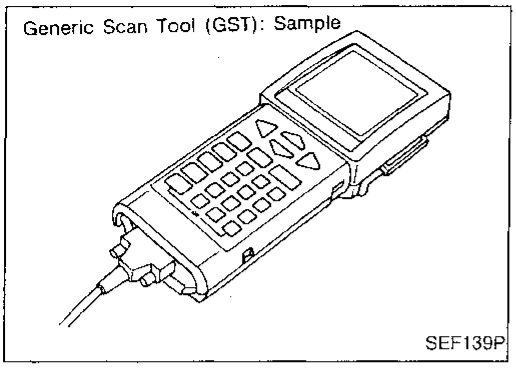
CONSULT has two kinds of triggers and they can be selected by touching "SETTING" in "DATA MONITOR" mode.

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 in case the incident is intermittent.
     When you are inspecting the circuit by gently shaking (or twisting) the suspicious connectors, components and harness in the "DTC CONFIRMATION PROCEDURE", the moment a malfunction is found the DTC/1st trip DTC will be displayed. (Refer to GI 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.

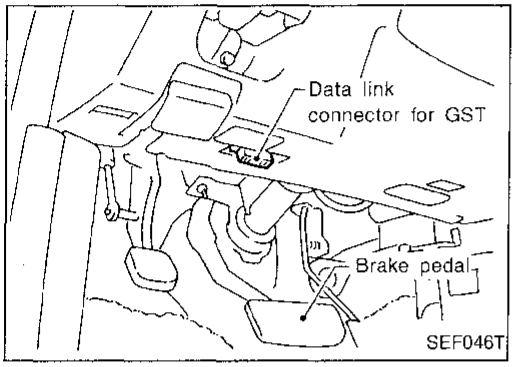




Generic Scan Tool (GST)

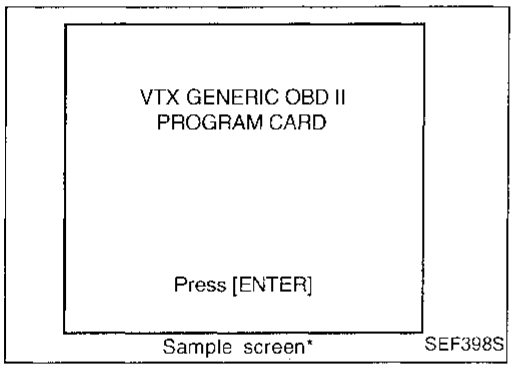
DESCRIPTION

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.



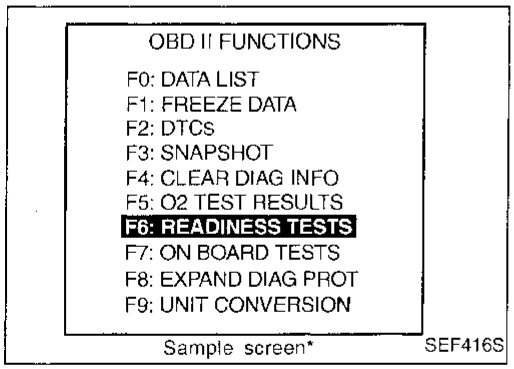
GST INSPECTION PROCEDURE

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 hood lock release handle.)



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.)



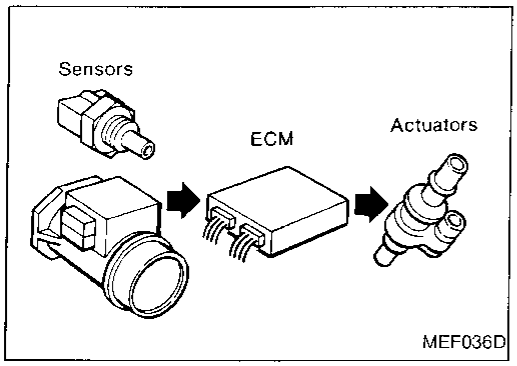
5. Perform each diagnostic mode according to each service procedure.

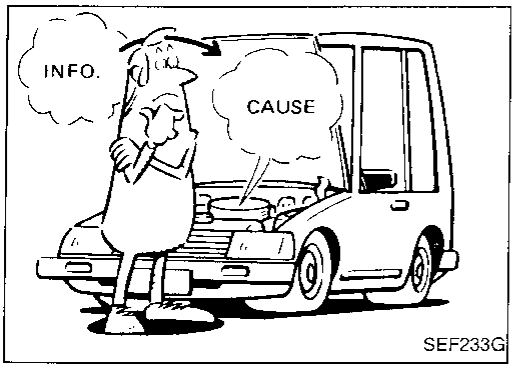
For further information, see the GST Operation Manual of the tool maker.

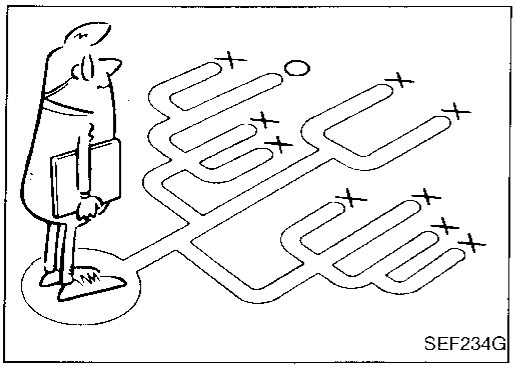
Generic Scan Tool (GST) (Cont'd)

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-59).]
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.







KEY POINTS

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

SEF907L

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-71.

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

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

Diagnostic Worksheet

There are many operating conditions that lead to the malfunctions of engine components. A good knowledge of such conditions can make troubleshooting faster and more accurate.

In general, each customer may feel differently about a given 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:

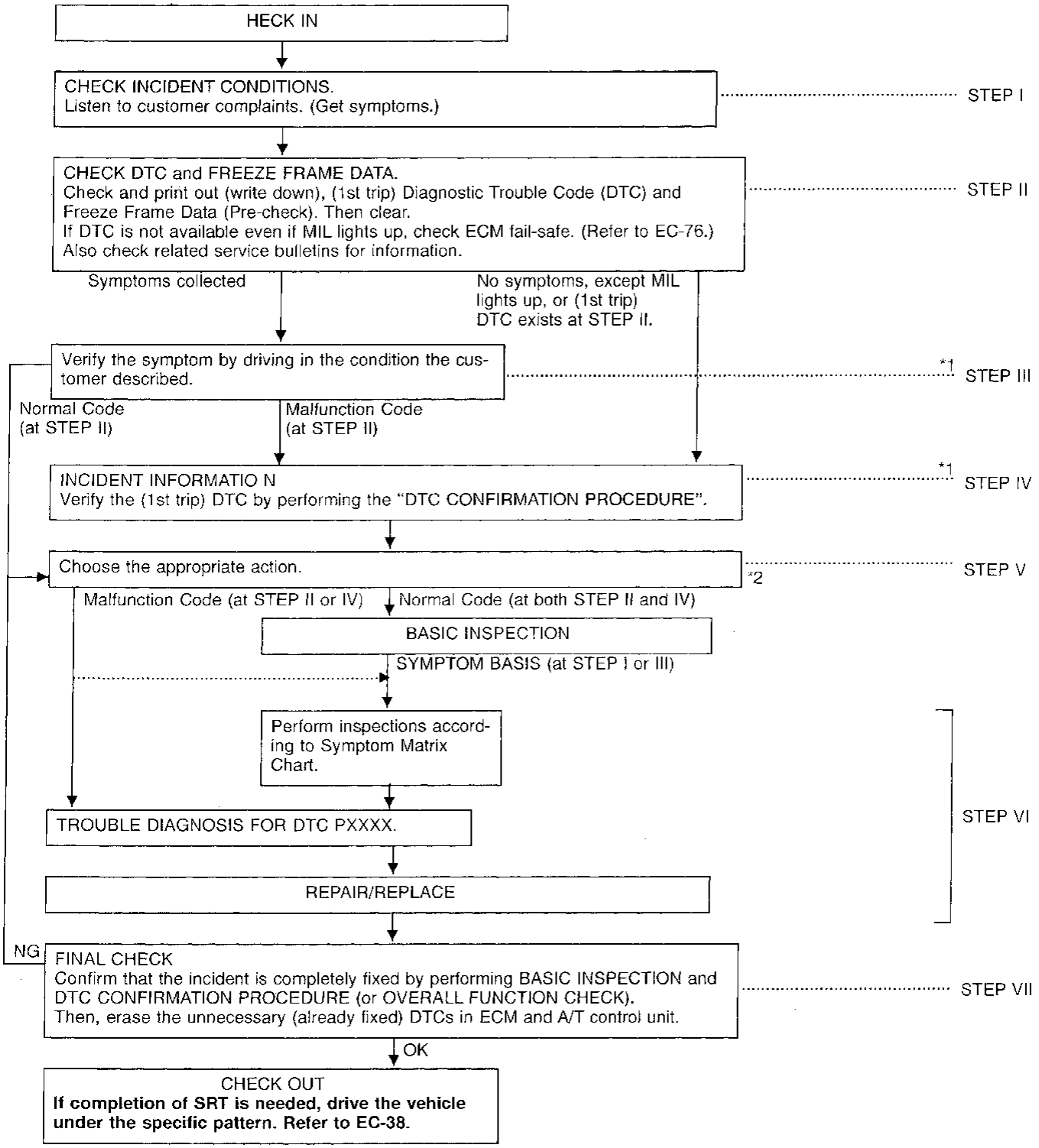
- Vehicle ran out of fuel, which caused engine misfire.
- Fuel filler cap was left off or incorrectly screwed on, allowing fuel to evaporate into the atmosphere [for models with EVAP (SMALL LEAK)] diagnosis.

Diagnostic Worksheet (Cont'd)

WORKSHEET SAMPLE

Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire. ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 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

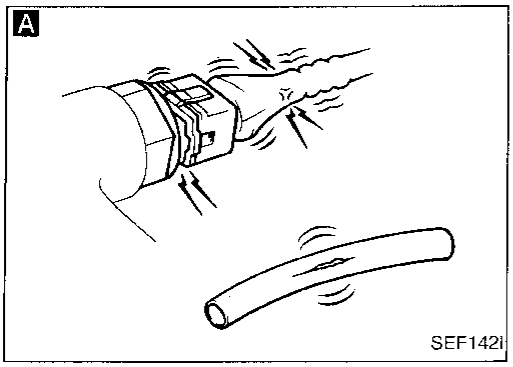


***1: If the incident cannot be duplicated, see "Incident Simulation Tests" of "HOW TO PERFORM EFFICIENT DIAGNOSIS FOR AN ELECTRICAL INCIDENT" in GI section.**

***2: If the on board diagnostic system cannot be performed, check main power supply and ground circuit (See TROUBLE DIAGNOSIS FOR POWER SUPPLY, EC-94).**

Description for Work Flow

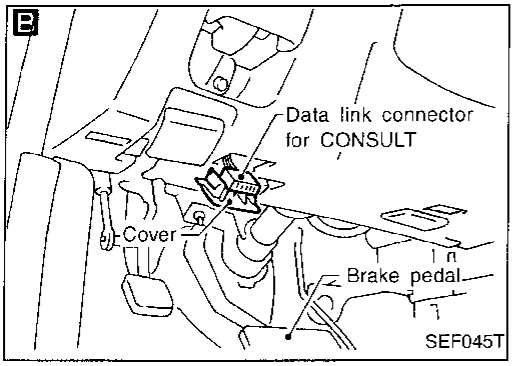
STEP	DESCRIPTION
STEP I	Get detailed information about the conditions and the environment when the incident/symptom occurred using the "DIAGNOSTIC WORK SHEET", EC-69.
STEP II	Before confirming the concern, check and write down (print out using CONSULT or Generic Scan Tool) the Diagnostic Trouble Code (DTC) and the (1st trip) freeze frame data, then erase the code and the data. (Refer to EC-45.) 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 page EC-77.) Also check related service bulletins for information.
STEP III	Try to confirm the symptom and under what conditions the incident occurs. The "DIAGNOSTIC WORK SHEET" and the freeze frame data are useful to verify the incident. Connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.) If the malfunction code is detected, skip STEP IV and perform STEP V.
STEP IV	Try to detect the (1st trip) Diagnostic Trouble Code by driving in (or performing) the "DTC CONFIRMATION PROCEDURE". Check and read the (1st trip) DTC and (1st trip) freeze frame data by using CONSULT or Generic Scan Tool. During the (1st trip) DTC verification, be sure to connect CONSULT to the vehicle in DATA MONITOR (AUTO TRIG) mode and check real time diagnosis results. If the incident cannot be verified, perform INCIDENT SIMULATION TESTS. (Refer to GI section.) In case the "DTC CONFIRMATION PROCEDURE" is not available, perform the "OVERALL FUNCTION CHECK" instead. The (1st trip) DTC cannot be displayed by this check, however, this simplified "check" is an effective alternative. The "NG" result of the "OVERALL FUNCTION CHECK" is the same as the (1st trip) DTC detection.
STEP V	Take the appropriate action based on the results of STEP I through IV. If the malfunction code is indicated, proceed to TROUBLE DIAGNOSIS FOR DTC PXXXX. If the normal code is indicated, proceed to the BASIC INSPECTION on next page. Then perform inspections according to the Symptom Matrix Chart. (Refer to EC-77.)
STEP VI	Identify where to begin diagnosis based on the relationship study between symptom and possible causes. Inspect the system for mechanical binding, loose connectors or wiring damage using (tracing) "Harness Layouts". Gently shake the related connectors, components or wiring harness with CONSULT set in "DATA MONITOR (AUTO TRIG)" mode. Check the voltage of the related ECM terminals or monitor the output data from the related sensors with CONSULT. Refer to EC-80. 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-45.)

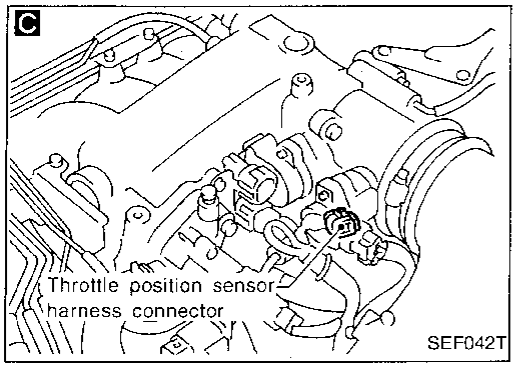


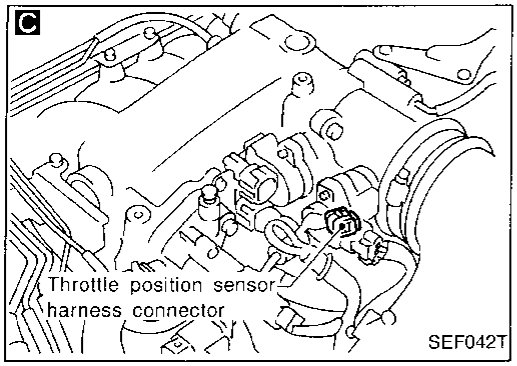
Basic Inspection

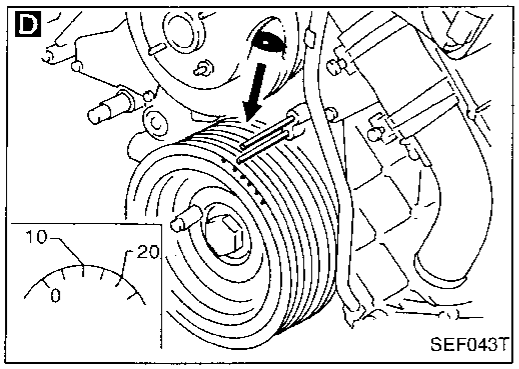
Precaution:
Perform Basic Inspection without electrical or mechanical loads applied;

- **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 recent repairs of related problems, 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 page EC-56.)

↓

Warm up engine sufficiently.

↓

C

Disconnect throttle position sensor harness connector.
When disconnecting the throttle position sensor harness connector, does the engine speed drop?

No → If engine speed does not drop, check the following.
1. Check closed throttle position idle position, refer to next page.
2. Check throttle opener operation as follows:
When the engine is running at idle speed, make sure that there is a clearance between throttle drum and the rod of throttle opener due to intake vacuum.
If NG, check vacuum hose.

Yes ↓

D

CHECK IGNITION TIMING.
Check ignition timing at idle using timing light. (Refer to EC-25.)
Ignition timing:
15°±2° BTDC

NG → Adjust ignition timing by turning camshaft position sensor.

OK ↓

D

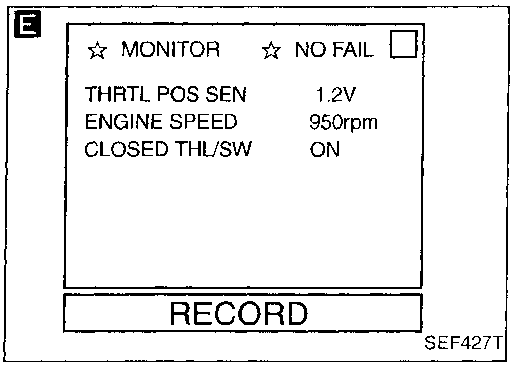
CHECK IDLE ADJ. SCREW INITIAL SET RPM.
When disconnecting throttle position sensor harness connector, does engine speed fall to the following speed?
(Refer to EC-25.)
600±50 rpm (in "N" position)

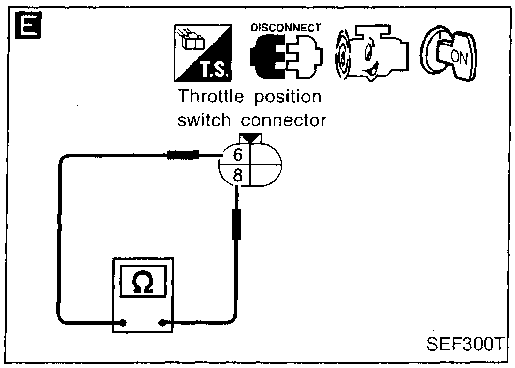
No → Adjust engine speed by turning idle adjusting screw.

Yes ↓

(Go to Ⓐ on 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:
   - Increase engine speed to 2,000 rpm
   - Gradually reduce engine speed.

   "CLOSED THL/SW" signal should turn "ON" at 825±150 rpm with transmission in N position.

NG → Adjust continuity signal by rotating throttle position sensor body

RESET IDLE POSITION MEMORY.

1. Warm up engine sufficiently and stop.
2. Select "CLSD THL/P SW" in "DATA MONITOR" mode (manual trigger) with CONSULT before stopping 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 3. and 4. until "CLSD THL/P SW" in "DATA MONITOR" mode with CONSULT changes to "ON".
7. Repeat steps 3. and 4. 20 times.

OR

1. Disconnect closed throttle position switch harness connector.
2. Check engine speed with circuit tester probing closed throttle position switch while gradually releasing accelerator pedal from 2,000 rpm.

Engine speed at the point throttle position switch OFF (No continuity) → ON (Continuity exists.):
825±150 rpm ("N" position)

OK

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

CHECK TARGET IDLE SPEED

Read the engine idle speed in "DATA MONITOR" mode with CONSULT.
650±50 rpm (in "N" position)

OR

Check idle speed.
650±50 rpm (in "N" position)

NG → Adjust idle speed. (See page EC-28.)

OK

After this inspection, unnecessary diagnostic trouble code No. might be displayed.

- Erase the stored memory in ECM and A/T control unit.
  Refer to "ON BOARD DIAGNOSTIC SYSTEM DESCRIPTION" (EC-45) and "HOW TO ERASE DTC" in AT section.
- Erase the store memory in ABS/TCS control unit. Refer to "TROUBLE DIAGNOSIS FOR ABS/TCS C/U SIGNAL", EC-306 or refer to ("TROUBLE DIAGNOSIS", HOW TO ERASE SELF-DIAGNOSTIC RESULTS") in BR section.

OK

INSPECTION END

Diagnostic Trouble Code (DTC) Inspection Priority Chart

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

Priority	Detected items (DTC)		
1	• ECM (P0605, 0301)	• Vehicle speed sensor circuit (P0500, 0104)	• Engine coolant temperature sensor circuit (P0115, 0103) (P0125, 0908)
	• Mass air flow sensor circuit (P0100, 0102)	• Intake air temperature sensor circuit (P0110, 0401)	• Ignition signal circuit (P1320, 0201)
	• Throttle position sensor circuit (P0120, 0403)	• Knock sensor circuit (P0325, 0304)	• Park/Neutral position switch circuit (P0705, 1003)
	• EGR valve & EVAP canister control solenoid valve circuit (P1400, 1005)	• Crankshaft position sensor (OBD) circuit (P0335, 0802) (P1336, 0905)	• Camshaft position sensor circuit (P0340, 0101)
	• A/T communication line (P0600, 0504)		
2	• EGR temperature sensor circuit (P1401, 0305)	• Front heated oxygen sensor's heater circuit (P0135, 0901) (P0155, 1001)	• Front heated oxygen sensor circuit (P0130, 0303) (P0150, 0503)
	• A/T related sensors, solenoid valves and switches (P0705-P0710, 1101-1208)	• Cooling fan circuit (P1900, 1308)	• Rear heated oxygen sensors circuit (P0136, 0707), (P0156, 0708)
	• Tandem throttle position sensor (P1125, 0110) • Rear heated oxygen sensor heater circuit (P0141,0902) (P0161, 1002)	• Intake valve timing control position sensor circuit (P1140, 1303), (P1145, 1304)	
3	• EGR function (P0400, 0302)	• Misfire (P0300 - P0308, 0701 - 0601)	• Fuel injection system function (P0172, 0114), (P0171, 0115), (P0175, 0209), (P0174, 0210)
	• EGRC-BPT valve function (P0402, 0306)	• Closed loop control (P0130, 0307) (P0150, 0308)	• Three way catalyst function (P0420, 0702) (P0430, 0703)
	• IACV-AAC valve circuit (P0505, 0205)	• Improper shifting (P0731 - P0734, 1103 - 1106)	• Intake valve timing control function (P1110, 0805), (P1135, 1301)
	• TCS signal circuit (P1210, 0106)	• Fuel pump control module (FPCM) circuit (P1220, 1305)	

Fail-Safe Chart

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

<table>
<tr><th colspan="2">DTC No.</th><th rowspan="2">Detected items</th><th rowspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><th>CONSULT GST</th><th>ECM*</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 4 minutes after ignition 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 amount of mass air flow and the engine speed.
Therefore, acceleration will be poor.
<table>
<tr><th></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>—</td><td>—</td><td>Secondary throttle position sensor circuit</td><td>TCS does not operate.
For details, refer to BR section ("TROUBLE DIAGNOSIS FOR TCS").</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 the fail-safe system 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 value.</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>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	OVERCOOLS	OVERCHARGING	BATTERY DEAD (UNDER CHARGE)	
New CT/CS		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	1P	1X	HA	
Fuel	Fuel pump circuit	●	●	●	○	●		○	○			○					EC-323
	Fuel pressure regulator system	●	○	○	○	○	○	●	○	○		○					EC-23
	Injector circuit	●	●	●	●	●	●	●	●			●					EC-310
	Evaporative emission system	○	○	○	○	○	○	○	○	○		○					EC-20
Air	Positive crankcase ventilation system	○	○	○	○	○	○	○	○	○		○	○				EC-22
	Incorrect idle speed adjustment	○	○				●	○	○	●		○					EC-28
	IACV-AAC valve circuit	●	●	●	●	●	●	●	●	●		●					EC-222
	IACV-FICD solenoid circuit		○				●	○	○	●							EC-327
Ignition	Incorrect ignition timing adjustment	○	○	●	●	●		●	●			●					EC-28
	Ignition circuit	●	●	●	○	●		●	○			●					EC-270
EGR	EGR & EVAP canister purge control solenoid valve circuit	●	○	○	○	○		○				○					EC-283
	EGR system	●	○	●	○	○	○	●	○	○		○					EC-203
Main power supply and ground circuit		●	○	○	○	○		●	●		○	○				○	EC-94
Cooling	Cooling fan circuit	○	○	○	○	○	○	○	○	○	●	○		●		○	EC-293
Air conditioner circuit		○	○	○	○	○	○	○	○	○		○				○	HA section

● ; High Possibility Item
○; Low Possibility Item

Symptom Matrix Chart (Cont'd)

SYSTEM — ECCS system		SYMPTOM: HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERCOOLS	OVERCHARGING	BATTERY DEAD (UNDER CHARGE)	Reference page
New CT/CS		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	1P	1X	HA	
ECCS	Camshaft position sensor circuit	●	●	●	●	●	○	○	○								EC-197
	Mass air flow sensor circuit	●	●	●	○	●	●	●	●	●		●					EC-99
	Front heated oxygen sensor circuit	●	●	●	○	●		●	○			●					EC-145, 126
	Engine coolant temperature sensor circuit	●	●	○	○	○	○	●	○	○	●	○					EC-110, 121
	Throttle position sensor circuit		●	●		●	○	●	●	○		●					EC-115
	Incorrect throttle position sensor adjustment		●	○		○	●	○	○	●		○					EC-73
	Intake valve timing control system		○	○		○		○				○					EC-238, 245
	Vehicle speed sensor circuit		○	○		○						○					EC-218
	Knock sensor circuit	●	○	●	●	●	○	●				○					EC-189
	ECM	○	○	○	○	○	○	○	○	○	○	○					EC-231, 76
	Start signal circuit	○															EC-321
	Park/Neutral position switch circuit			○		○		○	○			○					EC-233
	FPCM	●	●	●		●		●									EC-264
	Power steering oil pressure switch circuit		○					○	○								EC-327

● ; High Possibility Item
○; Low Possibility Item

Symptom Matrix Chart (Cont'd)

SYSTEM — Engine mechanical & other		SYMPTOM															Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	OVERCOOLS	OVERCHARGING	BATTERY DEAD (UNDER CHARGE)	
New CT/CS		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	1P	1X	HA	
Fuel	Fuel tank	○	○														
	Fuel piping	●	○	○	○	●		○	○			○					
	Vapor lock		○														
	Valve deposit	○	○	○	○	○		○	○			○					
	Poor fuel (Heavy weight gasoline, Low octane)	○	○	○	○	○		○	○			○					—
Air	Air duct	○	○	○		○		○	○			○					
	Air cleaner		○	●		○		○	○			○					
	Air leakage from air duct (Mass air flow sensor — throttle body)	○	○	○	○	○	○	○	○	○		○					
	Throttle body, Throttle wire	●	●	●	●	●	●	●	○	○		○					FE section
	Air leakage from intake manifold/ Collector/Gasket	●	●	●	○	●	○	○	●	○		●					—
Cranking	Battery	○	○	○		○		○	○			○			○	○	
	Alternator circuit	○	○	○		○		○	○			○			○	○	EL section
	Starter circuit	●		○													
	Drive plate	○															—
	Inhibitor switch	●															AT section
	Theft warning circuit	○															EL section
Engine	Cylinder head	●	○	○	○	○		○	○			○					
	Cylinder head gasket	○	○	○	○	○		○	○		○	○	○				
	Cylinder block	●	●	○	○	○		○	○			○	○				
	Piston	●	○	○	○	○		○	○			○	○				
	Piston ring	○	○	○	○	○		○	○			○	○				
	Connecting rod	○	○	○	○	○		○	○			○					
	Bearing	●	●	○	○	○		○	○			○					
	Crankshaft	○	○	○	○	●		○	○			○	●				
Valve mechanism	Timing chain	●	●	●	●	●		●	●			○	○				
	Camshaft	○	○	○	○	●		●	●			○					
	Intake valve	●	○	○	○	●		●	○			○	○				
	Exhaust valve	●	●	○	○	○		●	○			○	○				—
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	●	●	●	●	○		●	●			○					
	Three way catalytic converter	○	○	○	○	○		○	○			○					
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 components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the crankshaft position sensor (POS) and other ignition timing related sensors.
- If the real-time diagnosis results are NG and the on board diagnostic system results are OK when diagnosing the mass air flow sensor, first check to see if the fuel pump control circuit is normal.

MONITOR ITEM	CONDITION		SPECIFICATION
CMPS-RPM (POS)	• 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
		2,500 rpm	Approx. 2.1V
COOLAN TEMP/S	• Engine: After warming up		More than 82°C (180°F)
FR O2 SEN-B1 FR O2 SEN-B2	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1 FR O2 MNTR-B2			LEAN ↔ RICH Changes more than 5 times during 10 seconds.
RR O2 SEN-B1 RR O2 SEN-B2	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
RR O2 MNTR-B1 RR O2 MNTR-B2			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	0.35 - 0.65V
		Throttle valve: fully opened	Approx. 4.0V
THRTL/P SEN2	• Ignition switch: ON (Engine stopped)	Throttle valve: fully closed	0.60 - 1.15V
		Throttle valve: fully open	4.3 - 4.7V
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
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON
AMB TEMP SW	• Engine: Running	Ambient air temperature more than 23.5°C	ON
		Ambient air temperature less than 20.5°C	OFF
LOAD SIGNAL	• Engine: Running	Rear window defogger or headlamp "ON"	ON
		Except above	OFF
A/C PRESS SW	• Engine: Running	A/C pressure is more than 1,422 - 1,618 kPa (14.5 - 16.5 kg/cm^2, 206 - 235 psi)	ON
		A/C pressure is less than 1,128 - 1,422 kPa (11.5 - 14.5 kg/cm^2, 164 - 206 psi)	OFF

Note: B1 indicates Left bank, B2 indicates Right bank.

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

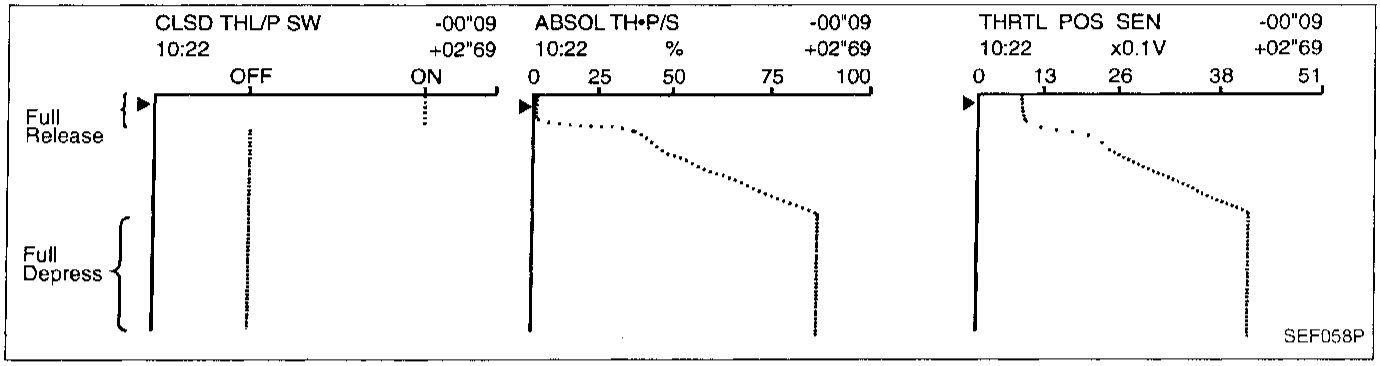
MONITOR ITEM	CONDITION		SPECIFICATION
IGNITION SW	• Ignition switch: ON → OFF		ON → OFF
INJ PULSE-B1	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	2.4 - 3.2 msec.
INJ PULSE-B2		2,000 rpm	1.9 - 2.8 msec.
B/FUEL SCHDL	ditto	Idle	1.0 - 1.6 msec
		2,000 rpm	2.5 - 3.5 msec
IGN TIMING	ditto	Idle	15° BTDC
		2,000 rpm	More than 25° BTDC
IACV-AAC/V	ditto	Idle	20 - 10 step
		2,000 rpm	—
A/F ALPHA-B1 A/F ALPHA-B2	• 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 1 second) • Engine running and cranking		ON
	Except as shown above		OFF
INT/V SOL-B1	• Engine is running • Engine speed is more than 1,100 rpm • Quickly depressed accelerator pedal. • Vehicle speed is more than 4 km/h (2 MPH)		OFF → ON
INT/V SOL-B2			except above OFF
INT/V TIM-B1	• Engine is running • Engine speed is more than 1,100 rpm • Quickly depressed accelerator pedal. • Vehicle speed is more than 4 km/h (2 MPH)	Intake valve timing control solenoid is "ON"	75 deg - 80 deg
INT/V TIM-B2		Intake valve timing control solenoid is "OFF"	95 deg - 100 deg
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) at vehicle speed less than 80 km/h (50 MPH)	HIGH
		Engine coolant temperature is 105°C (221°F) or more	HIGH
EGRC SOL/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		Racing up to 1,500 - 2,000 rpm	OFF
O2 SEN HTR-B1	• Engine speed: Idle		ON
O2 SEN HTR-B2	• Engine speed: Above 3,200 or 3,600 rpm		OFF
CAL/LD VALUE	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	13.0 - 32%
		2,500 rpm	13.0 - 25.5%
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	3.0 - 6.0 g·m/s
		2,500 rpm	12.9 - 25.3 g·m/s
FPCM	• Within 16 seconds after starting engine, when engine coolant temperature is more than 100°C (212°F)		HIGH → LOW
FPCM F/P VOLT	• Within 16 seconds after starting engine, when engine coolant temperature is more than 100°C (212°F)		Approx. 5V → Approx. 0.4V

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.)

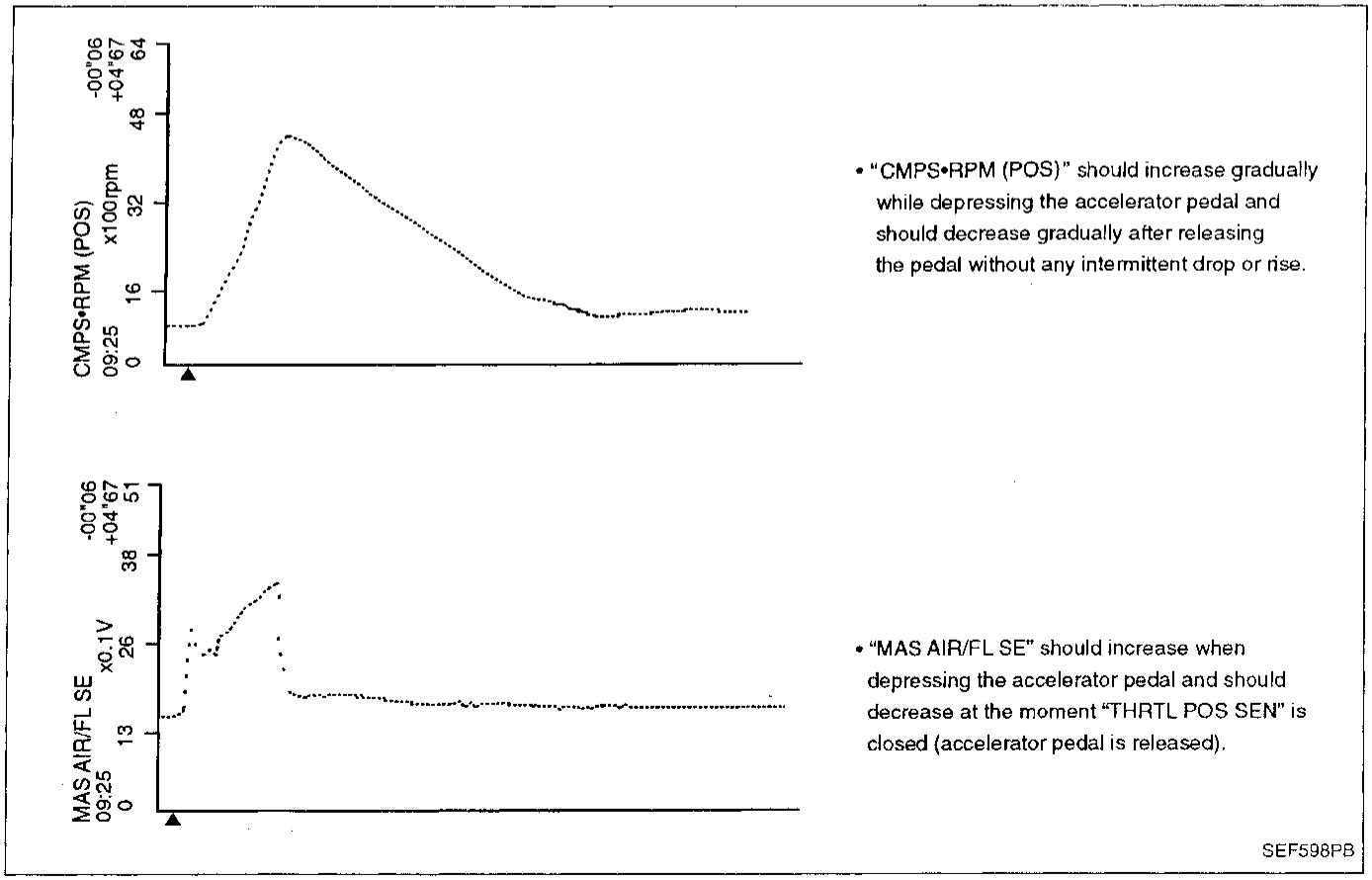
THRTL POS SEN, ABSOL TH·P/S, CLSD THL/P SW

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".

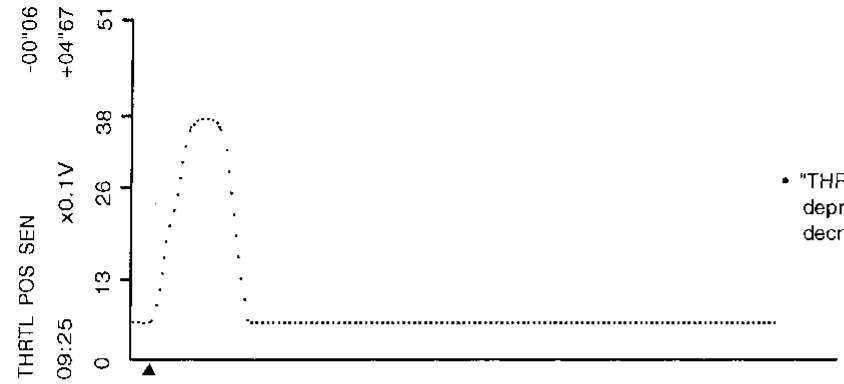


CMPS·RPM (POS), MAS AIR/FL SE, THRTL POS SEN, RR O2 SENSOR, FR O2 SENSOR, INJ PULSE

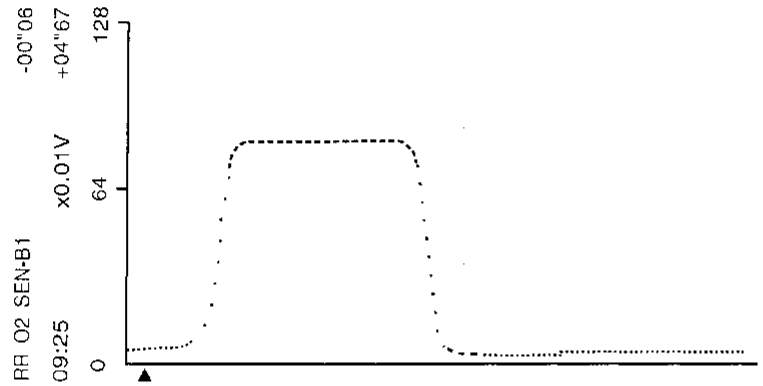
Below is the data for "CMPS·RPM (POS)", "MAS AIR/FL SE", "THRTL POS SEN", "RR O2 SENSOR", "FR O2 SENSOR" and "INJ PULSE" when revving engine quickly up to 4,800 rpm under no load after warming up engine sufficiently.
Each value is for reference, the exact value may vary.



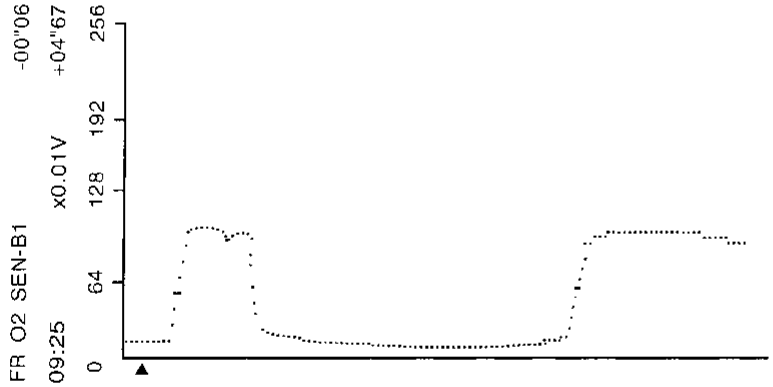
Major Sensor Reference Graph in Data Monitor Mode (Cont'd)



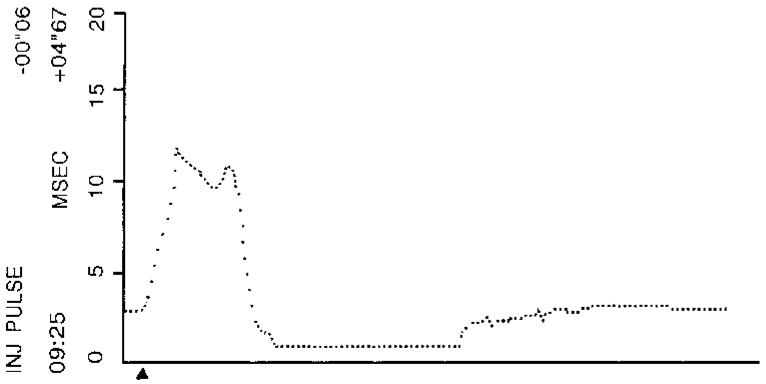
• "THRTL POS SEN" should increase while depressing the accelerator pedel and should decrease while releasing it.



• "RR O2 SEN-B1" may increase immediately after depressing the accelerator pedel and may decrease after releasing the pedal.

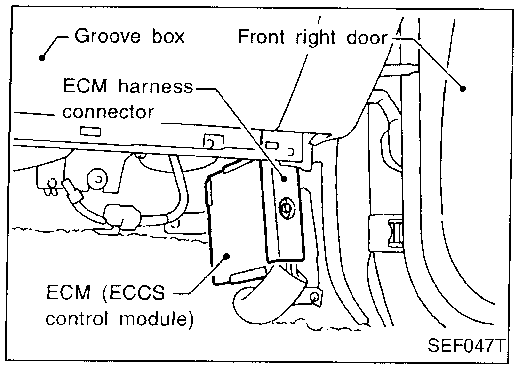


• "FR O2 SEN-B1" may increase immediately after depressing the accelerator pedel and may decrease after releasing the pedal.



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

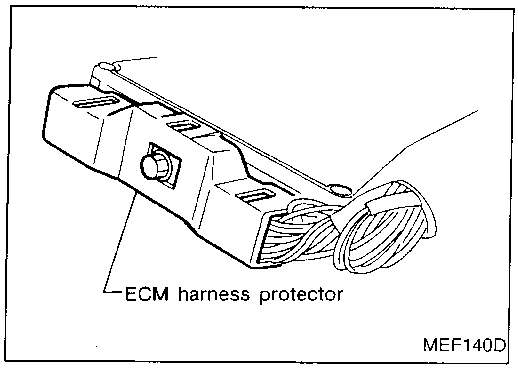
SEF323R



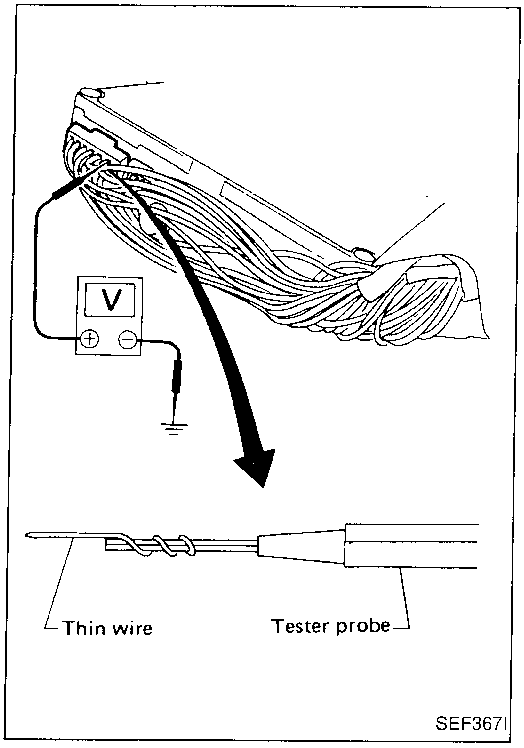
ECM Terminals and Reference Value

PREPARATION

1. ECM is located behind right side front pillar lower garnish. For this inspection, remove the glove box.

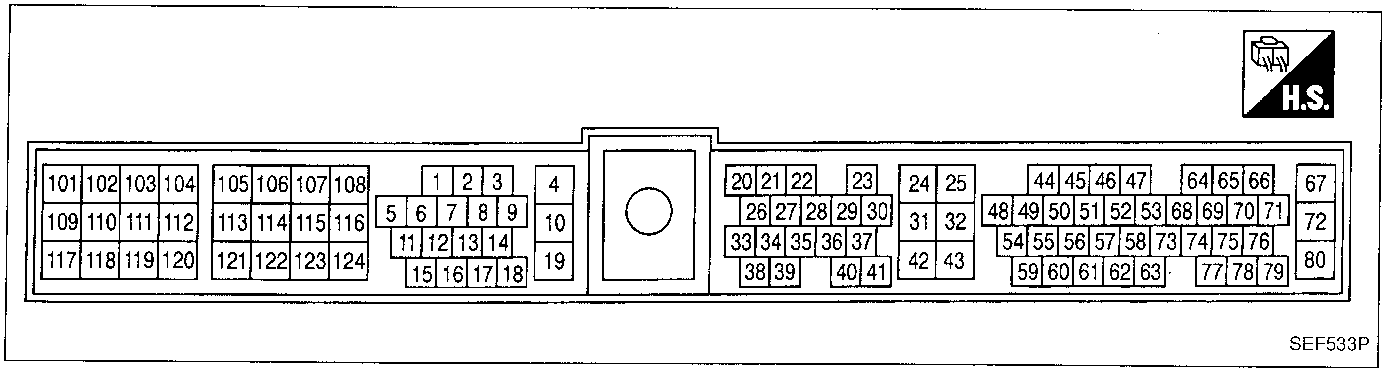


2. Remove ECM harness protector.



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

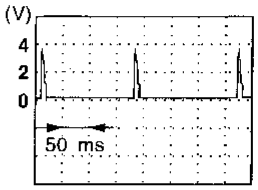
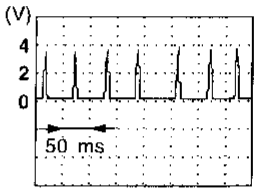
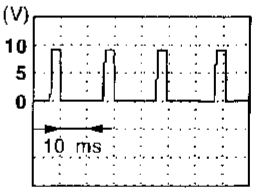
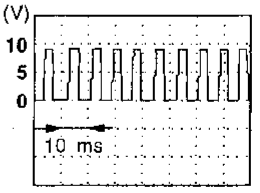
ECM HARNESS CONNECTOR TERMINAL LAYOUT



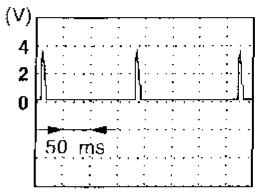
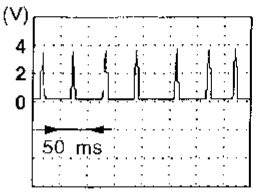
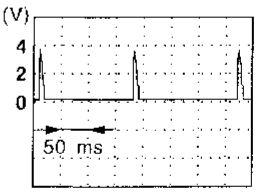
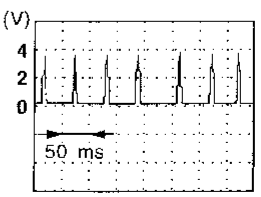
ECM Terminals and Reference Value (Cont'd)

ECM INSPECTION TABLE

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1 2 3	Y/R G/R L/R	Ignition signal (No. 1) Ignition signal (No. 8) Ignition signal (No. 7)	Engine is running. └ Idle speed	Approximately 0.38V  SEF538T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.55V  SEF539T
4	W/B	ECCS relay (Self-shutoff)	Engine is running. Ignition switch "OFF" └ For a few seconds after turning ignition switch "OFF"	0 - 1V
			Ignition switch "OFF" └ A few seconds passed after turning ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
5	W/G	Tachometer	Engine is running. └ Idle speed	Approximately 7V  SEF540T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0 - 14V  SEF541T
6	GY/L	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 14V

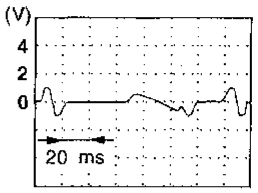
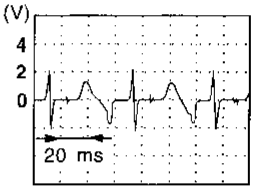
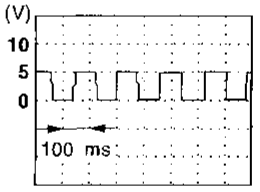
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
7 8 9	GY PU/W GY/R	Ignition signal (No. 3) Ignition signal (No. 6) Ignition signal (No. 5)	Engine is running. └ Idle speed	Approximately 0.38V  SEF538T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.55V  SEF539T
10	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
11	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 second after turning ignition switch "ON" Engine is running.	0 - 1V
			Ignition switch "ON" └ 5 second after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
12	B/R	Air conditioner relay	Engine is running. └ Both air conditioner switch and blower switch are "ON".	0 - 1V
			Engine is running. └ Air conditioner switch is "OFF".	BATTERY VOLTAGE (11 - 14V)
13 14	W/R R/L	Ignition signal (No. 4) Ignition signal (No. 6)	Engine is running. └ Idle speed	Approximately 0.38V  SEF538T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.55V  SEF539T

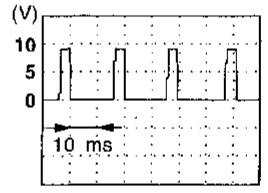
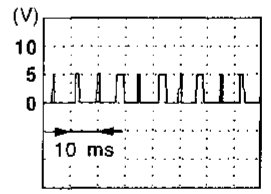
ECM Terminals and Reference Value (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
15	R/L	Fuel pump control module	Engine is cranking.	Approximately 0.4V
			Engine is running. └ Idle speed	Approximately 10V
17	GY/L	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 14V
18	PU/W	Malfunction indicator lamp	Ignition switch "ON"	Approximately 0.1V
			Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
19	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
20	SB	Start signal	Ignition switch "ON"	Approximately 0V
			Ignition switch "START"	BATTERY VOLTAGE (11 - 14V)
21	G/B	Air conditioner pressure switch	Engine is running. └ At idle speed	Approximately 5V
22	G/OR	Inhibitor switch	Ignition switch "ON" └ Gear position is "N" or "P".	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V
23	G	Throttle position sensor	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
24	W/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
25	B	ECCS ground	Engine is running. └ Idle speed	Engine ground

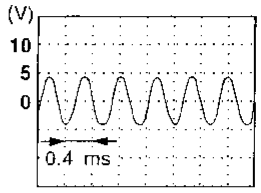
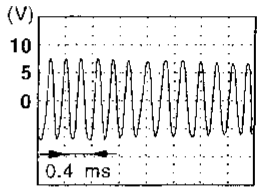
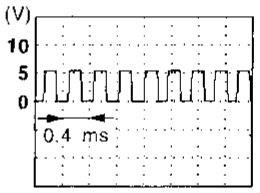
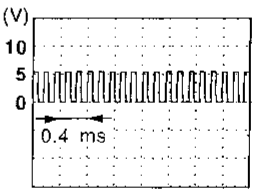
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
26 27	R/L L/W	Intake valve timing control position sensor (right bank) Intake valve timing control position sensor (left bank)	Engine is running. └ Idle speed	Approximately 0V  SEF551T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0V  SEF552T
28	L/W	Headlamp switch	Engine is running. └ Headlamp switch is "OFF".	0V
			Engine is running. └ Headlamp switch is "ON".	Battery voltage
29	P/L	Vehicle speed sensor	Engine is running. └ Jack up rear wheels and run engine at idle in "D" position.	Approximately 5.2V  SEF542T
30	L	Secondary throttle position sensor	Ignition switch "ON" └ Approximately 3 seconds after ignition switch "ON" and thereafter	Approximately 3.4V
			Ignition switch "ON" ├ Disconnect throttle motor harness connector. └ Fully close secondary throttle valve by hand.	Approximately 0.4V
31	R	TCS signal	Ignition switch "ON"	Approximately 5V
			Ignition switch "ON" ├ Disconnect throttle motor harness connector. └ Fully close secondary throttle valve by hand.	Approximately 0V
32	B	ECCS ground	Engine is running. └ Idle speed	Engine ground

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
33 34	LG LG/R	Cooling fan relay-1 Cooling fan relay-2	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Cooling fan is operating.	0 - 1V
37	L/W	Throttle position sensor signal	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	Approximately 0.4V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 3V
39	G	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0 - 1.5V
			Engine is running. └ Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)
42	BR/W	Sensor's power supply	Ignition switch "ON"	Approximately 5V
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V
44 48	P	Crankshaft position sensor (REF)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.6 - 1.0V  SEF540T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0.8 - 0.9V  SEF544T

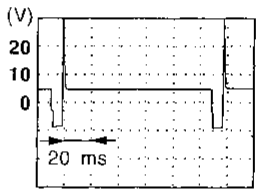
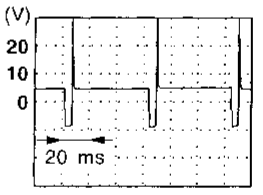
ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
47	B/R	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.7V  SEF545T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0V  SEF546T
49	L	Camshaft position sensor (POS)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.5V  SEF547T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 2.4V  SEF548T
50 51	R W	Front heated oxygen sensor (Right bank) Front heated oxygen sensor (Left bank)	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V (periodically change)
54	W	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.0 - 1.4V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	Approximately 2.1V
55	B	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56 57	W Y	Rear heated oxygen sensor (RH) Rear heated oxygen sensor (LH)	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V
59	Y/B	Engine coolant temperature sensor	Engine is running.	0 - 4.8V Output voltage varies with engine coolant temperature.
60	L/R	Ambient air temperature switch	Engine is running. └ Ambient air temperature is more than 23.5°C (74°C)	Approximately 5V
			Engine is running. └ Ambient air temperature is less than 20.5°C (69°F)	0V
61	G/R	Intake air temperature sensor	Engine is running.	0 - 4.8V Output voltage varies with intake air temperature.
62	BR/Y	Fuel pump control	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON".	Approximately 0.8V
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON" and thereafter	BATTERY VOLTAGE (11 - 14V)
			Engine is running. └ Idle speed	Approximately 0.9V
63	W	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 - 1.0V
64 68	W W	Knock sensor (RH) Knock sensor (LH)	Engine is running. └ Idle speed	2.0 - 3.0V
66	L/R	Electrical load signal	Engine is running. ├ Rear defogger switch is "OFF". └ Headlamp switch is "OFF".	0V
			Engine is running. ├ Rear defogger switch is "ON". └ Headlamp switch is "ON".	Battery voltage
67 72	R/G	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
69	P	Data link connector for GST	Ignition switch "ON" └ GST is disconnected.	6 - 10V

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
73	R/L	A/T communication line	Engine is running. └ Idle speed	Approximately 2V
74	G/R	Fuel pump control module (FPCM) check	When cranking the engine	Approximately 0V
			After starting the engine	Approximately 5V
75	BR/Y	Data link connector for CONSULT	Engine is running. └ Idle speed └ Connect CONSULT and select DATA MONITOR mode.	Approximately 0V
76	P			Approximately 4 - 6V
78	LG			Approximately 3.5V
80	L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
101	PU	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 11V
115	G/Y			
102	R/B	Injector No. 1	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF549T
104	R/Y	Injector No. 7		
106	W/R	Injector No. 6		
109	R/W	Injector No. 8		
111	R/W	Injector No. 3		
113	PU/R	Injector No. 5	Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF550T
118	GY/L	Injector No. 4		
120	L/G	Injector No. 2		
103	L/Y	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) └ Jack up rear wheels and run engine at 2,000 rpm in "1st" position.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0 - 0.7V
105	BR/Y	Intake valve timing control solenoid valve (right bank)	Engine is running. └ Intake valve timing control solenoid is operating.	Approximately 0V
110	BR	Intake valve timing control solenoid valve (left bank)	Engine is running. └ Intake valve timing control solenoid is not operating.	Battery voltage

ECM Terminals and Reference Value (Cont'd)

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
108	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
116	B	ECCS ground	Engine is running. └ Idle speed	Engine ground
117	W/L	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)
119	L/Y	Front heated oxygen sensor heater (right bank)	Engine is running. └ Engine speed is below 3,200 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
121	G/W	Front heated oxygen sensor heater (left bank)	Engine is running. └ Engine speed is below 3,200 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)
122	Y/R	Rear heated oxygen sensor heater (Right bank)	Engine is running. └ Engine speed is below 3,600 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
123	PU	Rear heated oxygen sensor heater (left bank)	Engine is running. └ Engine speed is below 3,600 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)
124	B	ECCS ground	Engine is running. └ Idle speed	Engine ground

Main Power Supply and Ground Circuit

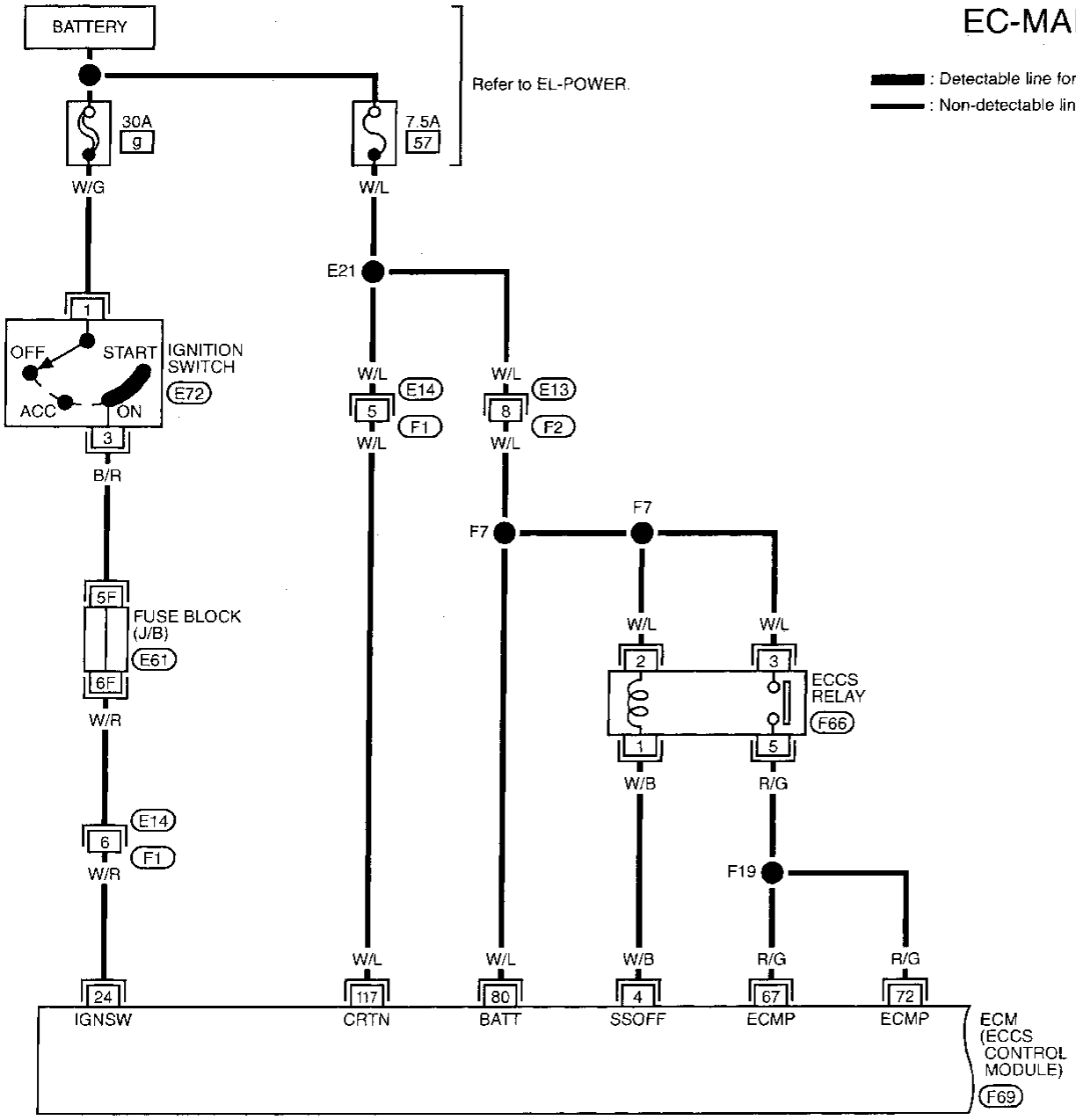
ECM TERMINALS AND REFERENCE VALUE

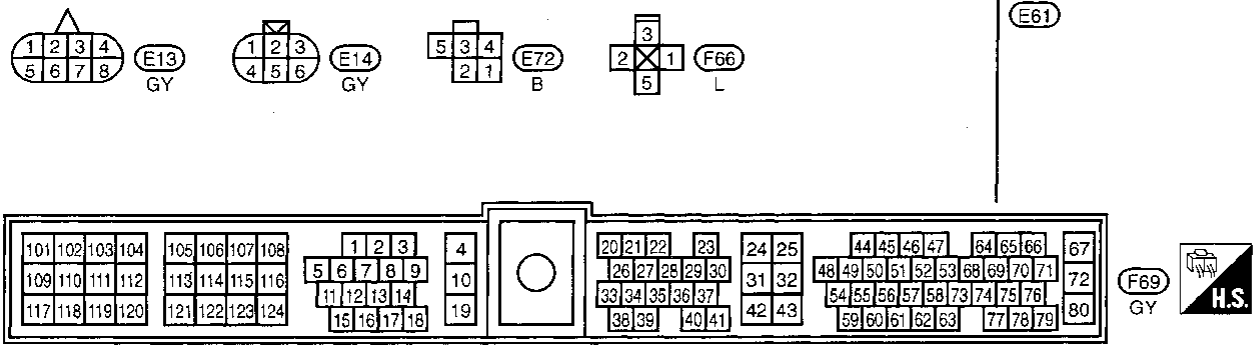
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
4	W/B	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)
24	W/R	Ignition switch	Ignition switch "OFF"	0V
			Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
67 72	R/G	Power supply for ECM	Ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)
80	L	Power supply (Back-up)	Ignition switch "OFF"	BATTERY VOLTAGE (11 - 14V)
117	W/L	Current return	Engine is running. └ Idle speed	BATTERY VOLTAGE (11 - 14V)

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-01



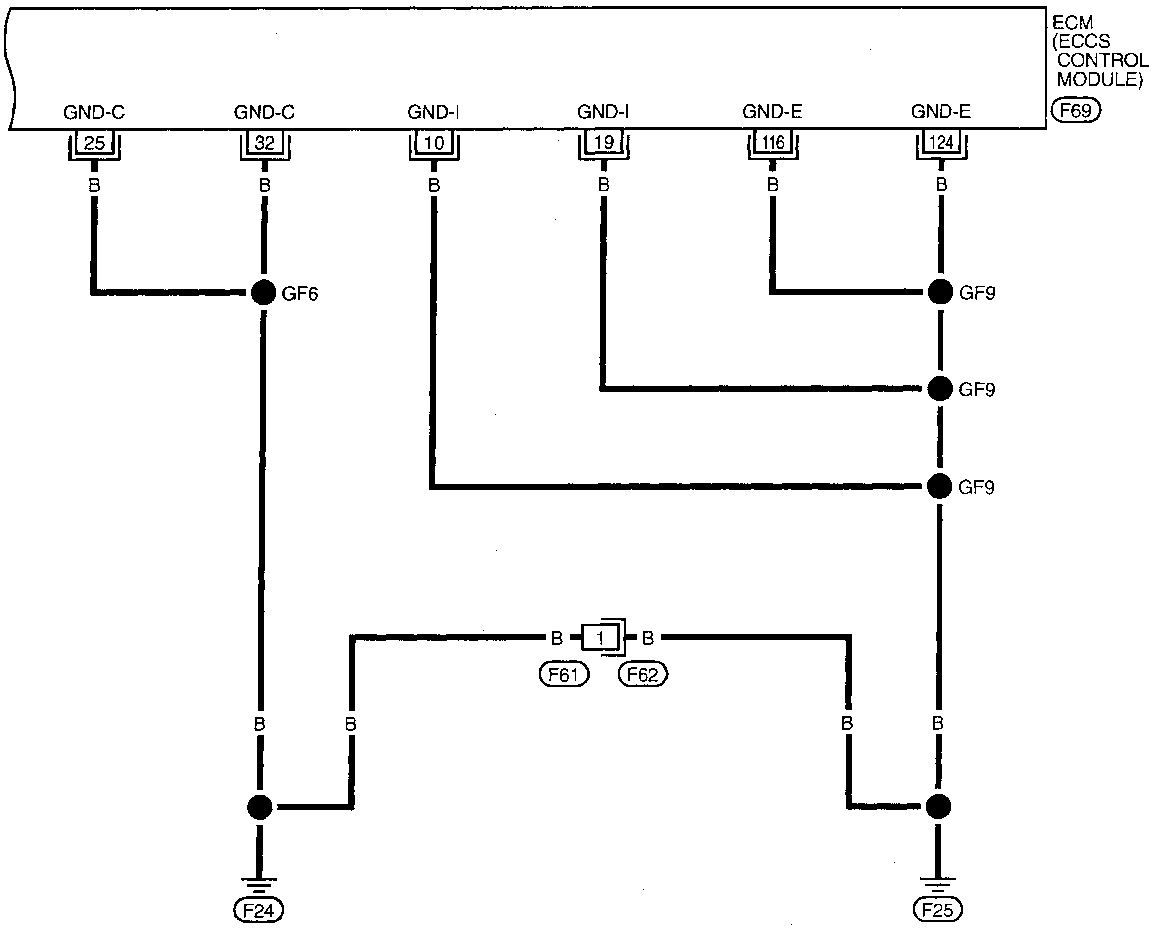


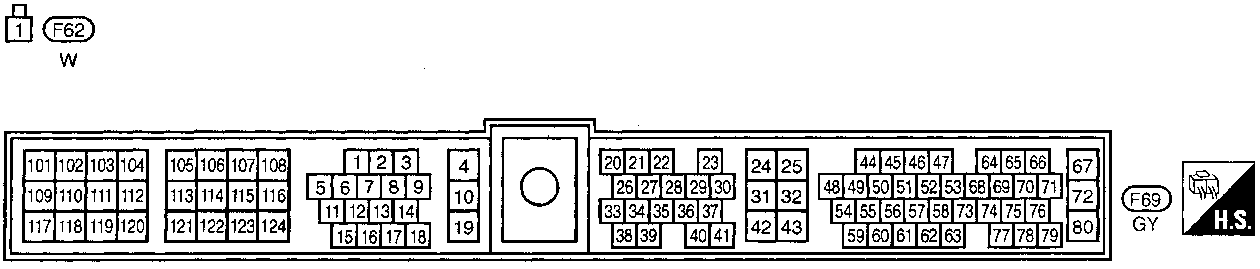
SEF866S

Main Power Supply and Ground Circuit (Cont'd)

EC-MAIN-02

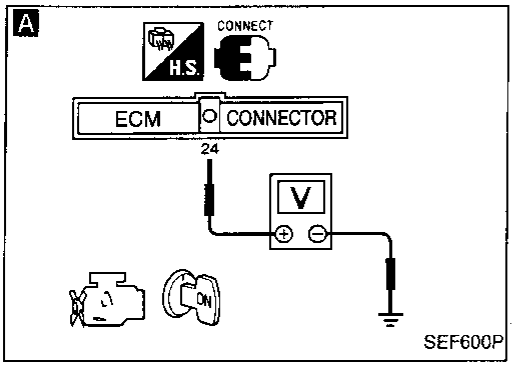
: Detectable line for DTC
: Non-detectable line for DTC

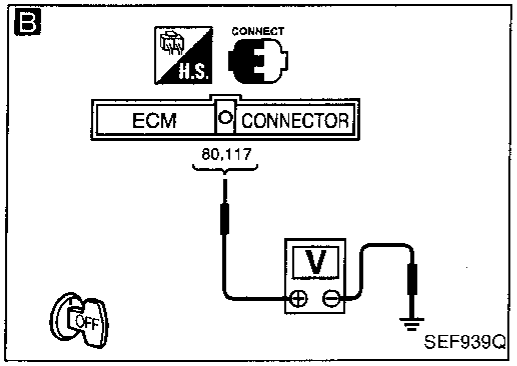


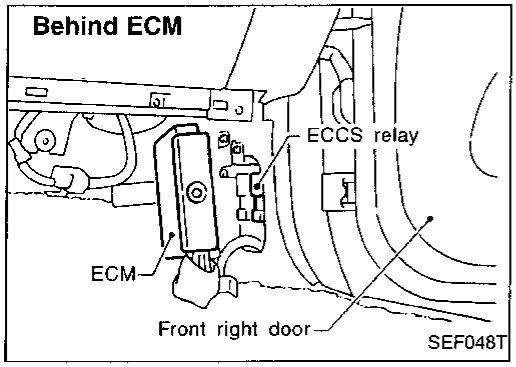


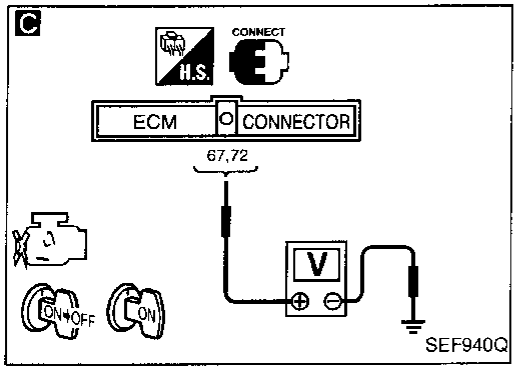
SEF867S

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 ㉔ and ground with CONSULT or tester.
   Voltage: Battery voltage

If NG, check the following.
- Harness connectors (F1), (E14)
- Harness connectors (E61) (Junction block)
- Harness for open or short between ECM and ignition switch

If NG, repair harness or connectors.

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

Yes

B

CHECK POWER SUPPLY-II.
1. Stop engine.
2. Check voltage between ECM terminals ㊽, (117) and ground with CONSULT or tester.
   Voltage: Battery voltage

NG →
Check the following.
- Harness connectors (F2), (E13)
- Harness connectors (F1), (E14)
- 7.5A 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 turn "OFF".
2. Check voltage between ECM terminals ㊼, ㊷ 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 "CHECK GROUND CIRCUIT" on next page.

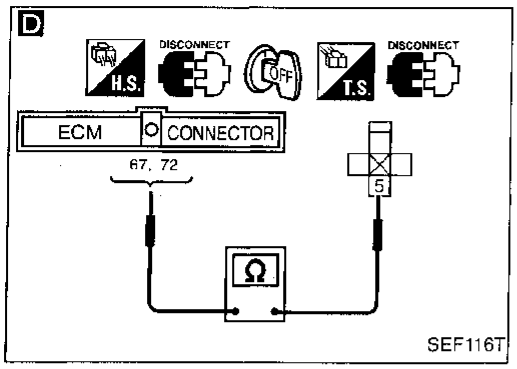
Case-1: Battery voltage does not exist.
Case-2: Battery voltage exists for more than a few seconds.

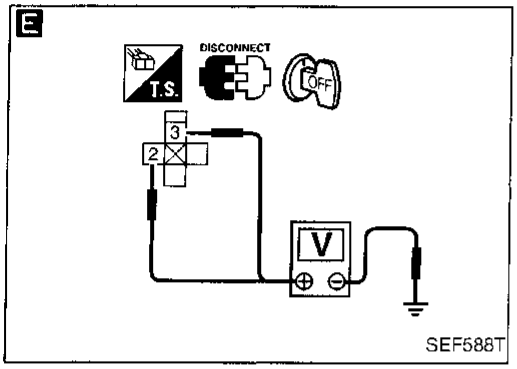
NG

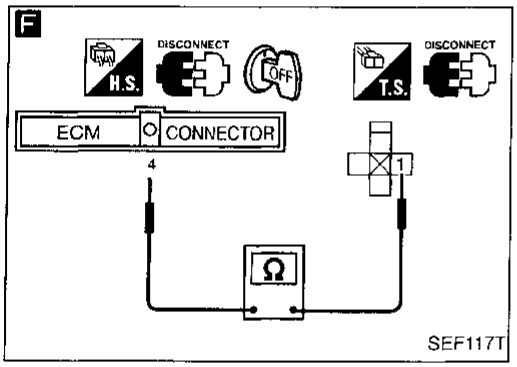
Case-1 → Go to "CHECK ECCS RELAY" on next page.

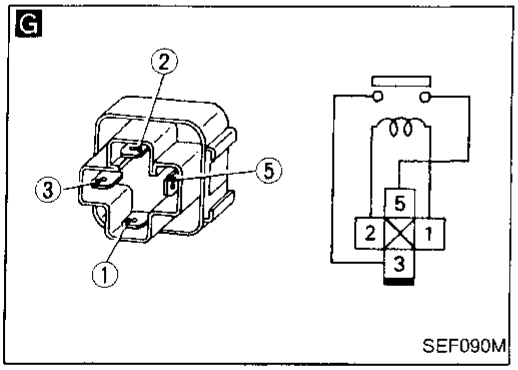
Case-2 → Ⓐ

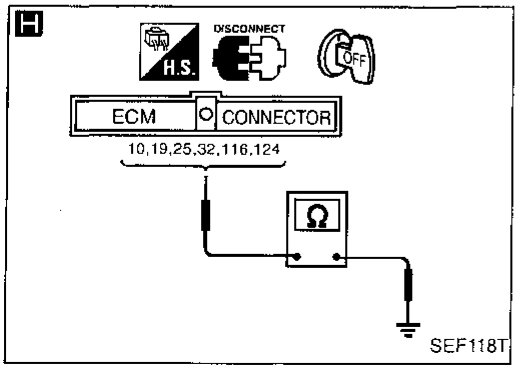
Main Power Supply and Ground Circuit (Cont'd)











Ⓐ

D

CHECK HARNESS CONTINUITY BETWEEN ECCS RELAY AND ECM.
1. Disconnect ECM harness connector.
2. Disconnect ECCS relay.
3. Check harness continuity between ECM terminals ⑥⑦, ⑦② and terminal ⑤.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

E

CHECK VOLTAGE BETWEEN ECCS RELAY AND GROUND.
1. Check voltage between terminal ②, ③ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F2), (E13)
- 7.5A fuse
- Harness for open or short between ECCS relay and battery

If NG, repair harness or connectors.

OK ↓

F

CHECK OUTPUT SIGNAL CIRCUIT.
1. 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. Loosen and retighten engine ground screws.
3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminals ⑩, ⑲, ㉕, ㉜, (116), (124) and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F61), (F62)
- Harness for open or short between engine grounds (F24) and (F25)

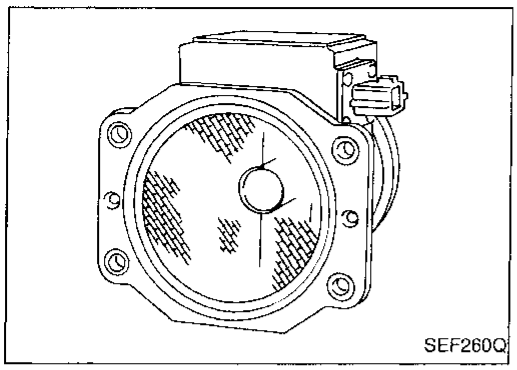
If NG, repair harness or connectors.

OK ↓

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

↓

INSPECTION END


SEF260Q

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 film that is supplied with electric current from the ECM. The temperature of the hot film is controlled by the ECM a certain amount. The heat generated by the hot film is reduced as the intake air flows around it. The more air, the greater the heat loss.

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

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS AIR/FL SE	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	1.0 - 1.7V
		2,500 rpm	Approximately 2.1V
CAL/LD VALUE	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	13.0 - 32%
		2,500 rpm	13.0 - 25.5%
MASS AIRFLOW	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	3.0 - 6.0 g·m/s
		2,500 rpm	12.9 - 25.3 g·m/s

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
54	W	Mass air flow sensor	Engine is running. (Warm-up condition) └ Idle speed	1.0 - 1.4V
			Engine is running. (Warm-up condition) └ Engine speed is 2,500 rpm.	Approximately 2.1V
55	B	Mass air flow sensor ground	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0V

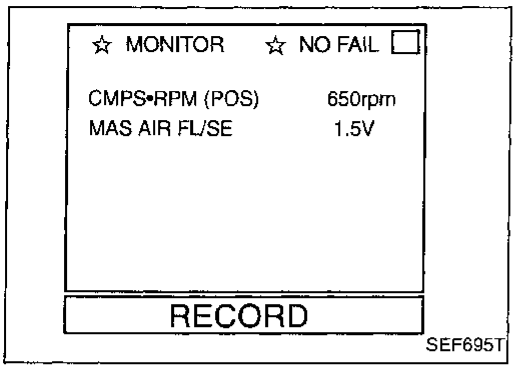
ON BOARD DIAGNOSTIC LOGIC

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

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

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

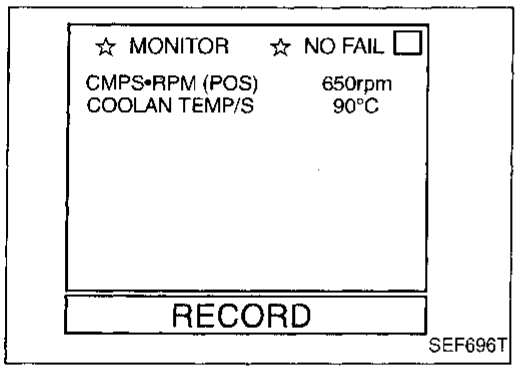
1) Turn ignition switch "ON", and wait at least 6 seconds.
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and wait at least 3 seconds.

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.



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) Wait at least 10 seconds at idle speed.

OR

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

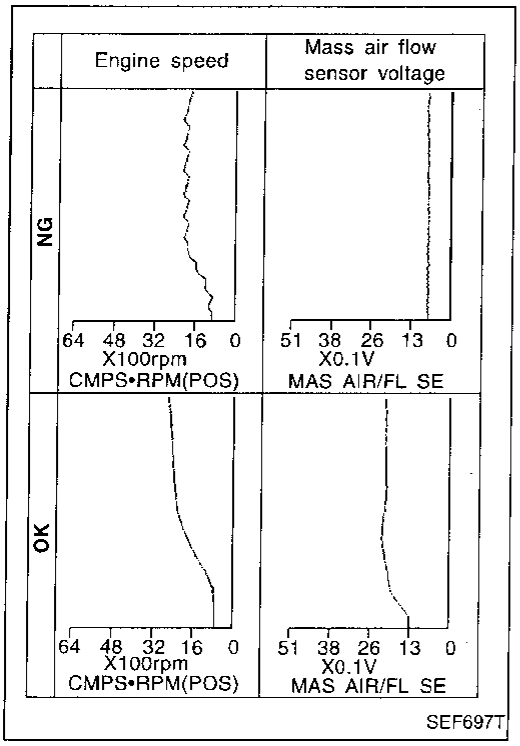
OR

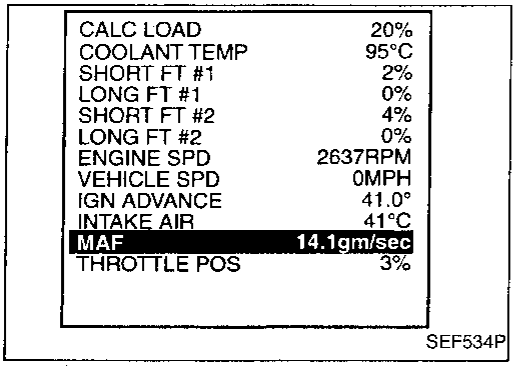
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Wait at least 10 seconds at idle speed.
4) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

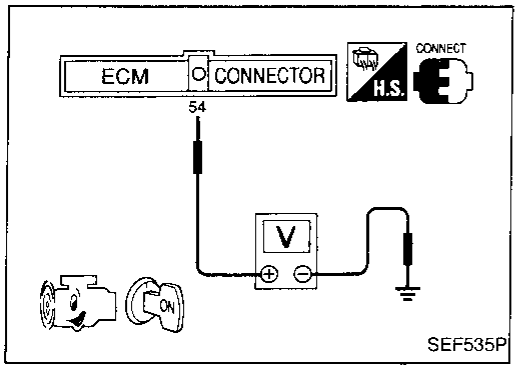
Mass Air Flow Sensor (MAFS) (Cont'd)

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) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and warm it up sufficiently.
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

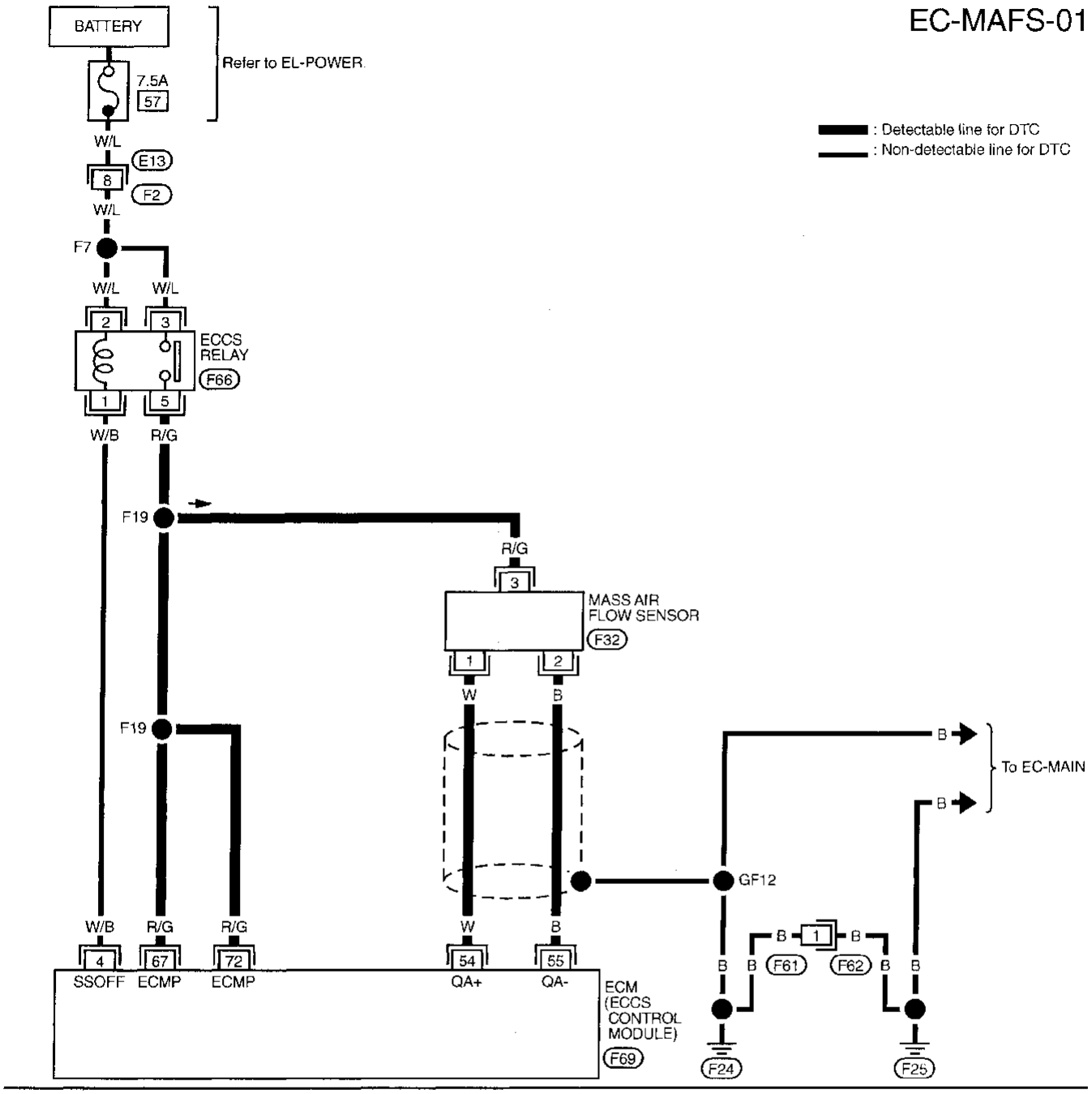
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Select "MODE 1" with GST.
4) Check the mass air flow with "MODE 1".
5) Check for linear mass air flow rise in response to increases to about 4,000 rpm in engine speed.

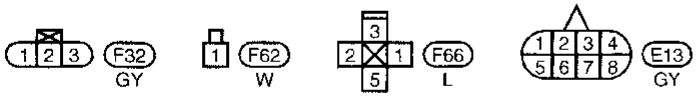
OR

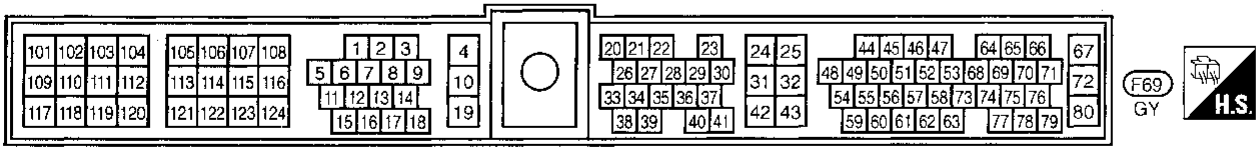
1) Turn ignition switch "ON".
2) Start engine and warm it up sufficiently.
3) Check the voltage between ECM terminal 54 and ground.
4) Check for linear voltage rise in response to increases to about 4,000 rpm in engine speed.

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

EC-MAFS-01



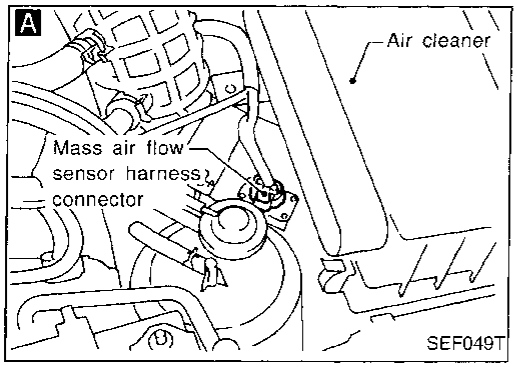


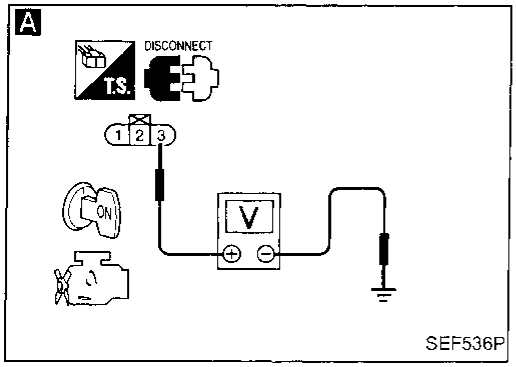


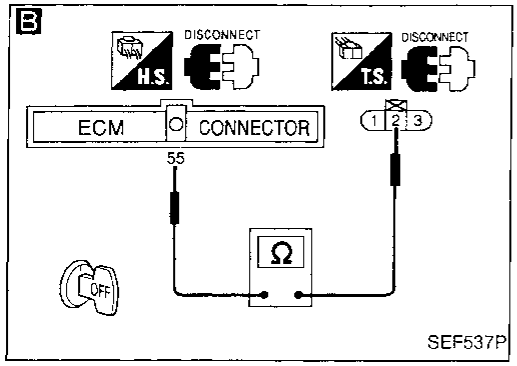
SEF868S

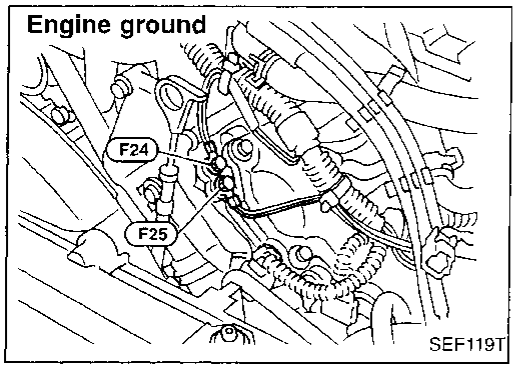
Mass Air Flow Sensor (MAFS) (Cont'd)

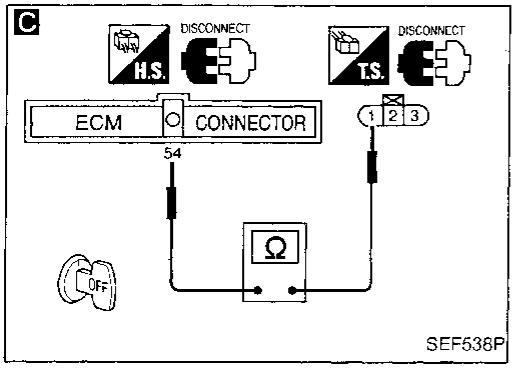
DIAGNOSTIC PROCEDURE











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 positive voltage

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

If NG, repair harness or connector.

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 ⑮.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

C

CHECK INPUT SIGNAL CIRCUIT.
Check harness continuity between terminal ① and ECM terminal ⑭.
Continuity should exist.
If OK, check harness for short.

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.

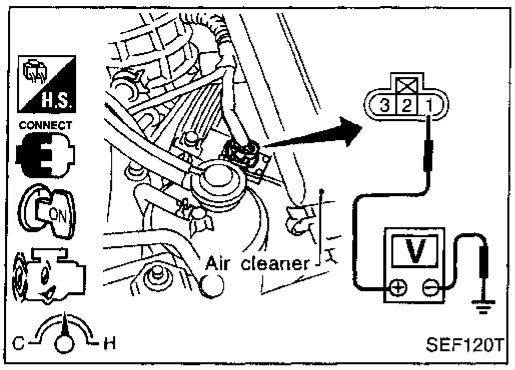
Trouble is not fixed. ↓

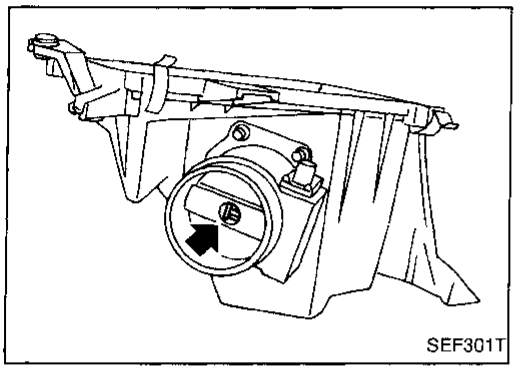
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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

COMPONENT INSPECTION





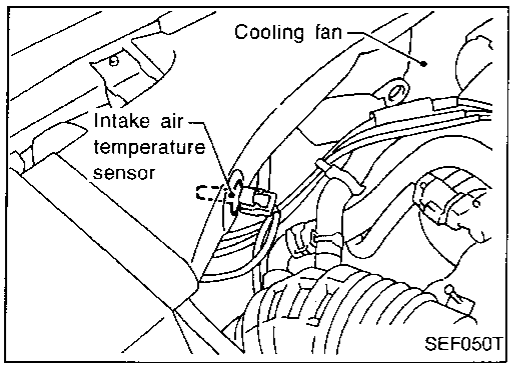
Mass air flow sensor

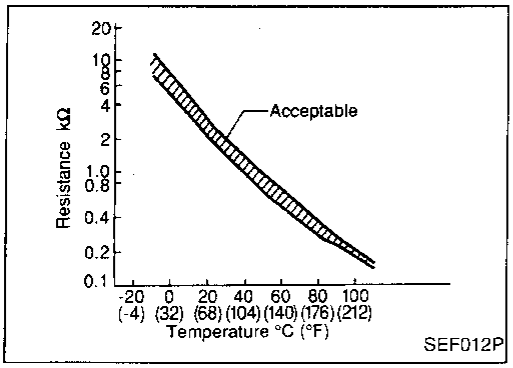
1. Turn ignition switch "ON".
2. Start engine and warm it up sufficiently.
3. Check voltage between terminal ① and ground.

Conditions	Voltage V
Ignition switch "ON" (Engine stopped.)	Less than 1.0
Idle (Engine is warmed-up sufficiently.)	1.0 - 1.7
2,500 rpm	Approximately 2.1V
Idle to about 4,000 rpm*	1.0 - 1.7 to Approx. 4.0

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

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





Intake Air Temperature Sensor

COMPONENT DESCRIPTION

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

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

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

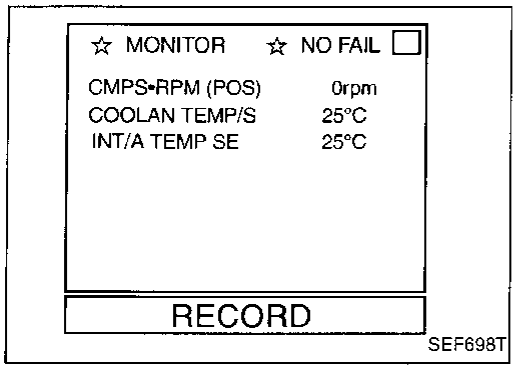
⟨Reference data⟩

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 ⑥① (Intake air temperature sensor) and ECM terminal ㉕ (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.

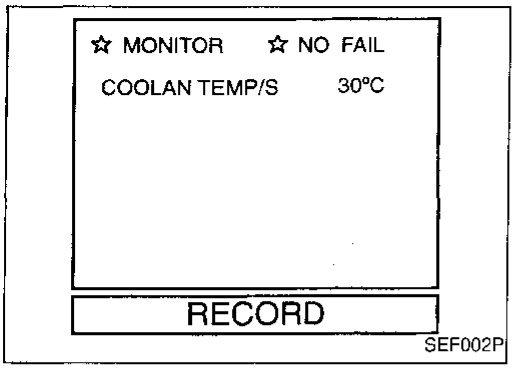
OR

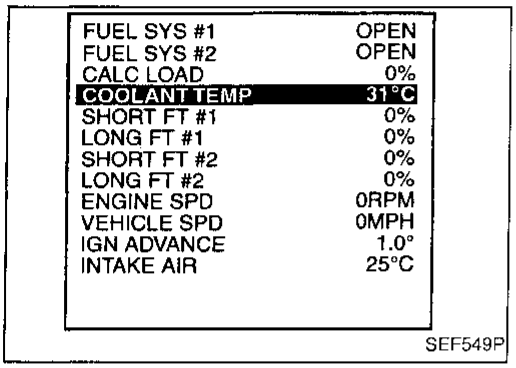
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select MODE 7 with GST.

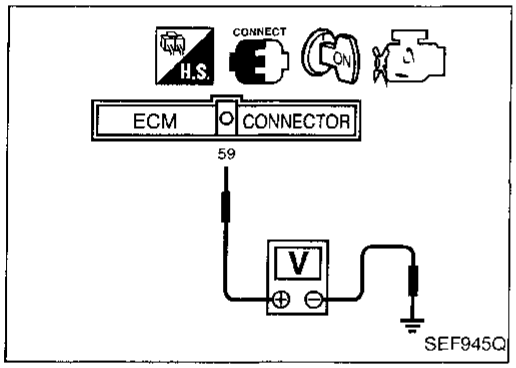
OR

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.

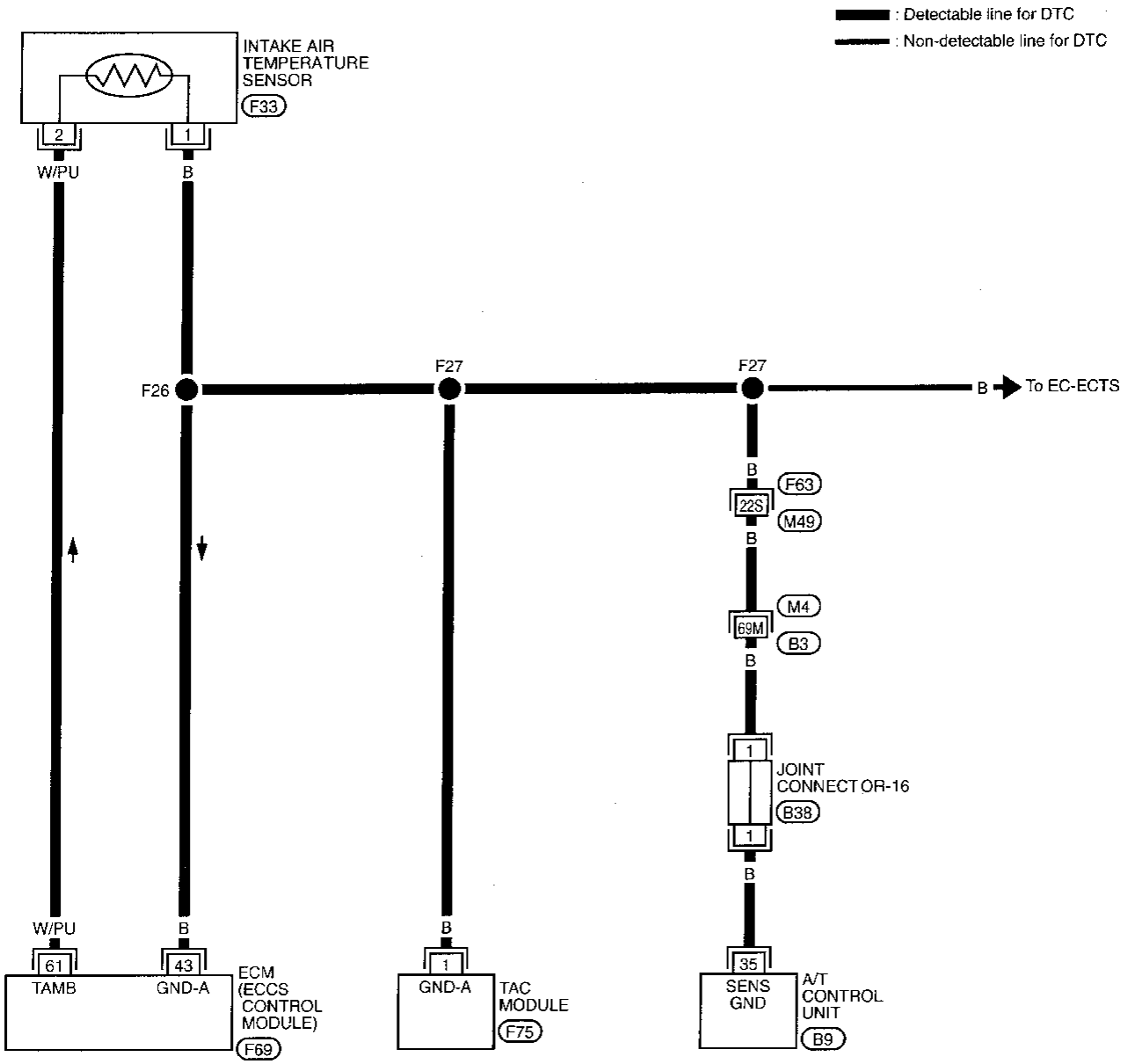
OR

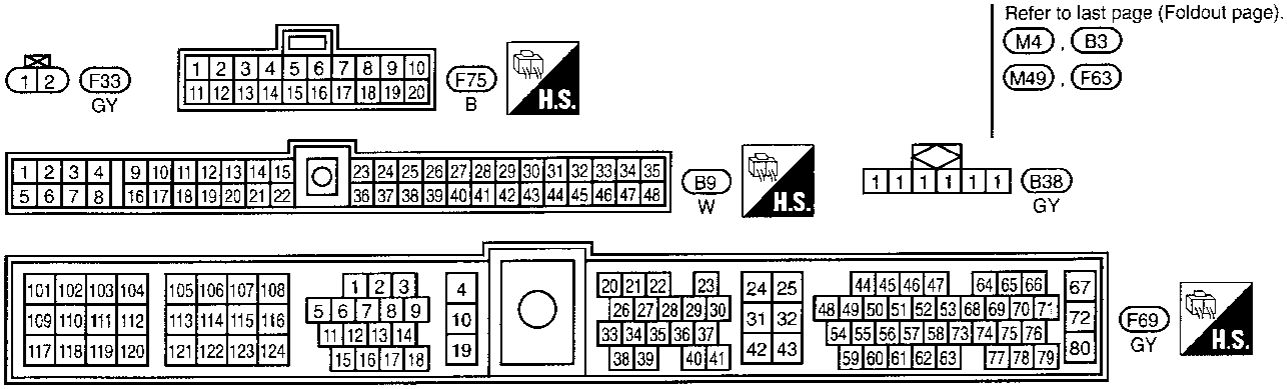
1) Lift up vehicle and open engine hood.
2) Wait until engine coolant temperature is less than 90°C (194°F).
   (a) Turn ignition switch "ON".
   (b) Check voltage between ECM terminal ⑤⑨ and ground.
   Voltage: More than 1.0 (V)
   (c) If the voltage is not more than 1.0 (V), turn ignition switch "OFF" 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



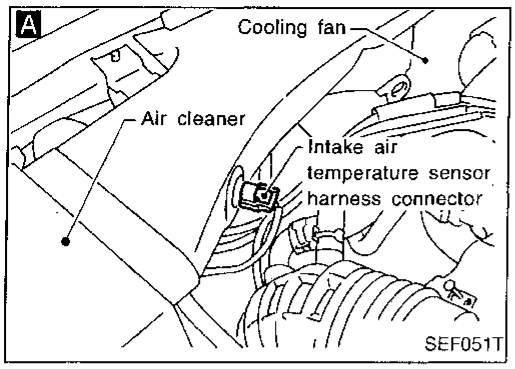


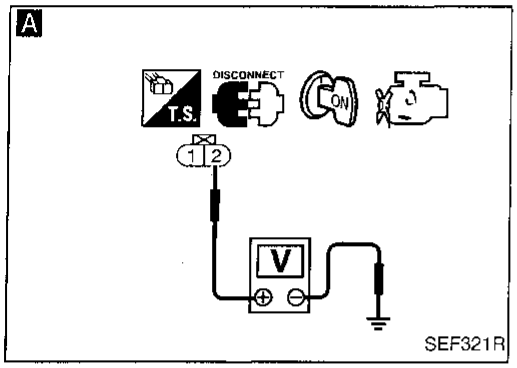
Refer to last page (Foldout page).
M4, B3
M49, F63

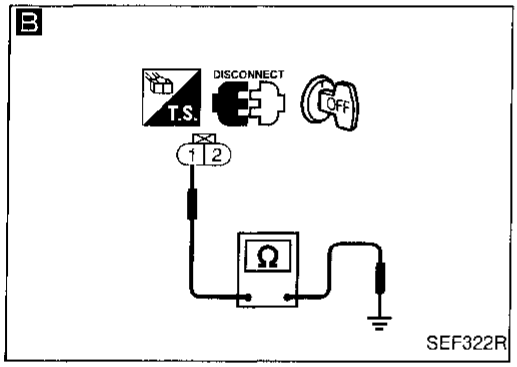
SEF869S

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 → 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 connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Joint connector-16
- Harness for open or short between ECM and intake air temperature sensor
- Harness for open or short between air temperature sensor and throttle actuator control (TAC) module
- Harness for open or short between A/T control unit and intake air temperature sensor

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.

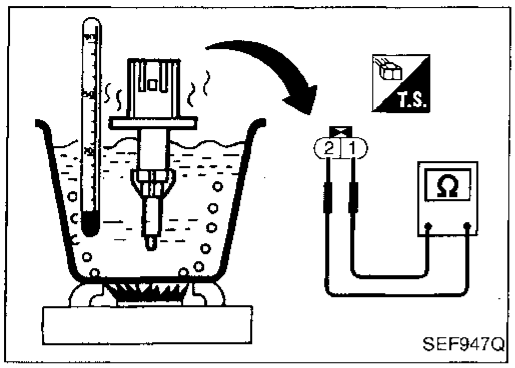
INSPECTION END

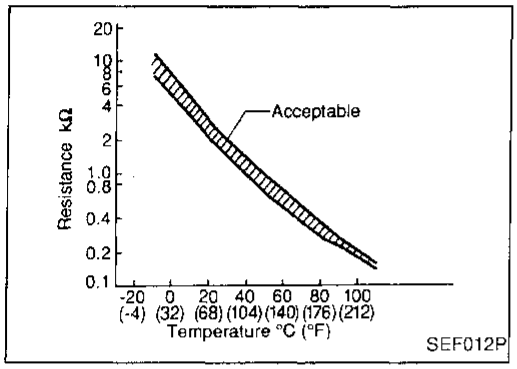
Intake Air Temperature Sensor (Cont'd)

COMPONENT INSPECTION

Intake air temperature sensor

Check resistance as shown in the figure.

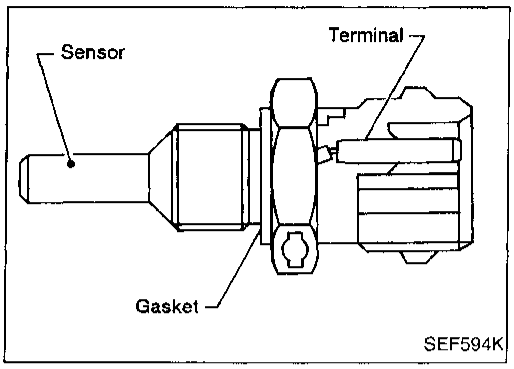




⟨Reference data⟩

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

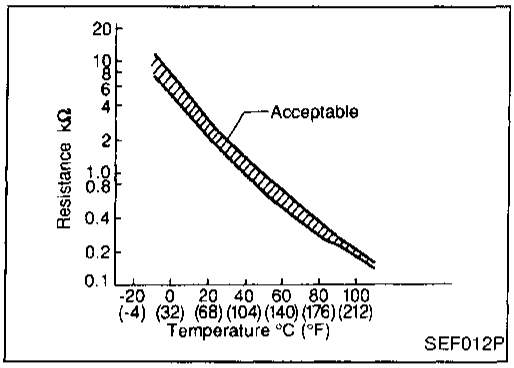
If NG, replace intake air temperature sensor.



Engine Coolant Temperature Sensor (ECTS)

COMPONENT DESCRIPTION

The engine coolant temperature sensor is located near the No. 2 injector. The 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)	1.0	0.236 - 0.260

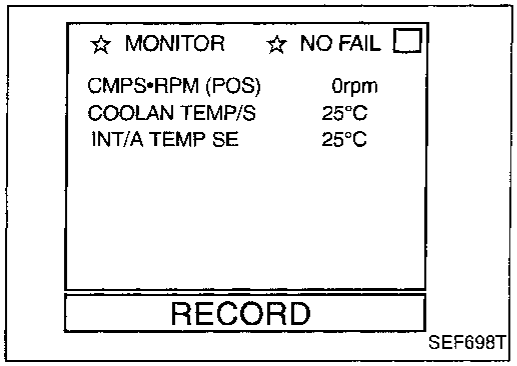
*: These data are reference values and are measured between ECM terminal ⑲ (Engine coolant temperature sensor) and ECM terminal ㉕ (ECCS ground).

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	Condition	Engine coolant temperature decided (CONSULT DISPLAY)
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.	Just as ignition switch is turned ON or Start	20°C (68°F)
	More than 4 minutes after ignition 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

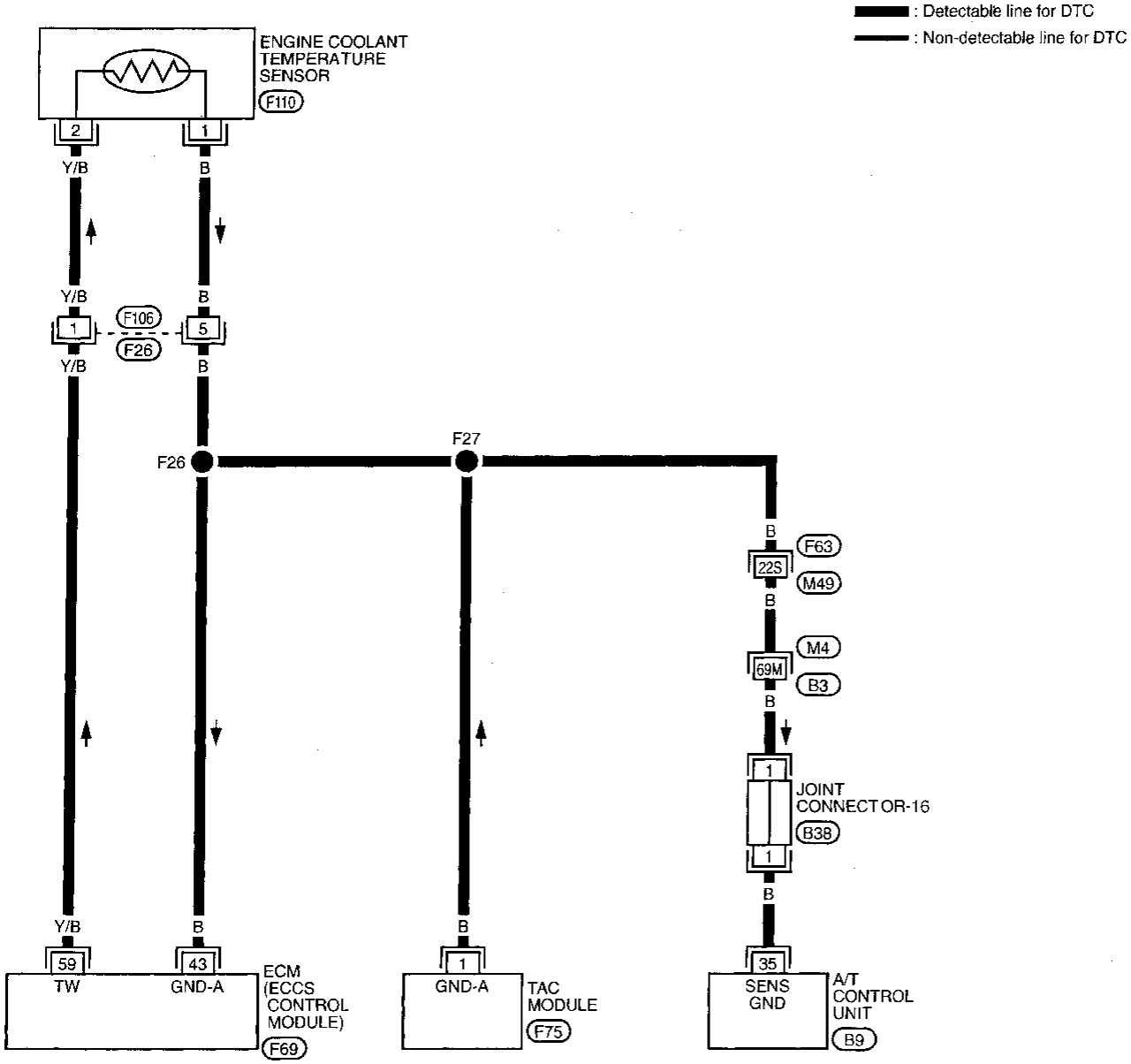
1) Turn ignition switch "ON" and wait at least 5 seconds.
2) Select "MODE 7" with GST.

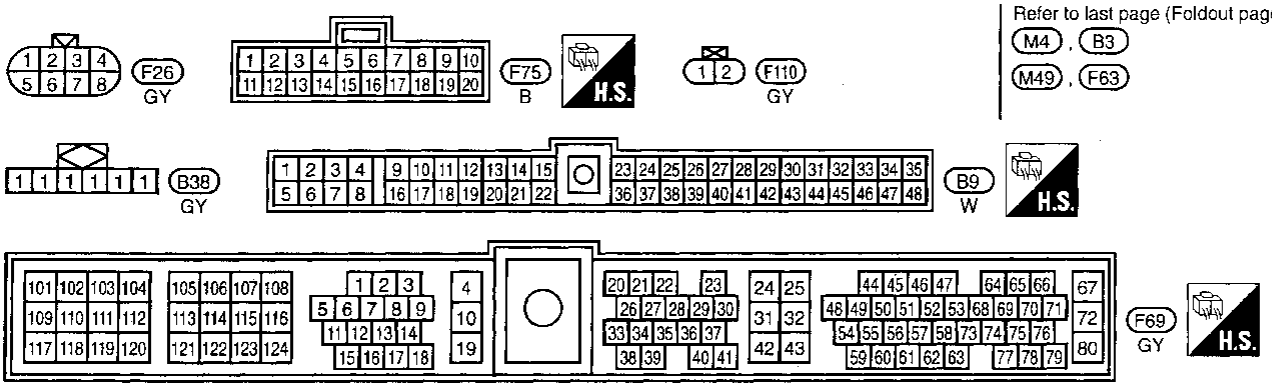
OR

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



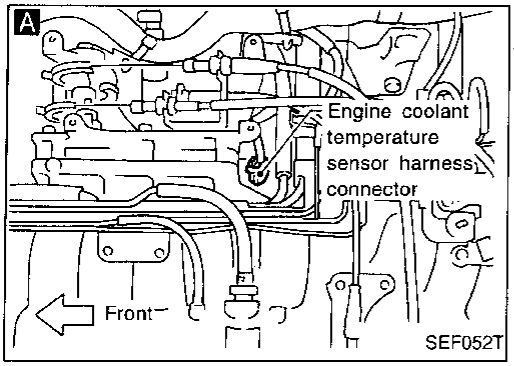


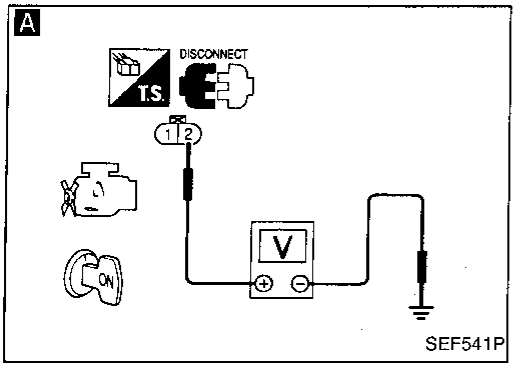
Refer to last page (Foldout page).
M4, B3
M49, F63

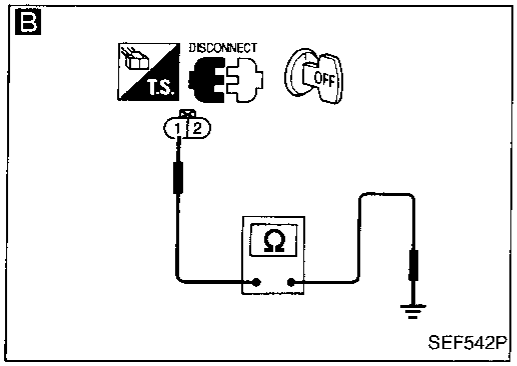
SEF870S

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 connectors (F26), (F106)
- 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 connectors (F26), (F106)
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Joint connector-16
- 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 for open or short between engine coolant temperature sensor and throttle actuator control (TAC) module

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 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.

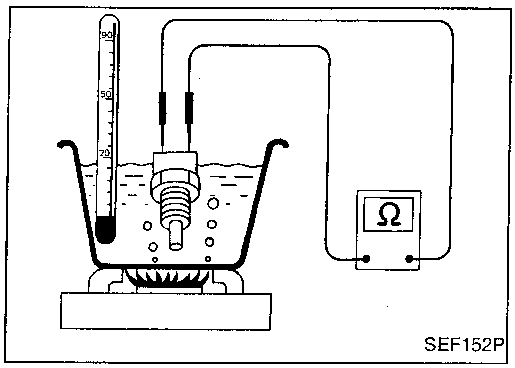
INSPECTION END

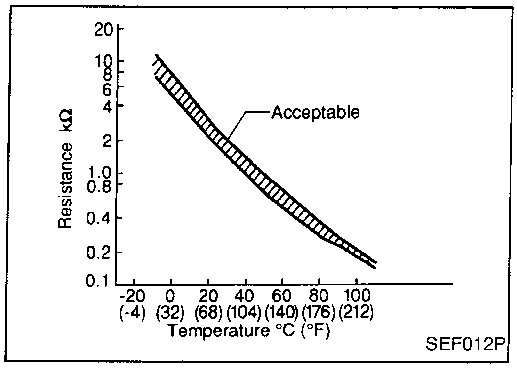
Engine Coolant Temperature Sensor (ECTS) (Cont'd)

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

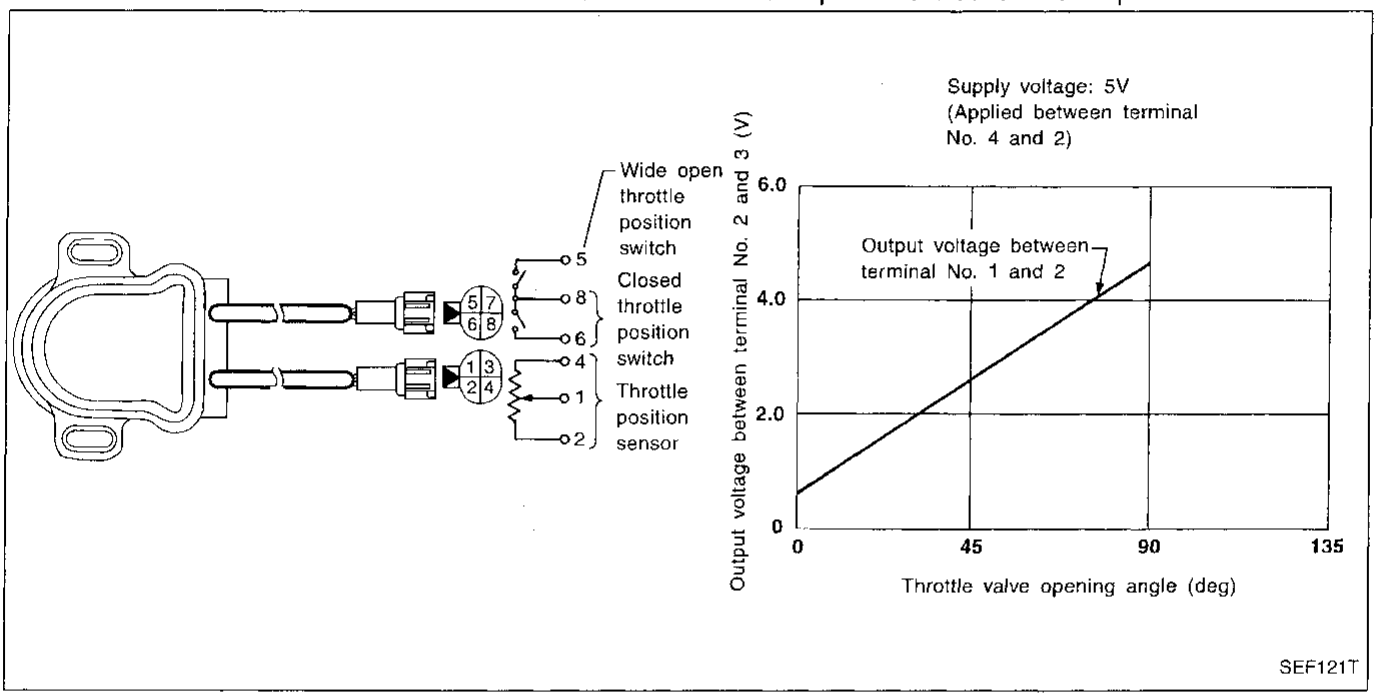
If NG, replace engine coolant temperature sensor.

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



CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL POS SEN	• Ignition switch: ON (Engine stopped)	Throttle valve: fully closed	0.35 - 0.65V
		Throttle valve: fully opened	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 fully opened	Approx. 88%

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
23	G	Throttle position sensor signal	Ignition switch "ON" (Warm-up condition) └ Accelerator pedal released	0.35 - 0.65V
			Ignition switch "ON" └ Accelerator pedal fully depressed	Approximately 4V
42	BR/W	Sensor's power supply	Ignition switch "ON"	Approximately 5V
43	B	Sensor's ground	Engine is running. (Warm-up condition) └ Idle speed	0V

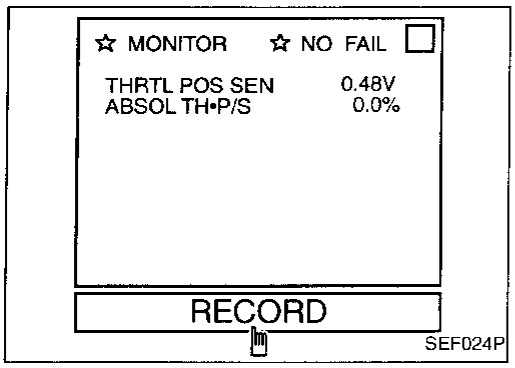
ON BOARD DIAGNOSIS LOGIC

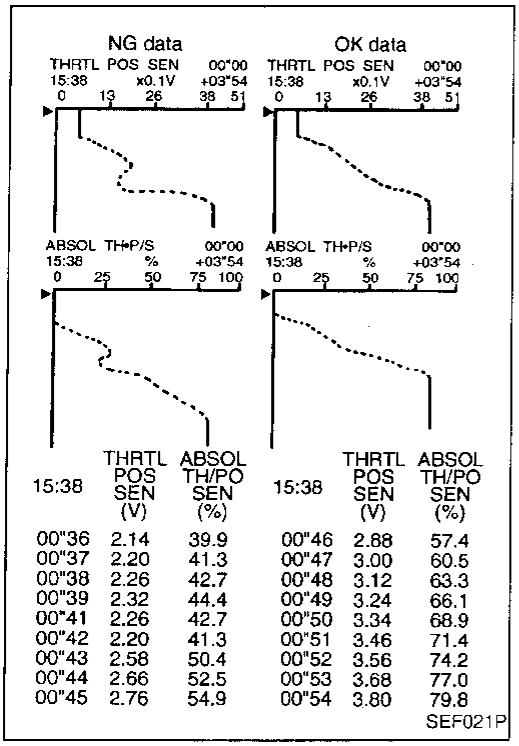
Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0120 0403	• An excessively low or high voltage from the sensor is sent to ECM.* • Rationally incorrect voltage is sent to ECM compared with the signals from mass air flow sensor, crankshaft position sensor and IACV-AAC valve.	• 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.

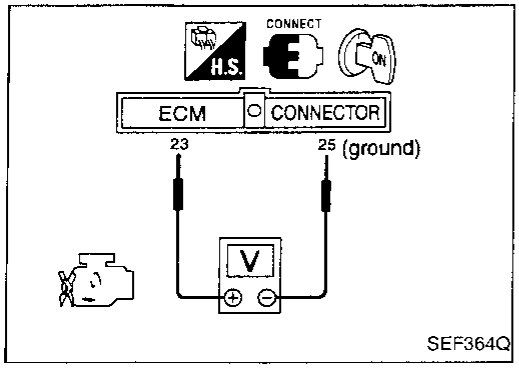
Engine operating condition in fail-safe mode	Condition	Driving condition
Throttle position will be determined based on the amount of mass air flow and the engine speed. Therefore, acceleration will be poor.	When engine is idling	Normal
	When accelerating	Poor acceleration

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	2.68	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.

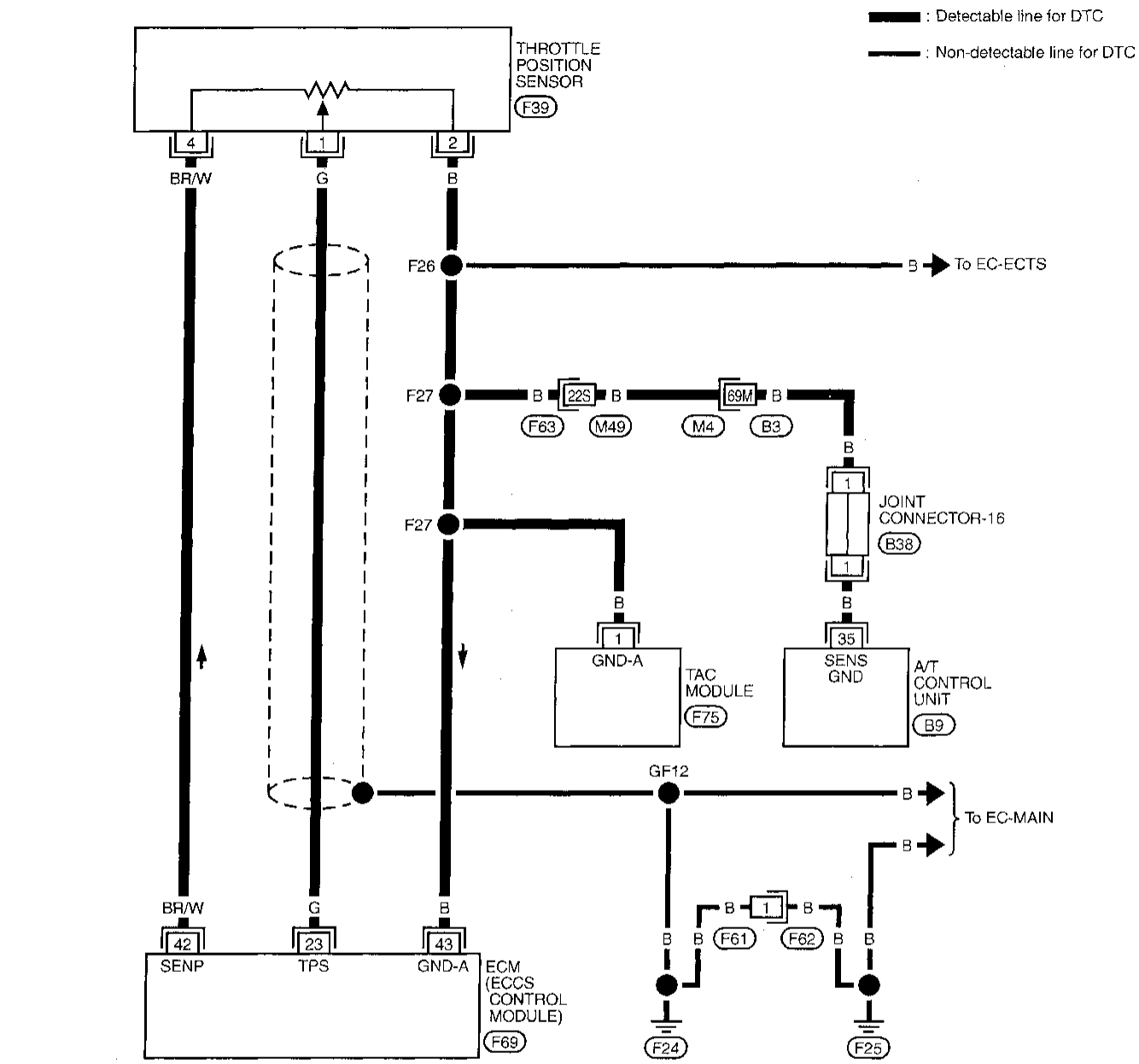
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON".
4) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
5) Select "THRTL POS SEN" and "ABSOL TH·P/S" in "DATA MONITOR" mode with CONSULT.
6) Press RECORD on CONSULT SCREEN at the same time accelerator pedal is depressed.
7) Print out the recorded data and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal fully depressed is approximately 4V.

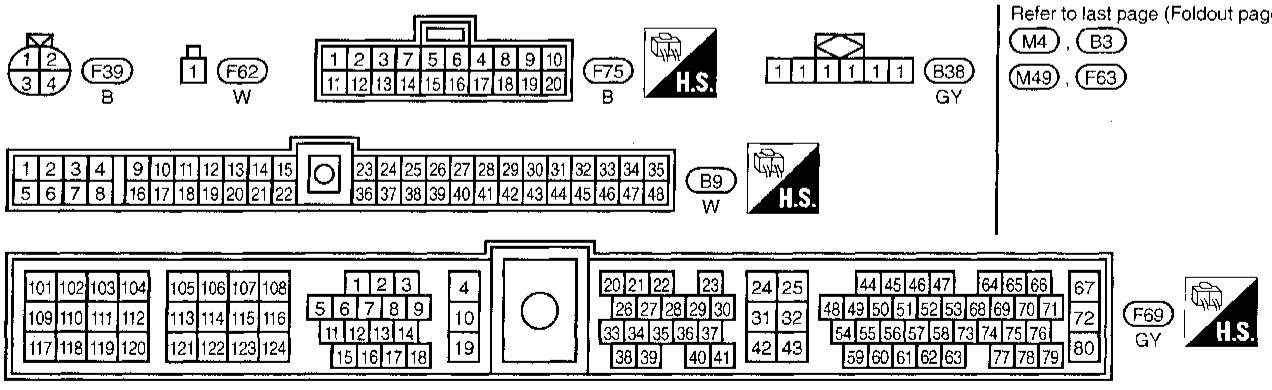
OR

1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON".
4) Check the voltage between ECM terminal ㉓ and ㉕ (ground) and check the following:
   - The voltage when accelerator pedal fully released is approximately 0.35 - 0.65V.
   - The voltage rise is linear in response to accelerator pedal depression.
   - The voltage when accelerator pedal fully depressed is approximately 4V.

Throttle Position Sensor (Cont'd)

EC-TPS-01

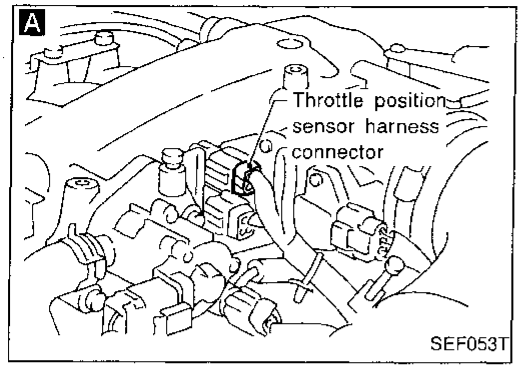


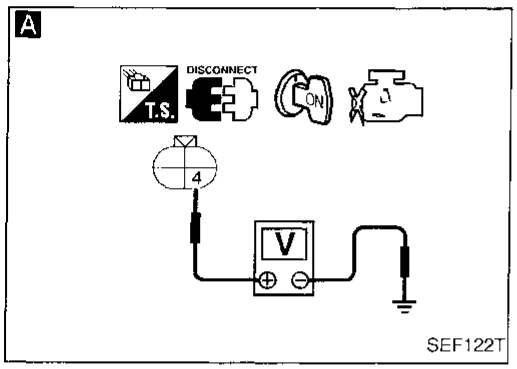


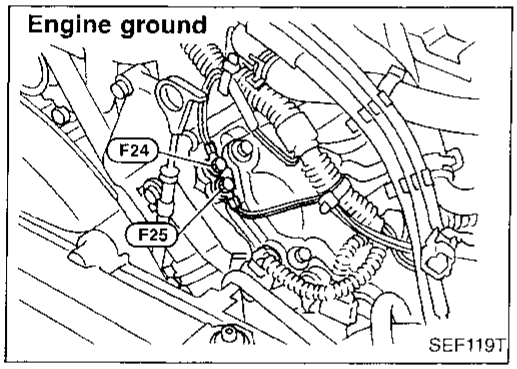
SEF871S

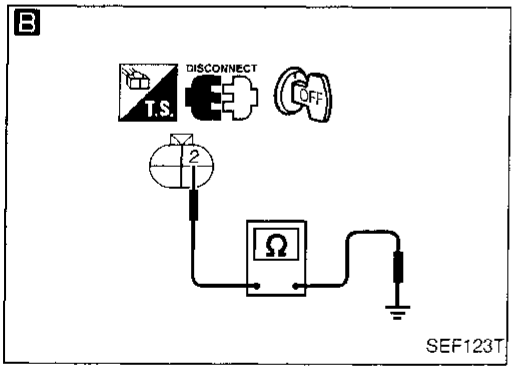
Throttle Position Sensor (Cont'd)

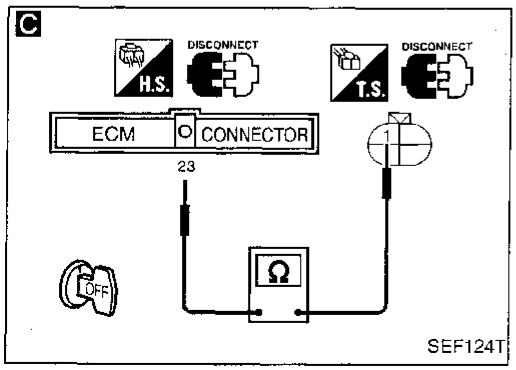
DIAGNOSTIC PROCEDURE











INSPECTION START

↓

ADJUST THROTTLE POSITION SENSOR.
Perform "BASIC INSPECTION", EC-73.

↓ 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 ④ and ground with CONSULT or tester.
   Voltage: Approximately 5V

NG → Repair harness or connectors.

↓ OK

B

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

NG → Check the following.
- Joint connector-16
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Harness for open or short between throttle position sensor and ECM
- Harness for open or short between throttle position sensor and A/T control unit
- Harness for open or short between throttle position sensor and throttle actuator control (TAC) module

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 ① .
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

↓ OK

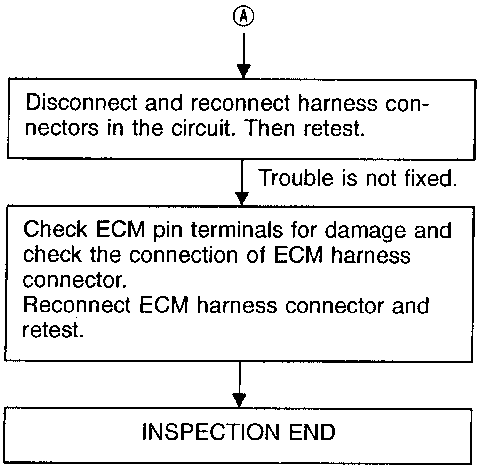
CHECK COMPONENT
(Throttle position sensor).
Refer to "COMPONENT INSPECTION" on next page.

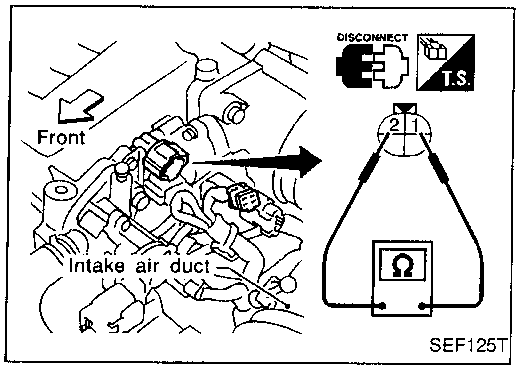
NG → Replace throttle position sensor. To adjust it, perform "BASIC INSPECTION", EC-73.

↓ OK

Ⓐ

Throttle Position Sensor (Cont'd)





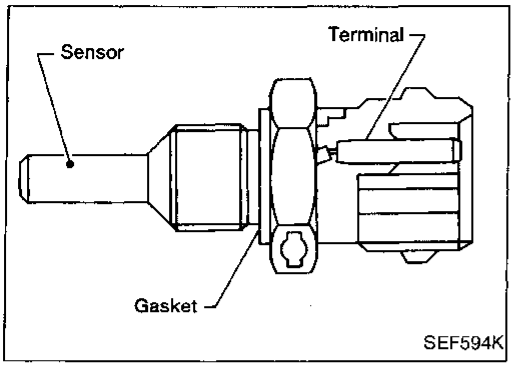
COMPONENT INSPECTION

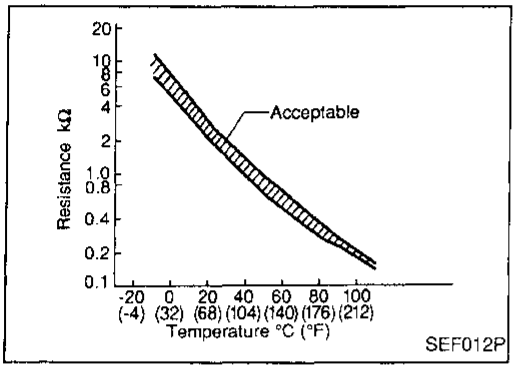
Throttle position sensor

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

Throttle valve conditions	Resistance at 25°C (77°F)
Completely closed	Approximately 0.6 kΩ
Partially open	0.6 - 4.0 kΩ
Completely open	Approximately 5 kΩ

If NG, replace throttle position sensor.
To adjust throttle position sensor, perform "BASIC INSPECTION", EC-73.





Engine Coolant Temperature (ECT) Sensor

COMPONENT DESCRIPTION

The engine coolant temperature sensor is located near the No. 2 injector. The 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.

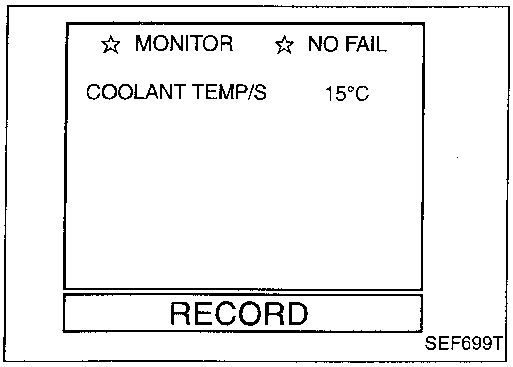
⟨Reference data⟩

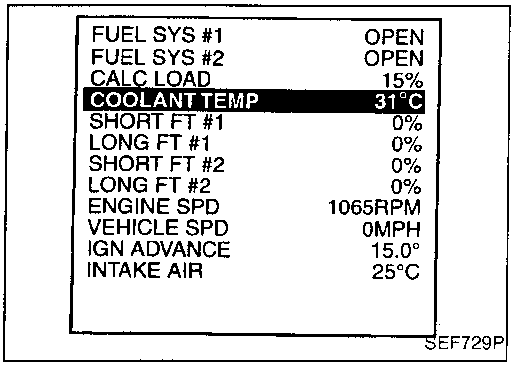
Engine coolant temperature °C (°F)	Voltage* (V)	Resistance (kΩ)
−10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	1.0	0.236 - 0.260

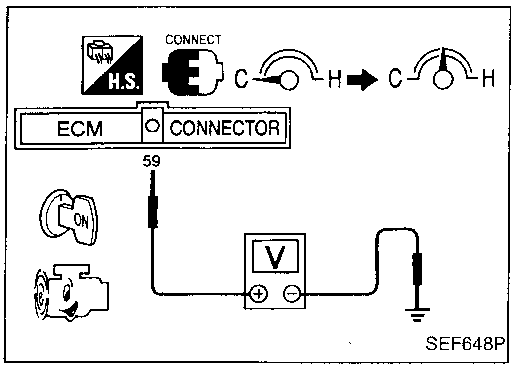
*: These data are reference values and are measured between ECM terminal ⑲ (Engine coolant temperature sensor) and ECM terminal ㉕ (ECCS ground).

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. • Engine coolant temperature is insufficient for closed loop fuel control.	• Harness or connectors (High resistance in the circuit) • Engine coolant temperature sensor • Thermostat







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

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, EC-110.

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 15°C (59°F) or more within 20 minutes. (Be careful not to overheat engine.)

OR

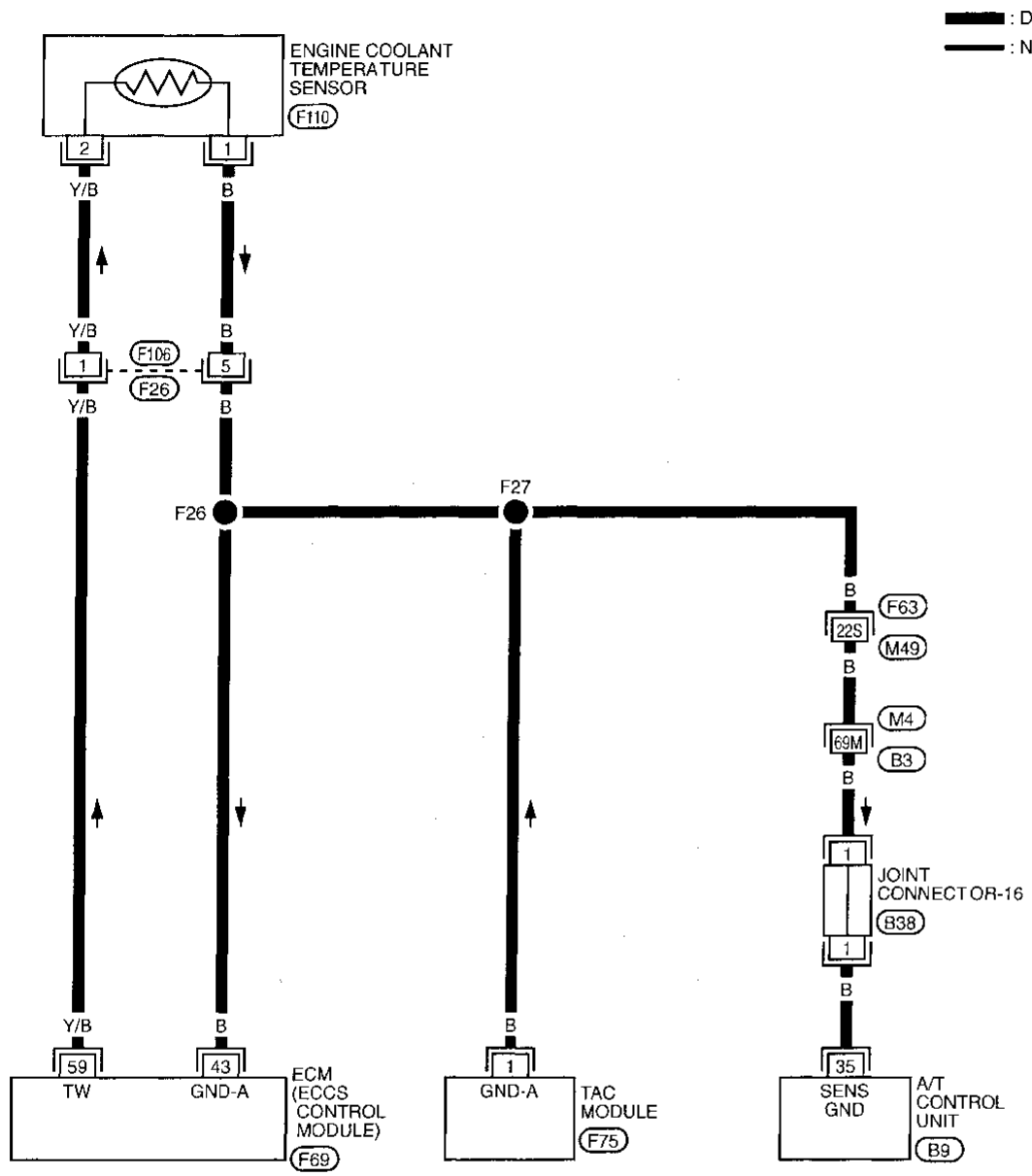
1) Turn ignition switch "ON".
2) Select "MODE 1" with GST.
3) Start engine and run it at idle speed.
4) Check that the engine coolant temperature rises to 15°C (59°F) or more within 20 minutes. (Be careful not to overheat engine.)

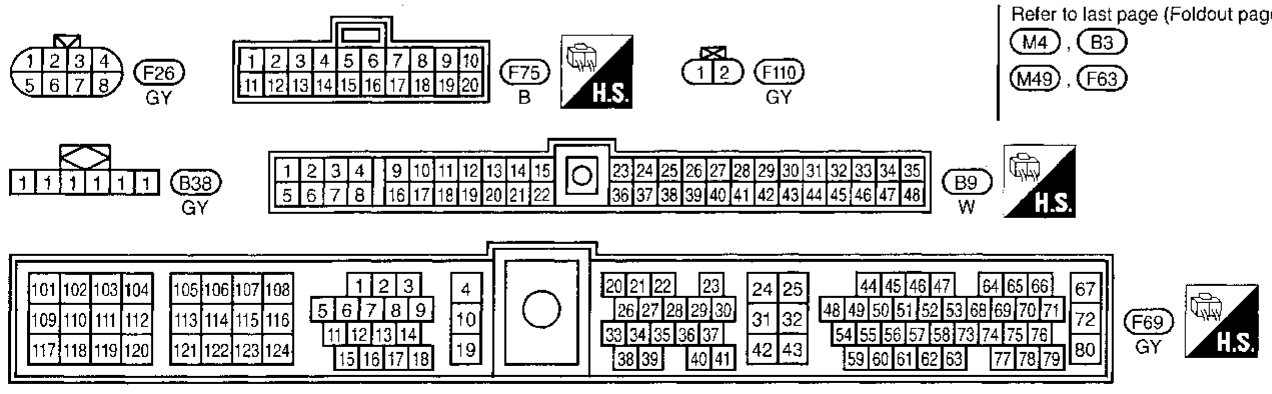
OR

1) Turn ignition switch "ON".
2) Probe voltage meter between ECM terminal 59 and ground.
3) Start engine and run it at idle speed.
4) Check that voltage of engine coolant temperature changes to less than 3.7 (V) within 20 minutes. (Be careful not to overheat engine.)

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

EC-ECTS-01





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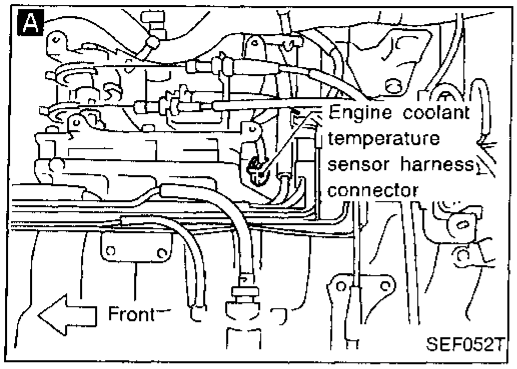
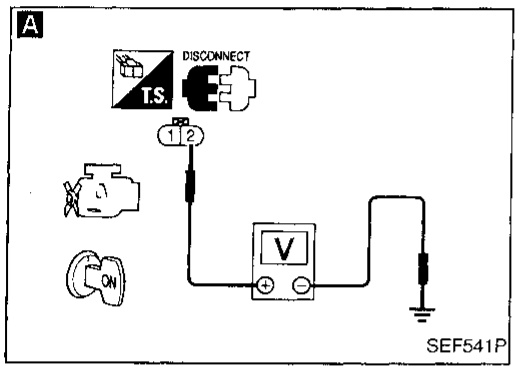
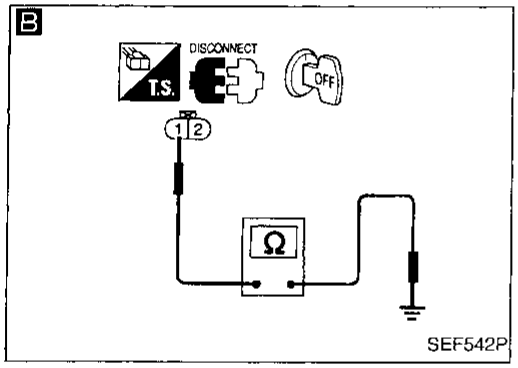
Engine Coolant Temperature (ECT) Sensor (Cont'd)

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 connectors (F26), (F106)
- 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 connectors (F26), (F106)
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Joint connector-16
- 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 for open or short between engine coolant temperature sensor and throttle actuator control (TAC) module

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 75°C (167°F)], grasp lower radiator hose and confirm the engine coolant does not flow.

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

OK ↓

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.

↓

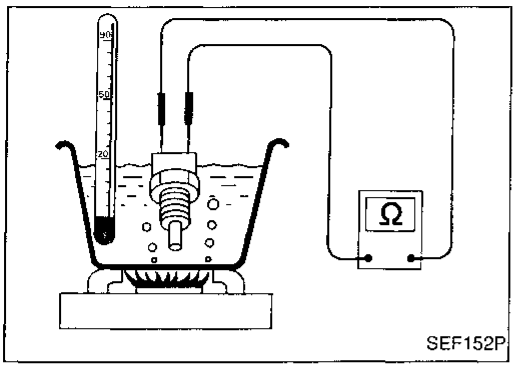
INSPECTION END

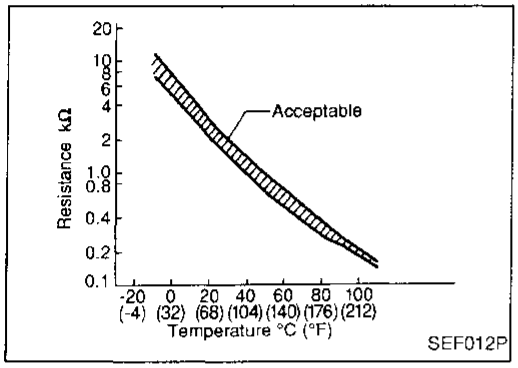
Engine Coolant Temperature (ECT) Sensor (Cont'd)

COMPONENT INSPECTION

Engine coolant temperature sensor

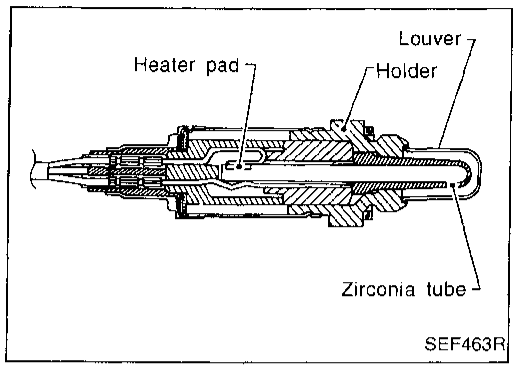
Check resistance as shown in the figure.

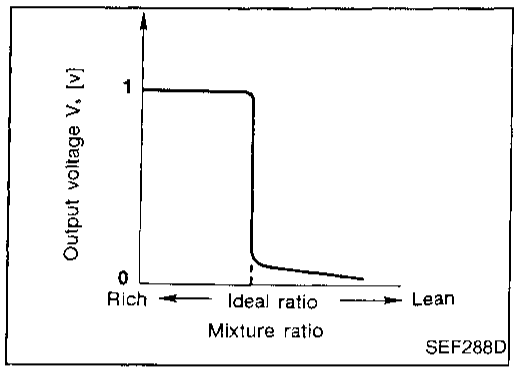




Temperature °C (°F)	Resistance kΩ
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

If NG, replace engine coolant temperature sensor.





Front Heated Oxygen Sensor (Front HO2S) (Left bank)

COMPONENT DESCRIPTION

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

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B1	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V
FR O2 MNTR-B1			LEAN ↔ RICH Changes more than 5 times during 10 seconds.

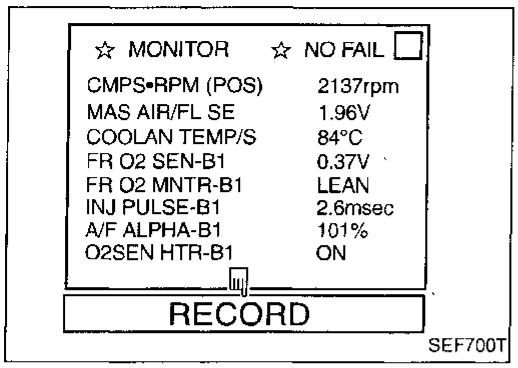
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

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

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 are not reached to the specified voltages. • It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors (The sensor circuit is open or shorted.) • Front heated oxygen sensor (left bank) • Fuel pressure • Injectors • Intake air leaks



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

OVERALL FUNCTION CHECK

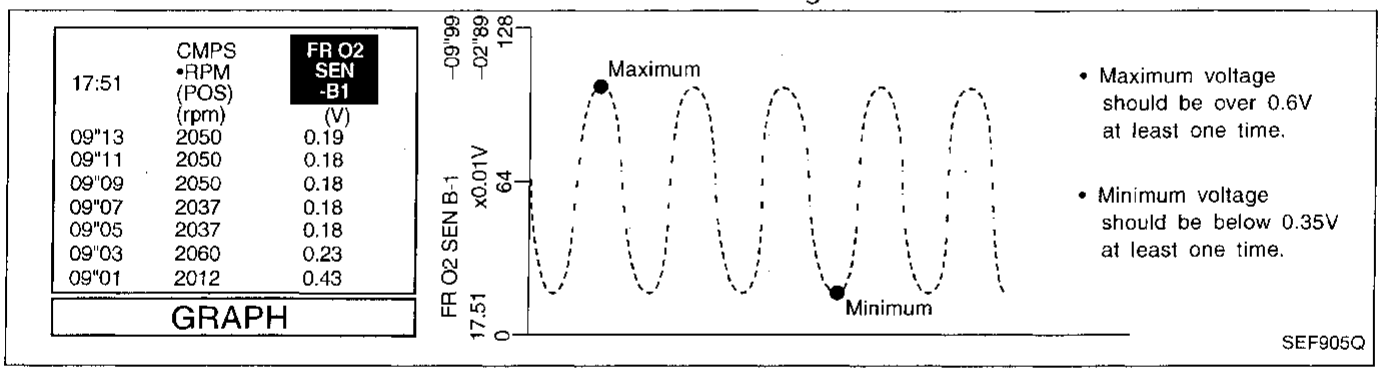
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

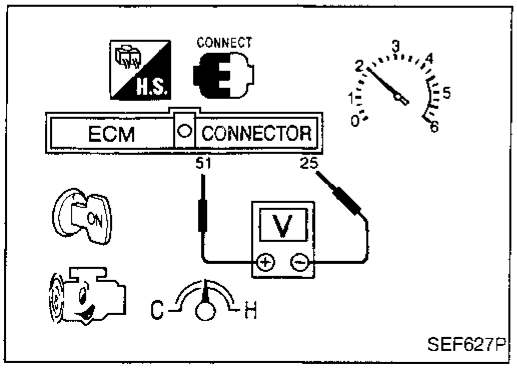
1) Start engine and warm it up sufficiently.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B1" and "FR O2 MNTR-B1".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT screen.
5) Check the following.

- "FR O2 MNTR-B1" 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-B1	R-L-R-L-R	L-R-L-R-L	R-L-R-L-R	L-R-L-R-L	R-L-R-L-R

  R = "FR O2 MNTR-B1", "RICH"
  L = "FR O2 MNTR-B1", "LEAN"
- "FR O2 SEN-B1" voltage goes above 0.6V at least once.
- "FR O2 SEN-B1" voltage goes below 0.35V at least once.
- The voltage never exceeds 1.0V.





OR

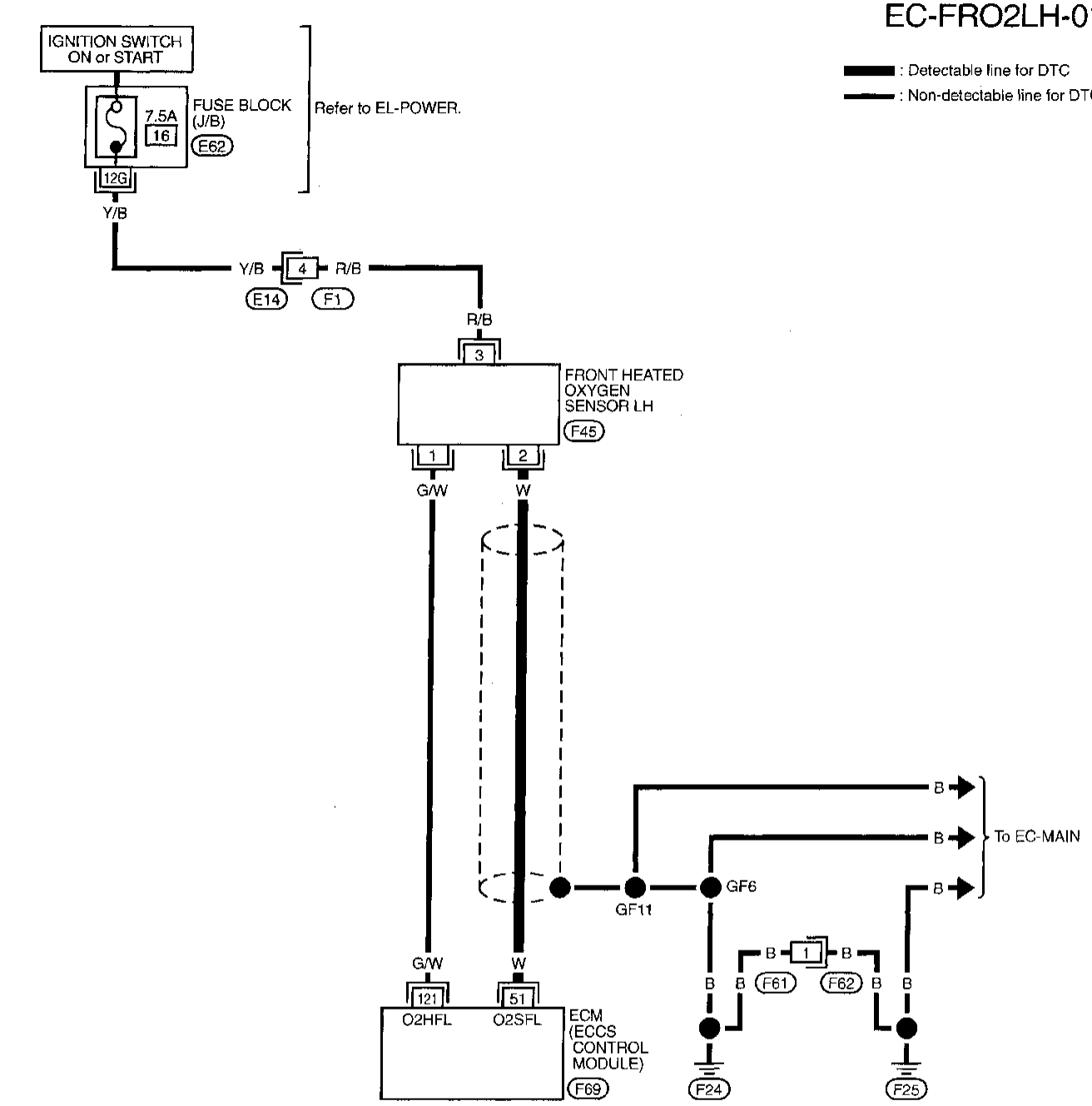
1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminal ⑤① (sensor signal) and ㉕ (engine ground).
3) Check the following with engine speed held at 2,000 rpm constant under no load.

- 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 0.35V at least one time.
- The voltage never exceeds 1.0V.

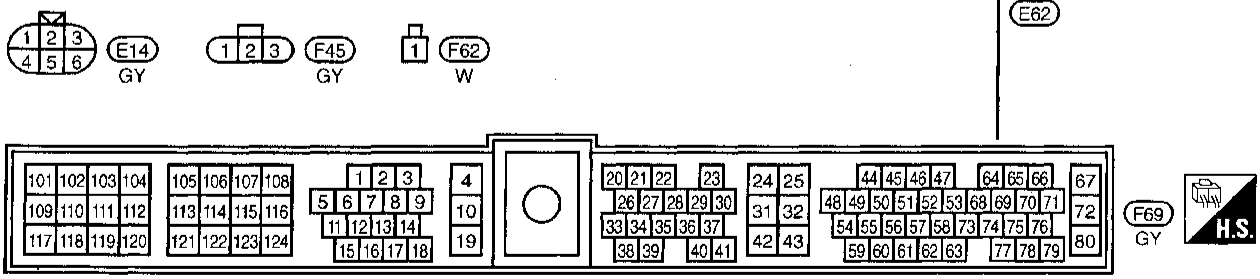
Front Heated Oxygen Sensor (Front HO2S) (Left bank) (Cont'd)

EC-FRO2LH-01

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



Refer to last page (Foldout page).



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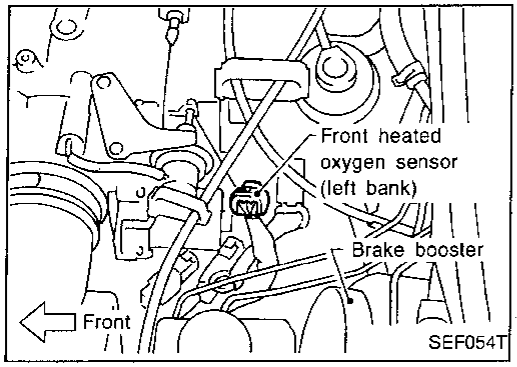
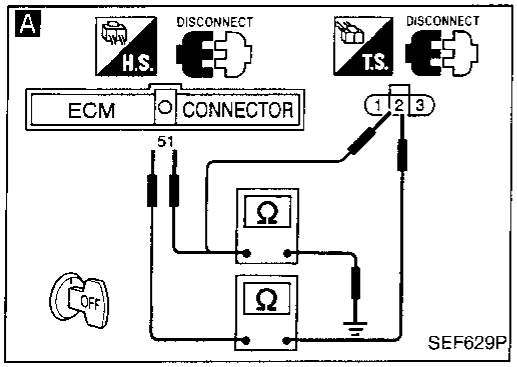
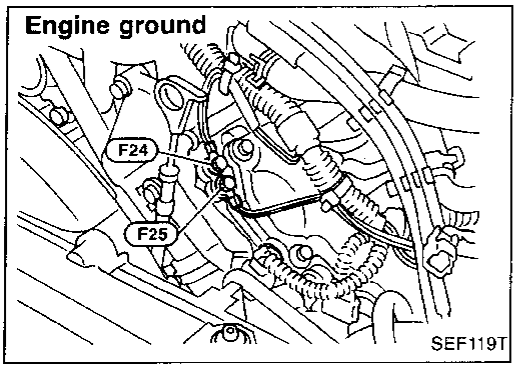
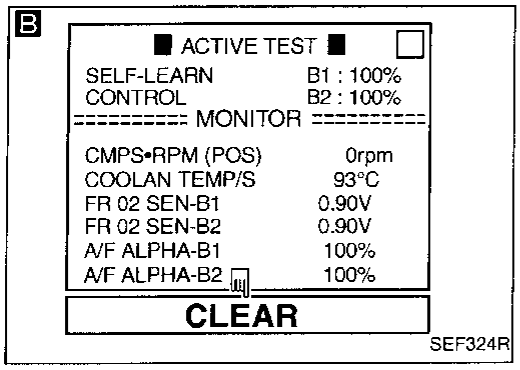
Front Heated Oxygen Sensor (Front HO2S) (Left bank) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor (left bank) harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ⑤1 and terminal ②. **Continuity should exist.**
4. Check harness continuity between ECM terminal ⑤1 (or terminal ②) and ground. **Continuity should not exist.**
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

Loosen and retighten engine ground screws.

B

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

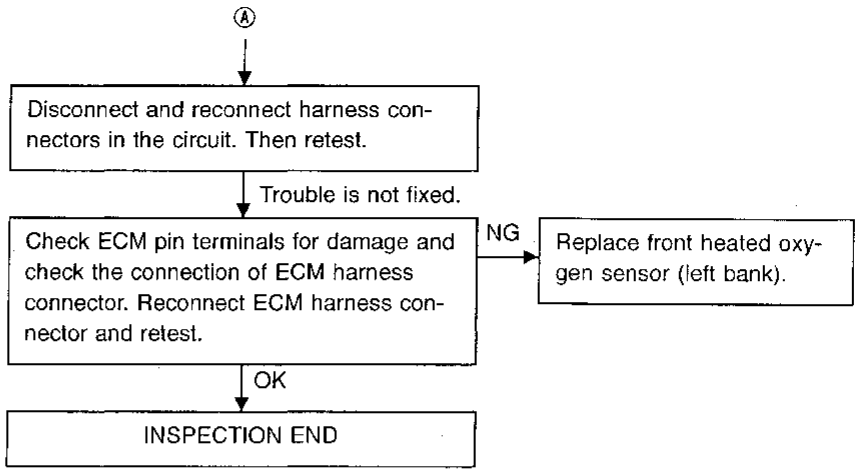
Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0171, P0172", EC-163, 169.

OR

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

No ↓ Ⓐ

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

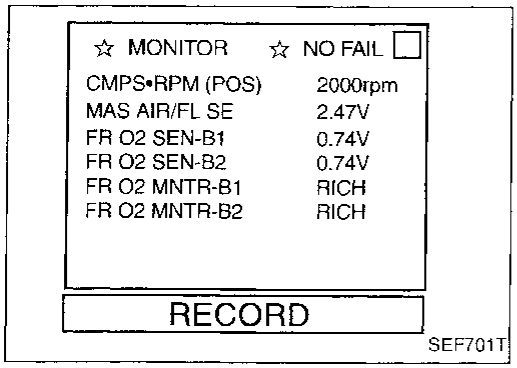


Closed Loop Control

★ **The closed loop control has the one trip detection logic.**

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0130 0307	• The closed loop control function for left bank does not operate even when vehicle is driving in the specified condition.	• The front heated oxygen sensor (left bank) circuit is open or shorted. • Front heated oxygen sensor (left bank) • Front heated oxygen sensor heater (left bank)
P0150 0308	• The closed loop control function for right bank does not operate even when vehicle is driving in the specified condition.	• The front heated oxygen sensor (right bank) circuit is open or shorted. • Front heated oxygen sensor (right bank) • Front heated oxygen sensor heater (right bank)



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 "FRO2 MNTR-B1(B2)".
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-B1(B2)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
5 times (cycles) are counted as shown below:

cycle	1	2	3	4	5
FR O2 MNTR-B1(B2)	R-L-R-L-R-L-R-L-R-L-R				

R = "FR O2 MNTR-B1(B2)", "RICH"
L = "FR O2 MNTR-B1(B2)", "LEAN"

OR

1) Start engine and warm it up sufficiently.
2) Make sure that malfunction indicator lamp goes on more than 5 times within 10 seconds while keeping at 2,000 rpm in Diagnostic Test Mode II (Front heated oxygen sensor monitor).

DIAGNOSTIC PROCEDURE

For left bank

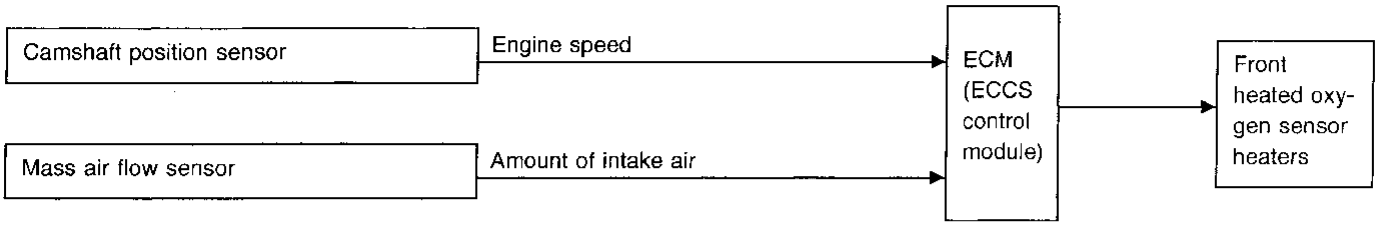
Refer to TROUBLE DIAGNOSIS FOR DTC P0130, EC-126.
Refer to TROUBLE DIAGNOSIS FOR DTC P0135, on next page.

For right bank

Refer to TROUBLE DIAGNOSIS FOR DTC P0150, EC-145.
Refer to TROUBLE DIAGNOSIS FOR DTC P0155, EC-150.

Front Heated Oxygen Sensor Heater (Left bank)

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Front heated oxygen sensor heaters
Above 3,200	OFF
Below 3,200	ON

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
O2 SEN HTR-B1	• Engine speed: Idle	ON
	• Engine speed: Above 3,200	OFF

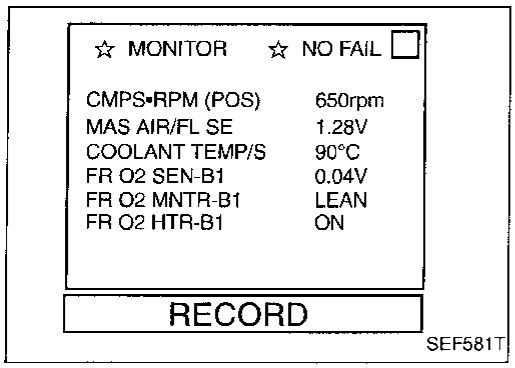
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
121	G/W	Front heated oxygen sensor heater (left bank)	Engine is running. └ Engine speed is below 3,200 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,200 rpm.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0135 0901	• The current amperage in the front heated oxygen sensor heater (left bank) circuit is out of the normal range. (The 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 (left bank)



Front Heated Oxygen Sensor Heater (Left bank) (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

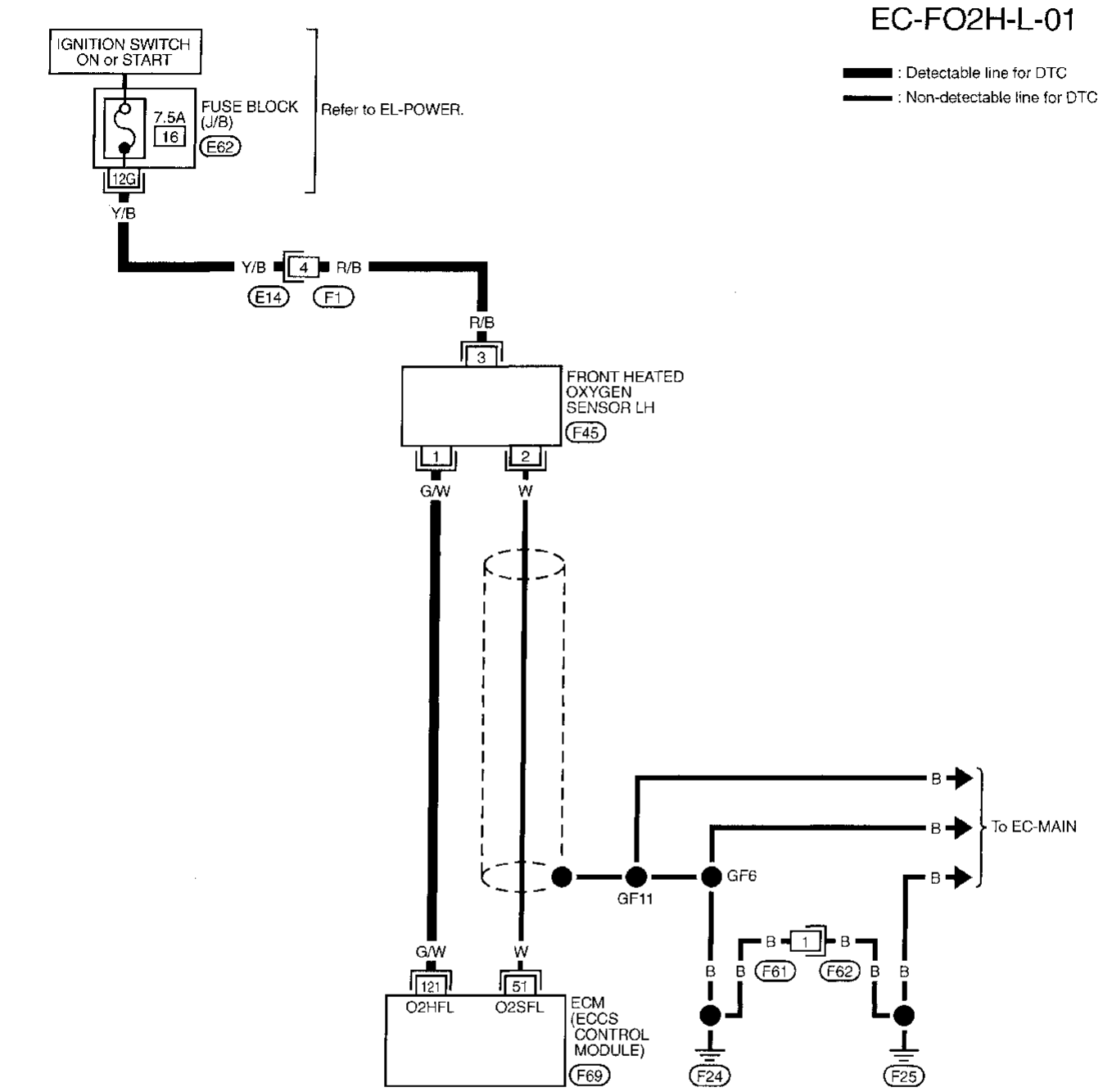
1) Start engine and run it for at least 6 seconds at idle speed.
2) Select "MODE 3" with GST.

OR

1) Start engine and run it for at least 6 seconds in idle condition.
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.**

Front Heated Oxygen Sensor Heater (Left bank) (Cont'd)



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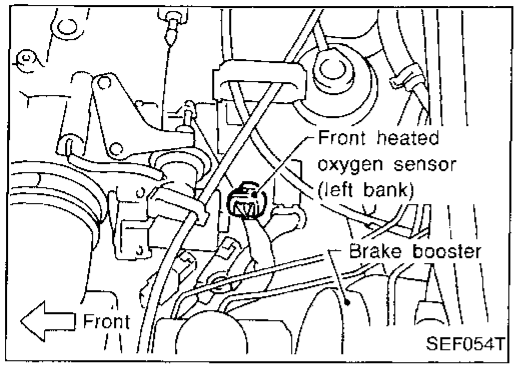
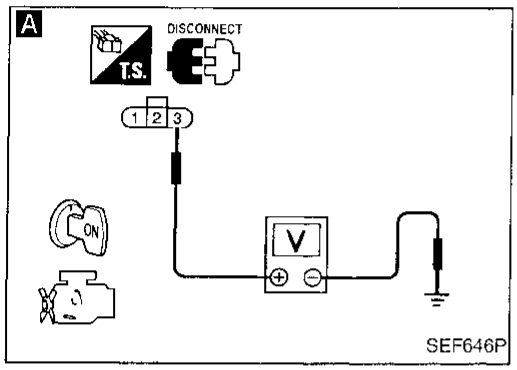
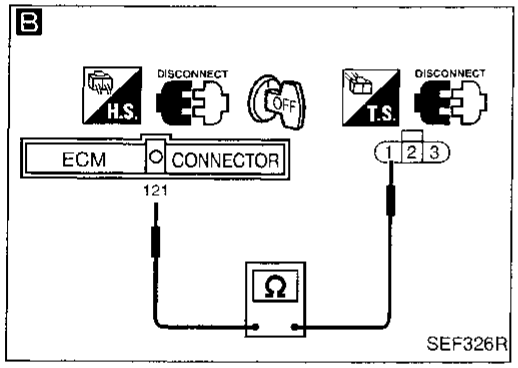
Front Heated Oxygen Sensor Heater (Left bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors (F1), (E14)
- 7.5A 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 (121).
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace front heated oxygen sensor (left bank).

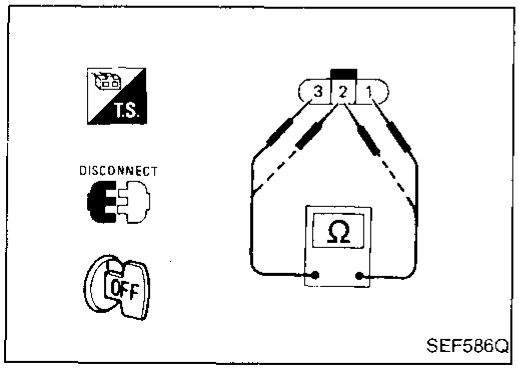
OK ↓

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

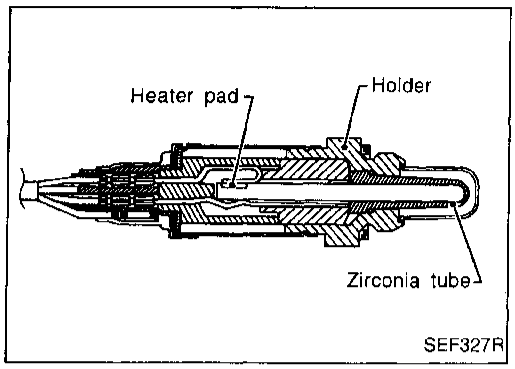
Front heated oxygen sensor heater

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) (Left bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on left bank. Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SEN-B1	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V

ECM terminals and reference value

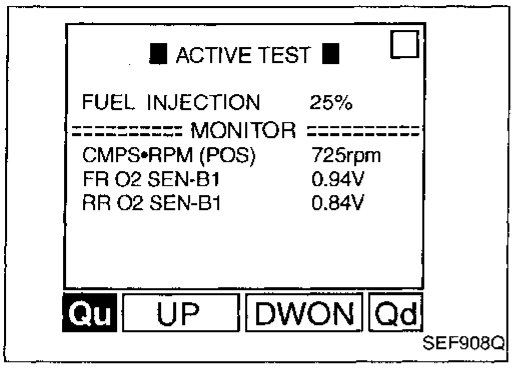
Remarks: Specification data are reference values, and are measured between each terminal and ㉖ (ECCS ground) with a voltmeter.

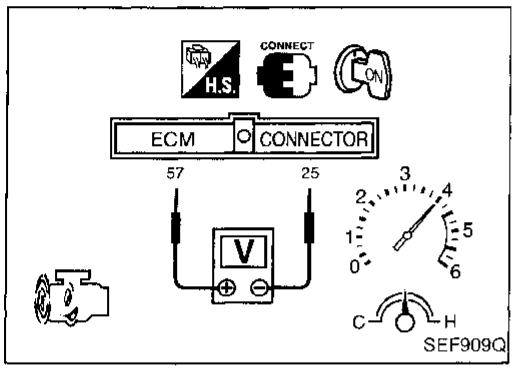
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
57	Y	Rear heated oxygen sensor (LH)	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V

ON BOARD DIAGNOSIS LOGIC

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

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





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

OVERALL FUNCTION CHECK

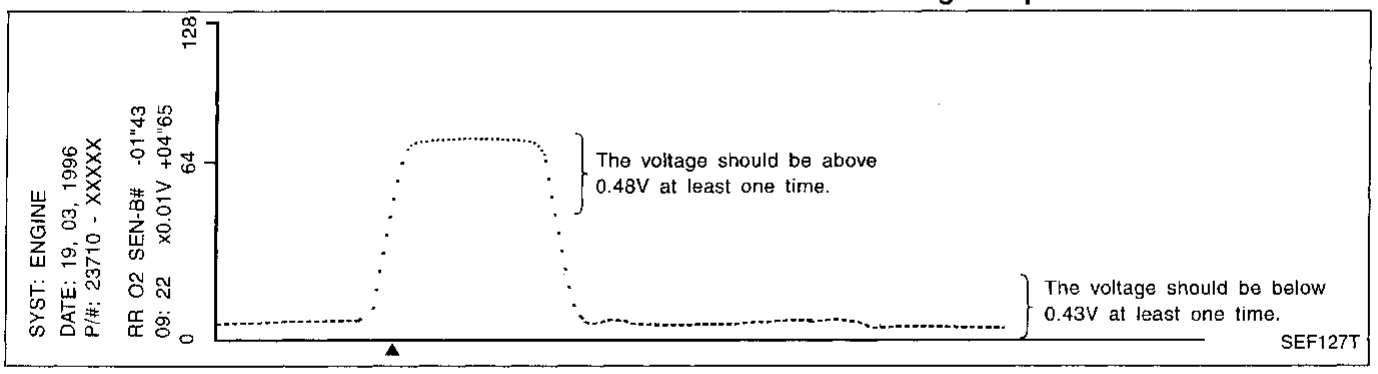
Use this procedure to check the overall function of the rear heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

1) Start engine and warm it up sufficiently.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR-B1" 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 ⑤⑦ (sensor signal) and ㉕ (engine ground).
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
(depress and release accelerator pedal as soon as possible)
The voltage should be above 0.48V and below 0.43V at least once during this procedure.
If the voltage can be confirmed in step 3, step 4 is not necessary.

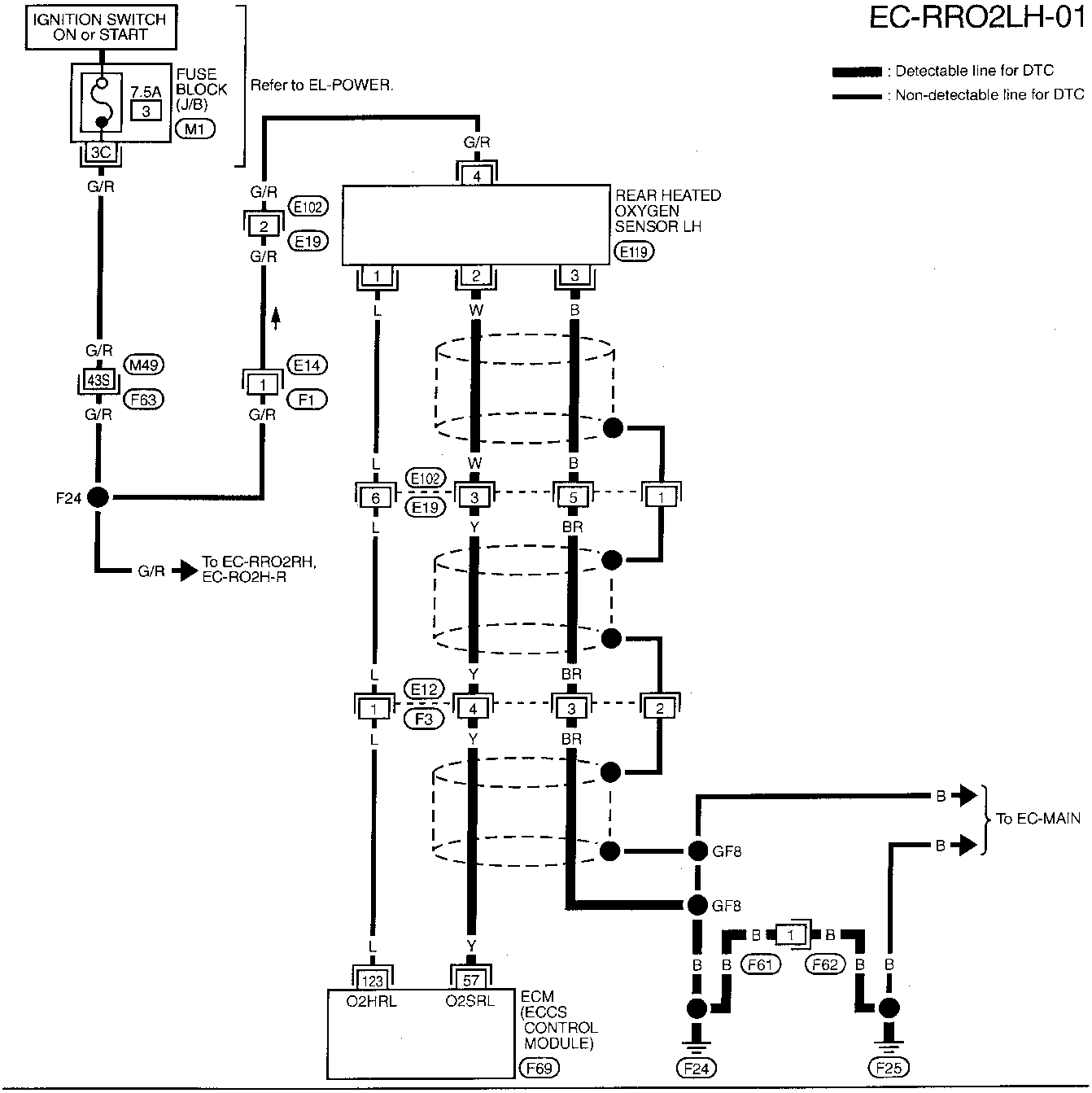
4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
The voltage should be above 0.48V and below 0.43V at least once during this procedure.



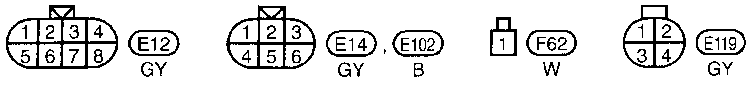
Rear Heated Oxygen Sensor (Rear HO2S) (Left bank) (Cont'd)

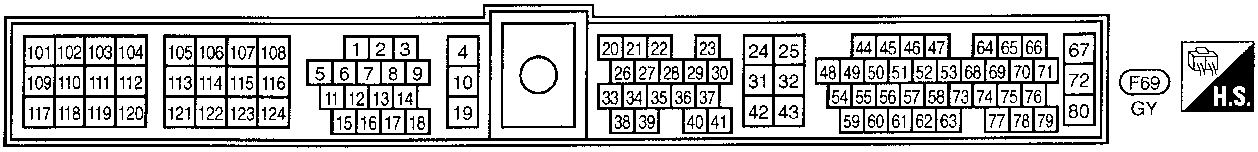
EC-RRO2LH-01

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



Refer to last page (Foldout page).
M49, F63
M1





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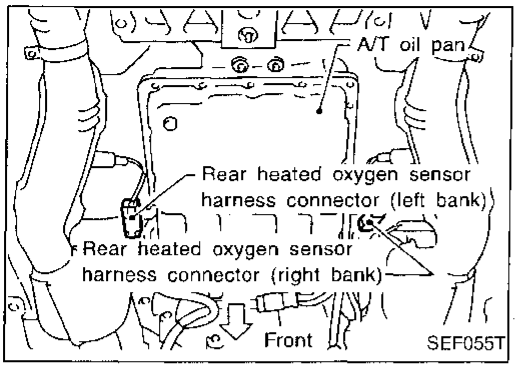
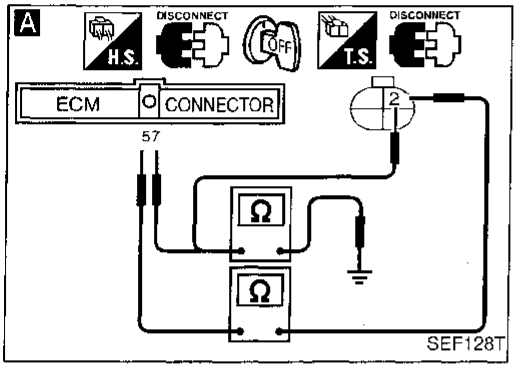
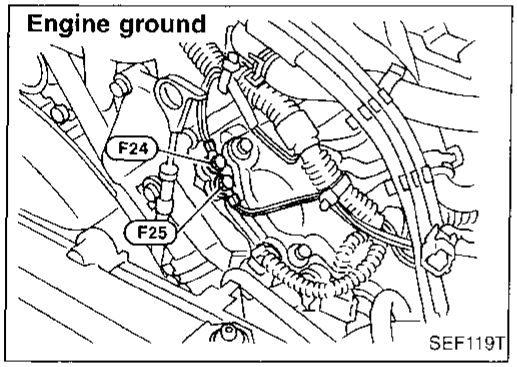
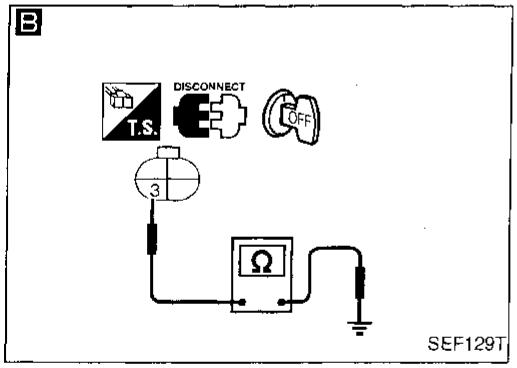
Rear Heated Oxygen Sensor (Rear HO2S) (Left bank) (Cont'd)

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 ⑰ and terminal ② .
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑰ (or terminal ②) and ground.
   Continuity should not exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (F3) , (E12)
- Harness connectors (E19) , (E102)

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Loosen and retighten ground screws.
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 (F3) , (E12)
- Harness connectors (E19) , (E102)
- Harness connectors (F62) , (F61)
- 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.

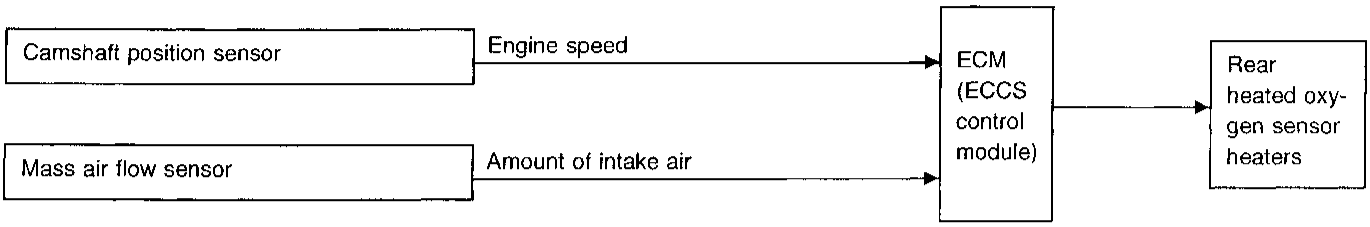
NG → Replace rear heated oxygen sensor.

OK ↓

INSPECTION END

Rear Heated Oxygen Sensor Heater (Left bank)

SYSTEM DESCRIPTION



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

OPERATION

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

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
O2 SEN HTR-B1	• Engine speed: Idle	ON
	• Engine speed: Above 3,600 rpm	OFF

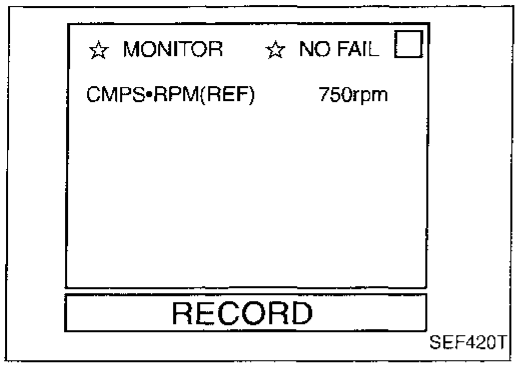
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
123	PU	Rear heated oxygen sensor heater (left bank)	Engine is running. └ Engine speed is below 3,600 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0141 0902	• The current amperage in the rear heated oxygen sensor heater (left bank) circuit is out of the normal range. (The 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 (left bank)



Rear Heated Oxygen Sensor Heater (Left bank) (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

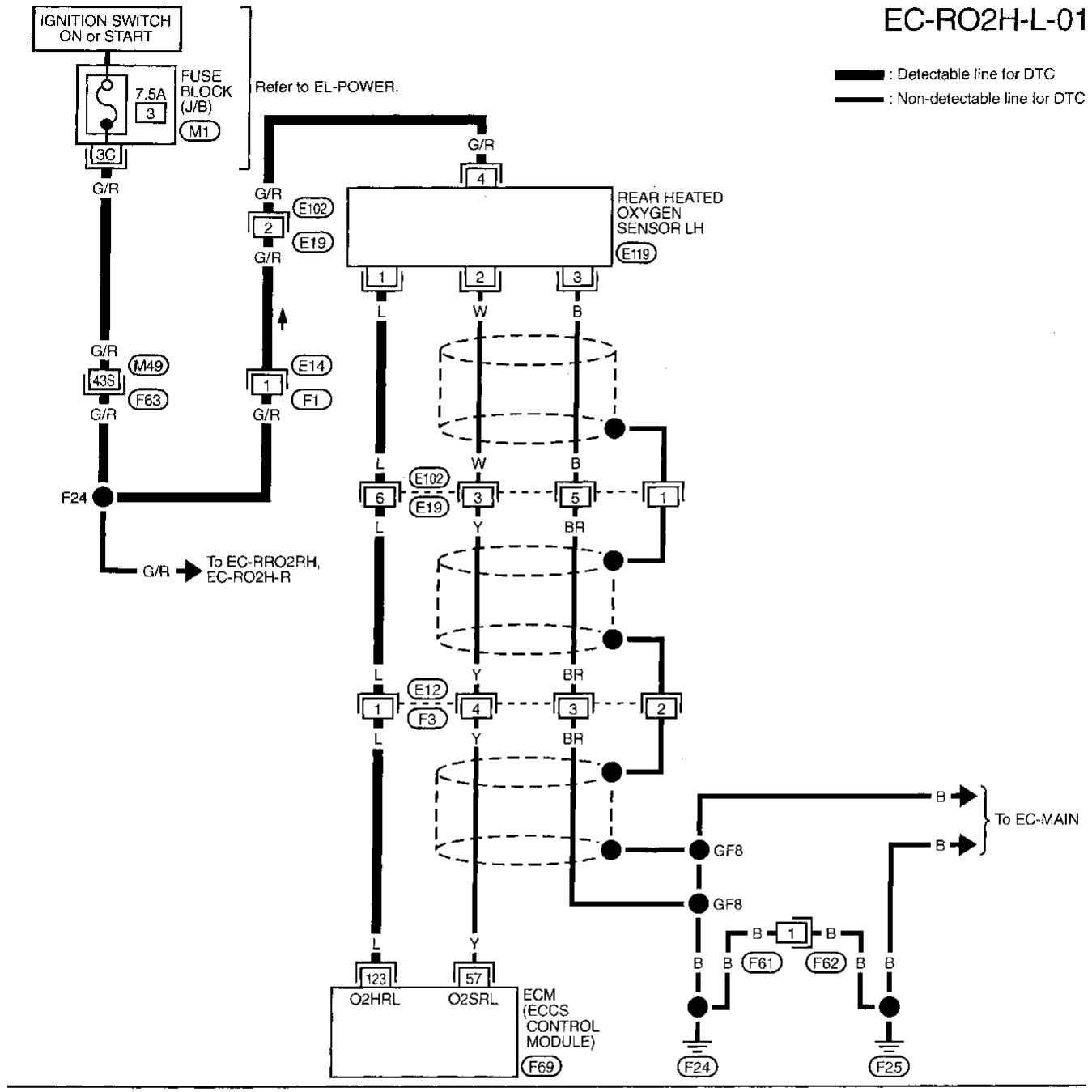
1) Start engine and run it for at least 6 seconds at idle speed.
2) Select "MODE 3" with GST.

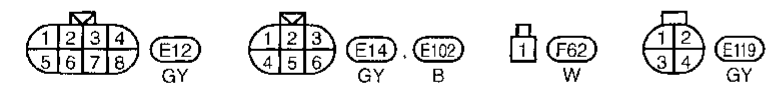
OR

1) Start engine and run it for at least 6 seconds in idle condition.
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.

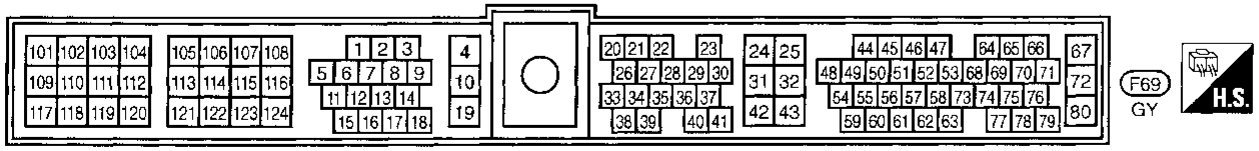
- **When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.**

Rear Heated Oxygen Sensor Heater (Left bank) (Cont'd)





Refer to last page (Foldout page).
M49, F63
M1



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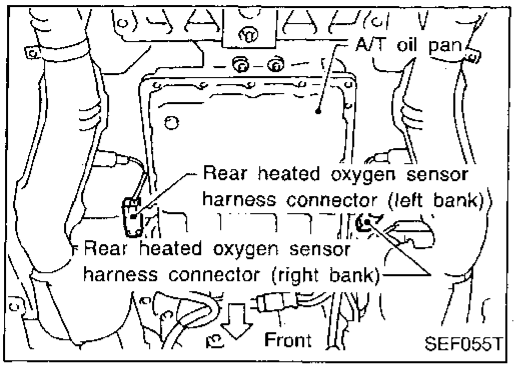
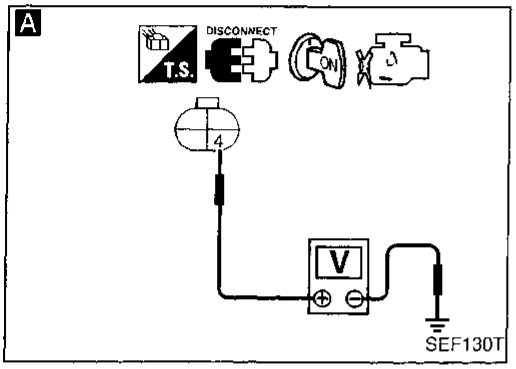
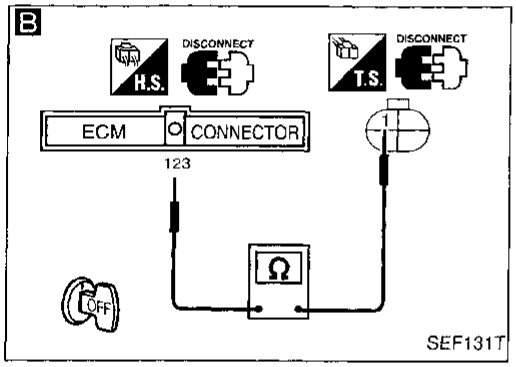
Rear Heated Oxygen Sensor Heater (Left bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors (E102), (E19)
- Harness connectors (E14), (F1)
- Harness connectors (F63), (M49)
- 7.5A 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 (123).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F3), (E12)
- Harness connectors (E19), (E102)
- Harness for open or short between sensor and ECM.

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 (left bank).

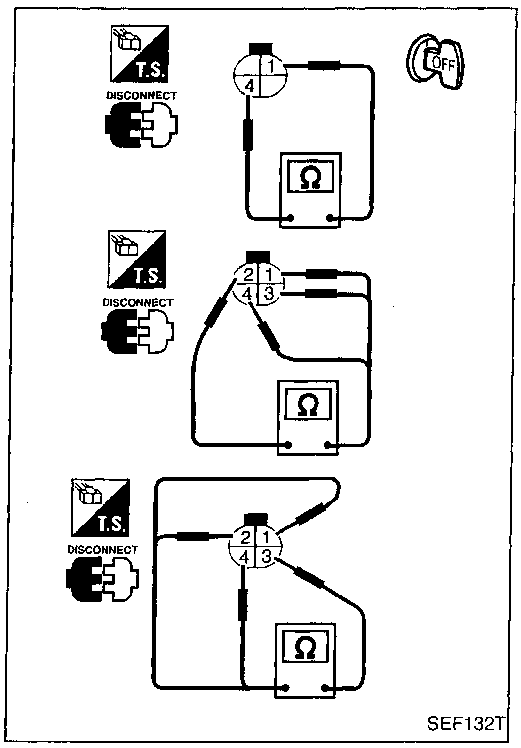
OK ↓

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



Rear Heated Oxygen Sensor Heater (Left bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

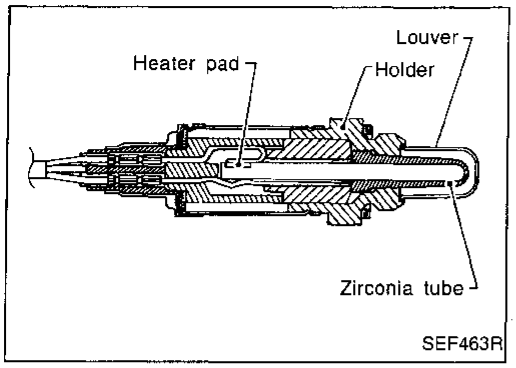
1. Check resistance between terminals ④ and ① .
   Resistance: 2.3 - 4.3Ω at 25°C (77°F)
2. Check continuity.

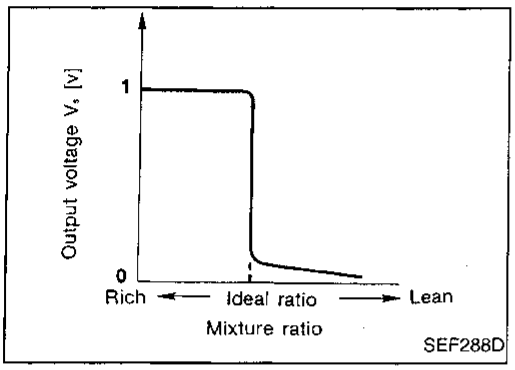
Terminal No.	Continuity
② and ① , ③ , ④	No
③ and ① , ② , ④	

If NG, replace the 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.





Front Heated Oxygen Sensor (Front HO2S) (Right bank)

COMPONENT DESCRIPTION

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

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
FR O2 SEN-B2	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V

ECM terminals and reference value

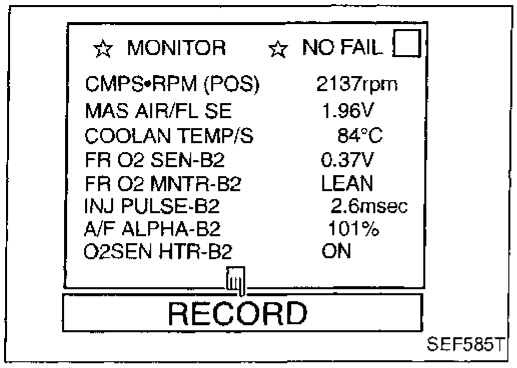
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

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

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0150 0503	• 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 are not reached to the specified voltages. • It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors (The sensor circuit is open or shorted.) • Front heated oxygen sensor (right bank) • Fuel pressure • Injectors • Intake air leaks

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



OVERALL FUNCTION CHECK

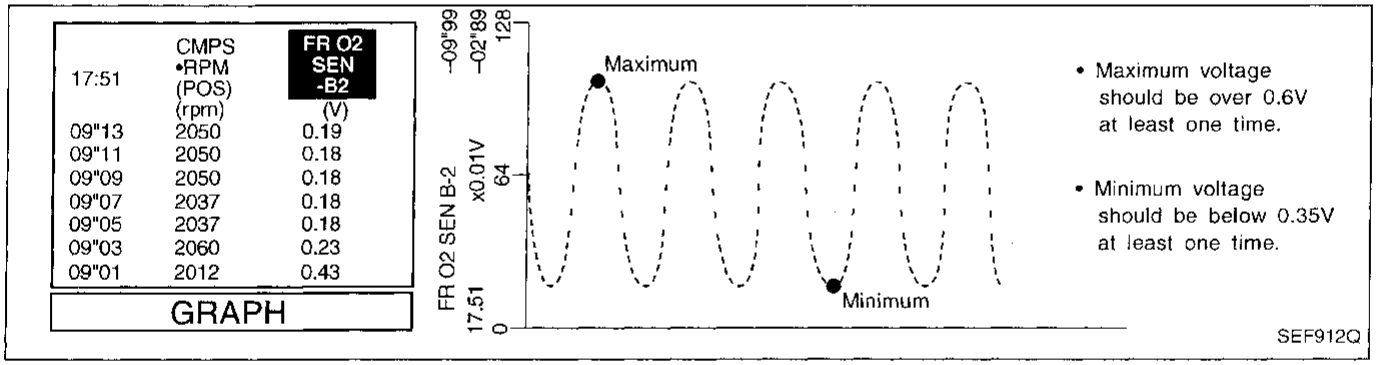
Use this procedure to check the overall function of the front heated oxygen sensor circuit. During this check, a 1st trip DTC might not be confirmed.

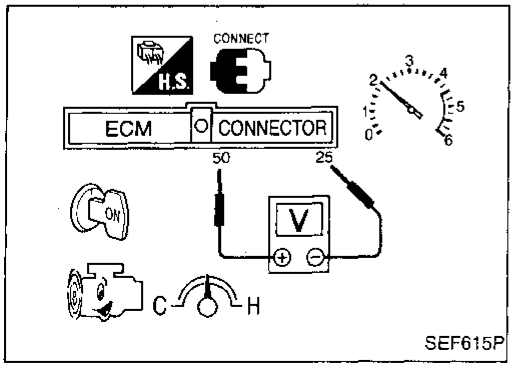
1) Start engine and warm it up sufficiently.
2) Select "MANU TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT, and select "FR O2 SEN-B2" and "FR O2 MNTR-B2".
3) Hold engine speed at 2,000 rpm under no load during the following steps.
4) Touch "RECORD" on CONSULT screen.
5) Check the following.

- "FR O2 MNTR-B2" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" 5 times in 10 seconds.
  5 times (cycles) are counted as shown below:

cycle	1	2	3	4	5
FR O2 MNTR-B2	R-L-R-L-R	L-R-L-R-L	R-L-R-L-R	L-R-L-R-L	R-L-R

  R = "FR O2 MNTR-B2", "RICH"
  L = "FR O2 MNTR-B2", "LEAN"
- "FR O2 SEN-B2" voltage goes above 0.6V at least once.
- "FR O2 SEN-B2" voltage goes below 0.35V at least once.
- The voltage never exceeds 1.0V.





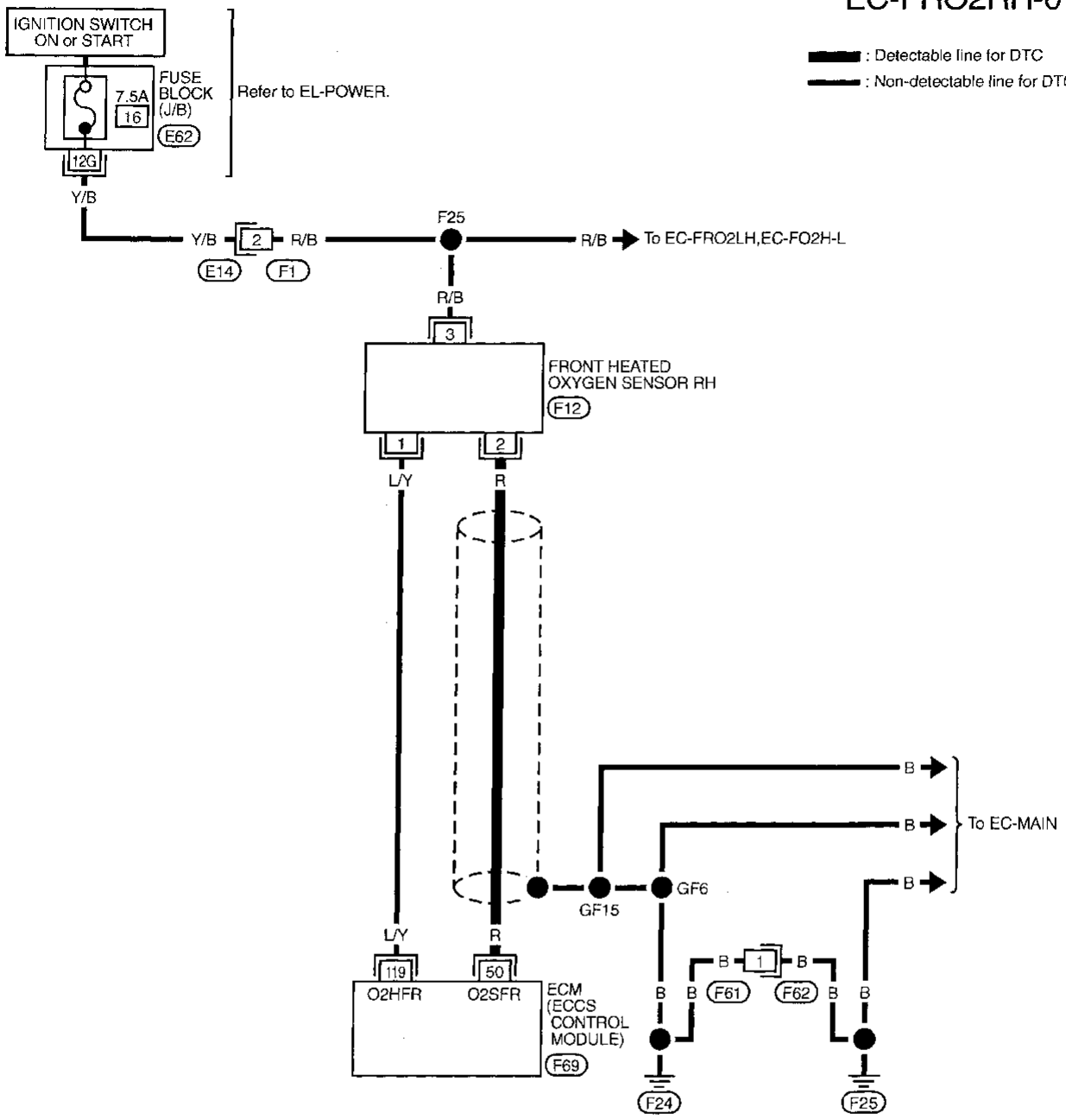
OR

1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminal ⑤⓪ (sensor signal) and ㉕ (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 0.35V at least one time.
- The voltage never exceeds 1.0V.

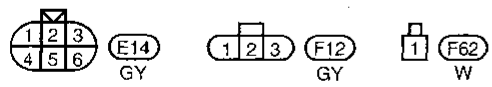
Front Heated Oxygen Sensor (Front HO2S) (Right bank) (Cont'd)

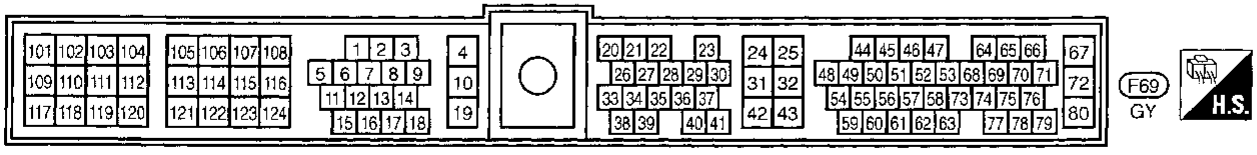
EC-FRO2RH-01



Refer to last page(Foldout page).

E62

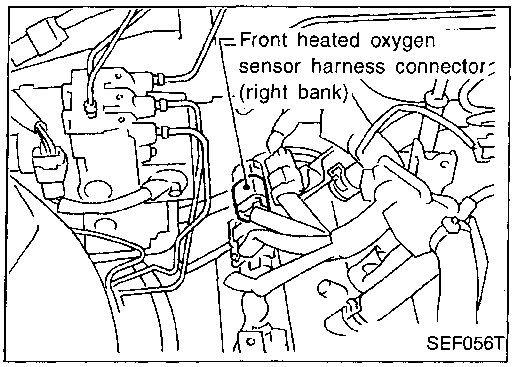


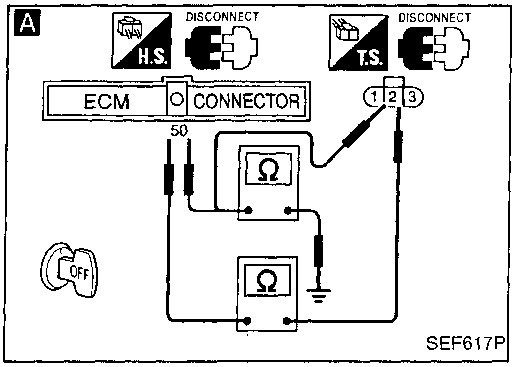


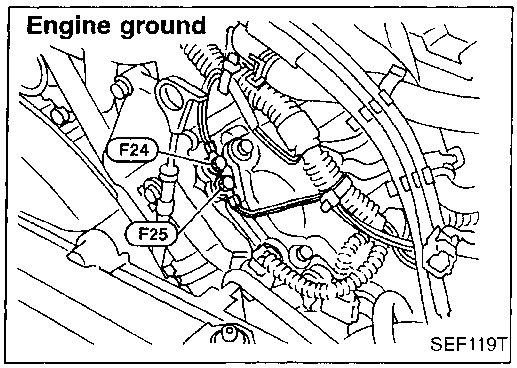
SEF876S

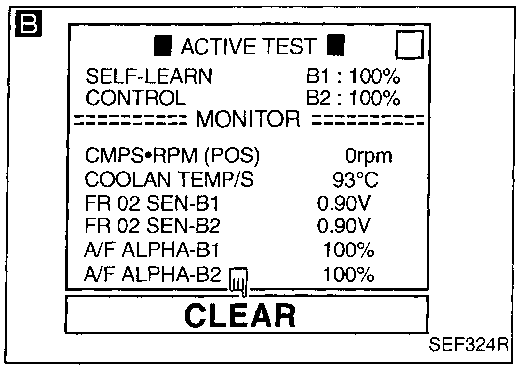
Front Heated Oxygen Sensor (Front HO2S) (Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor (right bank) harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ⑤⓪ and terminal ② .
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑤⓪ (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

Loosen and retighten engine ground screws.

B

CLEAR THE SELF-LEARNING DATA
1. Start engine and warm it up sufficiently.
2. Select "SELF-LEARNING CONT" in "ACTIVE TEST" mode with CONSULT.
3. Clear the self-learning control coefficient by touching "CLEAR".
4. Run engine for at least 10 minutes at idle speed.
   Are the 1st trip DTCs P0174, P0175 detected? Is it difficult to start engine?

Yes → Go to "TROUBLE DIAGNOSIS FOR DTC P0174, P0175, EC-180, 174.

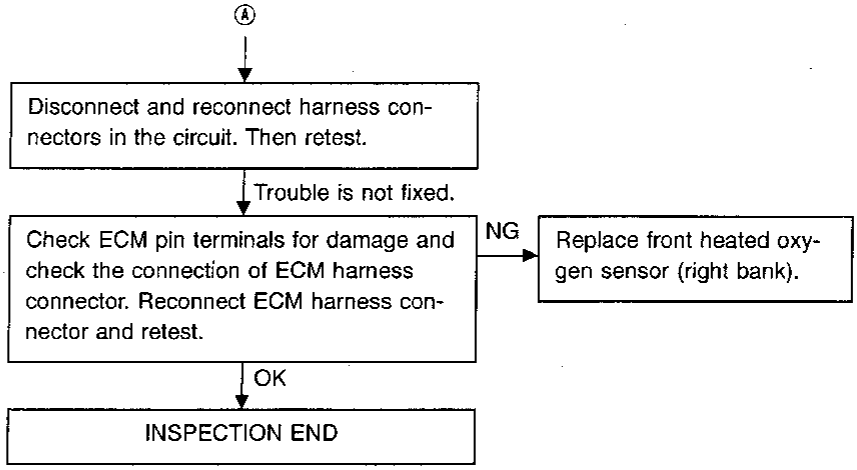
OR

2. Turn ignition switch "OFF".
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 3 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure diagnostic trouble code No. 0102 is displayed in Diagnostic Test Mode II.
6. Erase the diagnostic test mode II (Self-diagnostic results) memory. Make sure diagnostic trouble code No. 0505 is displayed in Diagnostic Test Mode II.
7. Run engine for at least 10 minutes at idle speed.
   Are the 1st trip DTCs 0209, 0210 detected? Is it difficult to start engine?

No ↓

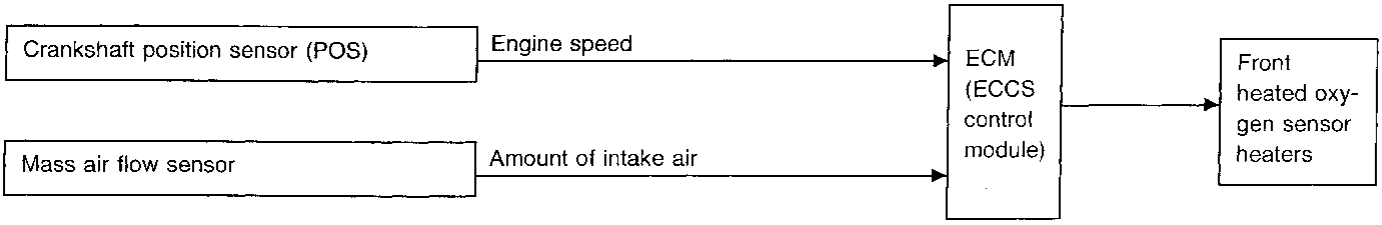
Ⓐ

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



Front Heated Oxygen Sensor Heater (Right bank)

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Front heated oxygen sensor heaters
Above 3,200	OFF
Below 3,200	ON

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
O2 SEN HTR-B2	• Engine speed: Idle	ON
	• Engine speed: Above 3,200	OFF

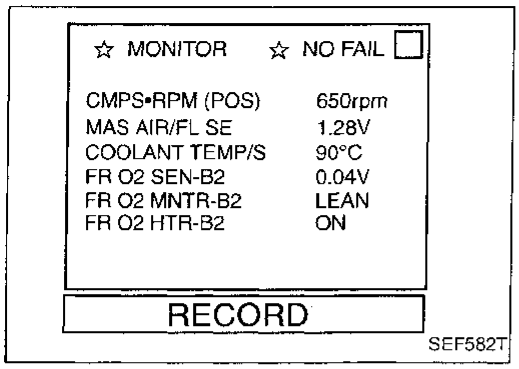
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
122	Y/R	Rear heated oxygen sensor heater (Right bank)	Engine is running. └ Engine speed is below 3,600 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0155 1001	• The current amperage in the front heated oxygen sensor heater (right bank) circuit is out of the normal range. (The 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 (right bank)



Front Heated Oxygen Sensor Heater (Right bank) (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) Select "MODE 3" with GST.

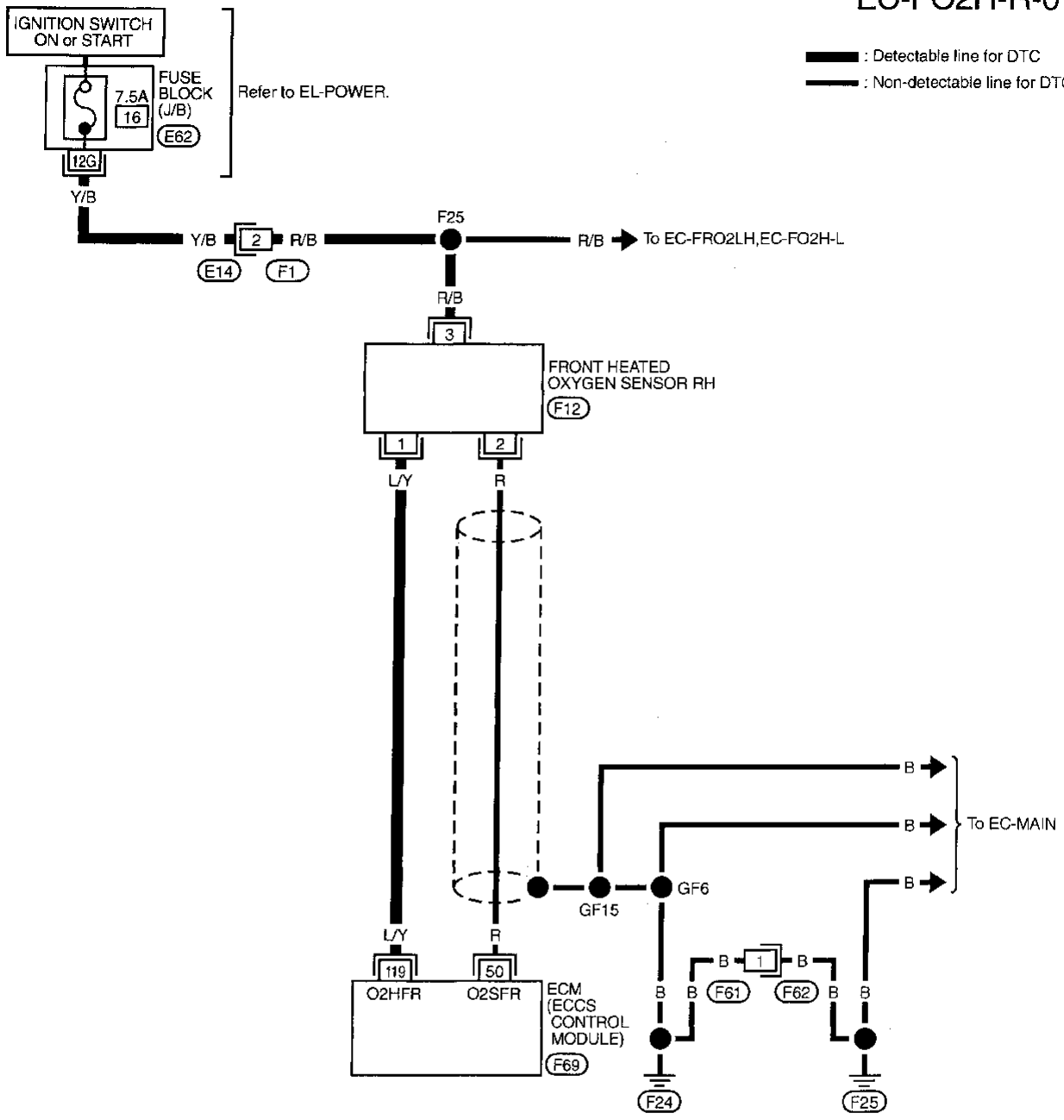
OR

1) Start engine and run it for at least 6 seconds in idle condition.
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.

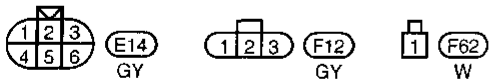
- **When using GST, "DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE" should be performed twice as much as when using CONSULT or ECM (Diagnostic Test Mode II) because GST cannot display MODE 7 (1st trip DTC) concerning this diagnosis. Therefore, using CONSULT or ECM (Diagnostic Test Mode II) is recommended.**

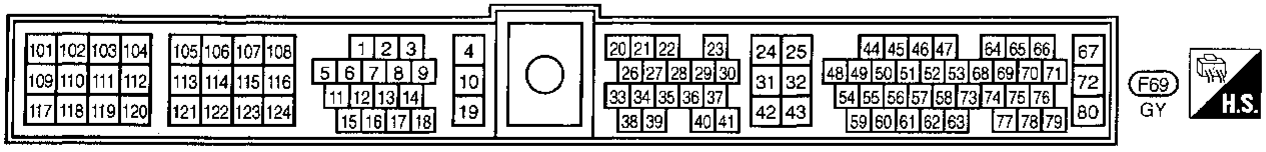
Front Heated Oxygen Sensor Heater (Right bank) (Cont'd)

EC-FO2H-R-01



Refer to last page(Foldout page).
E62





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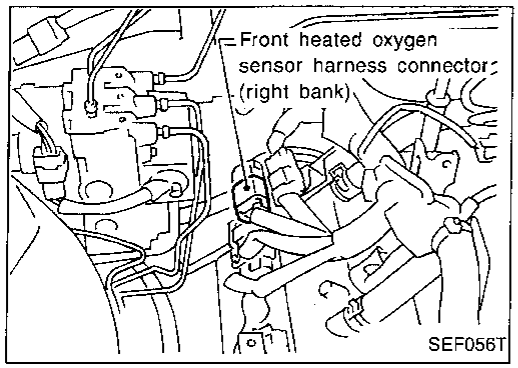
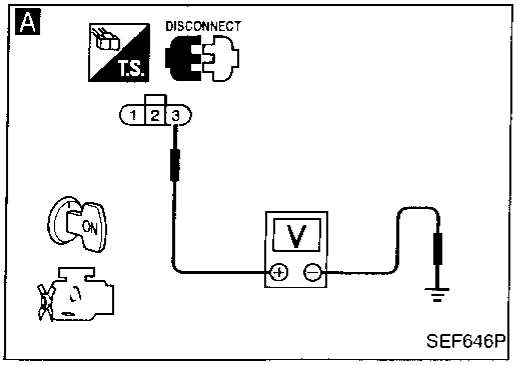
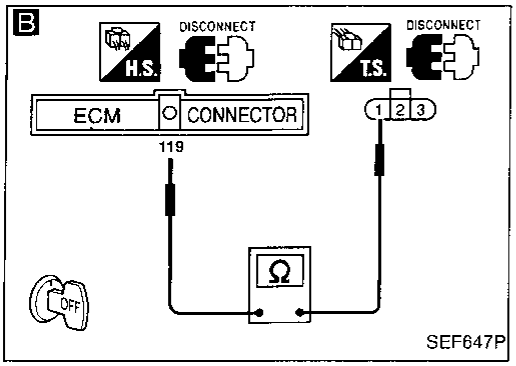
Front Heated Oxygen Sensor Heater (Right bank) (Cont'd)



DIAGNOSTIC PROCEDURE





INSPECTION START

A

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

NG → Check the following.
- Harness connectors (F1), (E14)
- 7.5A 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 (119).
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

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

NG → Replace front heated oxygen sensor (right bank).

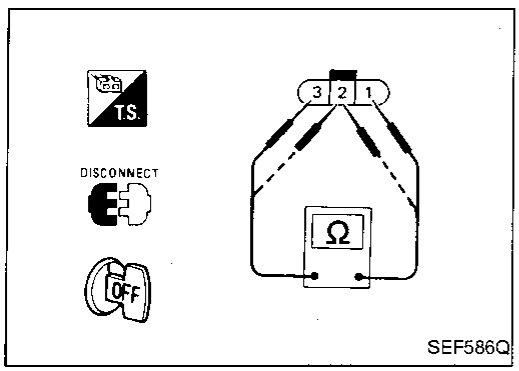
OK ↓

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

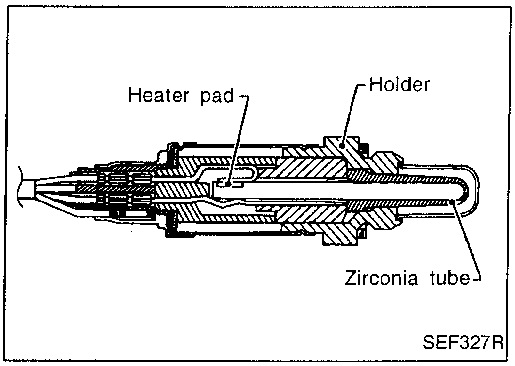
Front heated oxygen sensor heater

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) (Right bank)

COMPONENT DESCRIPTION

The rear heated oxygen sensor (Rear HO2S), after three way catalyst, monitors the oxygen level in the exhaust gas on right bank.
Even if switching characteristics of the front heated oxygen sensor are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the rear heated oxygen sensor.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the rear heated oxygen sensor is not used for engine control operation.

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
RR O2 SEN-B2	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ↔ 0.6 - 1.0V

ECM terminals and reference value

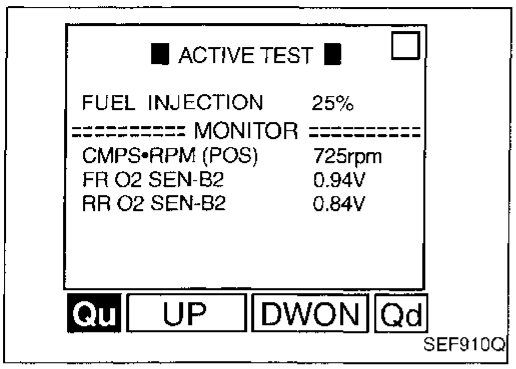
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

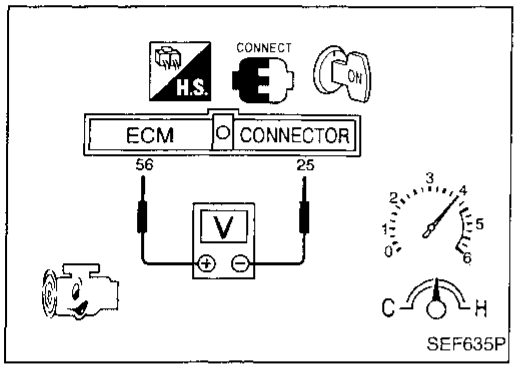
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
56	W	Rear heated oxygen sensor (RH)	Engine is running. └ After warming up sufficiently and engine speed is 2,000 rpm.	0 - Approximately 1.0V

ON BOARD DIAGNOSIS LOGIC

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

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0156 0708	• An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors on right bank (The sensor circuit is open.) • Rear heated oxygen sensor (right bank)
	• The maximum and minimum voltages from the sensor are not reached to the specified voltages. • It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors on right bank (The sensor circuit is shorted.) • Rear heated oxygen sensor (right bank) • Fuel pressure • Injectors • Intake air leaks





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

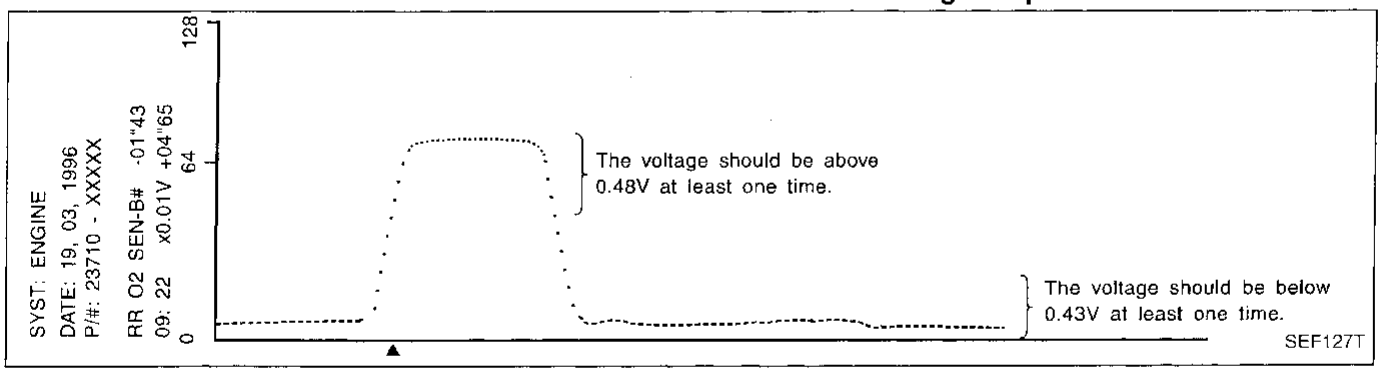
OVERALL FUNCTION CHECK

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

1) Start engine and warm it up sufficiently.
2) Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "RR O2 SENSOR-B2" 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

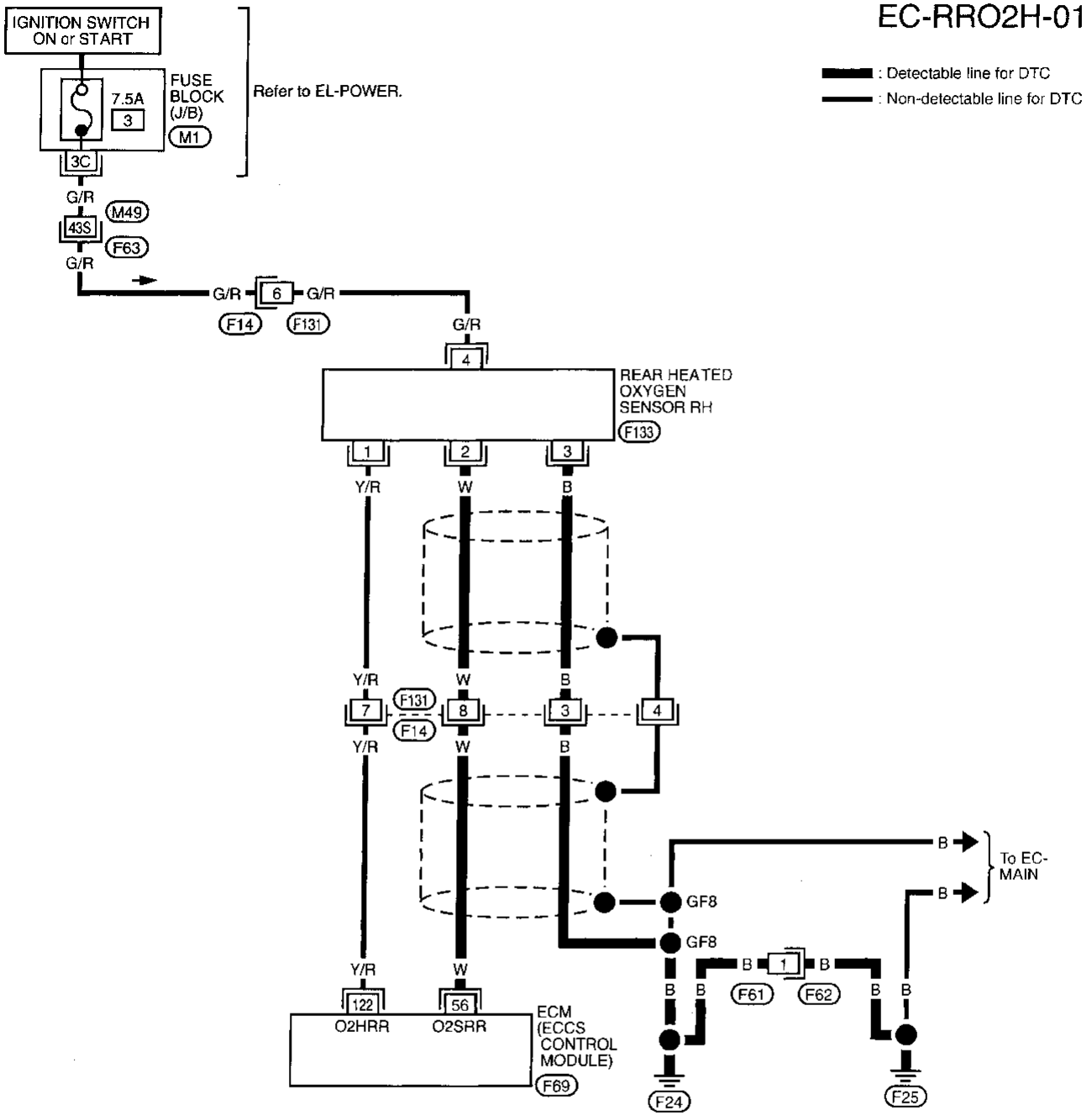
1) Start engine and warm it up sufficiently.
2) Set voltmeter probes between ECM terminals ⑯ (sensor signal) and ㉕ (engine ground).
3) Check the voltage when racing up to 4,000 rpm under no load at least 10 times.
   (depress and release accelerator pedal as soon as possible)
   The voltage should be above 0.48V and below 0.43V at least once during this procedure.
   If the voltage can be confirmed in step 3, step 4 is not necessary.
4) Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in 3rd gear position.
   The voltage should be above 0.48V and below 0.43V at least once during this procedure.

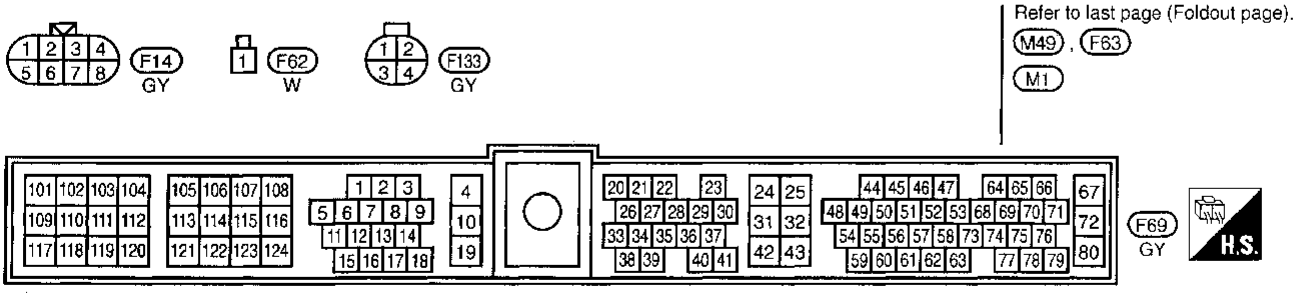


Rear Heated Oxygen Sensor (Rear HO2S) (Right bank) (Cont'd)

EC-RRO2H-01

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





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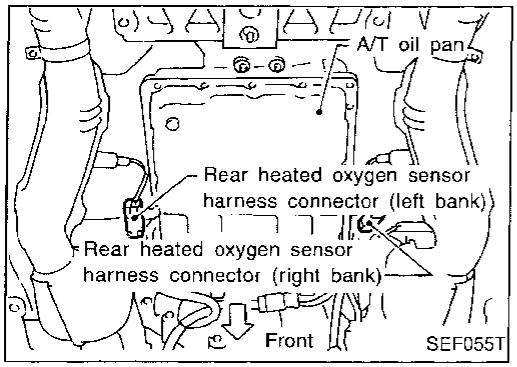
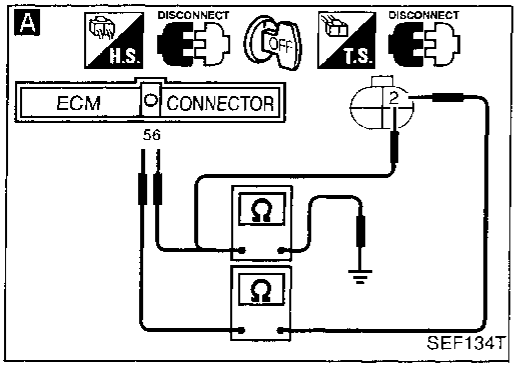
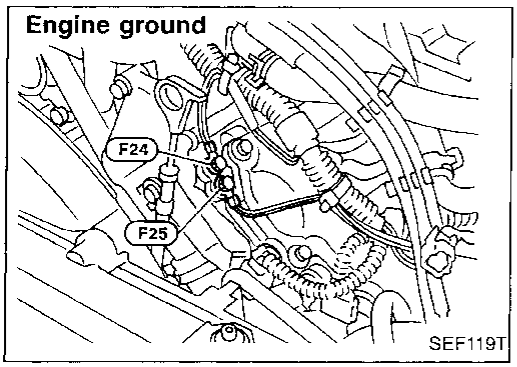
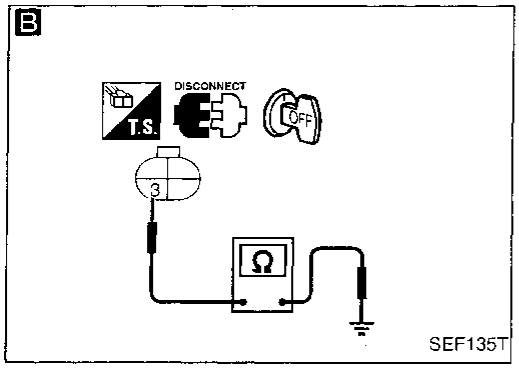
Rear Heated Oxygen Sensor (Rear HO2S) (Right bank) (Cont'd)

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 ⑯ and terminal ② .
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑯ (or terminal ②) and ground.
   Continuity should not exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (F14) , (F131)

If NG, repair harness or connectors.

OK

B

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Loosen and retighten ground screws.
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 (F14) , (F131)
- Harness connectors (F62) , (F61)
- 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.

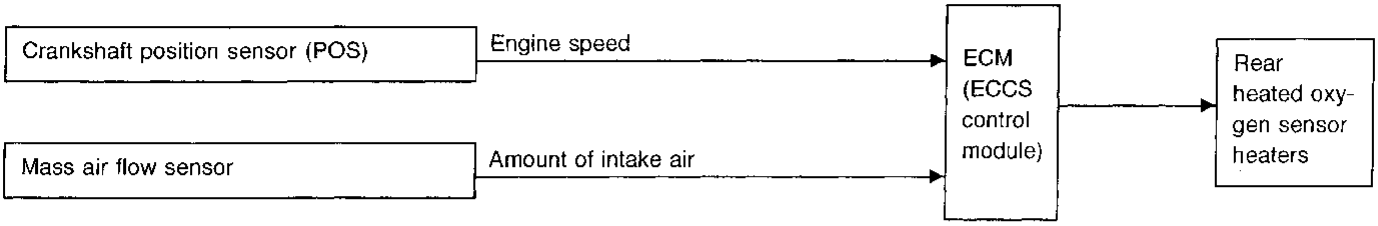
NG → Replace rear heated oxygen sensor.

OK

INSPECTION END

Rear Heated Oxygen Sensor Heater (Right bank)

SYSTEM DESCRIPTION



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

OPERATION

Engine speed rpm	Front heated oxygen sensor heaters
Above 3,600	OFF
Below 3,600	ON

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
O2 SEN HTR-B2	• Engine speed: Idle	ON
	• Engine speed: Above 3,600 rpm	OFF

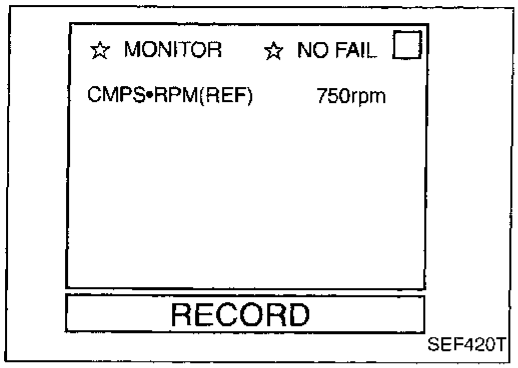
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
122	Y/R	Rear heated oxygen sensor heater (Right bank)	Engine is running. └ Engine speed is below 3,600 rpm.	0 - 0.5V
			Engine is running. └ Engine speed is above 3,600 rpm.	BATTERY VOLTAGE (11 - 14V)

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0161 1002	• The current amperage in the rear heated oxygen sensor heater (right bank) circuit is out of the normal range. (The 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 (right bank)



Rear Heated Oxygen Sensor Heater (Right bank) (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) Select "MODE 3" with GST.

OR

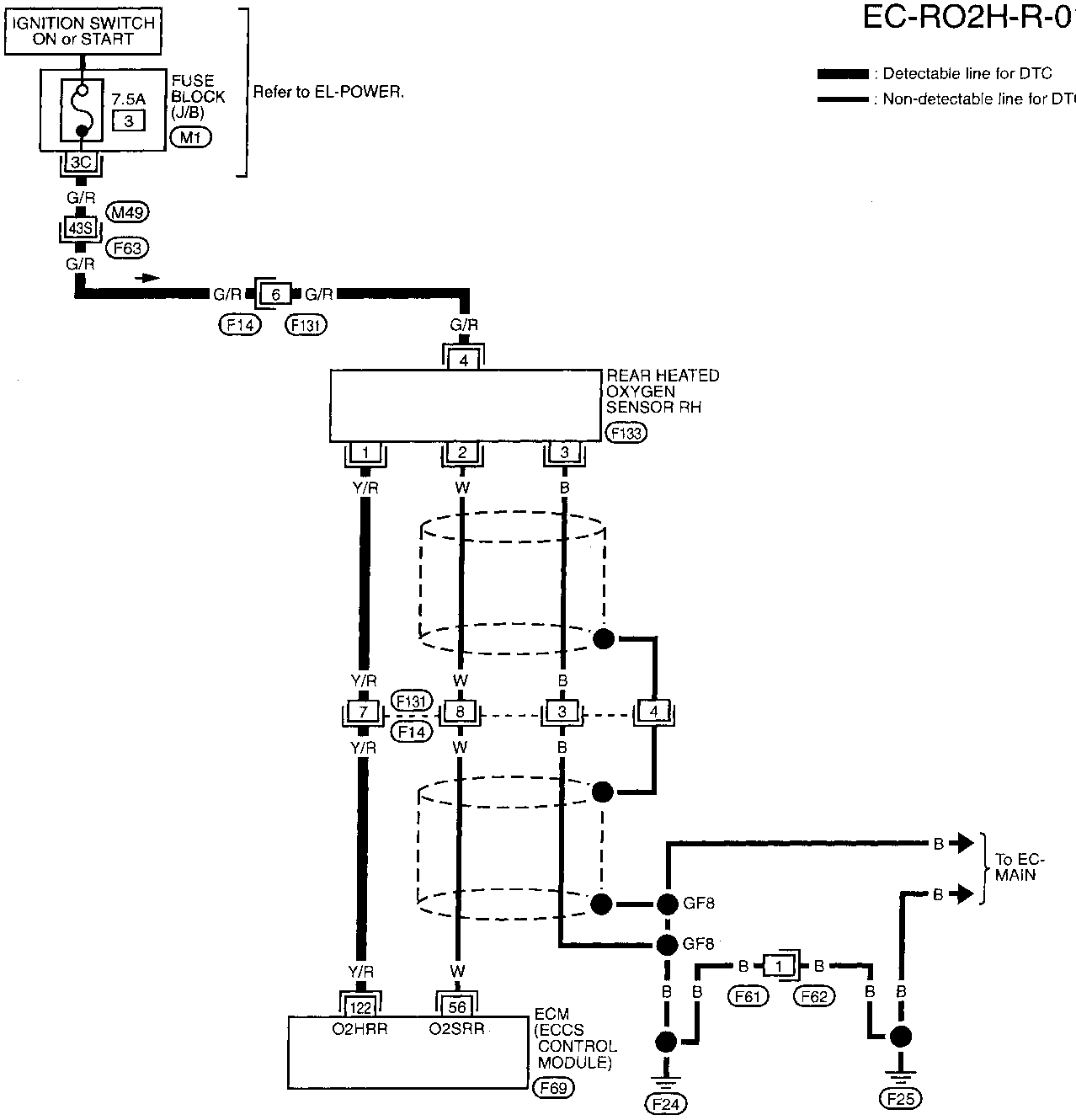
1) Start engine and run it for at least 6 seconds in idle condition.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

- **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.**

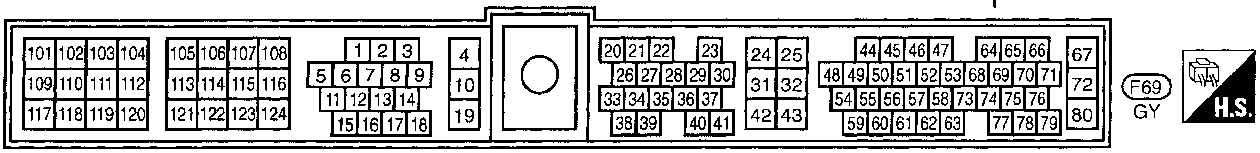
Rear Heated Oxygen Sensor Heater (Right bank) (Cont'd)

EC-RO2H-R-01

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



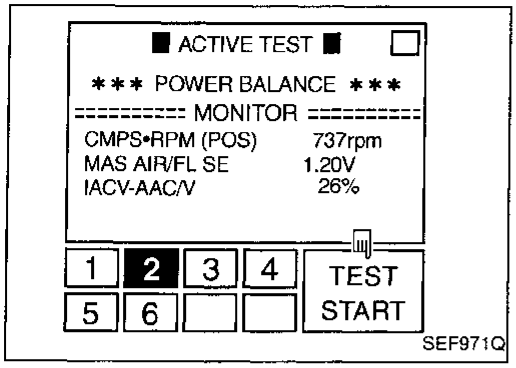
Refer to last page (Foldout page).
M49, F63
M1

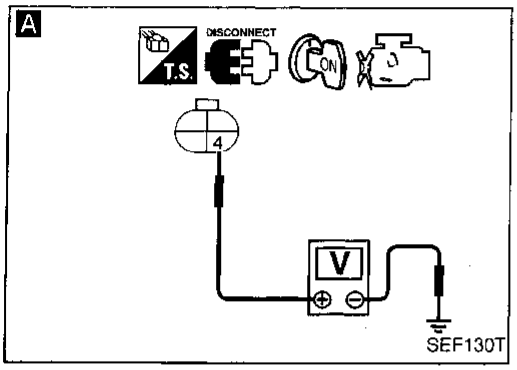


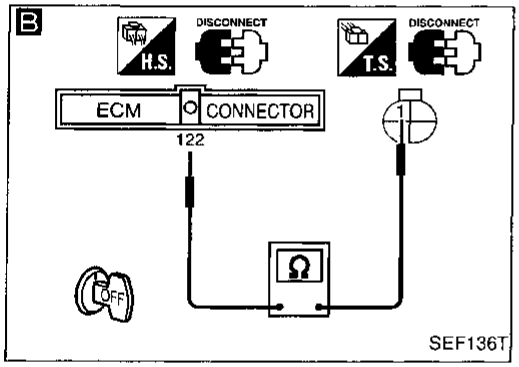
SEF879S

Rear Heated Oxygen Sensor Heater (Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

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

NG → Check the following.
- Harness connectors (F14), (F131)
- Harness connectors (F63), (M49)
- 7.5A 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 (122).
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F14), (F131)
- Harness for open or short between sensor and ECM

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 (right bank).

OK ↓

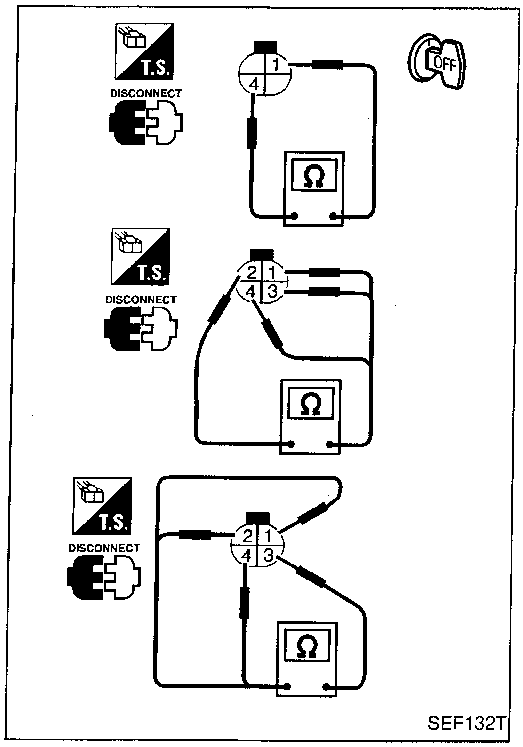
Disconnect and reconnect harness connectors in the circuit. Then retest.

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



Rear Heated Oxygen Sensor Heater (Right bank) (Cont'd)

COMPONENT INSPECTION

Rear heated oxygen sensor heater

Check the following.

1. Check resistance between terminals ④ and ① .
   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 front heated oxygen sensor.

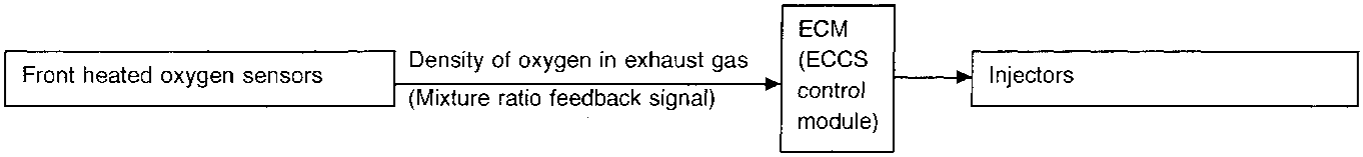
CAUTION:

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.

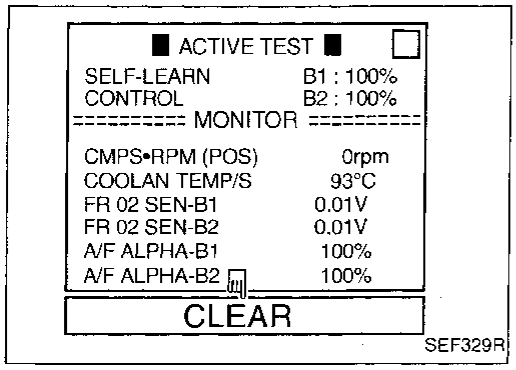
Fuel Injection System Function (Left bank) (Lean side)

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 (left bank) • Injectors (left bank) • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

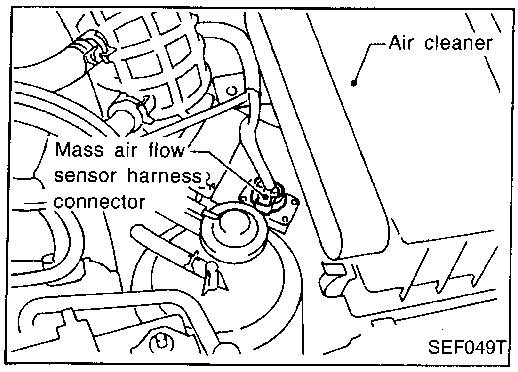
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
4) Clear the self-learning control coefficient by touching "CLEAR".
5) Select "DATA MONITOR" mode with 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.

- **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.**

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

Crank engine while depressing accelerator pedal.
If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-167.
If the engine does not start, visually check exhaust and intake air leak again.

OR



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.

- **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.**

Crank engine while depressing accelerator pedal.
If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-167.
If the engine does not start, visually check exhaust and intake air leak again.

OR

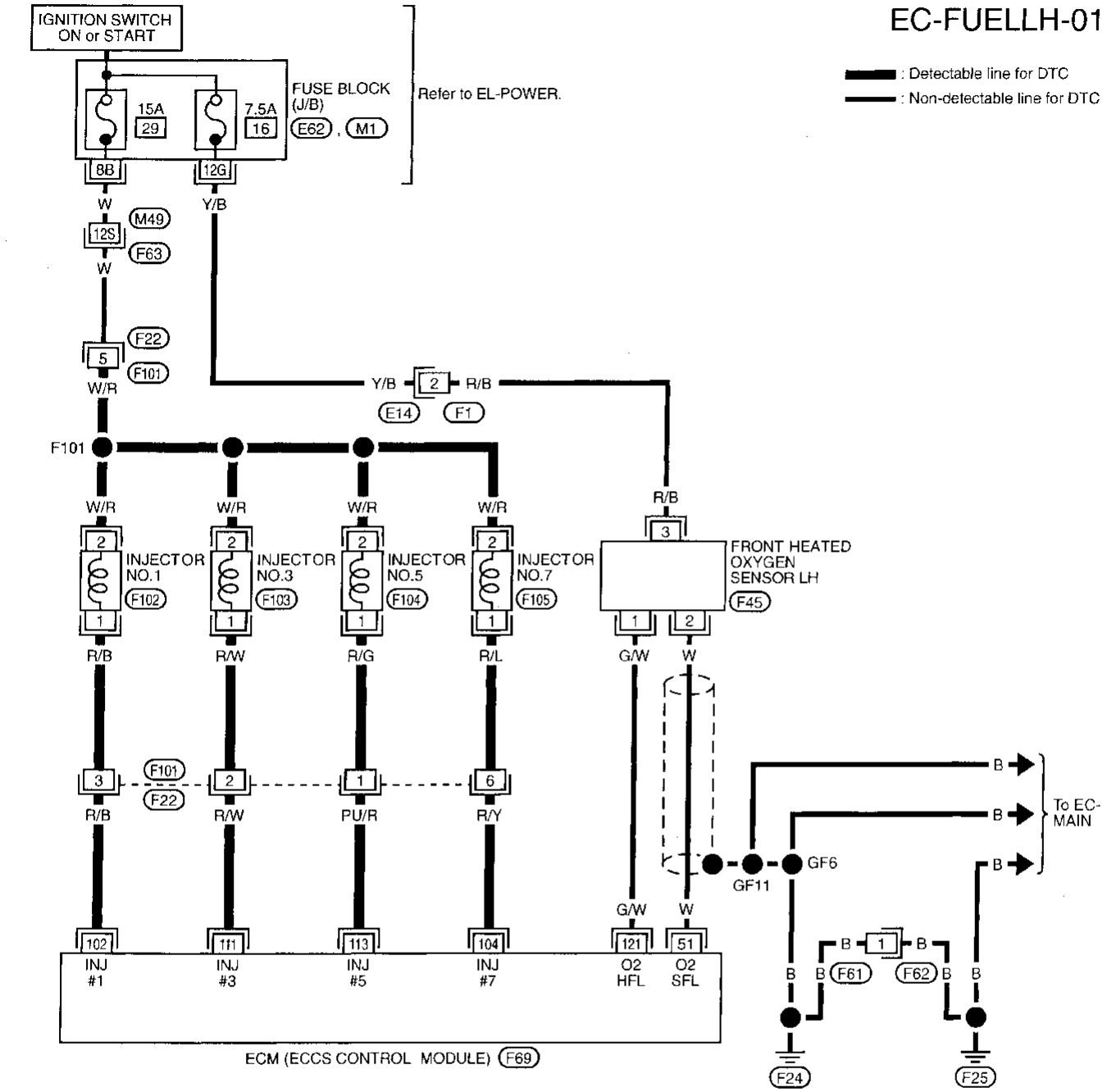
1) Disconnect mass air flow sensor harness connector.
2) Start engine and run it at least 3 seconds at idle speed.
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Turn ignition switch "ON".
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0102 is detected.
6) Erase the 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 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.

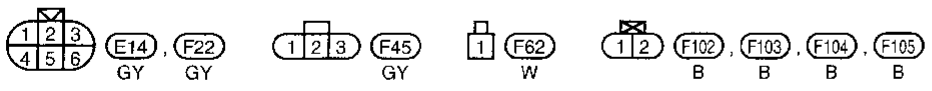
Fuel Injection System Function (Left bank) (Lean side) (Cont'd)

- **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.**

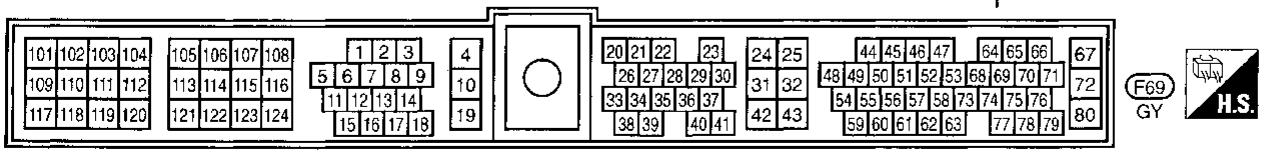
Crank engine while depressing accelerator pedal.
If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-167.
If the engine does not start, visually check exhaust and intake air leak again.

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





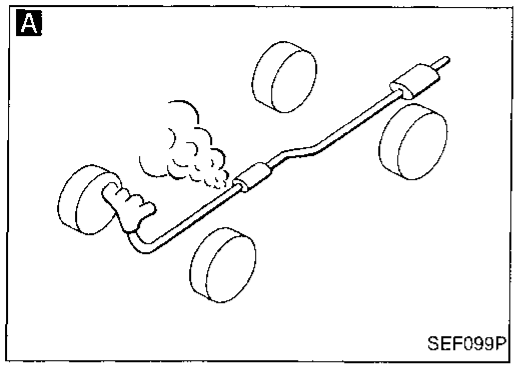
Refer to last page (Foldout page).
M49, F63
E62
M1

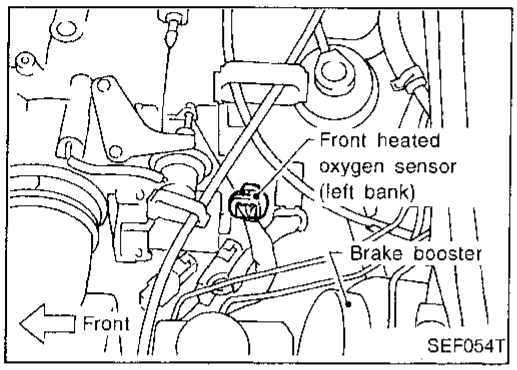


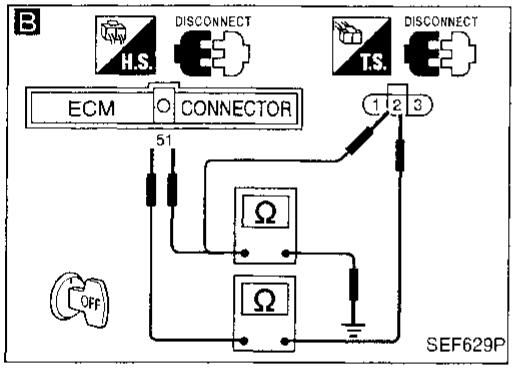
SEF880S

Fuel Injection System Function (Left bank) (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 (LEFT BANK).
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor (left bank) harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ⑤① and terminal ② .
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑤① (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.
OK ↓

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-23.
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-323.
OK ↓

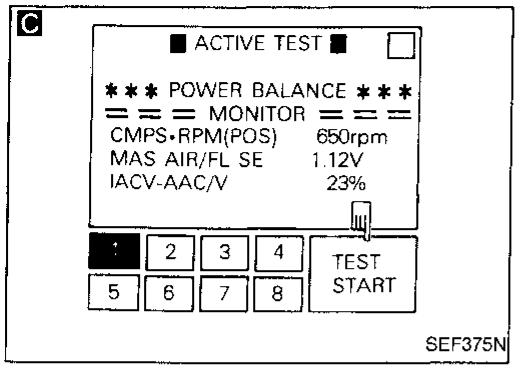
CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm
OR
Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm
OR
Check mass air flow sensor output voltage, refer to EC-104.
Approximately 2.1V: 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-99.
OK ↓

Ⓐ

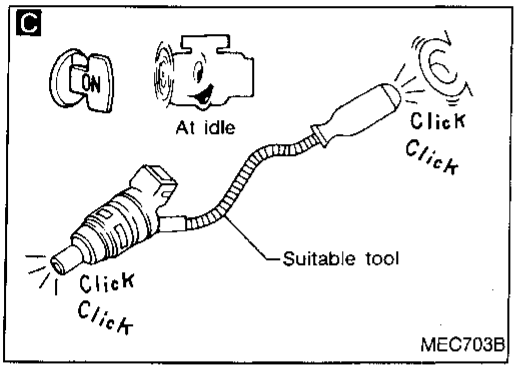
Fuel Injection System Function (Left bank) (Lean side) (Cont'd)

C



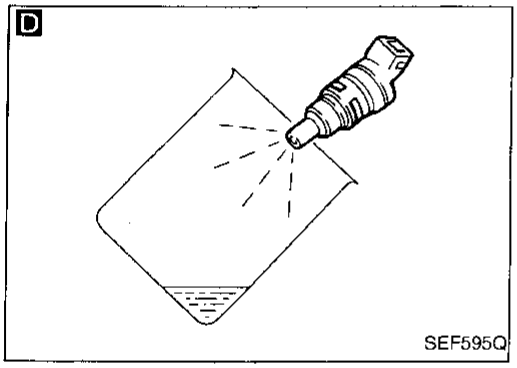
SEF375N

C



MEC703B

D



SEF595Q

Ⓐ

C

CHECK FUNCTION OF INJECTORS (LEFT BANK).

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

OR

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

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-310. Repair harness or connectors.

OK ↓

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

↓

1. Turn ignition switch "OFF".
2. Disconnect injector harness connectors on left bank.
3. Remove injector gallery assembly.
   Refer to EC-24.
   Keep fuel hose and all injectors connected to injector gallery.
   The injector harness connectors on right bank should remain connected.

↓

D

1. Disconnect all ignition coil harness connectors.
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.

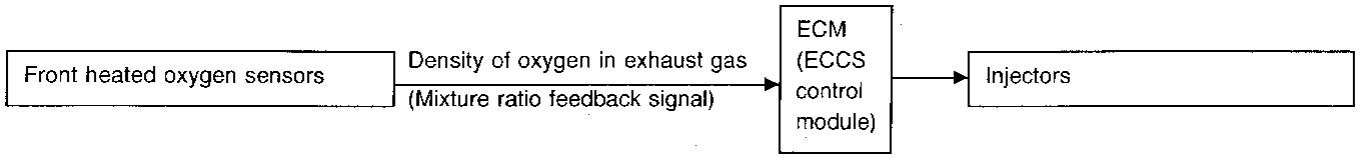
↓

INSPECTION END

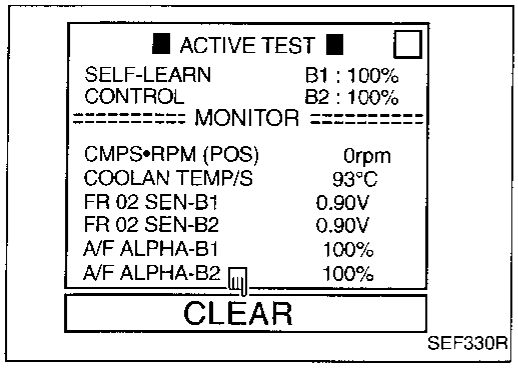
Fuel Injection System Function (Left bank) (Rich side)

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 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)
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 (left bank) • Injectors (left bank) • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor

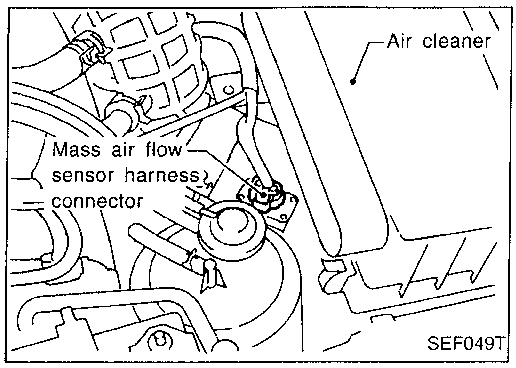


DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

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.
   If engine does not start, remove ignition plugs and check for fouling, etc.

OR

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



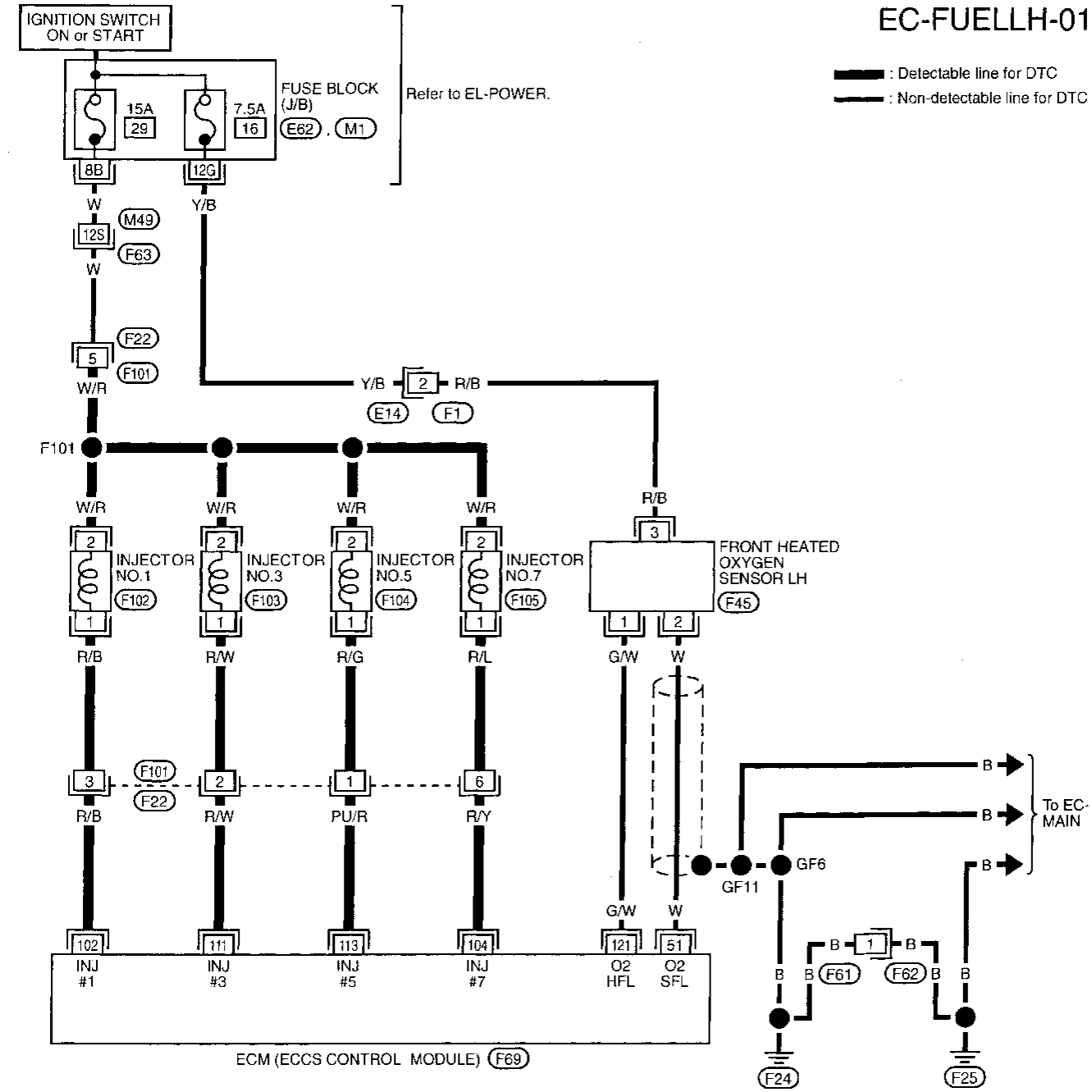
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "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 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.
   If engine does not start, remove ignition plugs and check for fouling, etc.

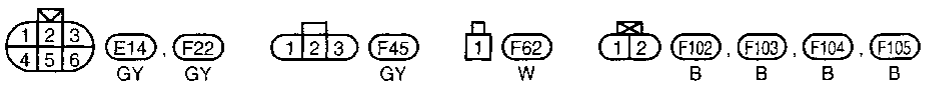
OR

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 DTC 0102 is detected.
6) Erase the 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 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.
   If engine does not start, remove ignition plugs and check for fouling, etc.

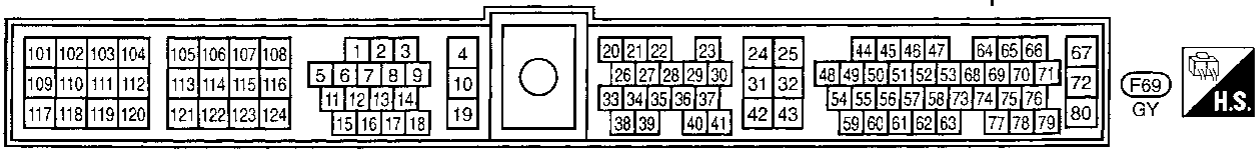
Fuel Injection System Function (Left bank) (Rich side) (Cont'd)

EC-FUELLH-01





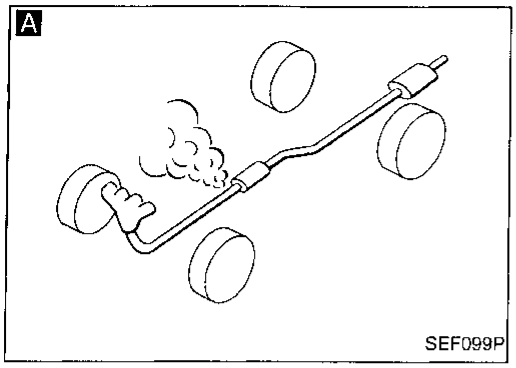
Refer to last page (Foldout page).
M49, F63
E62
M1

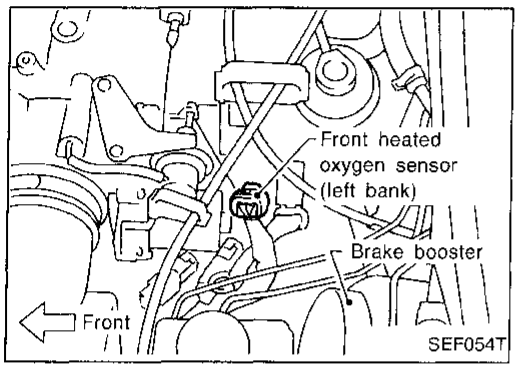


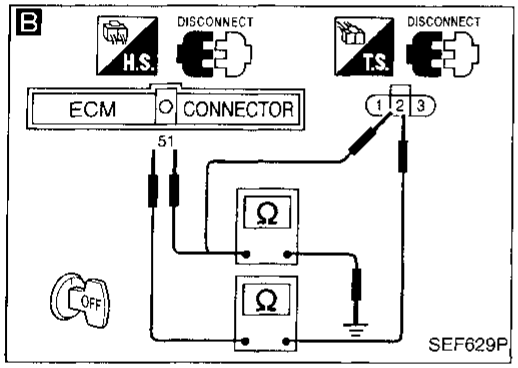
SEF880S

Fuel Injection System Function (Left bank) (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 (LEFT BANK).
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor (left bank) harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ⑤① and terminal ② .
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑤① (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-23.
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-323.

OK

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

OR

Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

OR

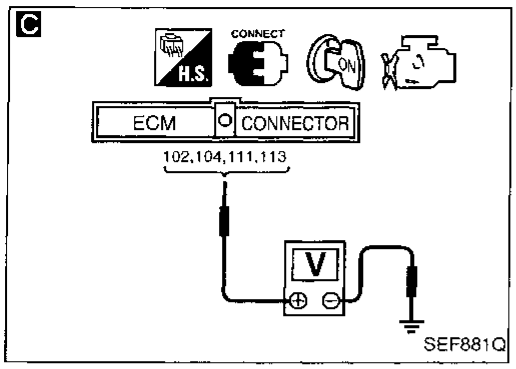
Check mass air flow sensor output voltage, refer to EC-104.
Approximately 2.1V: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-99.

OK

Ⓐ

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



Ⓐ

C

CHECK INJECTORS (LEFT BANK).
1. Turn ignition switch "ON".
2. Check voltage between ECM terminals (102), (104), (111), (113) 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-310. Repair harness or connectors.

OK ↓

Remove injector assembly. Refer to EC-24. Keep fuel hose and all injectors connected to injector gallery.

↓

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

↓

1. Disconnect all injector harness connectors.
2. Disconnect all ignition coil harness connectors.
3. Crank engine for about 3 seconds. Make sure fuel does not drip from injector.

Drips → Replace the injectors from which fuel is dripping.

Does not drip. ↓

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

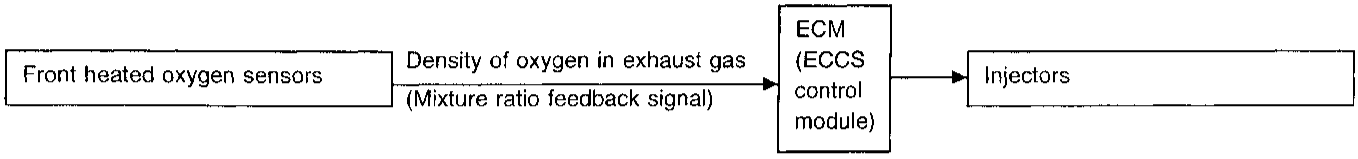
↓

INSPECTION END

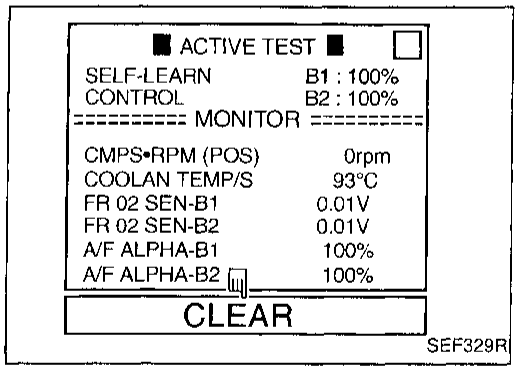
Fuel Injection System Function (Right bank) (Lean side)

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)
P0174 0210	• 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 (right bank) • Injectors (right bank) • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

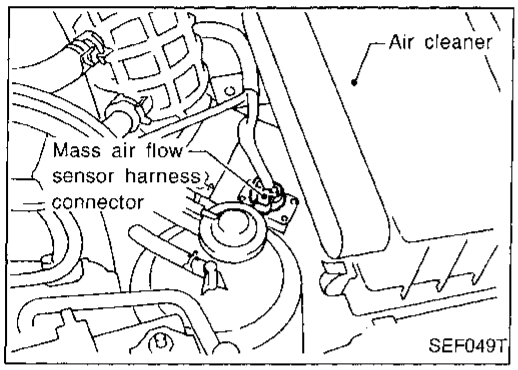
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "SELF-LEARN CONTROL" in "ACTIVE TEST" mode with CONSULT.
4) Clear the self-learning control coefficient by touching "CLEAR".
5) Select "DATA MONITOR" mode with CONSULT.
6) Start engine again and run it for at least 10 minutes at idle speed.
   The 1st trip DTC P0174 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.

- **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.**

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

Crank engine while depressing accelerator pedal.
If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-178.
If the engine does not start, visually check exhaust and intake air leak again.

OR



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.

- **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.**

Crank engine while depressing accelerator pedal.
If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-178.
If the engine does not start, visually check exhaust and intake air leak again.

OR

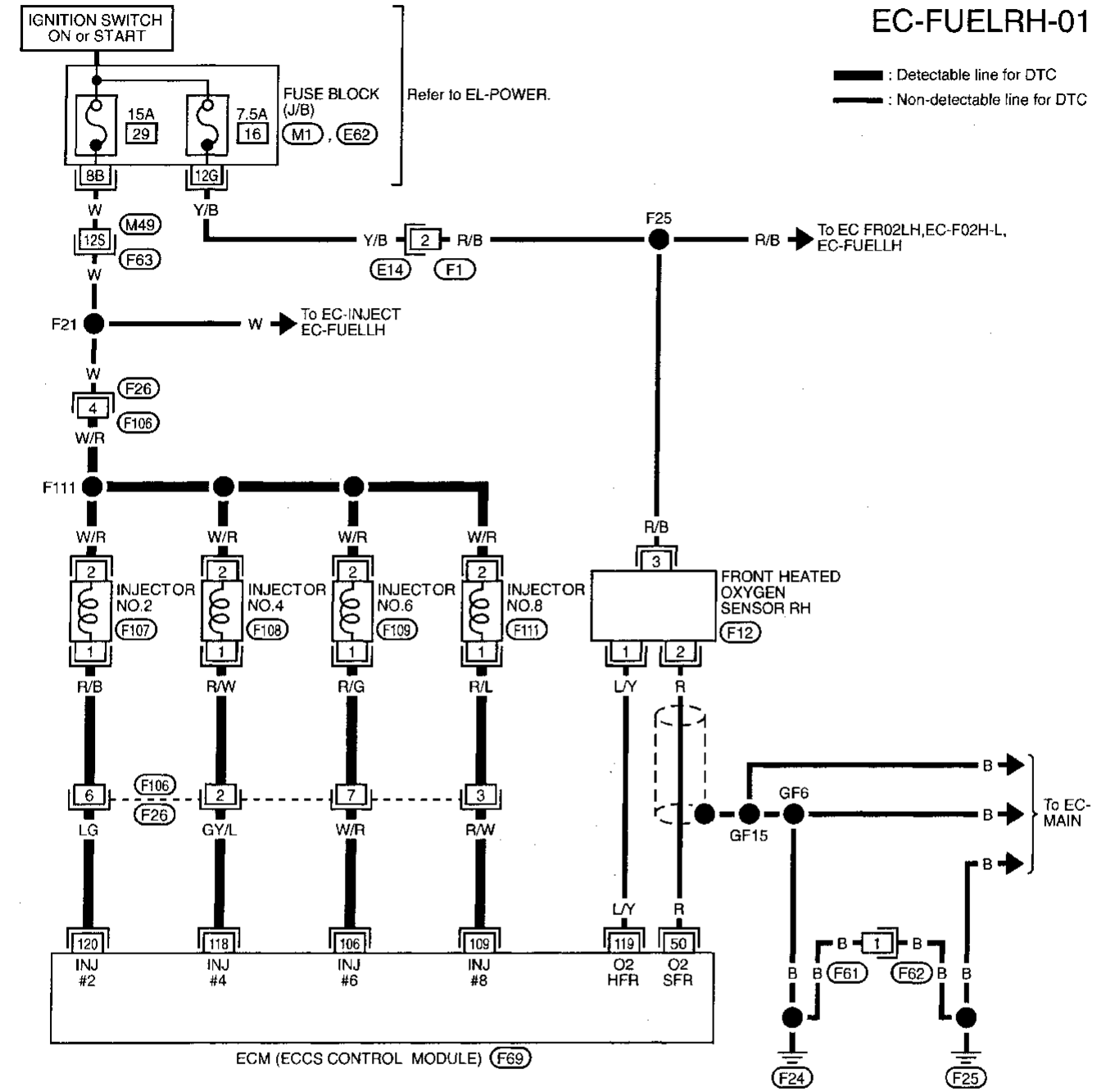
1) Disconnect mass air flow sensor harness connector.
2) Start engine and run it for at least 3 seconds at idle speed.
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Turn ignition switch "ON".
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0102 is detected.
6) Erase the 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 DTC 0210 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.

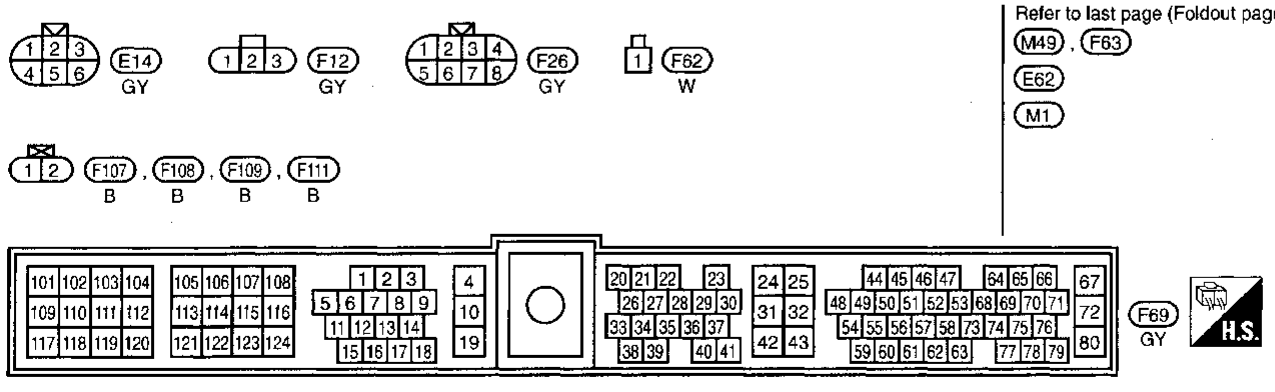
Fuel Injection System Function (Right bank) (Lean side) (Cont'd)

- **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.**

Crank engine while depressing accelerator pedal.
If engine starts, go to "DIAGNOSTIC PROCEDURE", EC-178.
If the engine does not start, visually check exhaust and intake air leak again.

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



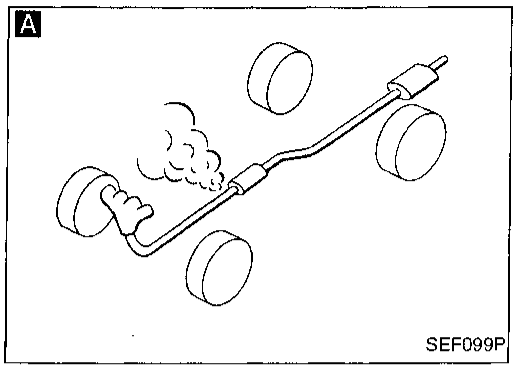


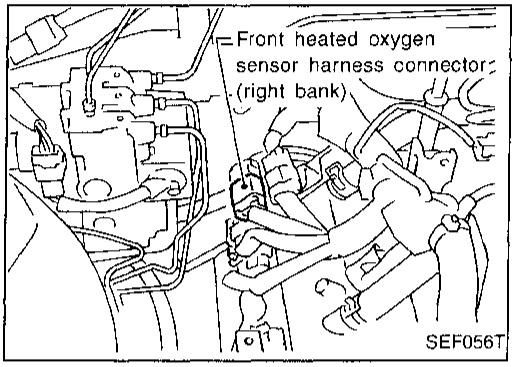
Refer to last page (Foldout page).
M49, F63
E62
M1

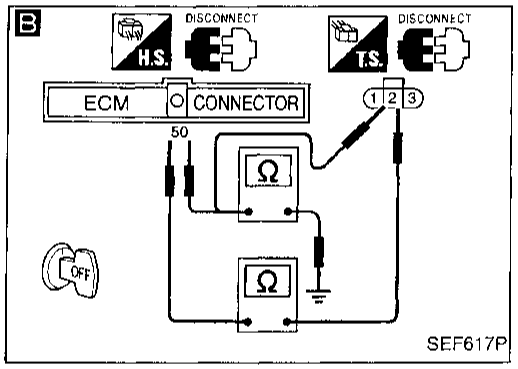
SEF881S

Fuel Injection System Function (Right bank) (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 mass air flow sensor.
NG → Repair or replace.

OK

B

CHECK FRONT HEATED OXYGEN SENSOR (RIGHT BANK).
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor (right bank) harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ⑤⓪ and terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑤⓪ (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-23.
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-323.

OK

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

OR

Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

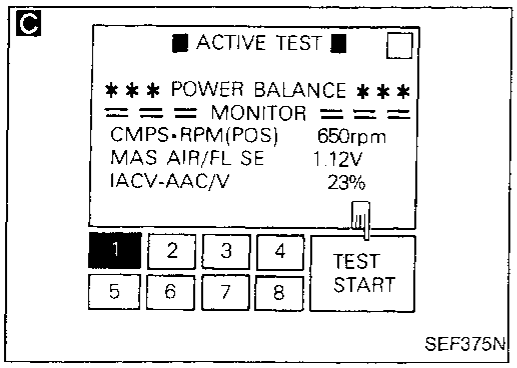
Check mass air flow sensor output voltage, refer to EC-104.
Approximately 2.1V: at 2,500 rpm

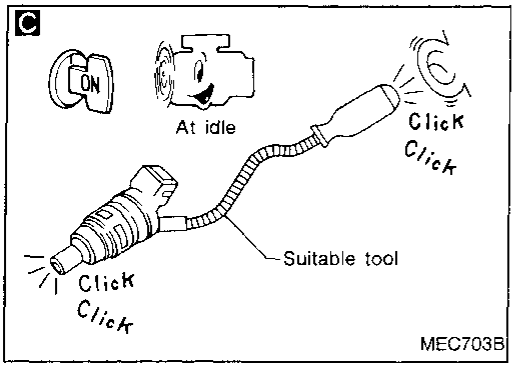
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-99.

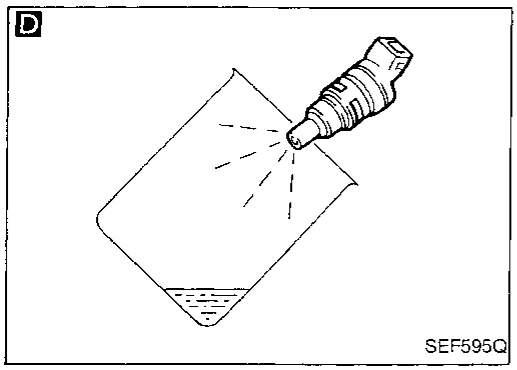
OK

Ⓐ

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







Ⓐ

C

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

OR

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

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-310. Repair harness or connectors.

OK ↓

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

↓

1. Turn ignition switch "OFF".
2. Disconnect injector harness connectors on right bank.
3. Remove injector gallery assembly. Refer to EC-24.
Keep fuel hose and all injectors connected to injector gallery.
The injector harness connectors on left bank should remain connected.

↓

D

1. Disconnect all ignition coil harness connectors.
2. Crank engine for about 3 seconds. Make sure that fuel sprays out from injector.

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.

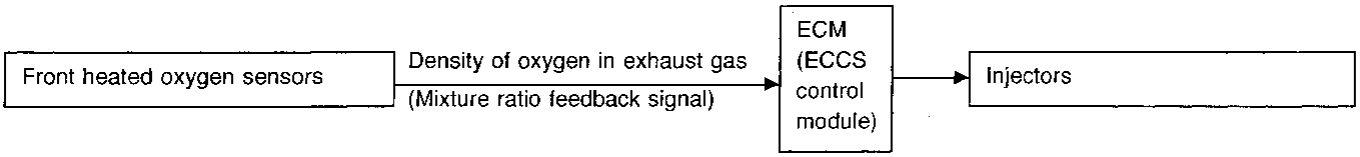
↓

INSPECTION END

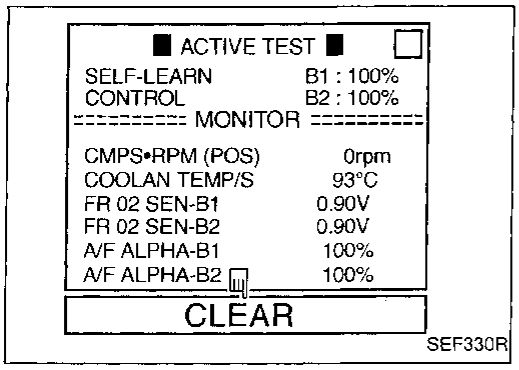
Fuel Injection System Function (Right bank) (Rich side)

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 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)
P0175 0209	• 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 (right bank) • Injectors (right bank) • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor

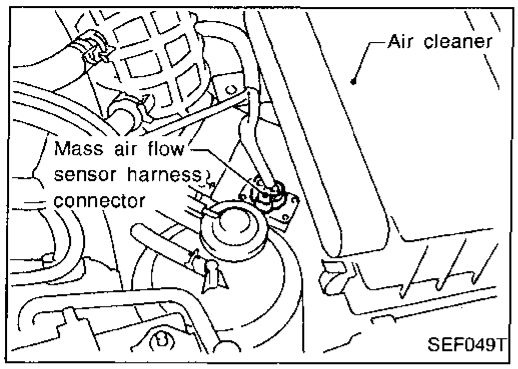


DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE (Overall)

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 P0175 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.
   If engine does not start, remove ignition plugs and check for fouling, etc.

OR

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

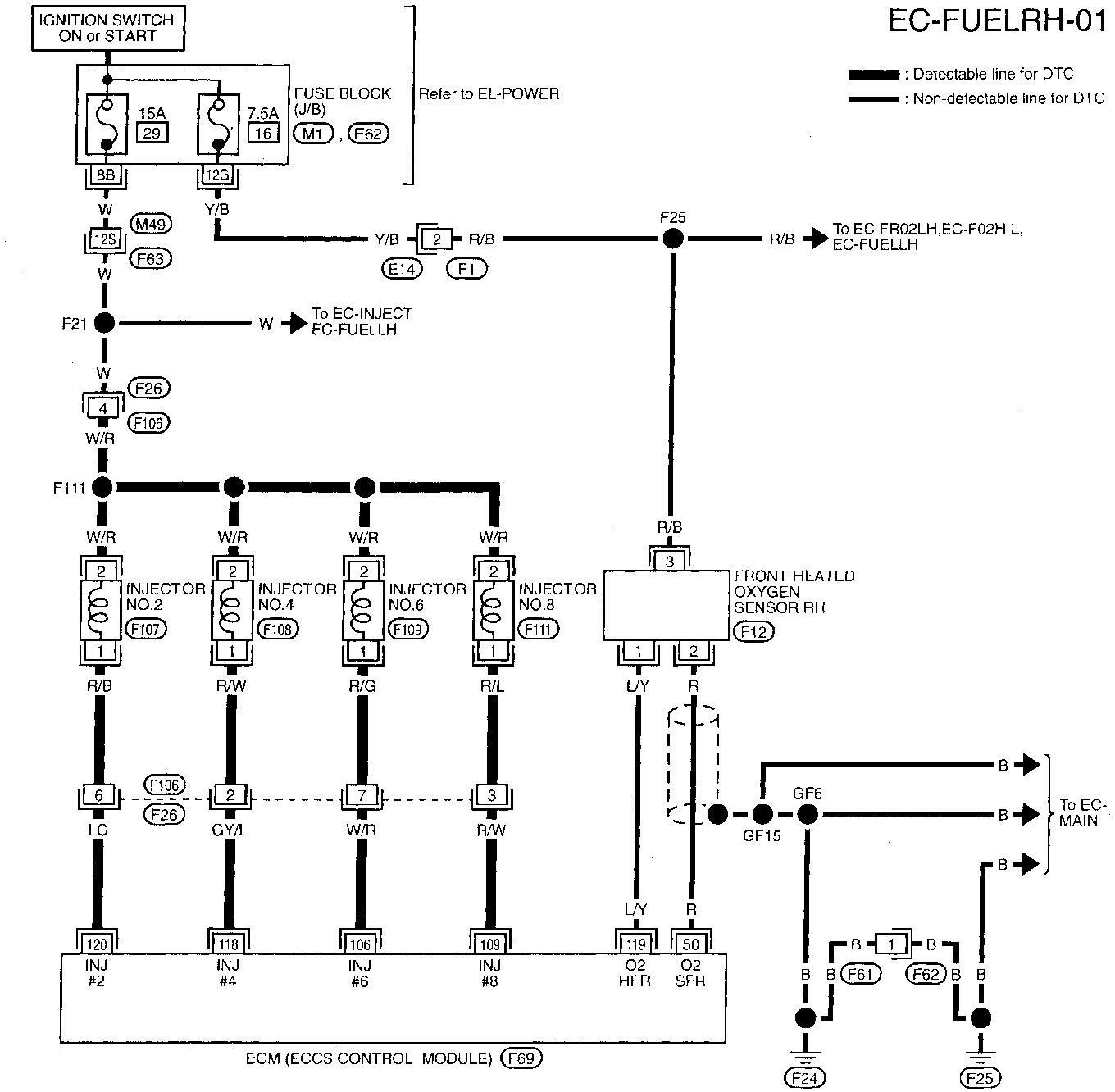


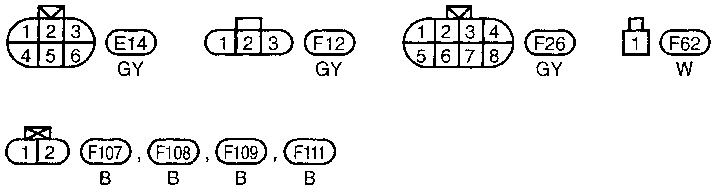
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Disconnect mass air flow sensor harness connector. Then restart and run engine for at least 3 seconds at idle speed.
4) Stop engine and reconnect mass air flow sensor harness connector.
5) Select "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 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.
   If engine does not start, remove ignition plugs and check for fouling, etc.

OR

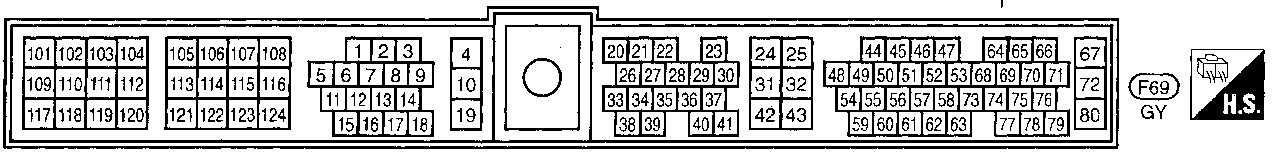
1) Disconnect mass air flow sensor harness connector.
2) Start engine and run it for at least 3 seconds at idle speed.
3) Stop engine and reconnect mass air flow sensor harness connector.
4) Turn ignition switch "ON".
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM. Make sure DTC 0102 is detected.
6) Erase the 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 DTC 0209 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.
   If engine does not start, remove ignition plugs and check for fouling, etc.

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





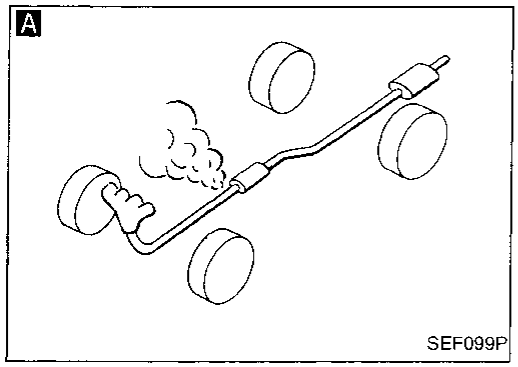
Refer to last page (Foldout page).
M49, F63
E62
M1

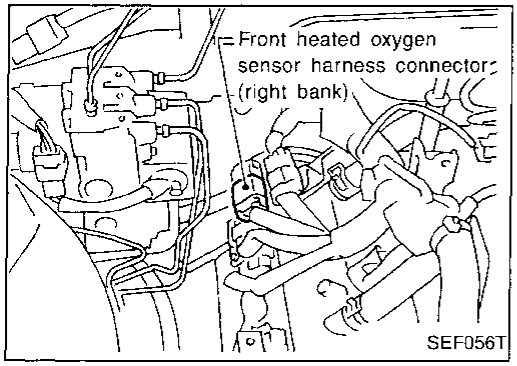


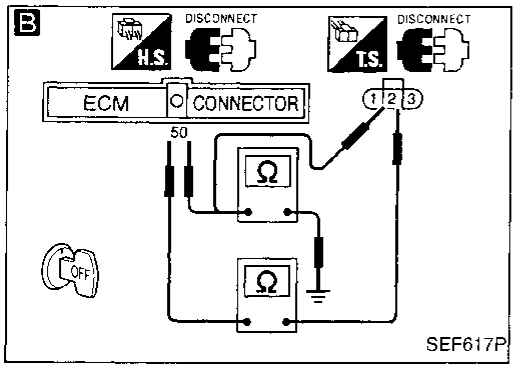
SEF881S

Fuel Injection System Function (Right bank) (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 (RIGHT BANK).
1. Turn ignition switch "OFF".
2. Disconnect front heated oxygen sensor (right bank) harness connector and ECM harness connector.
3. Check harness continuity between ECM terminal ⑤⓪ and terminal ②.
   Continuity should exist.
4. Check harness continuity between ECM terminal ⑤⓪ (or terminal ②) and ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK

CHECK FUEL PRESSURE.
1. Release fuel pressure to zero. Refer to EC-23.
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-323.

OK

CHECK MASS AIR FLOW SENSOR.
Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

OR

Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

OR

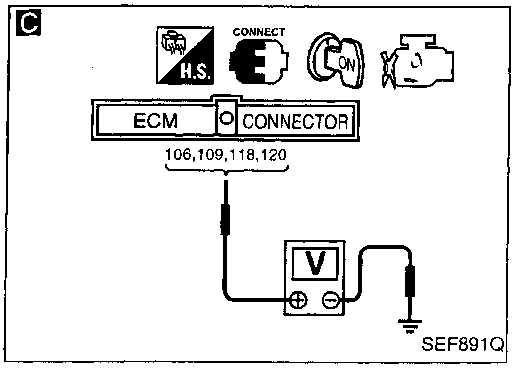
Check mass air flow sensor output voltage, refer to EC-104.
Approximately 2.1V: at 2,500 rpm

NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds. Refer to EC-99.

OK

Ⓐ

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



Ⓐ

C

CHECK INJECTORS (RIGHT BANK).
1. Turn ignition switch "ON".
2. Check voltage between ECM terminals (106), (109), (118), (120) 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-310. Repair harness or connectors.

OK ↓

Remove injector assembly. Refer to EC-24. Keep fuel hose and all injectors connected to injector gallery.

↓

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

↓

1. Disconnect all injector harness connectors.
2. Disconnect all ignition coil harness connectors.
3. Crank engine for about 3 seconds. Make sure fuel does not drip from injector.

Drips → Replace 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.

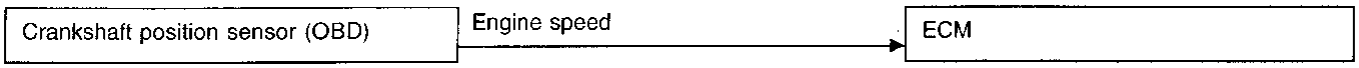
↓

INSPECTION END

No. 1 - 8 Cylinder Misfire, Multiple Cylinder Misfire

ON BOARD DIAGNOSIS LOGIC

If 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 engine 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 • The injector circuit is open or shorted. • Injectors • Intake air leaks • The ignition secondary circuit is open or shorted. • Lack of fuel • Magnetized signal plate (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.	
P0307 (0602)	• No. 7 cylinder misfires.	
P0308 (0601)	• No. 8 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 2 minutes and 10 seconds.
   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 2 minutes and 10 seconds.
   Hold the accelerator pedal as steady as possible during driving.

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

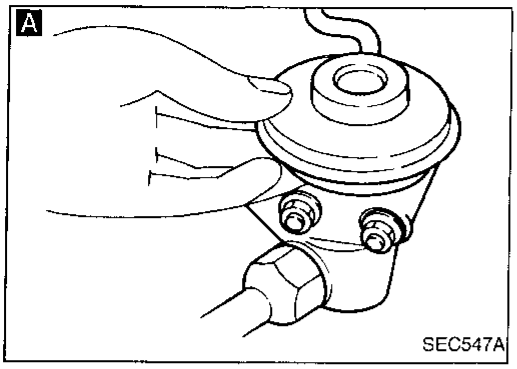
4) Select "MODE 3" with GST.

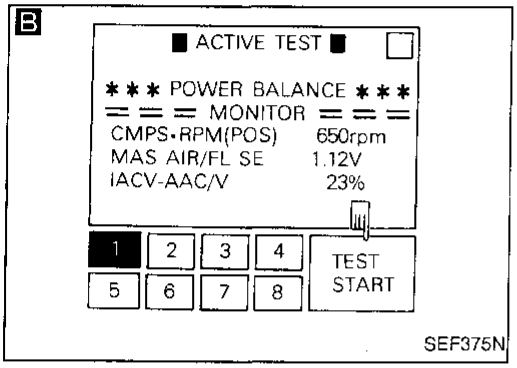
OR

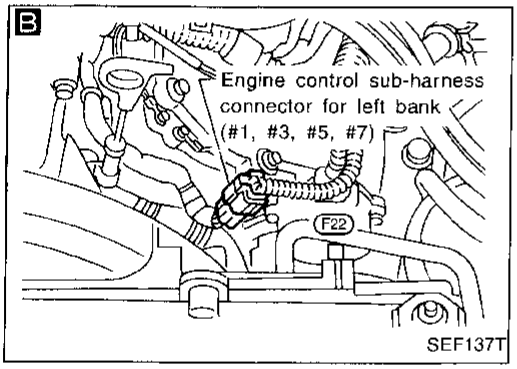
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Start engine again and drive at 1,500 - 3,000 rpm for at least 2 minutes and 10 seconds.
4) Turn ignition switch "OFF", wait at least 5 seconds, and then turn "ON".
   Hold the accelerator pedal as steady as possible during driving.
5) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

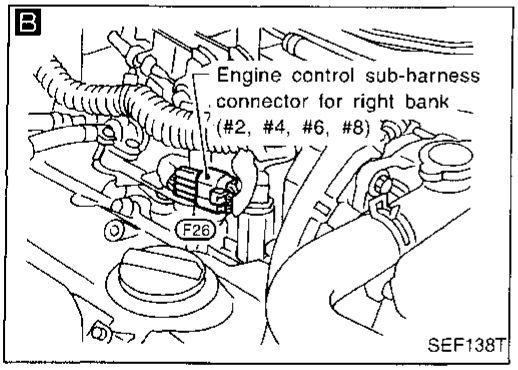
No. 1 - 8 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

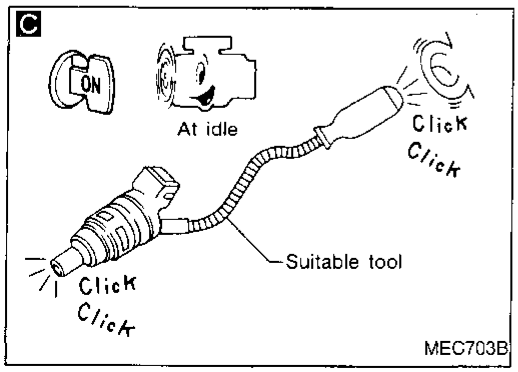
DIAGNOSTIC PROCEDURE











INSPECTION START

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

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

A

CHECK EGR FUNCTION.
Perform OVERALL FUNCTION CHECK (malfunction b) for EGR Function, EC-203.
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 .
Yes ↓

C

CHECK INJECTOR.
Does each injector make an operating sound at idle?
No → Check injector(s) and circuit(s). Refer to EC-310.
Yes ↓

D

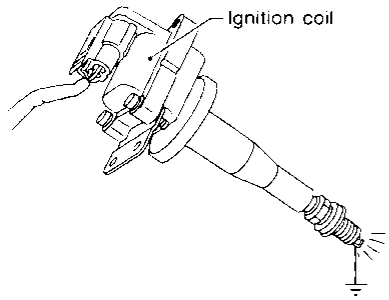
CHECK IGNITION SPARK.
1. Disconnect ignition coil assembly from rocker cover.
2. Connect a known good spark plug to the ignition coil assembly.
3. Place end of spark plug against a suitable ground and crank engine.
4. Check for spark.

NG → Check ignition coil with power transistor and their circuits. Refer to EC-270.
OK ↓

(Go to Ⓐ on next page.)

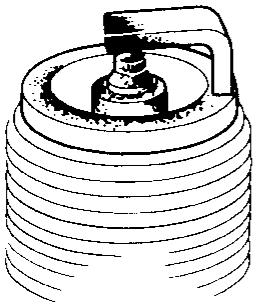
No. 1 - 8 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)

D



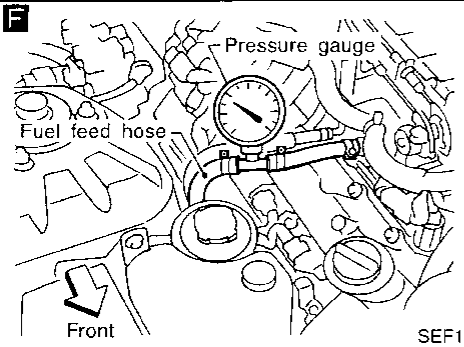
SEF575Q

E



SEF156I

F



SEF112T

Ⓐ

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 page EC-23.
2. Install fuel pressure gauge and check fuel pressure.

At idle:
Approx. 235 kPa (2.4 kg/cm², 34 psi)

NG → Check fuel pump and circuit.

OK ↓

CHECK COMPRESSION PRESSURE.
Check compression pressure.
Standard:
kPa (kg/cm², psi)/300 rpm
1,285 (13.1, 186)
Minimum:
kPa (kg/cm², psi)/300 rpm
991 (10.1, 144)
Difference between each cylinder:
kPa (kg/cm², 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-73.

NG → Adjust ignition timing.

OK ↓

CHECK MASS AIR FLOW SENSOR.

Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

— OR —

Check "mass air flow" in MODE 1 with GST.
3.0 - 6.0 g·m/sec: at idling
12.9 - 25.3 g·m/sec: at 2,500 rpm

— OR —

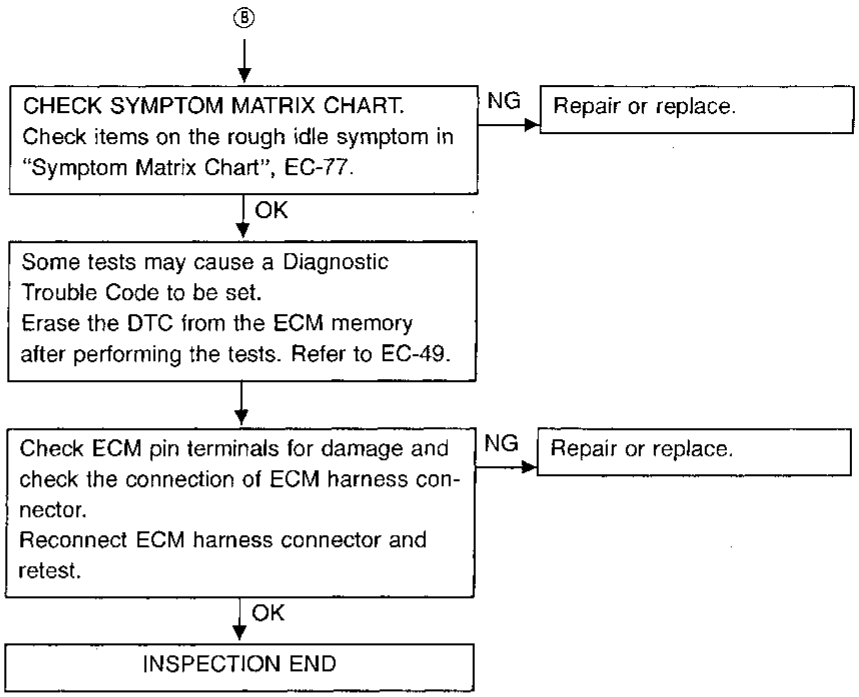
Check mass air flow sensor output voltage, refer to EC-104.
Approximately 2.1V: at 2,500 rpm

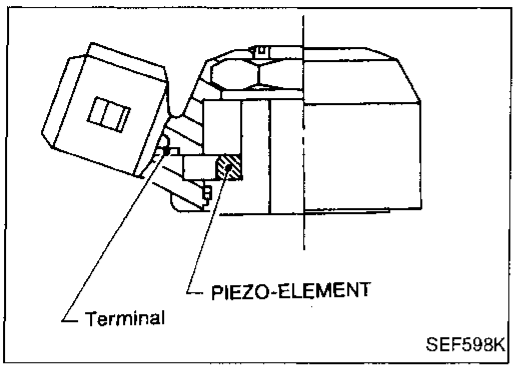
NG → Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or engine grounds.
Refer to EC-99.
If NG, repair or replace it.

OK ↓

(Go to Ⓑ on next page.)

No. 1 - 8 Cylinder Misfire, Multiple Cylinder Misfire (Cont'd)





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 is not stored in the ECM for the knock sensor.**
The MIL will not light for knock sensor malfunction.

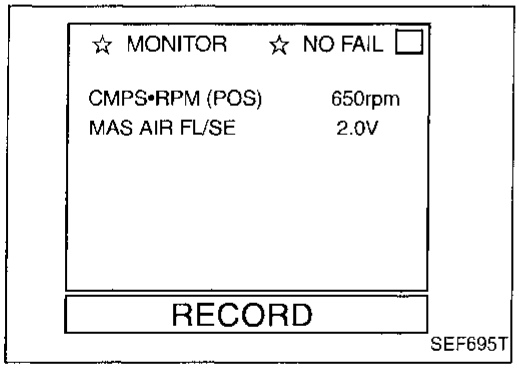
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
64 68	W W	Knock sensor (RH) Knock sensor (LH)	Engine is running. └ Idle speed	2.0 - 3.0V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
For left bank (-B1) 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
For right bank (-B2) P0330 0212		



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

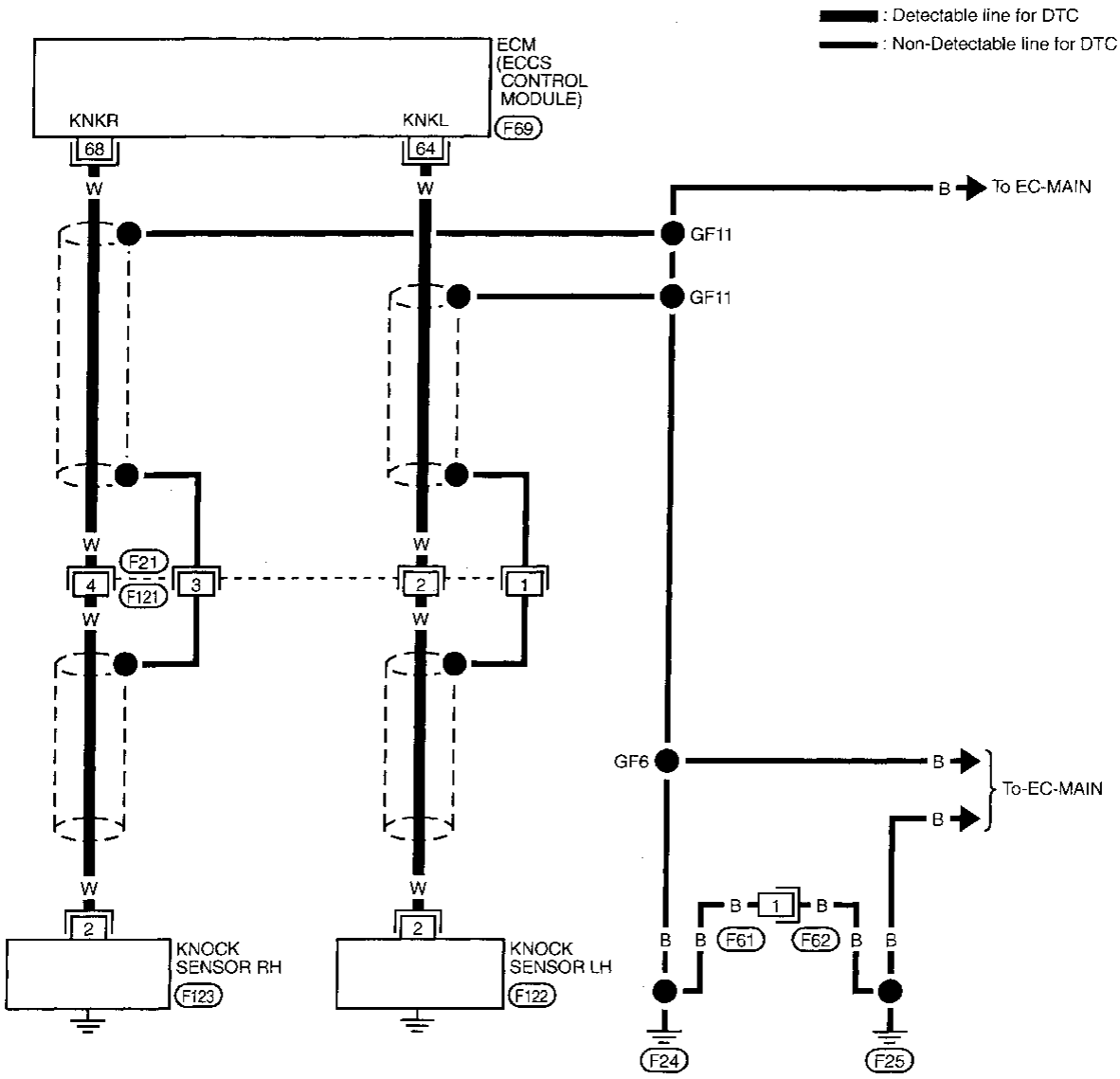
1) Start engine and run it for at least 5 seconds at idle speed.
2) Select "MODE 3" with GST.

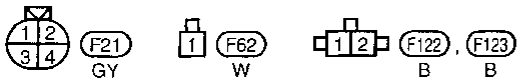
OR

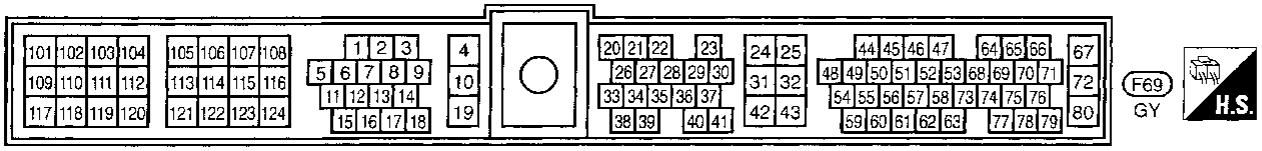
1) Start engine and run it for at least 5 seconds at idle speed.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Knock Sensor (KS) (Cont'd)

EC-KS-01







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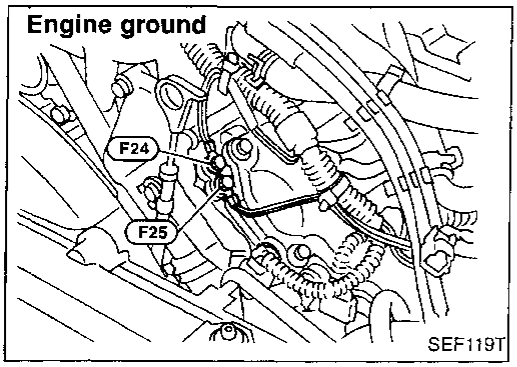
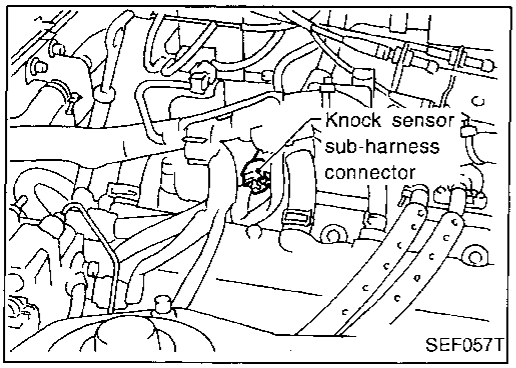
Knock Sensor (KS) (Cont'd)

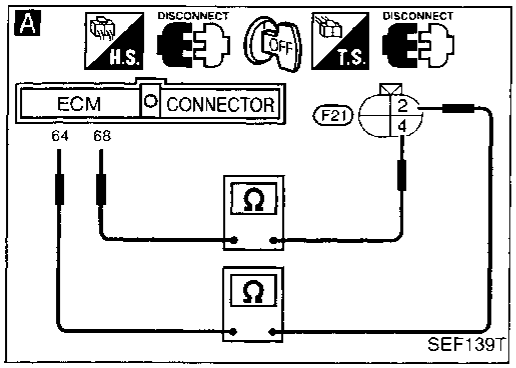
DIAGNOSTIC PROCEDURE



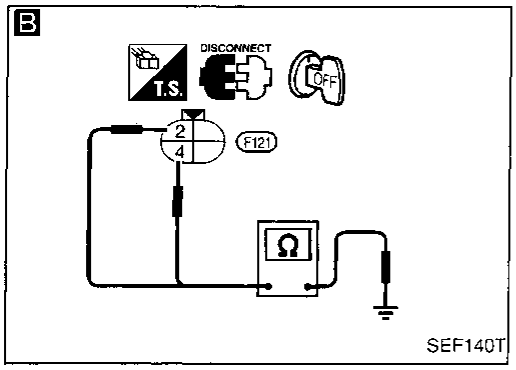
SEF119T



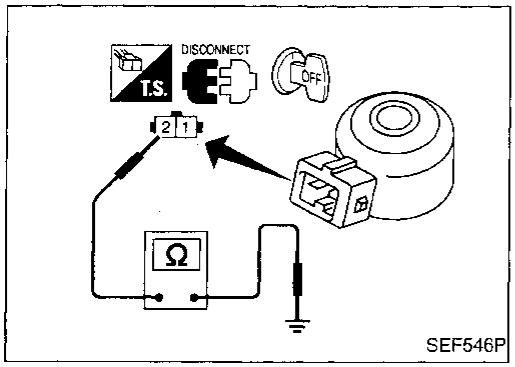
SEF057T



SEF139T



SEF140T



SEF546P

INSPECTION START

Loosen and retighten engine ground screws.

A

CHECK INPUT SIGNAL CIRCUIT-1.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and knock sensor sub-harness connector.
3. Check harness continuity between terminal ④ (right bank), ② (left bank) and ECM terminal ⑭ (left bank), ⑱ (right bank).
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK

B

CHECK INPUT SIGNAL CIRCUIT-2.
Check harness continuity between terminal ④ (right bank), ② (left bank) and engine ground.
Continuity should exist.
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 sub-harness connector-2 and knock sensor

If NG, repair harness or connectors.
- As for knock sensor (COMPONENT INSPECTION), refer to 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

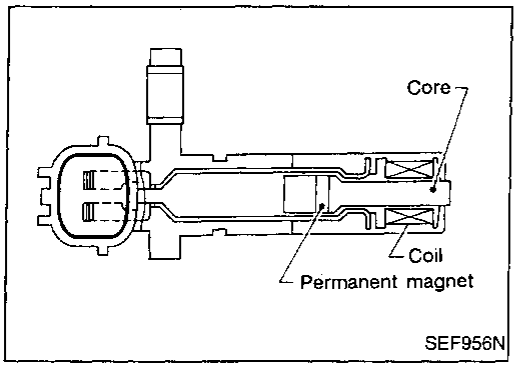
Knock sensor

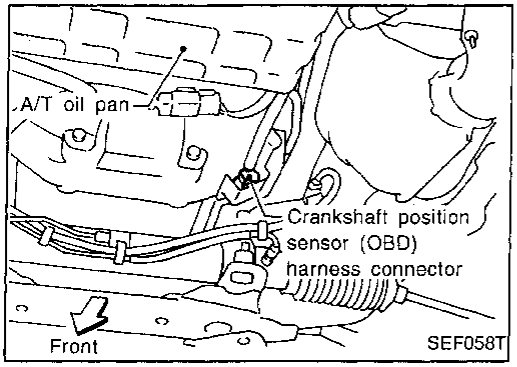
1. Disconnect knock sensor harness connector.
2. Check resistance between terminal ② and ground.

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

- It is necessary to use an ohmmeter which can measure more than 10 MΩ.

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





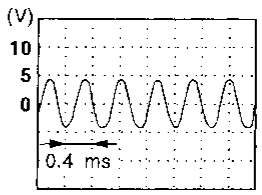
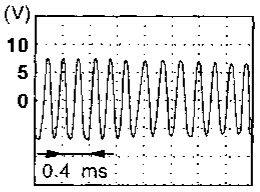
Crankshaft Position Sensor (CKPS) (OBD)

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.

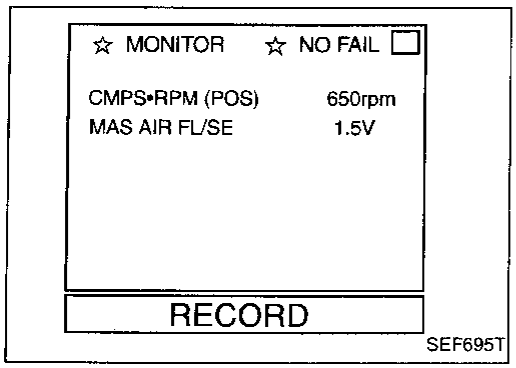
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
47	B/R	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.7V  SEF545T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0V  SEF546T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0335 0802	• The proper pulse signal from the crankshaft position sensor (OBD) is not sent to ECM while the engine is running at the specified engine speed.	• Harness or connectors (The crankshaft position sensor (OBD) circuit is open.) • Crankshaft position sensor (OBD) • Dead (Weak) battery



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.

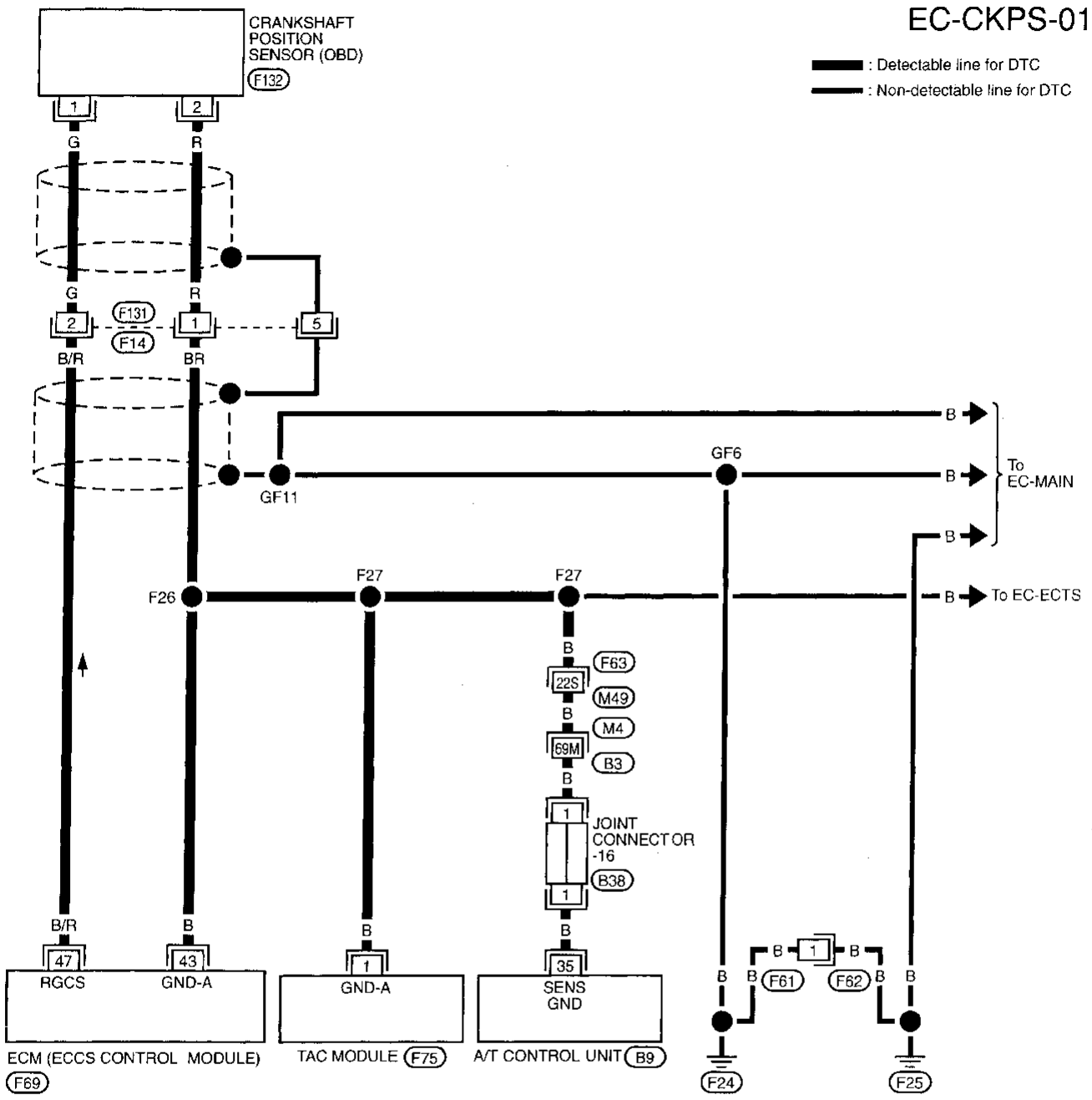
OR

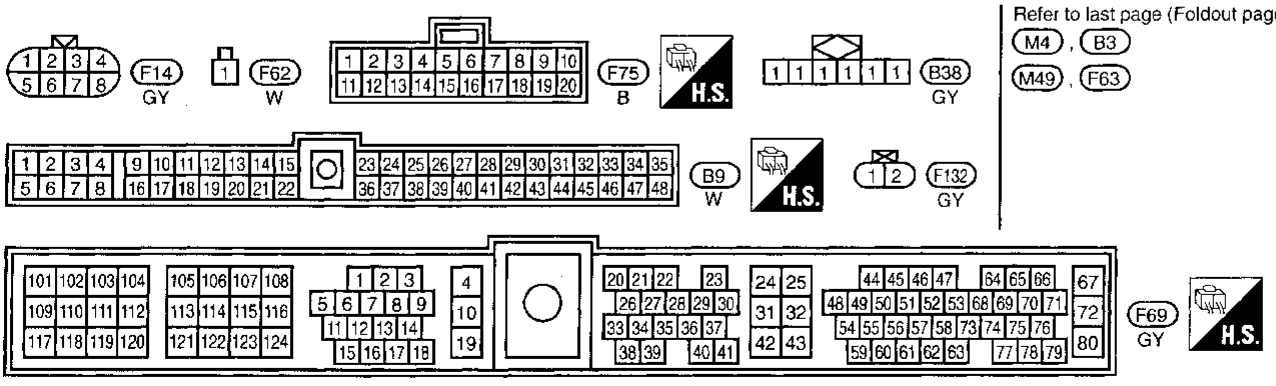
1) Start engine and run it for at least 15 seconds at idle speed.
2) Select "MODE 7" with GST.

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)



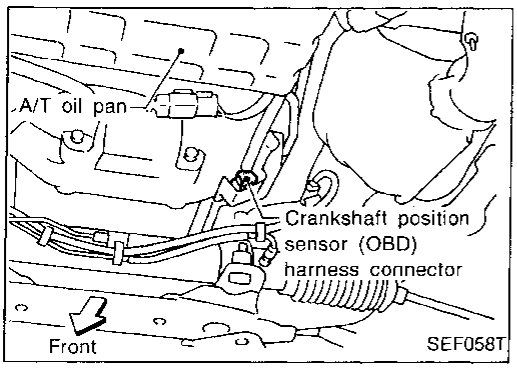


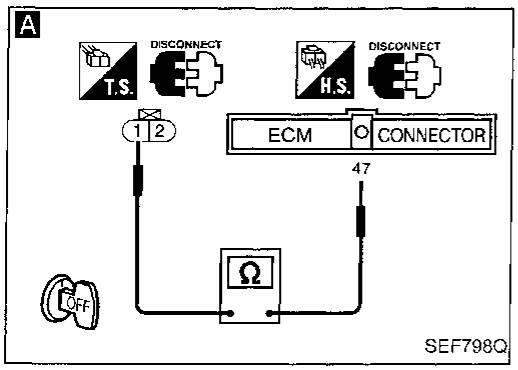
Refer to last page (Foldout page).
M4, B3
M49, F63

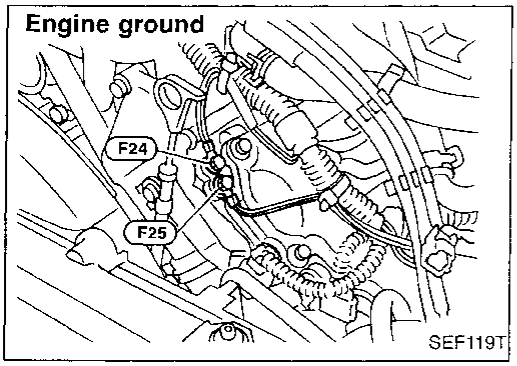
SEF883S

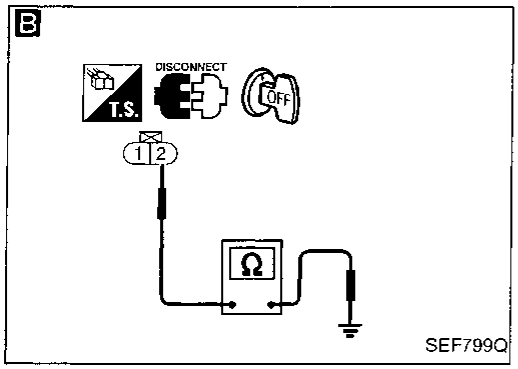
Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (OBD) harness connector and ECM harness connector.
3. Check continuity between sensor terminal ① and ECM terminal ㊼ with CONSULT or tester.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F14), (F131)
- Harness for open or short between crankshaft position sensor (OBD) and ECM

If NG, repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- Harness connectors (F14), (F131)
- Harness connectors (F63), (M69)
- Harness connectors (M4), (B3)
- Joint connector-16
- Harness for open or short between crankshaft position sensor (OBD) harness connector and ECM
- Harness for open or short between crankshaft position sensor (OBD) and throttle actuator control module (TAC)
- Harness for open or short between crankshaft position sensor and A/T control unit

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 ↓

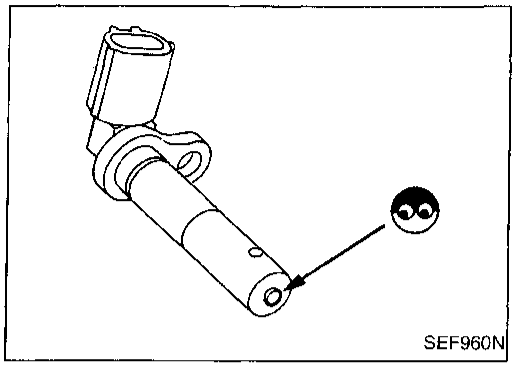
Disconnect and reconnect harness connectors in the circuit. Then retest.

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

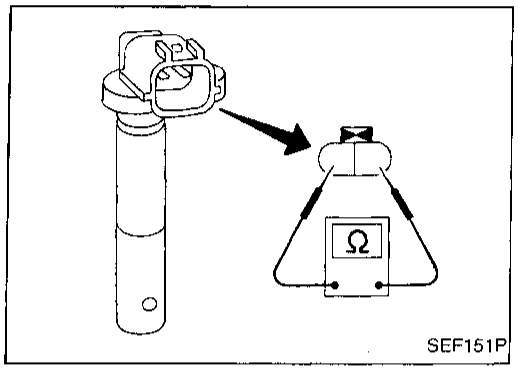
Crankshaft Position Sensor (CKPS) (OBD) (Cont'd)


SEF960N

COMPONENT INSPECTION

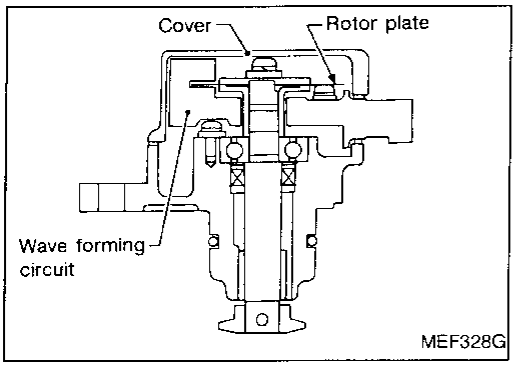
Crankshaft position sensor (OBD)

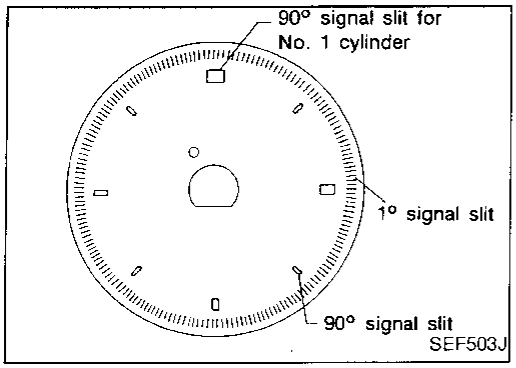
1. Disconnect crankshaft position sensor (OBD) harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.



SEF151P

5. Check resistance as shown in the figure.
   Resistance:
   166.5 - 203.5Ω [at 25°C (77°F)]





Camshaft Position Sensor (CMPS)

COMPONENT DESCRIPTION

The camshaft position sensor (CMPS) is a basic component of the ECCS. It monitors engine speed and piston position. It sends signals to the ECM to control fuel injection, ignition timing and other functions.

The camshaft position sensor has a rotor plate and a wave-forming circuit. The rotor plate has 360 slits for 1° signal and 8 slits for 90° signal. Light Emitting Diodes (LED) and photo diodes are built into the wave-forming circuit.

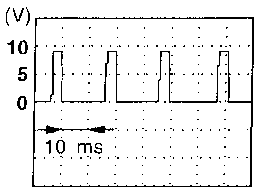
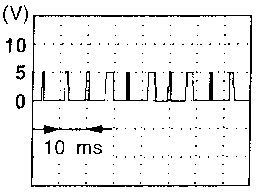
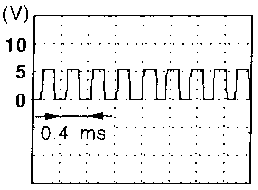
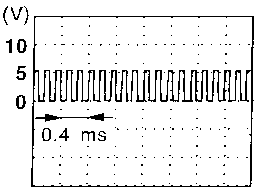
When the rotor plate passes between the LED and the photo diode, the following happens:

Slits in the rotor plate continually cut the transmitted light to the photo diode from the LED. This generates rough-shaped pulses converted into on-off pulses by the wave forming circuit sent to the ECM.

Camshaft Position Sensor (CMPS) (Cont'd)

ECM terminals and reference value

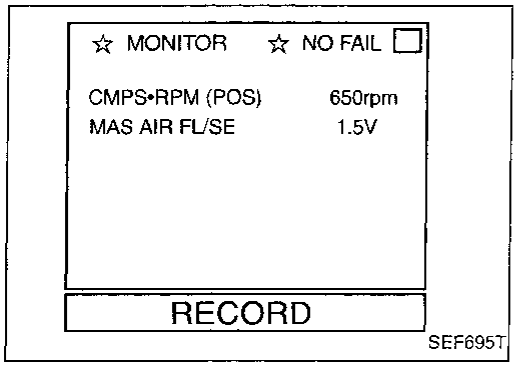
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
44 48	P	Crankshaft position sensor (REF)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 0.6 - 1.0V  SEF540T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0.8 - 0.9V  SEF544T
49	L	Camshaft position sensor (POS)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 2.5V  SEF547T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 2.4V  SEF548T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0340 0101	• Either 1° or 90° signal is not sent to ECM for the first few seconds during engine cranking. • Either 1° or 90° signal is not sent to ECM during engine running. • Either 1° or 90° signal is not in the normal pattern during engine running.	• 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

Note: If both DTC P0340 and P0335 (0802) or P1336 (0905) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0335 or P1336 first. (See EC-192 or EC-278.)

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

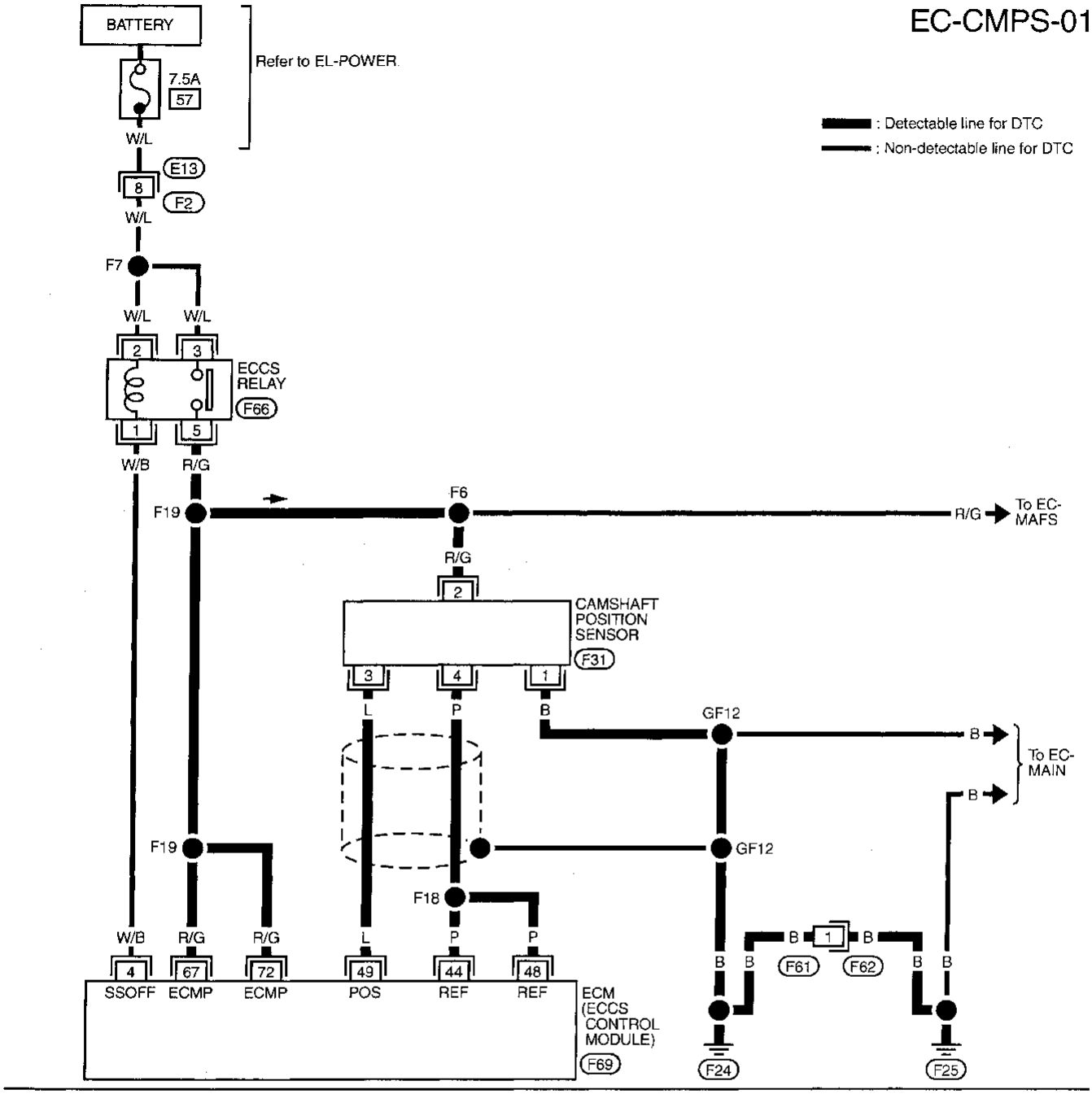
1) Start engine and run it for at least 2 seconds at idle speed.
   (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
2) Select "MODE 7" with GST.

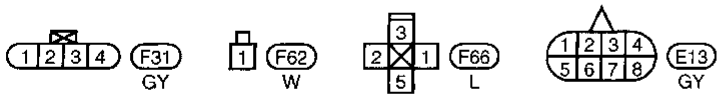
OR

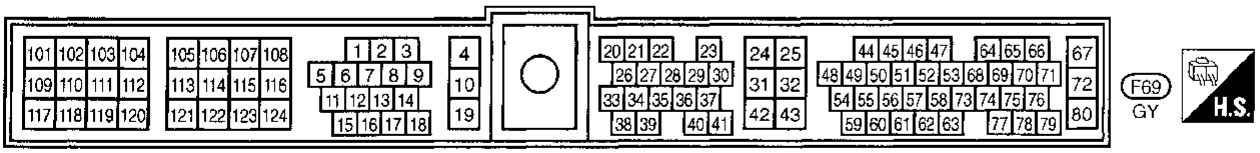
1) Start engine and run it for at least 2 seconds at idle speed.
   (If engine does not run, turn ignition switch to "START" for at least 2 seconds.)
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Camshaft Position Sensor (CMPS) (Cont'd)

EC-CMPS-01



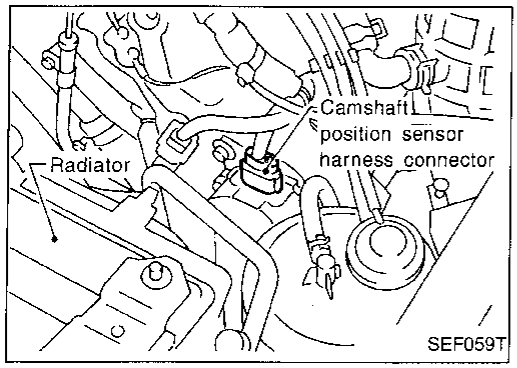




SEF884S

Camshaft Position Sensor (CMPS) (Cont'd)

DIAGNOSTIC PROCEDURE



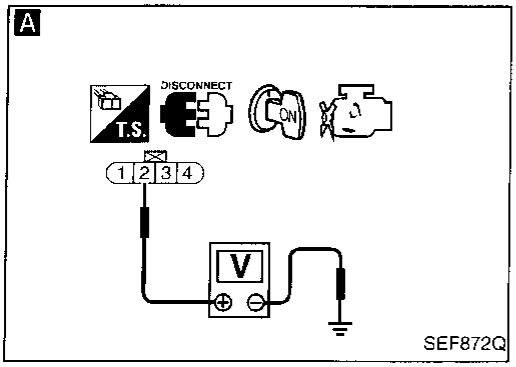
INSPECTION START

CHECK STARTING SYSTEM.
Does the engine turn over?
(Does the starter motor operate?)

No → Check starting system. (Refer to EL section.)

Yes

A

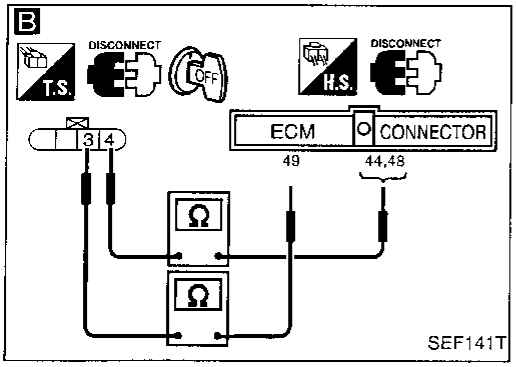


CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Repair harness or connector.

OK

B

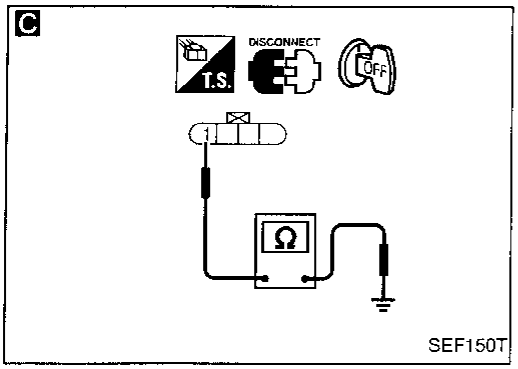


CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector and ECM harness connector.
3. Check harness continuity between terminal ③ and ECM terminal ㊾, terminal ④ and ECM terminals ㊹, ㊽.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK

C



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

NG → Check the following.
- Harness connectors (F61), (F62)

If NG, repair harness or connectors.

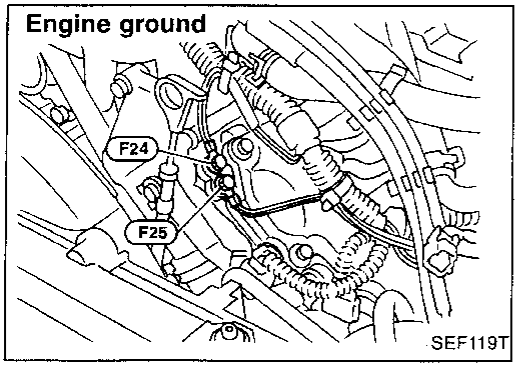
OK

CHECK COMPONENT
[Camshaft position sensor].
Refer to "COMPONENT INSPECTION" on next page.

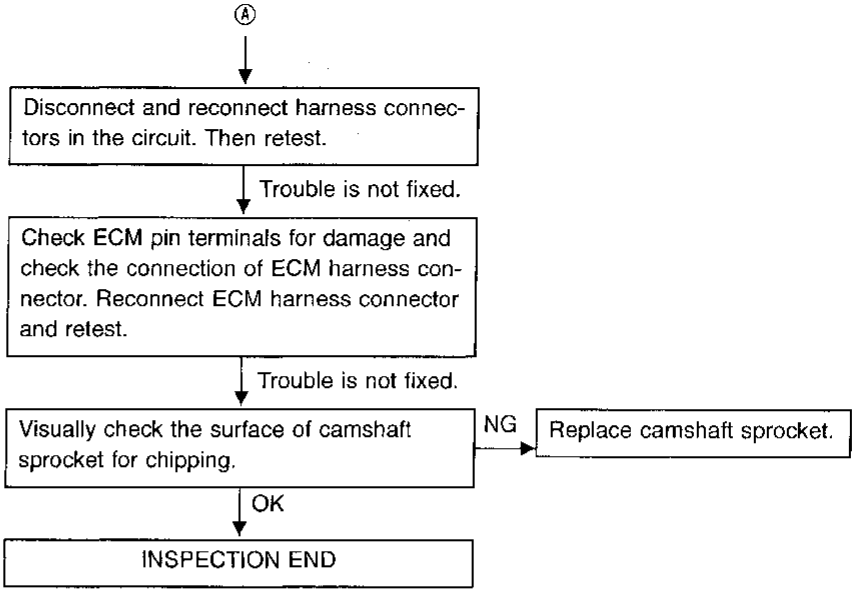
NG → Replace camshaft position sensor.

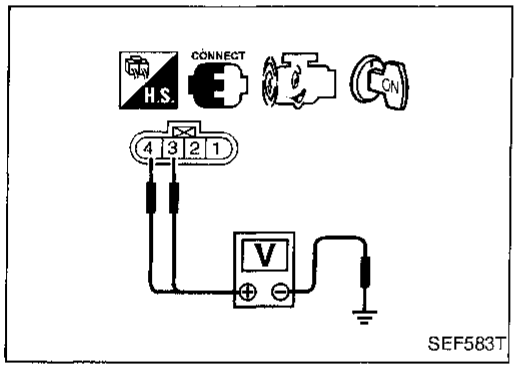
OK

Ⓐ



Camshaft Position Sensor (CMPS) (Cont'd)





COMPONENT INSPECTION

Camshaft position sensor

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

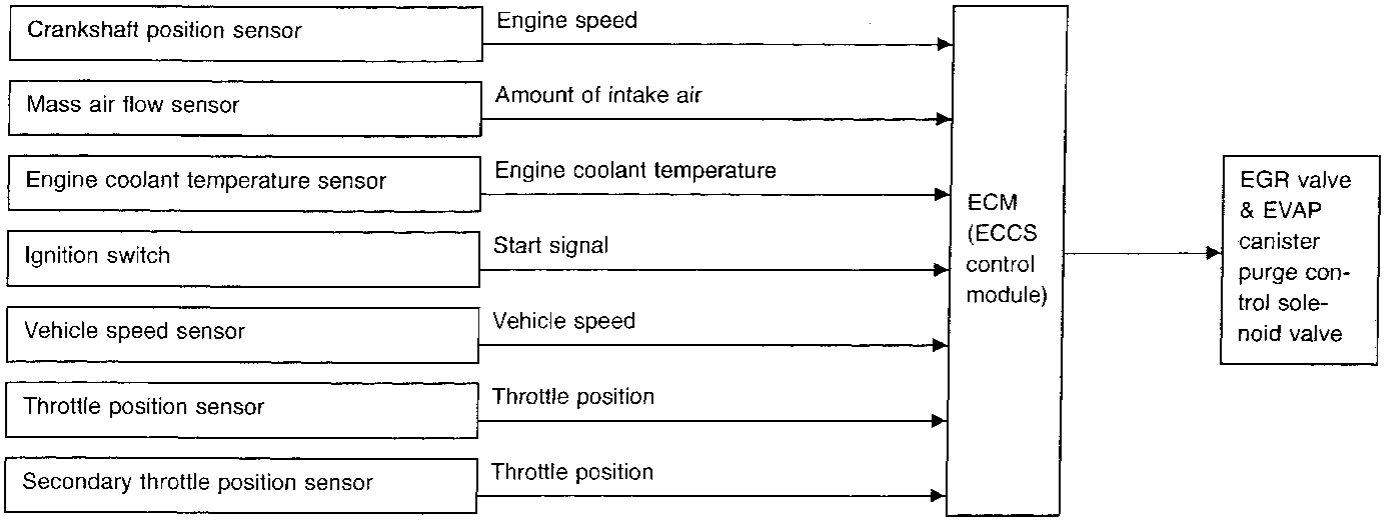
Condition	Terminals	Voltage
Engine running at idle	③ and ground	Approx. 2.5V
	④ and ground	Approx. 0.7 - 1.2V

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

If NG, replace camshaft position sensor.

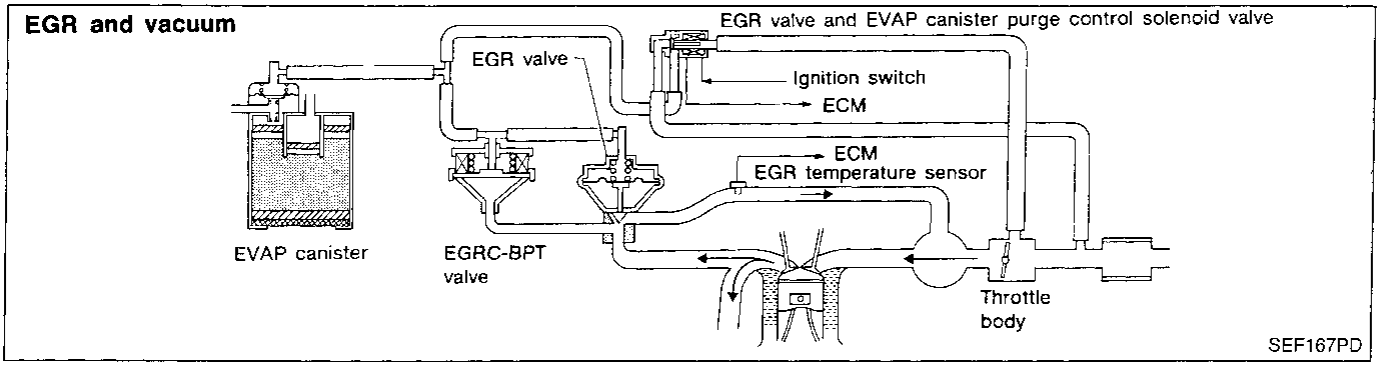
EGR Function

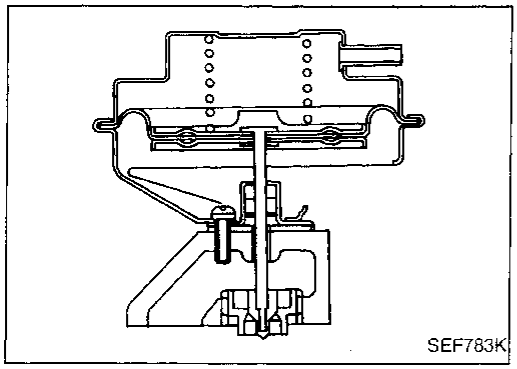
SYSTEM DESCRIPTION



This system cuts and controls vacuum applied to the EGR valve to suit engine operating conditions. This cut-and-control operation is accomplished through the ECM and the 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 remain closed.

- Low engine coolant temperature
- Engine starting
- Engine stopped
- Engine idling
- Excessively high engine coolant temperature
- Mass air flow sensor malfunction
- Low vehicle speed
- TCS is operating



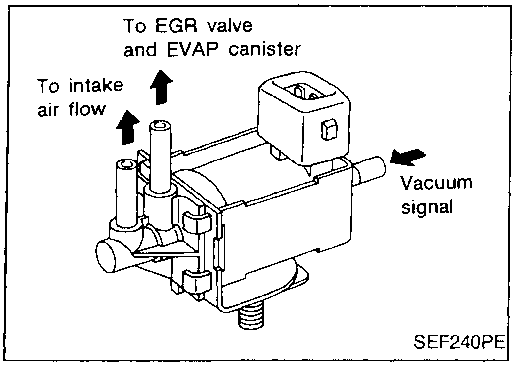


COMPONENT DESCRIPTION

Exhaust gas recirculation (EGR) valve

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

EGR Function (Cont'd)



EGR valve and EVAP canister purge control solenoid valve

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

CONSULT reference value in data monitor mode

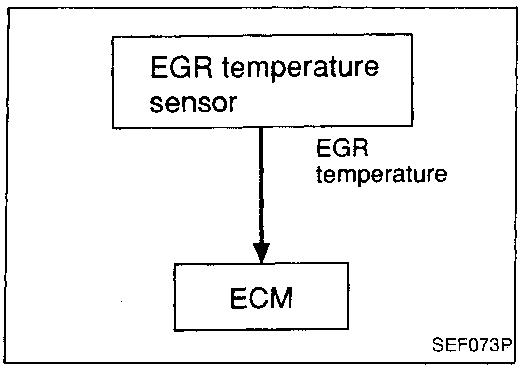
Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGR TEMP SEN	• Engine: After warming up		Less than 4.5V
EGRC SOL/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		Racing up to 1,500 - 2,000 rpm	OFF

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
63	W	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 - 1.0V
103	L/Y	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) └ Jack up rear wheels and run engine at 2,000 rpm in "1st" position.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0 - 0.7V



ON BOARD DIAGNOSIS LOGIC

If the absence of EGR flow is detected by EGR temperature sensor under the condition that calls for EGR, a low-flow malfunction is diagnosed.
If EGR temperature sensor detects EGR flow under the condition that does not call for EGR, a high-flow malfunction is diagnosed.

EGR Function (Cont'd)

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

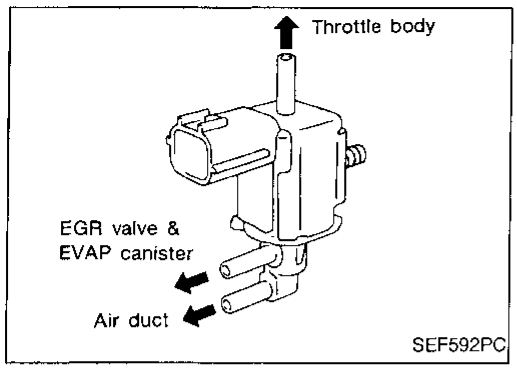
If the engine coolant temperature is higher than or equal to 65°C (149°F), perform only "Procedure for malfunction A".

If the engine coolant temperature is lower than 65°C (149°F), perform both "Procedure for malfunction A" and "Procedure for malfunction B".

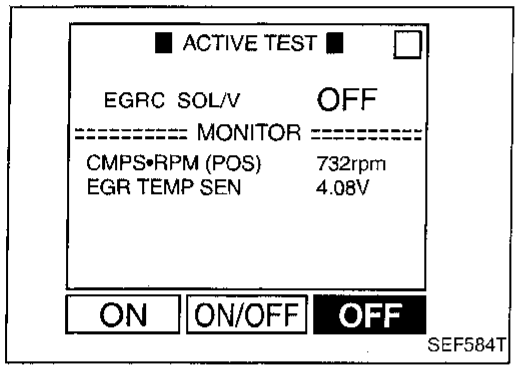
If the freeze frame data for another malfunction is stored in the ECM, perform both "Procedure for malfunction A" and "Procedure for malfunction B". In this case, check DTCs in the ECM and perform inspections one by one based on "INSPECTION PRIORITY", EC-75.

EGR Function (Cont'd)

Procedure for malfunction A

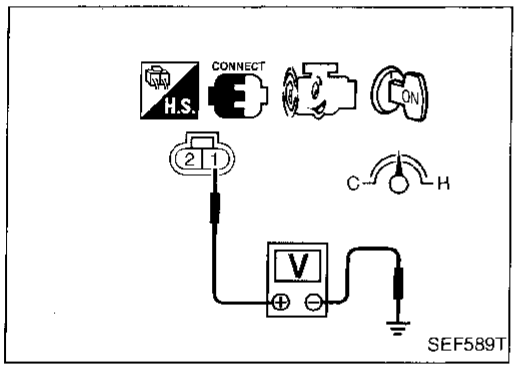


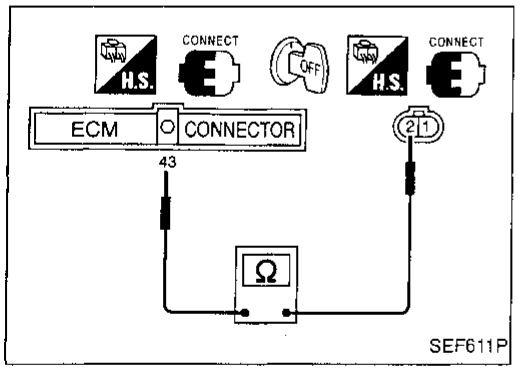
1) Start engine and warm it up sufficiently.
2) Select "EGRC SOLENOID VALVE" in "ACTIVE TEST" mode with CONSULT and turn the solenoid valve "OFF".
3) Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.
   EGR valve should lift up and down without sticking.
4) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.
   Less than 4.5V should exist.
5) Turn ignition switch "OFF".
6) Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ㊸.
   Continuity should exist.
7) Perform "COMPONENT CHECK", "EGR temperature sensor", EC-212.

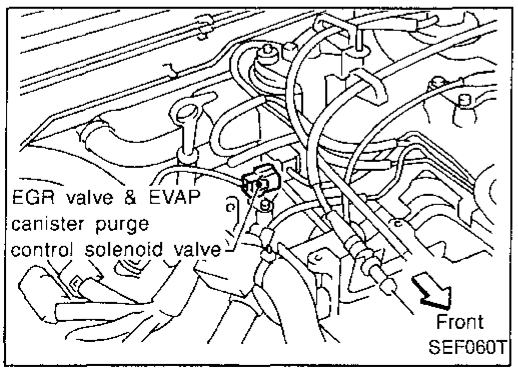


OR

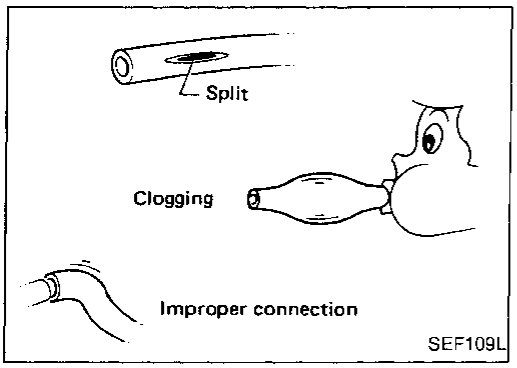
1) Disconnect EGR valve & EVAP canister purge control solenoid valve harness connector. (The DTC for EGR valve & EVAP canister purge control solenoid valve will be displayed, however, ignore it.)
2) Start engine and warm it up sufficiently.
3) Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.
   EGR valve should lift up and down without sticking.
4) Reconnect EGR valve & EVAP canister purge control solenoid valve harness connector.
5) Check voltage between EGR temperature sensor harness connector terminal ① and ground at idle speed.
   Less than 4.5V should exist.
6) Turn ignition switch "OFF".
7) Check harness continuity between EGR temperature sensor harness connector terminal ② and ECM terminal ㊸.
   Continuity should exist.
8) Perform "COMPONENT CHECK", "EGR temperature sensor", EC-212.



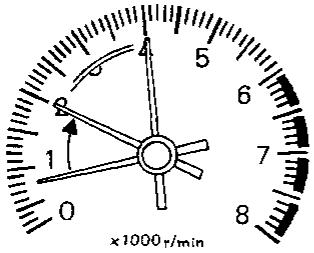


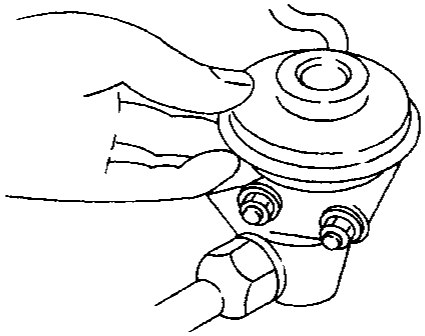


EGR Function (Cont'd)



Overall function check



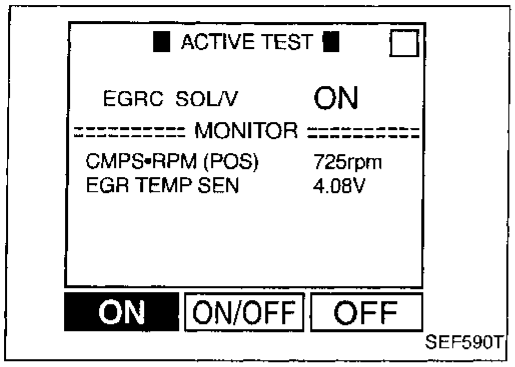


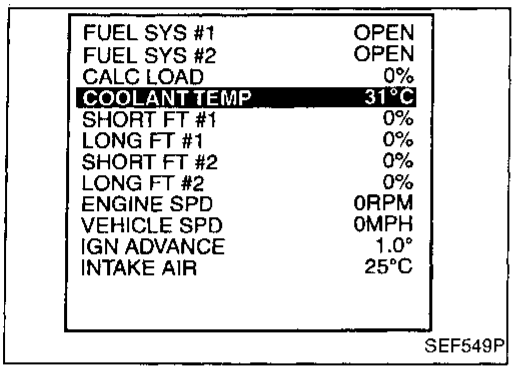
Check the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm.

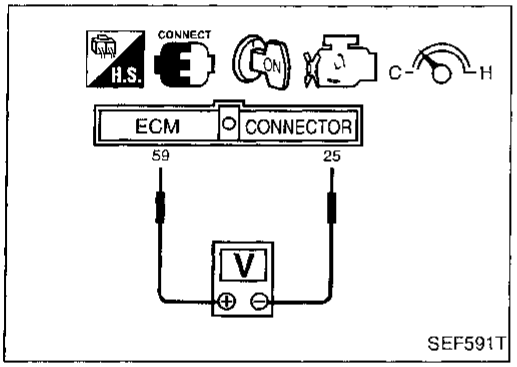
SEF642Q

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 engine from 2,000 rpm up to 4,000 rpm under no load.
EGR valve should be closed and should not lift up.

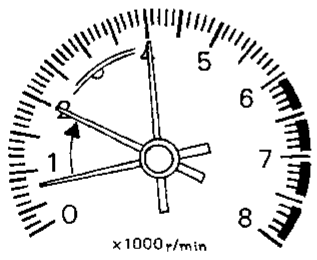
OR

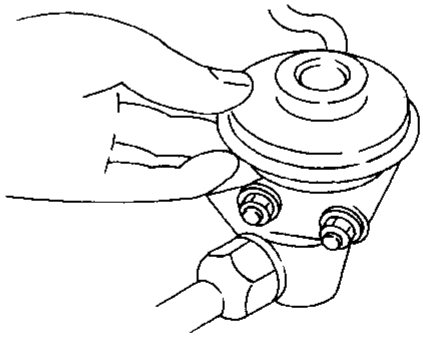
1) Turn ignition switch "ON".
2) Confirm the engine coolant temperature is lower than 52°C (126°F) in "Mode 1" with GST.
Perform the following steps before its temperature becomes higher than 52°C (126°F).
3) Start engine.
4) Check for the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.
EGR valve should be closed and should not lift up.

OR

1) Turn ignition switch "ON".
2) Confirm the voltage between ECM terminals ⑤⑨ and ② is higher than 2.24V.
Perform the following steps before the voltage becomes lower than 2.24V.
3) Start engine.
4) Check for the EGR valve lifting when revving engine from 2,000 rpm up to 4,000 rpm under no load.
EGR valve should be closed and should not lift up.

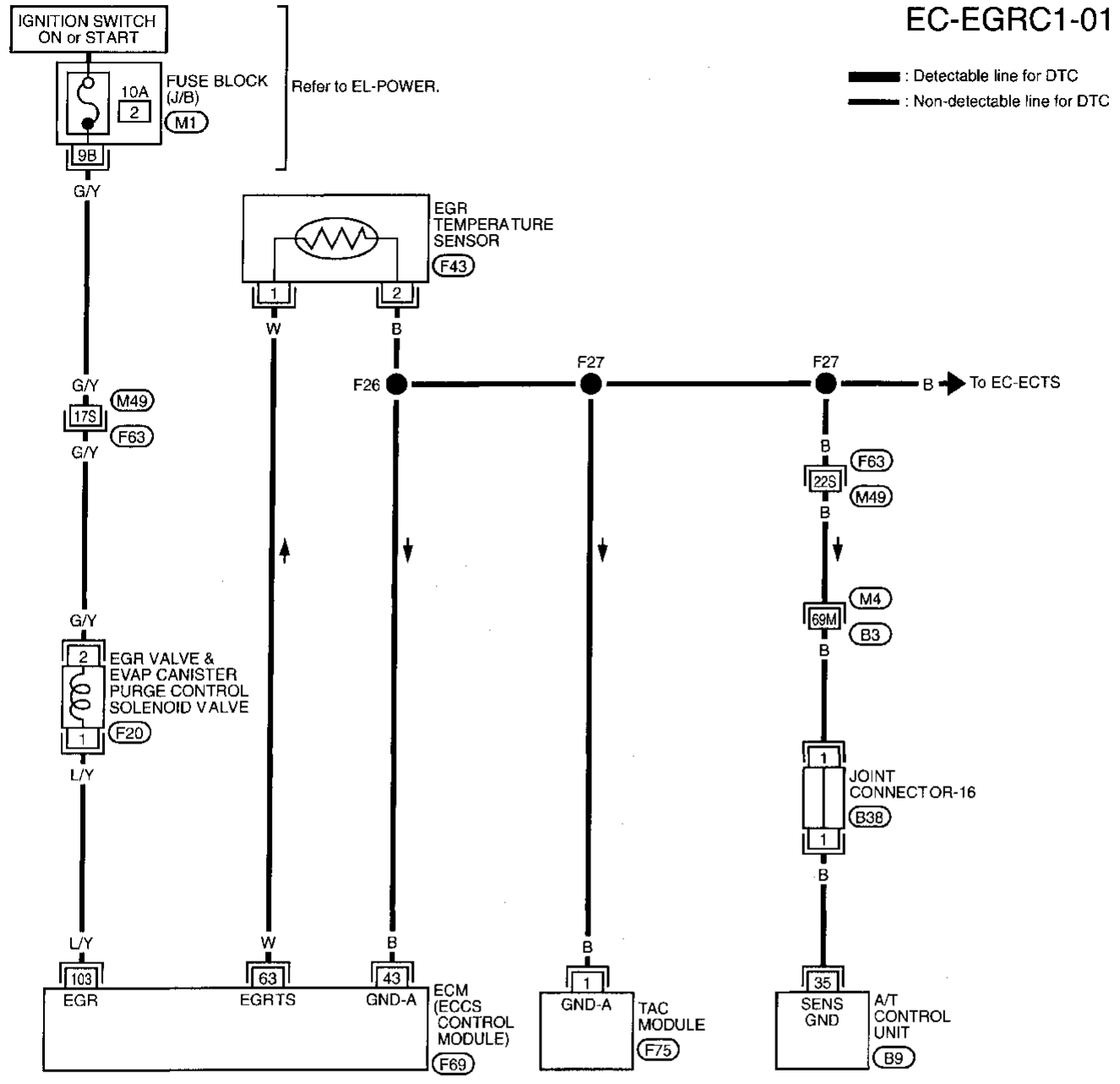
Overall function check





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

SEF642Q

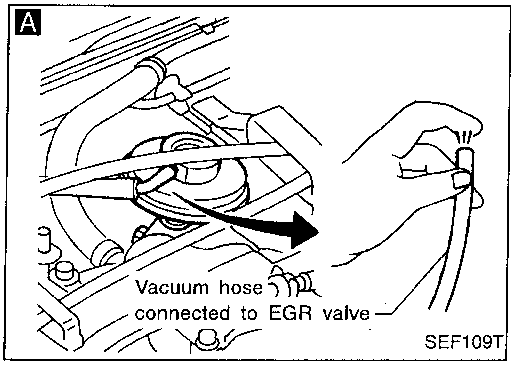

EC-EGRC1-01
: Detectable line for DTC
: Non-detectable line for DTC
IGNITION SWITCH ON or START
FUSE BLOCK (J/B)
10A
2
M1
9B
Refer to EL-POWER.
G/Y
EGR TEMPERATURE SENSOR
F43
1
2
W
B
F26
F27
F27
B
To EC-ECTS
G/Y
17S
M49
F63
G/Y
B
F63
22S
M49
B
G/Y
M4
69M
B3
B
2
EGR VALVE & EVAP CANISTER PURGE CONTROL SOLENOID VALVE
1
F20
L/Y
1
JOINT CONNECTOR-16
B38
1
B
L/Y
W
B
B
103
63
43
1
35
EGR
EGRTS
GND-A
GND-A
SENS GND
ECM (ECCS CONTROL MODULE)
F69
TAC MODULE
F75
A/T CONTROL UNIT
B9
Refer to last page (Foldout page).
M4 , B3
M49 , F63
M1
F20
B
F43
GY
F75
B
H.S.
B9
W
B38
GY
F69
GY

SEF885S

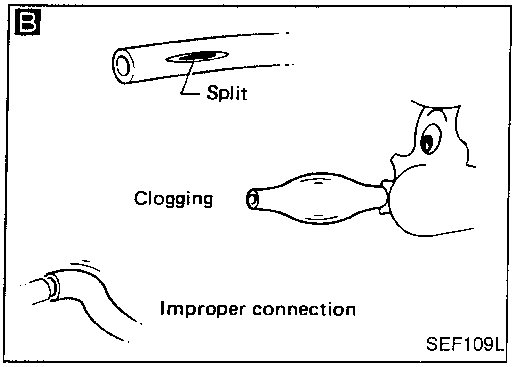
EGR Function (Cont'd)

DIAGNOSTIC PROCEDURE

A



B



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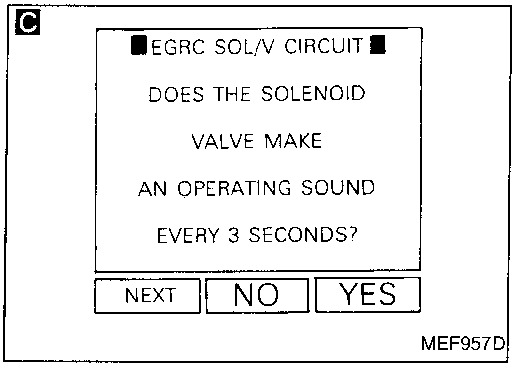
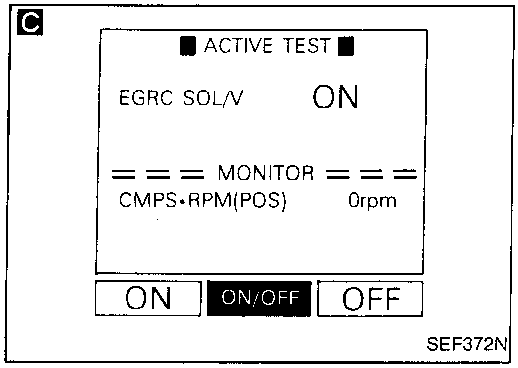


C



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 hoses.
   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 COMPONENT (EGR valve). Refer to "COMPONENT INSPECTION", EC-212.

NG → Replace EGR valve.

NG

B

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

NG → Repair it.

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 EGRC-solenoid valve "ON" and "OFF" in "ACTIVE TEST" mode with CONSULT and check operating sound.

OR

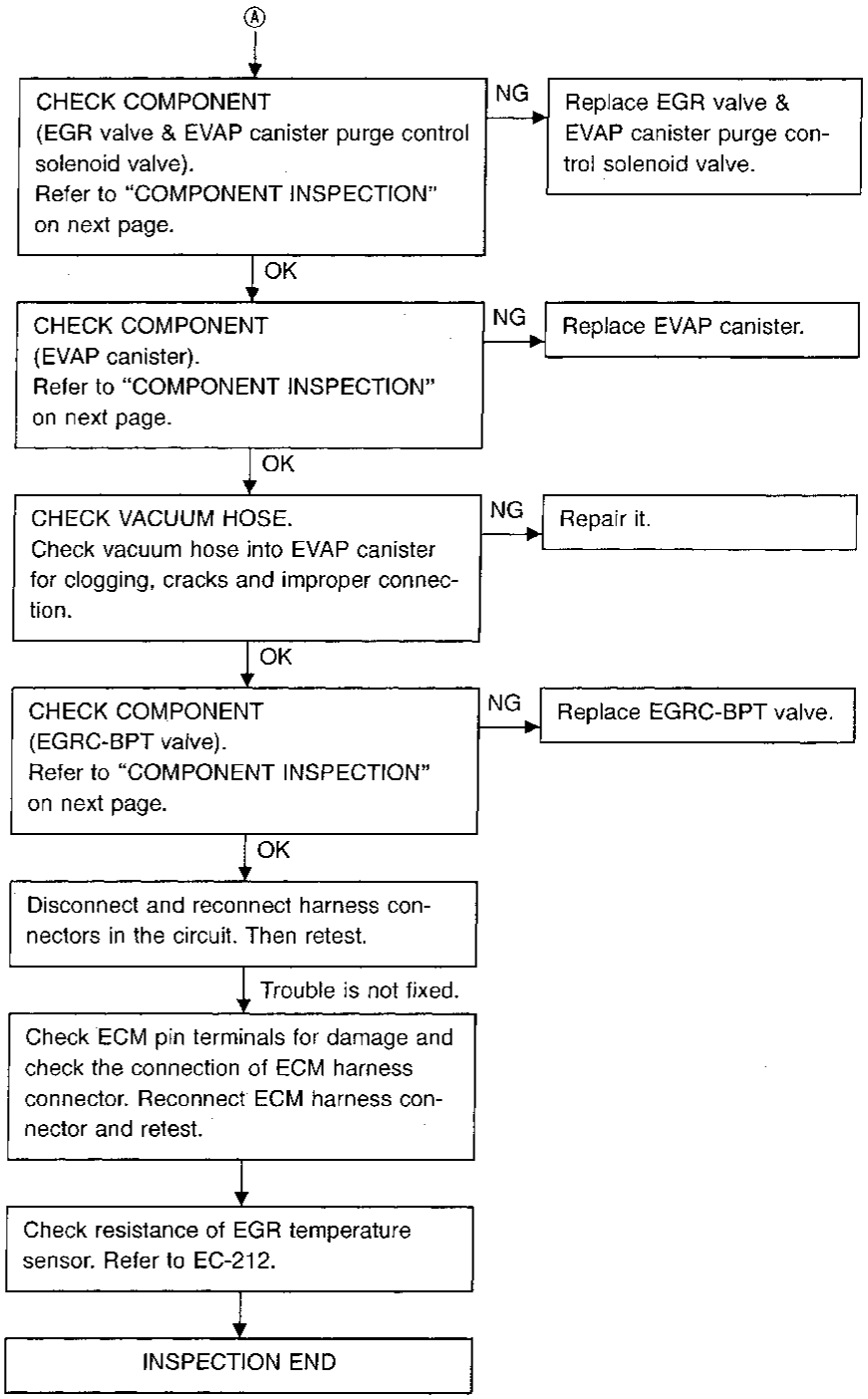
1. Turn ignition switch "ON".
2. When disconnecting and reconnecting the solenoid valve harness connector, make sure that the solenoid valve makes operating sound.

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

OK

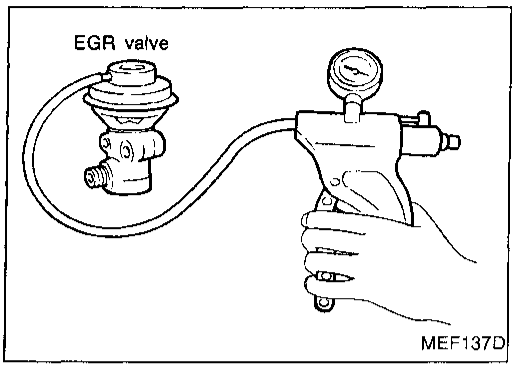
Ⓐ

EGR Function (Cont'd)



EGR Function (Cont'd)

COMPONENT INSPECTION

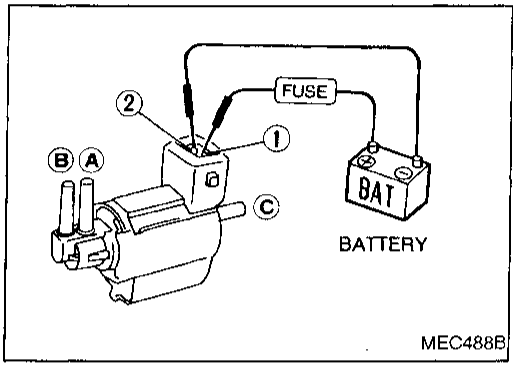


EGR valve

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

EGR valve spring should lift.

If NG, replace EGR valve.

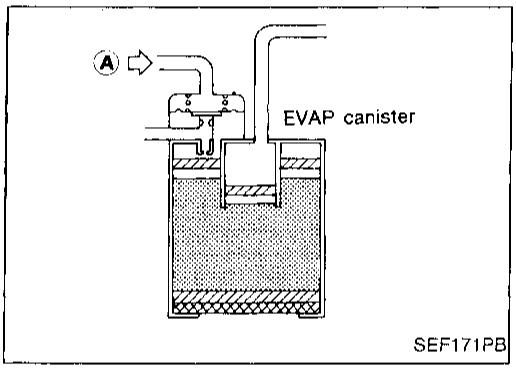


EGR valve & EVAP canister purge control solenoid valve

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

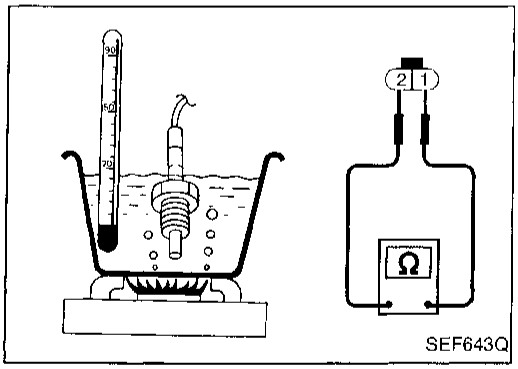
If NG, replace the solenoid valve.



EVAP canister

Gently blow air from Ⓐ.

No leakage should exist.

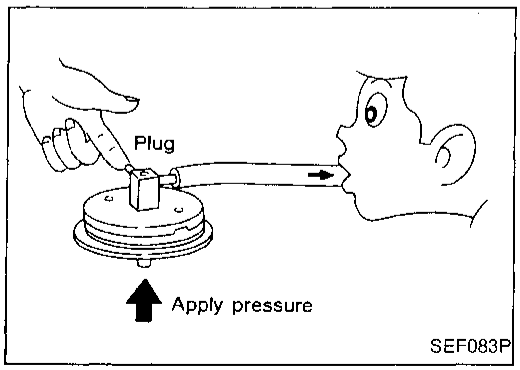


EGR temperature sensor

Check resistance change and resistance value.

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

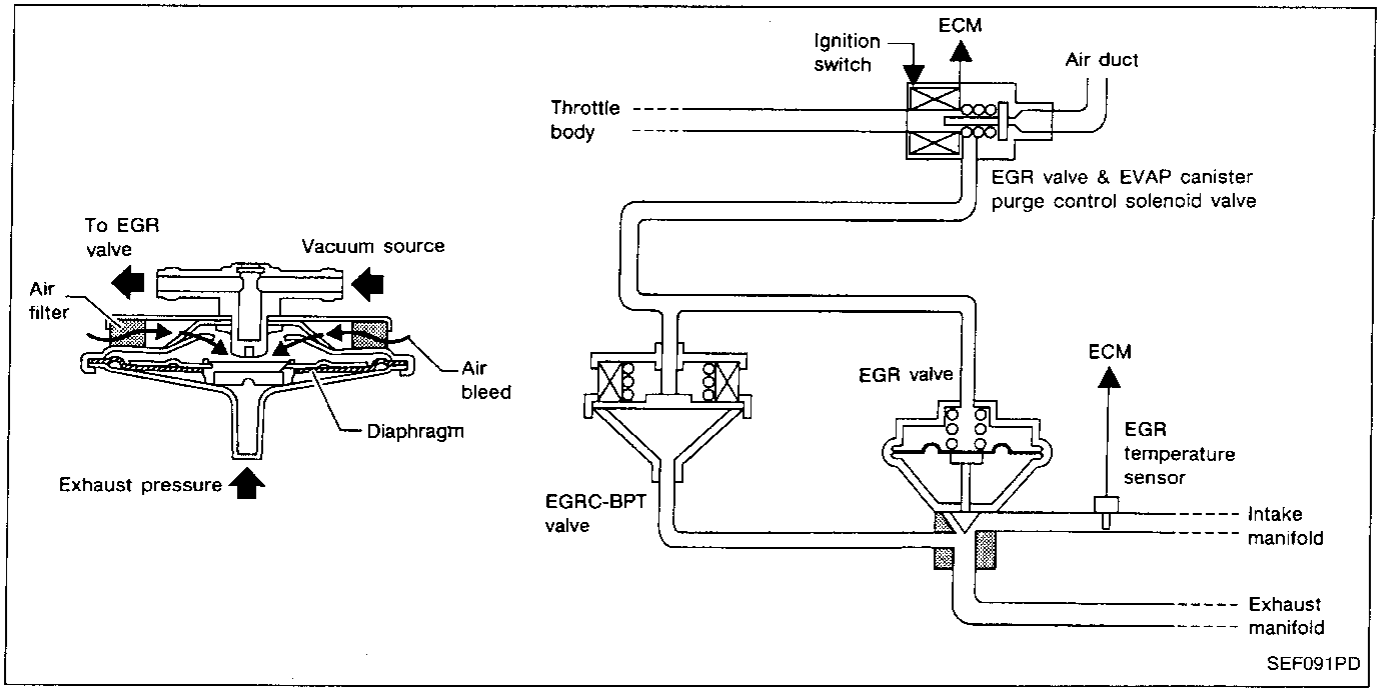
If NG, replace EGR temperature sensor.



EGRC-BPT valve

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

EGRC-BPT Valve Function



SYSTEM DESCRIPTION

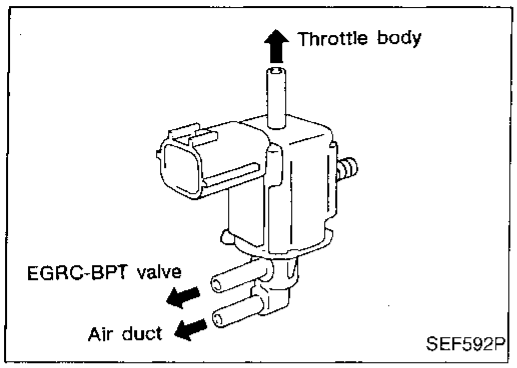
The EGRC-BPT valve monitors exhaust pressure to activate the diaphragm, controlling throttle body vacuum applied to the EGR valve. In other words, recirculated exhaust gas is controlled in response to positioning of the EGR valve or to engine operation.

ON BOARD DIAGNOSIS LOGIC

If too much EGR flow exists due to an EGRC-BPT valve malfunction, off idle engine roughness will increase. If the roughness is excessive, then the vacuum to the EGR valve is interrupted through the EGR valve & 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 • Loose or disconnected rubber tube • Blocked rubber tube • Intake manifold EGR passage

EGRC-BPT Valve Function (Cont'd)



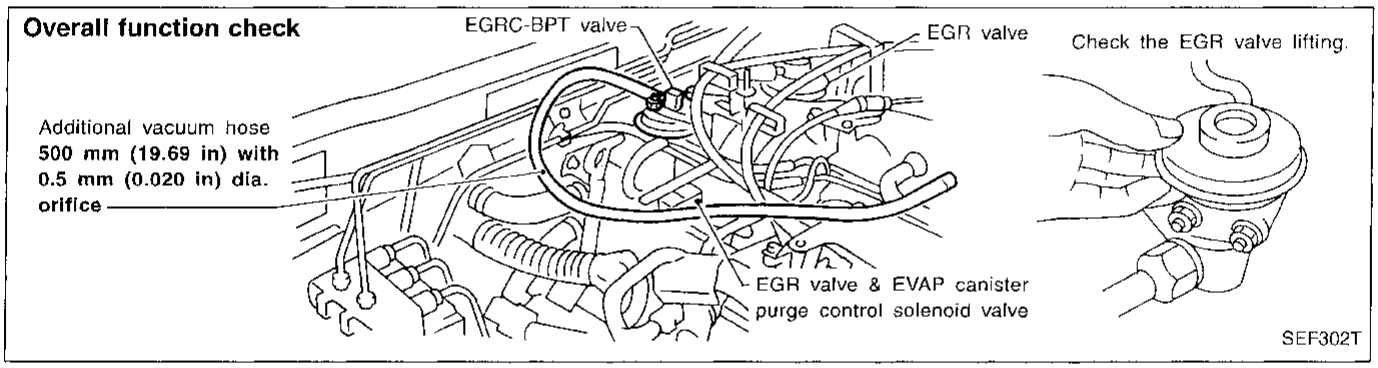
OVERALL FUNCTION CHECK

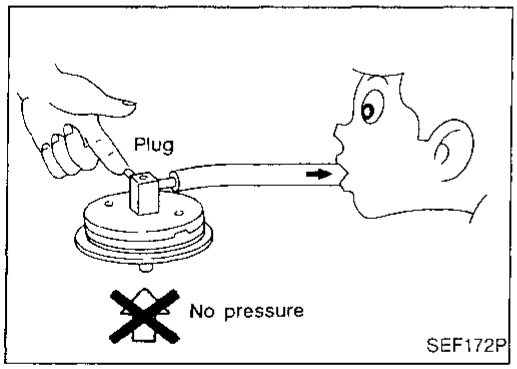
Use this procedure to check the overall function of the EGRC-BPT valve. During the check, a 1st trip DTC might not be confirmed.

1) Disconnect the vacuum hose to the fuel pressure regulator at the intake manifold collector.
2) Disconnect the vacuum hose to the EGR valve & EVAP canister purge control solenoid valve at the EGRC-BPT valve.
3) Connect the intake manifold collector and the EGRC-BPT valve with a rubber tube that has 0.5 mm (0.020 in) dia. orifice. (The intake manifold vacuum will be directly applied to the EGRC-BPT valve.)
4) Start engine.
5) Check for the EGR valve lifting with engine at less than 1,500 rpm under no load.

   EGR valve should remain closed or slightly lift up.
6) Keep engine speed at about 2,000 rpm, then check the EGR valve lifting when revving engine up to 4,000 rpm under no load.

   EGR valve should lift up to the full position, and go down without sticking when the engine is returned to idle.
7) Check rubber tube between the EGR valve & EVAP canister purge control solenoid valve and throttle body for misconnection, cracks or obstruction.





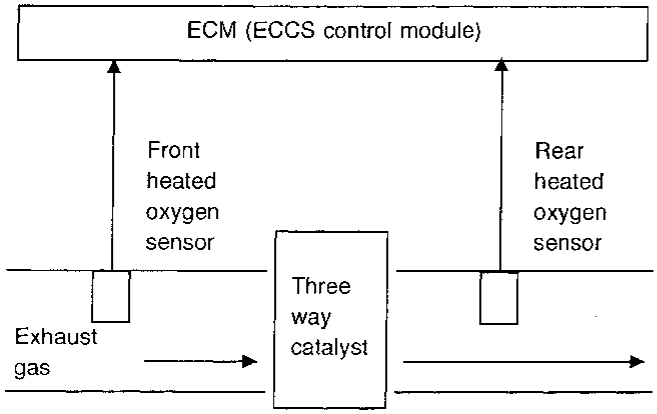
COMPONENT INSPECTION

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 EGRC-BPT valve.
   Leakage should exist.

Three Way Catalyst Function

ON BOARD DIAGNOSIS LOGIC

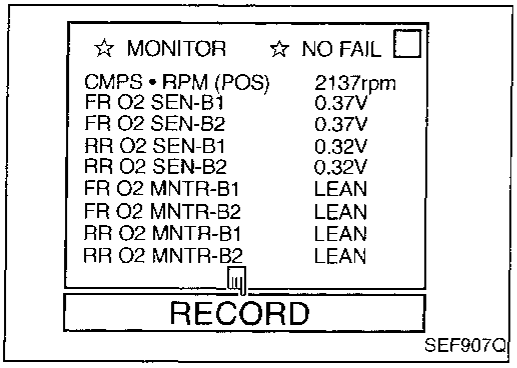


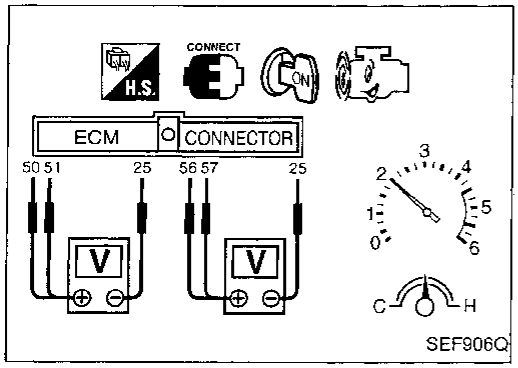
ECM monitors the switching frequency ratio of front and rear heated oxygen sensors.
A three way catalyst with high oxygen storage capacity will indicate a low switching frequency of rear heated oxygen sensor. As oxygen storage capacity decreases, the rear heated oxygen sensor switching frequency will increase.
When the frequency ratio of front and rear heated oxygen sensors approaches a specified limit value, the three way catalyst malfunction is diagnosed.

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
For left bank (-B1) P0420 0702	• Three way catalyst does not operate properly. • Three way catalyst does not have enough oxygen storage capacity.	• Three way catalyst • Exhaust tube • Intake air leaks • Injectors • Injector leaks
For right bank (-B2) P0430 0703		

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the three way catalyst.
During this check, a DTC might not be confirmed.





1) Start engine and warm it up sufficiently.
2) Set "MANU TRIG" and "HI SPEED", then select "FR O2 SEN-B1", "FR O2 SEN-B2", "RR O2 SEN-B1 or -B2", "FR O2 MNTR-B2", "FR O2 MNTR-B1", "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-B1 or -B2" is very less than that of "FR O2 MNTR-B1" or "FR O2 MNTR-B2".

Switching frequency ratio =

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

This ratio should be less than 0.75.
If the ratio is greater than above, the three way catalyst is not operating properly.

Three Way Catalyst Function (Cont'd)

Note: If the "FR O2 MNTR-B1" or "FR O2 MNTR-B2" does not indicate "RICH" and "LEAN" periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC 0503 or 0303 first, EC-126 or EC-145.

OR

1) Start engine and warm it up sufficiently.
2) Set voltmeters probes between ECM terminals ⑤⓪ [front heated oxygen sensor (left bank) signal], ⑤① [front heated oxygen sensor (right bank) signal] and ②⑤ (engine ground), and ECM terminals ⑤⑥, ⑤⑦ [rear heated oxygen sensor signal (left and right)] and ②⑤ (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 ⑤⑥ and ②⑤ is very less than that of ECM terminals ⑤⓪ and ②⑤, or ⑤① and ②⑤.

Switching frequency ratio =

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

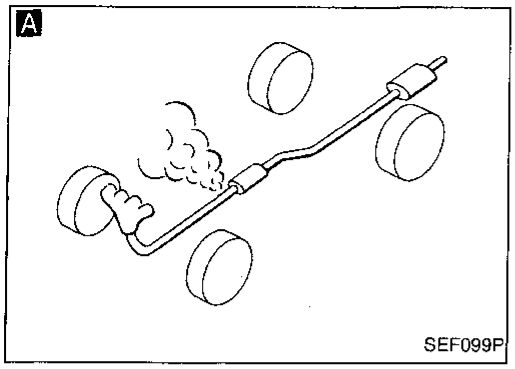
This ratio should be less than 0.75.

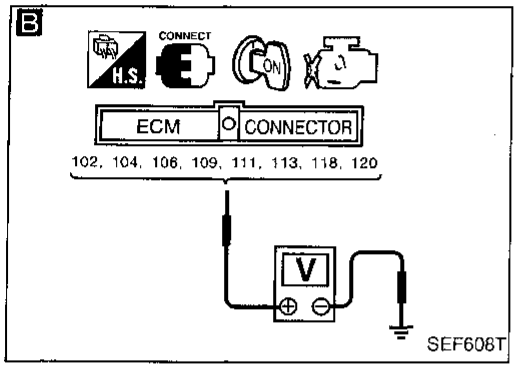
If the ratio is greater than above, it means three way catalyst does not operate properly.

Note: If the voltage at terminal ⑤⓪ or ⑤① does not switch periodically more than 5 times within 10 seconds at step 3, perform TROUBLE DIAGNOSIS FOR DTC 0503 or 0303 first, EC-126 or EC-145.

Three Way Catalyst Function (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

CHECK EXHAUST SYSTEM.
Visually check exhaust tubes and muffler for dent.
NG → Repair or replace it.
OK

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

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 INJECTORS.
1. Refer to WIRING DIAGRAM for Injectors, EC-310.
2. Stop engine and then turn ignition switch "ON".
3. Check voltage between ECM terminals (102), (104), (106), (109), (111) or (113), (118), (120) and ground with CONSULT or tester.
   Battery voltage should exist.
4. Turn ignition switch "OFF".

NG → Perform TROUBLE DIAGNOSIS FOR NON-DETECTABLE ITEMS, "Injectors", EC-310. Repair harness or connectors.
OK

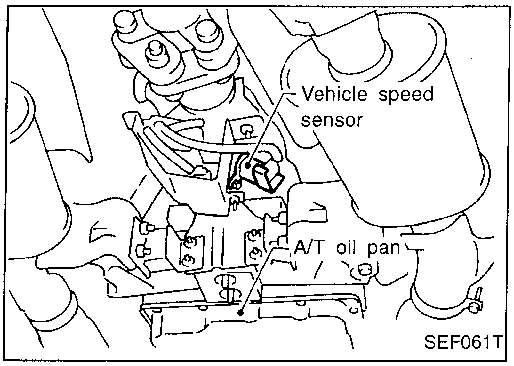
Remove injector assembly.
Refer to EC-24.
Keep fuel hose and all injectors connected to injector gallery.

1. Turn ignition switch "OFF".
2. Disconnect camshaft position sensor harness connector.
3. Turn ignition switch "ON".
   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.
Trouble is not fixed. → Replace three way catalyst.
Trouble is fixed.

INSPECTION END



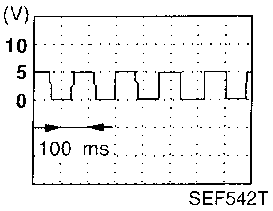
Vehicle Speed Sensor (VSS)

COMPONENT DESCRIPTION

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

ECM terminals and reference value

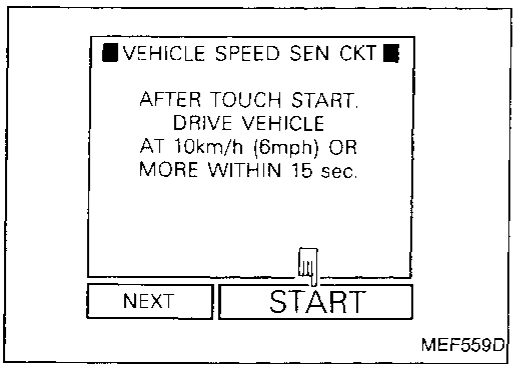
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

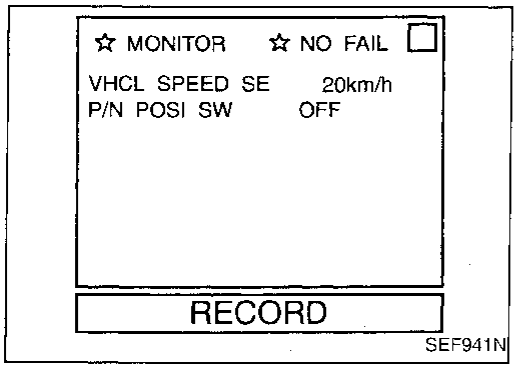
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
29	P/L	Vehicle speed sensor	Engine is running. └ Jack up rear wheels and run engine at idle in "D" position.	Approximately 5.2V  SEF542T

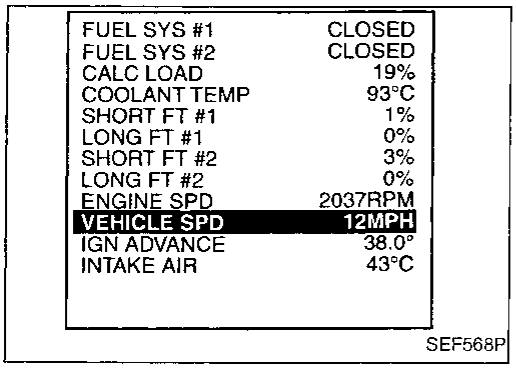
ON BOARD DIAGNOSIS LOGIC

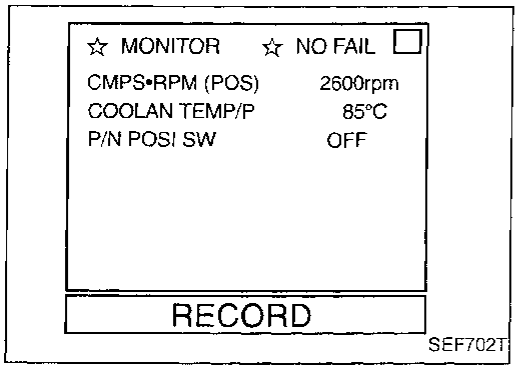
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P0500 0104	• The almost 0 km/h (0 MPH) signal from the vehicle speed sensor is sent to ECM even when the vehicle is driving.	• Harness or connector (The vehicle speed sensor circuit is open or shorted.) • Vehicle speed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

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

2) Start engine.

3) Read vehicle speed sensor signal in "MODE 1" with GST.

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

OR

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Start engine and warm it up sufficiently.

2) Perform test drive for at least 10 seconds continuously in the following recommended condition.
   - Engine speed : 1,300 - 2,250 rpm
   - Intake manifold vacuum: −60.0 to −36.0 kPa (−450 to −270 mmHg, −17.72 to −10.63 inHg)
   - Gear position : "D" position

3) Stop the vehicle, turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".

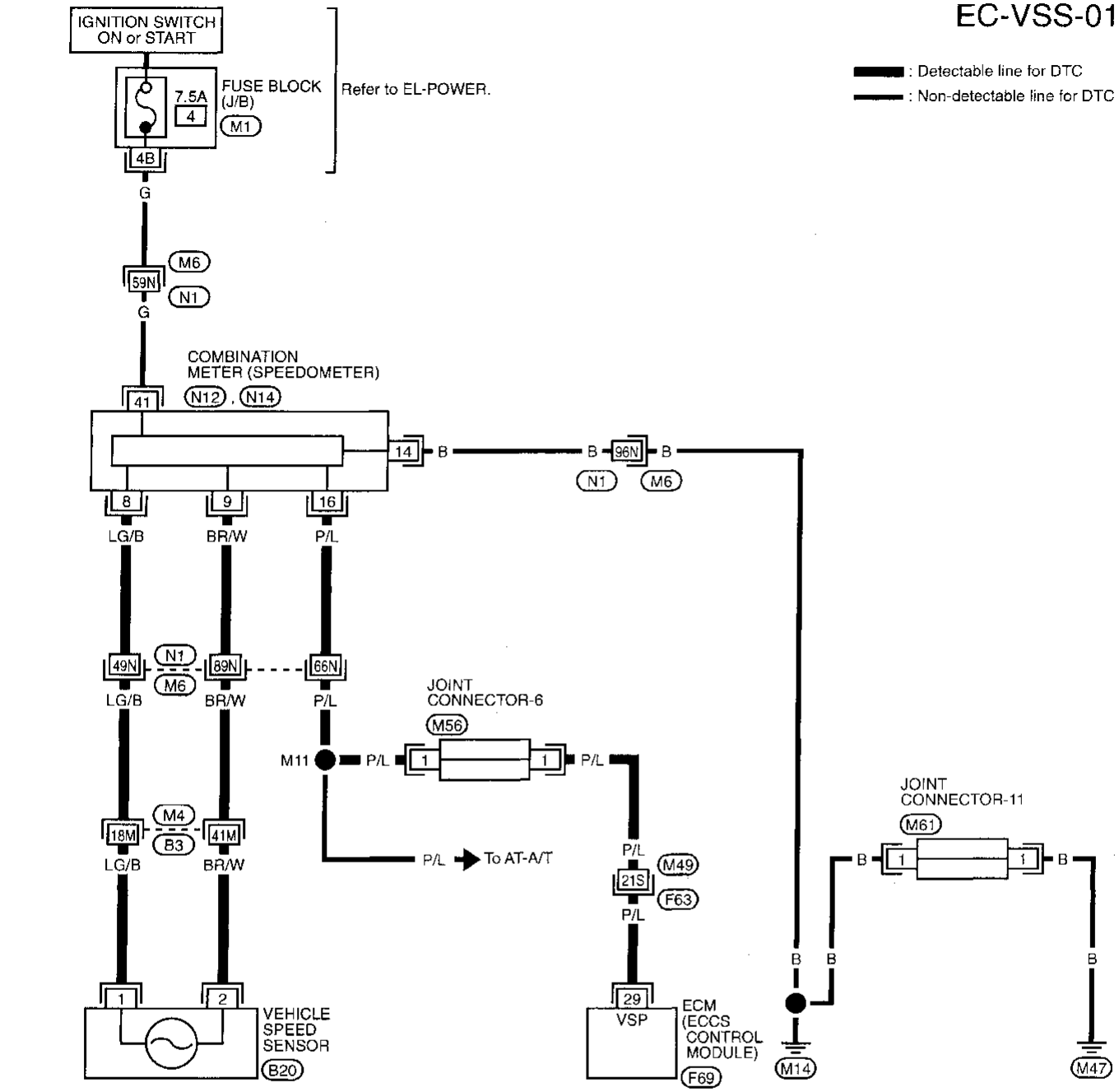
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

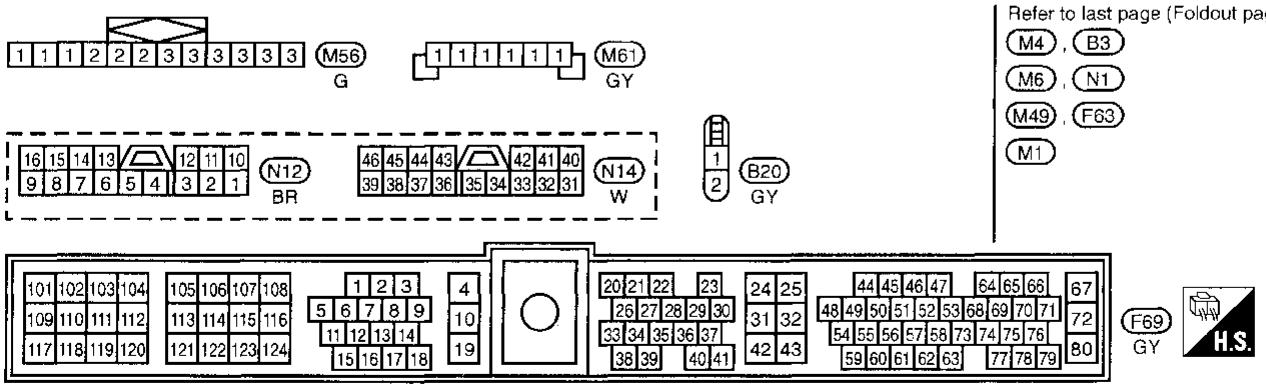
Even though 1st trip DTC is not detected, perform the above test drive at least one more time.

Vehicle Speed Sensor (VSS) (Cont'd)

EC-VSS-01

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



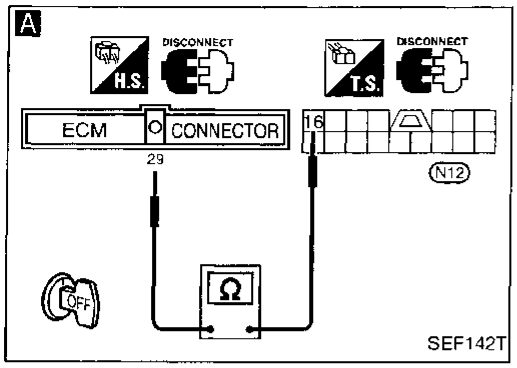


Refer to last page (Foldout page).
M4, B3
M6, N1
M49, F63
M1

SEF886S

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 ㉙ and terminal ⑯.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F63), (M49)
- Harness connectors (M6), (N1)
- Joint connector-6
- 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 for open or short between combination meter and vehicle speed sensor

If NG, repair harness or connectors.
- Vehicle speed sensor and its circuit (Refer to EL section.)

OK ↓

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

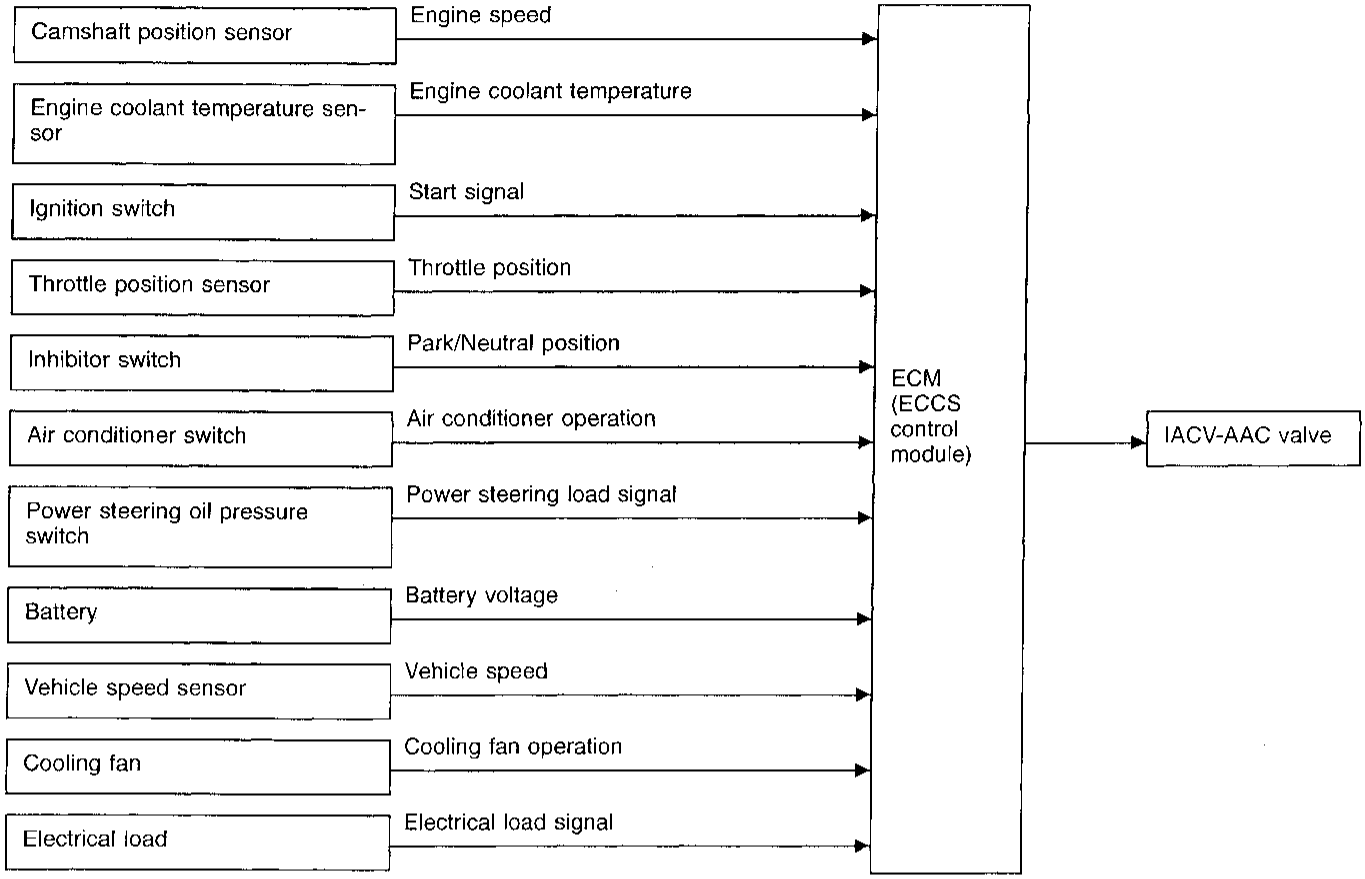
Trouble is not fixed. ↓

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

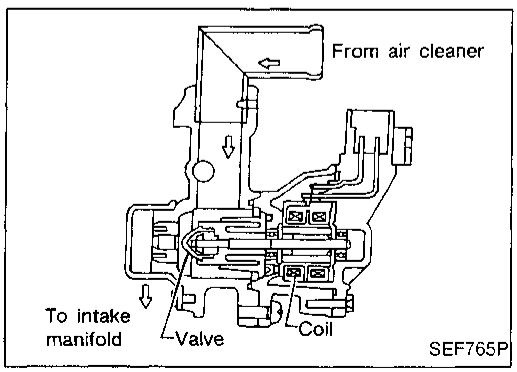
INSPECTION END

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 by-passes the throttle valve via IACV-AAC valve. The IACV-AAC valve changes the opening of the air by-pass passage to control the amount of auxiliary air. This valve is actuated by a step motor built into the valve, which moves the valve in the axial direction in steps corresponding to the ECM output signals. One step of IACV-AAC valve movement causes the respective opening of the air by-pass passage. (i.e. when the step advances, the opening is enlarged.) The opening of the valve is varied to allow for optimum control of the engine idling speed. The camshaft position sensor detects the actual engine speed and sends a signal to the ECM. The ECM then controls the step position of the IACV-AAC valve so that engine speed coincides with the target value memorized in ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by 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

The IACV-AAC valve is operated by a step motor for centralized control of auxiliary air supply. This motor has four winding phases and is actuated by the output signals of ECM which turns ON and OFF two windings each in sequence. Each time the IACV-AAC valve opens or closes to change the auxiliary air quantity, the ECM sends a pulse signal to the step motor. When no change in the auxiliary air quantity is needed, the ECM does not issue the pulse signal. A certain voltage signal is issued so that the valve remains at that particular opening.

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

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
IACV-AAC/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	20 - 10 step
		2,000 rpm	—

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
6 17	GY/L	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 14V
101 115	PU GY	IACV-AAC valve	Engine is running. └ Idle speed	0.1 - 11V

ON BOARD DIAGNOSIS LOGIC

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

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

Procedure for malfunction A

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle.
4) Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.
   Do not rev engine up to speeds more than 3,000 rpm.
5) Perform step 4 once more.

OR

1) Start engine and let it idle.
2) Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.
   Do not rev engine up to speeds more than 3,000 rpm.
3) Perform step 2 once more.
4) Select "MODE 7" with GST.

OR

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

(NO TOOLS)
1) Start engine and let it idle.
2) Keep engine speed at 2,500 rpm for 3 seconds, then let it idle for 3 seconds.
   Do not rev engine up to speeds more than 3,000 rpm.
3) Perform step 2 once more.
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.

Procedure for malfunction B

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

OR

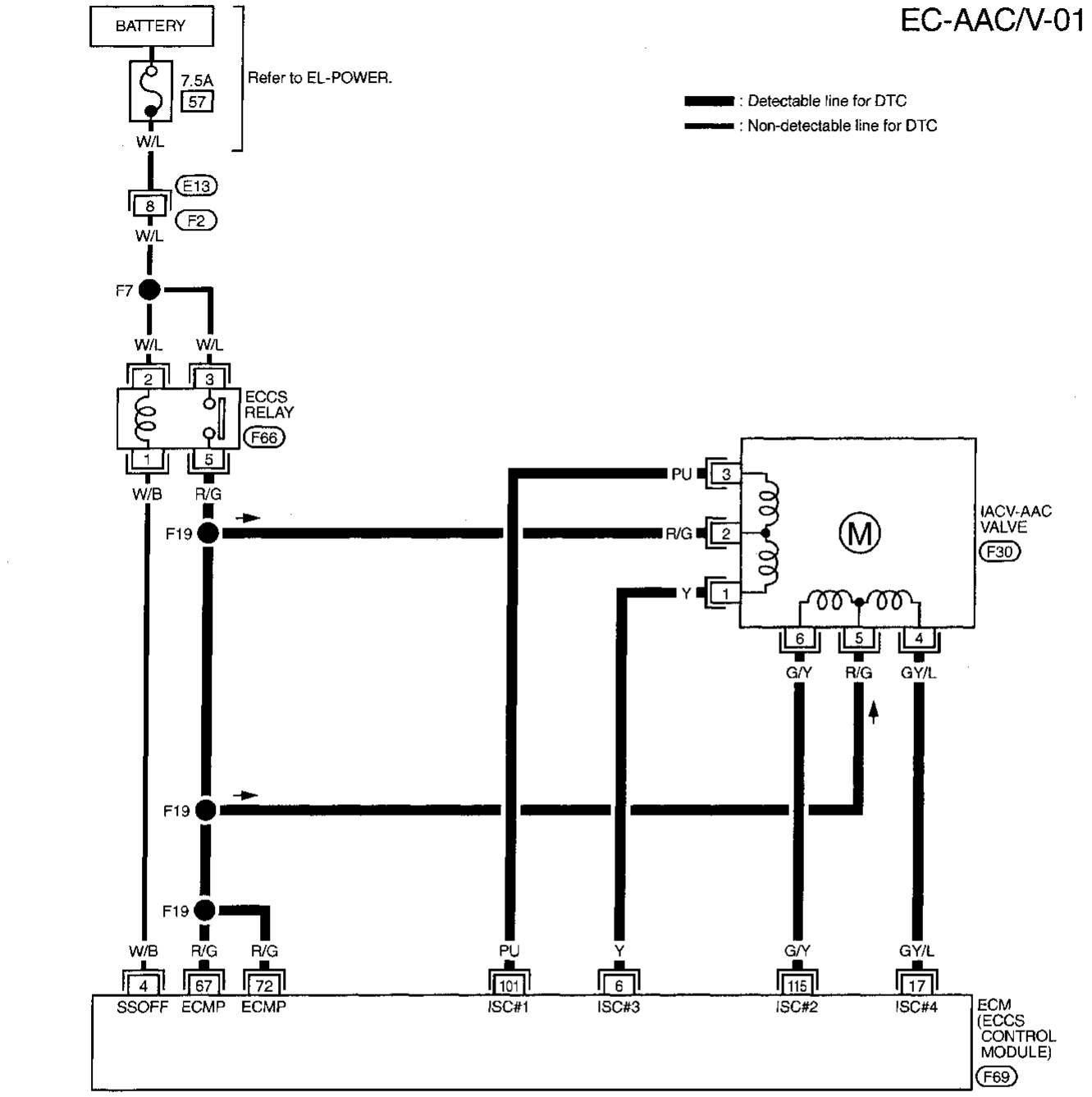
1) Open engine hood.
2) Start engine and warm it up sufficiently.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Start engine again and run it for at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)
5) Select "MODE 7" with GST.

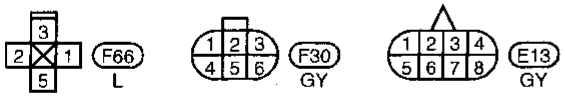
OR

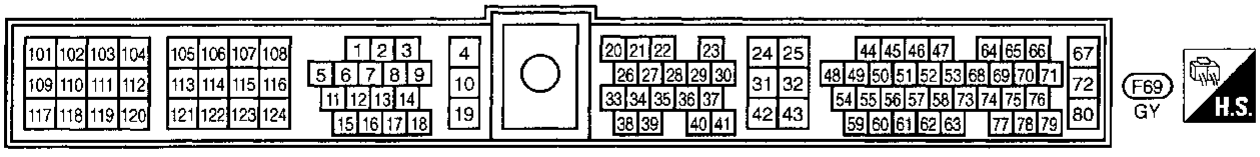
(NO TOOLS)
1) Open engine hood.
2) Start engine and warm it up sufficiently.
3) Turn ignition switch "OFF" and wait at least 5 seconds.
4) Start engine again and run it for at least 1 minute at idle speed. (Headlamp switch, rear defogger switch: OFF)
5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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

EC-AAC/V-01



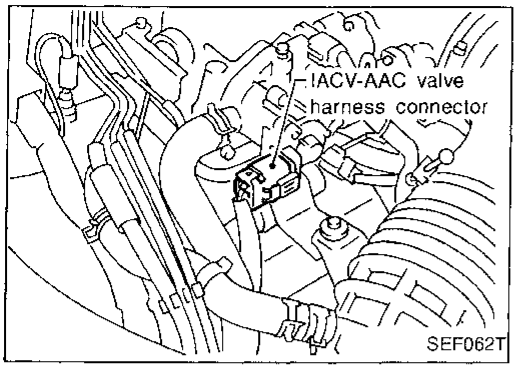


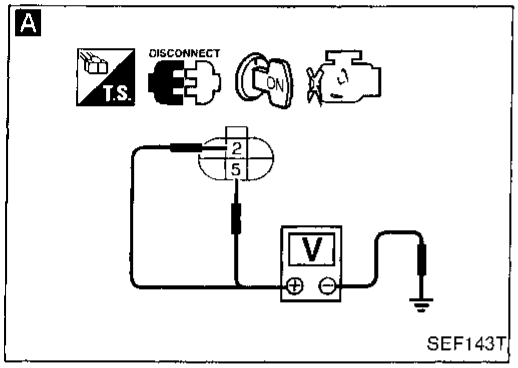


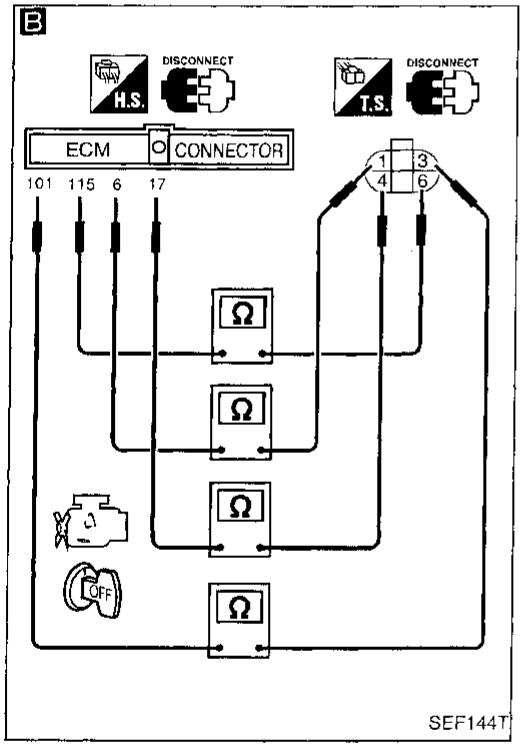
SEF888S

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

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect IACV-AAC valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminals ②, ⑤ and ground with CONSULT or tester.
   Voltage: Battery voltage

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 (101) and terminal ③,
   ECM terminal (115) and terminal ⑥,
   ECM terminal ⑥ and terminal ①,
   ECM terminal ⑰ and terminal ④.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK

CHECK COMPONENT (IACV-AAC valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace IACV-AAC valve.

OK

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

Trouble is not fixed.

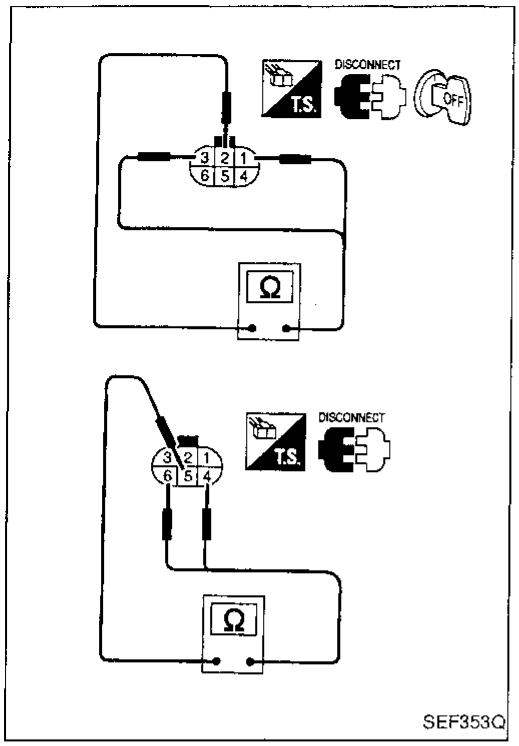
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

INSPECTION END

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

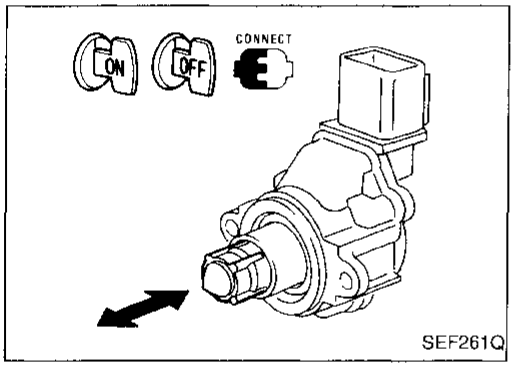
COMPONENT INSPECTION

IACV-AAC valve



SEF353Q

1. Disconnect IACV-AAC valve harness connector.
2. Check resistance between the following terminals.
   terminal ② and terminals ①, ③
   terminal ⑤ and terminals ④, ⑥
   Resistance:
   Approximately 30Ω [at 20°C (68°F)]



SEF261Q

3. Reconnect IACV-AAC valve harness connector.
4. Remove idle air adjusting unit assembly (IACV-AAC valve is built-in) from engine.
   (The IACV-AAC valve harness connector should remain connected.)
5. Turn ignition switch "ON" and "OFF", and ensure the IACV-AAC valve shaft smoothly moves forward and backward, according to the ignition switch position.
   If NG, replace the IACV-AAC valve.

A/T Communication Line (P0600) and A/T Diagnostic Communication Line (P1605)

This circuit line (LAN) controls the smooth shifting up and down of A/T during the hard acceleration/deceleration. Pulse signals are exchanged between ECM and A/T control unit (P0600).
This circuit line is also used to communicate malfunction information related to A/T (Automatic Transmission) is transferred through the line (LAN circuit) from A/T control unit to ECM (P1605).

Be sure to erase the malfunction information such as DTC not only in A/T control unit but also ECM after the A/T related repair.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P0600 0504	• ECM receives incorrect voltage from A/T control unit continuously.	• Harness or connectors (The communication line circuit between ECM and A/T control unit is open or shorted.) • A/T control unit • Dead (Weak) battery
P1605 0804	• Signal from A/T control units is not sent to ECM.	

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle for at least 2 seconds (P0600) and 40 seconds (P1605).

OR

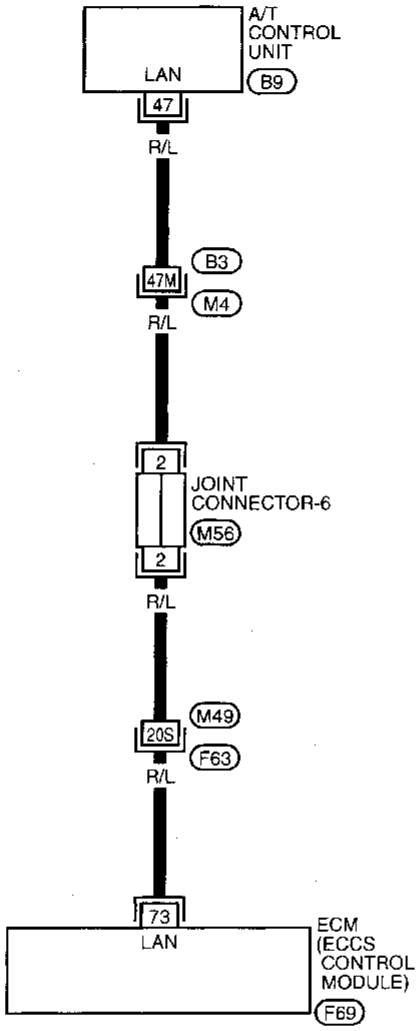
1) Start engine and let it idle for at least 2 seconds (P0600) and 40 seconds (P1605).
2) Select "MODE 7" with GST.

OR

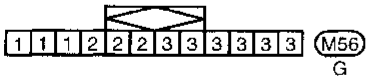
1) Start engine and let it idle for at least 2 seconds (0504) and 40 seconds (0804).
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

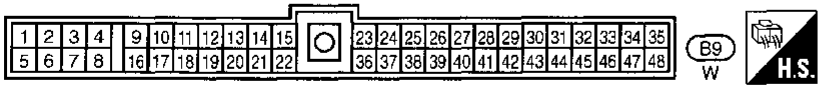
A/T Communication Line (P0600) and A/T Diagnostic Communication Line (P1605) (Cont'd)

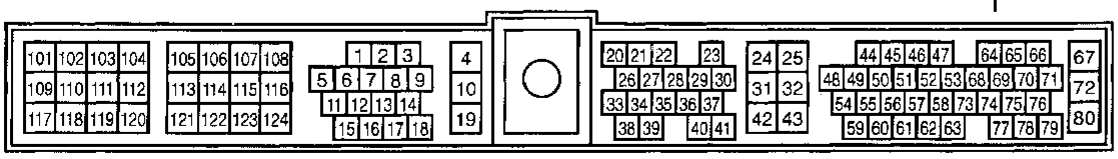
EC-AT/C-01



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





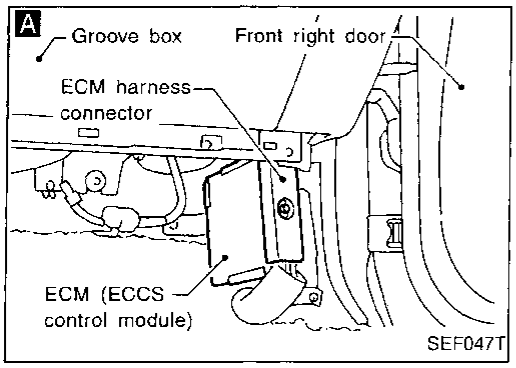


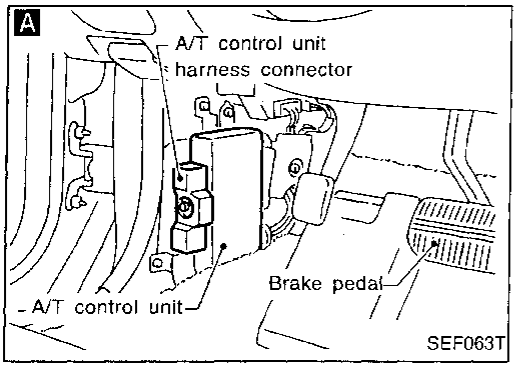
Refer to last page (Foldout page).
M4, B3
M49, F63

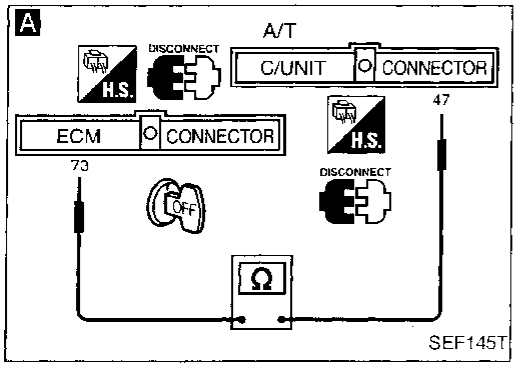
SEF889S

A/T Communication Line (P0600) and A/T Diagnostic Communication Line (P1605) (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 ⑦③ and terminal ④⑦.
   Continuity should exist.
   If OK, check harness for short.

NG →
Check the following.
- Harness connectors (M4), (B3)
- Harness connectors (F63), (M49)
- Joint connector-6
- Check harness for open or short between ECM and A/T control unit.

If NG, repair harness or connectors.

OK ↓

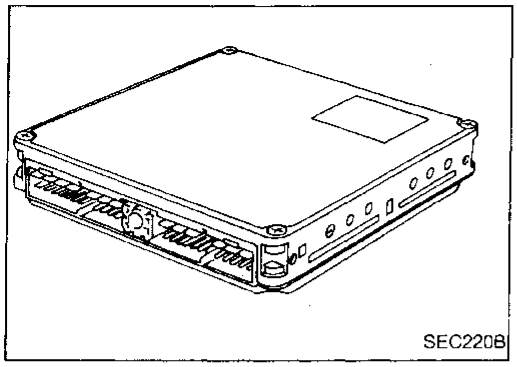
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END

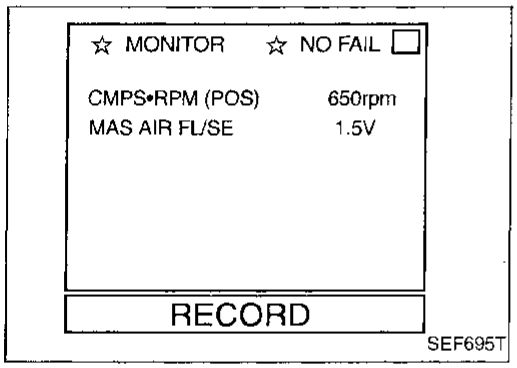

SEC220B

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



SEF695T

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.

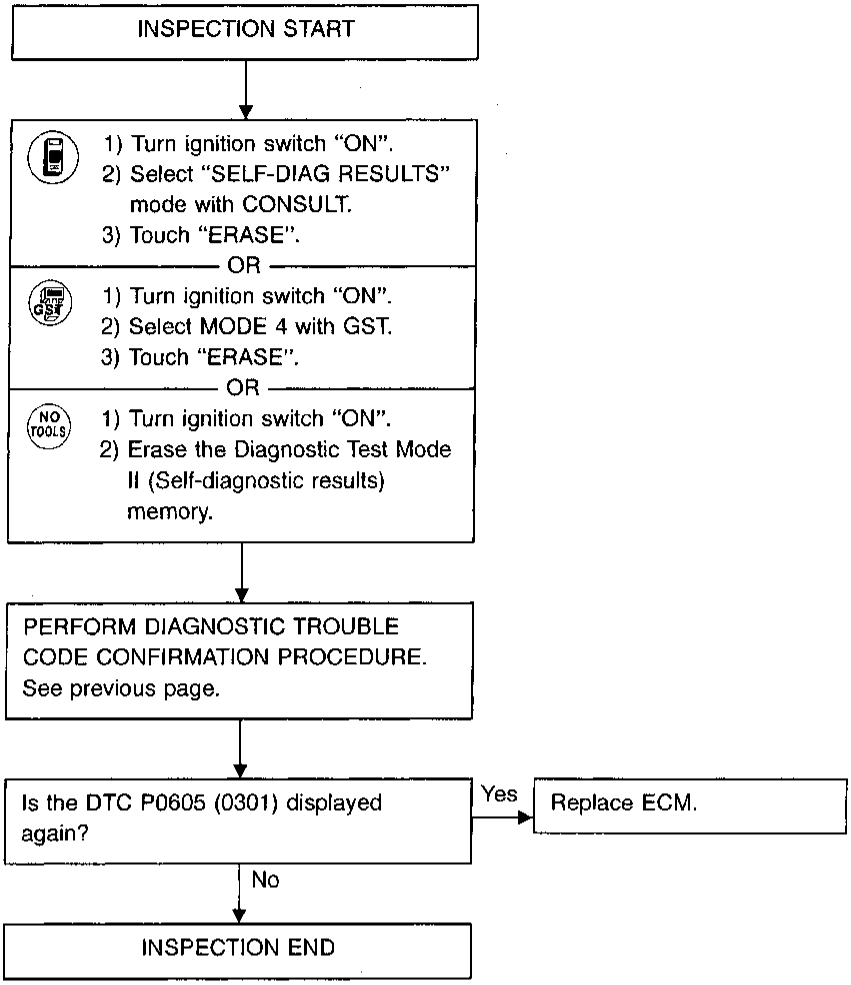
OR

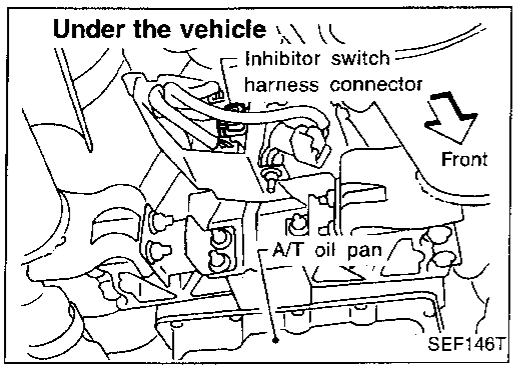
1) Turn ignition switch "ON".
2) Select "Mode 7" with GST.
3) Start engine and run it for at least 2 seconds at idle speed.

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" and wait at least 5 seconds.
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

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





Park/Neutral Position Switch

COMPONENT DESCRIPTION

When the gear position is in "P" or "N", park/neutral position is "ON". ECM detects the position because the continuity of the line (the "ON" signal) exists.

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

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

ECM terminals and reference value

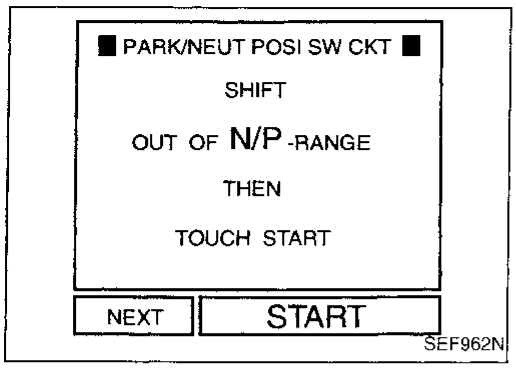
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

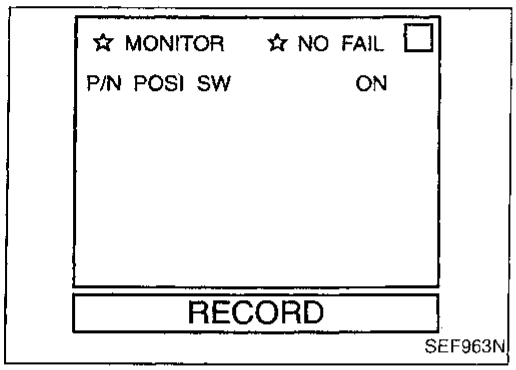
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
22	G/OR	Inhibitor switch	Ignition switch "ON" └ Gear position is "N" or "P".	Approximately 0V
			Ignition switch "ON" └ Except the above gear position	Approximately 5V

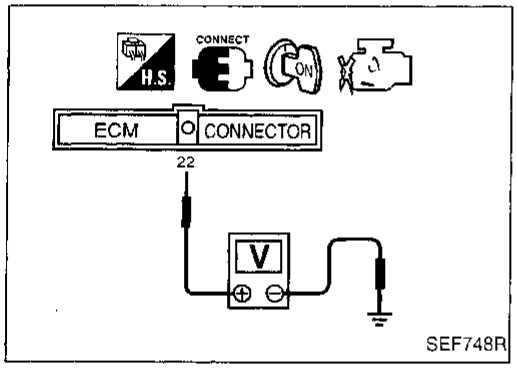
ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
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 park/neutral position relay circuit is open or shorted.) • Inhibitor switch • Park/neutral position relay

Park/Neutral Position Switch (Cont'd)







OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the park/neutral position switch circuit. During this check, a 1st trip DTC might not be confirmed.

1) Turn ignition switch "ON".
2) Perform "PARK/NEUT POSI SW CKT" in "FUNCTION TEST" mode with CONSULT.

OR

2) Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT.
3) Check the "P/N POSI SW" signal under the following conditions.

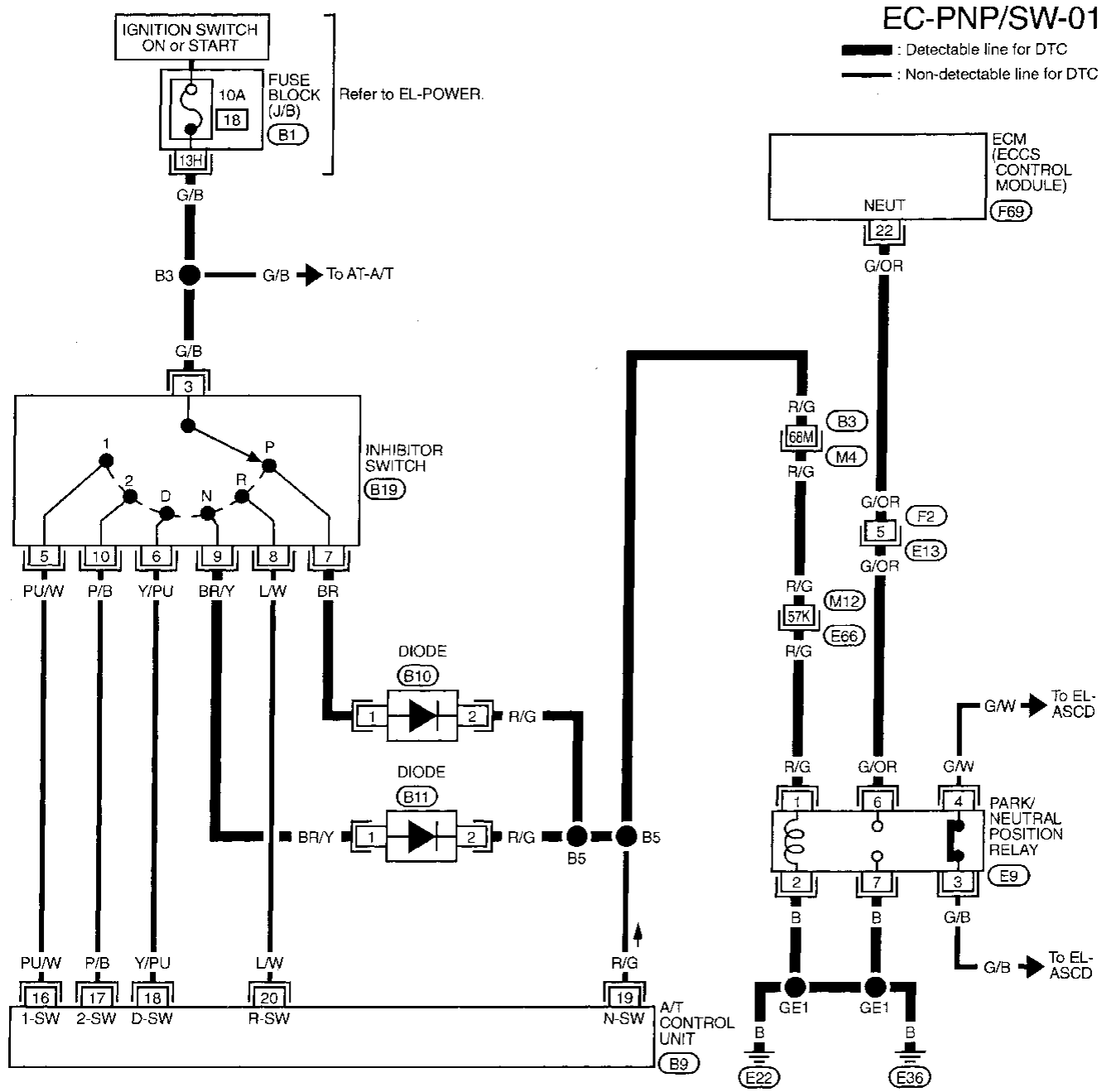
Condition (Gear position)	Known good signal
"P" and "N" position	ON
Except the above position	OFF

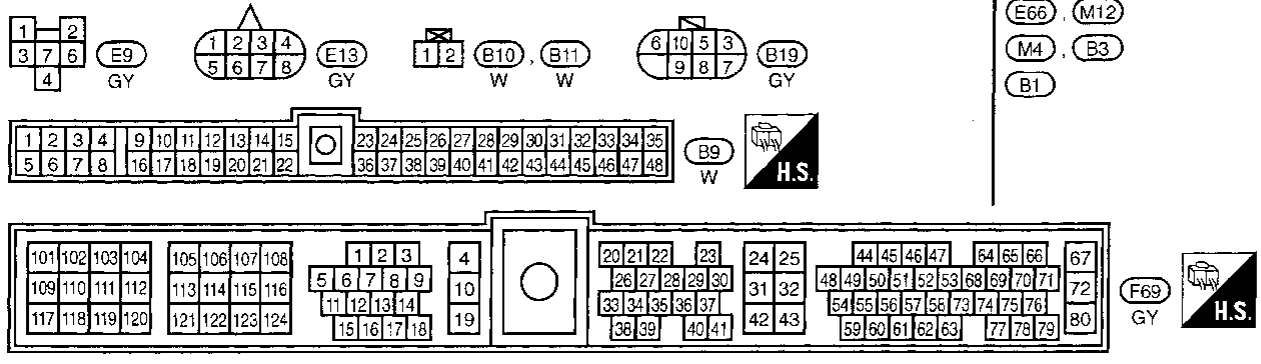
OR

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

Condition (Gear position)	Voltage (V) (Known good data)
"P" and "N" position	Approx. 0
Except the above position	Approx. 5

Park/Neutral Position Switch (Cont'd)



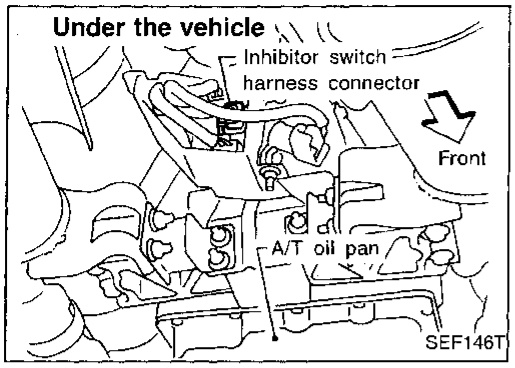


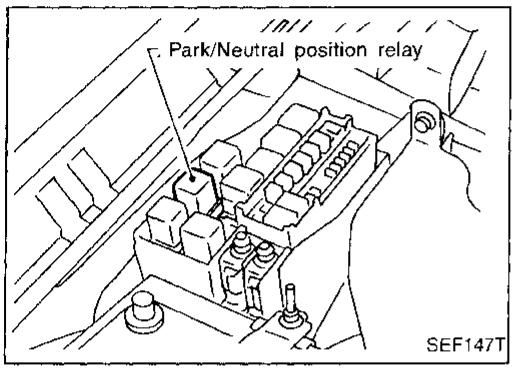
Refer to last page (Foldout page).
E66, M12
M4, B3
B1

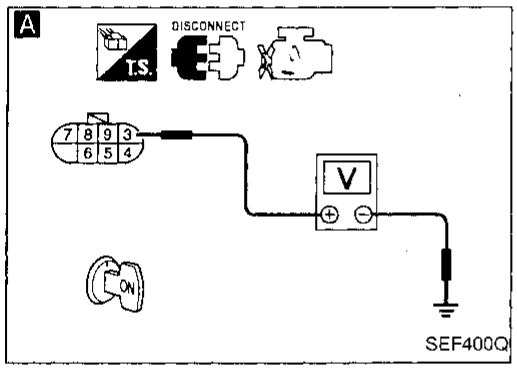
SEF887S

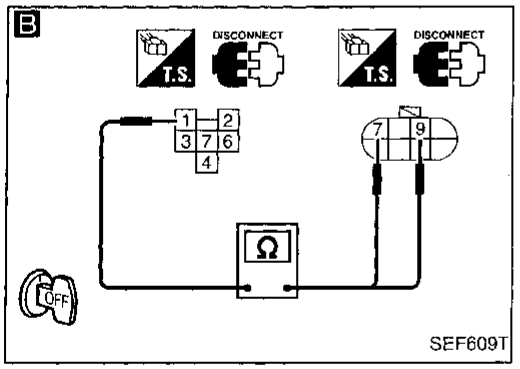
Park/Neutral Position Switch (Cont'd)

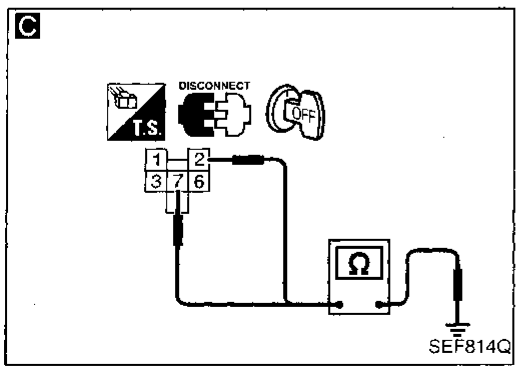
DIAGNOSTIC PROCEDURE











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.
- 10A fuse
- Harness for open or short between inhibitor switch and fuse

If NG, repair harness or connectors.

OK ↓

B

CHECK OUTPUT SIGNAL CIRCUIT-I.
1. Turn ignition switch "OFF".
2. Disconnect park/neutral position relay harness connector.
3. Check harness continuity between relay terminal ① and inhibitor switch terminals ⑦, ⑨.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E66), (M12)
- Harness connectors (M4), (B3)
- Harness connectors (diodes) (B10), (B11)
- Harness for open or short between inhibitor switch and relay

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT.
1. Check harness continuity between relay terminals ②, ⑦ and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT-II.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉒ and relay terminal ⑥.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E13), (F2)
- Harness for open or short between ECM and relay

If NG, repair harness or connectors.

OK ↓

E

CHECK PARK/NEUTRAL POSITION RELAY.
1. Apply 12V direct current between relay terminals ① and ②.
2. Check continuity between relay terminals ⑥ and ⑦.
   12V (① - ②) applied:
   Continuity exists.
   No voltage applied:
   No continuity

NG → Replace park/neutral position relay.

OK ↓

CHECK COMPONENT (Inhibitor switch).
Refer to AT section.

NG → Replace inhibitor switch.

OK ↓

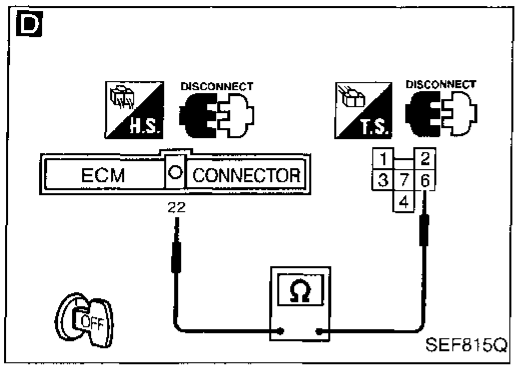
Disconnect and reconnect harness connectors in the circuit. Then retest.

↓ Trouble is not fixed.

Ⓐ

Park/Neutral Position Switch (Cont'd)

D

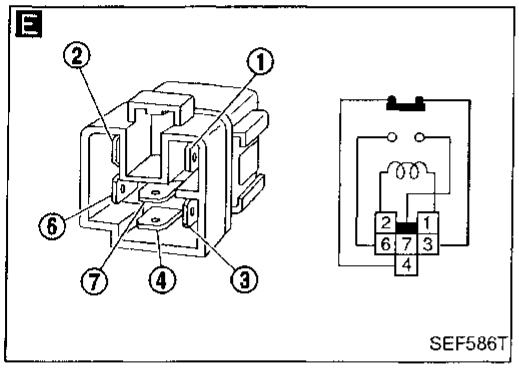


Ⓐ

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

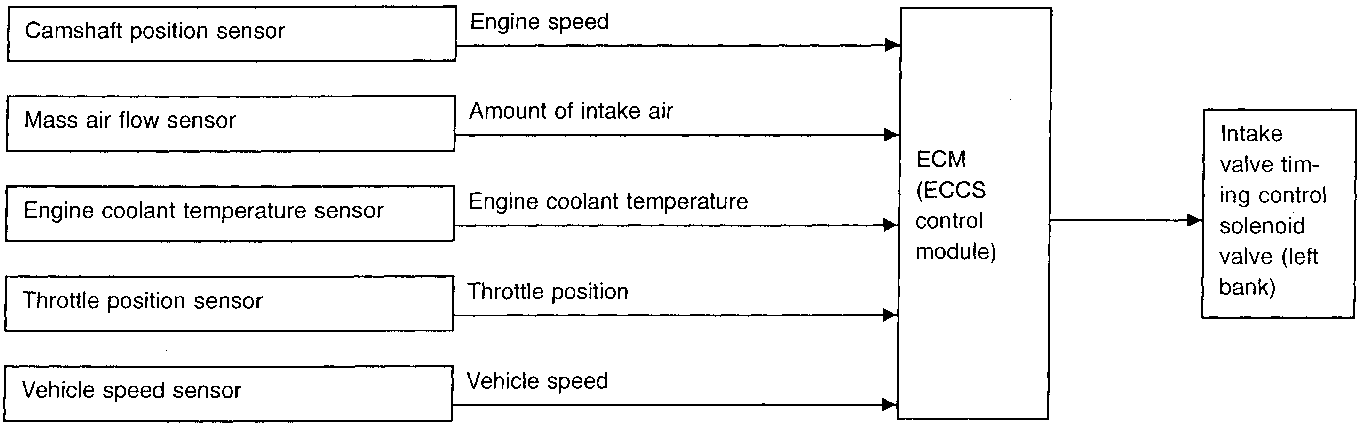
INSPECTION END

E



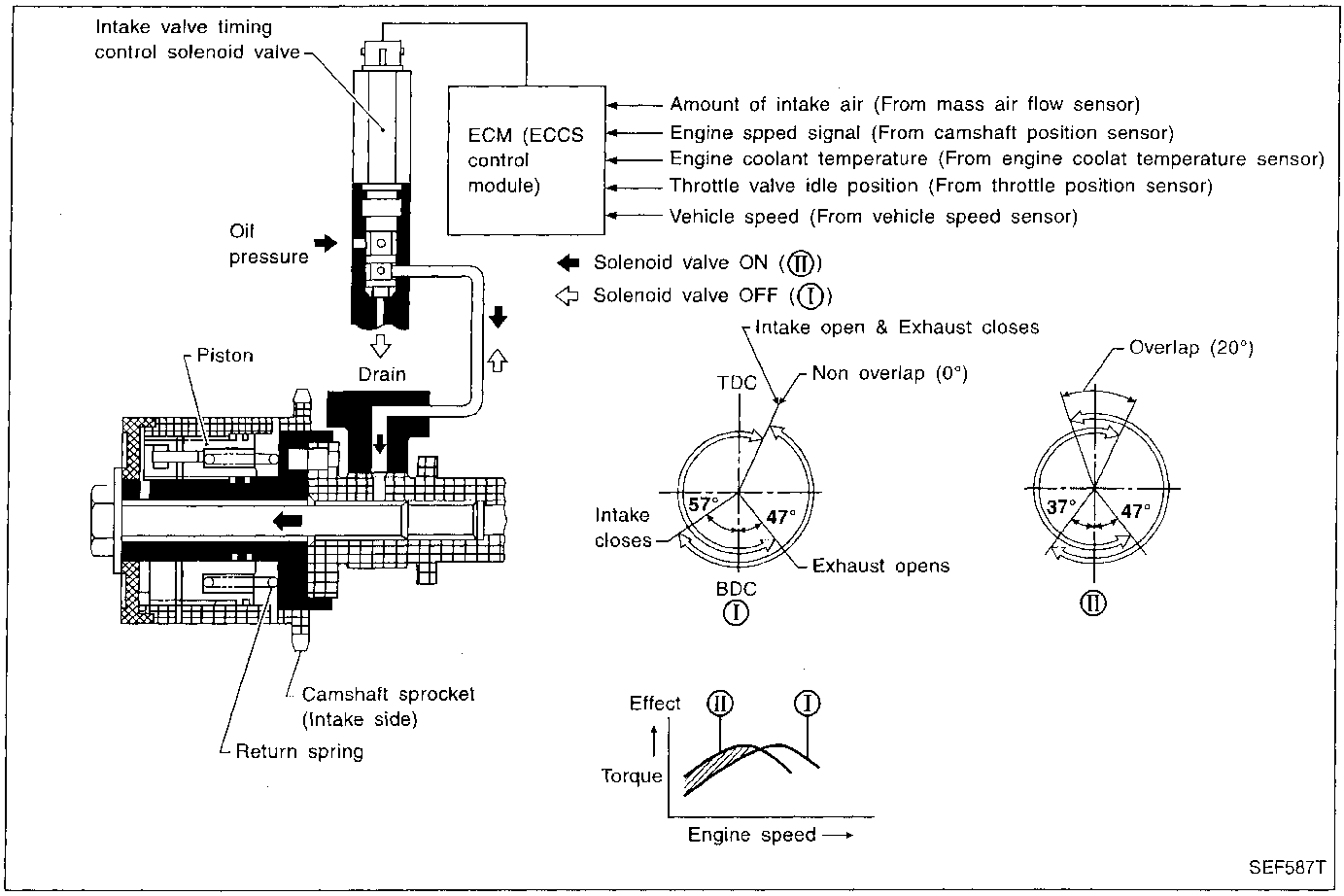
Intake Valve Timing Control (Left bank)

SYSTEM DESCRIPTION



The intake valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine speed, amount of intake air, vehicle speed and throttle position are used to determine intake valve timing.
The intake camshaft sprocket position is regulated by oil pressure controlled by the intake valve timing control.

When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.



Intake Valve Timing Control (Left bank) (Cont'd)

OPERATION

Engine operating condition	Intake valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine valve timing
• Engine coolant temperature is between 15°C (59°F) to 110°C (230°F) and engine speed is between 1,100 rpm and 4,600 rpm. • During high load condition • Vehicle speed is more than 4 km/h (2 MPH)	ON	Advance	Increased	ⓑ
Those other than above	OFF	Normal	Normal	ⓐ

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL-B1	• Engine is in warm up condition. • Engine speed is more than 1,100 rpm. • Quickly depressed accelerator pedal • Vehicle speed is more than 4 km/h (2 MPH).	Intake valve timing control solenoid is operating.	ON
		Intake valve timing control solenoid is not operating.	OFF

ECM terminals and reference value

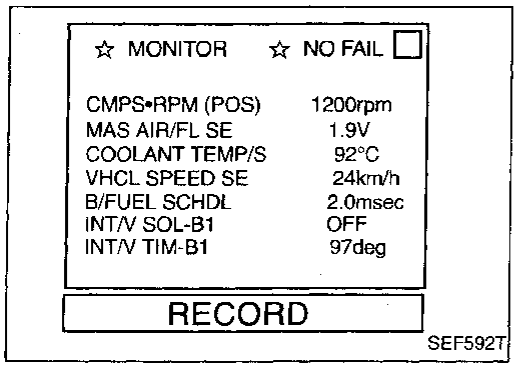
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
110	B/R	Intake valve timing control solenoid valve (left bank)	Engine is running. └ Intake valve timing control solenoid is operating.	Approximately 0V
			Engine is running. └ Intake valve timing control solenoid is not operating.	Battery voltage

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1110 0805	Comparing the intake valve timing position when the intake valve timing solenoid is ON with that when the solenoid is OFF, the difference does not exceed a certain limit.	• Harness or connectors (The left bank intake valve timing control position sensor circuit is open.) • Intake valve timing control position sensor • Accumulation of debris to the signal pick-up portion of the camshaft

Intake Valve Timing Control (Left bank) (Cont'd)



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Warm up engine sufficiently [more than 82°C (180°F)].
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
4) Restart engine and wait at least 30 seconds.
5) Turn TCS switch "OFF".
6) Shift A/T selector lever to "2nd" position.
7) Gradually raise engine speed and keep it between 1,100 rpm and 1,500 rpm for at least 20 seconds. (Test is completed when "INT/V SOL - B1 in "DATA MONITOR" with CONSULT remains "OFF". If indication is "ON", repeat 7.
8) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds. (Test is completed when "INT/V SOL - B1 in "DATA MONITOR" with CONSULT remains "ON". If indication is "OFF", repeat 8.

OR

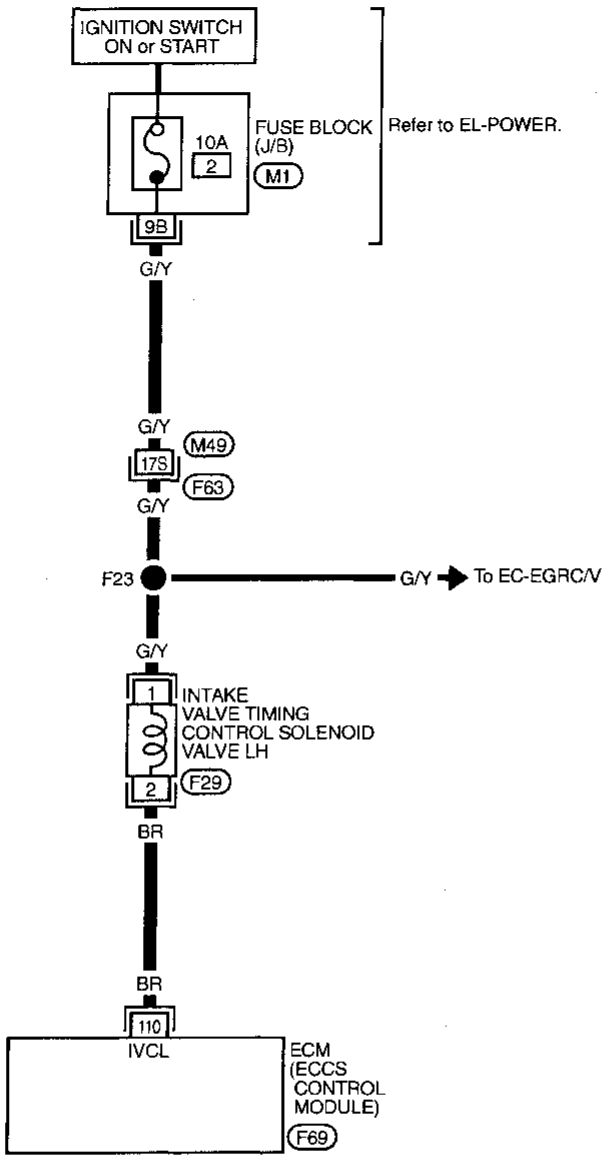
1) Warm up engine sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Restart engine and wait at least 30 second.
4) Turn TCS switch "OFF".
5) Shift A/T selector lever to "2nd" positions.
6) Gradually raise engine speed and keep it between 1,000 rpm and 1,500 rpm for at least 12 seconds.
7) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds.
8) Select "MODE 7" with GST.

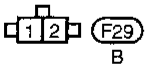
OR

1) Warm up engine sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Restart engine and wait at least 30 seconds.
4) Turn TCS switch "OFF".
5) Shift A/T selector lever to "D" position.
6) Gradually raise engine speed and keep it between 1,000 rpm and 1,500 rpm for at least 12 seconds.
7) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds.
8) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

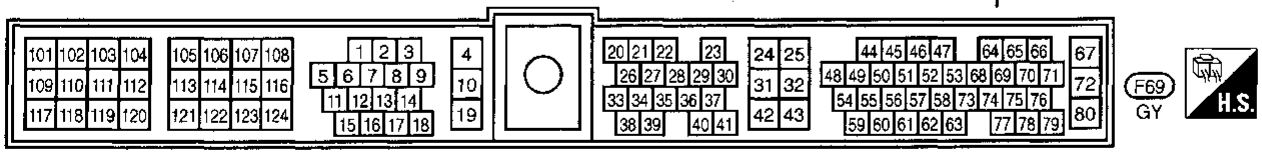
Intake Valve Timing Control (Left bank) (Cont'd)

EC-IVC-L-01





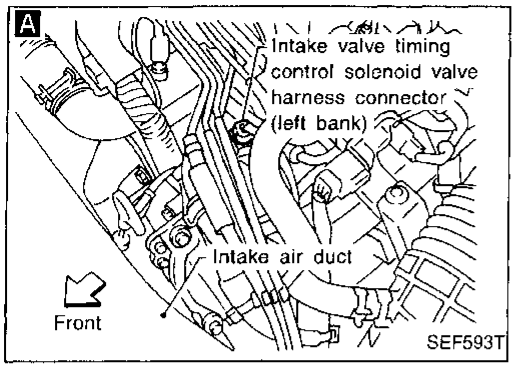
Refer to last page (Foldout page).
M49, F63
M1

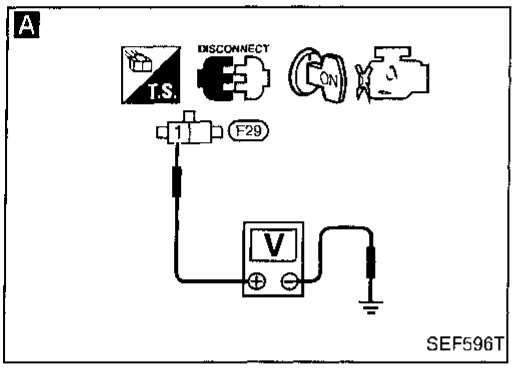


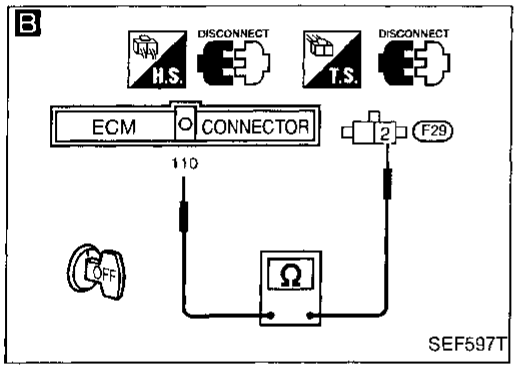
SEF906S

Intake Valve Timing Control (Left bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F63), (M49)
- 10A fuse
- Harness for open or short between the intake valve timing 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 (110) and solenoid valve terminal ②.
   Continuity should exist.
4. Check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK ENGINE OIL PRESSURE.
Refer to LC section ("Oil Pressure Check", "ENGINE LUBRICATION SYSTEM").

NG → Repair lubrication system.

OK ↓

CHECK INTAKE AIR SYSTEM.
Check intake air system for leaks.

NG → Repair intake air system.

OK ↓

CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR.
Refer to DTC P1140, EC-251.

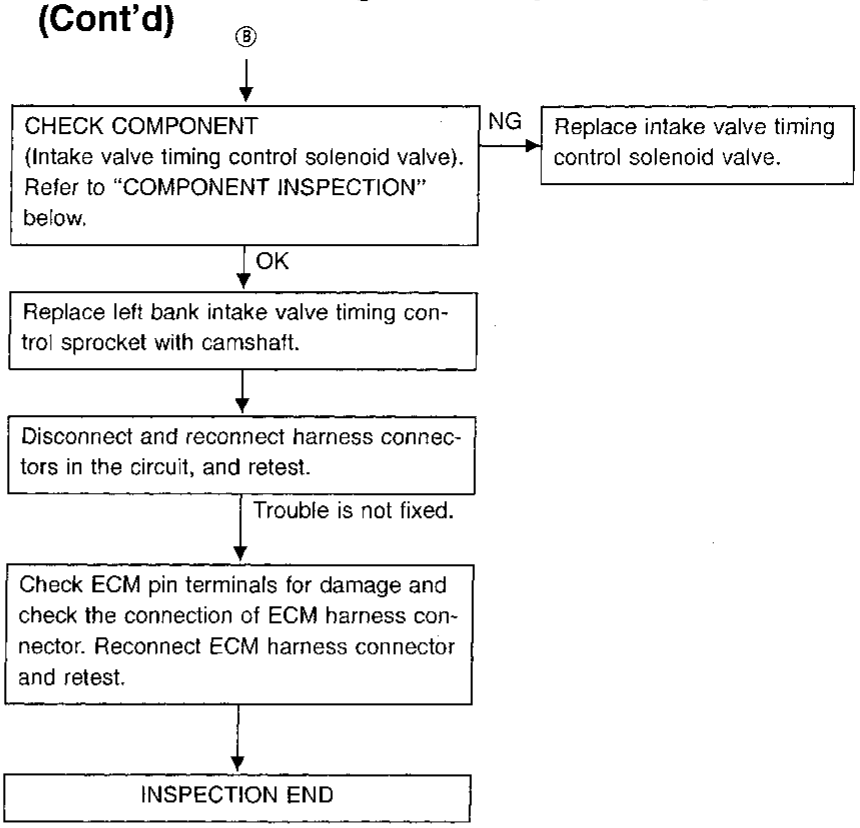
NG → Repair or replace.

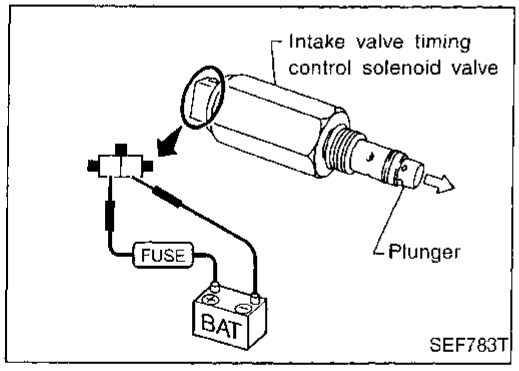
OK ↓

Ⓑ

(Go to next page.)

Intake Valve Timing Control (Left bank) (Cont'd)





COMPONENT INSPECTION

Intake valve timing control solenoid valve

1. Supply intake valve timing control solenoid valve terminals with battery voltage.
2. Make sure that inside plunger protrudes.
   If NG, replace intake valve timing control solenoid valve.

Tandem Throttle Position Sensor

This diagnosis is for tandem throttles (main throttle and secondary throttle). The quantity of intake air is determined by these two throttle valves. A rationality check is then carried out by ECM after monitoring the signals of these two throttle position sensors.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
P1125 1502	• Rationally incorrect voltage is entered to ECM compared with the signals from mass air flow sensor, camshaft position sensor and IACV-AAC valve.	• Harness or connectors (The sensor circuits are open or shorted.) • Throttle position sensor or secondary throttle position sensor • Throttle actuator control (TAC) module

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Before performing the following procedure, start engine and warm it up sufficiently.

1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and run it for 15 seconds.

OR

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

OR

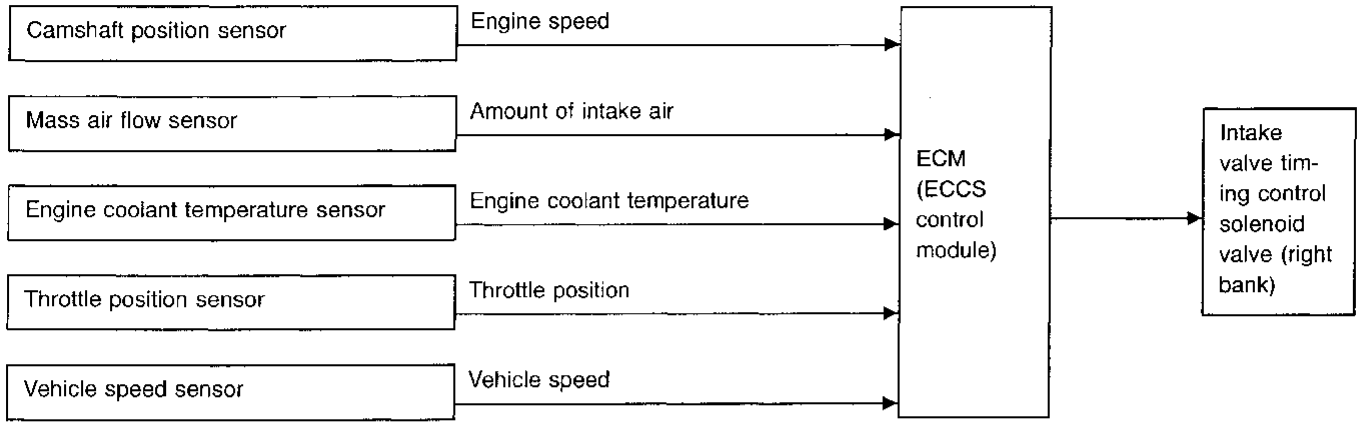
1) Start engine and run it for 15 seconds.
2) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
3) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR DTC P0120, EC-115 OR Refer to TROUBLE DIAGNOSIS FOR NON DETECTABLE ITEMS, EC-316.

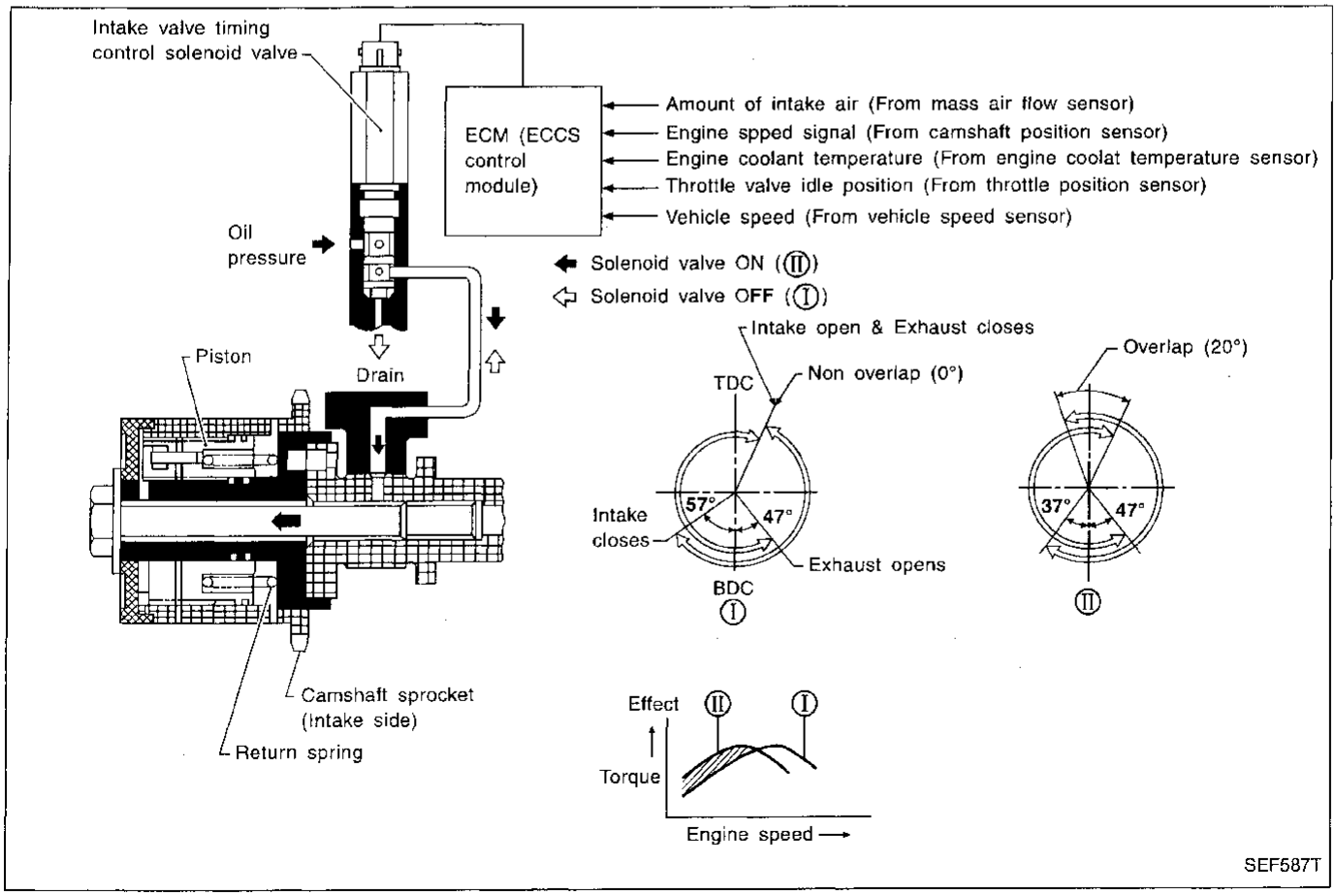
Intake Valve Timing Control (Right bank)

SYSTEM DESCRIPTION



The intake valve timing control system is utilized to control intake valve opening and closing timing. Engine coolant temperature signals, engine speed, amount of intake air, vehicle speed and throttle position are used to determine intake valve timing.
The intake camshaft sprocket position is regulated by oil pressure controlled by the intake valve timing control.

When ECM sends ON signal to intake valve timing control solenoid valve, oil pressure is transmitted to camshaft sprocket. Then, intake side camshaft is advanced.



Intake Valve Timing Control (Right bank) (Cont'd)

OPERATION

Engine operating condition	Intake valve timing control solenoid valve	Intake valve opening and closing time	Valve overlap	Engine valve timing
• Engine coolant temperature is between 15°C (59°F) to 110°C (230°F) and engine speed is between 1,100 rpm and 4,600 rpm. • During high load condition • Vehicle speed is more than 4 km/h (2 MPH).	ON	Advance	Increased	⑪
Those other than above	OFF	Normal	Normal	⑩

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL-B1	• Engine is in warm up condition. • Engine speed is more than 1,100 rpm. • Quickly depressed accelerator pedal • Vehicle speed is more than 4 km/h (2 MPH).	Intake valve timing control solenoid is operating.	ON
		Intake valve timing control solenoid is not operating.	OFF

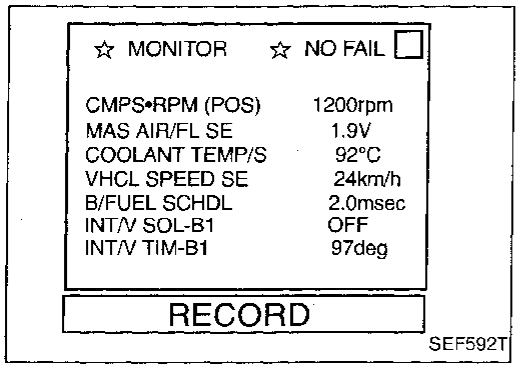
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
105	BR/Y	Intake valve timing control solenoid valve (right bank)	Engine is running. └ Intake valve timing control solenoid is operating.	Approximately 0V
			Engine is running. └ Intake valve timing control solenoid is not operating.	Battery voltage

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1135 1301	Comparing the intake valve timing position when the intake valve timing solenoid is ON with that when the solenoid is OFF, the difference does not exceed a certain limit.	• Harness or connectors (The left bank intake valve timing control position sensor circuit is open.) • Intake valve timing control position sensor • Accumulation of debris to the signal pick-up portion of the camshaft



Intake Valve Timing Control (Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Warm up engine sufficiently [more than 82°C (180°F)].
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
4) Restart engine and wait at least 30 seconds.
5) Turn TCS switch "OFF".
6) Shift A/T selector lever to "2nd" position.
7) Gradually raise engine speed and keep it between 1,100 rpm and 1,500 rpm for at least 20 seconds. (Test is completed when "INT/V SOL - B2 in "DATA MONITOR" with CONSULT remains "OFF". If indication is "ON", repeat 7.
8) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds. (Test is completed when "INT/V SOL - B2 in "DATA MONITOR" with CONSULT remains "ON". If indication is "OFF", repeat 8.

OR

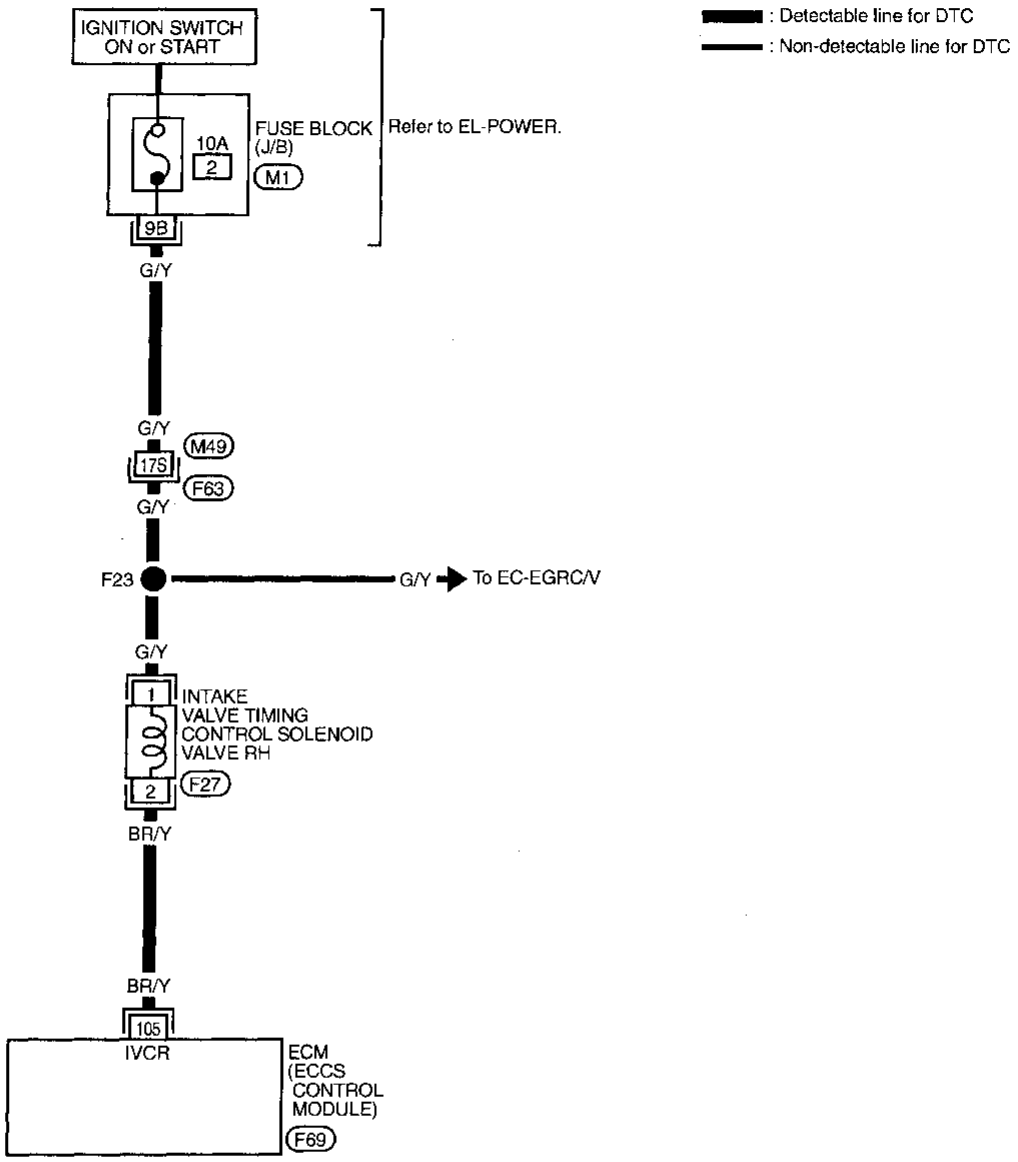
1) Warm up engine sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Restart engine and wait at least 30 seconds.
4) Turn TCS switch "OFF".
5) Shift A/T selector lever to "2nd" position.
6) Gradually raise engine speed and keep it between 1,000 rpm and 1,500 rpm for at least 12 seconds.
7) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds.
8) Select "MODE 7" with GST.

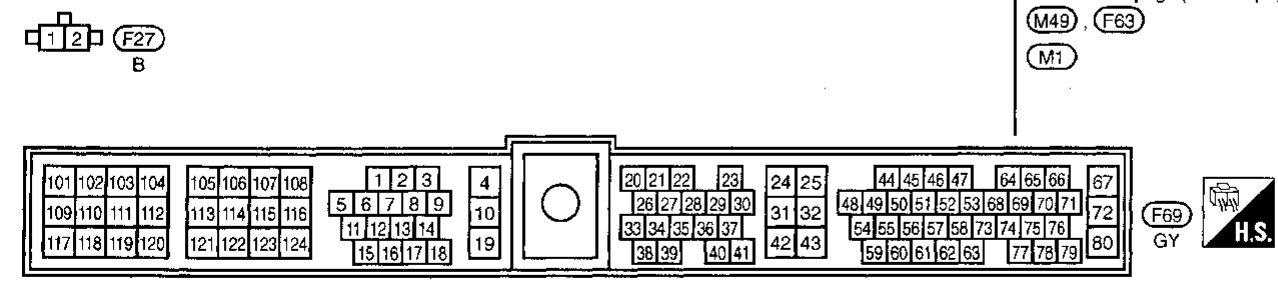
OR

1) Warm up engine sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Restart engine and wait at least 30 seconds.
4) Turn TCS switch "OFF".
5) Shift A/T selector lever to "D" position.
6) Gradually raise engine speed and keep it between 1,000 rpm and 1,500 rpm for at least 12 seconds.
7) Quickly raise engine speed to more than 2,500 rpm and keep it there for at least 6 seconds.
8) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
9) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Intake Valve Timing Control (Right bank) (Cont'd)

EC-IVC-R-01

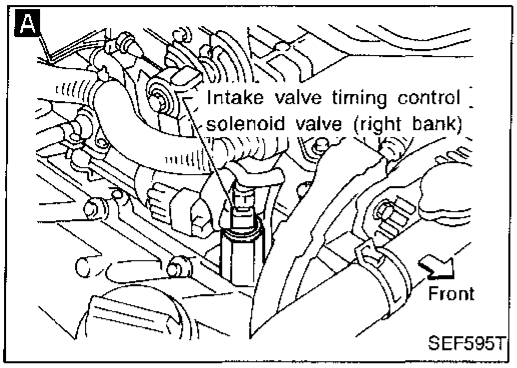


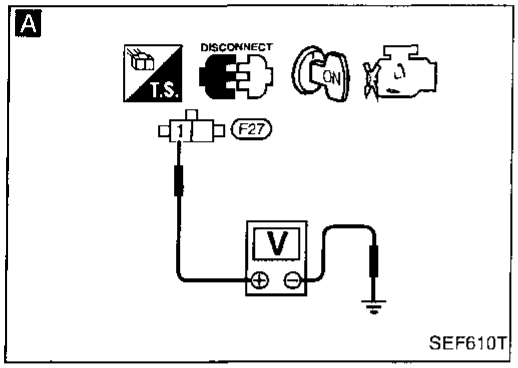


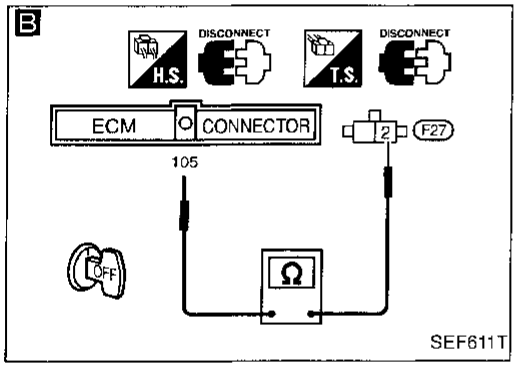
SEF452T

Intake Valve Timing Control (Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F63), (M49)
- 10A fuse
- Harness for open or short between the intake valve timing 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 (105) and solenoid valve terminal ②.
   Continuity should exist.
4. Check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK ENGINE OIL PRESSURE.
Refer to LC section ("Oil Pressure Check", "ENGINE LUBRICATION SYSTEM").

NG → Repair lubrication system.

OK ↓

CHECK INTAKE AIR SYSTEM.
Check intake air system for leaks.

NG → Repair intake air system.

OK ↓

CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR.
Refer to DTC P1145, EC-256.

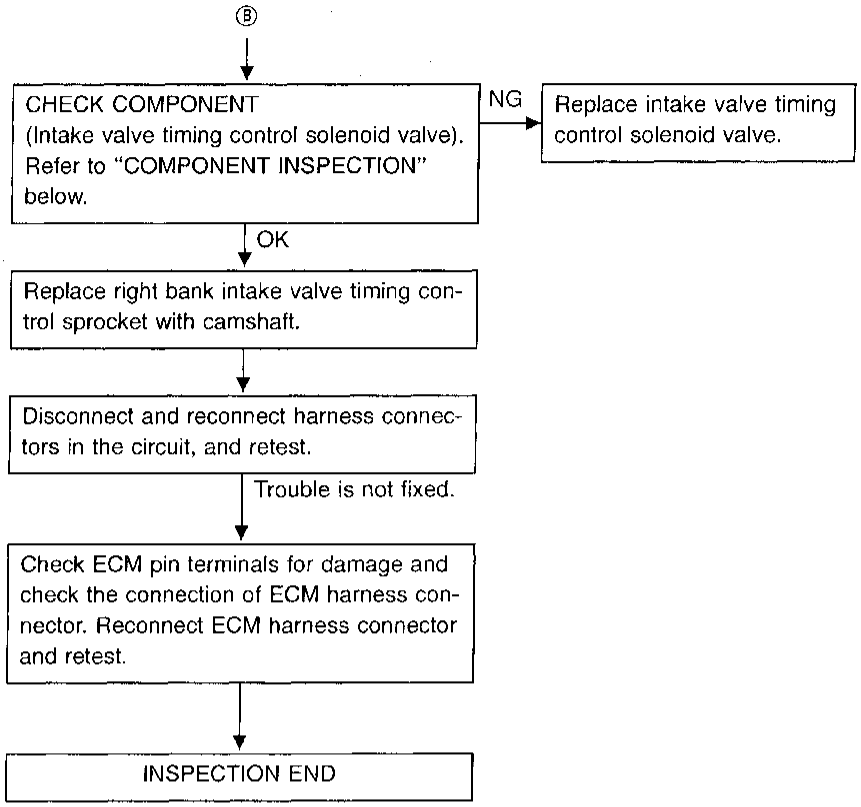
NG → Repair or replace.

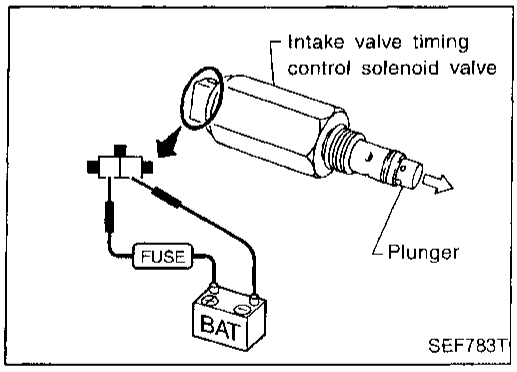
OK ↓

Ⓑ

(Go to next page.)

Intake Valve Timing Control (Right bank) (Cont'd)

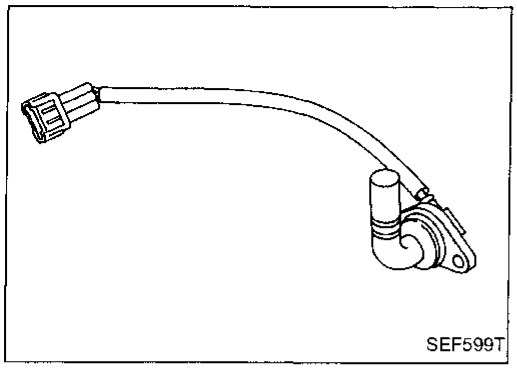




COMPONENT INSPECTION

Intake valve timing control solenoid valve

1. Supply intake valve timing control solenoid valve terminals with battery voltage.
2. Make sure that inside plunger protrudes.
   If NG, replace intake valve timing control solenoid valve.


SEF599T

Intake Valve Timing Control Position Sensor (Left bank)

COMPONENT DESCRIPTION

The intake valve timing control position sensor is located rearmost of the left-bank cylinder head. This sensor detects a signal (intake valve position) generated by the cutout portion of camshaft and sends it to the ECM (ECCS control module). This sensor is not used to control the engine system. It is used only for the on board diagnosis of intake valve timing control.

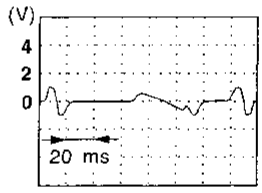
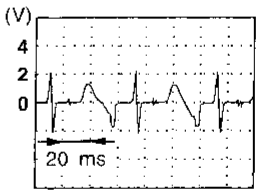
CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM-B1	• Engine is running. • Engine speed is more than 1,100 rpm. • Quickly depressed acceferator pedal • Vehicle speed is more than 4 km/h (2 MPH).	Intake valve timing control solenoid valve is "ON".	75 deg - 80 deg
		Intake valve timing control solenoid valve is "OFF".	95 deg - 100 deg

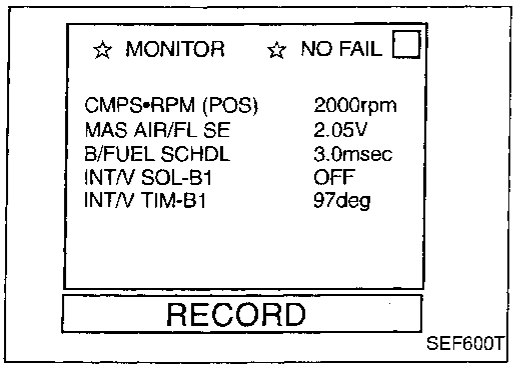
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
27	L/R	Intake valve timing control position sensor (left bank) (-B1)	Engine is running. └ Idle speed	Approximately 0V  SEF551T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0V  SEF552T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1140 1303	The proper pulse signal from the intake valve timing control position sensor (left bank) is not to send ECM while the engine is running at the specified engine speed.	• Harness or connectors (The left bank intake valve timing control position sensor circuit is open.) • Intake valve timing control position sensor • Accumulation of debris to the signal pick-up portion of the camshaft



Intake Valve Timing Control Position Sensor (Left bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.

OR

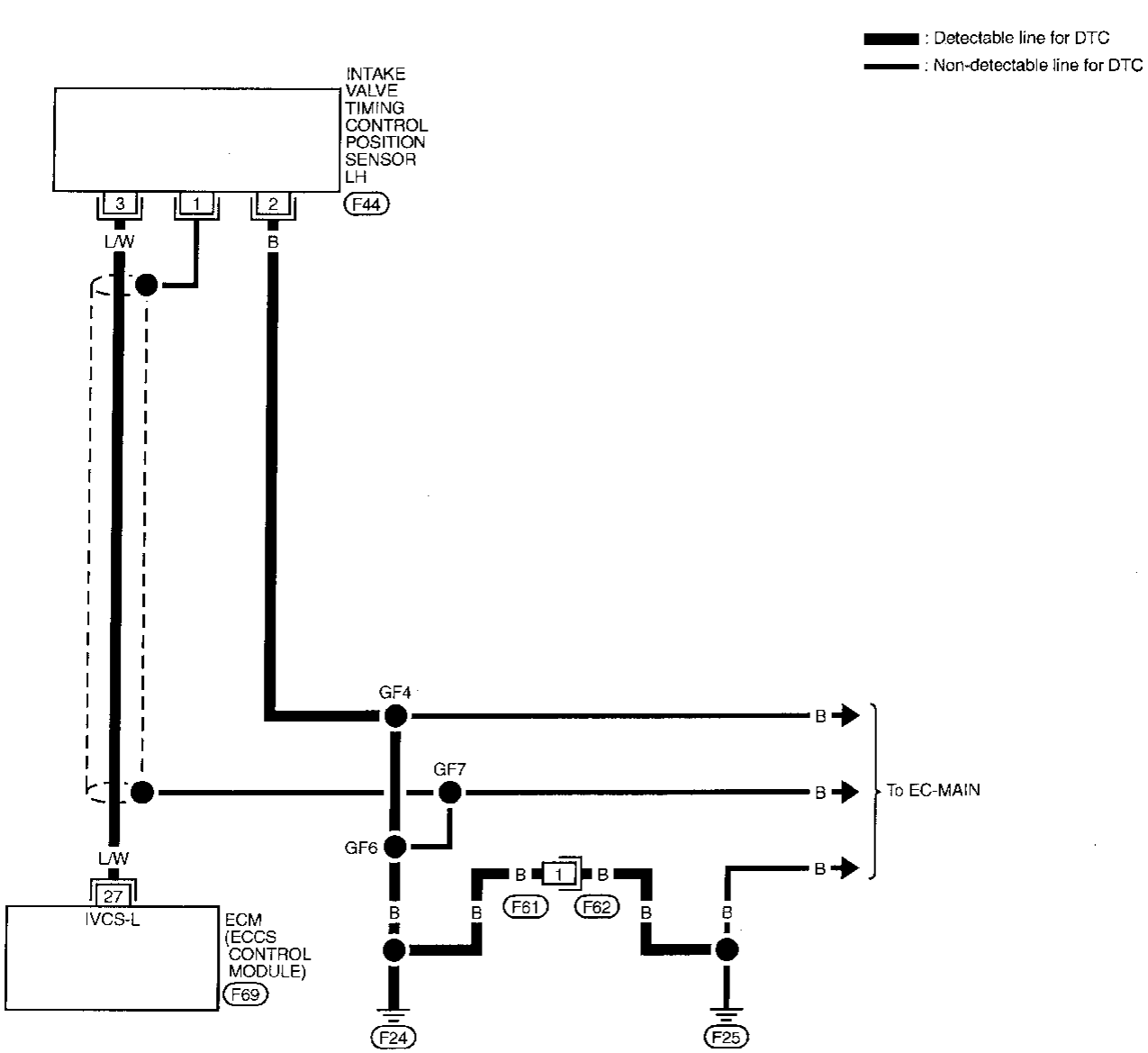
1) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.
2) Select "MODE 7" with GST.

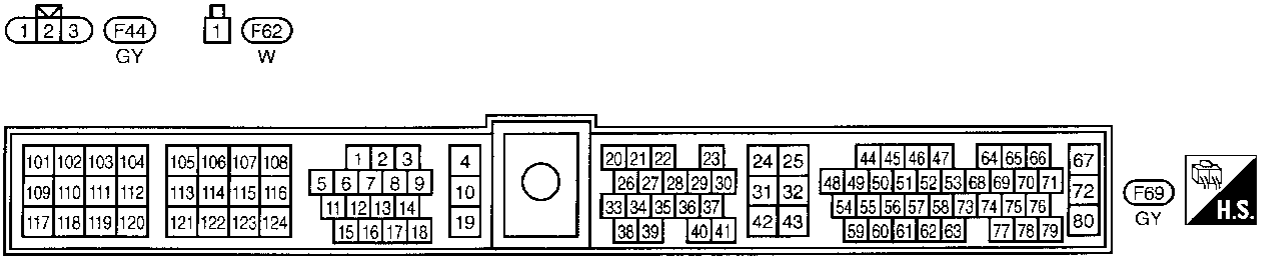
OR

1) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 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 Valve Timing Control Position Sensor (Left bank) (Cont'd)

EC-IVCS-L-01

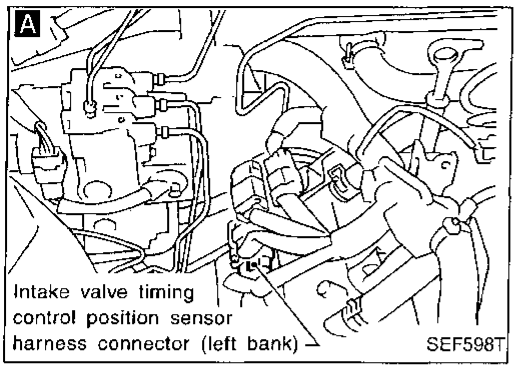


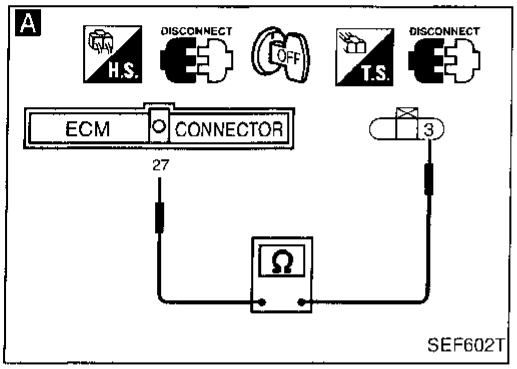


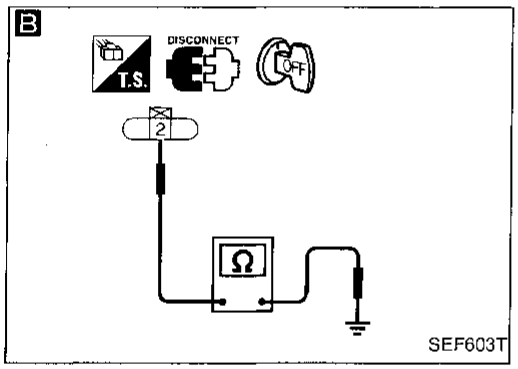
SEF907S

Intake Valve Timing Control Position Sensor (Left bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect intake valve timing control position sensor harness connector.
4. Check harness continuity between ECM terminal ㉗ and terminal ③ .
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- Harness connectors (F62) , (F61)

If NG, repair harness or connectors.

OK ↓

CHECK CAMSHAFT.
Check accumulation of debris to the signal pick-up portion of the camshaft. Refer to EM section ("Timing Chain").

NG → Remove debris and clean the signal pick-up cutout of camshaft.

OK ↓

Replace intake valve timing control position sensor.

↓

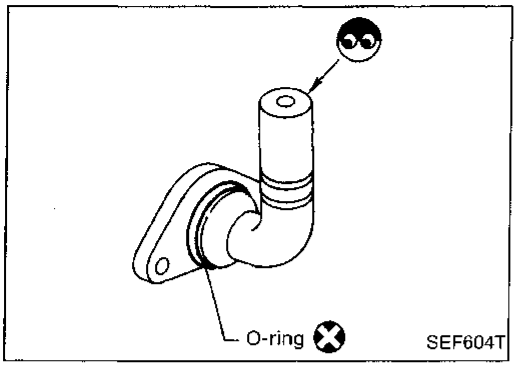
Disconnect and reconnect harness connectors in the circuit, and retest.

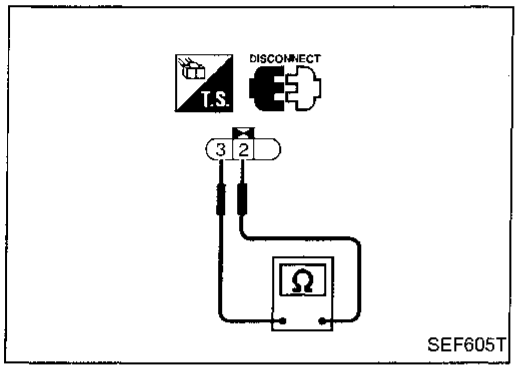
Trouble is not fixed. ↓

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

↓

INSPECTION END





Intake Valve Timing Control Position Sensor (Left bank) (Cont'd)

COMPONENT INSPECTION

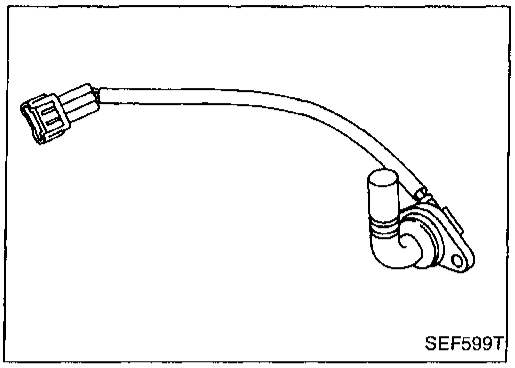
Intake valve timing control position sensor

1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen fixing bolt of the sensor.
3. Visually check the sensor for chipping.
4. Check resistance between terminals ② and ③.

Resistance:

730 - 890Ω [at 25°C (77°F)]

If NG, replace intake valve timing control position sensor.


SEF599T

Intake Valve Timing Control Position Sensor (Right bank)

COMPONENT DESCRIPTION

The intake valve timing control position sensor is located rearmost of the right-bank cylinder head. This sensor detects a signal (intake valve position) generated by the cutout portion of camshaft and sends it to the ECM (ECCS control module). This sensor is not used to control the engine system. It is used only for the on board diagnosis of intake valve timing control.

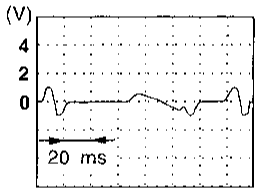
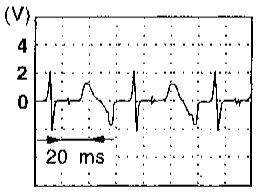
CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM-B2	• Engine is running. • Engine speed is more than 1,100 rpm. • Quickly depressed accelerator pedal • Vehicle speed is more than 4 km/h (2 MPH).	Intake valve timing control solenoid valve is "ON".	75 deg - 80 deg
		Intake valve timing control solenoid valve is "OFF".	95 deg - 100 deg

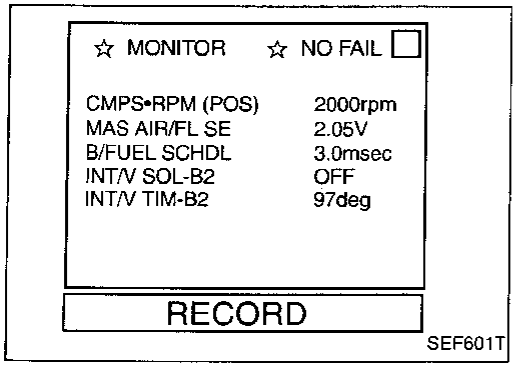
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
26	R/L	Intake valve timing control position sensor (right bank) (-B2)	Engine is running. └ Idle speed	Approximately 0V  SEF551T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0V  SEF552T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1145 1304	The proper pulse signal from the intake valve timing control position sensor (right bank) is not to send ECM while the engine is running at the specified engine speed.	• Harness or connectors (The right bank intake valve timing control position sensor circuit is open.) • Intake valve timing control position sensor • Accumulation of debris to the signal pick-up portion of the camshaft



Intake Valve Timing Control Position Sensor (Right bank) (Cont'd)

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.

OR

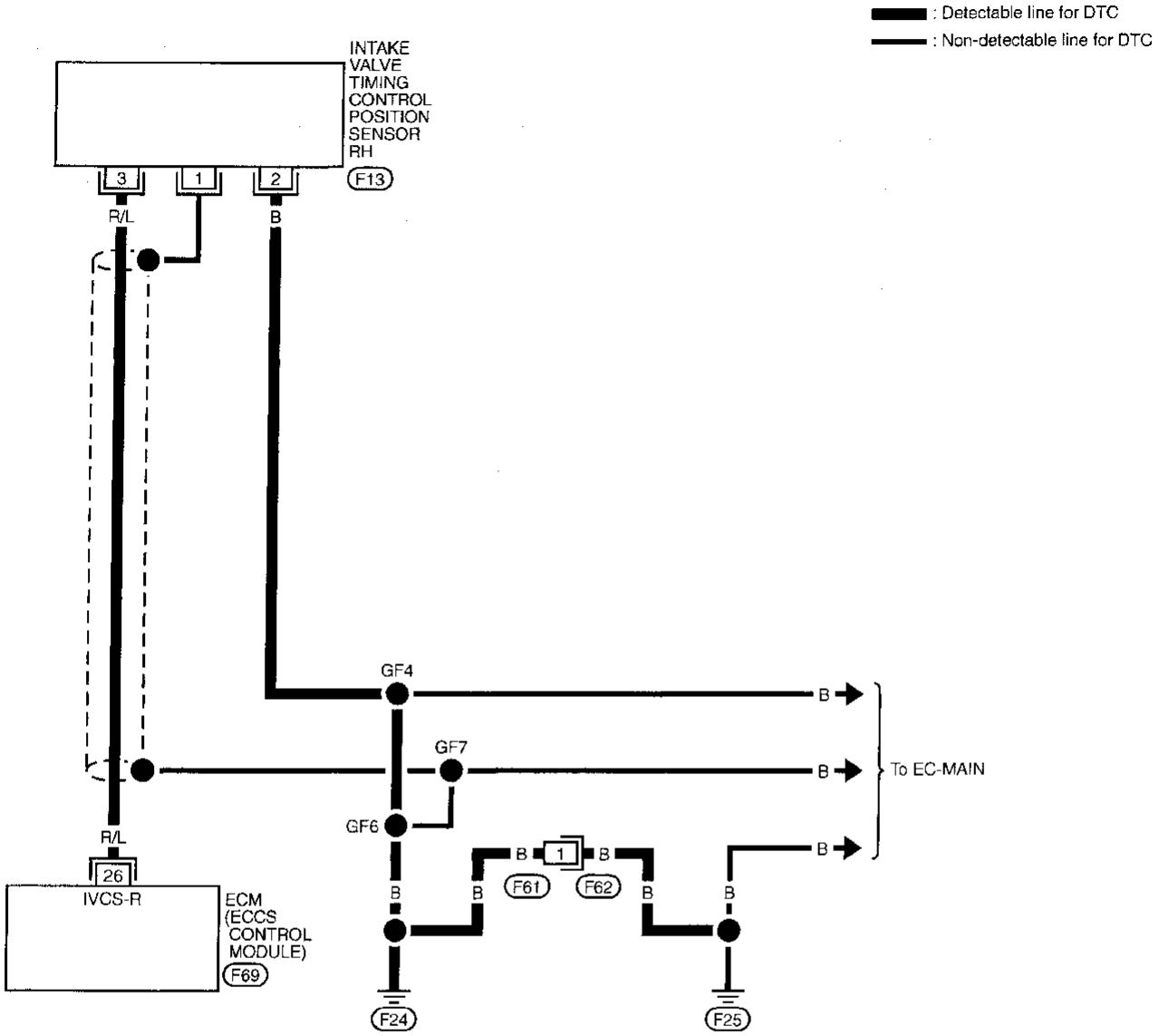
1) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 seconds.
2) Select "MODE 7" with GST.

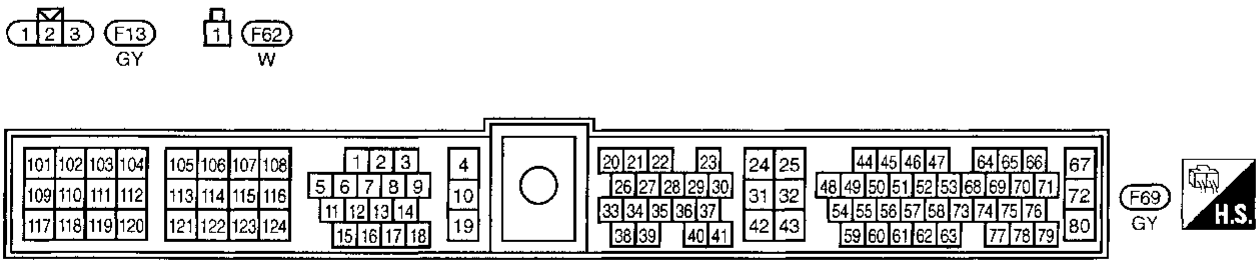
OR

1) Start engine and keep the engine speed at 2,000 rpm and wait at least 15 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 Valve Timing Control Position Sensor (Right bank) (Cont'd)

EC-IVCS-R-01

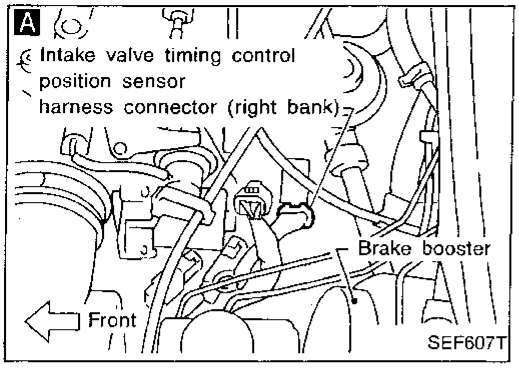


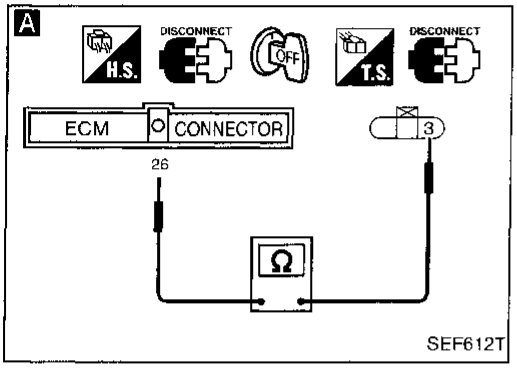


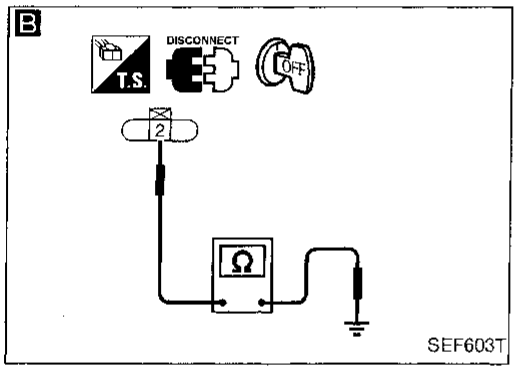
TEC225

Intake Valve Timing Control Position Sensor (Right bank) (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Disconnect intake valve timing control position sensor harness connector.
4. Check harness continuity between ECM terminal ㉖ and terminal ③.
   Continuity should exist.
   Check harness for short.

NG → Repair harness or connectors.

OK ↓

B

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

NG → Check the following.
- Harness connectors (F62), (F61)

If NG, repair harness or connectors.

OK ↓

CHECK CAMSHAFT.
Check accumulation of debris to the signal pick-up portion of the camshaft. Refer to EM section ("Timing Chain").

NG → Remove debris and clean the signal pick-up hole of camshaft.

OK ↓

Replace intake valve timing control position sensor.

↓

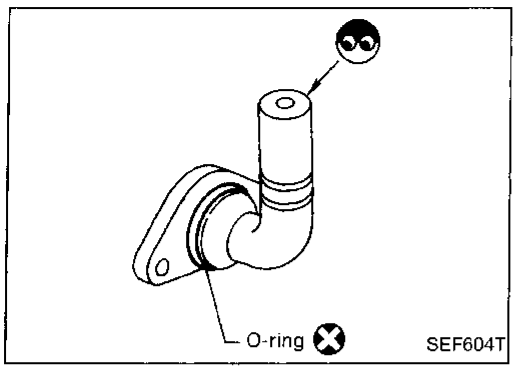
Disconnect and reconnect harness connectors in the circuit, and retest.

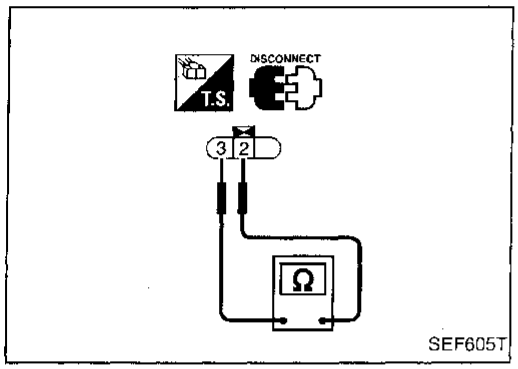
Trouble is not fixed. ↓

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

↓

INSPECTION END





Intake Valve Timing Control Position Sensor (Right bank) (Cont'd)

COMPONENT INSPECTION

Intake valve timing control position sensor

1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen fixing bolt of the sensor.
3. Visually check the sensor for chipping.
4. Check resistance between terminals ② and ③.

Resistance:

730 - 890Ω [at 25°C (77°F)]

If NG, replace intake valve timing control position sensor.

Traction Control System (TCS) Signal Circuit

The ECM uses this circuit line for checking the TCS operation. Voltage signals are sent and received between the ECM and the throttle actuator control module.

★ **Freeze frame data is not stored in the ECM for the TCS signal circuit. The MIL will not light for TCS signal circuit malfunction.**

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1210 0106	• An excessively low or high voltage from the throttle actuator control (TAC) module is sent to ECM.	• Harness or connectors (The circuit is open or shorted.) • Throttle actuator control (TAC) module

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

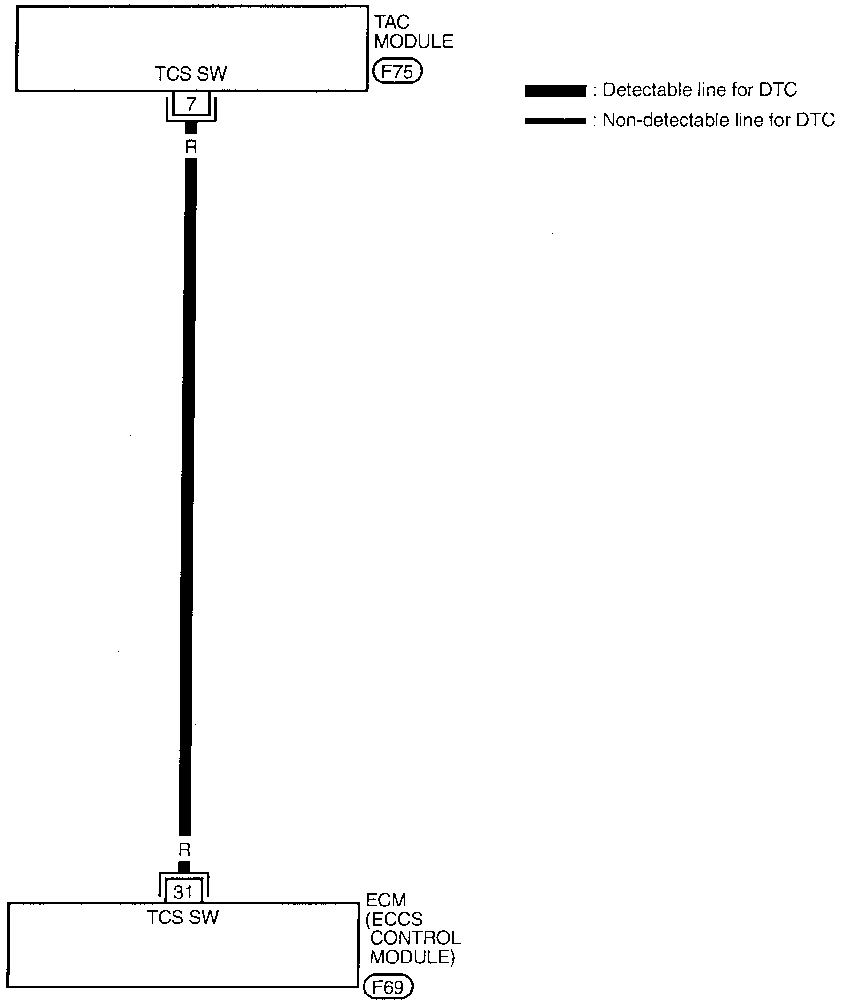
1) Turn ignition switch "ON" and TCS switch "ON", then start engine.
2) Select "DATA MONITOR" mode with CONSULT.
3) Run engine for at least 3 seconds.

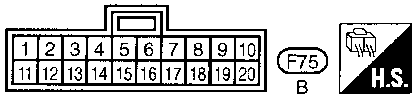
OR

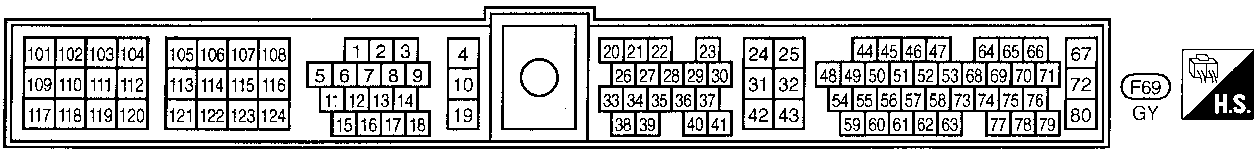
1) Turn ignition switch "ON" and TCS switch "ON", then start engine.
2) Run engine for at least 3 seconds at idle speed.
3) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
4) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

Traction Control System (TCS) Signal Circuit (Cont'd)

EC-TCS/SW-01



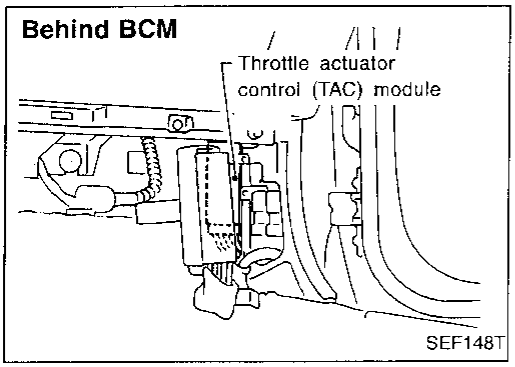


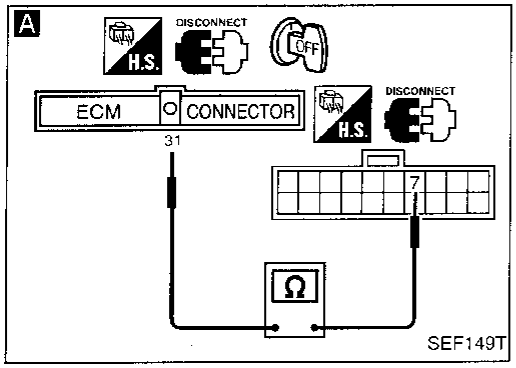


SEF891S

Traction Control System (TCS) Signal Circuit (Cont'd)

DIAGNOSTIC PROCEDURE





INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and TAC module harness connector.
3. ECM terminal ㉛ and TCS terminal ⑦.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK

CHECK COMPONENT
Check TAC module function.
Make sure that TAC module and circuit function properly. Refer to BR section ("Self-diagnosis for TAC module"), ("TROUBLE DIAGNOSIS FOR TCS").

NG → Replace throttle position switch.

OK

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

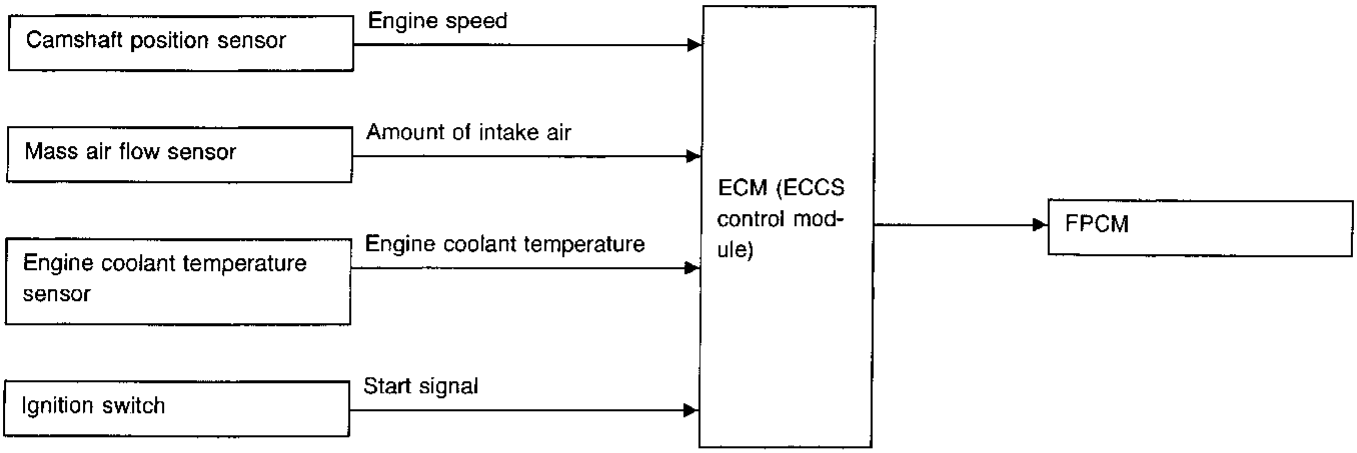
Trouble is not fixed.

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

INSPECTION END

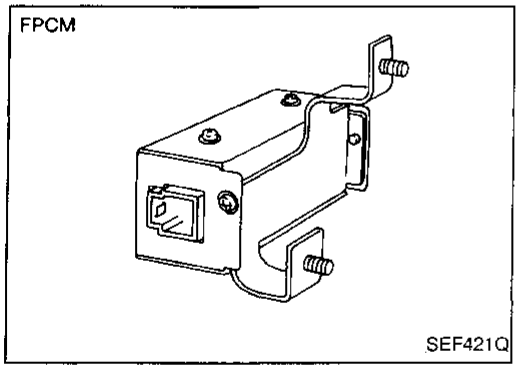
Fuel Pump Control Module (FPCM)

SYSTEM DESCRIPTION



This system controls the fuel pump operation. The amount of fuel flow delivered from the fuel pump is altered between two flow rates by the FPCM operation. The FPCM determines the voltage supplied to the fuel pump (and therefore fuel flow) according to the following conditions.

Conditions	Amount of fuel flow	Supplied voltage
• Engine cranking • Within 16 seconds after starting engine [above 100°C (212°F)] • Engine is running under heavy load and high speed conditions	high	Battery voltage (11 - 14V)
Except the above	low	Approximately 7V



COMPONENT DESCRIPTION

The FPCM adjusts the voltage supplied to the fuel pump to control the amount of fuel flow. When the FPCM increases the voltage supplied to the fuel pump, the fuel flow is increased. When the FPCM decreases the voltage, the fuel flow is decreased.

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FPCM	• Within 16 seconds after starting the engine, when engine coolant temperature is more than 100°C (212°F)	HIGH → LOW
FPCM F/P VOLT	• Within 16 seconds after starting the engine, when engine coolant temperature is more than 100°C (212°F)	Approx. 5.0V → Approx. 0.4V

Fuel Pump Control Module (FPCM) (Cont'd)

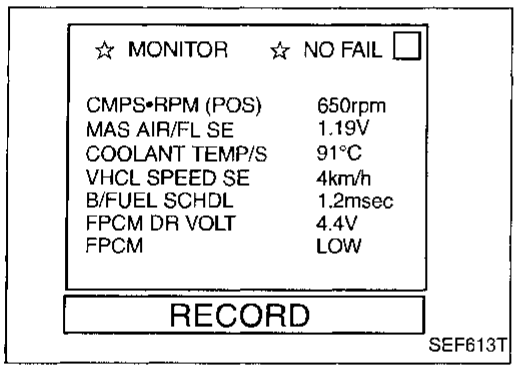
ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
15	R/L	Fuel pump control module	Engine is cranking.	Approximately 0.4V
			Engine is running. └ Idle speed	Approximately 10V
74	G/R	Fuel pump control module (FPCM) check	When cranking the engine	Approximately 0V
			After starting the engine	Approximately 5V

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1220 1305	• An improper voltage signal from the FPCM, which is supplied to a point between the fuel pump and the dropping resistor, is detected by ECM.	• Harness or connectors (FPCM circuit is open or shorted.) • Dropping resistor • FPCM



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

1) Lift up vehicle.
2) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
3) Start engine (TCS switch "OFF").
4) Shift A/T selector lever to "D" position.
5) Hold vehicle speed at 70 to 100 km/h (43 to 62 MPH) for 12 seconds.

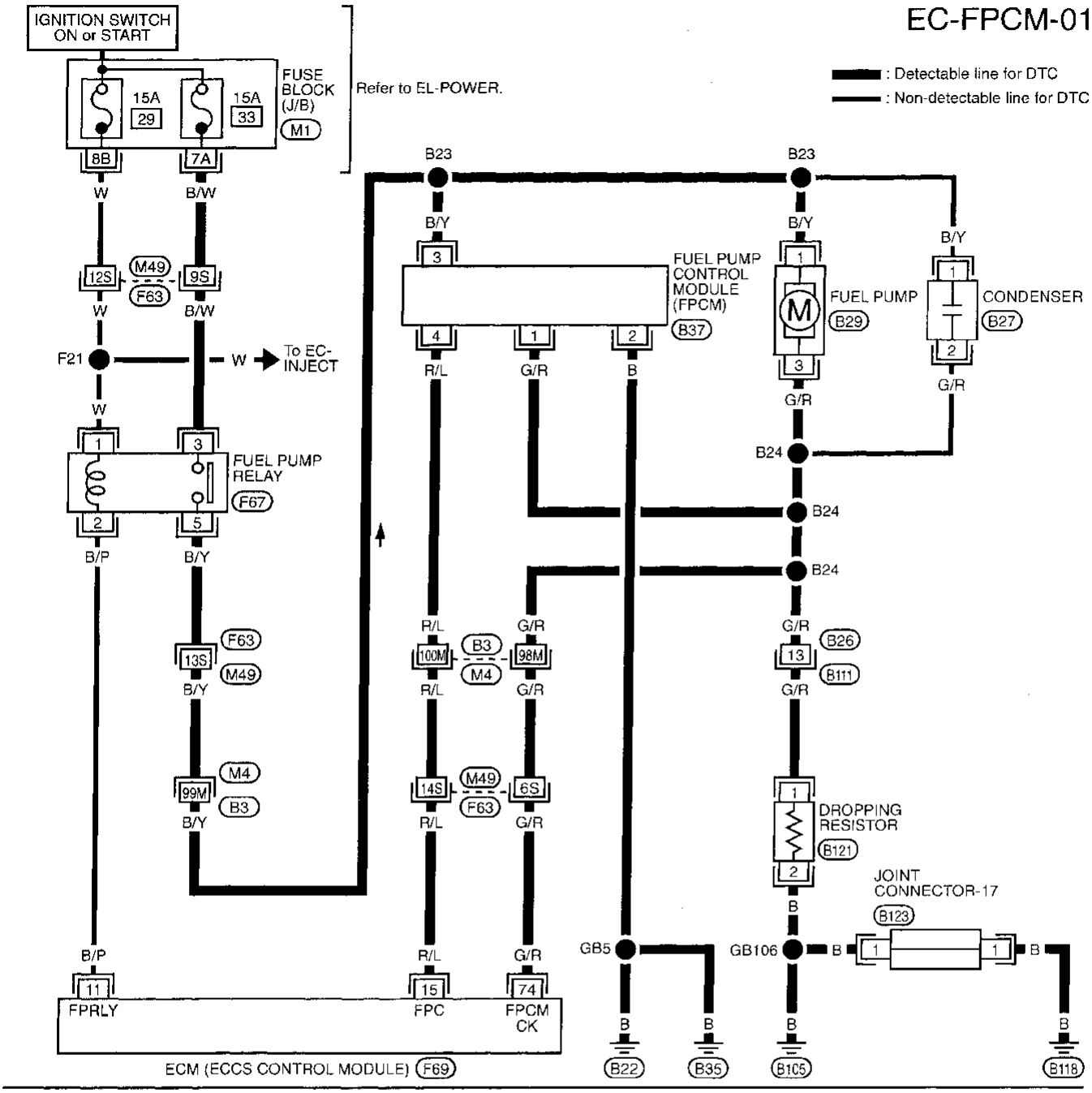
OR

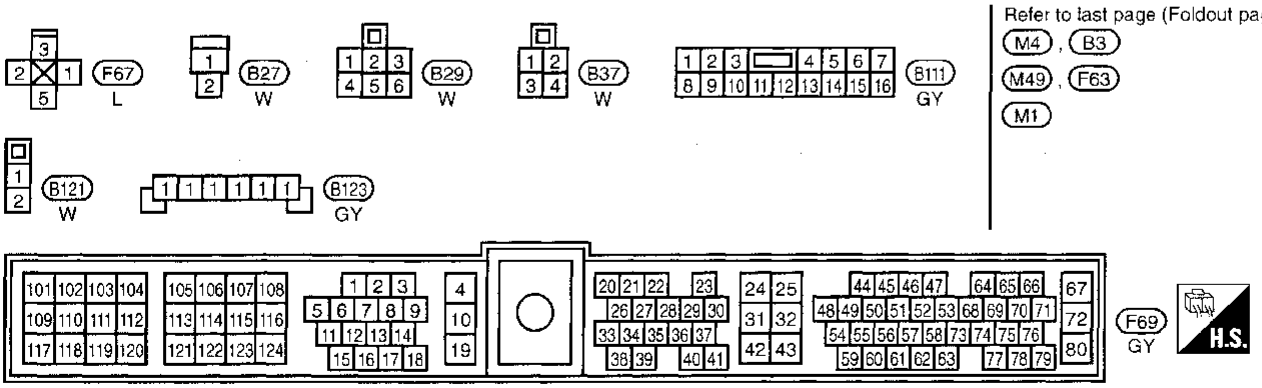
1) Lift up vehicle.
2) Start engine (TCS switch "OFF").
3) Shift A/T selector lever to "D" position.
4) Hold vehicle speed at 70 to 100 km/h (43 to 62 MPH) for 12 seconds.
5) Select "MODE 7" with GST.

OR

1) Lift up vehicle.
2) Start engine (TCS switch "OFF").
3) Shift A/T selector lever to "D" position.
4) Hold vehicle speed at 70 to 100 km/h (43 to 62 MPH) for 12 seconds.
5) Turn ignition switch "OFF", wait at least 5 seconds and then turn "ON".
6) Perform "Diagnostic Test Mode II (Self-diagnostic results)" with ECM.

EC-FPCM-01



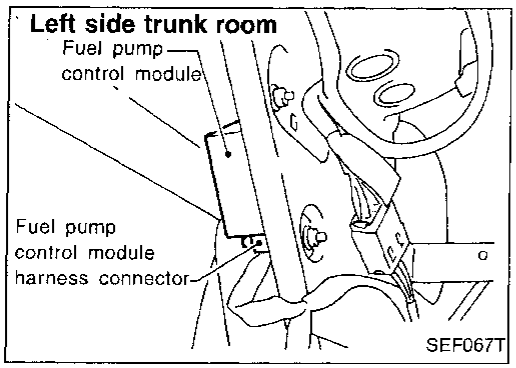


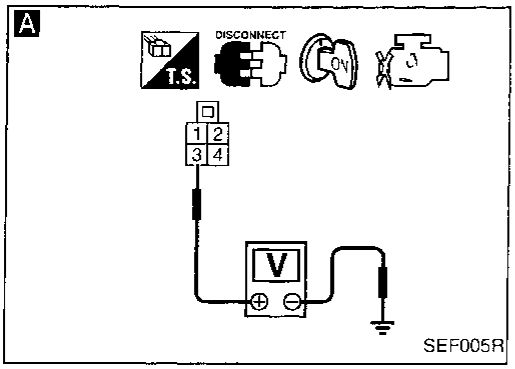
Refer to last page (Foldout page).
M4, B3
M49, F63
M1

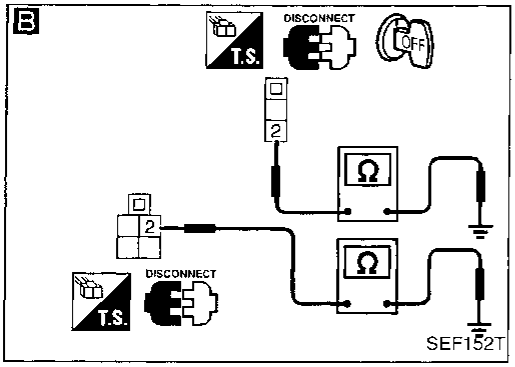
SEF892S

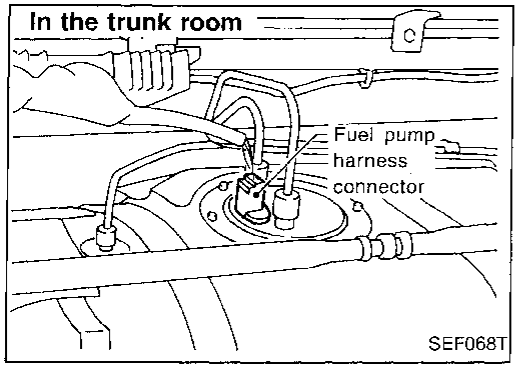
Fuel Pump Control Module (FPCM) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect FPCM 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 (F63), (M49)
- Harness for open or short between FPCM and fuel pump relay

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT-I.
1. Turn ignition switch "OFF".
2. Disconnect dropping resistor harness connector.
3. Check harness continuity between FPCM and dropping resistor terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connector (B123)

If NG, repair harness or connectors.

OK ↓

C

CHECK GROUND CIRCUIT-II.
1. Disconnect fuel pump harness connector.
2. Check harness continuity between fuel pump terminal ③ and dropping resistor terminal ①, resistor terminal ① and FPCM terminal ①.
   Continuity should exist.
3. Check harness continuity between FPCM terminal ① and engine ground, terminal ③ and engine ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑮ and terminal ④.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Harness for open or short between ECM and FPCM

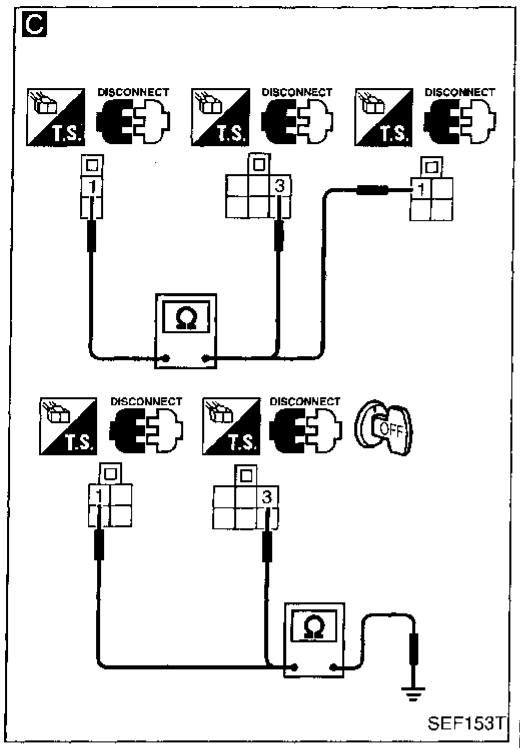
If NG, repair harness or connectors.

OK ↓

Ⓐ

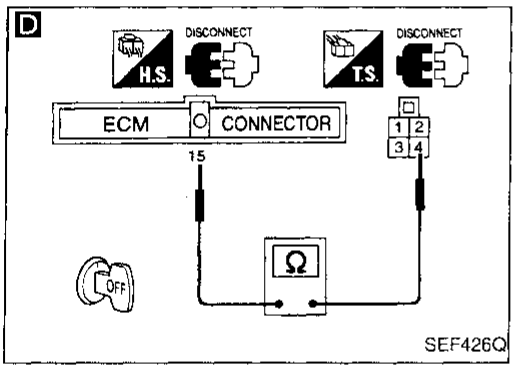
Fuel Pump Control Module (FPCM) (Cont'd)

C



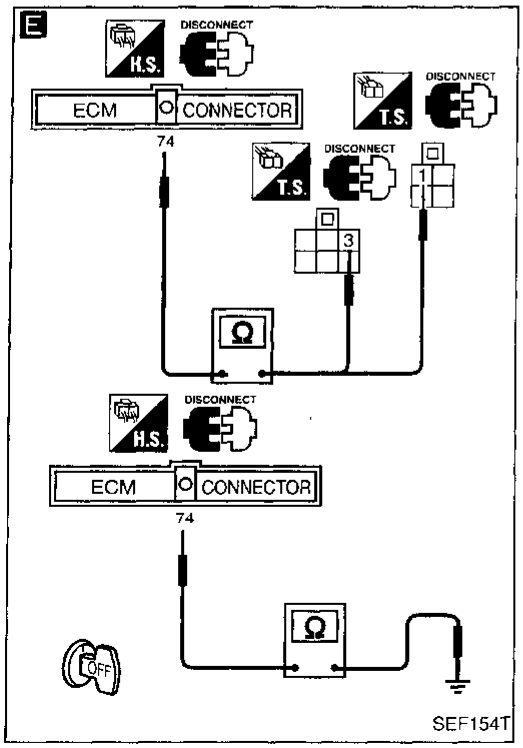
SEF153T

D



SEF426Q

E



SEF154T

Ⓐ

E

CHECK INPUT SIGNAL CIRCUIT.

1. Check harness continuity between ECM terminal ⑭ and terminal ① (or fuel pump terminal ③).
   Continuity should exist.
2. Check harness continuity between ECM terminal ⑭ and engine ground.
   Continuity should not exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F63) , (M49)
- Harness connectors (M4) , (B3)
- Harness for open or short between ECM and FPCM (or fuel pump)

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT (Dropping resistor).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace dropping resistor.

OK ↓

CHECK COMPONENT (FPCM).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace FPCM.

OK ↓

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

Trouble is not fixed. ↓

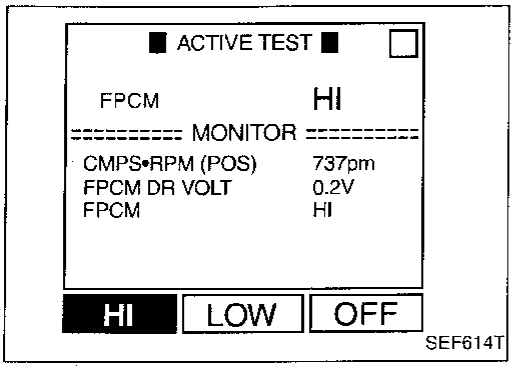
Check ECM pin terminals for damage and check the connection of ECM harness connector. Reconnect ECM harness connector and retest.

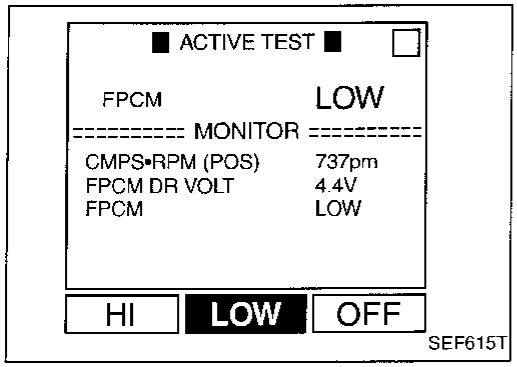
↓

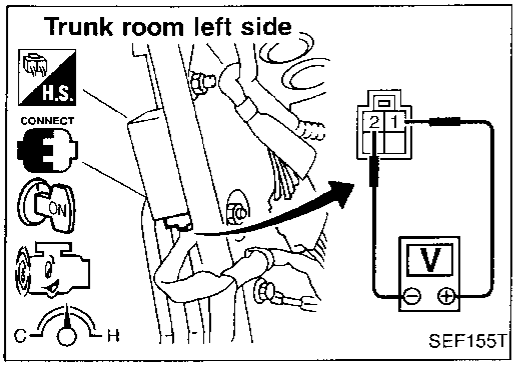
INSPECTION END

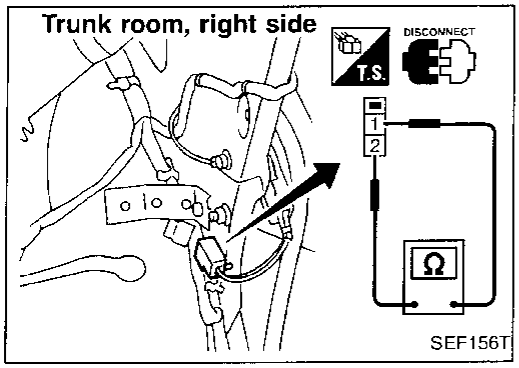
Fuel Pump Control Module (FPCM) (Cont'd)

COMPONENT INSPECTION









FPCM

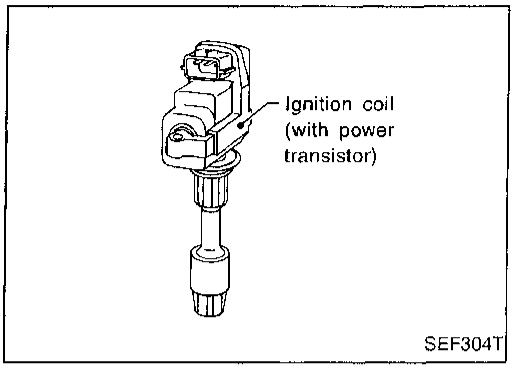
1. Start engine and let it idle.
2. Perform "FPCM" in "ACTIVE TEST" mode with CONSULT.
3. Check the following.
   - When selecting "HI", "FPCM DR VOLT" indicates approximately 0V.
   - When selecting "LOW", "FPCM DR VOLT" indicates approximately 4.4V.
4. If NG, replace FPCM.

OR

1. Start engine and warm it up sufficiently.
2. Turn ignition switch "OFF" and wait at least 5 seconds.
3. Start engine and let it idle.
4. Check voltage between terminals ① and ② .
   Within 30 seconds of starting engine:
   Approximately 0V
   More than 30 seconds after starting engine:
   Approximately 4.4V
5. If NG, replace FPCM.

Dropping resistor

Check resistance between terminals ① and ② .
Resistance: Approximately 0.8Ω at 25°C (77°F)



Ignition Signal

COMPONENT DESCRIPTION

Ignition coil & power transistor

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns on and off the ignition coil primary circuit. This on-off operation induces the proper high voltage in the coil secondary circuit.

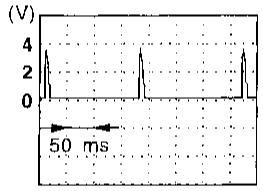
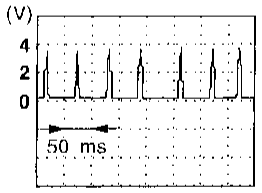
CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

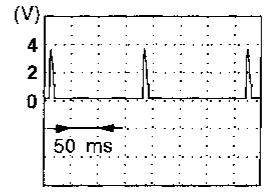
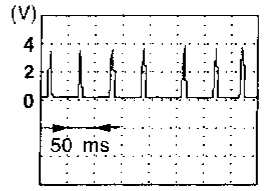
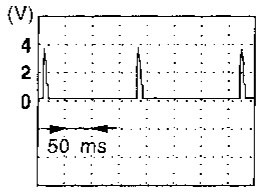
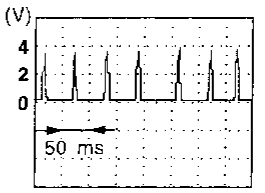
MONITOR ITEM	CONDITION		SPECIFICATION
IGN TIMING	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	15° BTDC
		2,000 rpm	More than 25° BTDC

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
1	Y/R	Ignition signal (No. 1)	Engine is running. └ Idle speed	Approximately 0.38V  SEF538T
2	G/R	Ignition signal (No. 8)		
3	L/R	Ignition signal (No. 7)	Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.55V  SEF539T

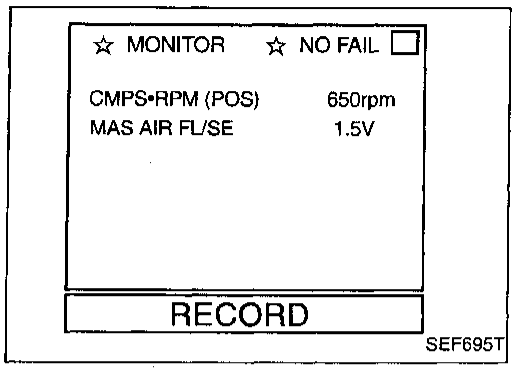
Ignition Signal (Cont'd)

TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
7 8 9	GY PU/W GY/R	Ignition signal (No. 3) Ignition signal (No. 6) Ignition signal (No. 5)	Engine is running. └ Idle speed	Approximately 0.38V  SEF538T
			Engine is running. └ Engine speed is 2,000 rpm	Approximately 0.55V  SEF539T
13 14	W/R R/L	Ignition signal (No. 4) Ignition signal (No. 2)	Engine is running. └ Idle speed	Approximately 0.38V  SEF538T
			Engine is running. └ Engine speed is 2,000 rpm.	Approximately 0.55V  SEF539T

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 during engine cranking or running.	• Harness or connectors (The ignition primary circuit is open or shorted.) • Power transistor unit built into ignition coil • Camshaft position sensor • Camshaft position sensor circuit

Ignition Signal (Cont'd)



DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

Note: If both DTC P1320 (0201) and DTC P0340 (0101), P0335 (0802) or P1336 (0905) are displayed, perform TROUBLE DIAGNOSIS FOR DTC P0340, P0335 or P1336 first. (See EC-192, 197 or 278.)

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.)

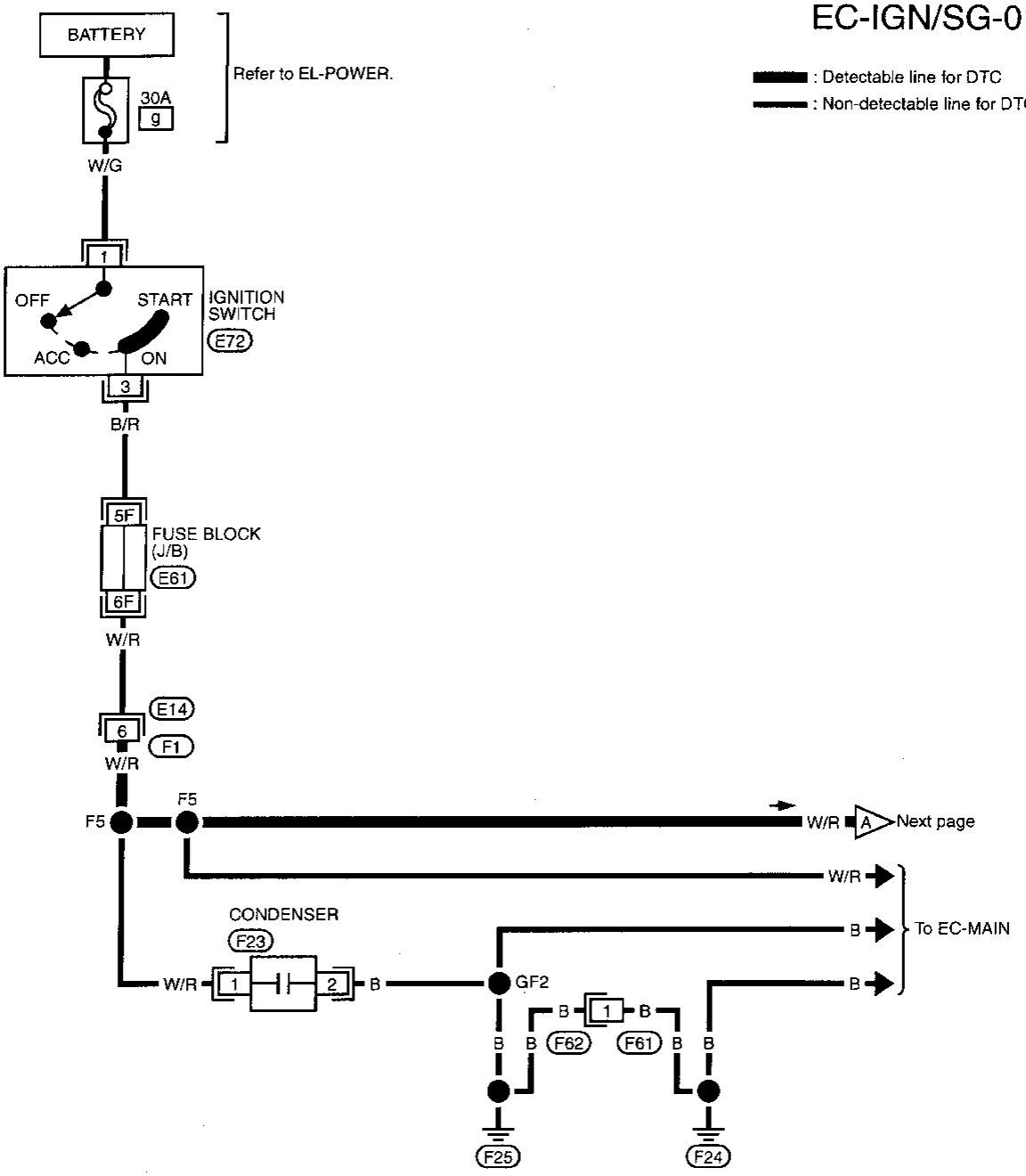
OR

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.

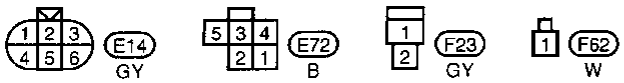
OR

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

EC-IGN/SG-01



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

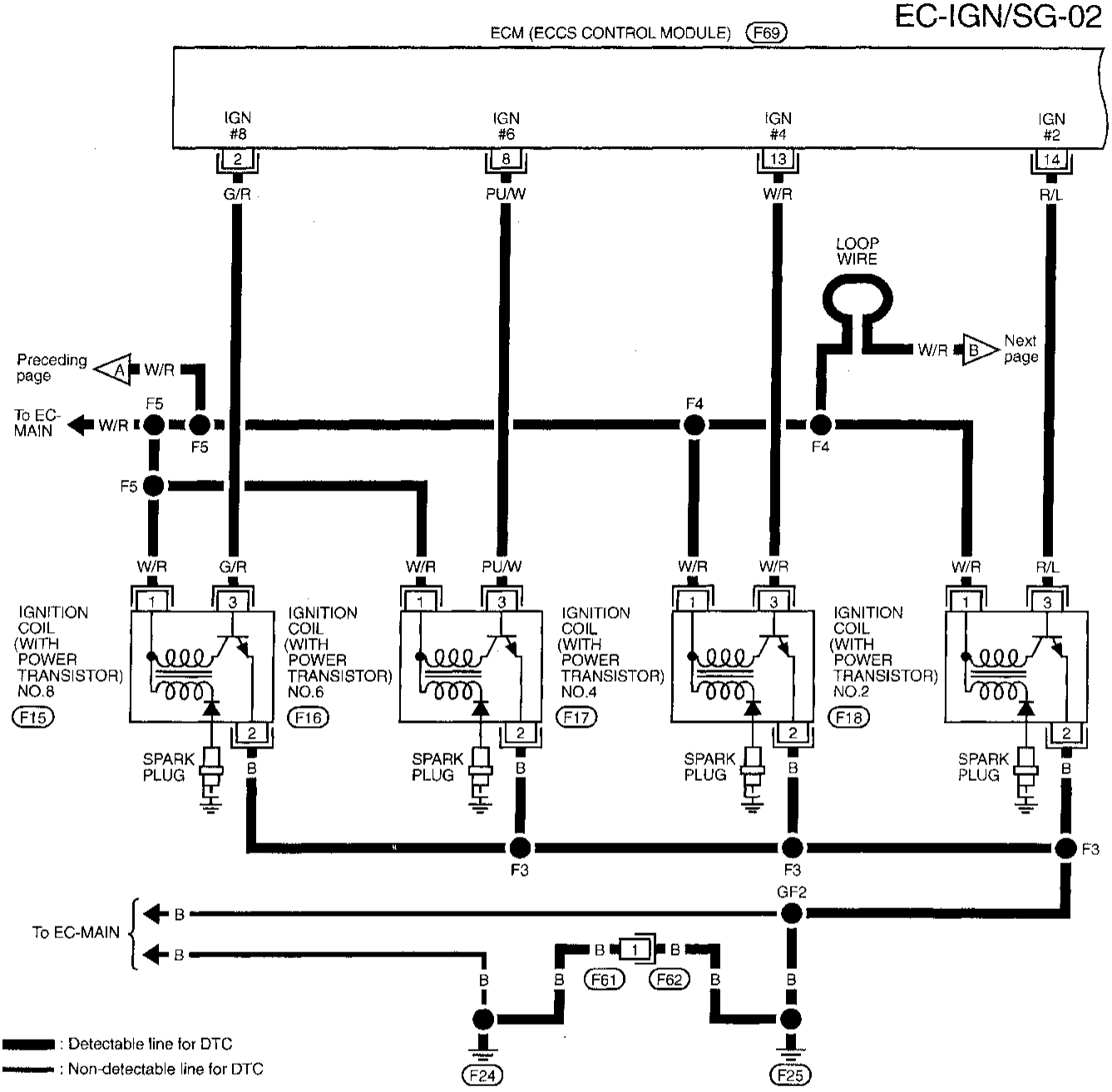


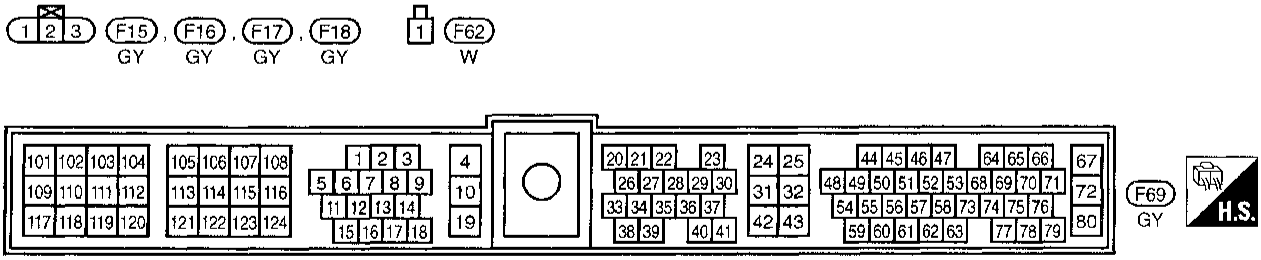
Refer to last page (Foldout page).
E61

SEF893S

Ignition Signal (Cont'd)

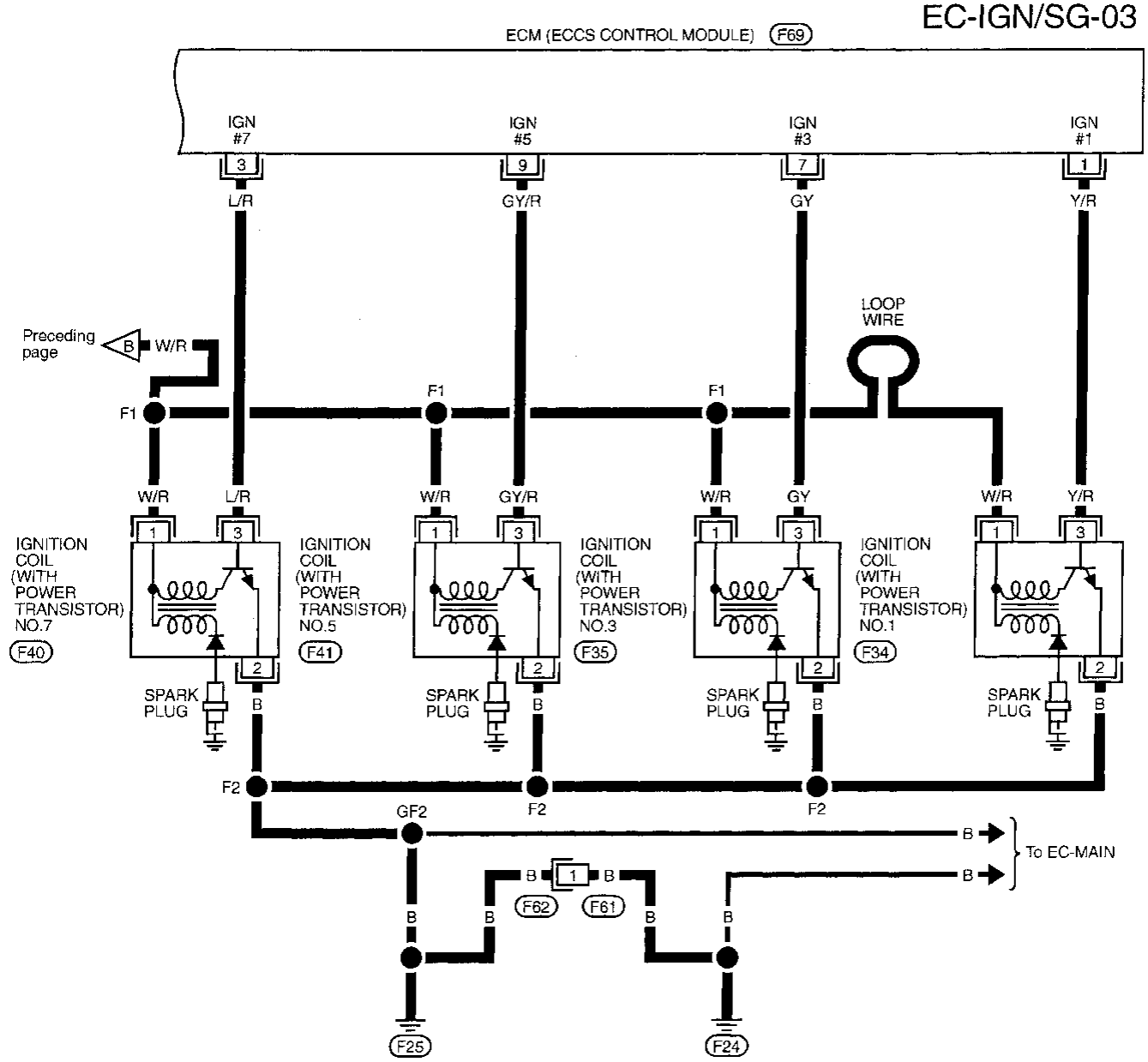
EC-IGN/SG-02

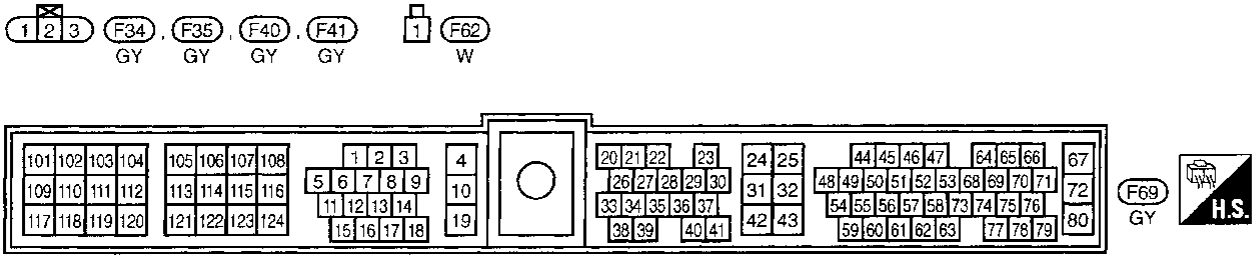




SEF894S

EC-IGN/SG-03

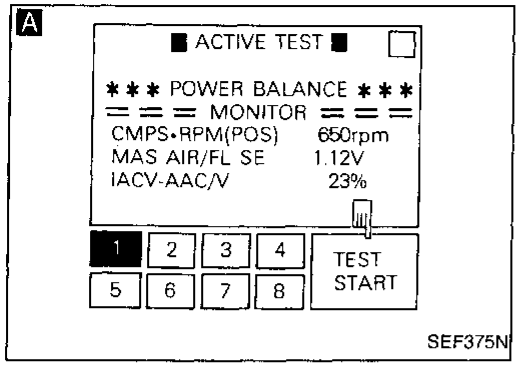


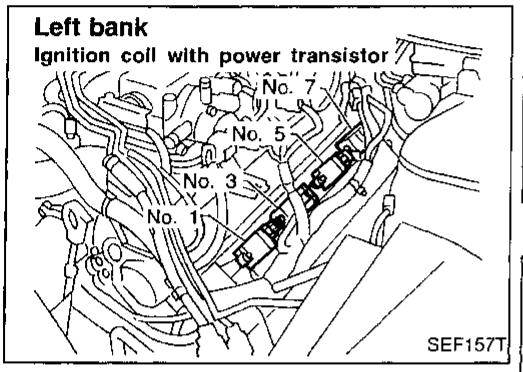


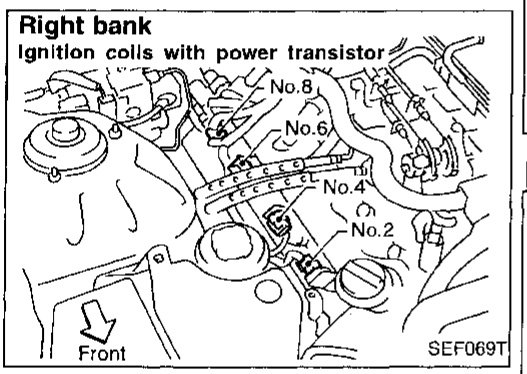
SEF895S

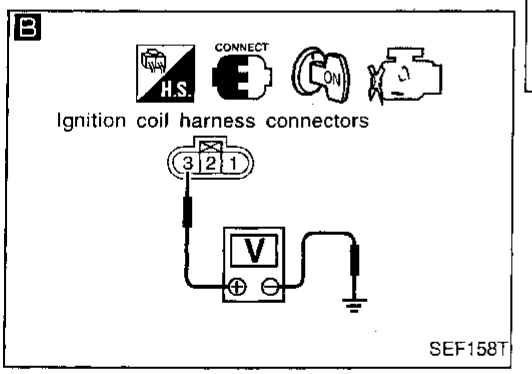
Ignition Signal (Cont'd)

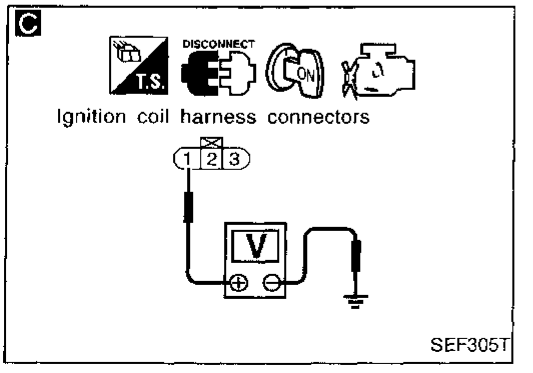
DIAGNOSTIC PROCEDURE











INSPECTION START

Does engine start?

No → B

Yes (without) → B

Yes (with) → A

A

SEARCH FOR MALFUNCTIONING CIRCUIT-1.
1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Search for circuit which does not produce a momentary engine speed drop.

B

SEARCH FOR MALFUNCTIONING CIRCUIT-2.
1. Turn ignition switch "ON".
2. Check voltage between ignition coil terminal ③ and ground.
   Voltage:
   Approx. 0.38V at DC range (Actual signal can be measured by oscilloscope.)

C

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

NG →
Check the following.
- Harness connectors (F1), (E14)
- Fuse block
- Harness for open or short between ignition switch and ignition coils

If NG, repair harness, connectors or component.

OK ↓

D

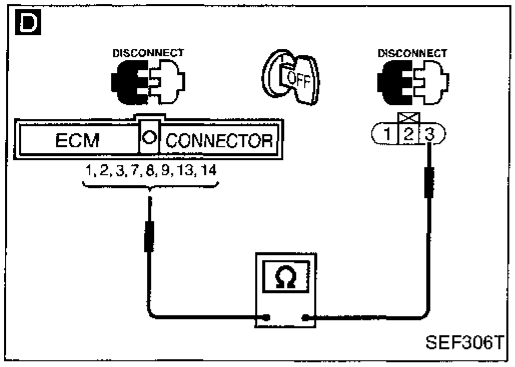
CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect each ignition coil harness connector and ECM harness connector.
3. Check harness continuity between each ignition coil harness connector terminal ③ and each ECM harness connector terminal.
   Continuity should exist.
   If OK,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

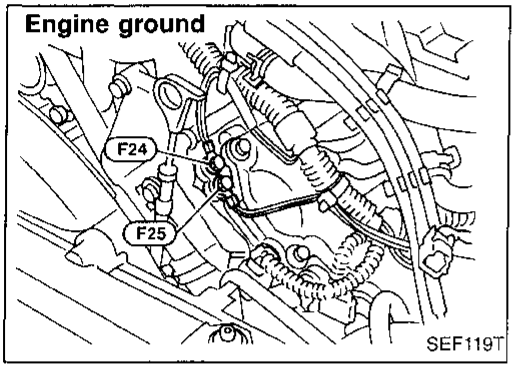
NG → Repair harness or connectors.

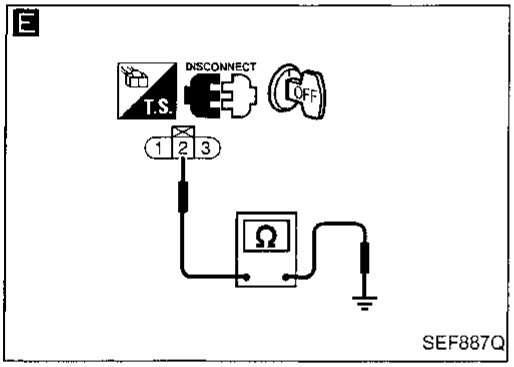
OK ↓

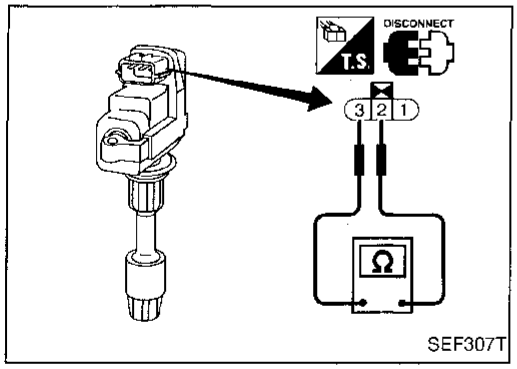
Ⓐ

Ignition Signal (Cont'd)









Ⓐ

E

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

NG → Check the following.
- Harness connectors (F61), (F62)
- Check for open or short between ignition coil and engine ground

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Ignition coil with power transistor).
Refer to "COMPONENT INSPECTION" below.

NG → Replace ignition coil assembly.

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

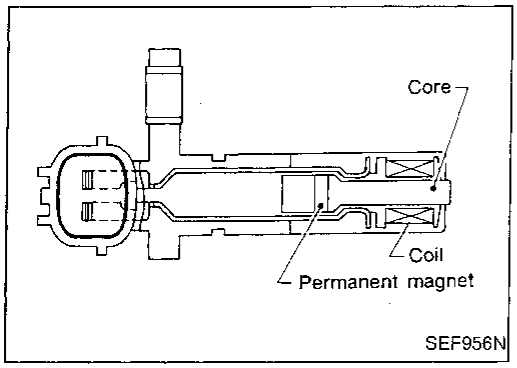
COMPONENT INSPECTION

Ignition coil with power transistor

1. Disconnect ignition coil with power transistor harness connector.
2. Check ignition coil with power transistor for resistance between terminals ③ and ② .

Terminals	Resistance	Result
③ and ②	Not 0Ω	OK
	0Ω	NG

If NG, replace ignition coil with power transistor assembly.



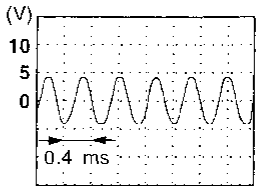
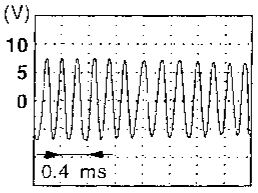
Crankshaft Position Sensor (CKPS) (OBD) (COG)

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 directly used to control the engine system. It is used only for the on board diagnosis of misfire.

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
47	B/R	Crankshaft position sensor (OBD)	Engine is running. (Warm-up condition) └ Idle speed	Approximately 1.7V  SEF545T
			Engine is running. (Warm-up condition) └ Engine speed is 2,000 rpm.	Approximately 0V  SEF546T

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1336 0905	• Chipping of the signal plate (on drive plate) gear teeth (cogs) is detected by the ECM.	• Harness or connectors • Crankshaft position sensor (POS) • Signal plate (drive plate) • Dead (Weak) battery

Crankshaft Position Sensor (CKPS) (OBD) (COG) (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 3 minutes at idle speed.

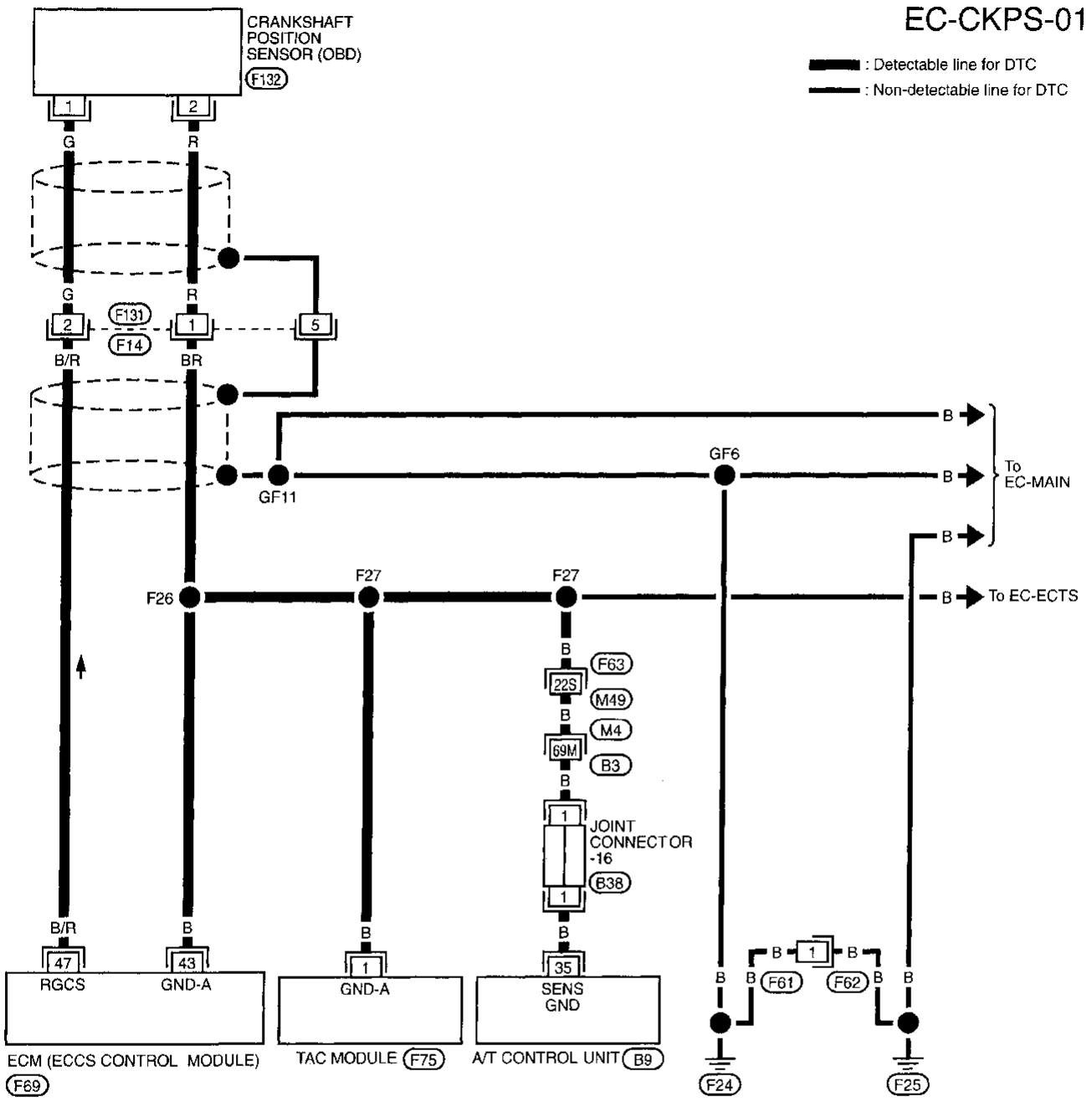
OR

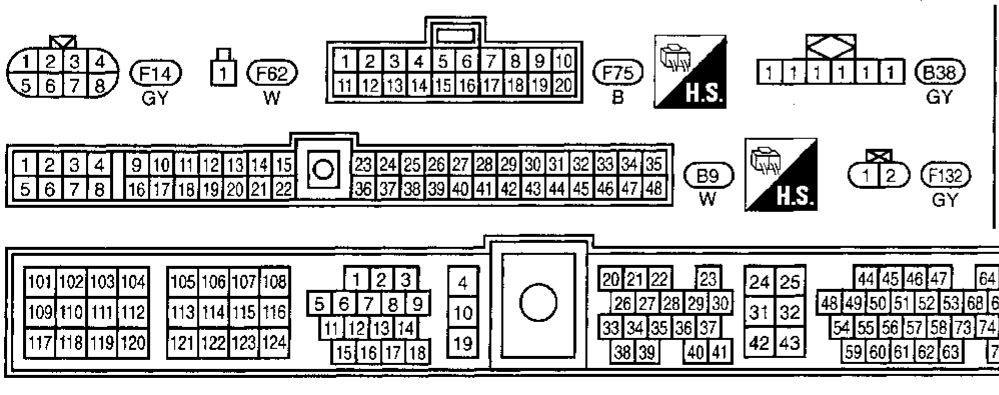
1) Start engine and run it for at least 3 minutes at idle speed.
2) Select "MODE 7" with GST.

OR

1) Start engine and run it for at least 3 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)



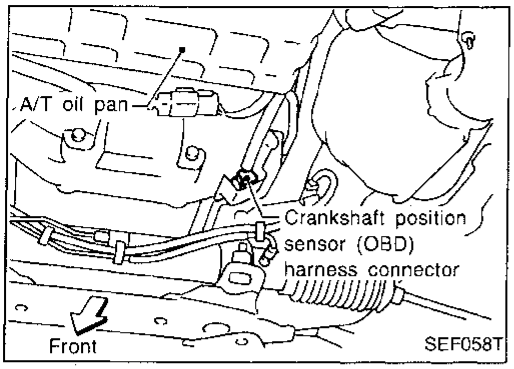


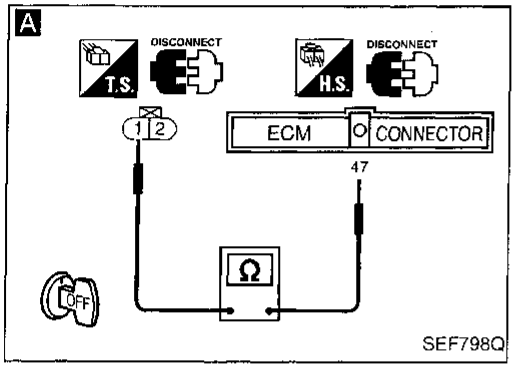
Refer to last page (Foldout page).
M4, B3
M49, F63

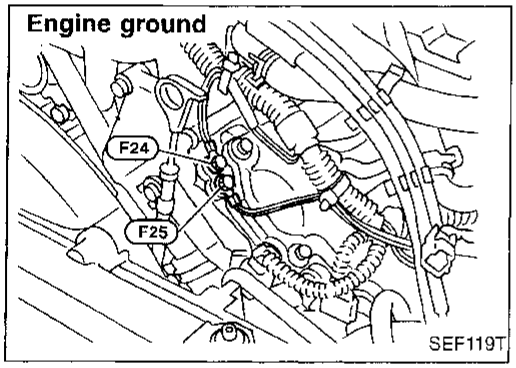
SEF883S

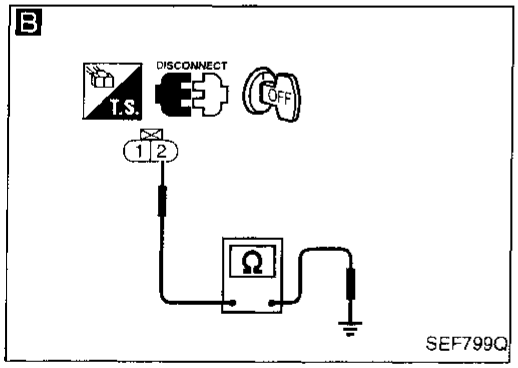
Crankshaft Position Sensor (CKPS) (OBD) (COG) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect crankshaft position sensor (OBD) harness connector and ECM harness connector.
3. Check continuity between sensor terminal ① and ECM terminal ㊼ with CONSULT or tester.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (F14), (F131)
- Harness for open or short between crankshaft position sensor (OBD) and ECM

If NG, repair harness or connectors.

OK ↓

B

CHECK GROUND CIRCUIT.
1. Loosen or retighten engine ground screws.
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 (F14), (F131)
- Harness connectors (F63), (M69)
- Harness connectors (M4), (B3)
- Joint connector-16
- Harness for open or short between crankshaft position sensor (OBD) harness connector and ECM
- Harness for open or short between crankshaft position sensor (OBD) and throttle actuator control (TAC) module
- Harness for open or short between crankshaft position sensor and A/T control unit

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).

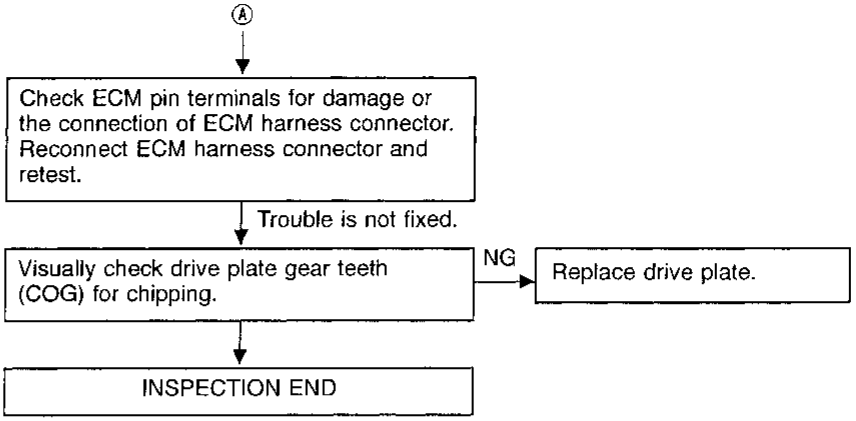
OK ↓

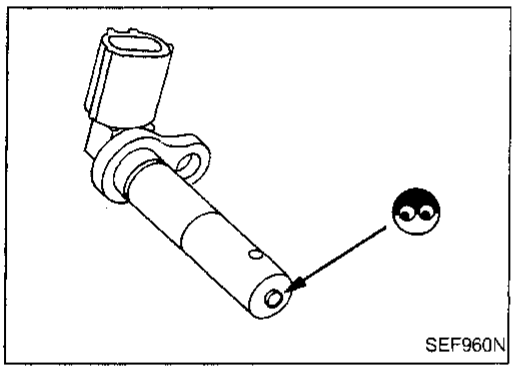
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

Ⓐ

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

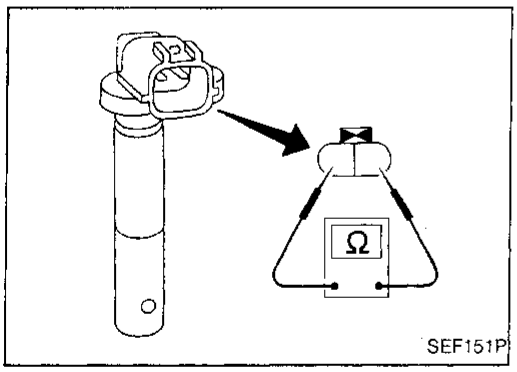




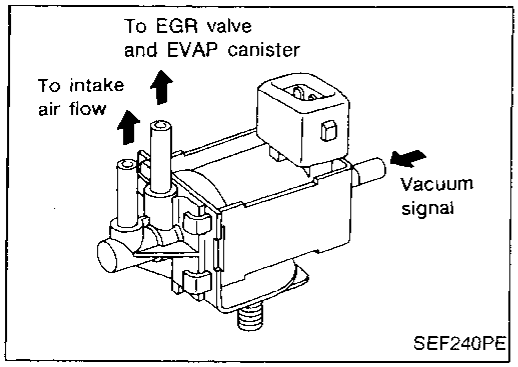
COMPONENT INSPECTION

Crankshaft position sensor (OBD)

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



5. Check resistance as shown in the figure.
   Resistance:
   166.5 - 203.5Ω [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.)
When the ECM sends an OFF signal, the vacuum signal passes through the solenoid valve. The signal then reaches the EVAP canister and the EGR valve.

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
EGRC SOL/V	• Engine: After warming up • Air conditioner switch: "OFF" • Shift lever: "N" • No-load	Idle	ON
		Racing up to 1,500 - 2,000 rpm	OFF

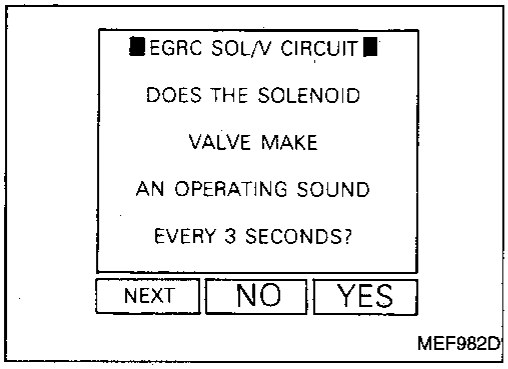
ECM terminals and reference value

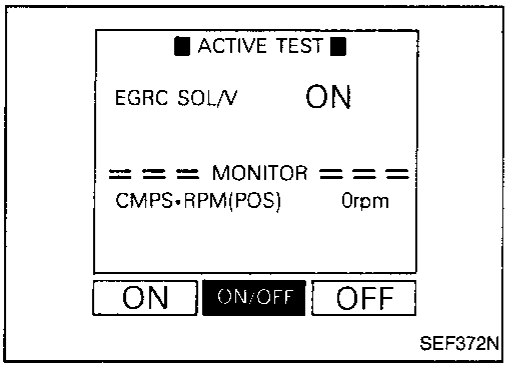
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

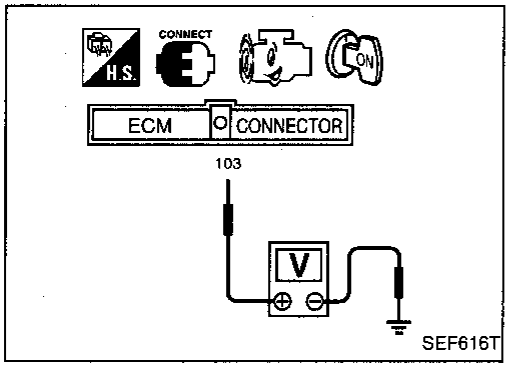
TER-MINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
103	L/Y	EGR valve & EVAP canister purge control solenoid valve	Engine is running. (Warm-up condition) └ Jack up rear wheels and run engine at 2,000 rpm in "1st" position.	BATTERY VOLTAGE (11 - 14V)
			Engine is running. (Warm-up condition) └ Idle speed	0 - 0.7V

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

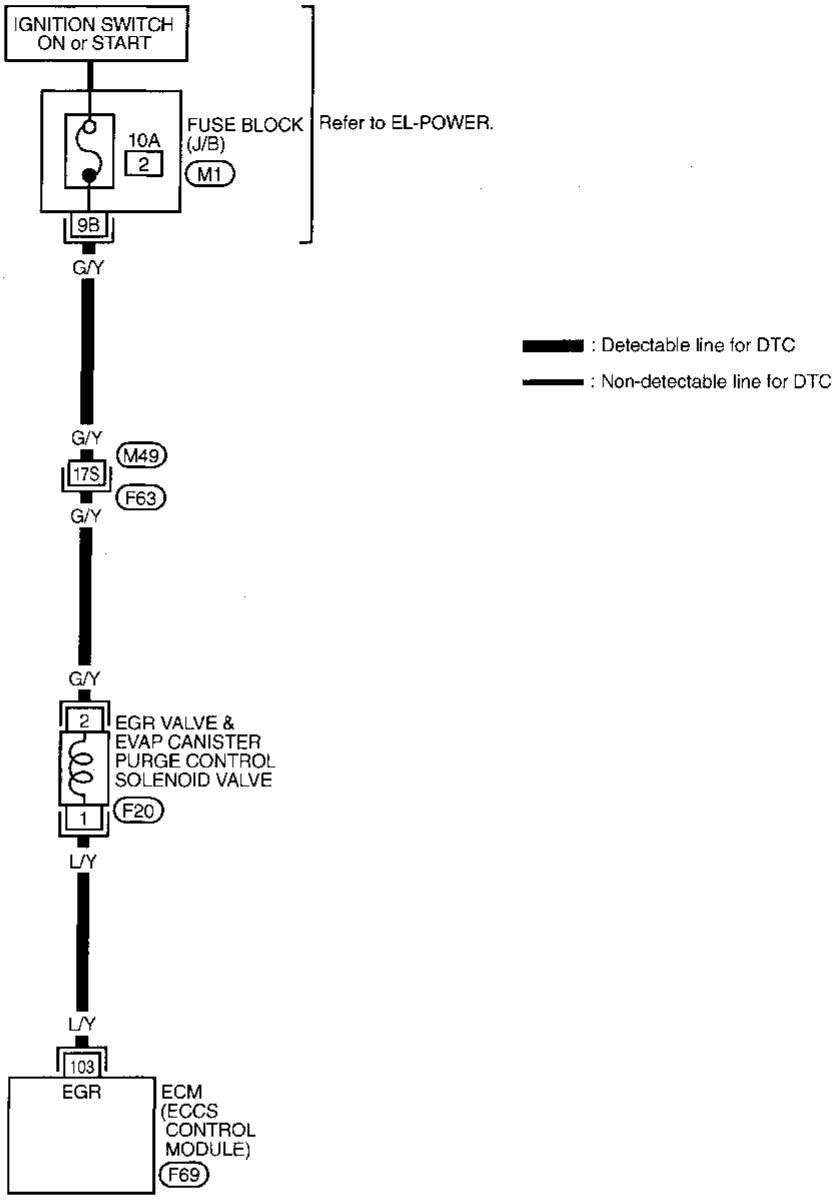
1) Start engine and warm it up sufficiently.
2) Turn ignition switch "OFF" and wait at least 5 seconds.
3) Raise drive wheels off the ground. Ensure that vehicle is properly and securely supported, and that drive wheels can spin freely.
4) Start engine again.
5) Turn off the "TCS" switch and shift A/T selector lever in "D" position.
6) Check the voltage between ECM terminal (103) and ground at idle speed.

Voltage: Approximately 1.0V

7) Check that the voltage changes to battery voltage and returns to approx. 1.0V when the engine speed increases to over 3,000 rpm.

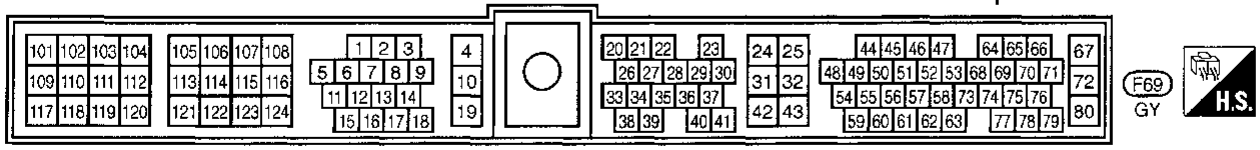
EGR Valve and EVAP Canister Purge Control Solenoid Valve (Cont'd)

EC-EGRC/V-01



Refer to last page (Foldout page).
M49, F63
M1

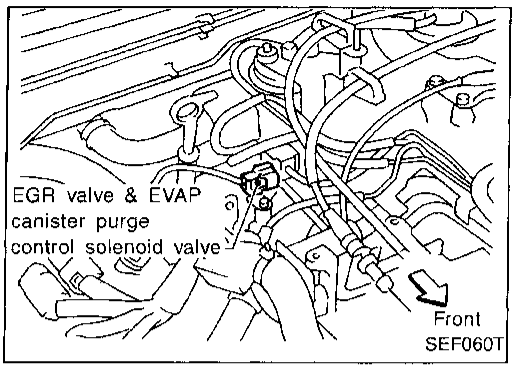
1 2 F20
B

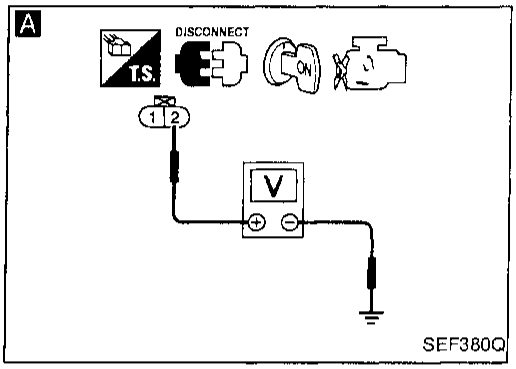


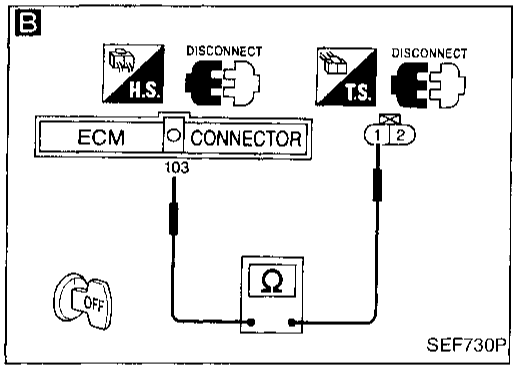
SEF896S

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 ② and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F63), (M49)
- 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. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal (103) and terminal ①.
   Continuity should exist.
   If OK, check harness for short.

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 ↓

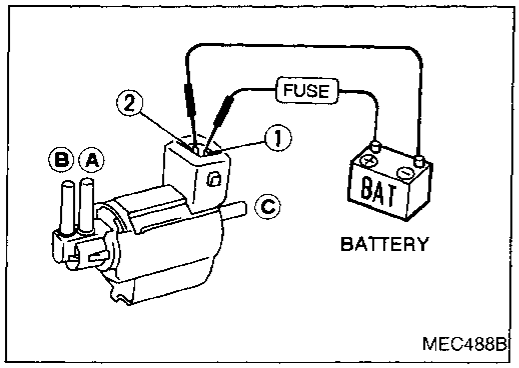
Disconnect and reconnect harness connectors in the circuit. Then retest.

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)

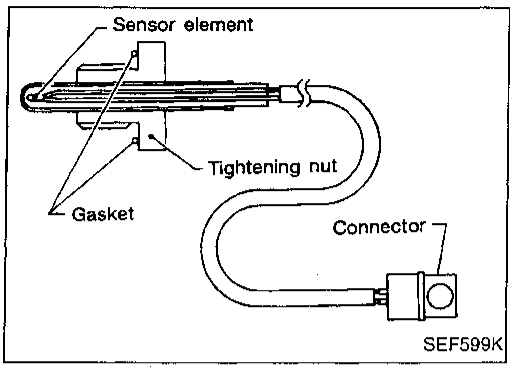
COMPONENT INSPECTION

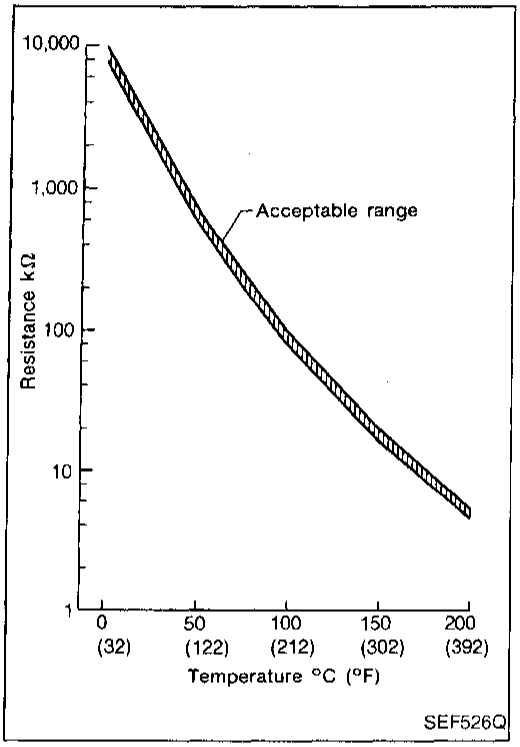
EGR valve & EVAP canister purge control solenoid valve

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 passage way. When the EGR valve opens, hot exhaust gases flow, and the temperature in the passage way changes. The EGR temperature sensor is a thermistor that modifies a voltage signal sent from the ECM. This modified signal then returns to the ECM as an input signal. As the temperature increases, EGR temperature sensor resistance decreases.

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

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

*: These data are reference values and measured between ECM terminal ⑥③ (EGR temperature sensor) and ECM terminal ㉕ (ECCS ground).

When EGR system is operating:

Voltage: 0 - 1.5V

ON BOARD DIAGNOSIS LOGIC

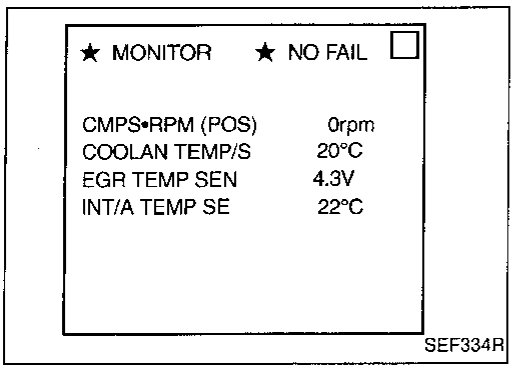
Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
P1401 0305	A) An excessively low voltage from the EGR temperature sensor is sent to ECM, even when engine coolant temperature is low.	• Harness or connectors (The EGR temperature sensor circuit is shorted.) • EGR temperature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

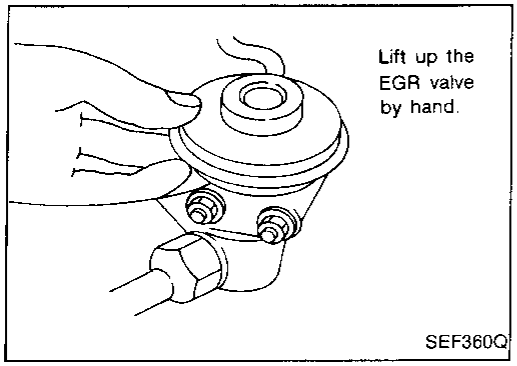
OVERALL FUNCTION CHECK

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 malfunctions A and B

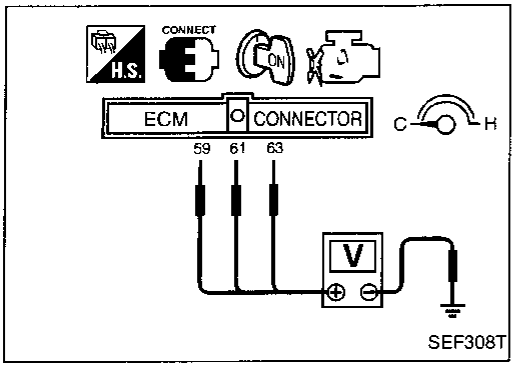


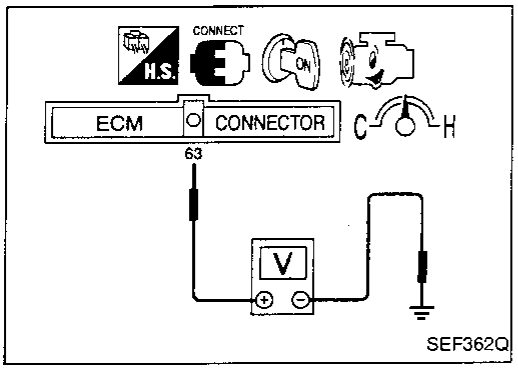
1) Turn ignition switch "ON" and select "DATA MONITOR" mode with CONSULT.
2) Confirm that engine coolant temperature and intake air temperature are lower than 50°C (122°F). (If necessary, wait until the temperatures equal atmospheric temperature.)
3) Confirm that "EGR TEMP SEN" reading is between 3.45V 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 P0306, EC-203 and 213.
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, P0306 and P1400, EC-203, 213 and 283.



OR

1) Turn ignition switch "ON".
2) Confirm that voltage between ECM terminals ⑤⑨, ⑥③ and ground is more than 2.56V. (If necessary, wait until engine coolant temperature and intake air temperature equal atmospheric temperature.)
3) Confirm that voltage between ECM terminal ⑥③ 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-203 and 213.
7) Check voltage between ECM terminal ⑥③ 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, P0306 and P1400, EC-203, 213 and 283.

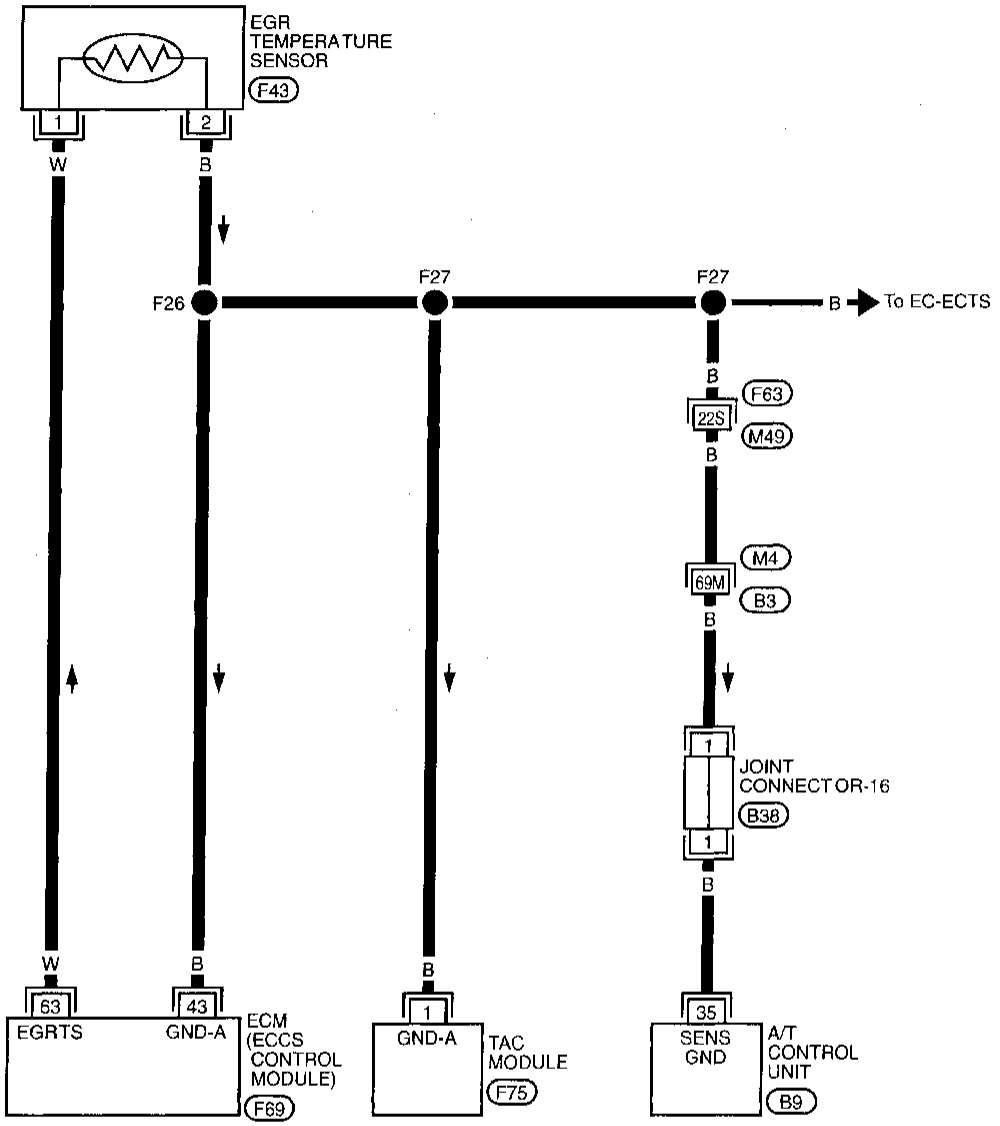


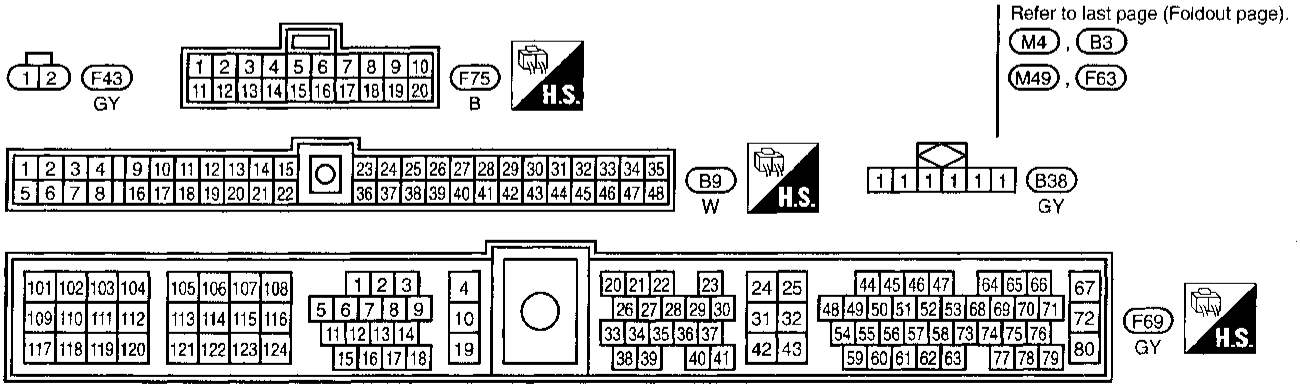


EGR Temperature Sensor (Cont'd)

EC-EGR/TS-01

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



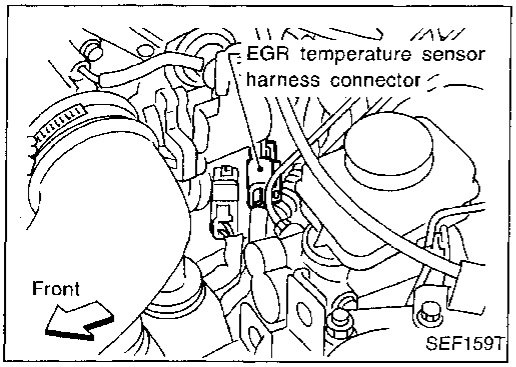


Refer to last page (Foldout page).
M4, B3
M49, F63

SEF897S

EGR Temperature Sensor (Cont'd)

DIAGNOSTIC PROCEDURE



INSPECTION START

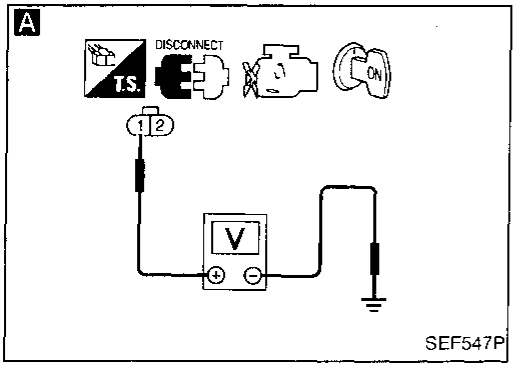
A

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

Voltage: Approximately 5V

NG → Repair harness or connectors.

OK



B

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

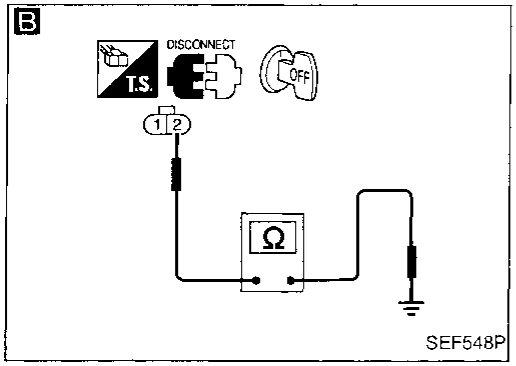
Continuity should exist.

If OK, check harness for short.

NG → Check the following.
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Joint connector-16
- Harness for open or short between ECM and EGR temperature sensor
- Harness for open or short between EGR temperature sensor and throttle actuator control (TAC) module
- Harness for open or short between A/T control unit and EGR temperature sensor

If NG, repair harness or connector.

OK



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

NG → Replace EGR temperature sensor.

OK

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

Trouble is not fixed.

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

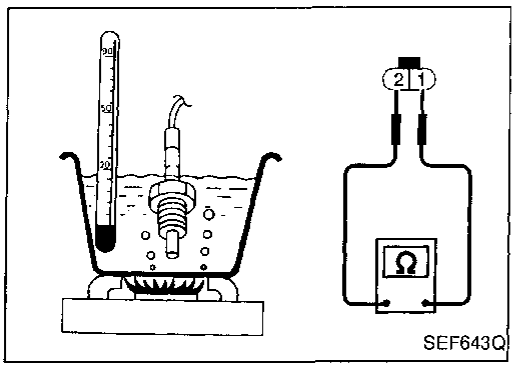
INSPECTION END

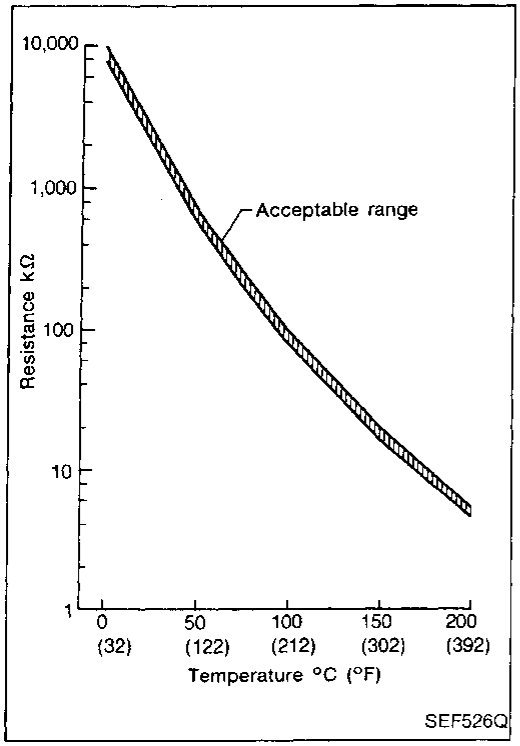
EGR Temperature Sensor (Cont'd)

COMPONENT INSPECTION

EGR temperature sensor

Check resistance change and resistance value.





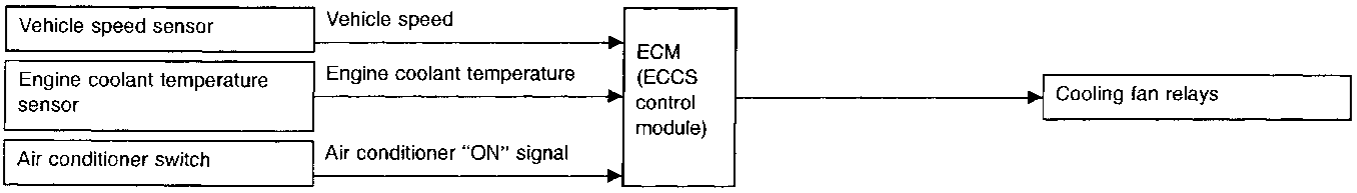
EGR temperature °C (°F)	Voltage (V)	Resistance (MΩ)
0 (32)	4.81	7.9 - 9.7
50 (122)	2.82	0.57 - 0.70
100 (212)	0.8	0.08 - 0.10

If NG, replace EGR temperature sensor.

Cooling Fan (Overheat)

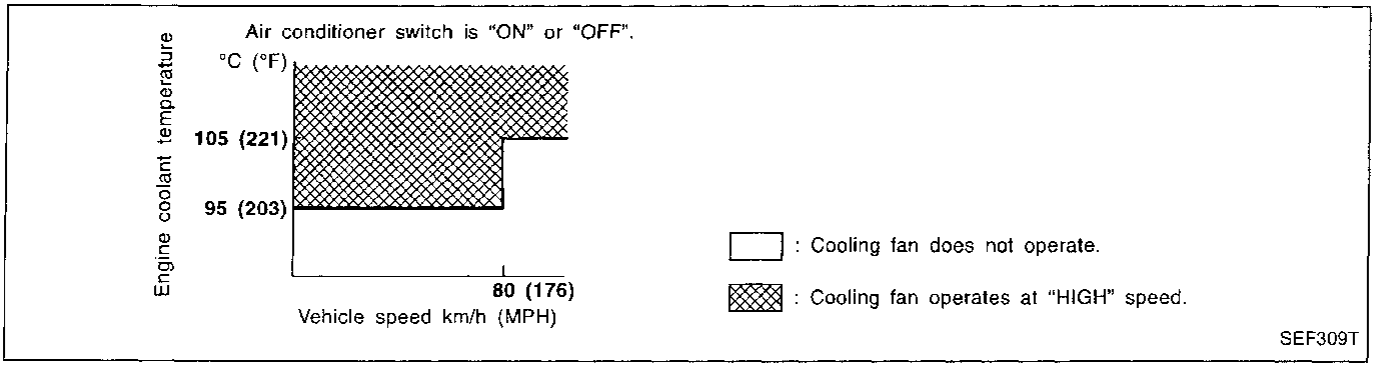
SYSTEM DESCRIPTION

Input/output signal line



The ECM controls the cooling fan corresponding to vehicle speed, engine coolant temperature and air conditioner ON signal. The control system has a 2-step control [HIGH/LOW/OFF].

Operation



The cooling fan operates at HIGH if diagnostic test mode II (self-diagnostic results) for engine coolant temperature sensor is "NG".

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
COOLING FAN	• After warming up engine, idle the engine. • 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) at vehicle speeds less than 80 km/h	HIGH
		Engine coolant temperature is 105°C (221°F) or more	HIGH

ECM terminals and reference value

Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
33	LG	Cooling fan relay-1 (High)	Engine is running. └ Cooling fan is not operating.	BATTERY VOLTAGE (11 - 14V)
34	LG/R	Cooling fan relay-2 (High)	Engine is running. └ Cooling fan is operating.	0 - 1V

Cooling Fan (Overheat) (Cont'd)

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

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
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) at vehicle speed less than 80 km/h	HIGH
		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, the engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

Diagnostic trouble code No.	Malfunction is detected when ...	Check Items (Possible Cause)
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-304).
P1900* 0208		

*: Since this diagnosis does not meet P1900 of SAE2012, it is indicated only by CONSULT.

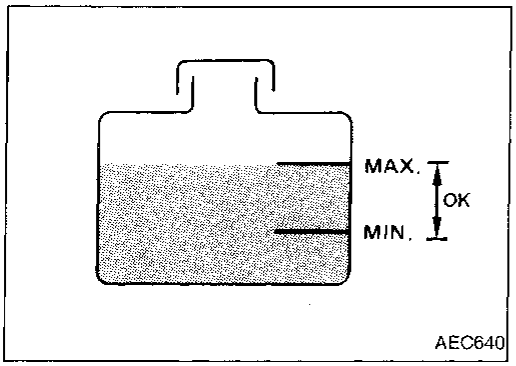
CAUTION:

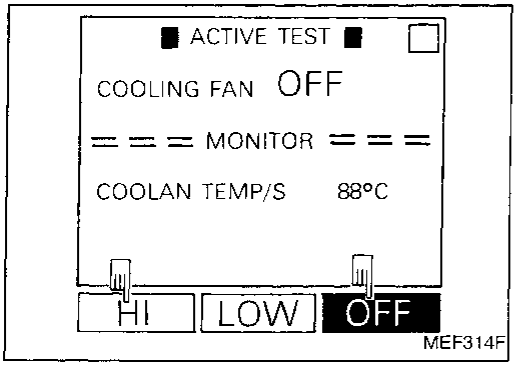
When a malfunction is indicated, be sure to replace the coolant following the procedure in the MA section ("Changing Engine Coolant", "ENGINE MAINTENANCE"). Also, replace the engine oil.

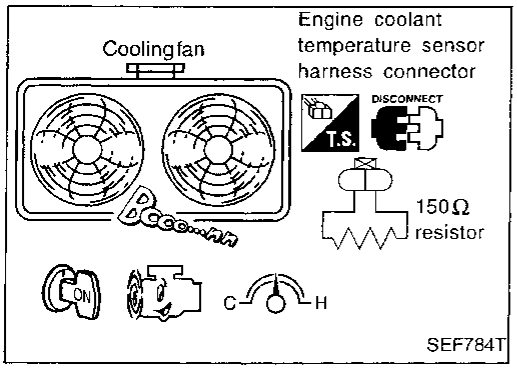
a. Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute like pouring coolant by kettle. Be sure to use coolant with the proper mixture ratio. Refer to MA section ("Anti-freeze Coolant Mixture Ratio", "RECOMMENDED FLUIDS AND LUBRICANTS").

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

Cooling Fan (Overheat) (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-298.
2) Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to "DIAGNOSTIC PROCEDURE", EC-298.

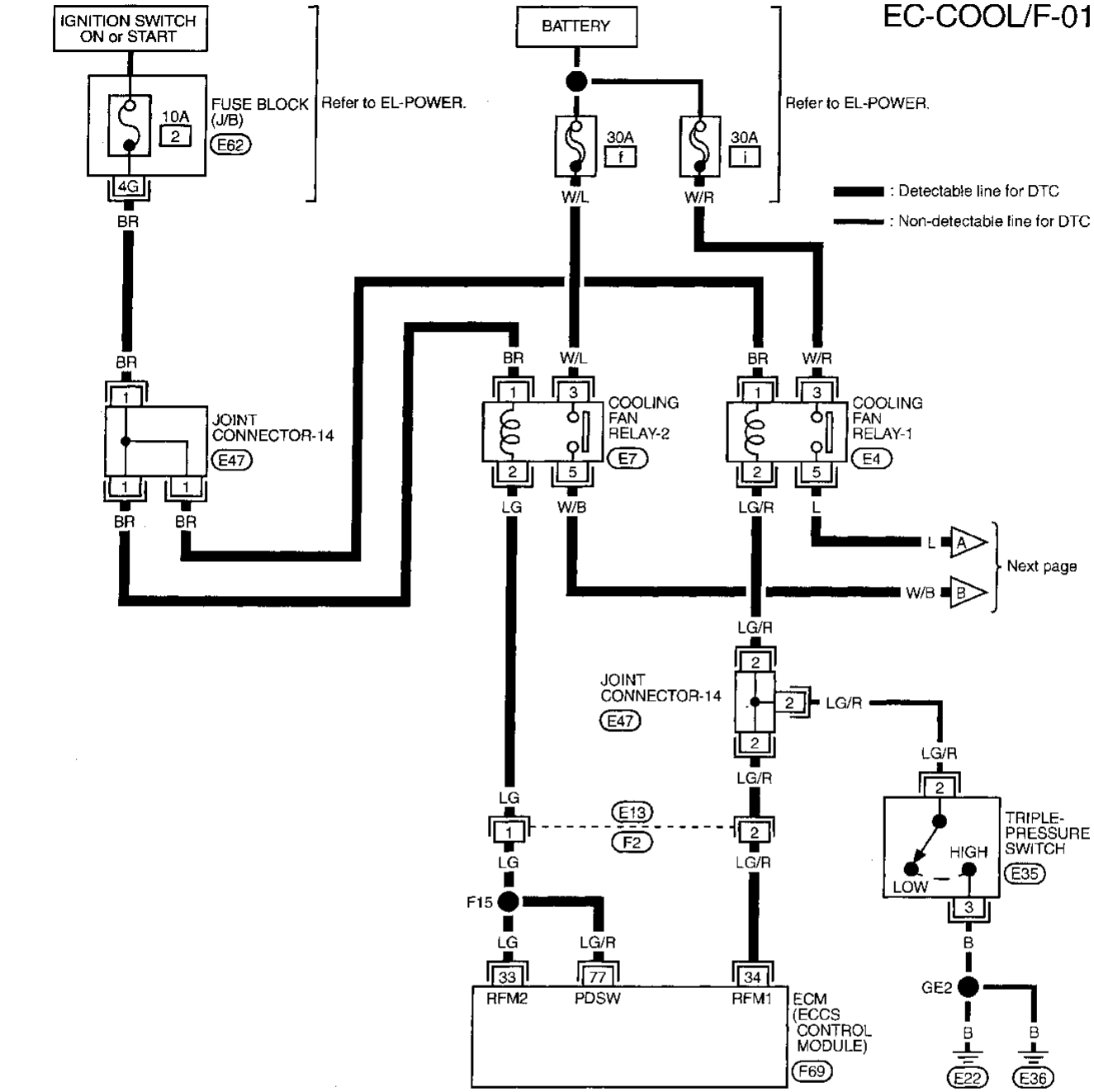
3) Turn ignition switch "ON".
4) Perform "COOLING FAN" in "ACTIVE TEST" mode with CONSULT.

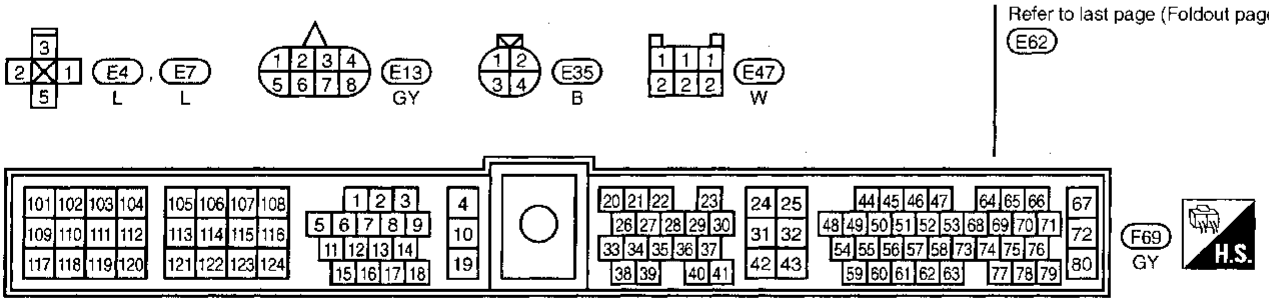
OR

3) Disconnect engine coolant temperature sensor harness connector.
4) Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5) Start engine and make sure that cooling fan operates at higher speed than low speed.
   Be careful not to overheat engine.

Cooling Fan (Overheat) (Cont'd)

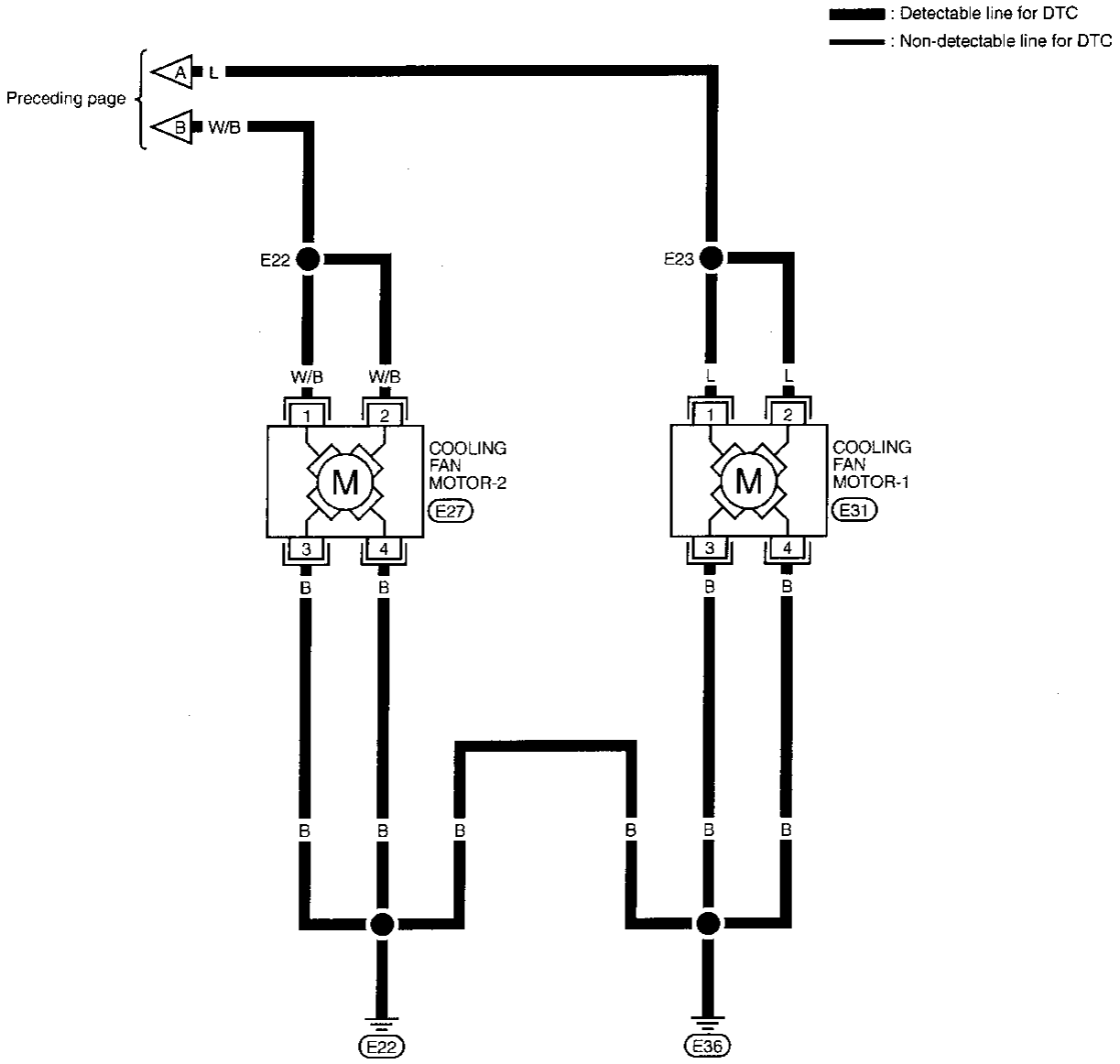
EC-COOL/F-01

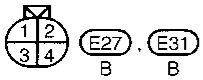




SEF898S

EC-COOL/F-02





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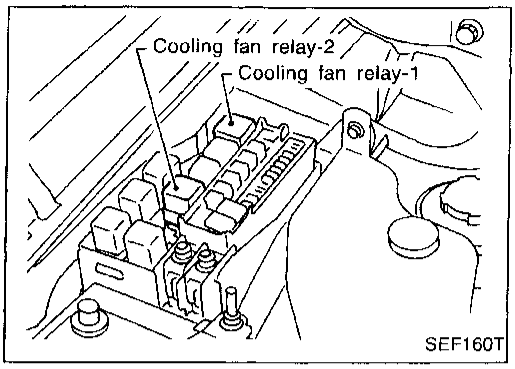
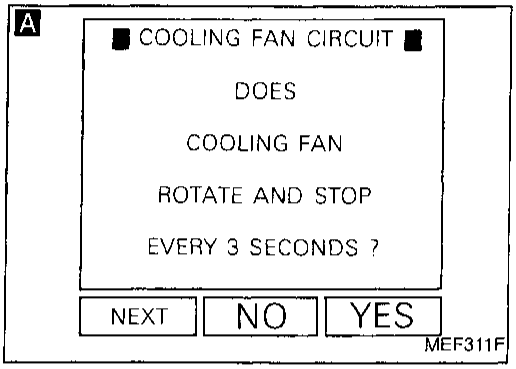
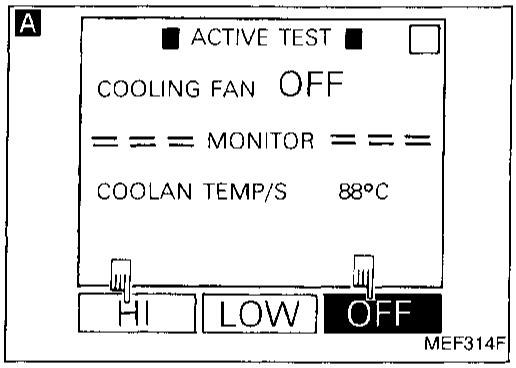
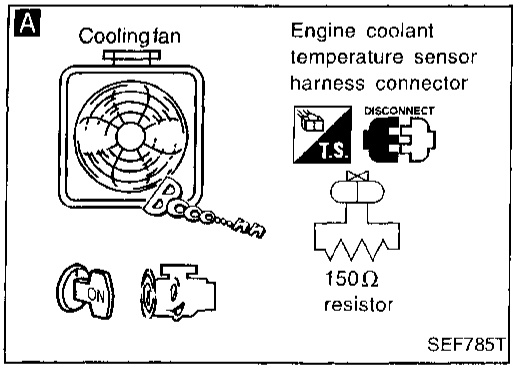
Cooling Fan (Overheat) (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK COOLING FAN MOTOR-1 OPERATION.

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

NG → Check cooling fan motor-1 speed control circuit. (Go to PROCEDURE A.)

OR

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

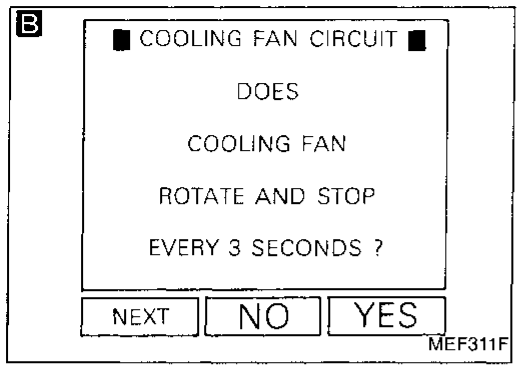
OR

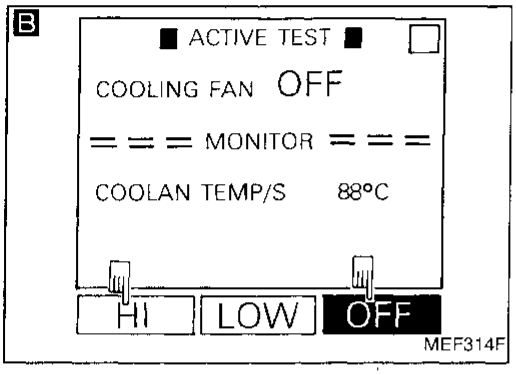
2. Disconnect engine coolant temperature sensor harness connector.
3. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
4. Start engine.
5. Make sure that cooling fan motor-1 operates.
   Be careful not to overheat engine.

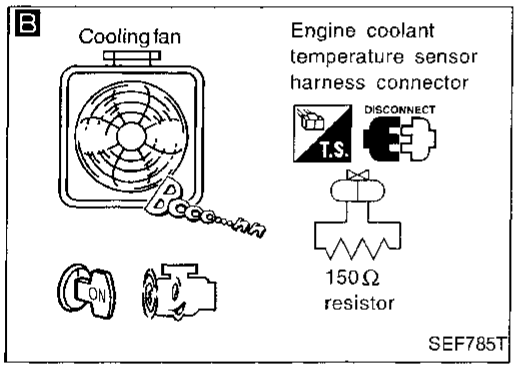
OK

Ⓐ

Cooling Fan (Overheat) (Cont'd)







Ⓐ

B

CHECK COOLING FAN MOTOR-2 OPERATION.
1. Turn ignition switch "OFF".
2. Reconnect cooling fan relay-2.
3. Disconnect cooling fan relay-1.
4. Turn ignition switch "ON".
5. Perform "COOLING FAN CIRCUIT" in "FUNCTION TEST" mode with CONSULT.

NG → Check cooling fan motor-2 control circuit. (Go to PROCEDURE B.)

OR

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

OR

4. Restart engine and make sure that cooling fan motor-2 operates.
Be careful not to overheat engine.

OK ↓

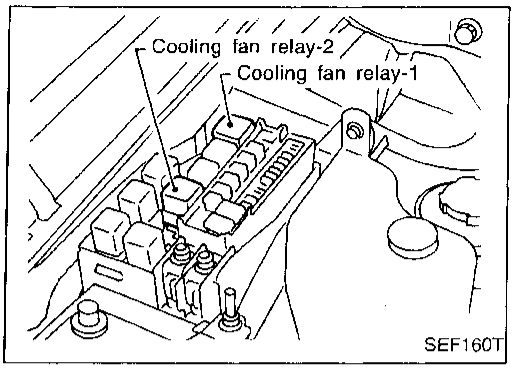
CHECK COMPONENT (Triple-pressure switch).
Refer to HA section ("Electrical Components Inspection", "TROUBLE DIAGNOSES").

NG → Replace triple-pressure switch.

OK ↓

Ⓑ
(Go to EC-303.)

Cooling Fan (Overheat) (Cont'd)



PROCEDURE A

INSPECTION START

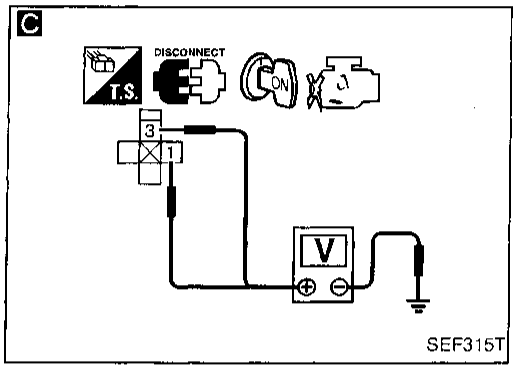
C

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

NG → Check the following.
- 10A fuse
- 30A fusible links
- Joint connector-14
- 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 ↓



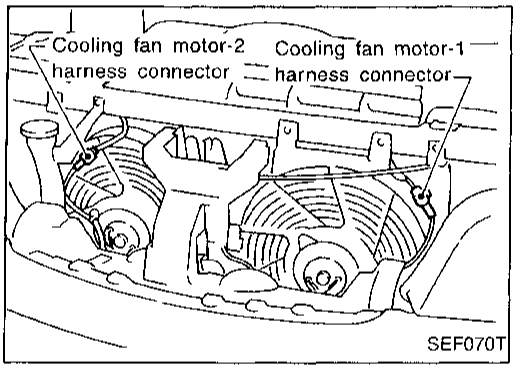
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor harness connector.

D 3. Check harness continuity between relay terminal ⑤ and cooling fan motor terminals ① and ②.
Continuity should exist.
If OK, check harness for short.

E 4. Check harness continuity between motor-1 terminals ③, ④ and engine ground.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓



F

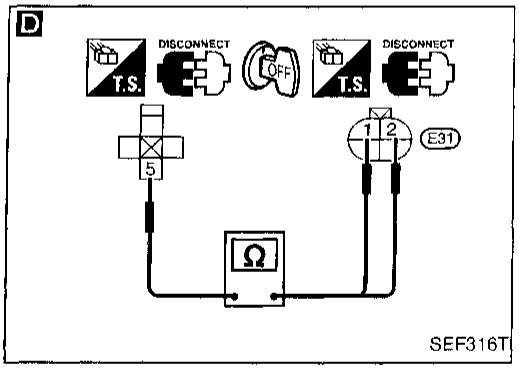
CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉞ and relay-1 terminal ②.
   Continuity should exist.
   If OK, check harness for short.

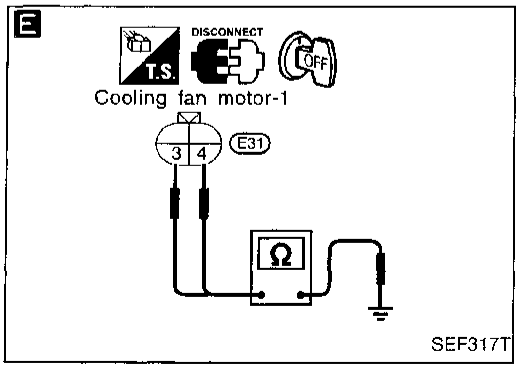
NG → Check the following.
- Harness connectors (F2), (E13)
- Joint connector-14
- Harness for open or short between cooling fan relay-1 and ECM

If NG, repair harness or connectors.

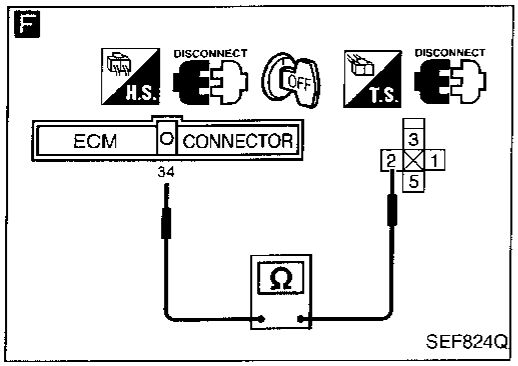
OK ↓

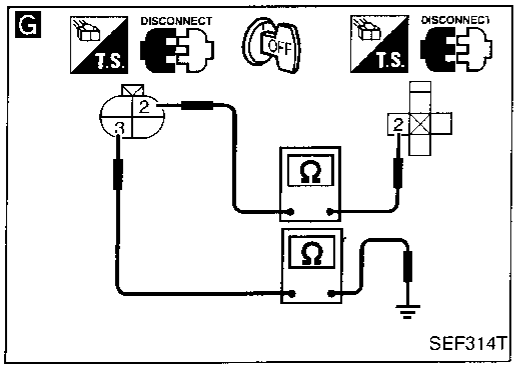
Ⓐ





Cooling Fan (Overheat) (Cont'd)





Ⓐ

G

CHECK HARNESS CONTINUITY BETWEEN COOLING FAN RELAY-1 AND GROUND.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-1.
3. Disconnect triple-pressure switch harness connector.
4. Check harness continuity between relay-1 terminal ② and switch terminal ② , switch terminal ③ and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Joint connector-14
- Harness for open or short between triple-pressure switch and relay-1

If NG, repair harness or connectors.

OK ↓

CHECK COMPONENT
(Cooling fan relay-1).
Refer to "COMPONENT INSPECTION", EC-305.

NG → Replace cooling fan relay.

OK ↓

CHECK COMPONENT
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-305.

NG → Replace cooling fan motors.

OK ↓

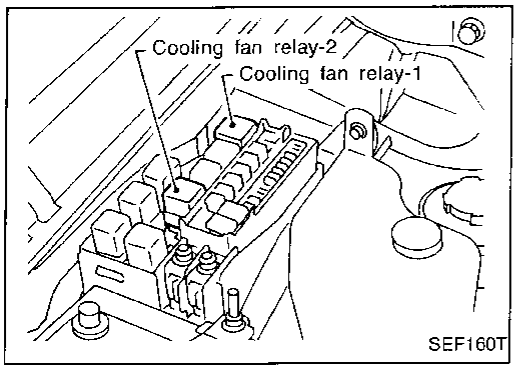
Disconnect and reconnect harness connectors in the circuit. Then retest.

Trouble is not fixed. ↓

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

↓

INSPECTION END



PROCEDURE B

INSPECTION START ↓

H

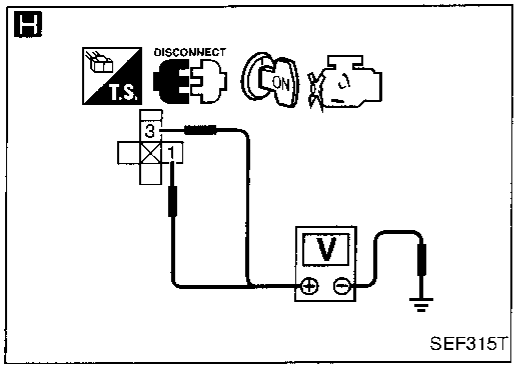
CHECK POWER SUPPLY.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan relay-2.
3. Turn ignition switch "ON".
4. Check voltage between cooling fan relay-2 terminals ① , ③ and ground with CONSULT or tester.
   Voltage: Battery voltage

NG → Check the following.
- Joint connector-14
- 30A fusible links
- 10A fuse
- Harness continuity between cooling fan relay-2 and fuse
- Harness continuity between cooling fan relay-2 and battery

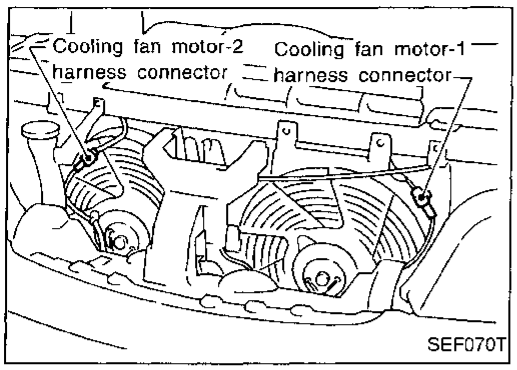
If NG, repair harness or connectors.

OK ↓

Ⓑ



Cooling Fan (Overheat) (Cont'd)



Ⓑ

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect cooling fan motor-2 harness connector.

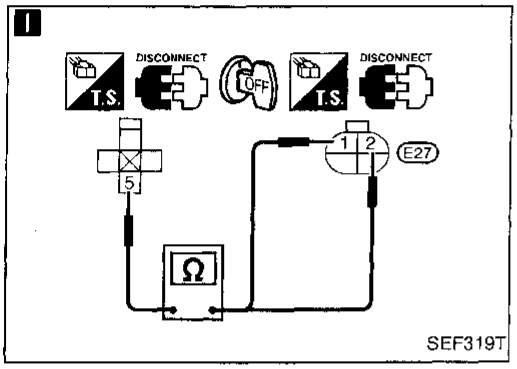
I 3. Check harness continuity between relay terminal ⑤ and cooling fan motor terminals ① and ② .
Continuity should exist.
If OK, check harness for short.

J 4. Check harness continuity between terminals ③ , ④ and engine ground.
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

I



K

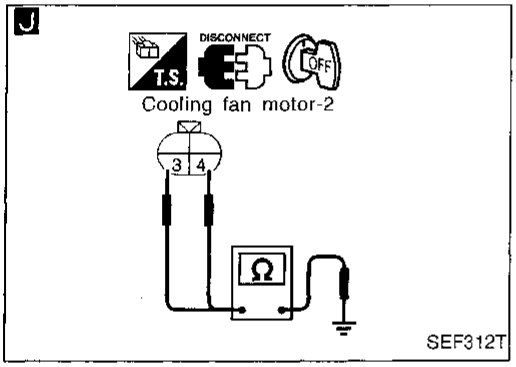
CHECK OUTPUT SIGNAL CIRCUIT-I.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㉝ and terminal ② .
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors F2 , E13
- Harness for open or short between cooling fan relay-2 and ECM

If NG, repair harness or connectors.

OK ↓

J



CHECK COMPONENT
(Cooling fan relay-2).
Refer to "COMPONENT INSPECTION", EC-305.

NG → Replace cooling fan relays.

OK ↓

CHECK COMPONENTS
(Cooling fan motors).
Refer to "COMPONENT INSPECTION", EC-305.

NG → Replace cooling fan motors.

OK ↓

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

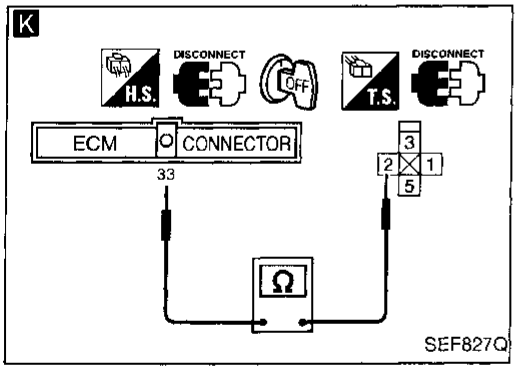
Trouble is not fixed. ↓

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

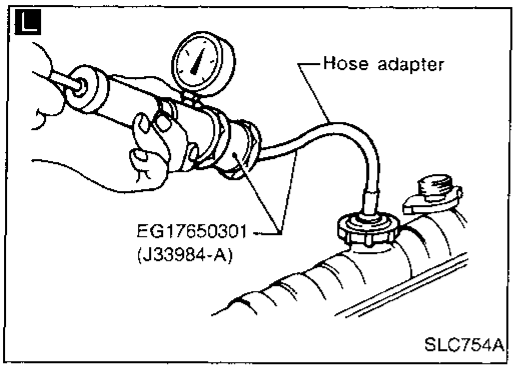
↓

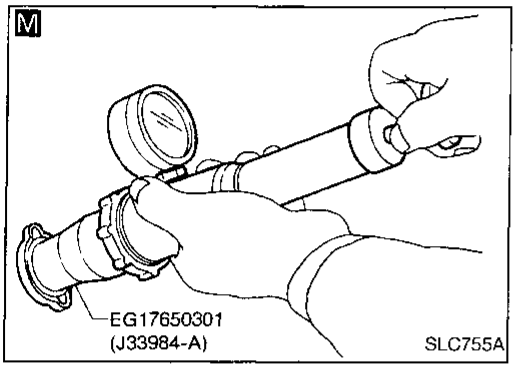
INSPECTION END

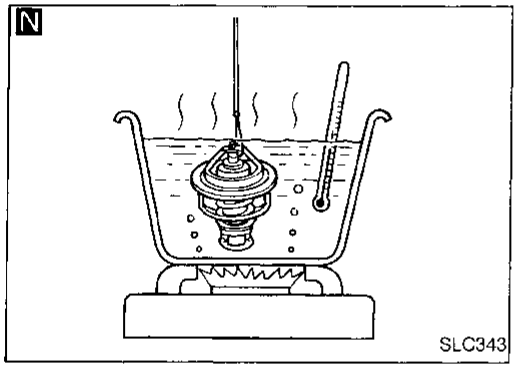
K



Cooling Fan (Overheat) (Cont'd)







Ⓑ

L

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 ↓

M

CHECK RADIATOR CAP.
Apply pressure to cap with a tester.
Radiator cap relief pressure:
Standard
78 - 98 kPa (0.8 - 1.0 kg/cm², 11 - 14 psi)
Limit
59 - 98 kPa (0.6 - 0.9 kg/cm², 9 - 13 psi)

NG → Replace radiator cap.

OK ↓

N

CHECK THERMOSTAT.
1. Check valve seating condition at normal room temperatures.
   It should seat tightly.
2. Check valve opening temperature and maximum valve lift.
   Valve opening temperature:
   82°C (180°F) [standard]
   Maximum valve lift:
   More than 8.6 mm/95°C (0.339 in/203°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-114.

NG → Replace engine coolant temperature sensor.

↓

If the cause can not be isolated, go to "MAIN 12 CAUSES OF OVERHEATING", EC-304.

↓

INSPECTION END

Perform FINAL CHECK by the following procedure after repair is completed.

1. Warn 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 (Overheat) (Cont'd)

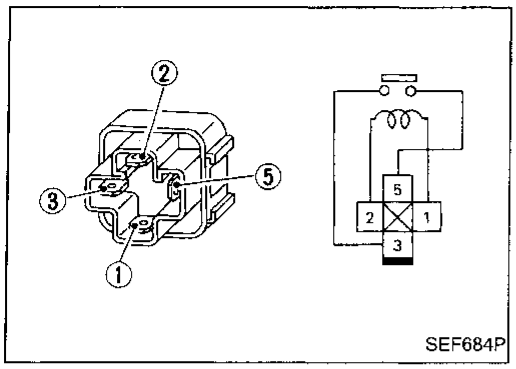
MAIN 12 CAUSES OF OVERHEATING

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	See "RECOMMENDED FLUIDS AND LUBRICANTS" in MA section
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	See "Changing Engine Coolant", "ENGINE MAINTENANCE" in MA section
	4	• Radiator cap	• Pressure tester	78 - 98 kPa (0.8 - 1.0 kg/cm^2, 11 - 14 psi) 59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	5	• Coolant leaks	• Visual	No leaks	See "System Check" "ENGINE COOLING SYSTEM" in LC section
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	See "Thermostat" and "Radiator", "ENGINE COOLING SYSTEM" in LC section
ON*1	7	• Cooling fan	• CONSULT	Operating	See "TROUBLE DIAGNOSIS FOR DTC P1900" (EC-293)
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 (Overheat) (Cont'd)

COMPONENT INSPECTION

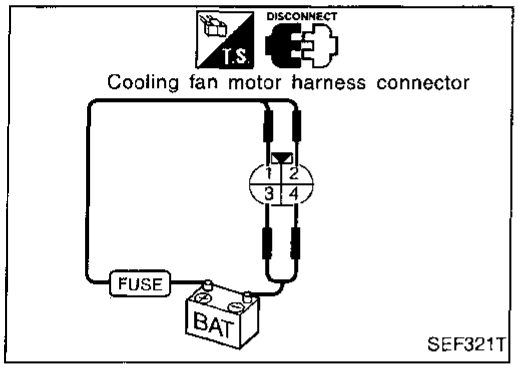


SEF684P

Cooling fan relays-1 and -2

Check continuity between terminals ③ and ⑤.

Conditions	Continuity
12V direct current supply between terminals ① and ②	Yes
No current supply	No



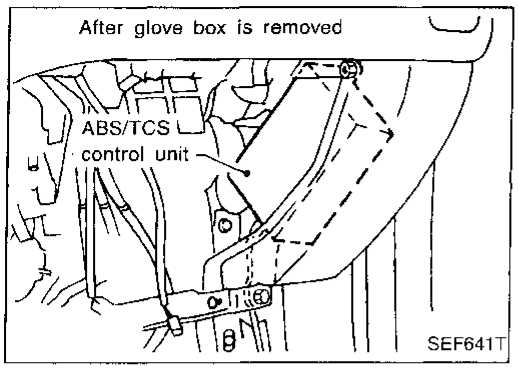
SEF321T

Cooling fan motor

1. Disconnect cooling fan motor harness connectors.
2. Supply cooling fan motor terminals with battery voltage and check operation as shown in the figure.

Conditions	Motor fan-1	Motor fan-2
12V direct current supply between terminal ① and ②	Cooling fan operates at low speed	Cooling fan operates at high speed

If NG, replace cooling fan motor.



ABS/TCS Control Unit

The malfunction information related to ABS/TCS control unit is transferred through the line (LAN) from ABS/TCS control unit to ECM.

Be sure to erase the malfunction information such as DTC not only for ABS/TCS control unit but also for ECM after the ABS/TCS related repair.

Freeze frame data is not strored in the ECM for the ABS/TCS control unit. The MIL will not light up for ABS/TCS control unit.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when	Check Items (Possible Cause)
—* 0107	• ECM receives incorrect voltage from ABS/TCS control unit continuously.	• Harness or connectors (The circuit between ECM and ABS/TCS control unit is open or shorted.) • ABS/TCS control unit

*: SAE J2012 number is not applicable

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

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

OR

1) Start engine and let it idle for at least 40 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.

DTC erasing procedure for ABS/TCS related repair

Erase DTC code by following procedure:

1) Turn ignition switch "OFF" and then turn it "ON".
2) Connect CONSULT and select "ABS".
3) Insert UE950 card and install it.
4) Select "ABS" and touch "SELF-DIAG RESULTS".
5) Touch "ERASE".
6. Touch "BACK" then erase malfunction code which has been stored in the A/T control unit or ECM.

DIAGNOSTIC PROCEDURE

Refer to TROUBLE DIAGNOSIS FOR 0404, EC-307.

ABS/TCS Communication Line

This circuit line is used to control the smooth engine operation of ABS/TCS during the TCS operation. Pulse signals are exchanged between ECM and ABS/TCS control unit.

Be sure to erase the malfunction information such as DTC not only in ABS/TCS control unit but also ECM after the ABS/TCS related repair. Refer to BR section (Self-diagnosis for ABS/TCS control unit, "HOW TO ERASE SELF DIAGNOSTIC RESULTS")

Freeze frame data is not stored in the ECM for the ABS/TCS communication line. The MIL will not light up for the ABS /TCS communication line.

ON BOARD DIAGNOSIS LOGIC

Diagnostic Trouble Code No.	Malfunction is detected when ...	Check Items (Possible Cause)
—* 0404	• ECM receives incorrect voltage from ABS/TCS control unit continuously.	• Harness or connectors (The communication line circuit between ECM and ABS/TCS control unit is open or shorted.) • ABS/TCS control unit • Dead (Weak) battery

*: SAE J2012 number is not applicable.

DIAGNOSTIC TROUBLE CODE CONFIRMATION PROCEDURE

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

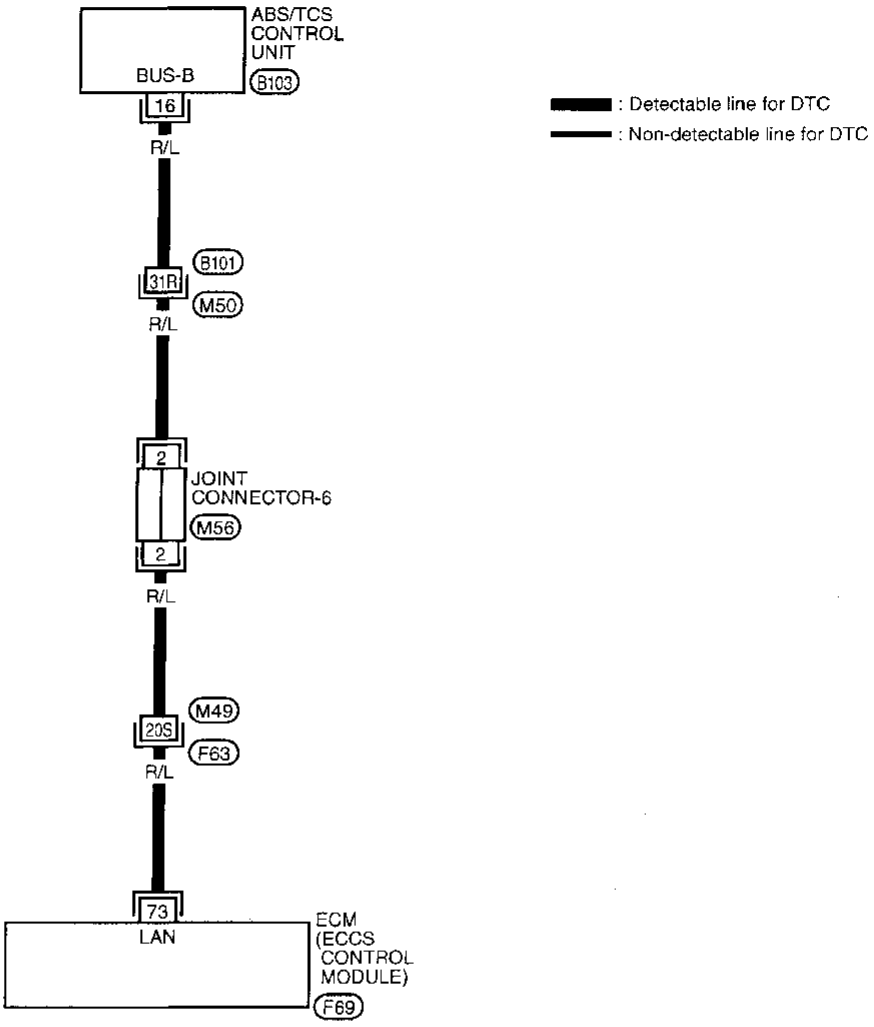
1) Turn ignition switch "ON".
2) Select "DATA MONITOR" mode with CONSULT.
3) Start engine and let it idle for at least 3 seconds.

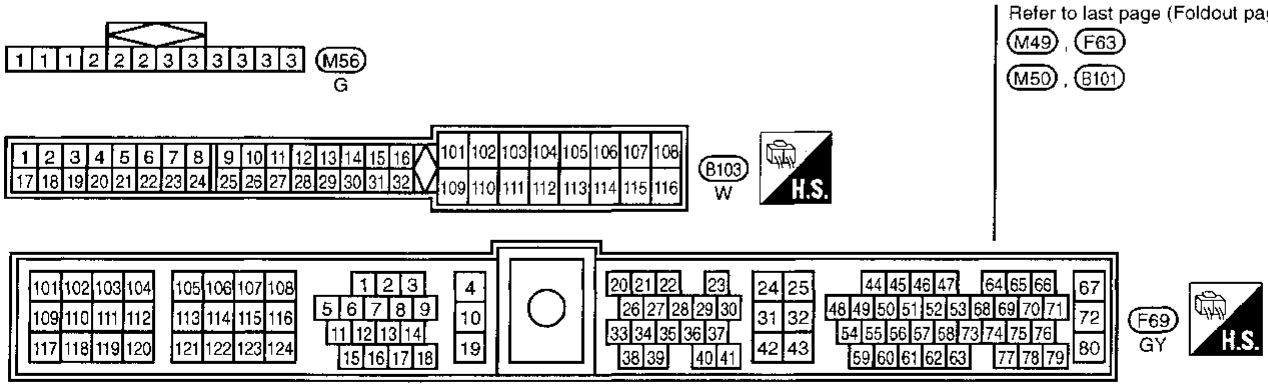
OR

1) Start engine and let it idle for at least 3 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.

ABS/TCS Communication Line (Cont'd)

EC-TCS-01



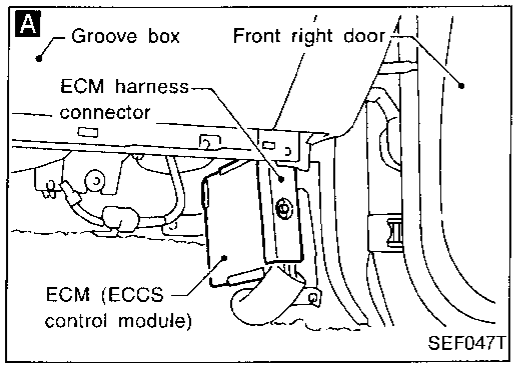


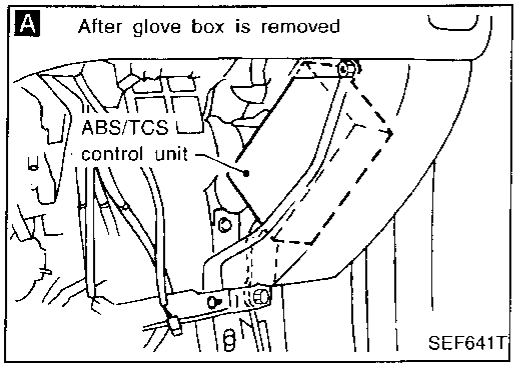
Refer to last page (Foldout page).
M49, F63
M50, B101

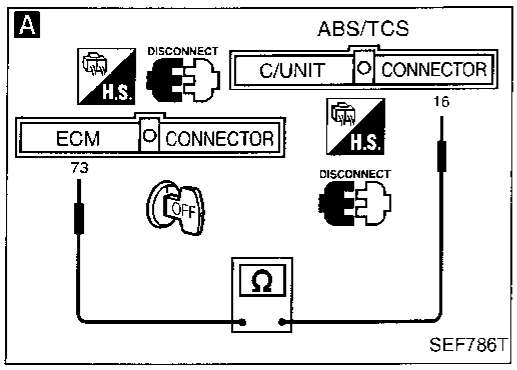
TEC229

ABS/TCS Communication Line (Cont'd)

DIAGNOSTIC PROCEDURE







INSPECTION START

A

CHECK INPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and ABS/TCS control unit harness connector.
3. Check harness continuity between ECM terminal ⑦③ and terminal ⑯.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (M50), (B101)
- Harness connectors (F63), (M49)
- Joint connector-6
- Check harness for open or short between ECM and ABS/TCS control unit.

If NG, repair harness or connectors.

OK ↓

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

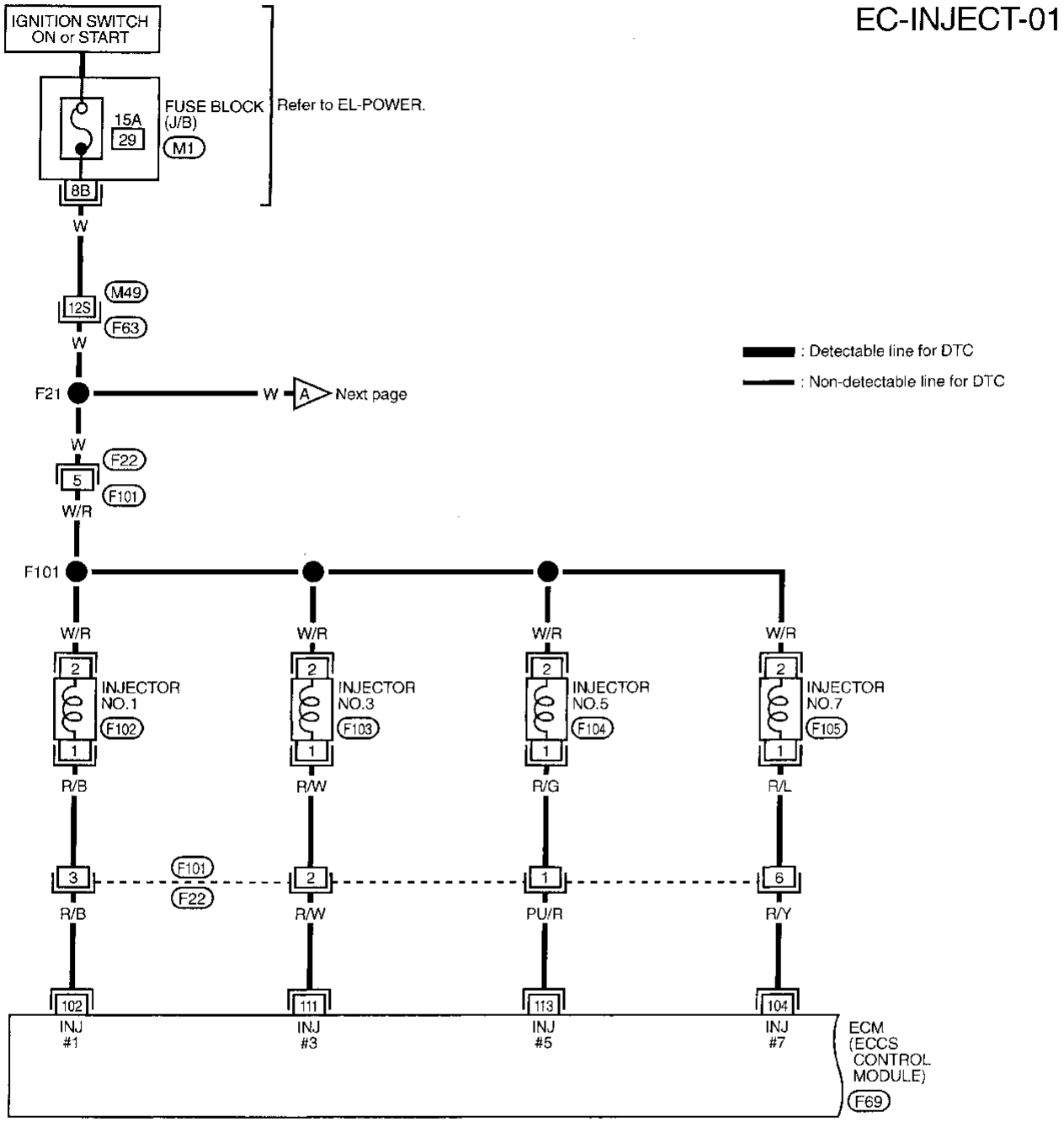
Trouble is not fixed. ↓

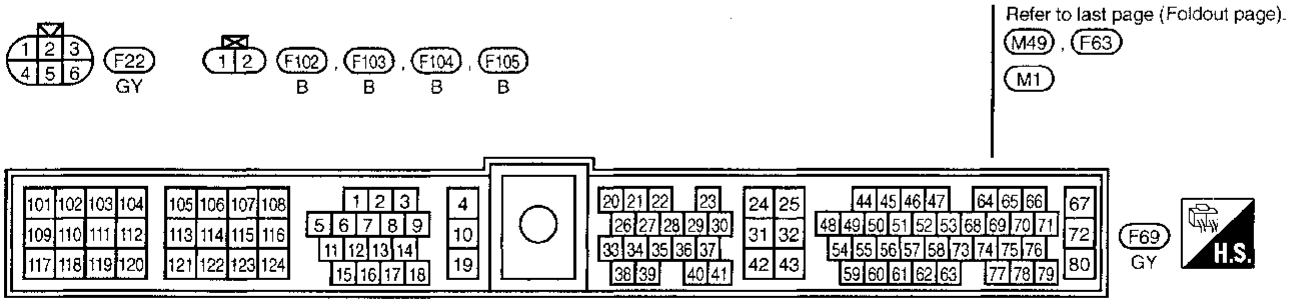
Check ECM and ABS/TCS control unit pin terminals for damage and check the connection of ECM and ABS/TCS control unit harness connectors. Reconnect ECM and ABS/TCS control unit harness connectors and retest.

INSPECTION END

Injector

EC-INJECT-01

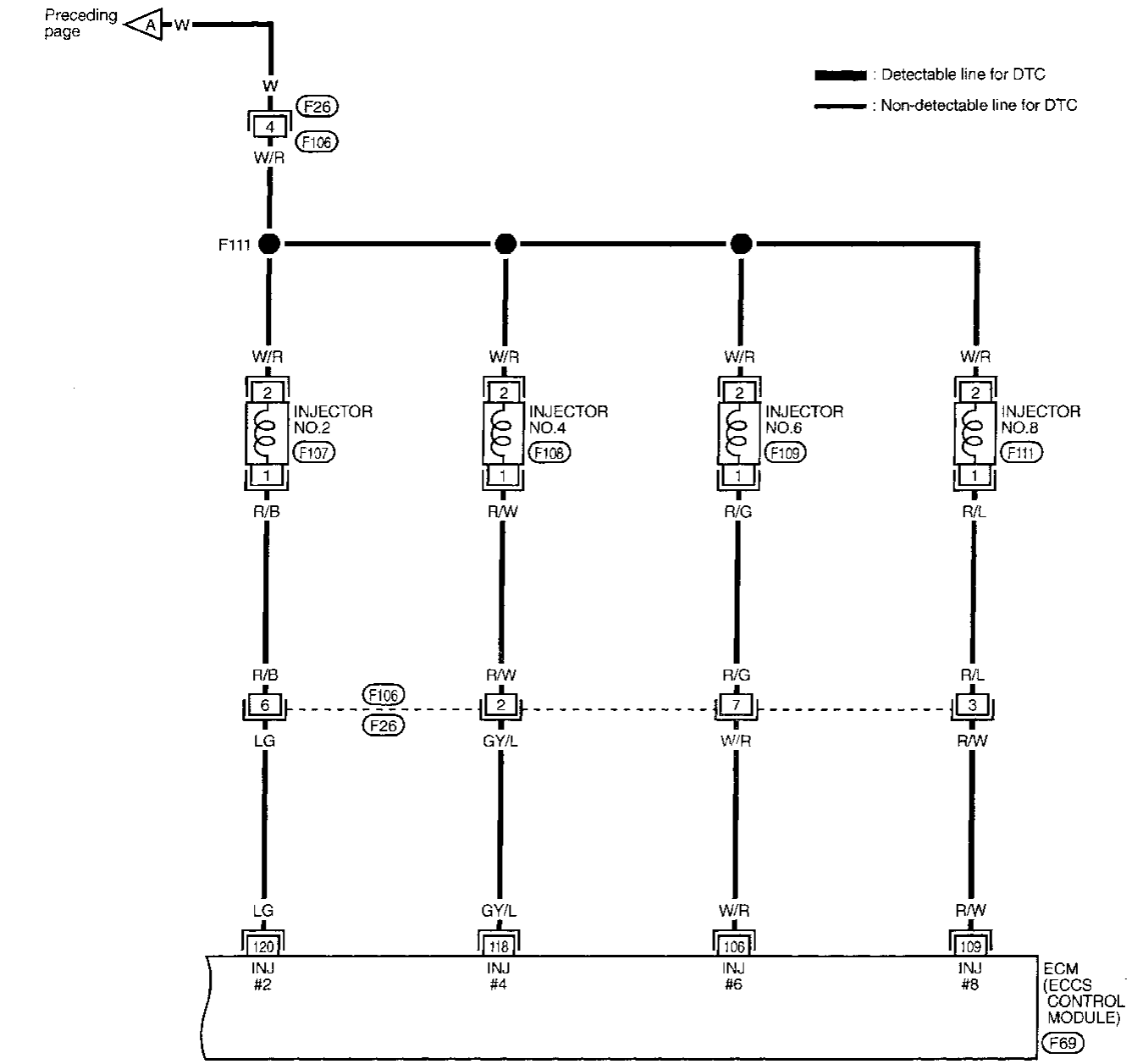


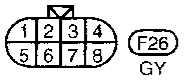


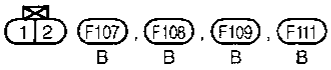
SEF900S

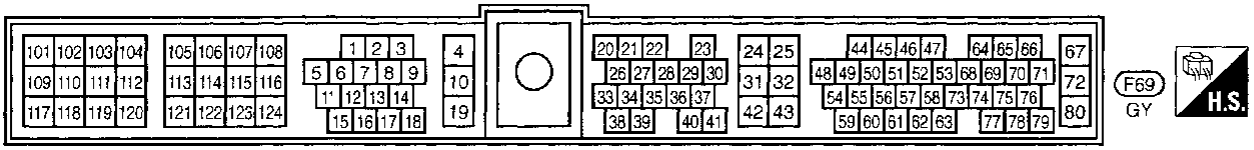
Injector (Cont'd)

EC-INJECT-02



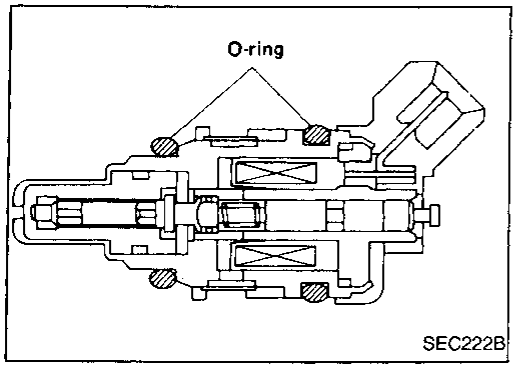






SEF901S

Injector (Cont'd)

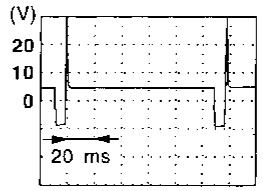
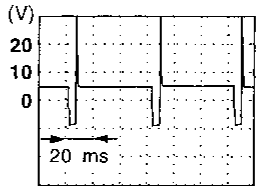


COMPONENT DESCRIPTION

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.

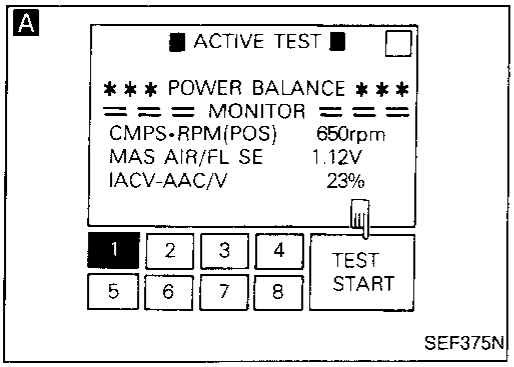
ECM terminals and reference value

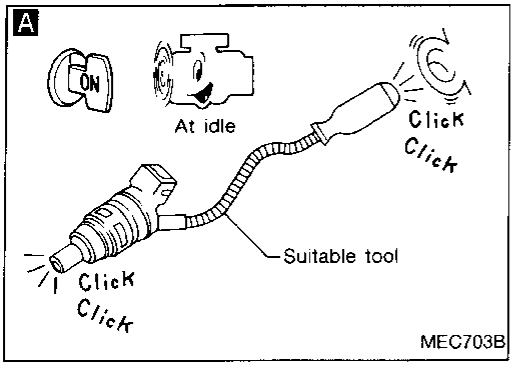
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

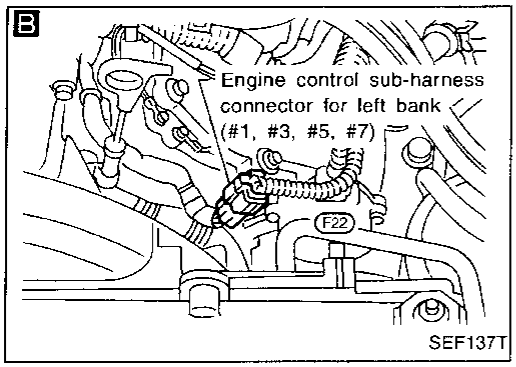
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
102	R/B	Injector No. 1	Engine is running. (Warm-up condition) └ Idle speed	BATTERY VOLTAGE (11 - 14V)  SEF549T
104	R/Y	Injector No. 7		
106	W/R	Injector No. 6		
109	R/W	Injector No. 8		
111	R/W	Injector No. 3		
113	PU/R	Injector No. 5	Engine is running. └ Engine speed is 2,000 rpm.	BATTERY VOLTAGE (11 - 14V)  SEF550T
118	GY/L	Injector No. 4		
120	L/G	Injector No. 2		

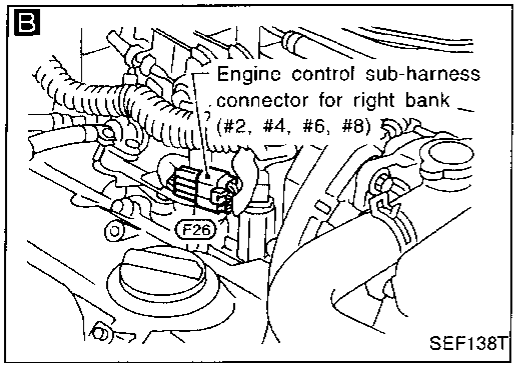
Injector (Cont'd)

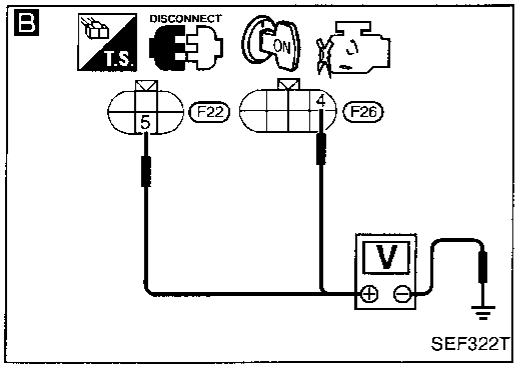
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

OR

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

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY.
1. Stop engine.
2. Disconnect right bank injector sub-harness connectors (F22) and sub-harness connector (F26) (on the right bank).
3. Turn ignition switch "ON".
4. Check voltage between terminal ④ (right bank), ⑤ (left bank) and ground with CONSULT or tester.
Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F63), (M49)
- 15A fuse
- Check harness for open or short between harness connector (F22), (F26) and ignition switch.

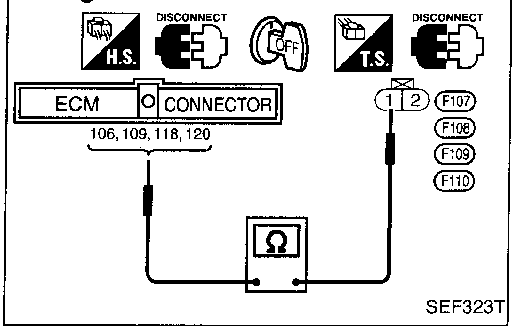
If NG, repair harness or connectors.

OK

Ⓐ

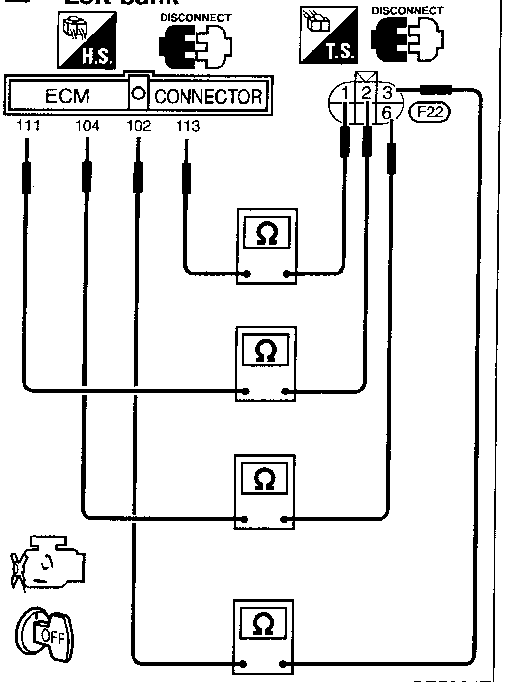
Injector (Cont'd)

C Right bank



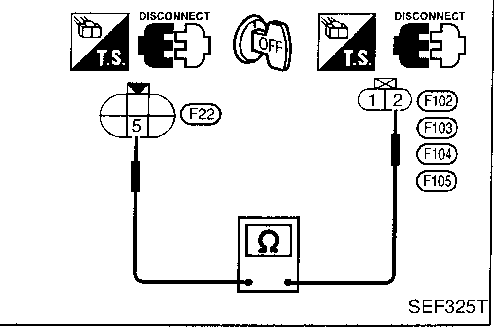
SEF323T

C Left bank



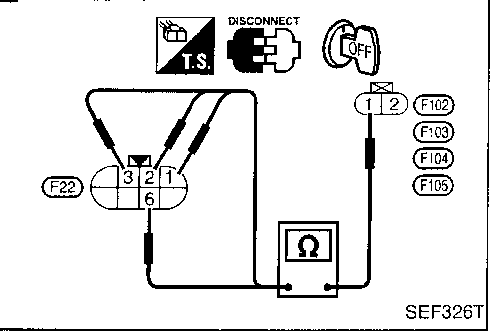
SEF324T

D Left bank



SEF325T

D Left bank



SEF326T

Ⓐ

C

CHECK OUTPUT SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals and ECM terminals.
   Right bank:
   ① **and** (120), (118), (106), (109)
   Left bank:
   ③ **and** (102),
   ② **and** (111),
   ① **and** (113),
   ⑥ **and** (104)
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

D

CHECK POWER SUPPLY CIRCUIT AND OUTPUT SIGNAL CIRCUIT (FOR LEFT BANK).
1. Remove intake manifold collector. (Refer to "TIMING CHAIN" in EM section.)
2. Disconnect injector sub-harness connector (F22).
3. Check harness continuity between terminal ⑤ and injector terminal ②.
   Continuity should exist.
   If OK, check harness for short.
4. Check harness continuity between injector terminal ① and terminals ③, ②, ①, ⑥.
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT (Injector).
Refer to "COMPONENT INSPECTION" on next page.

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.

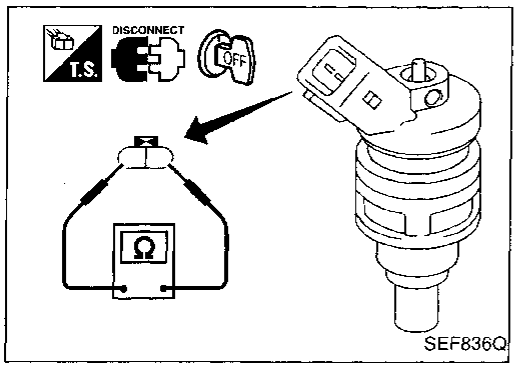
↓

INSPECTION END

Injector (Cont'd)

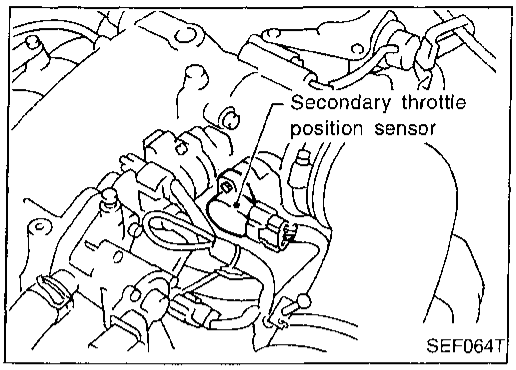
COMPONENT INSPECTION

Injector



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

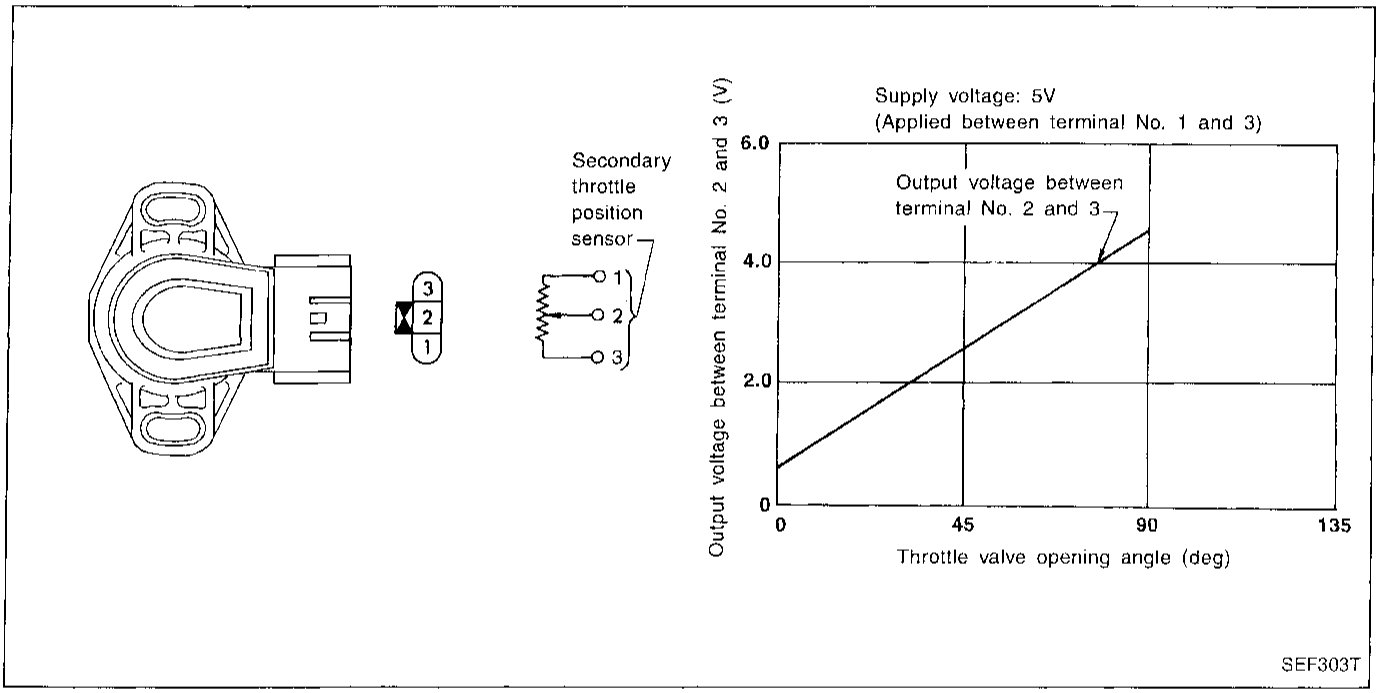
   If NG, replace injector.



Secondary Throttle Position Sensor (STPS)

COMPONENT DESCRIPTION

The secondary throttle position sensor responds to the movement of the throttle motor which is controlled by the TAC module.
This sensor is a kind of potentiometer which transforms the secondary throttle position into output voltage, and emits the voltage signal to the TAC module. In addition, the sensor detects the opening and closing speed and position of the secondary throttle valve and feeds the voltage signal to the TAC module.
Another case is when the secondary throttle valve opening becomes smaller than the ordinary throttle valve opening due to TCS operation. In this case, the signal from the secondary throttle valve is used for engine control. This replaces the signal from the ordinary throttle position sensor. The signal of the secondary throttle valve first enters the TAC module, from where it is sent to the ECM.



CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
THRTL/P SEN2	• Ignition switch: ON (Engine stopped)	Throttle valve: fully closed	0.60 - 1.15V
		Throttle valve: fully open	4.3 - 4.7V

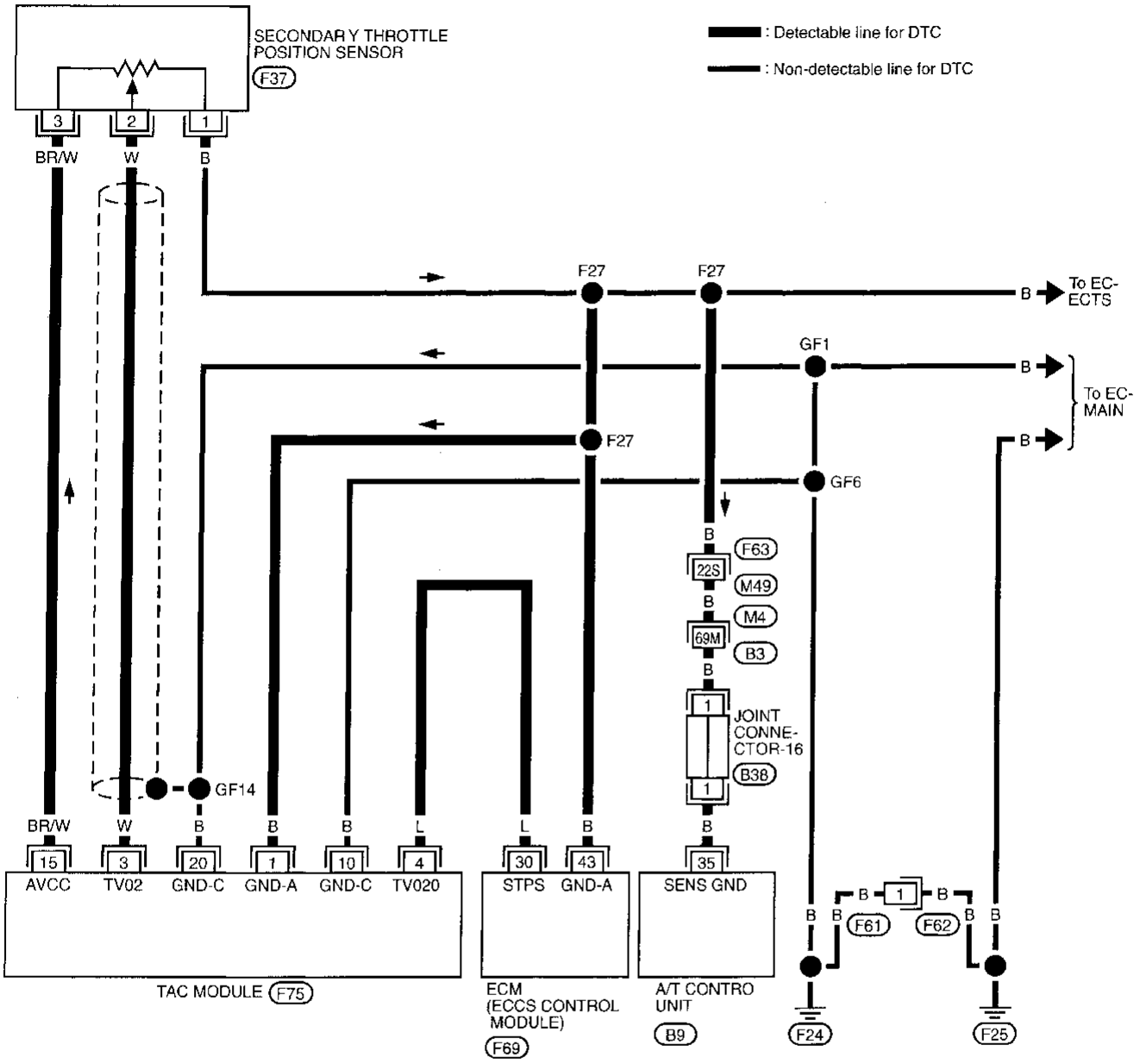
ECM terminals and reference value

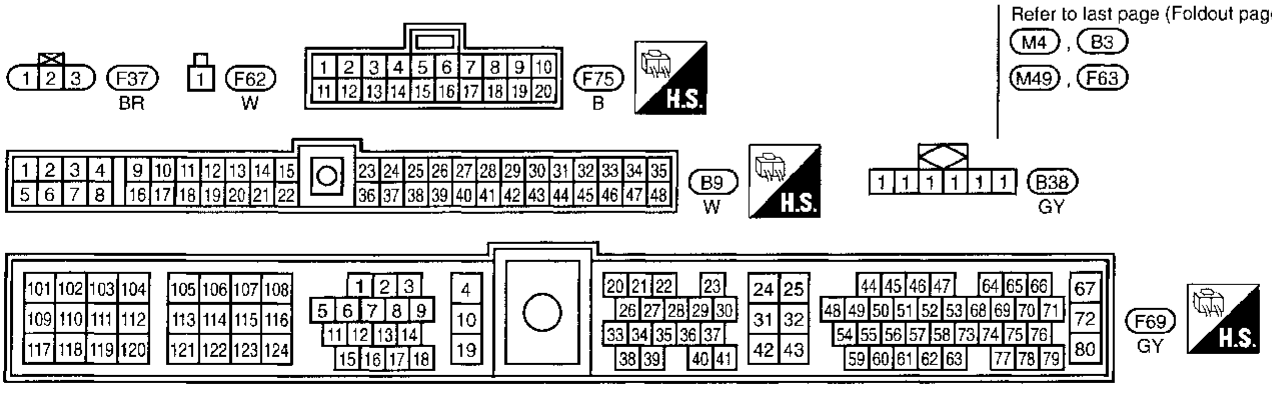
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
30	L	Secondary throttle position sensor	Ignition switch "ON" └ Approximately 3 seconds after ignition switch "ON" and thereafter	Approximately 3.4V
			Ignition switch "ON" └ Disconnect throttle motor harness connector. └ Fully close secondary throttle valve by hand.	Approximately 0.4V

Secondary Throttle Position Sensor (STPS) (Cont'd)

EC-STPS-01

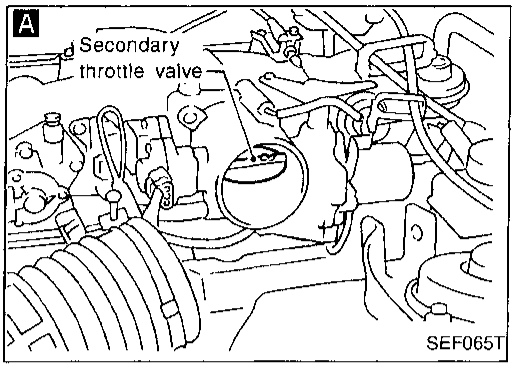


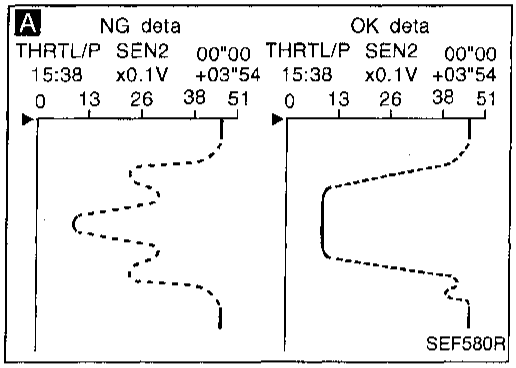


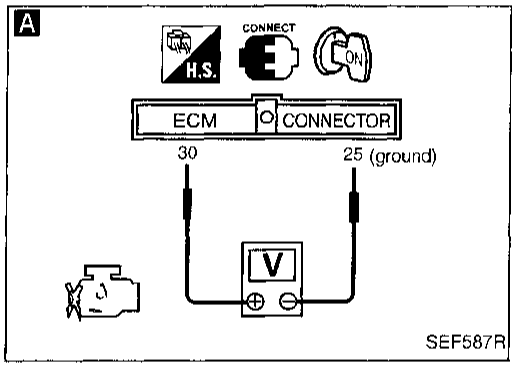
Refer to last page (Foldout page).
M4, B3
M49, F63

SEF890S

Secondary Throttle Position Sensor (STPS) (Cont'd)







DIAGNOSTIC PROCEDURE

INSPECTION START

A

OVERALL FUNCTION CHECK

Use this procedure to check the overall function of the secondary throttle position sensor circuit.

WARNING:

Before touching the secondary throttle valve, be sure to disconnect the throttle motor harness connector. Failure to do so may cause injury due to accidental actuation of the valve.

1. Start engine and warm it up sufficiently.
2. Turn ignition switch "OFF" and disconnect throttle motor harness connector.
3. Remove intake air duct.
4. Turn ignition switch "ON".
5. Select "MANUAL TRIG" and "HI SPEED" in "DATA MONITOR" mode with CONSULT.
6. Select "THRTL/P SEN2" in "DATA MONITOR" mode with CONSULT.
7. Press RECORD on CONSULT SCREEN at the same time close the secondary throttle valve by hand.
8. Print out the recorded data and check the following:
   - The voltage when secondary throttle valve is closed by hand is approximately 0.60 - 1.15V.
   - The voltage decrease is linear in response to secondary throttle valve closing.
   - The voltage when secondary throttle valve is fully opened is approximately 4.3 - 4.7V.

OK → END

OR

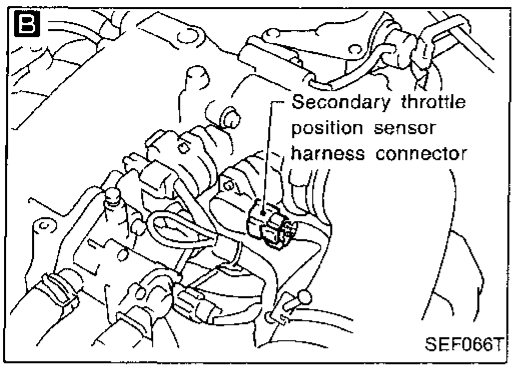
1. Start engine and warm it up sufficiently.
2. Turn ignition switch "OFF" and disconnect throttle motor harness connector.
3. Remove intake air duct.
4. Turn ignition switch "ON".
5. Check the voltage between ECM terminals ㉚ and ㉕ (ground) and check the following:
   - The voltage when secondary throttle valve is closed by hand is approximately 0.60 - 1.15V.
   - The voltage decrease is linear in response to secondary throttle valve closing.
   - The voltage when secondary throttle valve is fully opened is approximately 4.3 - 4.7V.

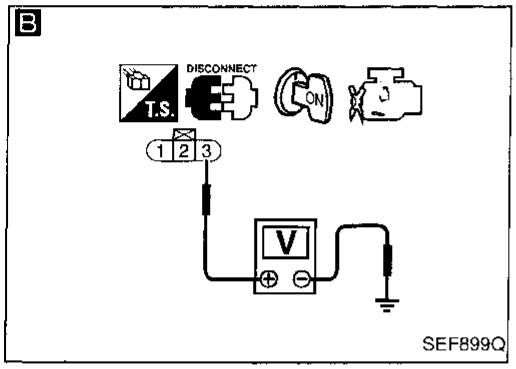
NG

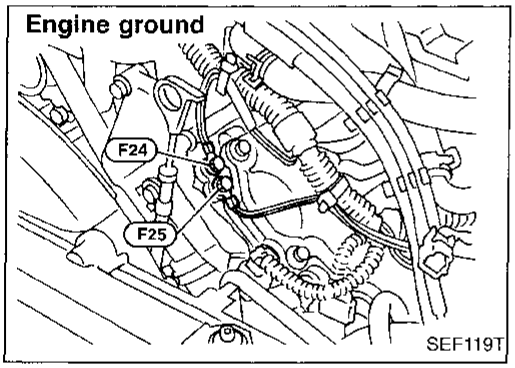
Ⓐ

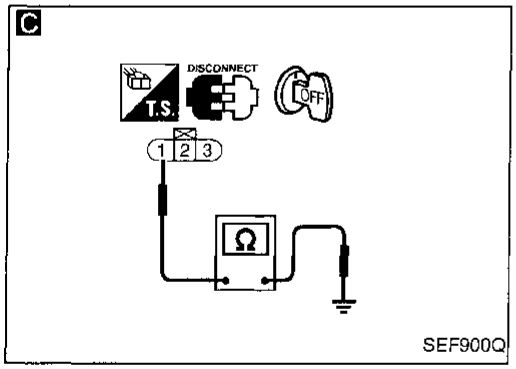
(Go to next page.)

Secondary Throttle Position Sensor (STPS) (Cont'd)









Ⓐ

B

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

NG → Repair harness or connectors.

OK ↓

C

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

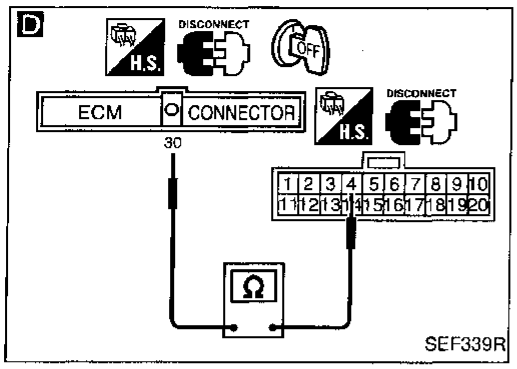
NG → Check the following.
- Harness connectors (F63), (M49)
- Harness connectors (M4), (B3)
- Harness connectors (F62), (F61)
- Joint connector-16
- Harness for open or short between sensor and throttle actuator control (TAC) module
- Harness for open or short between secondary throttle position sensor and ECM
- Harness for open or short between secondary throttle position sensor and A/T control unit

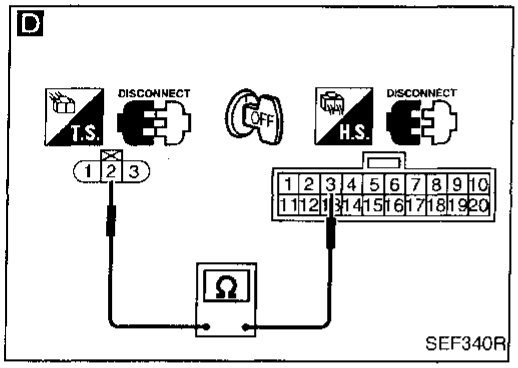
If NG, repair harness or connectors.

OK ↓

Ⓑ
(Go to next page.)

Secondary Throttle Position Sensor (STPS) (Cont'd)





Ⓑ

D

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector and throttle actuator control module harness connector.
2. Check harness continuity between ECM terminal ㉚ and throttle actuator control module terminal ④ , sensor terminal ② and throttle actuator control module terminal ③ .
Continuity should exist.
If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENT
(Secondary throttle position sensor).
Refer to BR section ("Adjustment for Secondary Throttle Position", "TRACTION CONTROL SYSTEM — TCS —").

NG → Replace secondary throttle position sensor. Refer to BR section.

OK ↓

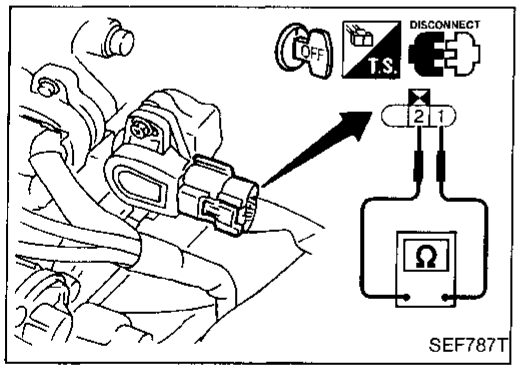
Disconnect and reconnect harness connectors in the circuit. Then retest.

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



COMPONENT INSPECTION

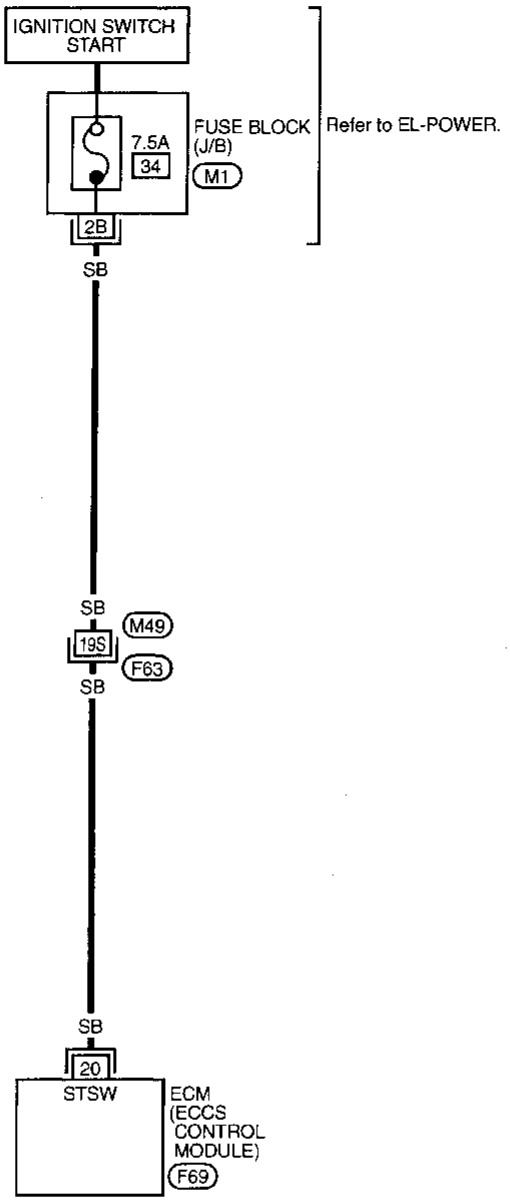
Secondary throttle position sensor

1. Turn ignition switch "OFF".
2. Disconnect secondary throttle position sensor harness connector.
3. Disconnect throttle motor harness connector.
4. Remove intake air duct.
5. Make sure that resistance between terminals ② and ① changes when opening secondary throttle valve manually.

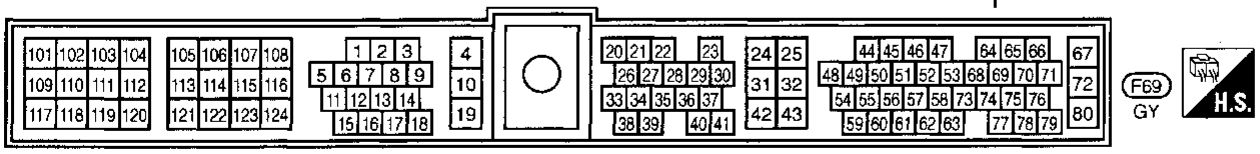
Throttle valve conditions	Resistance at 25°C (77°F)
Completely closed	Approximately 0.6 kΩ
Partially open	0.6 - 4.0 kΩ
Completely open	Approximately 5 kΩ

Start Signal

EC-S/SIG-01



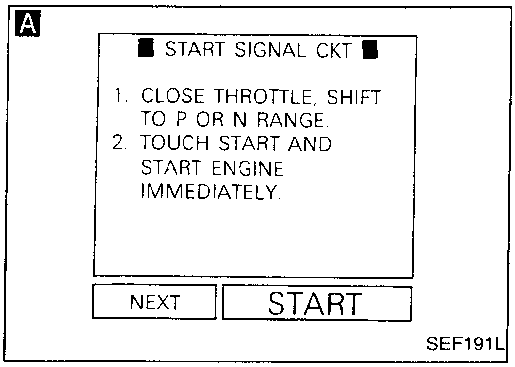
Refer to last page (Foldout page).
M49, F63
M1

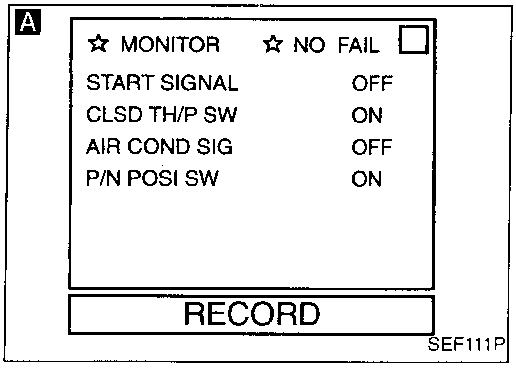


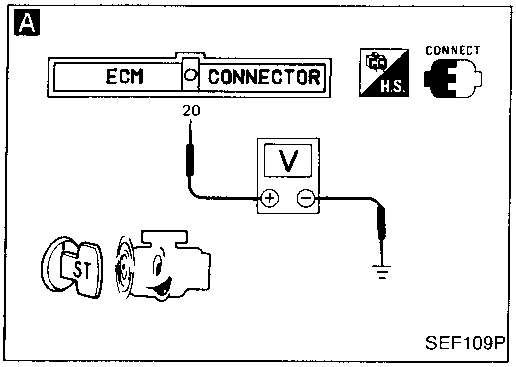
SEF902S

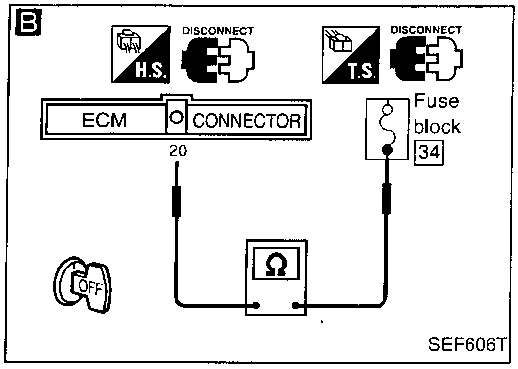
Start Signal (Cont'd)

DIAGNOSTIC PROCEDURE









INSPECTION START

A

CHECK OVERALL FUNCTION.

1. Turn ignition switch "ON".
2. Perform "START SIGNAL CKT" in "FUNCTION TEST" mode with CONSULT.

OK → INSPECTION END

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

NG

Check if 7.5A fuse is OK. → NG → Replace 7.5A fuse.

OK

B

CHECK INPUT SIGNAL CIRCUIT.

1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector and 7.5A fuse.
3. Check harness continuity between ECM terminal ⑳ and fuse block.

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

NG → Check the following.
- Harness connectors (F63), (M49)
- Harness for open or short between ECM and fuse block

If NG, repair harness or connectors.

OK

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

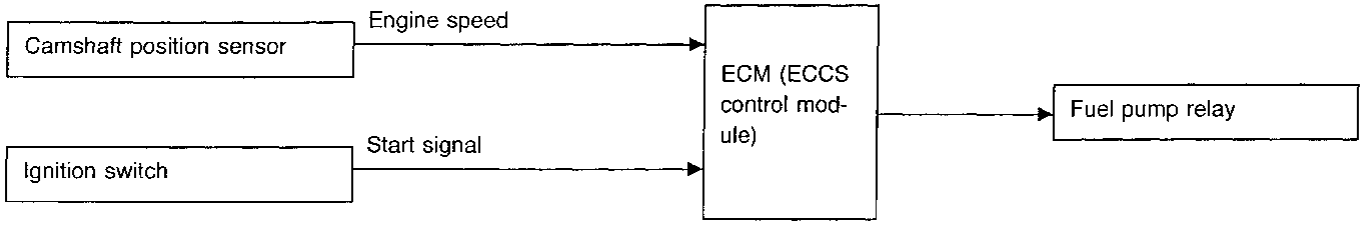
Trouble is not fixed.

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

INSPECTION END

Fuel Pump Control

SYSTEM DESCRIPTION



Fuel pump ON-OFF control

The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine start-up. If the ECM receives a 1° signal from the camshaft position sensor, it knows that the engine is rotating, and causes the pump to activate. If the 1° signal is not received when the ignition switch is ON, the engine stalls. The ECM stops pump operation and prevents the battery from 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 is running and cranking	Operates
When engine is stopped	Stops for 1.5 seconds
Except as shown above	Stops

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	• Ignition switch is turned to ON (Operates for 1 second) • Engine running and cranking	ON
	Except as shown above	OFF

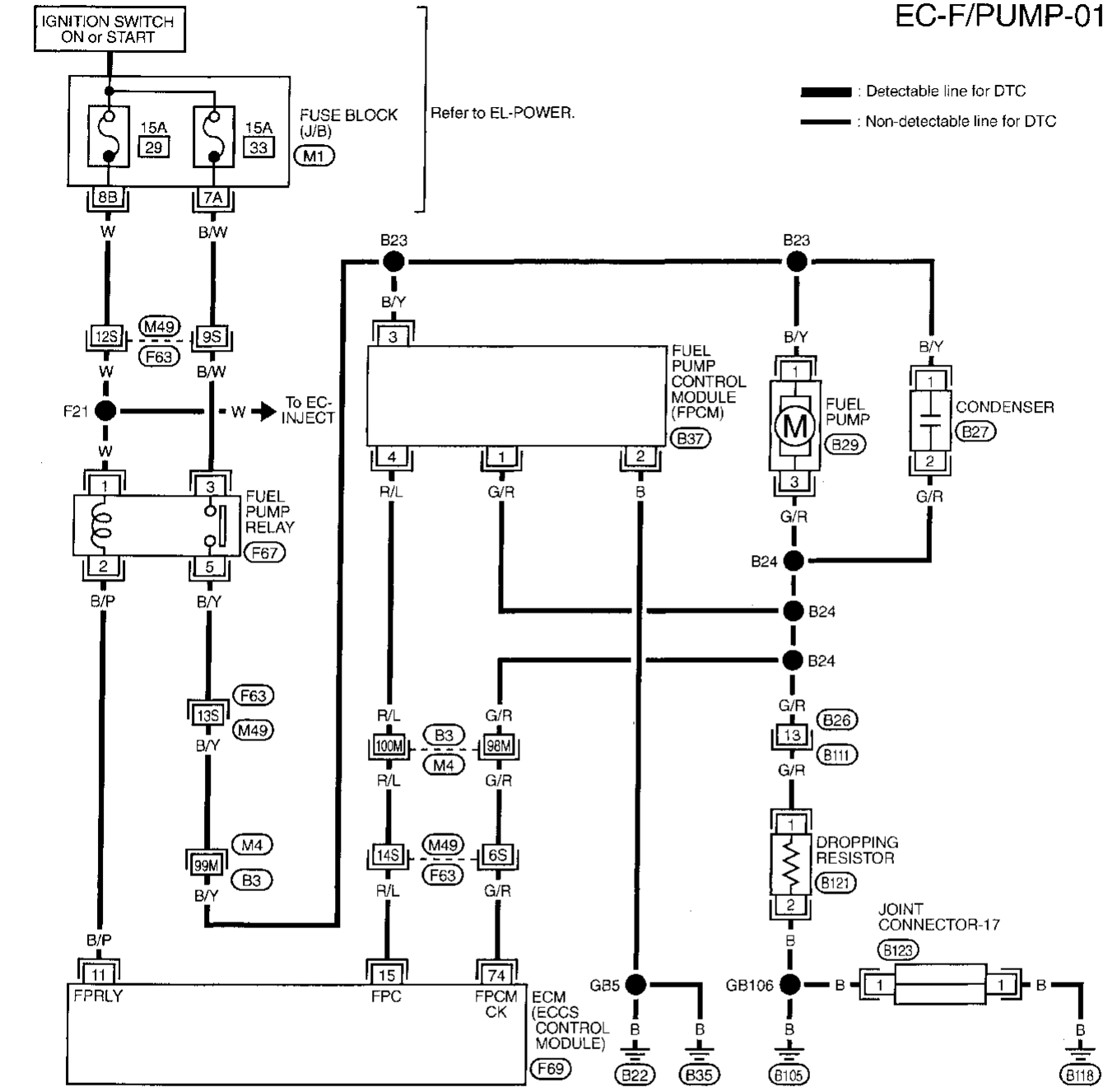
ECM terminals and reference value

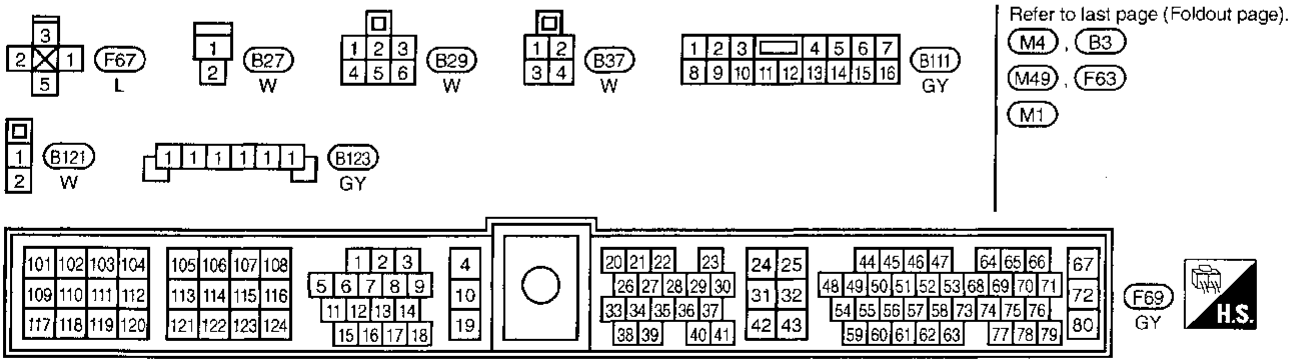
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
11	B/P	Fuel pump relay	Ignition switch "ON" └ For 5 seconds after turning ignition switch "ON" Engine is running.	0 - 1V
			Ignition switch "ON" └ 5 seconds after turning ignition switch "ON"	BATTERY VOLTAGE (11 - 14V)

Fuel Pump Control (Cont'd)

EC-F/PUMP-01



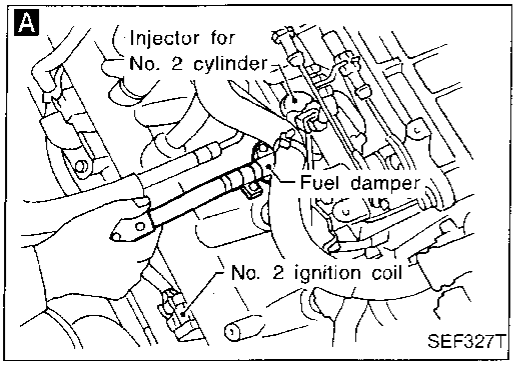


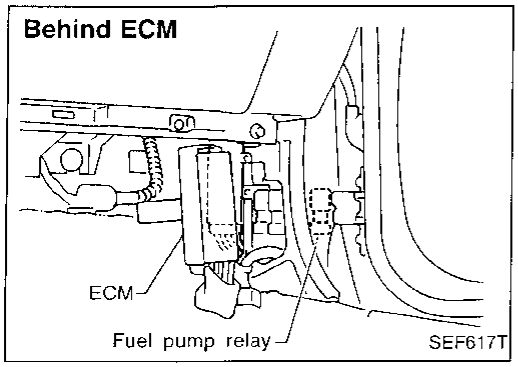
Refer to last page (Foldout page).
M4, B3
M49, F63
M1

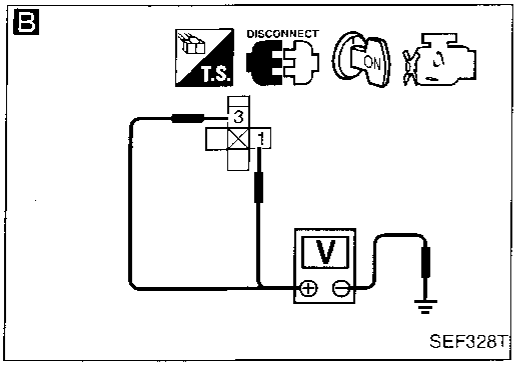
SEF903S

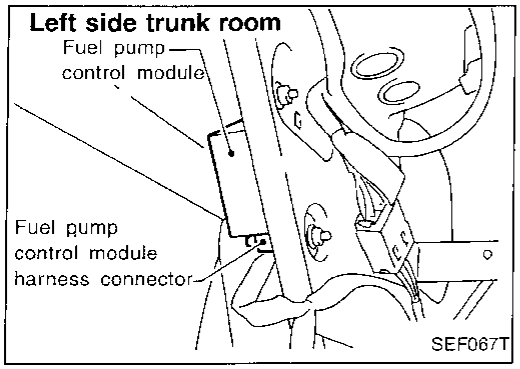
Fuel Pump Control (Cont'd)

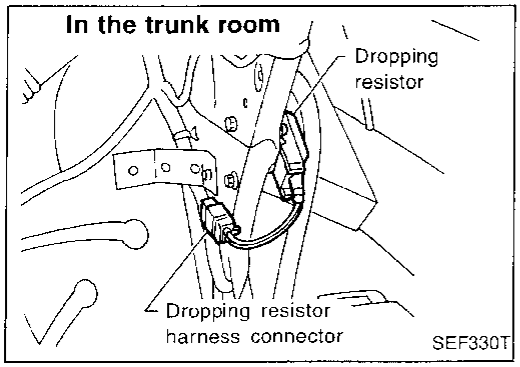
DIAGNOSTIC PROCEDURE











INSPECTION START

A

CHECK OVERALL FUNCTION.
1. Turn ignition switch "ON".
2. Pinch fuel feed hose with fingers.
   Fuel pressure pulsation should be felt on the fuel feed hose for 5 seconds after ignition switch is turned "ON".

OK → INSPECTION END

NG

B

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

NG →
Check the following.
- Harness connectors (F63), (M49)
- 15A fuse
- Harness continuity between fuel pump relay and ignition switch

If NG, repair harness or connectors.

OK

C

CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect fuel pump harness connector and dropping resistor harness connector.
3. Check harness continuity between relay terminal ⑤ and terminal ①, FPCM terminal ③ and terminal ①, terminal ② and body ground.
   Continuity should exist.
   If OK, check harness for short.

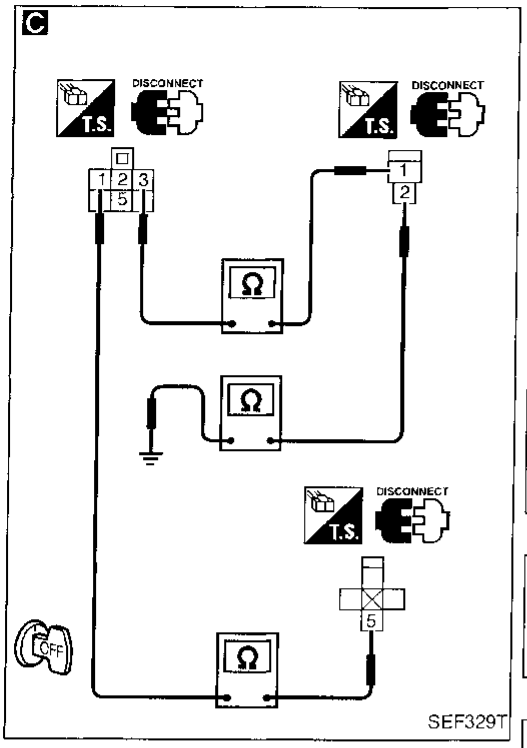
NG →
Check the following.
- Harness connectors (B3), (M4)
- Harness connectors (M49), (F63)
- Harness connectors (B111), (B26)
- Joint connector-17
- Harness for open or short between fuel pump relay and fuel pump
- Harness for open or short between fuel pump and dropping resistor
- Harness for open or short between dropping resistor and body ground

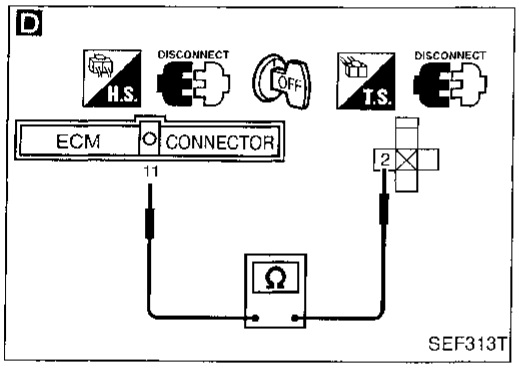
If NG, repair harness or connectors.

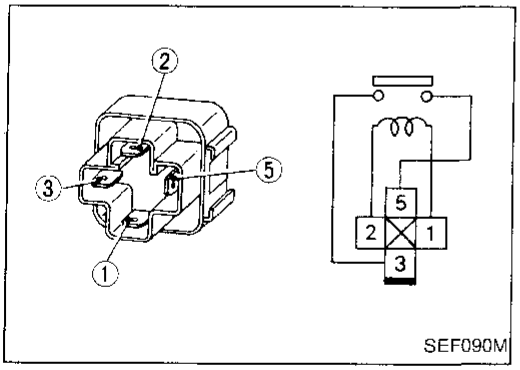
OK

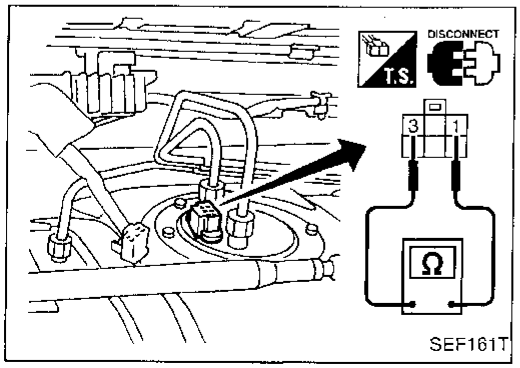
Ⓐ

Fuel Pump Control (Cont'd)









Ⓐ

D

CHECK OUTPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ⑪ and terminal ② .
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (B3) , (M2)
- Harness connectors (M74) , (F23)
- Harness for open or short between fuel pump relay and ECM

If NG, repair harness or connector.

OK ↓

CHECK COMPONENT (Fuel pump relay). Refer to "COMPONENT INSPECTION" below.

NG → Replace fuel pump relay.

OK ↓

CHECK COMPONENT (Fuel pump). Refer to "COMPONENT INSPECTION" below.

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

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

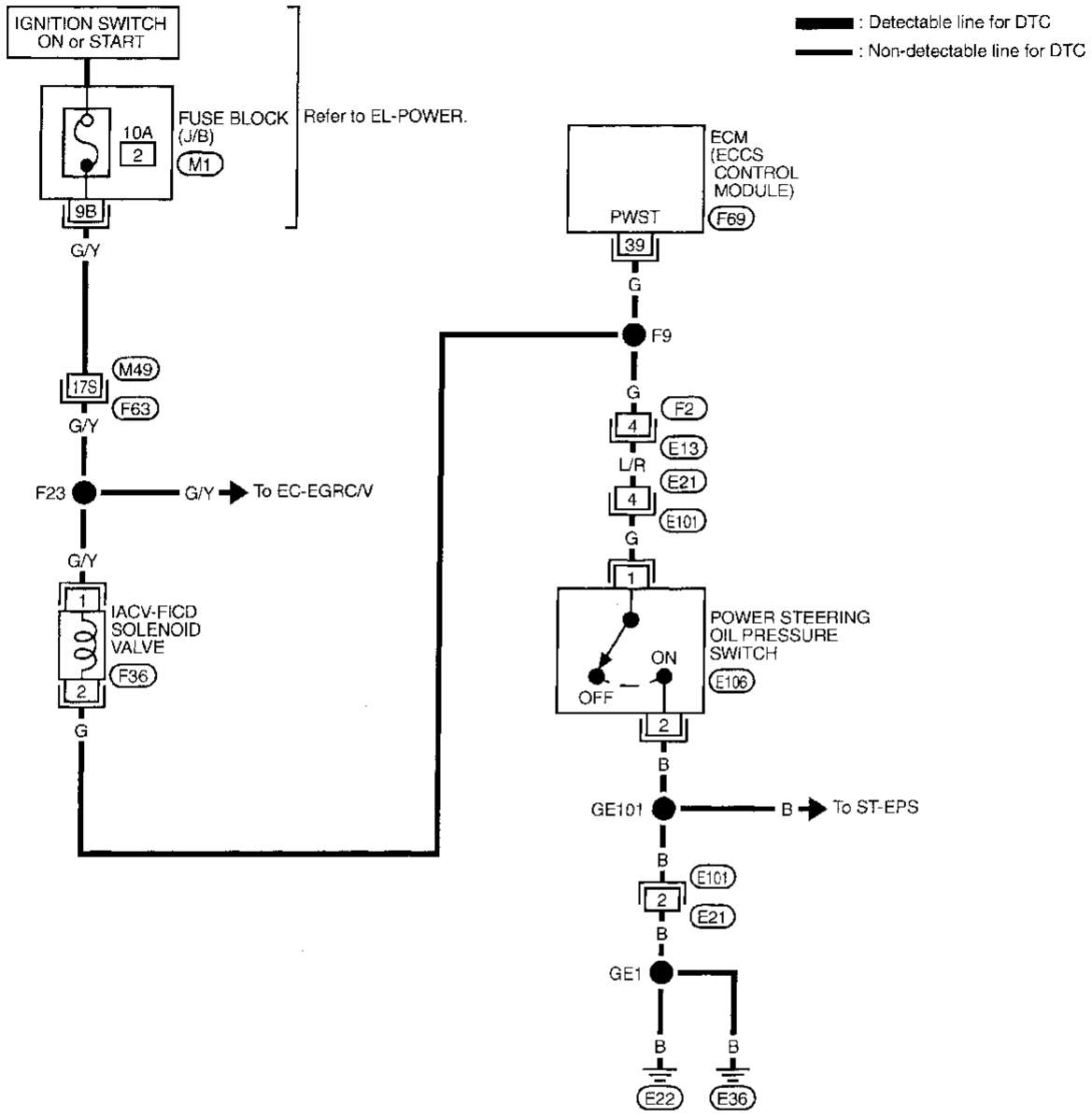
If NG, replace relay.

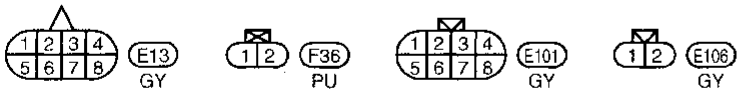
Fuel pump

1. Disconnect fuel pump harness connector.
2. Check resistance between terminals ① and ③ .
   Resistance: 0.2 - 5.0Ω at 25°C (77°F)
   If NG, replace fuel pump.

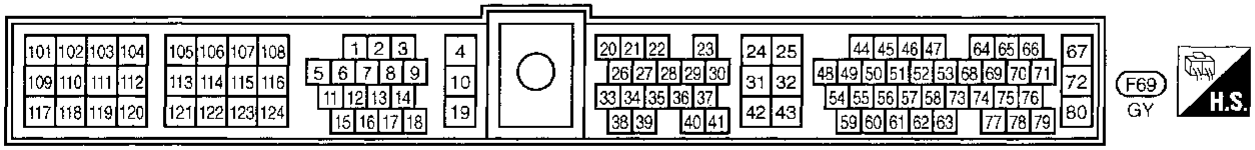
Power Steering Oil Pressure Switch

EC-PST/SW-01



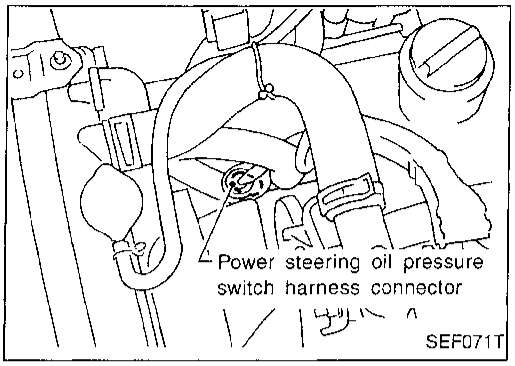


Refer to last page (Foldout page).
M49 , F63
M1



SEF904S

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-FICD solenoid valve to increase the idle speed and adjust for the increased load.

CONSULT reference value in data monitor mode

Remarks: Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel in neutral position (forward direction)	OFF
		The steering wheel is turned	ON

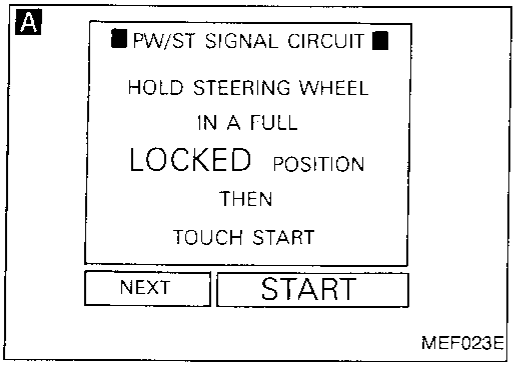
ECM terminals and reference value

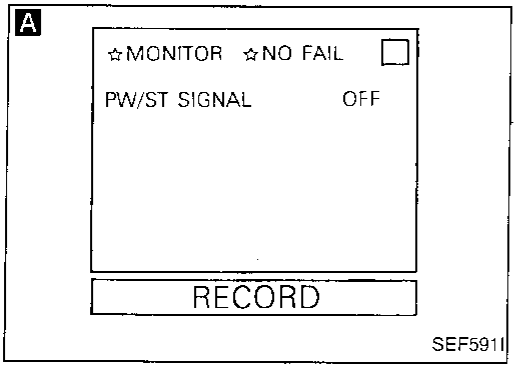
Remarks: Specification data are reference values, and are measured between each terminal and ㉕ (ECCS ground) with a voltmeter.

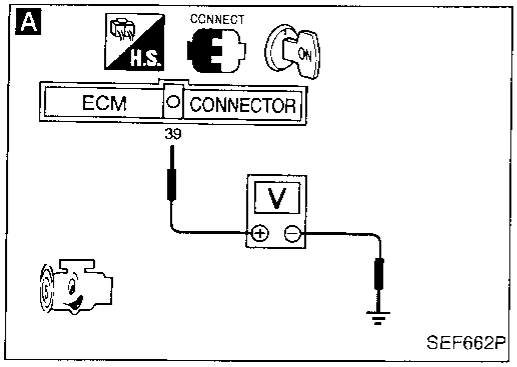
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC voltage)
39	G	Power steering oil pressure switch	Engine is running. └ Steering wheel is being turned.	0 - 1.5V
			Engine is running. └ Steering wheel is not being turned.	BATTERY VOLTAGE (11 - 14V)

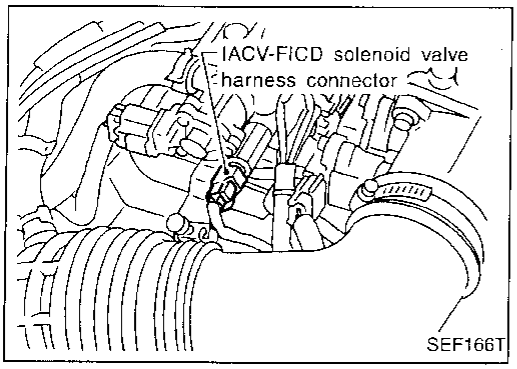
Power Steering Oil Pressure Switch (Cont'd)

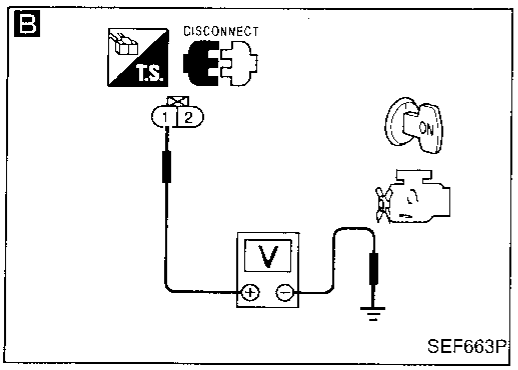
DIAGNOSTIC PROCEDURE











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 neutral position: OFF
Steering is turned: ON

OR

1. Start engine.
2. Check voltage between ECM terminal ㊴ and ground under the following conditions.

Voltage:
When steering wheel is turned quickly.
Approximately 0V
Except above
Battery voltage

OK → INSPECTION END

NG ↓

B

CHECK POWER SUPPLY-I.

1. Stop engine.
2. Disconnect IACV-FICD solenoid valve harness connector.
3. Turn ignition switch "ON".
4. Check voltage between terminal ① and ground with CONSULT or tester.

Voltage: Battery voltage

NG → Check the following.
- Harness connectors (F63), (M49)
- 10A fuse
- Harness for open or short between IACV-FICD solenoid valve and fuse

OK ↓

C

CHECK POWER SUPPLY-II.

1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check voltage terminal ① (or ECM terminal ㊴) and ground.

Voltage: Battery voltage
If OK, check harness for short.

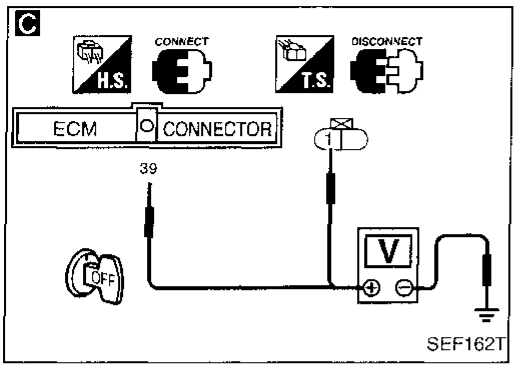
NG → Repair harness or connectors.

OK ↓

Ⓐ

Power Steering Oil Pressure Switch (Cont'd)

C



Ⓐ

D

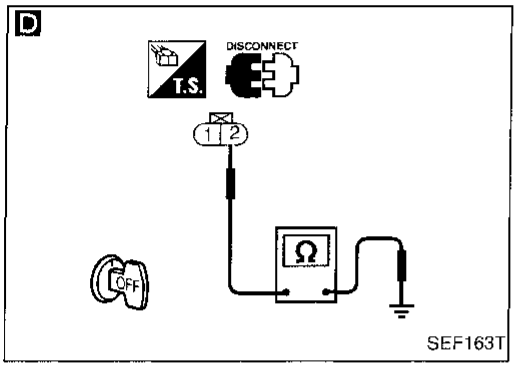
CHECK GROUND CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect power steering oil pressure switch harness connector.
3. Check harness continuity between terminal ② and engine ground.
   Continuity should exist.
   If OK, check harness for short.

NG → Check the following.
- Harness connectors (E101), (E21)
- Harness for open or short between power steering pressure switch and ground

If NG, repair harness or connectors.

OK ↓

D



E

CHECK INPUT SIGNAL CIRCUIT.
1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal ㊴ and terminal ① .
   Continuity should exist.
   If OK, check harness for short.

NG → Repair harness or connectors.

OK ↓

CHECK COMPONENTS
(Power steering oil pressure switch and IACV-FICD solenoid valve).
Refer to "COMPONENT INSPECTION" on next page.

NG → Replace power steering oil pressure switch or IACV-FICD solenoid valve.

OK ↓

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

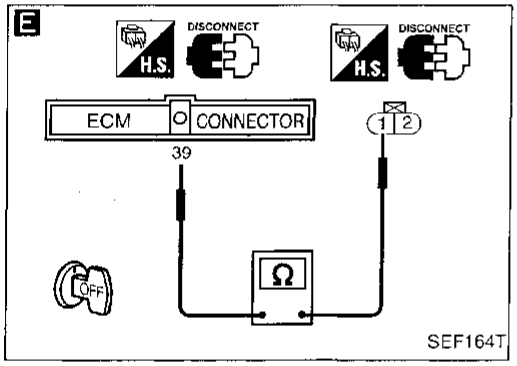
Trouble is not fixed. ↓

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

↓

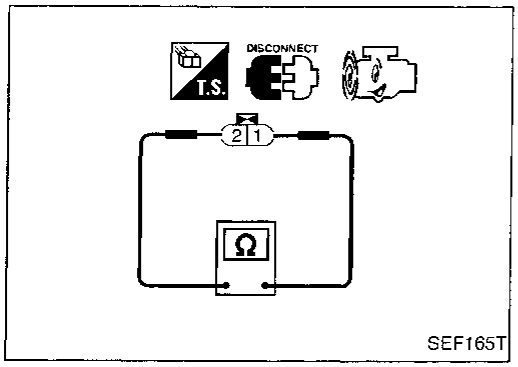
INSPECTION END

E



Power Steering Oil Pressure Switch (Cont'd)

COMPONENT INSPECTION

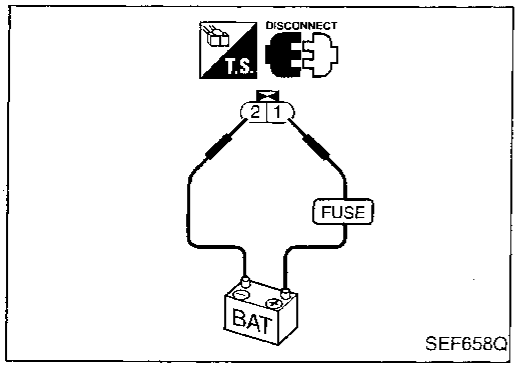


Power steering oil pressure switch

1. Disconnect power steering oil pressure switch harness connector then start engine.
2. Check continuity between terminals ① and ② .

Conditions	Continuity
Steering wheel is being turned	Yes
Steering wheel is not being turned	No

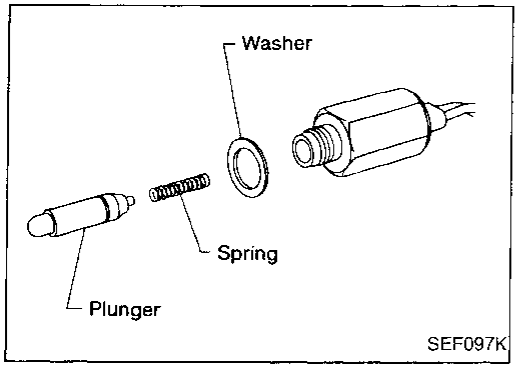
If NG, replace power steering oil pressure switch.



IACV-FICD solenoid valve

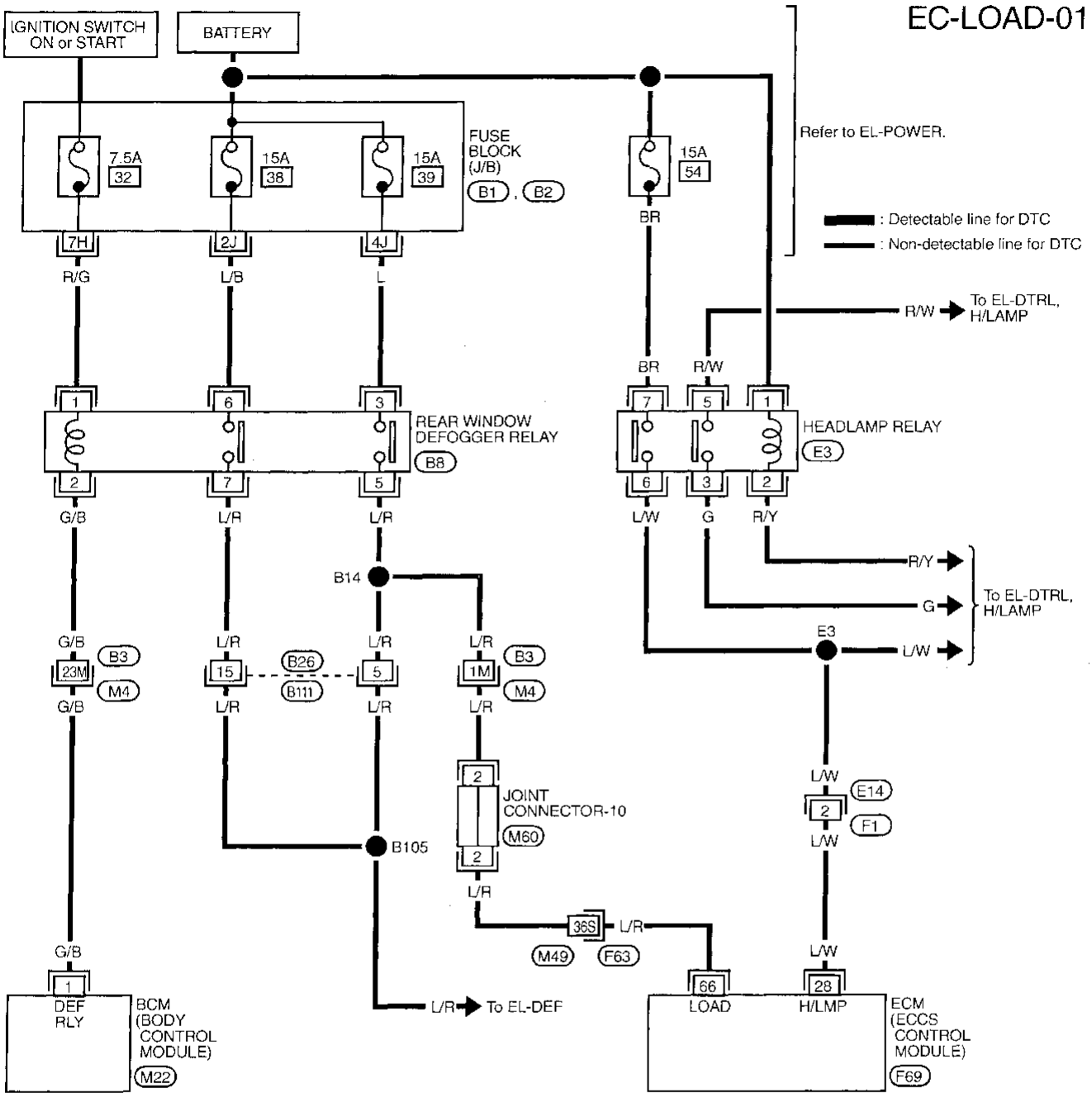
Disconnect IACV-FICD solenoid valve harness connector.

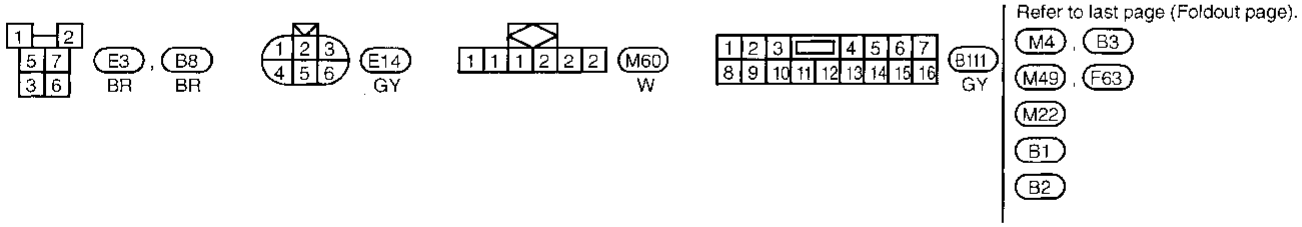
- Check for clicking sound when applying 12V direct current to terminals.

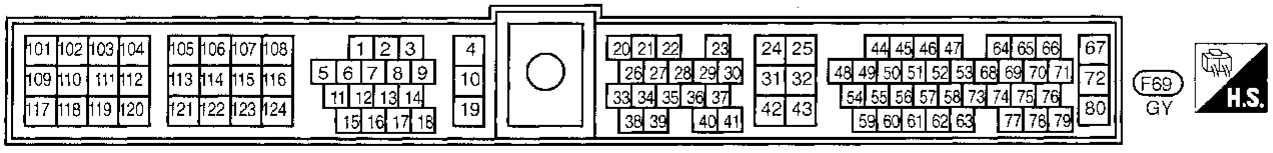


- Check plunger for seizing or sticking.
- Check for broken spring.

Electrical Load Signal

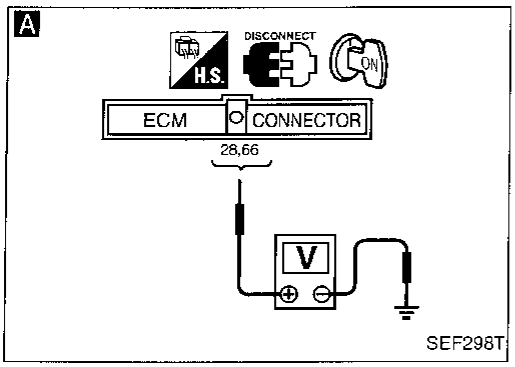


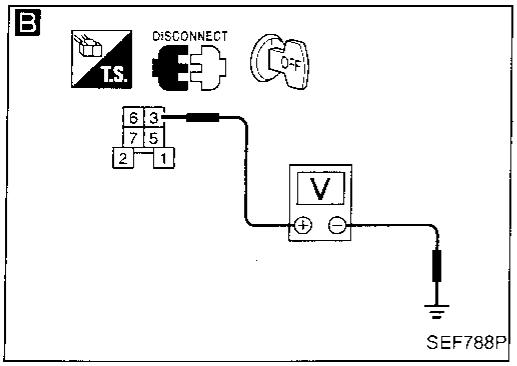


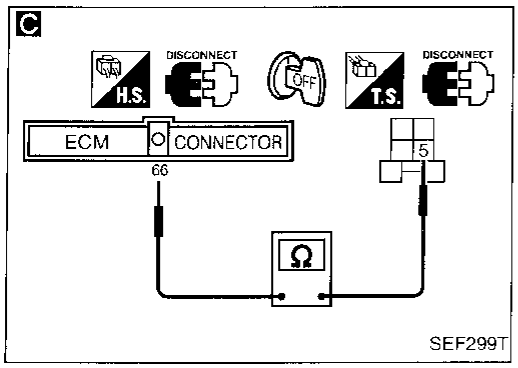


SEF908S

Electrical Load Signal (Cont'd)







DIAGNOSTIC PROCEDURE

INSPECTION START

A

CHECK THE OVERALL FUNCTION.
1. Turn ignition switch "OFF".
2. Disconnect ECM harness connector.
3. Turn ignition switch "ON".
4. Check voltage between ECM terminal ㉘, ㊻ and ground in the following conditions.

Conditions	ECM terminal No.	SW	Voltage (V)
Rear window defogger	㊻	ON	Battery voltage
Headlamp (1st or 2nd)	㉘		
Except the above			0

OK → INSPECTION END

NG

B

CHECK POWER SUPPLY FOR RR/DEF SIGNAL CIRCUIT.
1. Turn ignition switch "OFF".
2. Disconnect rear window defogger relay.
3. Check voltage between terminal ③ and ground.
   Voltage: Battery voltage

NG → Check the following.
- 15A fuse
- Harness for open or short between rear defogger relay and battery

If NG, repair harness or connectors.

OK

C

CHECK INPUT SIGNAL CIRCUIT FOR RR/DEF.
Check harness continuity between ECM terminal ㊻ and terminal ⑤.
Continuity should exist.
If OK, check harness for short.

NG → Check the following.
- Harness connectors (F53), (M49)
- Joint connector-10 (M60)
- Harness connectors (M4), (B3)
- Junction box

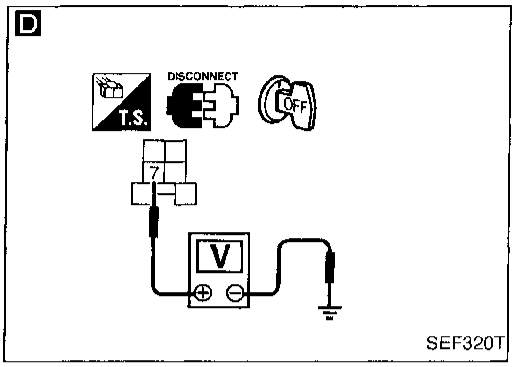
If NG, repair harness or connectors.

OK

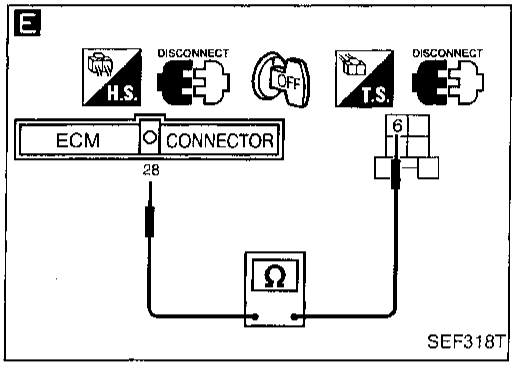
Ⓐ

Electrical Load Signal (Cont'd)

D



E



Ⓐ

D

CHECK POWER SUPPLY FOR HEADLAMP.
1. Turn ignition switch "OFF".
2. Disconnect headlamp relay.
3. Check voltage relay terminal ⑦ and ground.

NG → Check the following.
- 15A fuse
- Harness for open or short between headlamp relay and battery

If NG, repair harness or connectors.

OK ↓

E

CHECK INPUT SIGNAL CIRCUIT FOR HEADLAMP.
Check harness continuity between ECM terminal ㉘ and terminal ⑥.
Continuity should exist.
If OK, check harness for short.

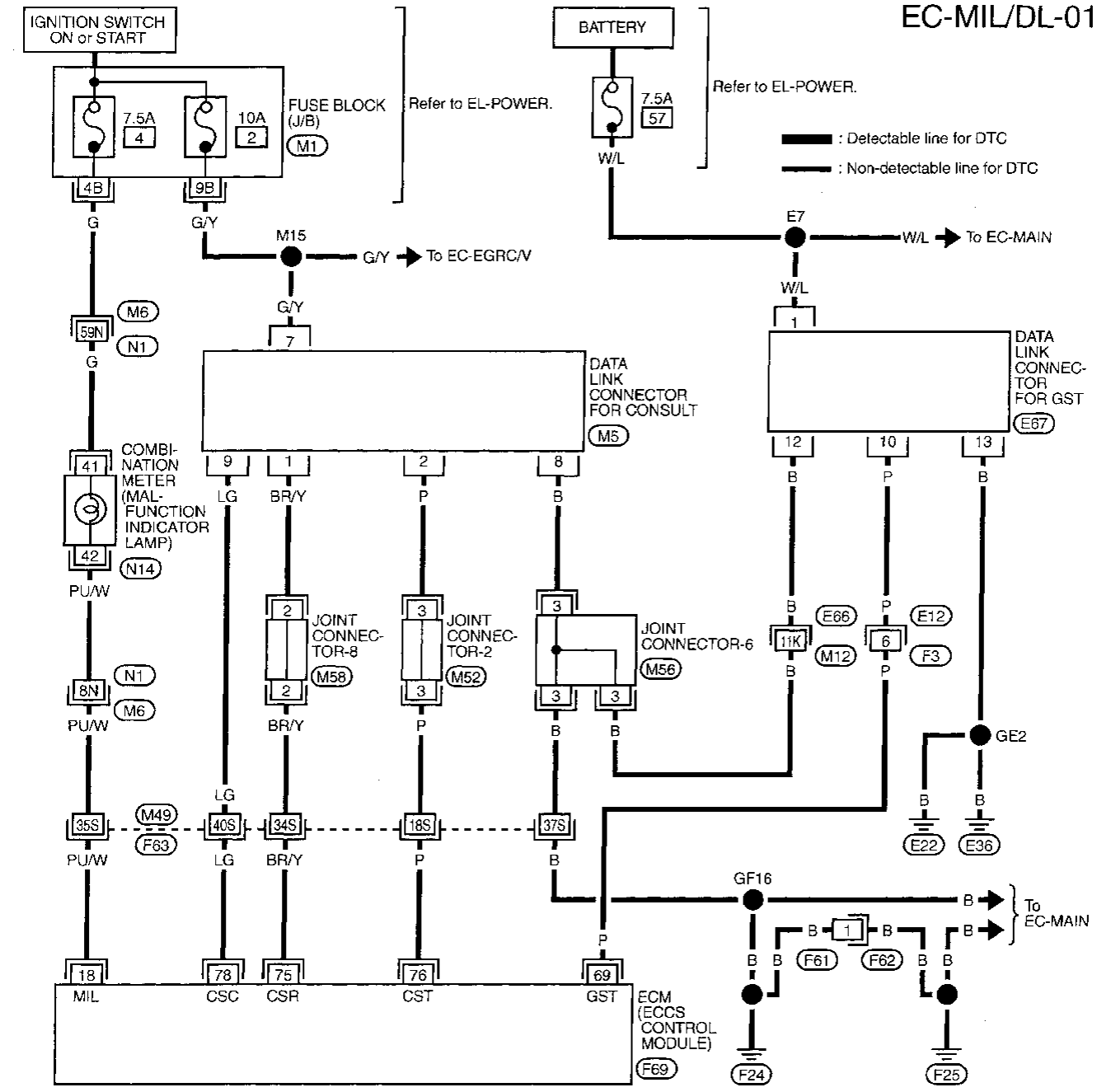
NG → Check the following.
- Harness connectors (F1), (E14)

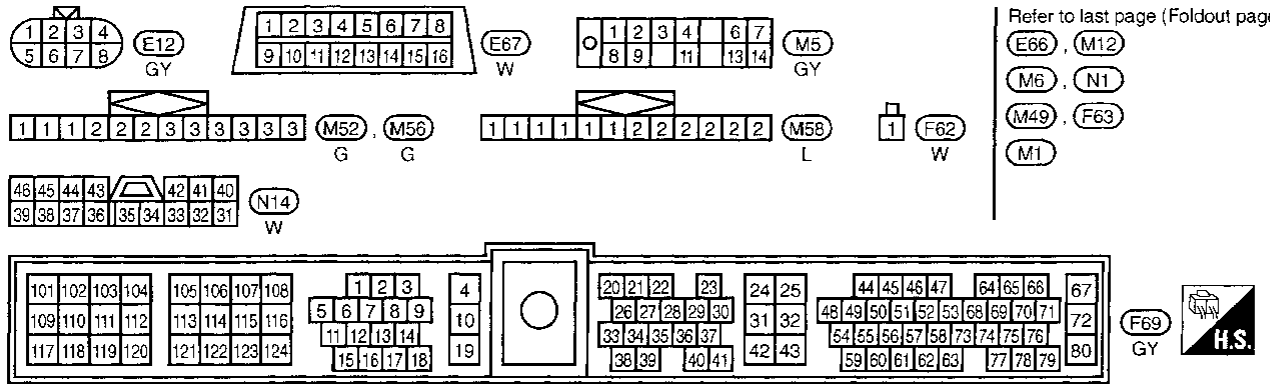
If NG, repair harness or connectors.

OK ↓

INSPECTION END

MIL & Data Link Connectors





Refer to last page (Foldout page).
E66, M12
M6, N1
M49, F63
M1

SEF905S

General Specifications

PRESSURE REGULATOR

Fuel pressure kPa (kg/cm^2, psi)	
At idle	Approximately 235 (2.4, 34)
A few seconds after ignition switch is turned OFF to ON	Approximately 294 (3.0, 43)

Inspection and Adjustment

Idle speed*1 rpm	
No-load*2 (in "N" position)	650±50
Air conditioner: ON (in "N" position)	More than 700 rpm
Ignition timing	15°±2° BTDC

*1: Feedback controlled and needs no adjustments
*2: Under the following conditions:
- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater, fan & rear defogger)

MASS AIR FLOW SENSOR

Supply voltage	V	Battery voltage (11 - 14)
Output voltage	V	1.0 - 1.7 at idle* Approximately 2.1 at 2,500
Mass air flow (Using CONSULT or GST)	g·m/sec	3.0 - 6.0 at idle* 12.9 - 25.3 at 2,500 rpm*

*: Engine is warmed up sufficiently and idling under no-load.

ENGINE COOLANT TEMPERATURE SENSOR

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

EGR TEMPERATURE SENSOR

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

FRONT HEATED OXYGEN SENSOR HEATER

Resistance [at 25°C (77°F)]	Ω	2.3 - 4.3

REAR 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 (Step motor type)

Resistance [at 25°C (77°F)]	Ω	Approximately 30

INJECTOR

Resistance [at 25°C (77°F)]	Ω	10 - 14

THROTTLE POSITION SENSOR

Accelerator pedal conditions	Resistance [at 25°C (77°F)]
Completely released	Approximately 0.5 kΩ
Partially released	0.5 - 4.0 kΩ
Completely depressed	Approximately 4.0 kΩ

CALCULATED LOAD VALUE

	Calculated load value % (Using CONSULT or GST)
At idle	13.0 - 32
At 2,500 rpm	13.0 - 25.5

INTAKE AIR TEMPERATURE SENSOR

Temperature °C (°F)	Resistance
20 (68)	2.1 - 2.9 kΩ
80 (176)	0.68 - 1.00 kΩ

DROPPING RESISTOR

Resistance [at 25°C (77°F)]	Ω	Approximately 0.8

CAMSHAFT POSITION SENSOR (OBD)

Resistance	Ω	166.5 - 203.5 [at 25°C (77°F)]

CRANKSHAFT POSITION SENSOR (REF)

Resistance [at 25°C (77°F)]	Ω	470 - 570

INTAKE VALVE TIMING CONTROL POSITION SENSOR

Resistance [at 25°C (77°F)]	Ω	730 - 890